

BS 7883:2019



BSI Standards Publication

**Personal fall protection equipment –
Anchor systems – System design,
installation and inspection –
Code of practice**

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Summary of pages

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 November 2019. It was prepared by Technical Committee PH/5, *Personal Fall Protection*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

BS 7883:2019 supersedes [BS 7883:2005](#), which is withdrawn.

Relationship with other publications

This British Standard is intended to complement [BS 8610](#), BS EN 795, PD CEN/TS 16415 by recommending good practice as followed by competent practitioners for installing and maintaining products conforming to those standards.

Information about this document

This British Standard provides information relating to anchor systems and recommendations for installation and use in conjunction with personal fall protection equipment for protection against falls from a height.

This revision of BS 7883 gives recommendations additional to those in the previous edition for system design, installation and inspection of anchor systems, including:

- a) the role of the system designer is introduced;
- b) applications and product types have been introduced, based on [BS 8610](#);
- c) recommendations have been introduced for:
 - 1) documentation, including the system technical file;
 - 2) configurations in use, in particular rope access;
 - 3) positioning;
 - 4) proof test loads; and
 - 5) the inspection of previously installed anchor systems.

Use of this document

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

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

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

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”. This British Standard includes examples which are illustrative and not a definitive list.

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

Contractual and legal considerations

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

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

Particular attention is drawn to the following specific regulations:

- The Work at Height Regulations 2005 (as amended) [1].
- The Construction (Design and Management) Regulations 2015 (CDM) [2].
- The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) [3].
- The Provision and Use of Work Equipment Regulations 1998 (PUWER) [4].
- The Workplace (Health, Safety and Welfare) Regulations 1992 [5].

0 Introduction

The dangers of working at height are not always apparent. Engineered controls have to be devised to protect persons working at height against the effects of gravity, i.e. falls from a height. Anchor systems are an essential part of such controls.

This British Standard is intended to guide system designers, installers, inspectors, duty holders, rescuers and users of anchor systems for fall protection in their safe use and relates primarily to anchor systems conforming to [BS 8610](#) (see [Table 1](#) and [Table 2](#)) and anchor devices conforming to BS EN 795 and PD CEN/TS 16415 (see [Table 3](#)).

For clarification, [BS 8610](#) specifies the type testing of anchor systems comprising the anchor device, the structural anchor and the base material for the following applications (single and multi-user):

- a) restraint;
- b) fall arrest;
- c) rope access;
- d) work positioning;
- e) rescue; and
- f) evacuation.

The test requirements within BS EN 795 are restricted to single user, fall arrest only and do not necessarily cover the structural anchor(s) and/or base material.

NOTE PD CEN/TS 16415 specifies requirements for multiple users, fall arrest only.

Table 1 — Non-load-limiting anchor system options and codification in accordance with BS 8610:2017, Table 1

Type	Application code	Application use
A – e.g. eyebolt ^{A)} /post	1	Restraint
	2	Fall arrest
	3	Rope access and work positioning
	4	Rescue – accompanied descent
	5	Rescue – remotely or self-operated – direct attachment
	6	Rescue – remotely operated – redirect attachment
	7	Evacuation
C – e.g. flexible horizontal anchor line	1	Restraint
	2	Fall arrest
	5	Rescue – remotely or self-operated – direct attachment
D – e.g. rigid horizontal anchor line	1	Restraint
	2	Fall arrest
	3	Rope access and work positioning
	4	Rescue – accompanied descent
	5	Rescue – remotely or self-operated – direct attachment
	6	Rescue – remotely operated – redirect attachment
	7	Evacuation

^{A)} As an example of codification, an eyebolt for fall arrest – non-load-limiting would be type A2.

NOTE Class A1 anchor devices that conform to BS EN 795:1997 are not the same as type A1 anchor systems (for restraint) that conform to [BS 8610](#).

Table 2 — Load-limiting anchor system options and codification in accordance with BS 8610:2017, Table 2

Type	Application code	Application use	Load-limiting
A – e.g. eyebolt ^{A)} /post	1	Restraint	L
	2	Fall arrest	L
	5	Rescue – remotely or self-operated – direct attachment	L
C – e.g. flexible horizontal anchor line	1	Restraint	L
	2	Fall arrest	L
	5	Rescue – remotely or self-operated – direct attachment	L

^{A)} As an example of codification, an eyebolt for restraint – load-limiting would be type A1L.

Table 3 — Anchor devices in accordance with BS EN 795:2012 and PD CEN/TS 16415:2013

Type	Application code	Application use
A – e.g. eyebolt/post	—	Suitable for multiple applications as specified in the information supplied by the manufacturer
B – anchor device without structural anchor	—	Suitable for multiple applications as specified in the information supplied by the manufacturer
C – horizontal flexible anchor line	—	Suitable for multiple applications as specified in the information supplied by the manufacturer
D – horizontal rigid anchor line	—	Suitable for multiple applications as specified in the information supplied by the manufacturer
E – anchor device relying on mass and friction	—	Suitable for multiple applications as specified in the information supplied by the manufacturer

NOTE 1 BS EN 795 and PD CEN/TS 16415 do not have a coding system for application and cover non-load-limiting and load-limiting anchor devices.

NOTE 2 For clarification, BS EN 795 and PD CEN/TS 16415 cover only anchor devices and not the structural anchor or the base material.

Section 1: General

1 Scope

This British Standard gives recommendations for the system design, installation, use, maintenance and inspection of anchor systems incorporating anchor devices conforming to BS EN 795, PD CEN/TS 16415 and/or anchor systems conforming to [BS 8610](#).

This British Standard also gives recommendations for the inspection of anchor systems installed prior to this edition of the British Standard.

NOTE 1 Anchor systems installed prior to this edition of the British Standard, but which have been inspected in accordance with [Section 4](#), can only be certified as meeting the inspection recommendations of [Section 4](#). The inspector can only claim that the anchor system conforms to the British Standard to which it was originally installed, e.g. "the anchor system was installed in accordance with [BS 7883:2005](#) and the inspection has been carried out in accordance with BS 7883:2019, Section 4".

This British Standard is only applicable to anchor systems for the direct attachment of PFPE for use in the workplace.

This British Standard is not applicable to:

- a) the lifting of equipment;
- b) anchor points comprising holes formed in the base material for the direct attachment of personal fall protection equipment (PFPE), e.g. hole drilled through steel girder;
- c) anchor points formed by the welded attachment of bars or plates to steel structures for the direct attachment of the PFPE, e.g. loops of steel bar or flat plates incorporating a hole, welded to a steel structure, unless:
 - 1) such anchor points form part of a manufactured product which has been successfully tested in accordance with [BS 8610](#); or
 - 2) the manufacturer, installer or inspector of such anchor points can demonstrate that the anchor point conforms to all relevant requirements of [BS 8610](#), BS EN 795 or PD CEN/TS 16415, in which case the documentation certifying conformity to [BS 8610](#), BS EN 795 or PD CEN/TS 16415 becomes part of the documentation provided to the duty holder;
- d) anchor systems for attachment of collective protection systems, e.g. work positioning platforms and fall arrest nets; and
- e) personal fall protection systems (PFPS) and equipment for use in leisure activities or in professional and private sports activities.

This British Standard is intended for use by system designers, installers, inspectors and users of anchor systems, including other interested parties, e.g. architects and structural engineers, and those who are responsible for the design of safe access and egress on buildings and structures.

NOTE 2 Advice on the selection, use and maintenance of PFPS and equipment for use in the workplace is given in [BS 8437](#) and recommendations and guidance on the use of rope access methods for industrial purposes are given in [BS 7985](#).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies¹. For undated references, the latest edition of the referenced document (including any amendments) applies.

[BS 7985:2013](#), *Code of practice for the use of rope access methods for industrial purposes*

[BS 8213-1:2004](#), *Windows, doors and rooflights — Part 1: Design for safety in use and during cleaning of windows, including door-height windows and roof windows — Code of practice*

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

[BS 8539](#), *Code of practice for the selection and installation of post-installed anchors in concrete and masonry*

[BS 8610](#), *Personal fall protection equipment — Anchor systems — Specification*

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

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

BS ISO 22846 (all parts), *Personal equipment for protection against falls — Rope access systems*

PD CEN/TS 16415, *Personal fall protection equipment — Anchor devices — Recommendations for anchor devices for use by more than one person simultaneously*

3 Terms and definitions

3.1 anchor device

element or series of elements incorporating an anchor point or anchor points, providing the interface between the anchor point(s) and the structure or base material

NOTE An anchor device can be a type B or type E anchor system when installed on the structure or part of a type A, type C or type D anchor system when connected to the base material.

3.2 anchor point

point on an anchor system for the attachment of PFPE

NOTE An anchor point can be fixed or guided to follow the user.

[SOURCE: BS 8610:2017, 3.2, modified]

3.3 anchor systems

3.3.1 anchor system

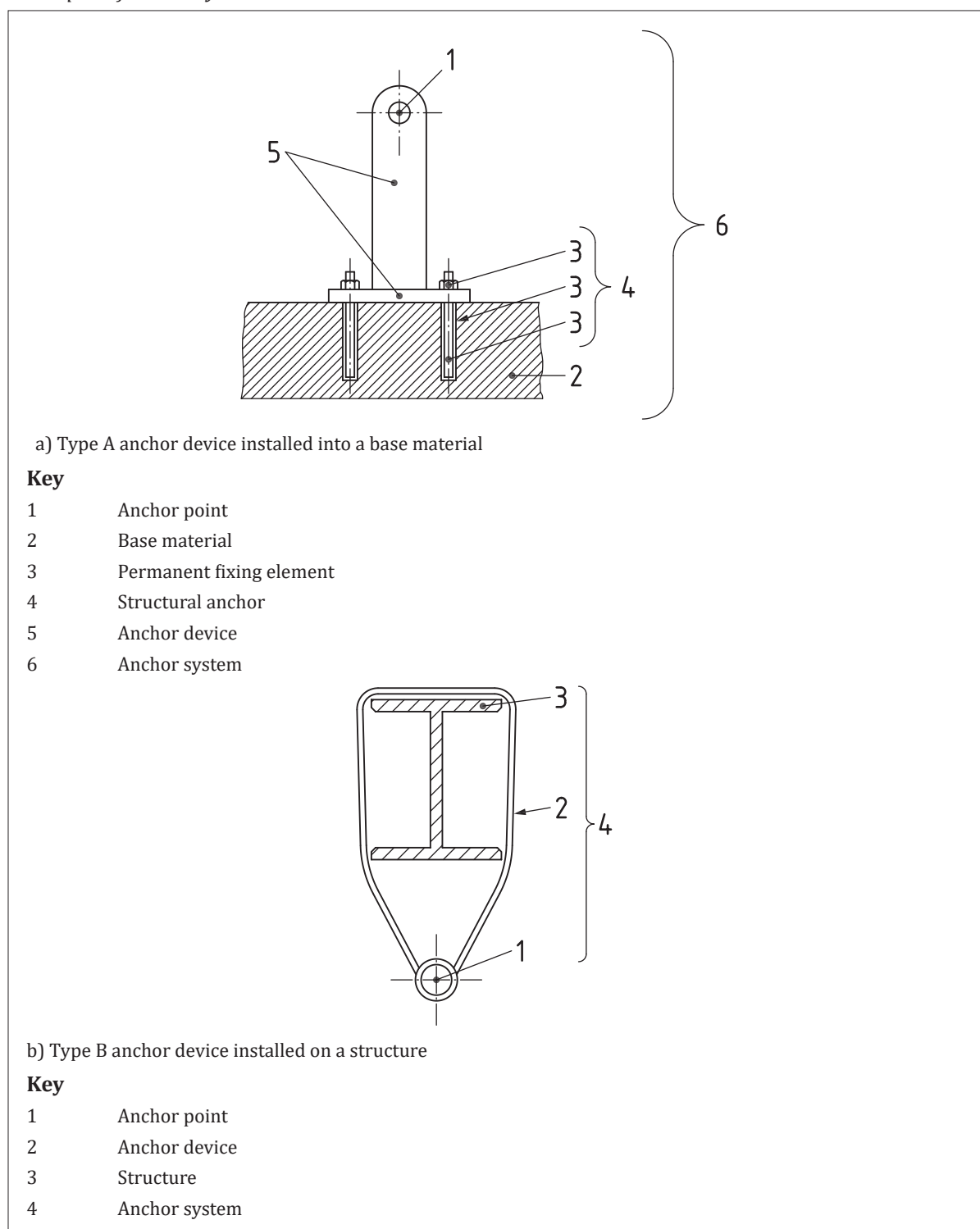
system incorporating an anchor device (which can be load-limiting or non-load-limiting), when installed on the structure (type B and type E) or connected to the base material by a structural anchor(s) (type A, type C and type D)

NOTE 1 For examples of anchor systems, see [Figure 1](#).

NOTE 2 BS EN 795 and PD CEN/TS 16415 only cover anchor devices and not the structural anchor or the base material.

NOTE 3 Type B and type E anchor devices, when combined with the structure, become an anchor system, e.g. wire strop around steel beam, tripod on concrete floor, deadweight anchor on flat roof [see [Figure 1b](#)].

¹ Documents that are referred to solely in an informative manner are listed in the Bibliography.

Figure 1 — Examples of anchor systems

3.3.2 type A anchor system

anchor system incorporating one or more non-travelling anchor points

NOTE 1 See [Figure 2](#), [Figure 3](#) and [Figure 4](#).

NOTE 2 Anchor points or elements of the anchor device can rotate or swivel when in use where designed to do so.

NOTE 3 Anti-pendulum and deviation anchor devices are considered to be type A anchor systems.

[SOURCE: BS 8610:2017, 3.3.2]

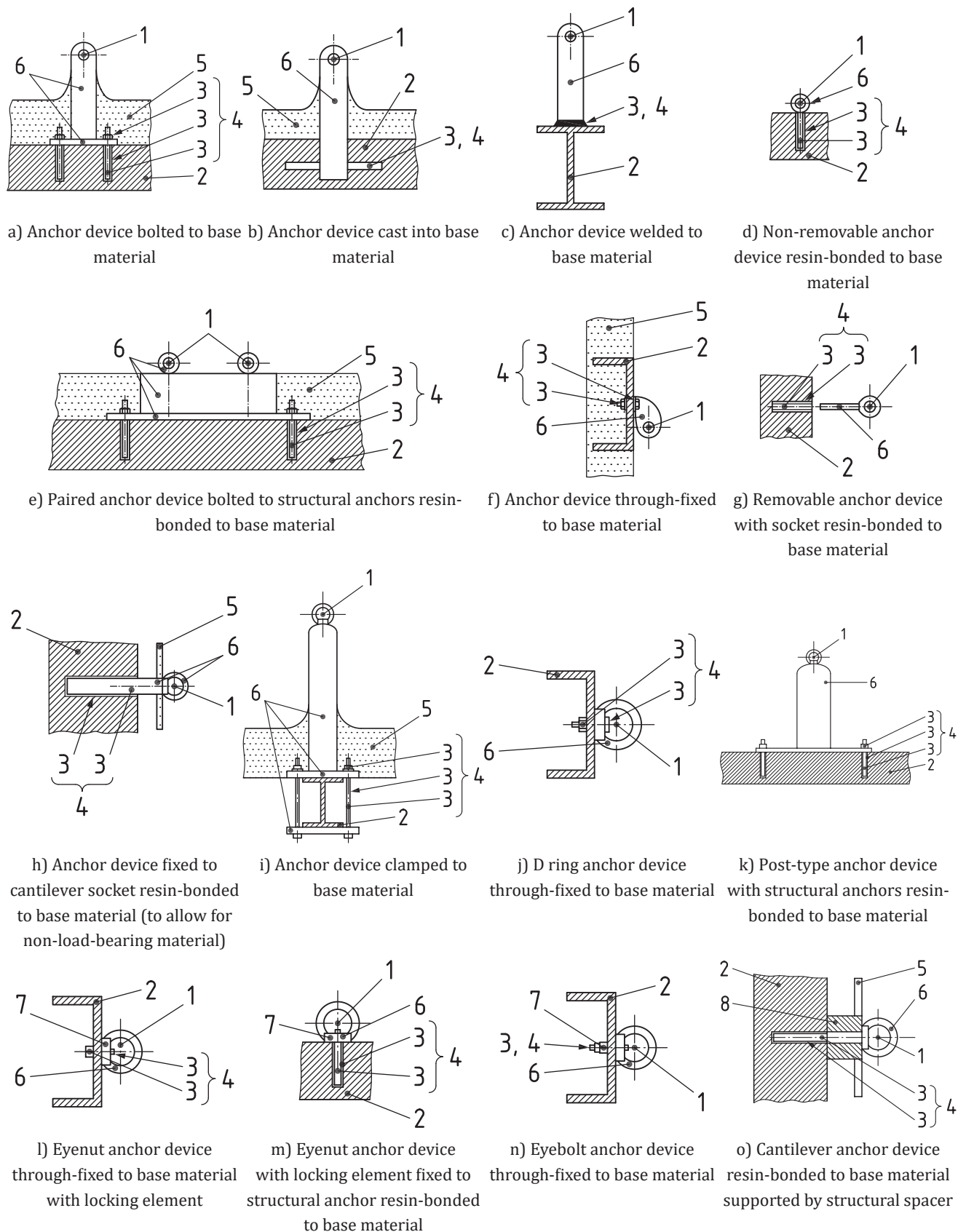
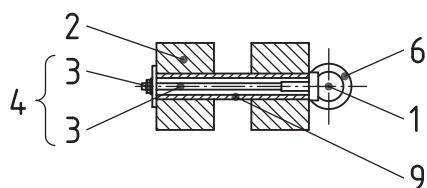
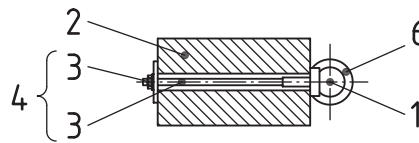
Figure 2 — Examples of type A non-load-limiting anchor systems

Figure 2 (continued)

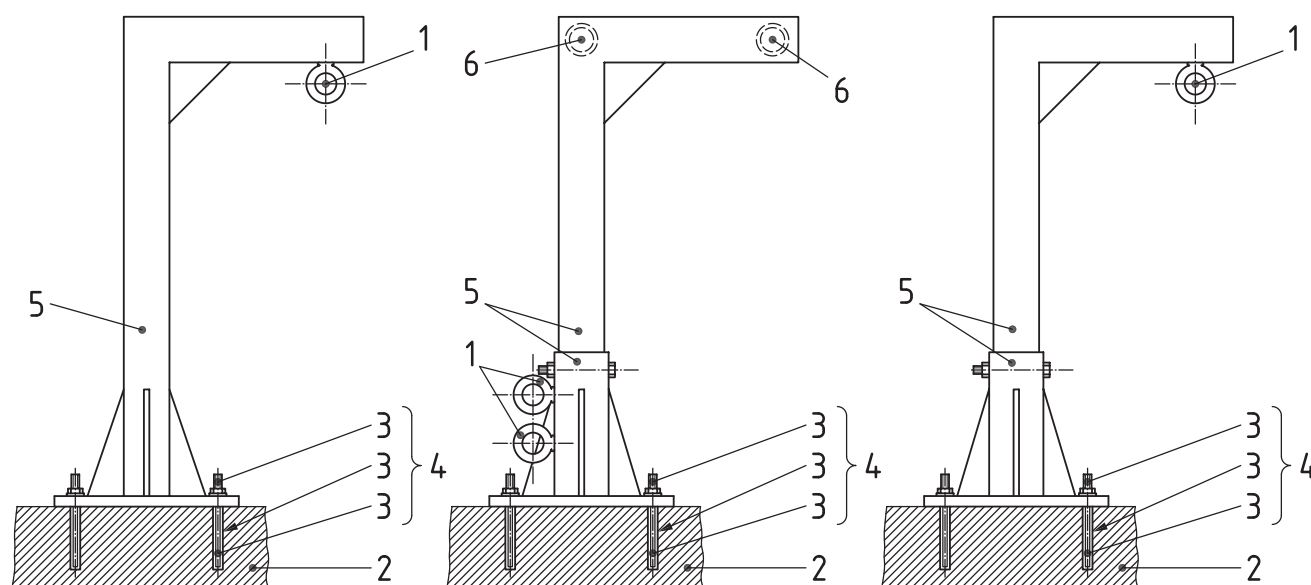
p) Through-fixed eyebolt anchor device with anti-compression tube in cavity or hollow-type construction



q) Through-fixed eyebolt anchor device without anti-compression tube in solid-type construction

Key

- | | |
|---|--|
| 1 | Anchor point(s) |
| 2 | Base material |
| 3 | Permanent fixing element |
| 4 | Structural anchor |
| 5 | Non-load-bearing material, e.g. insulation, plasterboard, weather proofing materials |
| 6 | Anchor device |
| 7 | Locking element, e.g. split pin, roll pin, half nut, castellated nut |
| 8 | Structural spacer |
| 9 | Anti-compression tube |

Figure 3 — Examples of type A davit-type anchor systems

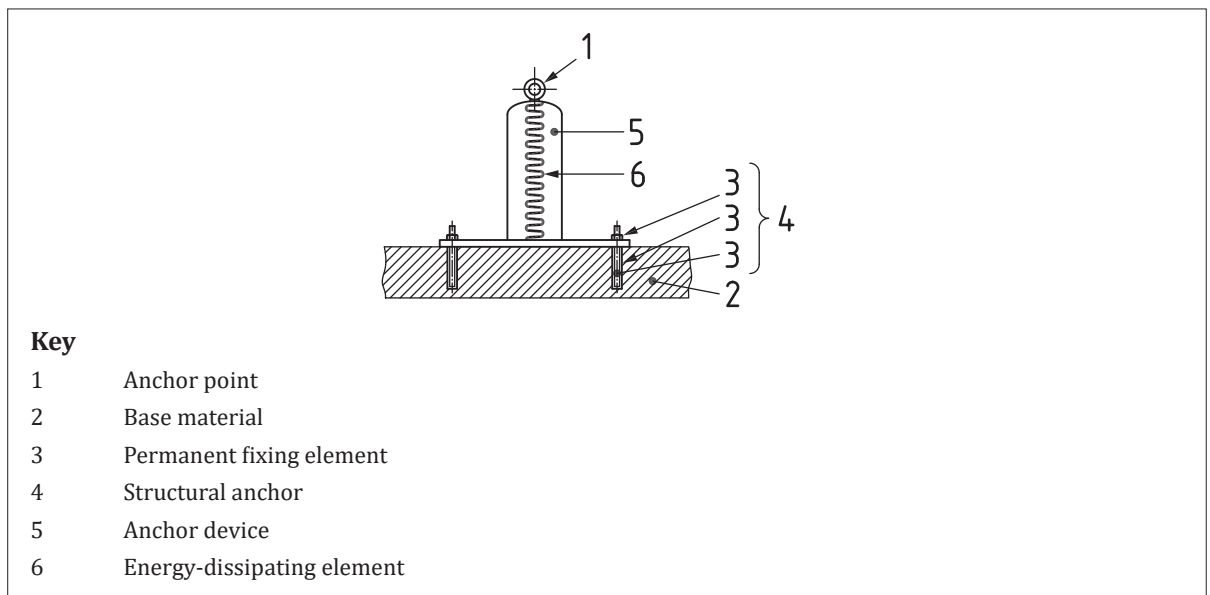
a) Anchor device with non-removable arm, bolted to base material with an anchor point on an arm

b) Anchor device with removable arm, bolted to base material with anchor points on the base

c) Anchor device with removable arm, bolted to base material with an anchor point on an arm

Key

- | | |
|---|--------------------------|
| 1 | Anchor point(s) |
| 2 | Base material |
| 3 | Permanent fixing element |
| 4 | Structural anchor |
| 5 | Anchor device |
| 6 | Re-direct pulleys |

Figure 4 — Example of a type A load-limiting anchor system

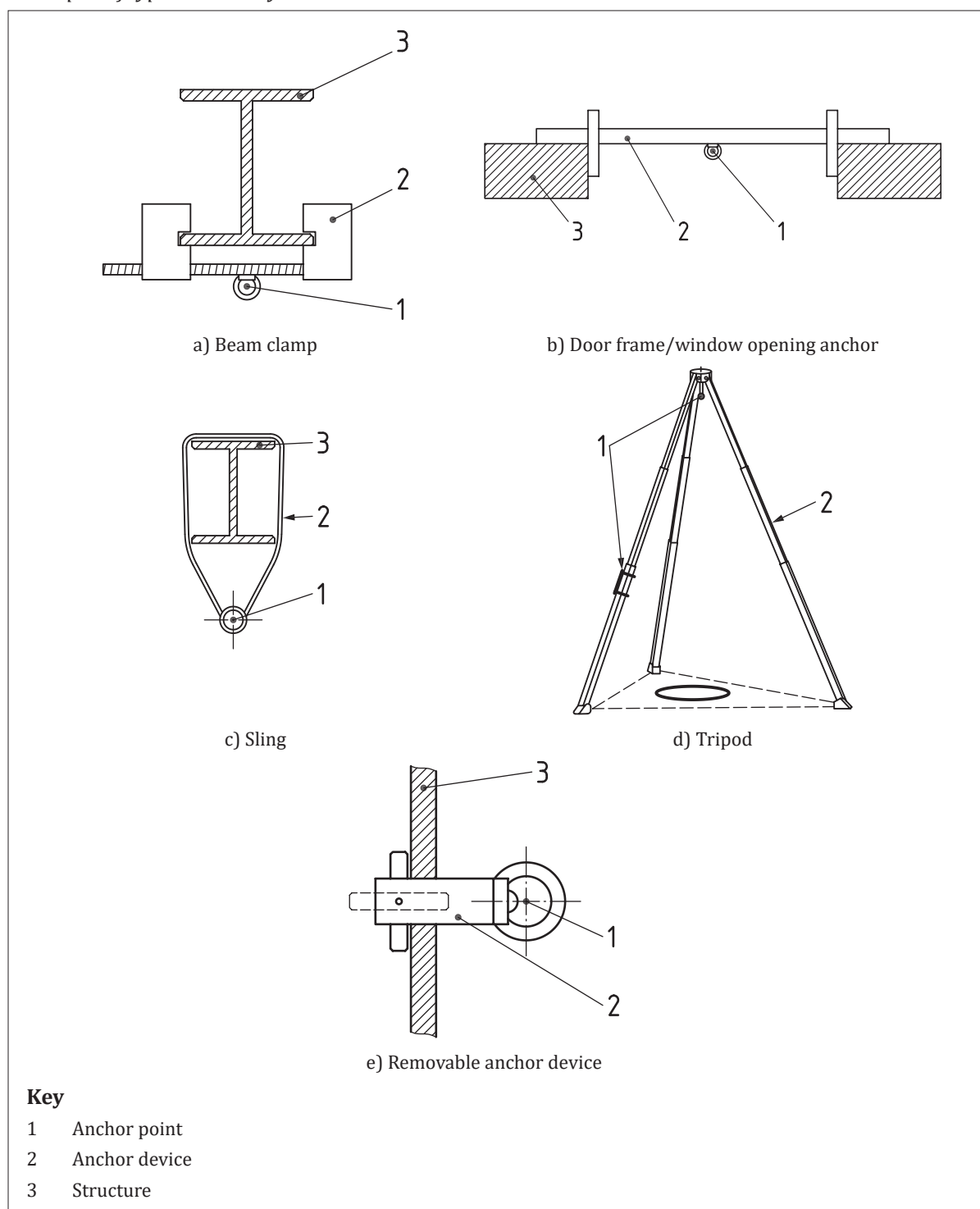
3.3.3 type B anchor system

anchor device with one or more anchor points, which are located on, through or around the structure, without the need for a structural anchor(s) or fixing element(s)

NOTE 1 See [Figure 5](#).

NOTE 2 Type B anchor devices are not permanently fixed to the structure. They are removable and transportable, allowing the user to relocate their anchor point.

NOTE 3 Anchor points or elements of the anchor device can rotate or swivel when in use where designed to do so.

Figure 5 — Examples of type B anchor systems

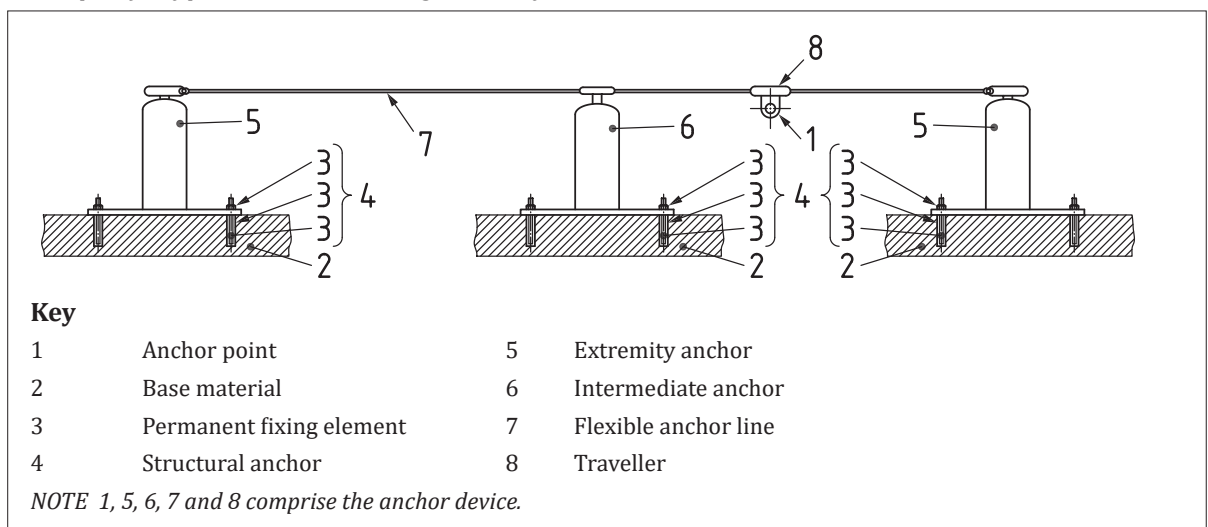
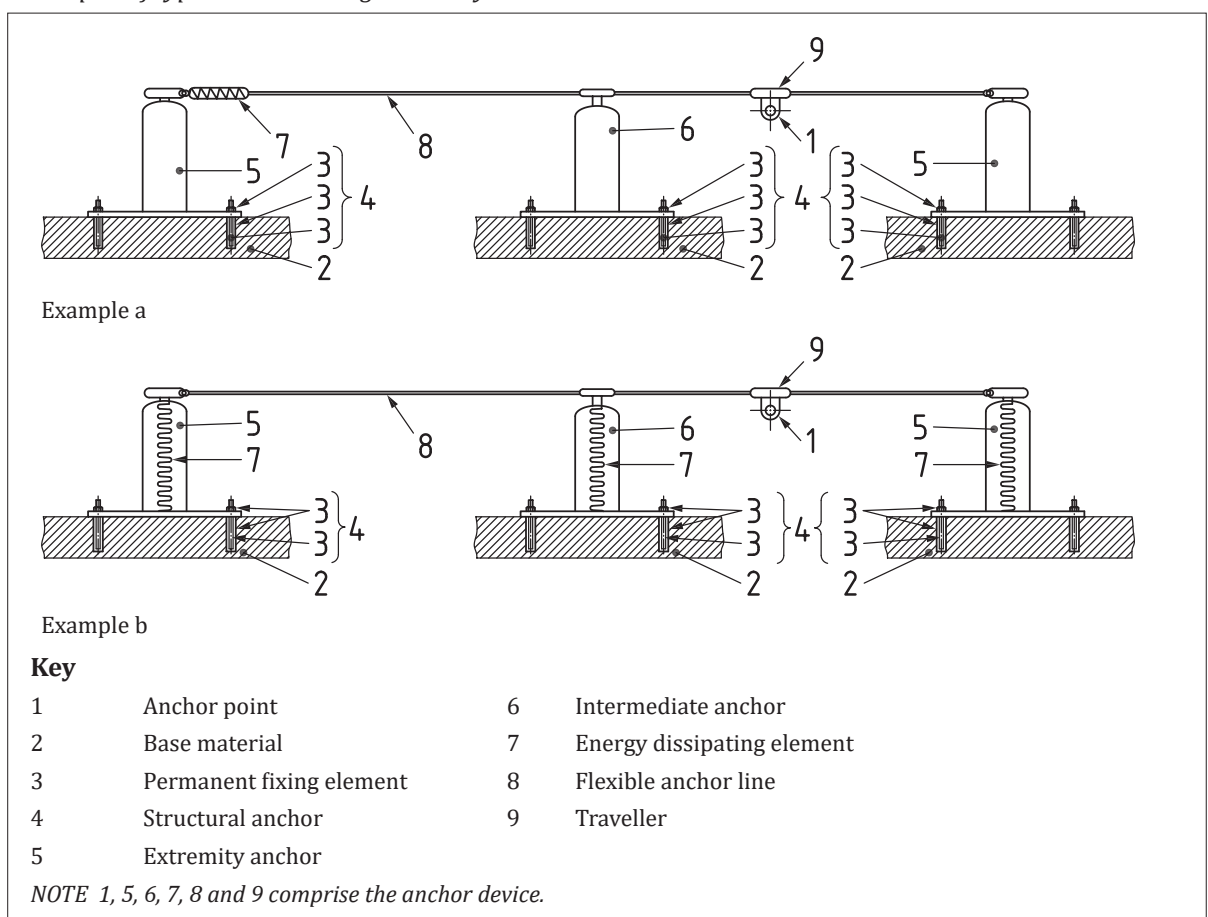
3.3.4 type C anchor system

anchor system employing a flexible anchor line deviating from the horizontal by not more than 15°, when measured between any extremity anchor, intermediate anchor or corner anchor

NOTE 1 See [Figure 6](#) and [Figure 7](#).

NOTE 2 Examples of flexible anchor lines are wire rope, fibre rope and webbing.

[SOURCE: BS 8610:2017, 3.3.3]

Figure 6 — Example of a type C non-load-limiting anchor system**Figure 7** — Examples of type C load-limiting anchor systems

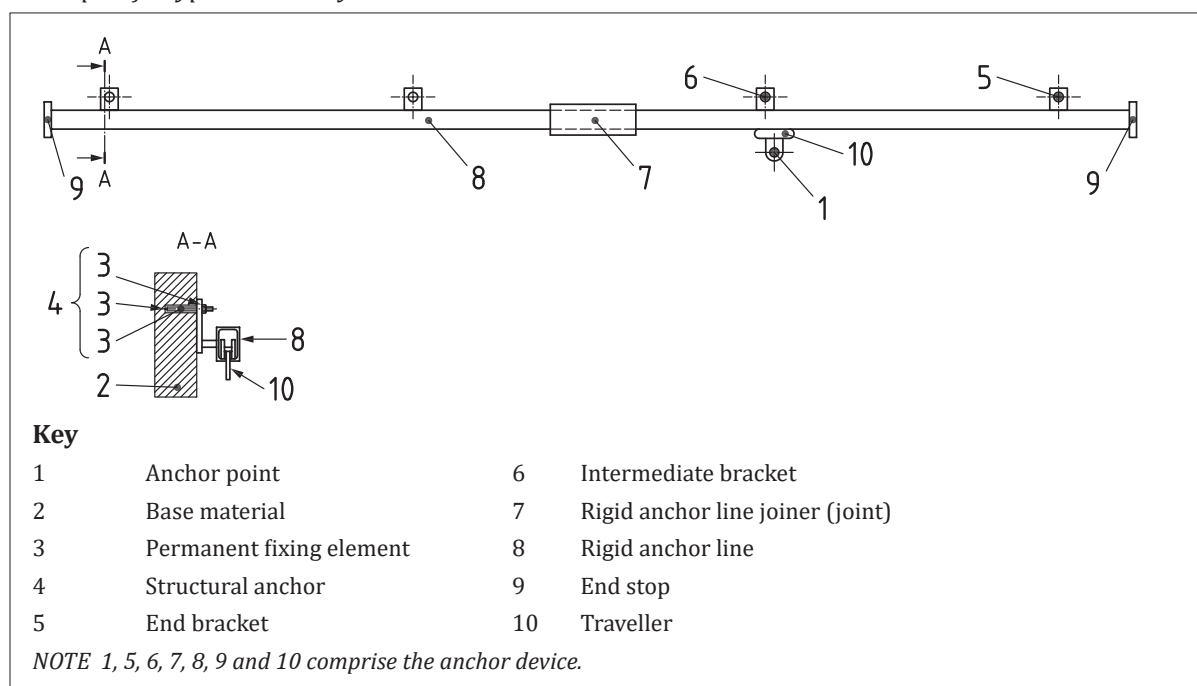
3.3.5 type D anchor system

anchor system employing a rigid anchor line deviating from the horizontal by not more than 15°, when measured between the extremity and intermediate anchors at any point along its length

NOTE 1 See [Figure 8](#).

NOTE 2 Examples of rigid anchor lines are tubes and rails.

[SOURCE: BS 8610:2017, 3.3.4]

Figure 8 — Example of a type D anchor system

3.3.6 type E anchor device

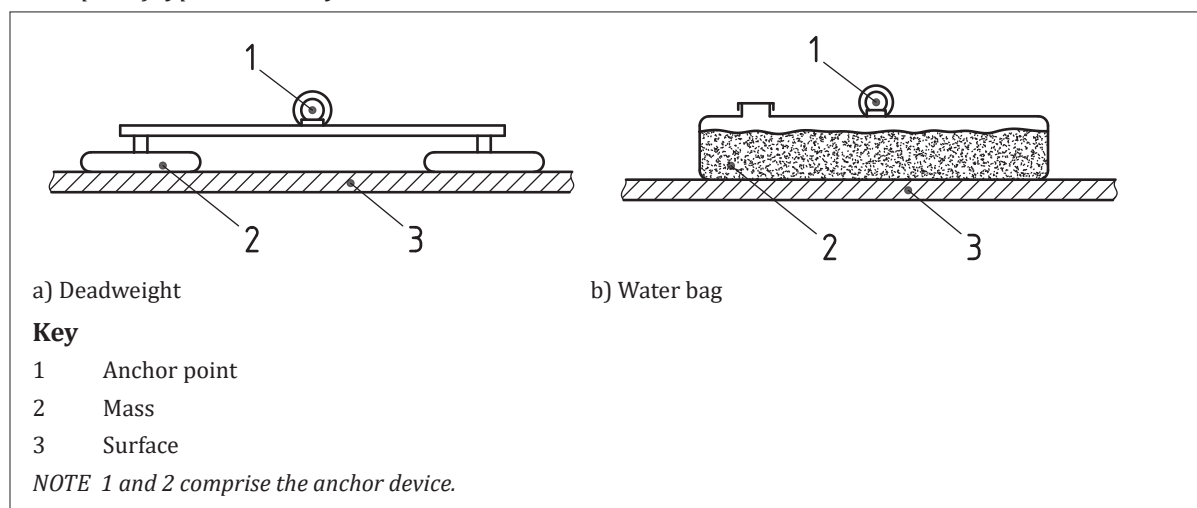
anchor device for use on surfaces up to 5° from the horizontal where the performance relies solely on mass and friction between itself and the surface

NOTE 1 See [Figure 9](#).

[SOURCE: BS EN 795:2012, 3.2.5]

NOTE 2 Type E anchor devices are removable and transportable, allowing the user to relocate their anchor point.

NOTE 3 Anchor points or elements of the anchor device can rotate or swivel when in use where designed to do so.

Figure 9 — Examples of type E anchor systems

3.4 anti-pendulum anchor device

anchor device used to help maintain a restraint position, or reduce a lateral swing of the user of a fall arrest system in the event of a fall

3.5 base material

material to which the anchor device is installed

NOTE Examples of base materials are concrete, steel, rock, masonry.

[SOURCE: BS EN 8610:2017, 3.4]

3.6 blockwork

masonry of blocks of concrete or other suitable material

3.7 brickwork

masonry of bricks

3.8 collective fall protection system

system which provides fall protection without the requirement for PFPE

NOTE In some work positioning situations, collective fall protection systems, such as guard rails or air bags, can be used instead of a safety back-up PFPE, where the risk assessment permits.

3.9 competent person

designated person suitably trained or qualified by knowledge and practical experience to enable the required task or tasks to be carried out properly

[SOURCE: BS 8437:2005+A1:2012, 3.10]

3.10 design life

predicted lifetime of the anchor system as specified by the system designer

NOTE The predicted lifetime of the anchor system takes into account the design life recommended by the manufacturer, the materials used, the climatic and other conditions likely to be experienced in service, after which the anchor system would be removed from service.

3.11 design load

load used in the design, based upon the service load with an appropriate factor of safety to ensure that neither the anchor device nor the base material fails, and is at least equivalent to the static strength requirements for the anchor system

NOTE For example, a type A anchor device conforming to BS EN 795:2012 has a service load of 6 kN and a design load of 12 kN.

3.12 deviation anchor device

anchor device used indirectly to redirect the path of PFPE

NOTE Deviation anchor devices can be used to avoid damage to the PFPE, e.g. abrasion, contact with the structure, and/or to provide a more preferred/accurate position for the user.

3.13 duty holder

person or organization with the responsibility for the overall standard and quality of the anchor system

NOTE The duty holder can also be the owner or client.

3.14 element

part of an anchor system

NOTE Elements of an anchor system can include an anchor device, traveller and extremity anchor.

[SOURCE: BS 8610:2017, 3.7]

3.15 energy-dissipating element

element of an anchor system that dissipates the kinetic energy developed during a fall from height

NOTE 1 Wire rope used in type C anchor systems is not considered to be an energy dissipating element.

NOTE 2 Energy-dissipating elements are deliberately designed to absorb energy, e.g. by yielding, deforming or elongating.

[SOURCE: BS 8610:2017, 3.8 modified]

3.16 evacuation

transfer of a person or persons from a place of danger or difficulty to a place of safety

[SOURCE: BS 8610:2017, 3.9]

3.17 evacuation system

PFPS by which a person or persons can transfer themselves, or be transferred from, a place of danger to a place of safety, in such a way that a free fall is prevented

[SOURCE: BS 8610:2017, 3.10 modified]

3.18 extremity anchor

element that connects the end of a flexible anchor line or rigid anchor line to the base material

3.19 fall arrest

technique using PFPE which prevents the user from colliding with the ground, structure or any other obstacle during a free fall

3.20 fall arrest system

PFPS which limits the impact force on the body of the user during fall arrest

[SOURCE: BS EN 363:2018, 3.2.1.4 modified]

3.21 flexible anchor line

flexible line between extremity anchors to which PFPE can be attached either directly by a connector or through a traveller

NOTE A flexible anchor line can be wire rope, fibre rope or webbing.

[SOURCE: BS EN 795:2012, 3.10 modified]

3.22 free fall distance

total vertical distance through which the user of a fall arrest system could fall, from the start of the fall to the onset of fall arrest

3.23 free space

total clearance distance that needs to be available below the anchor point to ensure that no part of the user can strike the ground or a projection from the building or structure during a fall

NOTE 1 The user might strike the building or structure, e.g. by swinging against it.

NOTE 2 For further information on free space, see [BS 8437](#).

3.24 inspection

examination in accordance with the examination scheme, carried out during installation, pre-use checks, interim inspections, periodic inspections and supplementary inspections, as appropriate, for safety purposes

NOTE 1 An inspection could include tests, as appropriate.

NOTE 2 Where anchor systems come under the jurisdiction of LOLER [\[3\]](#), periodic inspections are known as thorough examinations.

3.25 inspector

competent person carrying out the inspection in accordance with the examination scheme, and recommendations and instructions issued by the manufacturer applicable to the relevant PFPS, including the anchor system and PFPE

NOTE 1 An inspector might need to be trained by the manufacturer or their authorized representative on specific PFPE or other equipment, e.g. due to its complexity or innovation, or where safety critical knowledge is needed in the dismantling, reassembly or assessment of the PFPE or other equipment, and might need to have that training updated due to modifications and upgrades.

NOTE 2 An inspector could be competent to carry out inspections on one particular model of PFPE or other equipment or could be competent to inspect several models.

3.26 installation review

process where an inspector assesses an existing PFPS to ensure the anchor system and PFPE provide the desired level of safety and performance, including recommendations and requirements to the duty holder for any remedial work to be carried out

3.27 installer

person or company responsible for installing the anchor system in accordance with the system designer's specification and information supplied by the manufacturer

NOTE In cases where an installer decides which products to use and where to install them, they are also, for those aspects of the process, the system designer.

3.28 intermediate anchor

element located between the extremity anchors, connecting a flexible or rigid anchor line to the base material

NOTE Intermediate supports, e.g. a flexible anchor line guide, which are not intended to withstand the load, are not intermediate anchors.

[SOURCE: BS 8610:2017, 3.13]

3.29 load-limiting anchor device

anchor device with an integral energy-dissipating element intended to limit the dynamic force applied to the structural anchor

NOTE 1 The energy-dissipating element in a load-limiting anchor device can be integral to different types of anchor devices, e.g. an anchor device with a single anchor point, intermediate, corner or extremity anchors for a horizontal flexible anchor line.

NOTE 2 Load-limiting anchor devices include elements that are designed to absorb energy, e.g. by yielding, deforming or elongating.

[SOURCE: BS 8610:2017, 3.14]

3.30 manufacturer

person or company responsible for designing and manufacturing an anchor system and securing any certification necessary, with a view to placing it on the market on their own behalf

NOTE 1 References to the manufacturer of the anchor system are not intended to include the base material.

NOTE 2 The manufacturer has an obligation to ensure that a product intended to be placed on the market is designed and manufactured and its conformity assessed to the requirements in accordance with relevant standards.

NOTE 3 The manufacturer can use finished products, ready-made elements or subcontract these tasks. The manufacturer needs to maintain overall control and have the necessary competence to take responsibility for the product.

NOTE 4 The manufacturer can elect not to supply specified ancillary elements supplied by third parties as part of the original certification, e.g. type and specification of resin.

NOTE 5 Where element(s) (e.g. structural anchors, washers, nuts) are manufactured by someone other than the manufacturer of the anchor system this is clarified, e.g. "manufacturer of other elements".

3.31 masonry

construction of stone(s), brick(s) or block(s) bonded and solidly put together with mortar

3.32 maximum overhead grip reach capability

height to which 95% of the population can reach

[SOURCE: BS 8213-1:2004, Annex A]

3.33 maximum rated mass (RM_{max})

maximum mass of each user, as specified by the manufacturer, including tools and equipment carried, with which the anchor system can be used

NOTE 1 The maximum rated mass is defined in kg.

NOTE 2 Maximum rated mass, RM_{max} , was formerly known as maximum rated load, RL_{max} .

[SOURCE: BS 8610:2017, 3.16]

3.34 maximum system rating (SR_{max})

maximum number of users and their maximum rated mass (RM_{max}) that can be attached to the anchor system at any one time, as specified by the manufacturer

[SOURCE: BS 8610:2017, 3.17]

NOTE The maximum system rating is defined in kg.

3.35 non-load-limiting anchor device

anchor device without an integral energy-dissipating element

[SOURCE: BS 8610:2017, 3.18]

3.36 permanent fixing element

part of a structural anchor securing the anchor device permanently to the base material and not intended to be removed by the user

NOTE 1 Examples of a permanent fixing element are a nut, threaded stud, internally-threaded socket, screw, bolt, expansion anchor, cast-in anchor, rivet, resin bond and weld.

NOTE 2 Some permanent fixing elements, e.g. bolts or nuts, can be removed for inspection purposes.

[SOURCE: BS 8610:2017, 3.19]

3.37 personal fall protection equipment (PFPE)

components intended to protect the user against falls from height, including a body-holding device and an attachment system

NOTE 1 A body-holding device might be, for example, a full body harness, sit harness, work positioning belt, rescue harness, rescue loop.

NOTE 2 PFPE forms part of the overall personal protective equipment (PPE) that might be required to be worn by the user.

3.38 personal fall protection system (PFPS)

PFPE and an anchor system

3.39 primary anchor points

initial anchor points to which rope access working lines and safety lines are attached

NOTE Primary anchor points are not deviation or re-anchor devices.

3.40 re-anchor device

rope access anchor device(s), installed offset to the primary anchor point(s), in order to position the working and safety lines closer to the working location

3.41 recovery

act of retrieving an incapacitated person who is not in suspension, by gaining access to them and moving them to a place of safety using conventional access routes, such as walkways and stairways

NOTE An example of recovery would be to retrieve a person who has collapsed on a flat roof.

3.42 rescue

act of retrieving an incapacitated person suspended from an anchor system by gaining access to their position and moving them to a place of safety using equipment designed to raise or lower the incapacitated person remotely, or in accompanied descent

3.43 rescue – accompanied descent system

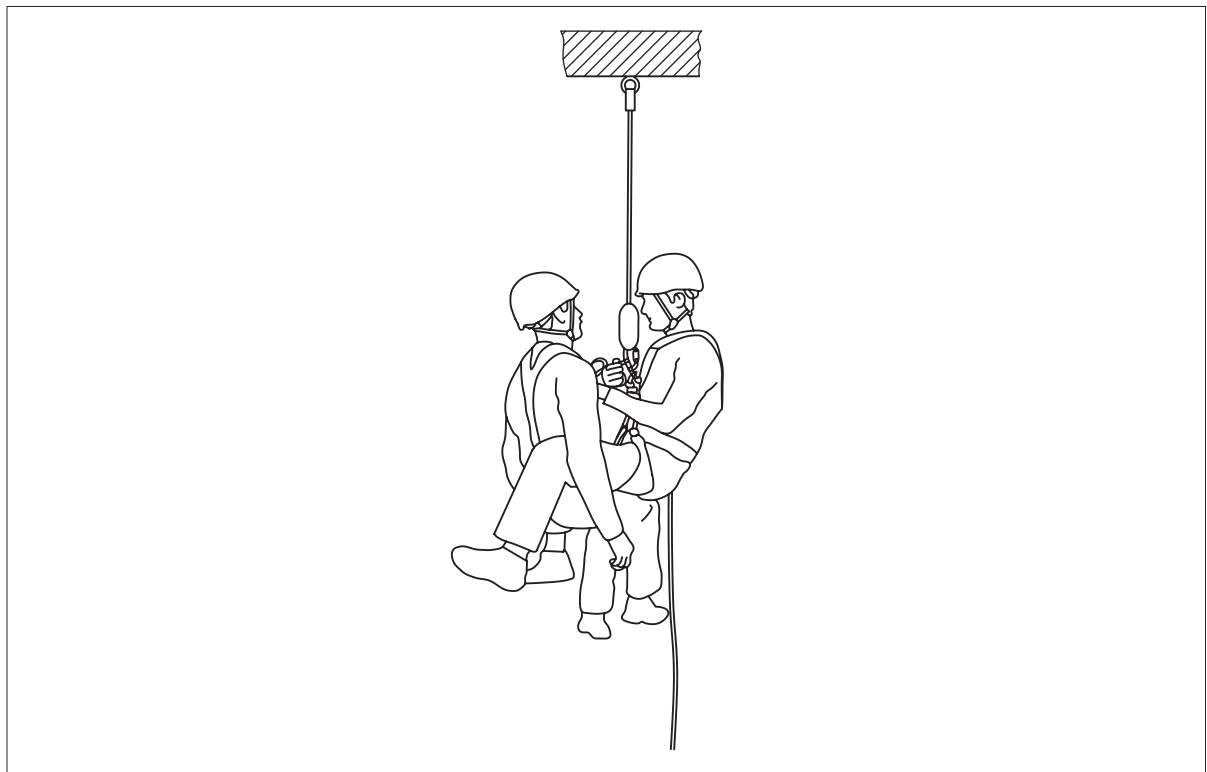
PFPS by which a person is rescued and accompanied by another person in such a way that a free fall is prevented

NOTE 1 See [Figure 10](#).

NOTE 2 An accompanied descent is also known as a pick-off rescue.

[SOURCE: BS 8610:2017, 3.21.1]

Figure 10 — Example of an accompanied descent type rescue



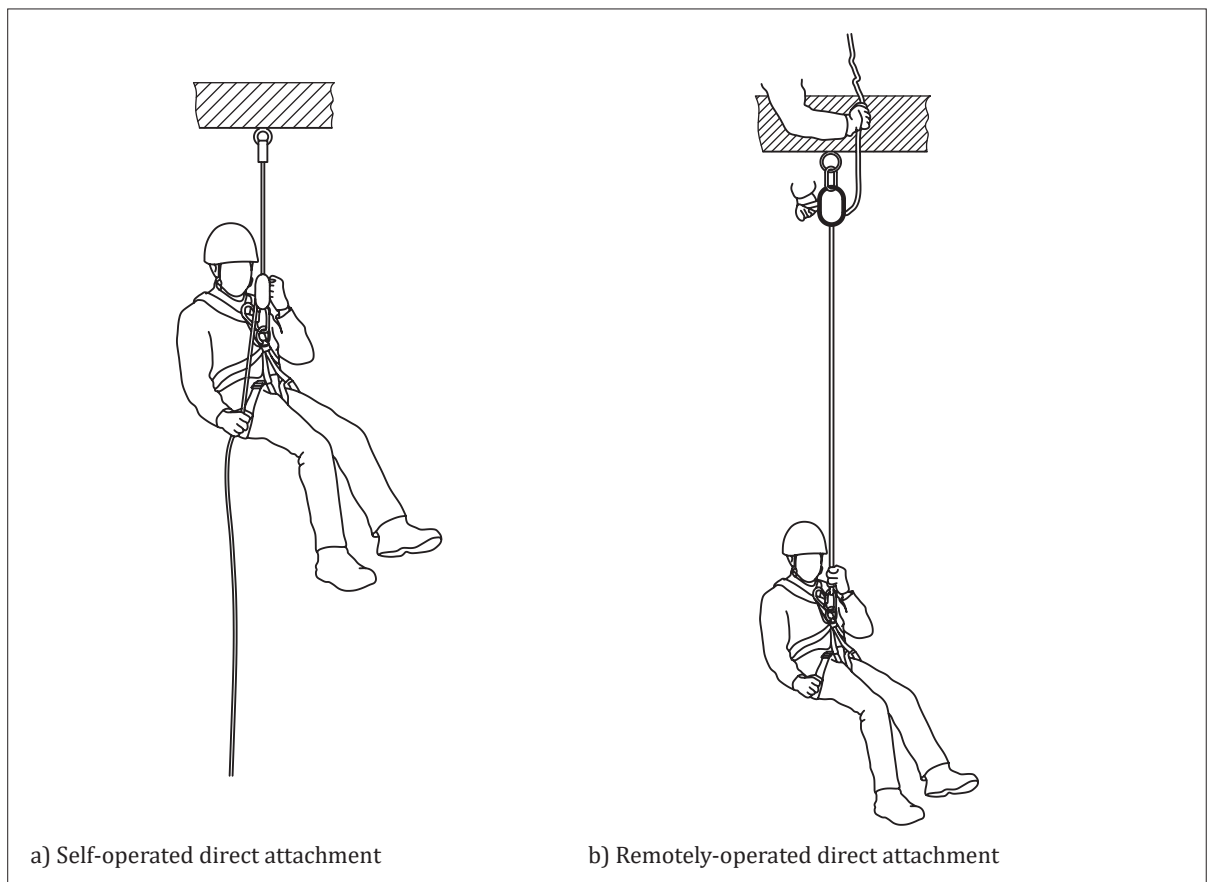
3.44 rescue – remotely or self-operated – direct attachment system

PFPS by which a person can rescue themselves or be rescued by another person by direct attachment to an anchor point in such a way that a free fall is prevented

NOTE 1 See [Figure 11](#).

NOTE 2 An example of a remote rescue is by the use of a reach pole and rescue kit to reach the person being rescued.

NOTE 3 An example of a self-operated rescue is by the use of a pre-packed rescue kit which the rescuer carries.

Figure 11 — Example of rescue – remotely or self-operated – direct attachment systems

[SOURCE: BS 8610:2017, 3.21.2]

3.45 rescue – remotely operated – redirect attachment system

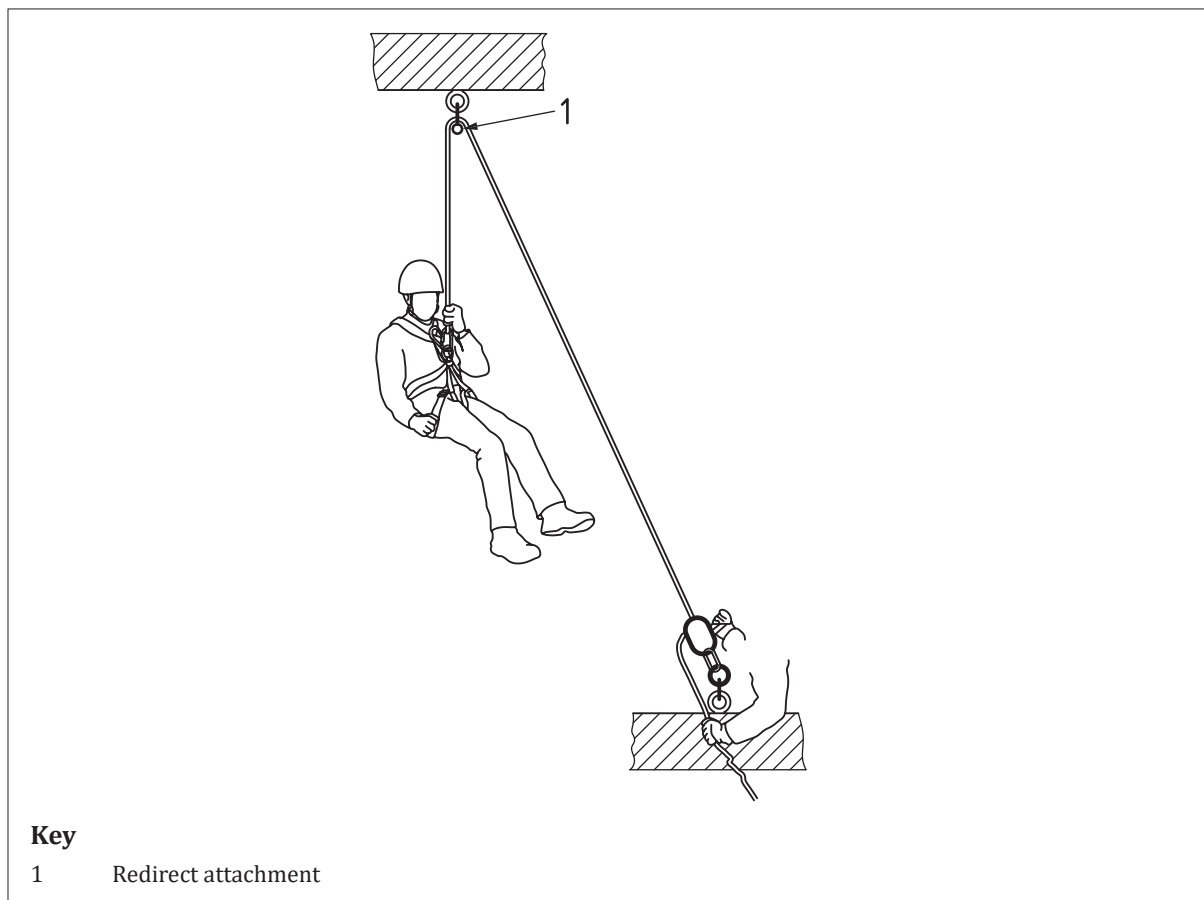
PFPS by which a person is rescued by another person by the use of an indirect attachment to an anchor point in such a way that a free fall is prevented

NOTE 1 See [Figure 12](#).

NOTE 2 An example of an indirect attachment is a pulley.

NOTE 3 The use of an indirect attachment can potentially double the load on an anchor system.

[SOURCE: BS 8610:2017, 3.21.3]

Figure 12 — Example of a remotely operated redirect attachment type rescue**3.46 rescuer**

person who carries out a rescue operation

3.47 restraint

technique using PFPE which prevents the user from reaching zones where the risk of a fall from height exists

NOTE A restraint system is not a fall arrest system.

3.48 restraint system

PFPS which prevents the user from reaching zones where the risk of a fall from height exists

[SOURCE: BS EN 363:2018, 3.2.1.1 modified]

NOTE A restraint system is not a fall arrest system.

3.49 rigid anchor line

rigid line between extremity anchors to which PFPE can be attached either directly by a connector or through a traveller

NOTE A rigid anchor line can be a rigid profile, e.g. a rigid tube or rigid rail.

[SOURCE: BS EN 795:2012, 3.11, modified]

3.50 rope access

technique which uses two separately attached PFPS, one as the working line (means of support) and the other as a safety line, for getting to and from the place of work, and which can be used for work positioning or rescue

3.51 rope access system

PFPS which enables the user to get to and from the place of work in such a way that a free fall is prevented or arrested, by using a working line and a safety line connected separately to anchor points

[SOURCE: BS EN 363:2018, 3.2.1.3 modified]

3.52 safety back-up PFPS

component or an assembly of components of PFPE providing a secondary safety system in the event of a fall occurring

3.53 safety line

safety back-up PFPS comprising a component or an assembly of components of PFPE used for rope access or work positioning, which provides a secondary safety system in the event of a failure of the primary system

3.54 service life

lifetime of the anchor system as required by the duty holder

3.55 service load

unfactored maximum load(s) applied to the anchor point of the anchor system, specific to the application(s) and configuration(s) during use

NOTE During use includes the instance of a fall, e.g. 6 kN service load for a single user in fall arrest. Examples of service loads for anchor systems conforming to [BS 8610](#) are shown in [Annex A](#), [Annex B](#) and [Annex C](#).

3.56 static strength

minimum force an anchor device or anchor system is capable of sustaining without failure

NOTE [BS 8610](#) and BS EN 795 define the static strength requirements of anchor devices and anchor systems.

3.57 stonework

masonry of stone, which might or might not have been worked

[SOURCE: BS ISO 6707-1:2017, 3.3.5.14]

3.58 structural anchor

combination of one or more permanent fixing element(s), not intended to be removed, used to connect an anchor device to the base material

[SOURCE: BS 8610:2017, 3.24]

3.59 structural limitations

minimum installation requirements for structural anchors

NOTE For example, minimum edge distance, minimum thickness of base material, minimum spacing between structural anchors and minimum strength of base material.

3.60 suitably qualified person

competent person capable of and responsible for assessing whether the specific requirements are met

NOTE 1 An assessment might include calculations.

NOTE 2 A suitably qualified person could be a chartered structural engineer.

NOTE 3 Specific requirements could include structural suitability, load calculations.

3.61 system designer

person with overall responsibility for the design of the PFPS (including the anchor system and PFPE), including certification and handover documentation

3.62 system design specification

output documentation resulting from the design process which specifies the anchor system(s) to be installed, how and where they are to be installed, and any criteria necessary for their safe access and use

NOTE The system design specification also details the appropriate PFPE to be provided for use with the anchor system.

3.63 system technical file

documentation supplied to the duty holder on completion of the installation by the system designer, to be retained for future reference for the life of the PFPS installed, including anchor system(s) and PFPE

NOTE The system technical file contains information provided by the system designer, installer and inspector.

3.64 traveller

element with an anchor point intended to travel along a flexible or rigid anchor line

NOTE 1 Travellers are also known as shuttles, trolleys, mobile anchor points.

NOTE 2 The definition also includes simple travellers, such as a connector attached directly to a flexible/rigid anchor line or a textile or wire sling passed over a rigid rail and linked by a connector.

[SOURCE: BS 8610:2017, 3.28]

3.65 user

competent person who uses the PFPS for work tasks, inspections or maintenance

NOTE The number of users might include the rescuer, where relevant, e.g. accompanied descent.

3.66 work positioning

technique using PFPE for partial or complete support for getting to and from, or maintaining position at, the place of work

NOTE When the user is using a work positioning system for partial support, the user is supported in tension, part of the user's weight being supported by the work positioning system and the remainder by the surface on which the user is standing. When the user is using a work positioning system for complete support, the user is in suspension and their weight is fully supported by the work positioning system.

3.67 work positioning system

system used for work positioning which uses a PFPS as the primary means of support and either a separately connected safety back-up PFPS or a collective fall protection system

NOTE 1 A safety back-up PFPS can include, for example, safety line, fall arrest lanyard, retractable-type fall arrester.

NOTE 2 In some situations, collective fall protection systems such as guard rails or air bags can be used instead of a safety back-up PFPS, where the risk assessment permits.

Section 2: System design

COMMENTARY ON SECTION 2

This section provides recommendations for the key aspects to be taken into account by the system designer in designing a PFPS that fulfils the needs of all interested parties, e.g. duty holder, user.

Further guidance for the design of buildings incorporating safe work at height can be found in [BS 8560](#).

4 Preliminary information

4.1 General

When designing the PFPS the system designer should take into account all the recommendations of this British Standard in consultation with the duty holder and other interested parties.

The system designer and/or installer should liaise with the principal designer, if appointed under The Construction (Design and Management) Regulations 2015 [2], or other relevant person(s) involved with the design of the overall project to ensure that the PFPS is compatible with the applicable aspects of the overall project design.

NOTE The system designer could also be the principal designer. Attention is drawn to The Construction (Design and Management) Regulations 2015 [2] for the definition of principal designer.

4.2 PFPS system design

The design of the PFPS should take into account the following, as a minimum:

- a) the tasks to be undertaken by the user;
NOTE Rescue and evacuation are considered to be tasks.
- b) the likely work method and proximity to work location, e.g. window cleaning by hand or via a pole;
- c) the requirement for the ongoing inspection, testing, repair and maintenance;
- d) the frequency, nature and duration of work tasks;
- e) the number of simultaneous users; and
- f) the level of competence of user(s) in using PFPE.

4.3 PFPS project details

The following should be taken into account in the design of the PFPS, as a minimum:

- a) type of workplace/site, e.g. structures, industrial plant, commercial property, mobile work equipment;
- b) location and environmental aspects affecting the workplace, e.g. remote, urban, coastal, offshore;
- c) other activities or potential hazards that can affect the use of the PFPS or consequences of the work tasks and rescue, e.g. public area below, moving vehicles, overhead power lines, over water;
- d) duty holder requirement for the service life of the anchor system;
- e) base material type and/or specification, e.g. strength, location, dimensions;
- f) limitations imposed on the system design, e.g. structure, locations, finishes, planning restrictions, listed building restrictions, preservation orders; and
- g) drawings and other information available, e.g. floor or roof plans, sectional drawings.

4.4 Risk assessment

COMMENTARY ON 4.4

Risk assessments are undertaken at system design stage and modified as the project develops. Attention is drawn to The Management of Health and Safety at Work Regulations 1999 [6].

Risk assessments should be undertaken at each stage of the project by the:

- a) system designer: a design risk assessment, e.g. to help determine the most appropriate type, configuration and position of the anchor system, taking into account the fall-related risks and the user-related factors identified in accordance with 4.2; and;
- b) installer and inspector: a work task risk assessment for the installation and inspection work to be undertaken.

Following each risk assessment the person responsible should evaluate the risks identified and propose appropriate control measures to mitigate the risks.

5 Design considerations

COMMENTARY ON CLAUSE 5

Attention is drawn to The Work at Height Regulations 2005 [1] for the hierarchy of approach to working at height, summarized in INDG401 (rev 2) [2] as follows:

- a) *avoid work at height where it is reasonably practicable to do so;*
- b) *where work at height cannot be avoided, prevent falls using either an existing place of work that is already safe or the correct type of equipment;*
- c) *minimize the distance and consequences of a fall by using the correct type of equipment where the risk cannot be eliminated.*

It also enshrines the principle that collective measures (e.g. guard rails) be given priority over personal measures (e.g. anchor systems).

The use of PFPE, in conjunction with anchor systems, is towards the lower end of the hierarchy and whilst suitably selected in the correct environment, they rely on training, information and supervision.

5.1 General

The system designer should select the appropriate anchor system and PFPE in respect to type and application to minimize the fall risk whilst maintaining the appropriate level of safety without adding unnecessary complexity.

The system designer should avoid, where possible, anchor systems which require:

- a) the user to frequently disconnect and reconnect to the system;
- b) the use of adjustable PFPE which might increase the risk of a fall, e.g. from restraint to fall arrest, greater pendulum fall;
- c) anti-pendulum anchor devices (see 5.6); and
- d) an increased level of user training, competency and supervision.

NOTE 1 Appropriate training is a necessity for all users on installed PFPS.

The system designer should not introduce features which expose the user to unnecessary risk or other nuisance factors, e.g. a system where the user has to first disconnect their lanyard to bypass an obstruction and then reconnect the lanyard which exposes them to a risk of falling.

NOTE 2 If used properly, a twin-legged lanyard can provide secure and continuous attachment to an anchor system even when bypassing an obstruction, eliminating the risk of an unprotected fall as in the case of the single leg lanyard.

The system designer should design a PFPS such that the user, where possible, maintains continuous attachment without the need for repeated disconnection and reconnection which could be the case with twin-legged lanyards.

The system designer should design the PFPS to reduce, as far as practical, any trip hazards. Where trip hazards cannot be eliminated, appropriate signage should be provided.

The system designer should, wherever possible, select a PFPS for restraint in preference to a PFPS for fall arrest, in order to remove the risk of a fall from height and the need for rescue.

The system designer should take into account the types and options of anchor systems available to provide the most appropriate design for the duty holder.

Anchor systems should conform to or be selected in accordance with the relevant standards, e.g. BS 8610, BS EN 795, PD CEN/TS 16415.

Type A, type C and type D anchor devices, which are dependent for their performance on the base material, should be qualified for use in the base material of the project concerned by tests in that base material in order to validate the structural limitations, e.g. minimum base material strength, minimum structural thickness, minimum edge distance and minimum anchor spacing.

NOTE 3 Type A, type C and type D anchor systems conforming to [BS 8610](#) satisfy this recommendation.

Where anchor systems conforming to [BS 8610](#) are unavailable, anchor devices conforming to BS EN 795 or PD CEN/TS 16415 should be used. The system designer should contact the manufacturer of the anchor device to validate the anchor device's suitability for the base material and application.

NOTE 4 This might require the manufacturer to undertake further appropriate testing, e.g. to [BS 8610](#), in the base material with the structural anchors recommended by the manufacturer, taking into account the structural limitations, e.g.:

- a) minimum material strength;*
- b) minimum structural thickness; and*
- c) closest edge distance and closest spacing.*

The system designer should take into account the appropriate recommendations for marking, signage and labelling (see [11.4](#)), and ensuring this is provided in the system design specification (see [Clause 9](#)).

5.2 Structural suitability

The system designer should ensure that all anchor devices and structural anchors are only fixed, or attached to load-bearing structures, i.e. base materials, that have sufficient strength and stability to sustain all design loads without failure. Where this is beyond the levels of competence of the system designer, they should consult with a suitably qualified person.

NOTE 1 This could be confirmed by, for example, reference to drawings or on-site investigation.

NOTE 2 Examples where strength and stability of the structure could be of concern include, but are not limited to, parapet walls, cavity walls, masonry below window openings, masonry in-fill panels on a concrete frame building, hollow core concrete, pre-stressed concrete.

NOTE 3 Testing, e.g. by trial tests or proof load tests, of the anchor system does not validate structural strength and stability of the load bearing structure.

Where there is any doubt as to the strength and stability of the structure(s) the system designer should provide to a suitably qualified person:

- a) loads and resulting forces (e.g. compressive, tension, shear) applied to the structural anchor(s) and base material from applying the following to the anchor point of each anchor system or anchor device:

- 1) service load; and
- 2) design load,

taking into account the maximum rated mass, $RM_{\max}$, maximum system rating, $SR_{\max}$, the configuration and application concerned; and

NOTE 4 The manufacturer of the anchor device(s) typically provides this information to the system designer.

NOTE 5 Examples of design loads for specific applications and configurations of use for type A, type C and type D anchor systems can be found in [Annex A](#), [Annex B](#) and [Annex C](#).

NOTE 6 Examples of static strength requirements for type B and type E anchor devices for fall arrest can be found in BS EN 795 and PD CEN/TS 16415.

- b) details of the anchor device and structural anchors.

The suitably qualified person should, from a) and b), determine and record the suitability of the structure to withstand the resultant forces applied through the anchor device and structural anchor(s) and provide this information in writing to the system designer, to form part of the system technical file (see [11.5.1](#)).

NOTE 7 [Figure 13](#) shows examples of the ways in which the service and design loads can change due to the design of the elements of the anchor system, between the position of the anchor point and the structural anchors.

NOTE 8 Calculations might be necessary to determine the suitability of the structure, taking into account the service load, design load and any effects of cantilever, offset or bending moment due to the design of the anchor system (see [Figure 13](#)).

NOTE 9 For type C and type D anchor systems, the resultant loads to the structural anchors from the service load and design load, when applied to the anchor point change depending on the position of the traveller. The system designer might need to provide the suitably qualified person with a series of loadings at different positions along the flexible/rigid anchor line, e.g. mid-span, extremity, intermediate, corner and cantilever.

NOTE 10 Examples of the maximum design loads for anchors conforming to [BS 8610](#) are given in [Annex A](#), [Annex B](#) and [Annex C](#).

NOTE 11 The specification of structural anchors does not need calculation as they are prescribed by the anchor device manufacturer and have been selected by calculation and proven by testing to, for example, [BS 8610](#) in the relevant base material.

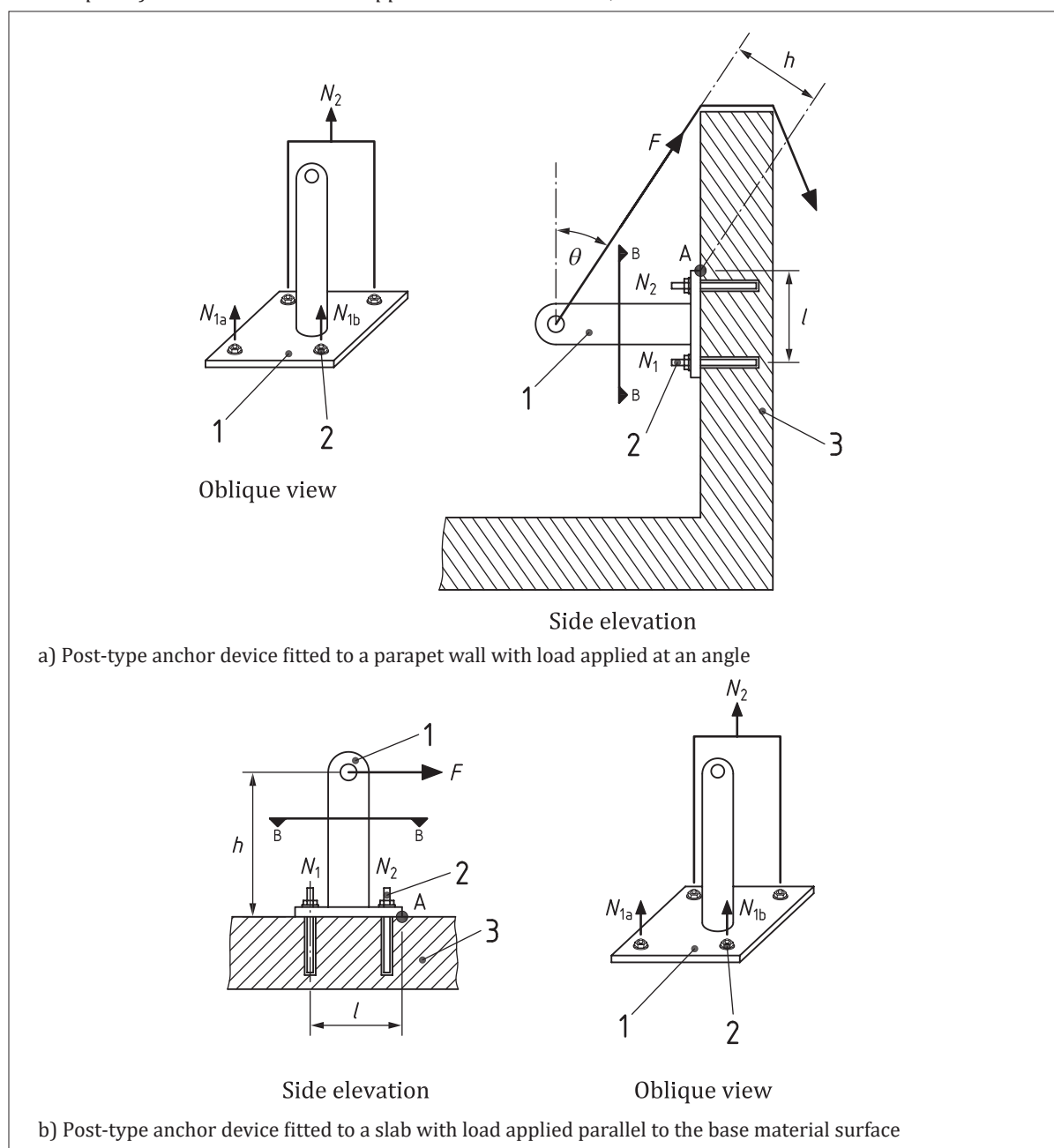
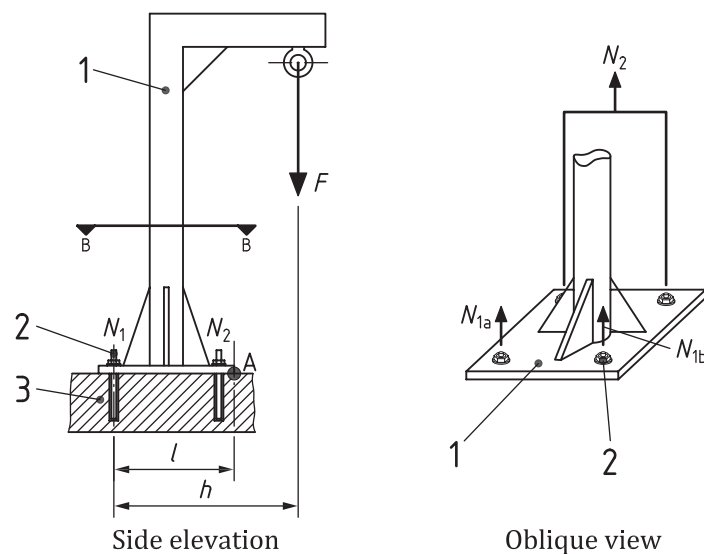
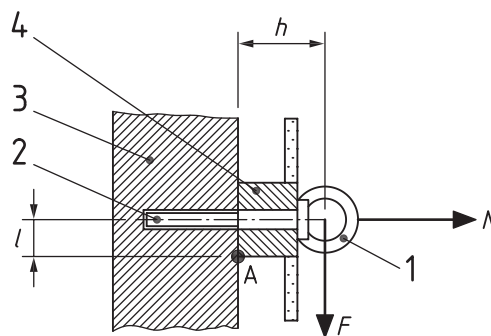
Figure 13 — Examples of calculations on loads applied to anchor devices, structural anchors and the base material

Figure 13 (continued)



c) Fixed davit arm fitted to slab, with anchor point extending beyond the base plate

NOTE Calculations for this particular case are only applicable if the davit arm is fixed, i.e. non-rotatable.



d) Cantilever eyebolt with structural spacer

Key

1	Anchor device	h	Length of lever arm from fulcrum (A) to the line of application of the service load (F), or length of lever arm from the rear structural anchors to the line of the application of the service load (F)
2	Structural anchor(s)	l	Length of lever arm from fulcrum (A) to the line of action of the load taken by the restraining structural anchors (N_1)
3	Base material	N_1	Calculated load for rear structural anchor design and selection
4	Structural spacer	N_{1a}	Calculated load for rear structural anchor design and selection in relation to the number of rear structural anchors, e.g. $N_{1a} = N_{1b} = \frac{1}{2} N_1$
A	Fulcrum	N_{1b}	Calculated load for rear structural anchor design and selection in relation to the number of rear structural anchors
F	Service load	N_2	Calculated load for front structural anchor design and selection
N	Calculated loads for structural anchor design and selection	θ	Angle at which the load would be applied in service

Figure 13 (continued)

NOTE 1 For the examples in a), b) and c), the required resistance of the structural anchors can be calculated using the formula:

$$N_1 = \frac{F \times h}{l}$$

Loads N_2 are ignored in the calculation, however, for the purpose of fixing selection, are assumed to be equal to N_1 .

NOTE 2 For d) the following formula can be used:

$$N = \frac{F \times h}{l}$$

NOTE 3 l and h assume the base material, base plate/structural spacer and cantilever arm are rigid

NOTE 4 For clarity, shear loads are not shown.

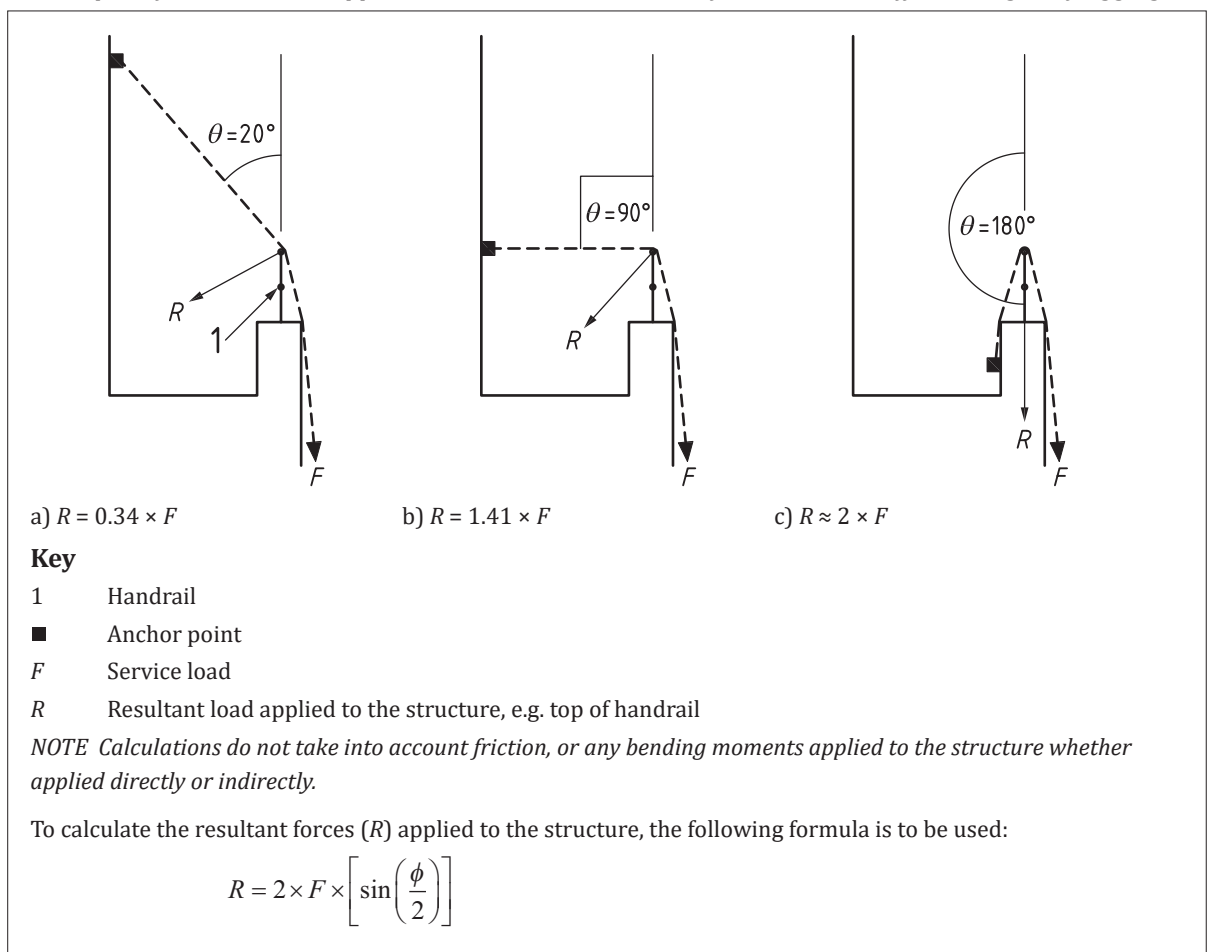
NOTE 5 In a), b) and c) only two rows of two structural anchors are shown. In some instances, anchor systems might include more than two structural anchors in each row.

NOTE 6 These calculations do not cover the design of the anchor device, e.g. size and thickness of the base material, which needs to have been carried out by the manufacturer prior to the type testing in accordance with relevant standards, e.g. [BS 8610](#), BS EN 795 or PD CEN/TS 16415.

The system designer should take into account any applied loads to the structure (e.g. working and safety lines for rope access or fall arrest lanyards passing over parapet walls or handrails and the weight of a user and any equipment on an inclined or vertical surface, taking into account environmental conditions).

NOTE 12 See [Figure 14](#).

The system designer should ensure that applied loads are taken into account and provided to the suitably qualified person to confirm that the structure is capable of sustaining these loads, including the consequences of failure at the point of applied load, e.g. glass infill panels below handrails, surface hazard(s), load transferring to non-load-bearing panels.

Figure 14 — Examples of how loads are applied to a structure in the case of a handrail at different angles of rigging

Where an anchor point is required on metalwork, a suitable anchor device, e.g. eyebolt, D-ring or eyenut, should be fixed to the metalwork [see [Figure 2 j\)](#), l) and n)].

5.3 Trial tests

Trial tests should be carried out on the structural anchors to determine whether the structural anchor(s) used to attach an anchor device to the base material on site can withstand the design load.

Trial tests should be carried out by a competent person, in accordance with the information provided by the manufacturer, in the same type of base material and as close as possible to the proposed anchor system but far enough away to ensure the anchor system is not affected.

Three static tensile tests should be carried out in the base material where the strength of that base material might be weaker than that used in the type tests conducted in accordance with [BS 8610](#) or BS EN 795 or PD CEN/TS 16415.

NOTE 1 Trial tests are not used to determine suitability in categories, e.g. concrete, brickwork, stonework, of base material not already validated by type tests in accordance with a recognized product standard, e.g. [BS 8610:2017](#), to validate edge distances closer than those validated in the type tests, nor to validate the use of a type of structural anchor other than that used in the type tests.

NOTE 2 Trial tests are only to be carried out on specially installed sample structural anchors and other elements which are to be removed or decommissioned after the trial tests.

NOTE 3 Concrete structures are usually at least as strong as the nominal design strength of concrete used in type tests. Trial tests are therefore not typically needed in concrete structures, but, there might be conditions where a concrete structure has deteriorated due to exposure to extreme conditions (e.g. marine, chemical) and needs to be subjected to trial tests. Such deterioration could be apparent from the visual appearance of the concrete surface but

is usually indicated by the concrete drilling unusually softly. The need for trial tests might therefore be initiated by installers at the start of a project.

The trial test load, which might need to be calculated (see [Annex D](#)), is based on the design load (see [Annex A](#), [Annex B](#) and [Annex C](#)) and should be held for a minimum of 3 min without failure for the anchor system to be deemed to have passed the test. In the case of masonry units, the reaction loads in the test should be directed into adjacent masonry units in order to ensure that the mortar joint is also tested.

After completion of the test, and irrespective of the result, demountable elements, e.g. anchor points, should be removed and the holes filled. If any structural anchors or other elements fail to pass the trial test, an alternative anchor system type should be selected and tested by means of a new series of trial tests or the anchor system should be redesigned.

NOTE 4 Trial tests only intend to prove the integrity of the base material in the immediate vicinity of the structural anchor. They do not prove whether or not the overall structure has sufficient strength and structural stability to support the design loads.

5.4 Maximum system rating, $SR_{\max}$

Based on information gathered in accordance with [4.1](#) to [4.4](#), the system designer should establish the system rating required by the duty holder which is not to exceed the maximum system rating, $SR_{\max}$, of the chosen anchor system.

NOTE The maximum system rating is based on the maximum number of users to be attached to the anchor system at any one time, their maximum mass and the configuration of the anchor system.

5.5 Configuration

Based on the information gathered in accordance with [4.1](#) to [4.4](#), the system designer should ensure that the range of movement permitted by the PFPS provides safe access and egress, allowing work tasks to be carried out safely.

NOTE Other equipment can be incorporated to assist with safe access and egress, e.g. level walkway.

The system designer should take into account any loading direction(s)/orientation(s) of the anchor point to ensure that the direction of loading is permitted by the manufacturer.

5.6 Anti-pendulum anchor devices

Anchor systems should be designed to avoid the need for anti-pendulum anchor devices. However, if their use is unavoidable, following a design risk assessment, they should be type A anchor system conforming to [BS 8610](#) or Type A, B or E anchor device conforming to BS EN 795 or PD CEN/TS 16415 (see also [6.2.3.1.2](#) and [Annex F](#)).

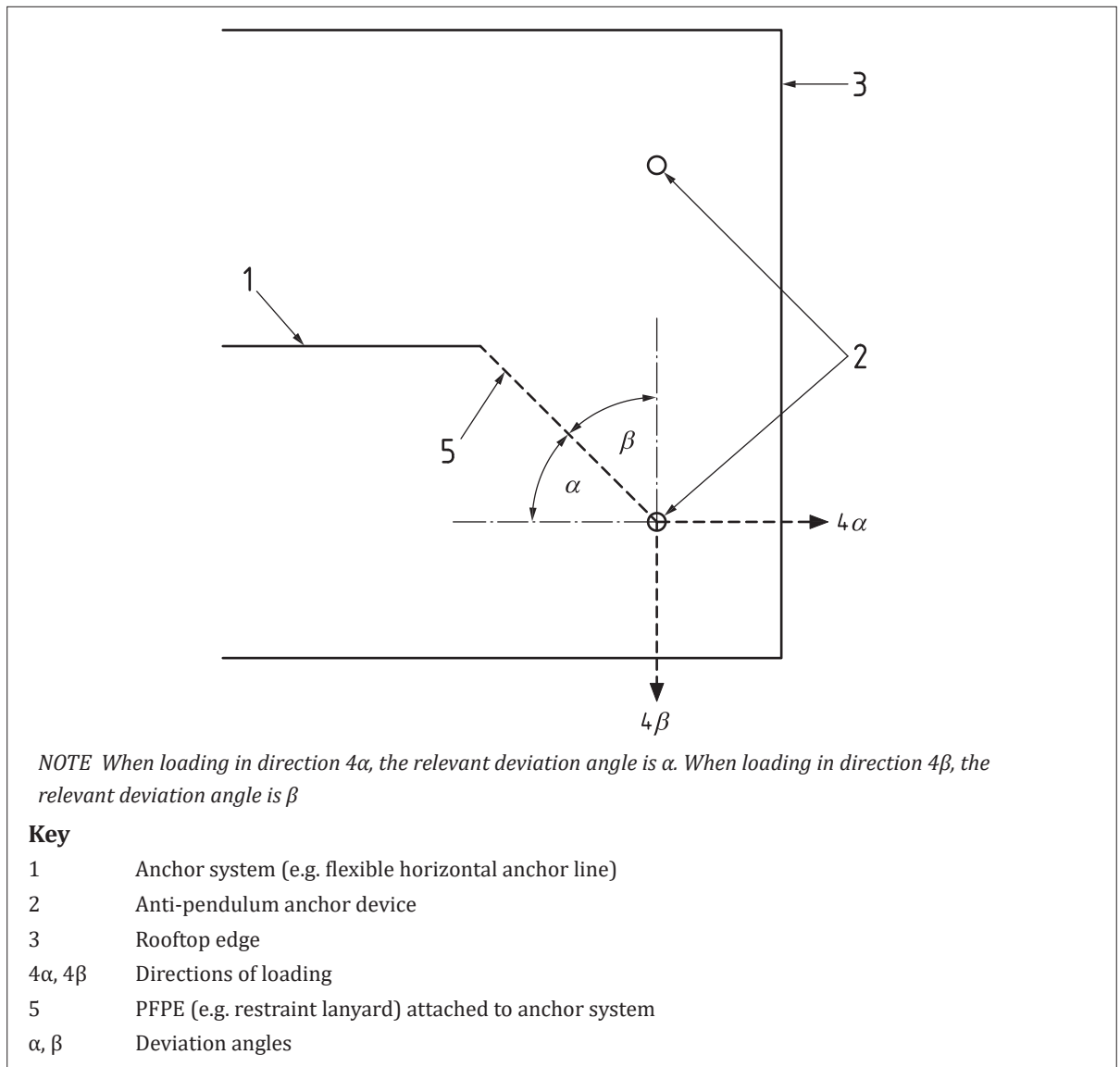
Where anti-pendulum anchor devices are used as part of a PFPS, the relevant deviation angle should not exceed 60° (see [Figure 15](#)).

NOTE Deviation angles greater than 60° are not recommended as the loads applied to the anti-pendulum anchor device are greater than the load applied to the anchor system (see [6.2.3.1.2](#)).

Where anti-pendulum anchor devices are required for more than one user, either a multi-user anti-pendulum anchor device or more than one anti-pendulum anchor device should be used.

Where the risk of a pendulum fall exists, the system designer should determine any increased ground clearance required for this fall.

Figure 15 — Example of angles on a rooftop PFPS using an anti-pendulum anchor device where their use is unavoidable – plan view



5.7 Obligations of the system designer

COMMENTARY ON 5.7

Attention is drawn to *The Health and Safety at Work etc. Act 1974* [8].

The system designer should:

- ensure that the anchor system is designed, assembled and installed to meet the requirements of its intended application, and is safe and without risks to health when maintained and used in accordance with the instructions provided in accordance with f);
- ensure the compatibility of assembled parts of the anchor system, including carrying out or arranging for such testing, where appropriate, to ensure compatibility;
- arrange for verification from a suitably qualified person that the overall structure has sufficient strength and structural stability to sustain the design loads that could be transferred from the anchor system (see 5.2);
- carry out or arrange for the carrying out of such on-site testing, e.g. trial tests (see 5.3), to confirm the strength of the base material in the immediate vicinity of the structural anchor(s)

to sustain the design loads that could be transferred from the structural anchor(s) where such strength is in doubt, e.g. in masonry;

- e) only attempt to design an anchor system if the PFPE to which it is to be connected is known;
- f) take such steps to ensure that the duty holder is provided with information (see [11.5](#)) about the use for which the anchor system is designed and tested and any conditions necessary to ensure that it is safe and without risk to health in accordance with a) to e), including when it is being dismantled or disposed of; and
- g) ensure that the duty holder is provided with all such revisions of information provided in accordance with f) that would otherwise give rise to a risk to health or safety.

Before the system designer selects any PFPE for use with the anchor system, or where the PFPE has been proposed by another party, the system designer should ensure that the PFPE is suitable for that anchor system and the intended purpose. A list of any approved and proposed PFPE should be provided to the duty holder as part of the system technical file (see [11.5.1](#)) and the operation and maintenance manual (see [11.5.2](#)).

PFPE should be selected in accordance with [BS 8437](#), taking account of:

- 1) the definition of the characteristics which PFPE needs to have in order to be effective against the risks, taking into account any risks which the equipment itself might create;
- 2) comparison of the characteristics of the PFPE available with the characteristics referred to in 1); and
- 3) whether the PFPE, when connected, is compatible with other PFPE or anchor system(s) in use.

5.8 Anchor system modification – system designer responsibilities

The system designer should not make any changes or modifications to the anchor system outside of the manufacturer of the anchor system's specification and design limitations, e.g. structural anchors; base material; structural limitations, without the manufacturer's written approval.

Where elements are added or changes made to the anchor system, the manufacturer should ensure, either directly or indirectly, that the added elements and/or modified anchor system are retested to ensure that performance is not adversely affected to the satisfaction of any notified body or third-party test laboratory responsible for the original certification.

NOTE The reason for this approach is that additions and modifications to anchor systems invalidate original test results and certifications and can have liability implications for the manufacturer and system designer, alongside safety implications for the user.

Where modifications are made to the PFPS design during its lifetime, the system designer should take into account any effects this might have to all areas of the anchor system design, e.g. rescue provision, system documentation.

5.9 Frequency, intensity of use and design life

Based on the information gathered in accordance with [4.1](#) to [4.4](#), the system designer should determine the frequency and intensity of use of the PFPS to ensure that it is fully functional for the design life agreed between the duty holder, manufacturer and/or system designer.

5.10 Accessible and hidden elements

Wherever possible, anchor systems should be designed such that all parts can be accessed for inspection at the time of periodic inspection.

Where elements of the anchor system are to be hidden after installation and not available for inspection, additional measures should be taken into account for inspections to enable the inspector

to fulfil their duties in ensuring the installation is safe to use between the date of the periodic inspection and the specified date of the next periodic inspection, including:

- a) using materials with a known lifespan when used in the hidden environment;
- b) using elements whose integrity, when hidden, is maintained throughout the lifetime of the installation or given lifespan;
- c) providing information to go within the system technical file, e.g.:
 - 1) a record of the type of materials used in the anchor system, including structural anchors;
 - 2) a record of the base material;
 - 3) a record of the materials used in the covering of the hidden elements;
 - 4) a specification for the means of preventing threaded elements coming loose through-out the lifespan of the installation;
 - 5) photographic evidence and sign-off documentation confirming that the installation has been carried out in accordance with the system design specification;
 - 6) confirmation of the life expectancy of the hidden elements of the installation; and
 - 7) any requirements for additional supplementary inspections of the hidden elements of the anchor system, how often these are to be completed and what they are to involve; and
- d) the frequency of supplementary inspections [see [11.5.3 d\)](#) and [12.2.4](#)] which might be required throughout the design life of the anchor system, e.g. to uncover hidden elements of the anchor system to verify suitability for continued safe use, taking into account other factors, e.g.:
 - 1) environmental;
 - 2) frequency of use;
 - 3) type and specification of materials covering hidden elements; and
 - 4) the need to maintain water tightness.

5.11 Environmental/climatic considerations and design life

Based on the information gathered in accordance with [4.1](#) to [4.4](#), the system designer should, in consultation with the anchor system manufacturer, ensure that the design life of the proposed anchor system meets or exceeds, if possible, the service life required by the duty holder, taking into account the materials used in the anchor system and likely climatic and environmental conditions, without compromising the integrity and operation of the anchor system.

The system designer should also take into account external factors, including:

- a) aggressive corrosion environments, e.g. polluted industrial, coastal, marine (splash zone, tidal, full immersion), high chlorine, reactive chemicals;
- b) contaminants;
- c) temperature extremes (effect on wire rope systems);
- d) snow loading; and
- e) wind conditions from, for example, terrain (flat open ground, mountainous, built environment), prevailing wind direction, oscillation and vibration.

Where PFPS are to be installed externally or, for example, in positions exposed to humidity, corrosive conditions, they should be manufactured from appropriate materials, e.g. stainless steel, to achieve the design life.