

**BS 8610:2017**



**BSI Standards Publication**

## **Personal fall protection equipment –**

Anchor systems – Specification



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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 2017. 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.

## Product certification/inspection/testing

Users of this British Standard are advised to consider the desirability of third-party testing of product conformity with this British Standard. Appropriate conformity attestation arrangements are described in [Annex A](#). Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

## Use of this document

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

Users of this British Standard are expected to be able to demonstrate compliance with all applicable requirements.

## Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

*Commentary, explanation and general informative material is presented in 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.**



## 0 Introduction

### 0.1 General

This British Standard covers two categories of anchor system:

- a) non-load-limiting, for single and multi-users; and
- b) load-limiting, for single and multi-users.

Each category consists of various types, i.e. type A, type C and type D, which cover different applications, including:

- restraint;
- fall arrest;
- rope access;
- work positioning;
- several types of rescue; and
- evacuation.

*NOTE For anchor system options and codification, see Table 1 and Table 2.*

**Table 1** — Non-load-limiting codification and anchor system options

| Type                                     | Application Code | Application Use                                        |
|------------------------------------------|------------------|--------------------------------------------------------|
| A – e.g. eyebolt <sup>A)</sup> /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                                             |

<sup>A)</sup> As an example of codification, an eyebolt for fall arrest – non-load-limiting would be A2.

*NOTE 1* Type A, type C and type D anchor systems are based on the types described in BS EN 795. Type B and type E, as described in BS EN 795, are not covered in this British Standard as they are not installed in a base material and so, therefore, the sequence of types in this British Standard is type A, type C, and type D.

*NOTE 2* For clarification, BS EN 795 (single user only) and PD/CEN TS 16415 (two or more users) cover only anchor devices and not the structural anchor or the base material.

**Table 2 — Load-limiting codification and anchor system options**

| Type                                 | Application Code                                                          | Application Use                                        |
|--------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------|
| A – eyebolt <sup>A)</sup> /post etc. | 1L                                                                        | Restraint                                              |
|                                      | 2L                                                                        | Fall arrest                                            |
|                                      | 5L                                                                        | Rescue – remotely or self-operated – direct attachment |
| C – flexible horizontal anchor line  | 1L                                                                        | Restraint                                              |
|                                      | 2L                                                                        | Fall arrest                                            |
|                                      | 5L                                                                        | Rescue – remotely or self-operated – direct attachment |
| D – rigid horizontal anchor line     | Not covered as load-limiting type D anchor systems do not currently exist |                                                        |

<sup>A)</sup> As an example of codification, an eyebolt for fall arrest – load-limiting would be A2L.

**NOTE 1** Type A, type C and type D anchor systems are based on the types described in BS EN 795. Type B and type E, as described in BS EN 795, are not covered in this British Standard as they are not installed in a base material and so, therefore, the sequence of types in this British Standard is type A, type C, and type D.

**NOTE 2** For clarification, BS EN 795 (single user only) and PD/CEN TS 16415 (two or more users) cover only anchor devices and not the structural anchor or the base material.

This British Standard is intended for the type testing of anchor systems and gives only minimum performance requirements. It is essential that anchor systems are designed and manufactured so that, in the foreseeable conditions of use for which they are intended, the user is able to perform the risk-related activity while being appropriately protected at the highest possible level.

This British Standard presumes that the manufacturer of the relevant parts of the anchor system, for the sake of consistency and traceability, operates a quality management system which complies with regulations in force at the time. Guidance on the form this quality management system could take can be found in BS EN ISO 9001.

## 0.2 Advice on using this British Standard

It is recommended that this British Standard is read in the following order to ensure the correct category of anchor system is selected and tested.

- a) [Clause 0](#), Table 1 and Table 2: depending on which category of anchor system has been chosen, select:
  - 1) the category of anchor system, i.e. non-load-limiting or load-limiting;
  - 2) the type of anchor system, i.e. type A, type C or type D; and
  - 3) an application or applications that apply (application codes 1 to 7).

- b) [Clause 1](#), Scope.

**NOTE** [Clause 3](#) clarifies terminology used in this British Standard.

- c) [Clause 4](#), Anchor system requirements, should be read in the following order:

- 1) [4.1](#), General requirements;
- 2) [4.2](#), Pre-testing verification and recording requirements;
- 3) [4.3](#), Materials; and
- 4) [4.4](#), Design and ergonomics.

- d) Depending on the category of anchor system selected [see a)], either select:

- 1) [4.5](#), Non-load-limiting anchor systems; or
- 2) [4.6](#), Load-limiting anchor systems.

- e) Using either [4.5](#) or [4.6](#), select the appropriate type and application, e.g. [4.5.1.1](#), Type A, Restraint – non-load-limiting.

*NOTE Some of the subclauses cover more than one application.*

- f) See Table 3 for the appropriate requirements and related test methods.

- g) [Clause 5](#), Test methods, should be read in the following order:

- 1) [5.1](#), Pre-test requirements;
- 2) [5.2](#), Dynamic performance test apparatus and preparation;
- 3) [5.3](#), Static strength test apparatus;
- 4) [5.4](#), General test requirements;
- 5) [5.5–5.7](#): Using Table 3 ([4.2.9](#)), select the test methods appropriate to the category, type and application chosen; and

*NOTE Test methods generally comprise deformation, dynamic performance and static strength, in that order. For some applications, there are no dynamic performance tests.*

- 6) [5.8](#), Corrosion resistance test method;
- h) [Clause 6](#), Marking.
- i) [Clause 7](#), Information to be supplied by the manufacturer.
- j) [Annex A](#) to [Annex C](#) provides further normative and informative information regarding:
- 1) criteria for test laboratories;
  - 2) test rationale; and
  - 3) requirements for test apparatus and procedures.

---

## 1 Scope

This British Standard provides requirements and test methods for type testing anchor systems that are installed and tested in the base materials specified by the manufacturer for:

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

This British Standard covers anchor systems intended for one or more users simultaneously and specifies the maximum number of users for each type of anchor system.

*NOTE 1 Where the manufacturer intends to rate their anchor systems for more than the specified maximum number of users, it is recommended that they liaise with an appropriate test house, taking into account the principles of this British Standard and develop a test specification accordingly.*

This British Standard is not applicable to:

- 1) equipment conforming to BS EN 516 or BS EN 517;
- 2) type A load-limiting anchor systems (see [3.3.2](#)) for:
  - rope access and work positioning;

- rescue – accompanied descent;
- rescue – remotely operated – redirect attachment; and
- evacuation,

as they are considered not to be appropriate for such use.

3) type C non-load-limiting and load-limiting anchor systems (see [3.3.3](#)) for:

- rope access and work positioning;
- rescue – accompanied descent;
- rescue – remotely operated – redirect attachment; and
- evacuation,

as they are considered not to be appropriate for such use.

4) type B and type E, as described in BS EN 795, are not covered in this British Standard as they are not installed in a base material;

5) bespoke structurally designed anchors incorporated into structures.

*NOTE 2 The performance requirements in this British Standard are intended as minimum requirements for anchor devices, structural anchors and their base material(s). The performance requirements do not constitute structural verification of the structures for the imposed loads.*

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

*NOTE 3 Information on the use of anchor systems in personal fall protection systems, including rope access, can be found in BS 8437, BS 7985 and BS 7883.*

*NOTE 4 Anchor systems conforming to this British Standard for rope access should meet the requirements of the rope access industry for anchor systems, as detailed in BS 7985 and the Industrial Rope Access Trade Association (IRATA), International code of practice for industrial rope access (ICOP) [1].*

## 2 Normative references

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

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

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

BS EN 363, *Personal fall protection equipment — Personal fall protection systems*

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

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

BS EN 12385-4, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

BS EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

BS EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Tension/compression testing machines — Part 1: Calibration and verification of the force-measuring system*

BS EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

BS EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 2232, *Round drawn wire for general purpose non-alloy steel wire ropes and for large diameter steel wire ropes — Specifications*

PD 6697, *Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2*

### 3 Terms and definitions

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

#### 3.1 anchor device

element or series of elements incorporating an anchor point or anchor points, providing the interface between the anchor point and structural anchor

#### 3.2 anchor point

point or points on an anchor system for the attachment of personal fall protection equipment

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

#### 3.3 anchor systems

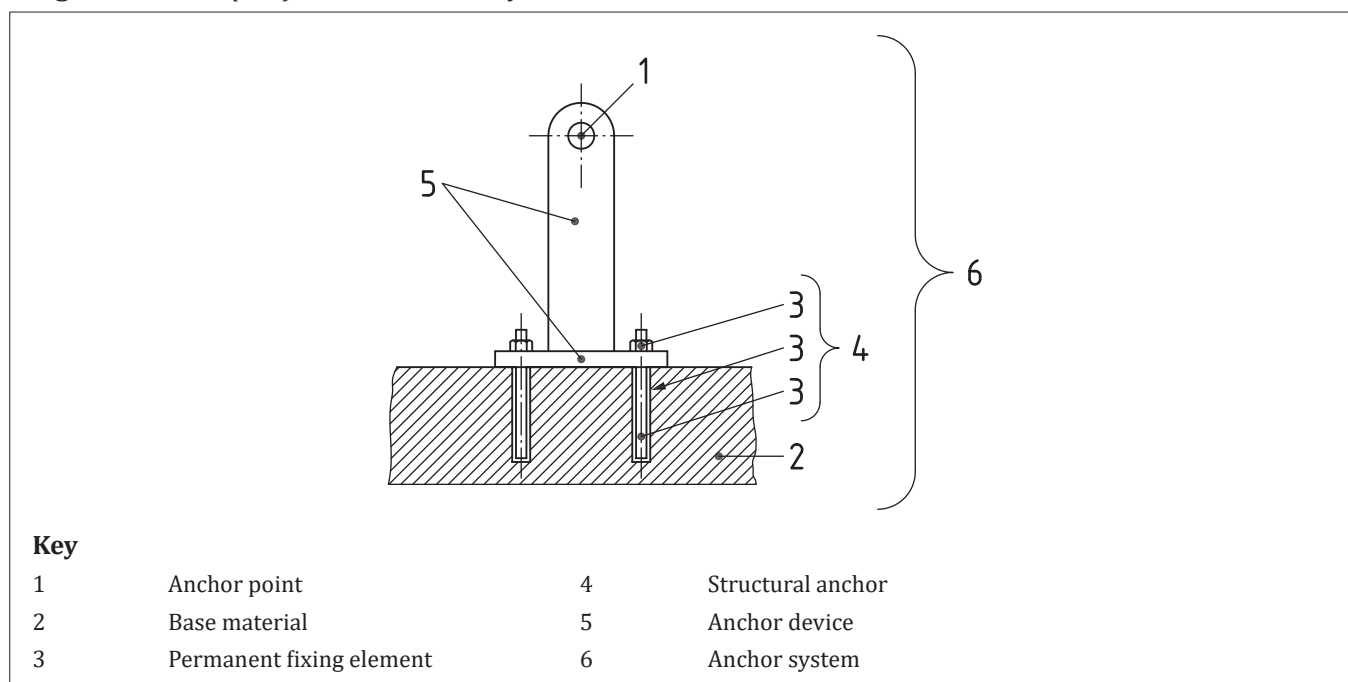
##### 3.3.1 anchor system

system incorporating an anchor device, structural anchor(s) and the base material

*NOTE 1* 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.

**Figure 1** — Example of a BS 8610 anchor system



### 3.3.2 type A anchor system

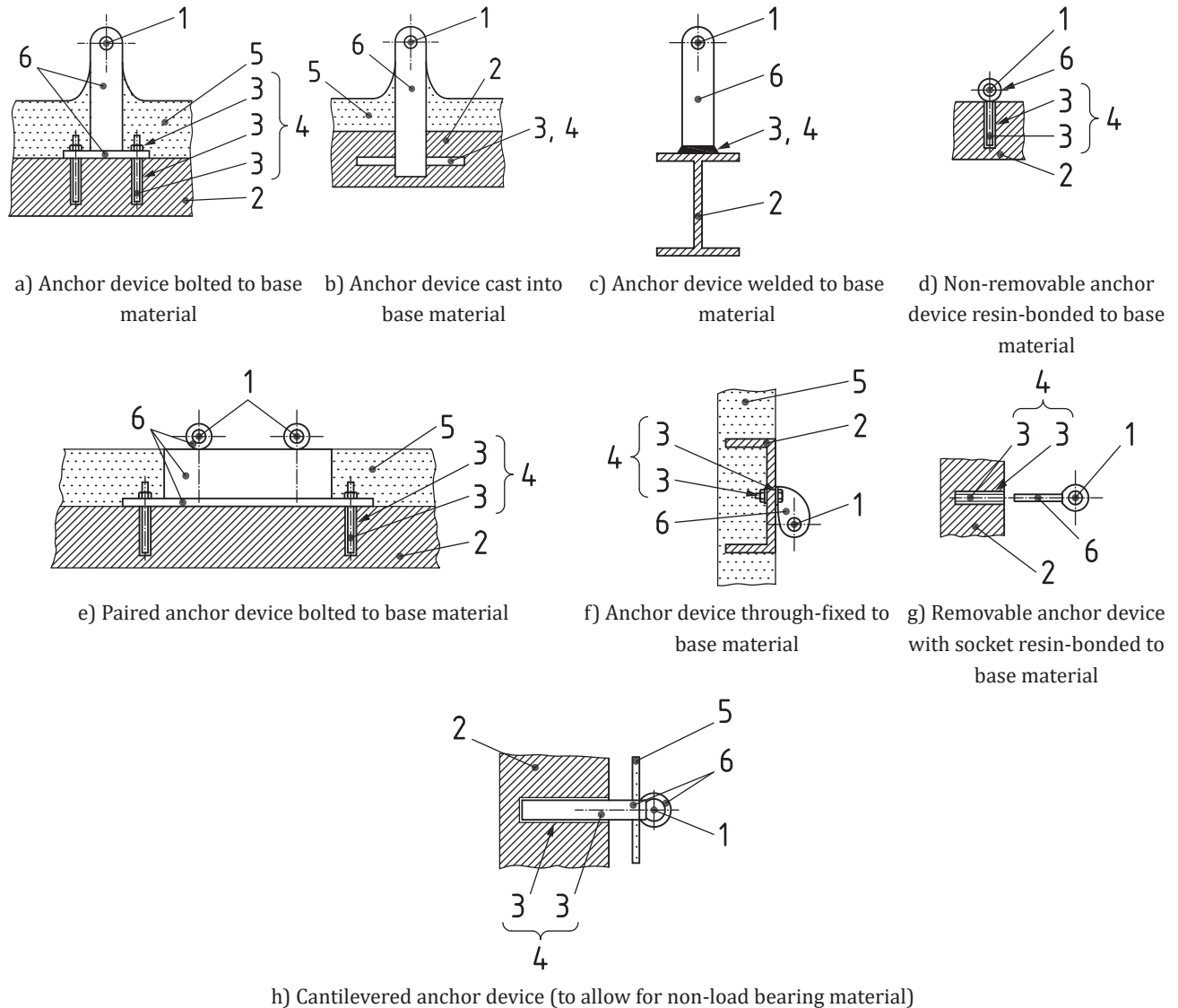
anchor system incorporating one or more non-travelling anchor points

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

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

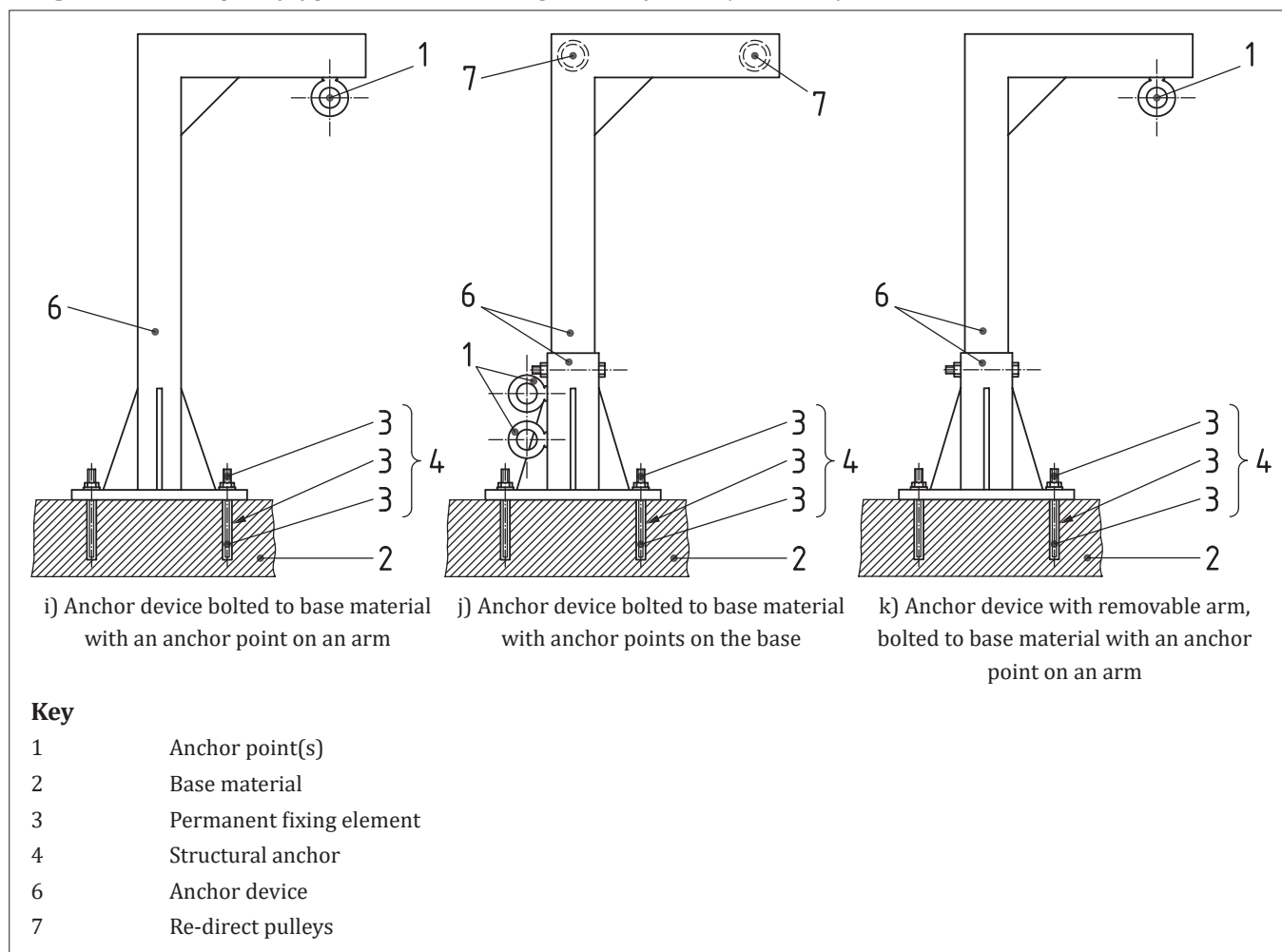
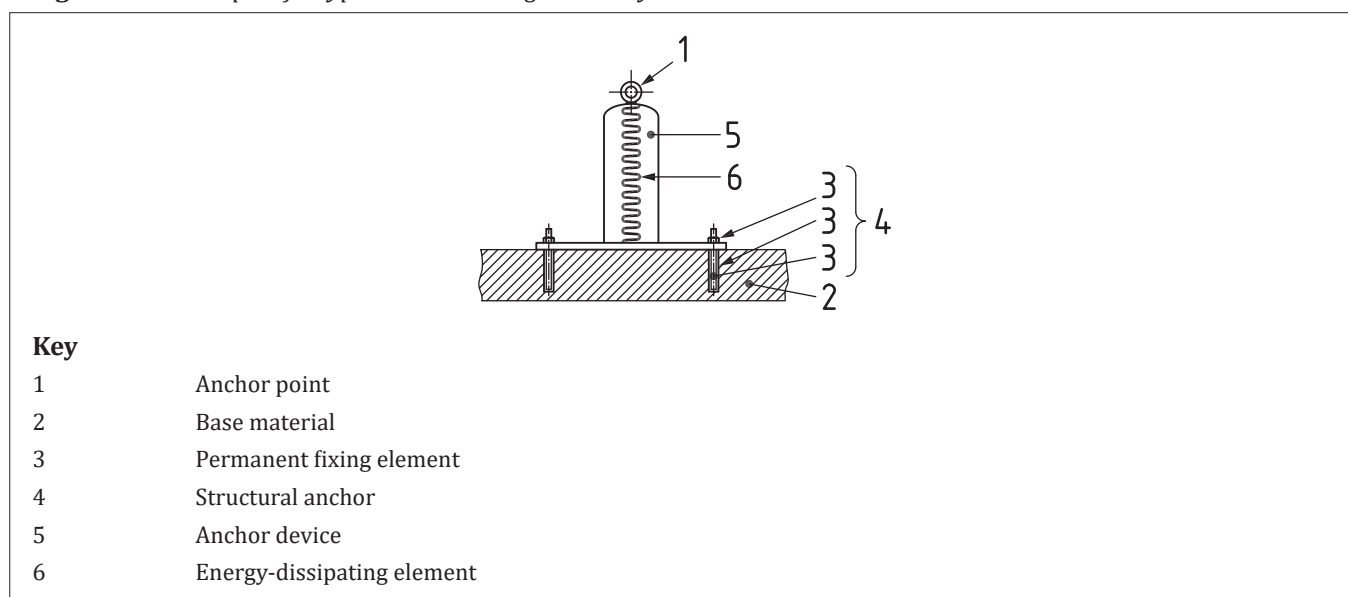
NOTE 3 Anti-pendulum and deviation anchor devices are considered to be type A anchor systems.

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



#### Key

- 1 Anchor point(s)
- 2 Base material
- 3 Permanent fixing element
- 4 Structural anchor
- 5 Non-load bearing material, including insulation and weather proofing materials
- 6 Anchor device

**Figure 2** — Examples of type A non-load-limiting anchor systems (continued)**Figure 3** — Example of a type A load-limiting anchor system

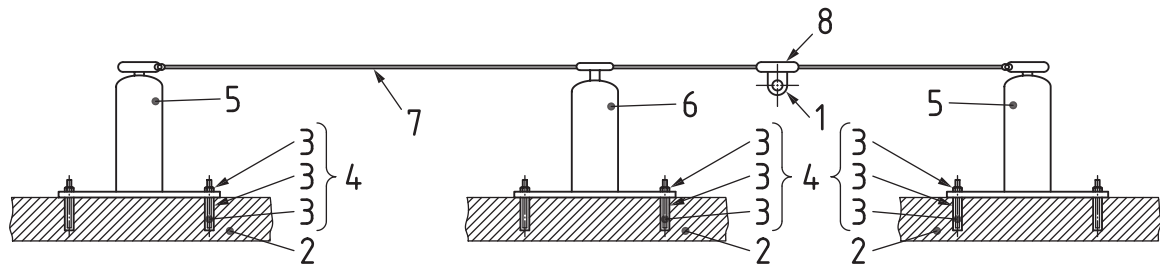
### 3.3.3 type C anchor system

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 4](#) and [Figure 5](#).

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

**Figure 4** — Example of a type C non-load-limiting anchor system

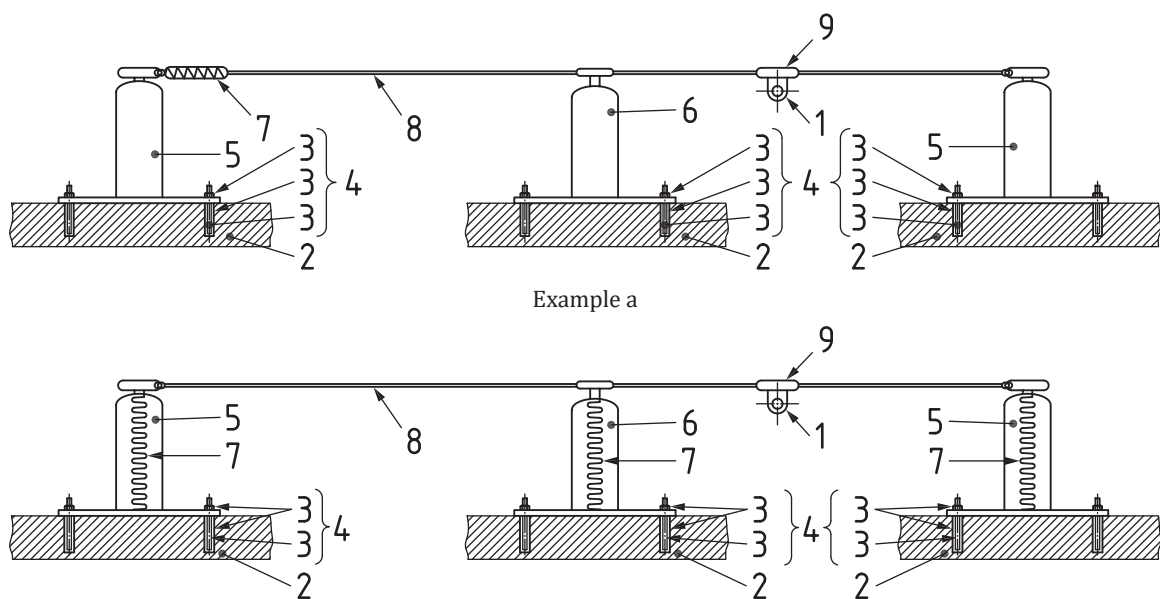


#### Key

|   |                          |   |                      |
|---|--------------------------|---|----------------------|
| 1 | Anchor point             | 5 | Extremity anchor     |
| 2 | Base material            | 6 | Intermediate anchor  |
| 3 | Permanent fixing element | 7 | Flexible anchor line |
| 4 | Structural anchor        | 8 | Traveller            |

NOTE 1, 5, 6, 7 and 8 comprise the anchor device.

**Figure 5** — Examples of type C load-limiting anchor systems



Example b

#### Key

|   |                          |   |                            |
|---|--------------------------|---|----------------------------|
| 1 | Anchor point             | 6 | Intermediate anchor        |
| 2 | Base material            | 7 | Energy-dissipating element |
| 3 | Permanent fixing element | 8 | Flexible anchor line       |
| 4 | Structural anchor        | 9 | Traveller                  |
| 5 | Extremity anchor         |   |                            |

NOTE 1, 5, 6, 7, 8 and 9 comprise the anchor device.

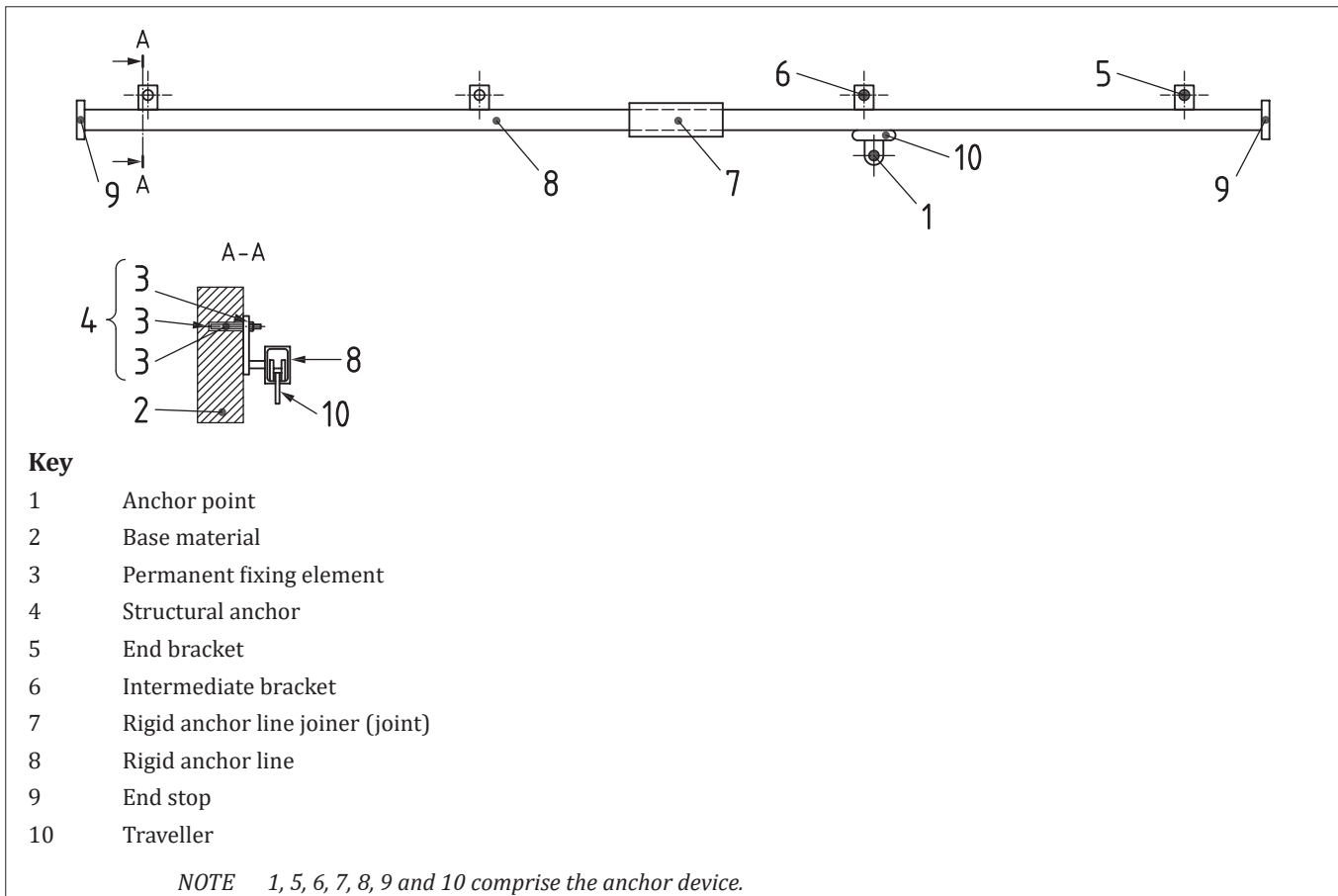
### 3.3.4 type D anchor system

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 6](#).

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

**Figure 6** — Example of a type D non-load-limiting anchor system



### 3.4 base material

material to which the anchor system is installed

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

### 3.5 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]

### 3.6 duty holder

person appointed by an organization with the responsibility for the maintenance of the overall quality of the anchor system

### 3.7 element

part of an anchor system

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

**3.8 energy-dissipating element**

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

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

**3.9 evacuation**

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

**3.10 evacuation system**

personal fall protection system 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

**3.11 extremity anchor**

element connecting the extremity of a flexible anchor line or rigid anchor line to the base material

**3.12 fall arrest system**

personal fall protection system which limits the impact force on the body of the user during fall arrest

[SOURCE: BS EN 363:2008, 3.2.1.4]

**3.13 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.*

**3.14 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 anchor line.*

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

**3.15 masonry**

construction of stone(s), brick(s) or block(s)

[SOURCE: BS ISO 6707-1:2017, 5.5.12]

**3.16 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 Maximum rated mass,  $RM_{max}$ , was formerly known as maximum rated load,  $RL_{max}$ .*

**3.17 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

**3.18 non-load-limiting anchor device**

anchor device without an integral energy-dissipating element

### 3.19 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 nut, threaded stud, internally-threaded socket, screw, bolt, expansion anchor, cast-in anchor, rivet, resin bond, weld.*

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

### 3.20 personal fall protection system

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

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

### 3.21 rescue

act of saving or being saved from danger or difficulty

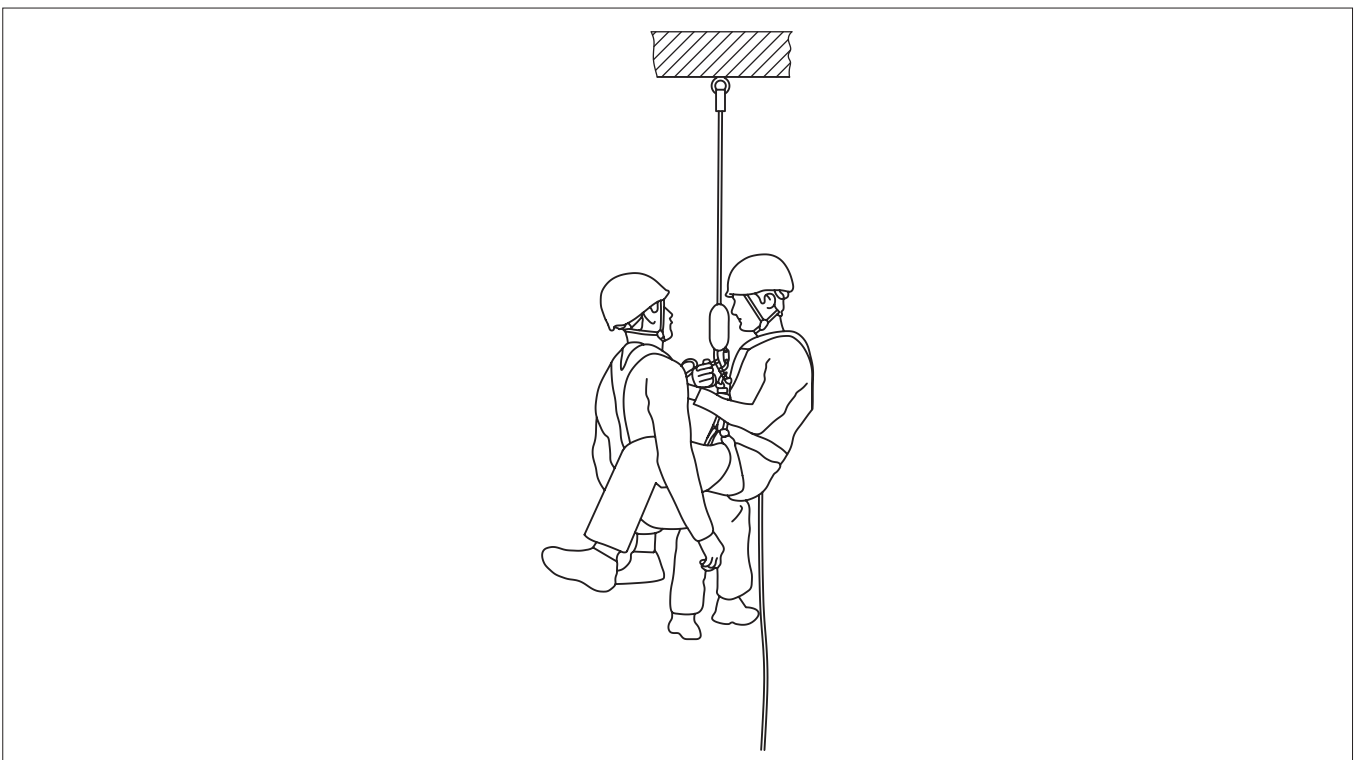
#### 3.21.1 rescue – accompanied descent system

personal fall protection system 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 7](#).*

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

**Figure 7** — Example of an accompanied descent type rescue



#### 3.21.2 rescue – remotely or self-operated – direct attachment system

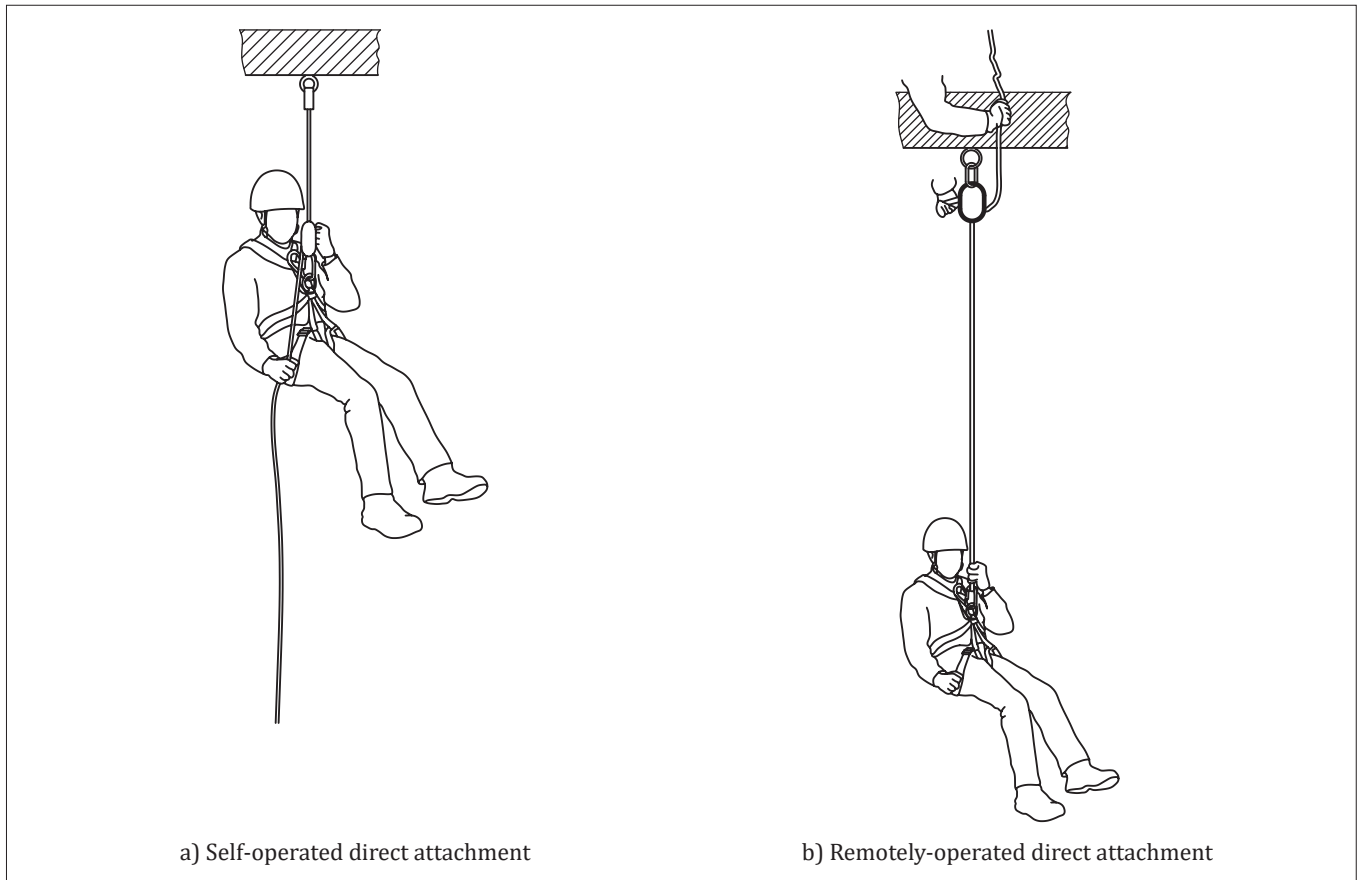
personal fall protection system by which a person can rescue themselves or be rescued by another person by direct attachment to an anchor point, in such a way that a free fall is prevented

*NOTE 1 See [Figure 8](#).*

*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 8** — Example of rescue — remotely or self-operated — direct attachment systems



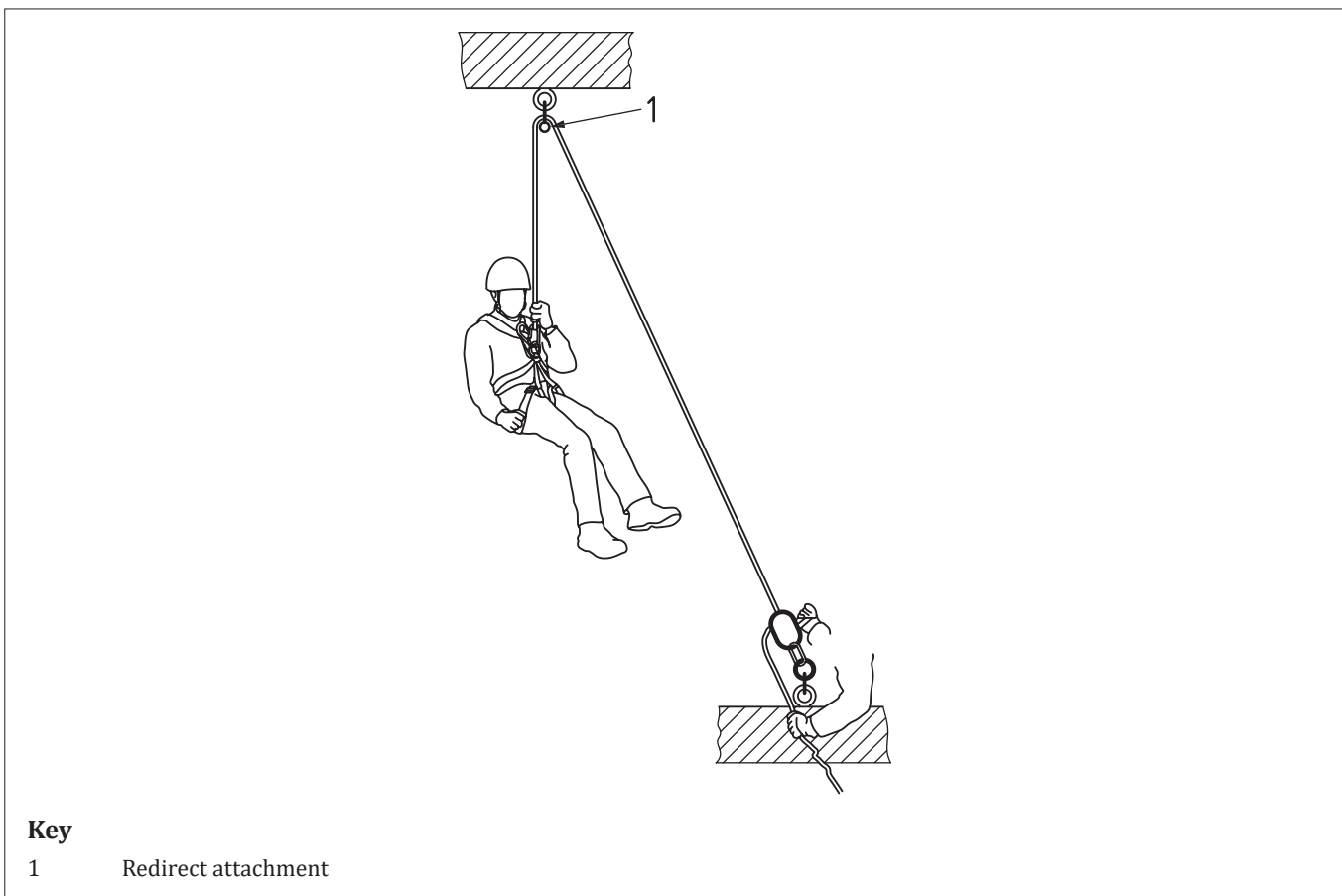
### 3.21.3 rescue – remotely operated – redirect attachment system

personal fall protection system by which a person is rescued by another person by the use of an anchor line attached indirectly to an anchor point, the effect of which changes the direction of force supplied, and in such a way that a free fall is prevented

*NOTE 1 See [Figure 9](#).*

*NOTE 2 Anchor lines in these systems are typically routed through a pulley.*

*NOTE 3 Redirect attachment systems can potentially double the load on an anchor system.*

**Figure 9** — Example of a remotely operated redirect attachment type rescue**3.22 restraint system**

personal fall protection system which prevents the user from reaching zones where the risk of a fall from a height exists

*NOTE* A restraint system is not a fall arrest system.

[SOURCE: BS EN 363:2008, 3.2.1.1]

**3.23 rope access system**

personal fall protection system 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, separately connected to reliable anchor points

[SOURCE: BS EN 363:2008, 3.2.1.3]

**3.24 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

**3.25 structure**

building, other object constructed from several parts, or natural feature

*NOTE* An example of a natural feature is a rock face.

**3.26  $T_{max}$** 

maximum tension load in a flexible anchor line measured at the extremity anchors during the dynamic performance test

### 3.27 principal safety-critical direction(s)

direction or directions of loading applied during testing intended to cover the range of directions of loading that could occur in use

*NOTE 1* See [5.4.2](#).

*NOTE 2* The principal safety-critical directions of loading are considered to be the most onerous in terms of exposing potential weaknesses in the anchor system.

### 3.28 traveller

element with an anchor point intended to travel along a horizontal 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 horizontal anchor line or a textile or wire sling passed over a rigid rail and linked by a connector.

### 3.29 work positioning system

personal fall protection system which enables the user to work in tension or suspension in such a way that a free fall is prevented

[SOURCE: BS EN 363:2008, **3.2.1.2**]

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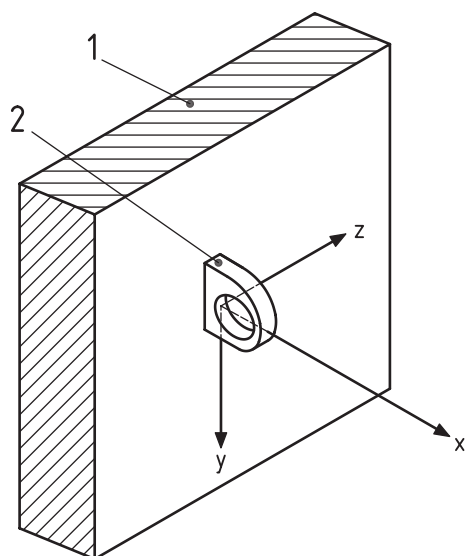
## 4 Anchor system requirements

### COMMENTARY ON Clause 4

Where the manufacturer wishes to claim two or more application codes for an anchor system type and where the deformation, dynamic performance, static strength and principal safety-critical test direction requirements for one application meets or exceeds the requirements for another application for a stated maximum system rating ( $SR_{max}$ ), and maximum rated mass ( $RM_{max}$ ), the test laboratory conducting the assessment can, at their discretion, waive the need for repeat or superfluous testing.

### 4.1 General requirements

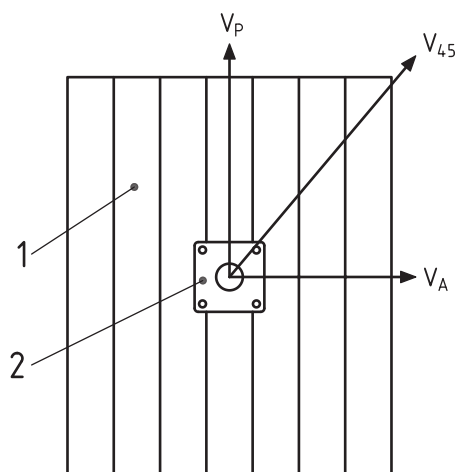
- 4.1.1** Anchor systems shall be tested in the base materials that the manufacturer permits, unless otherwise specified in the relevant test methods (see [Clause 5](#)). When tests are carried out in such base materials, they shall be carried out in base materials of suitable strength and dimensions so as to validate the structural limitations to be provided in [7.3 d](#)).
- 4.1.2** Anchor systems shall be tested in each relevant principal safety-critical direction, e.g. in tension, in shear, or a combination of the two (see [5.4.2](#) and [Figure 10](#)).

**Figure 10** — Examples of principal safety-critical test directions

a) Example of principal safety-critical test directions for a type A anchor system (eyebolt) using a single structural anchor

**Key**

- 1 Base material, e.g. wall
- 2 Anchor device and structural anchor
- x Tensile load direction
- y Shear load direction
- z Shear load direction 90° to y-axis

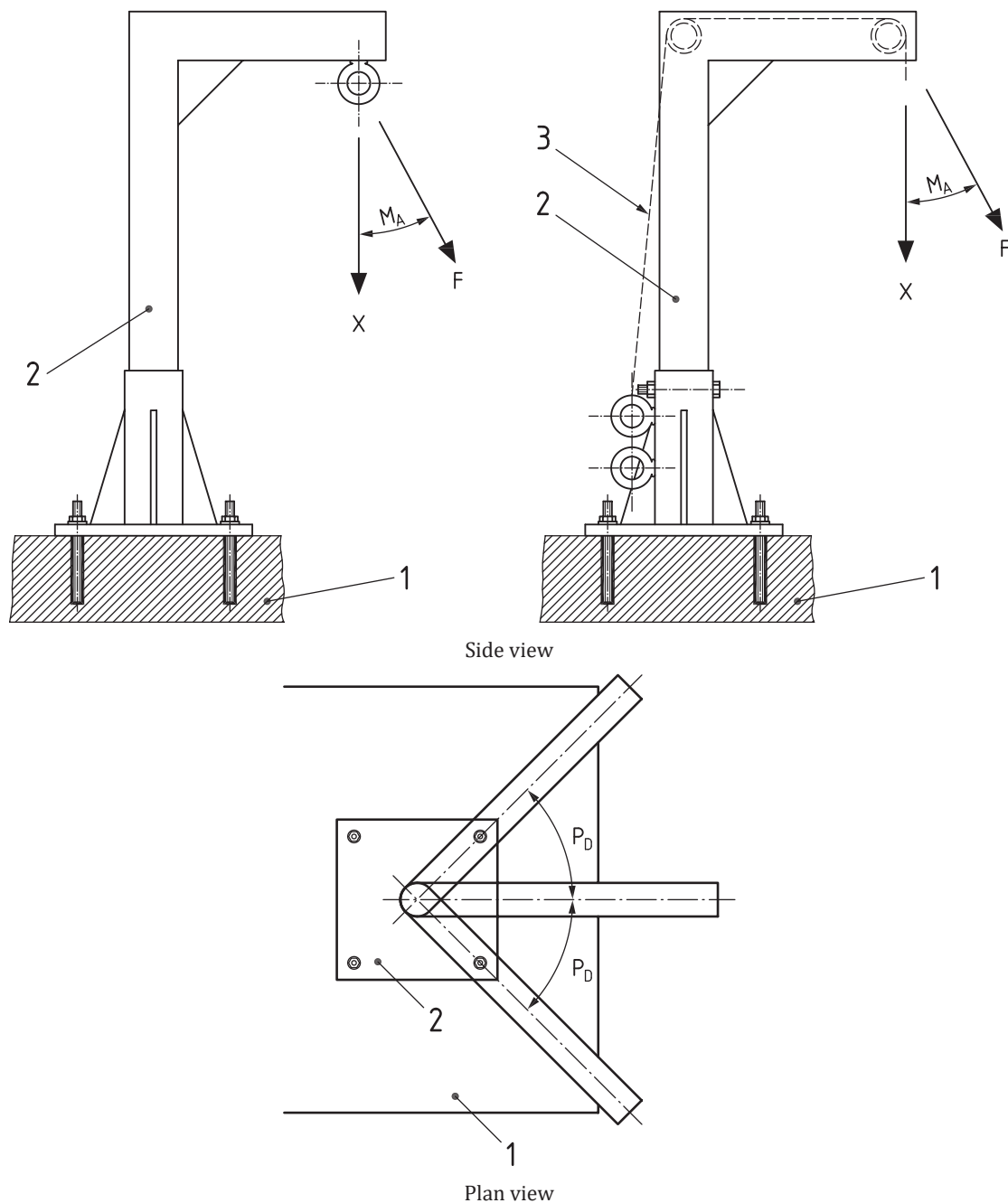
**Figure 10** — Examples of principal safety-critical test directions (continued)

b) Example of principal safety-critical test directions for a type A anchor system (roof post) or type C extremity, intermediate and corner anchors using more than one structural anchor

**Key**

- 1 Base material, e.g. roof structure
- 2 Anchor device, including structural anchor(s)
- $V_p$  Test load direction parallel to roof seam
- $V_A$  Test load direction across roof seam
- $V_{45}$  Test load direction – equally bisecting  $V_p$  and  $V_A$

**NOTE** Tests perpendicular to the base material surface can be undertaken if required by the manufacturer.

**Figure 10** — Examples of principal safety-critical test directions (continued)

c) Examples of principal safety-critical test directions for a type A davit arm anchor system

**Key**

- 1 Base material, e.g. roof structure
- 2 Anchor device, including structural anchor(s)
- 3 Connecting line
- $M_A$  Maximum deviation angle
- X Tensile load direction
- F Test load direction at maximum deviation angle
- $P_D$  Maximum pivot angle

**4.1.3** Where alternative configurations of the same type of anchor device are to be made available, e.g. different height posts and/or with different base plate dimensions, the worst configuration, as agreed

by the manufacturer and test laboratory, shall be tested, ensuring the limit is set for the configuration that could be offered, e.g. the tallest post, each type of base plate.

- 4.1.4** If the geometry, configuration or material of an anchor device, including the structural anchor, differs from the one that has been tested as part of the anchor system, the anchor system shall be verified by testing in accordance with Clause 5, or proven by calculation with the results recorded.
- 4.1.5** During deformation tests, cracks, ruptures or unintended tears of any part of the anchor system, visible with normal or corrected vision, shall not be permitted.
- 4.1.6** Where deformation tests and static strength tests are carried out simultaneously, (i.e. for type A1 and type D1 anchor systems), cracks, ruptures or unintended tears of any part of the anchor system, visible with normal or corrected vision, shall not be permitted.
- 4.1.7** During dynamic performance tests and static strength tests, any sign or evidence of partial failure of the anchor system, e.g. cracks, ruptures or unintended tears, visible with normal or corrected vision, shall not be classed as a failure, but shall be detailed in the test report (see [Annex A](#)).

## **4.2 Pre-testing verification and recording requirements**

- 4.2.1** Prior to testing, elements of the anchor system, where appropriate, shall be verified by:

- a) confirming appropriate documentation;
- b) visual and/or tactile examination;
- c) weighing elements; and
- d) measuring,

in order to ensure conformity to [4.2.2](#) to [4.2.8](#), [4.3](#) and [4.4](#), with the exception of [4.3.1.1](#) which shall be checked upon completion of the corrosion resistance test (see [5.8](#)).

- 4.2.2** It shall not be possible for elements of the anchor system to become unintentionally detached.

*NOTE Examples of elements which could become unintentionally detached include non-permanently binding fasteners, e.g. nuts or other threaded fasteners. These elements can be prevented from inadvertent loosening by, e.g. the addition of self-locking nuts, tabwashers, shakeproof washers, staking, peening, split or roll-pinning.*

- 4.2.3** If an element of the anchor system can be removed, it shall be designed such that it can only be detached after carrying out two separate, consecutive and deliberate manual actions.
- 4.2.4** For anchor systems which include removable elements, those elements shall be such that they cannot appear to be positively locked together when they are not, due to incorrect assembly.
- 4.2.5** Anchor points shall be so designed to ensure easy engagement and disengagement of the connector or connectors supplied or recommended by the manufacturer. Gates or other closing mechanisms of the connector shall be able to close and be locked without interference when engaged in the anchor point. Connectors shall be able to rotate freely around the anchor point in such a way that they can self-align in the directions of use and in the principal safety-critical directions when under load. Rotation and alignment under load shall not be so impeded to allow loading on the gate or other closing mechanism.

*NOTE This protects against connectors being incorrectly loaded and/or becoming detached unintentionally during use.*

- 4.2.6** Anchor systems equipped with a fall or overload indicator shall clearly indicate that a fall or an overload has occurred upon completion of the dynamic performance tests (see Table 3), or static strength tests (see Table 3) if there are no dynamic performance test requirements.
- 4.2.7** The mass of any element of an anchor system intended to be transported by a single person, e.g. during installation, shall not exceed 25 kg.
- 4.2.8** For testing purposes, the maximum rated mass ( $RM_{max}$ ) shall be a minimum of 100 kg. When calculating the loads to be used in the deformation tests and the static strength tests,  $RM_{max}$  shall be taken to be an equivalent load, and rounded up to the nearest 0.1 kN, e.g. 100 kg  $RM_{max} \equiv 1$  kN, 125 kg  $RM_{max} \equiv 1.3$  kN.
- 4.2.9** The specifications of all elements of the anchor system shall be recorded in a test report to ensure traceability, i.e. comparison of the specifications of an already installed anchor system with the anchor system as tested. This shall include, as applicable, part numbers, specifications of anchor devices, structural anchors, base materials and their construction (see [Annex A](#)).

**Table 3 — Schedule of tests**

| Anchor system                                                                      | Test type                                                           | Requirements            | Test method                                                                   |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------|
| <b>Type A Non-load-limiting</b>                                                    |                                                                     |                         |                                                                               |
| General                                                                            |                                                                     |                         | <a href="#">5.5.1</a>                                                         |
| Type A1 Restraint – non-load-limiting                                              | Static strength and deformation                                     | <a href="#">4.5.1.1</a> | <a href="#">5.5.2.1</a>                                                       |
| Type A2 Fall arrest – non-load-limiting                                            | Deformation<br>Dynamic performance<br>Static strength               | <a href="#">4.5.1.2</a> | <a href="#">5.5.3.1</a><br><a href="#">5.5.3.2</a><br><a href="#">5.5.3.3</a> |
| Type A3 Rope access and work positioning – non-load-limiting                       | Deformation<br>Dynamic performance<br>Static strength               | <a href="#">4.5.1.2</a> | <a href="#">5.5.3.1</a><br><a href="#">5.5.3.2</a><br><a href="#">5.5.3.3</a> |
| Type A4 Rescue – accompanied descent – non-load-limiting                           | Deformation<br>Static strength                                      | <a href="#">4.5.1.3</a> | <a href="#">5.5.4.1</a><br><a href="#">5.5.4.2</a>                            |
| Type A5 Rescue – remotely or self-operated – direct attachment – non-load-limiting | Deformation<br>Dynamic performance <sup>A)</sup><br>Static strength | <a href="#">4.5.1.2</a> | <a href="#">5.5.3.1</a><br><a href="#">5.5.3.2</a><br><a href="#">5.5.3.3</a> |
| Type A6 Rescue – remotely operated – redirect attachment – non-load-limiting       | Deformation<br>Static strength                                      | <a href="#">4.5.1.3</a> | <a href="#">5.5.4.1</a><br><a href="#">5.5.4.2</a>                            |
| Type A7 Evacuation – non-load-limiting                                             | Deformation<br>Static strength                                      | <a href="#">4.5.1.3</a> | <a href="#">5.5.5.1</a><br><a href="#">5.5.5.2</a>                            |

<sup>A)</sup> As rescue is a secondary function of an application code 2 anchor system, application code 5 anchor systems have to meet the dynamic performance requirements of application code 2 anchor systems.

Table 3 (continued)

| Anchor system                                                                                    | Test type                                                                                                                        | Requirements            | Test method                                                                                              |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Type A Load-limiting</b>                                                                      |                                                                                                                                  |                         |                                                                                                          |
| General                                                                                          |                                                                                                                                  |                         | <a href="#">5.5.1</a>                                                                                    |
| Type A1L Restraint – load-limiting                                                               | Deformation<br>Static strength                                                                                                   | <a href="#">4.6.1.1</a> | <a href="#">5.5.6.1</a><br><a href="#">5.5.6.2</a>                                                       |
| Type A2L Fall arrest – load-limiting                                                             | Deformation<br>Dynamic performance<br>Static strength                                                                            | <a href="#">4.6.1.2</a> | <a href="#">5.5.7.1</a><br><a href="#">5.5.7.2</a><br><a href="#">5.5.7.3</a>                            |
| Type A5L Rescue – remotely or self-operated – direct attachment – load-limiting                  | Deformation<br>Dynamic performance <sup>A)</sup><br>Static strength                                                              | <a href="#">4.6.1.2</a> | <a href="#">5.5.7.1</a><br><a href="#">5.5.7.2</a><br><a href="#">5.5.7.3</a>                            |
| <b>Type C Non-load-limiting</b>                                                                  |                                                                                                                                  |                         |                                                                                                          |
| General                                                                                          |                                                                                                                                  | <a href="#">4.5.2.1</a> | <a href="#">5.6.1</a>                                                                                    |
| Type C1 Restraint – non-load-limiting – single-span                                              | Anchor device deformation<br>Anchor system static strength<br>Anchor device static strength                                      | <a href="#">4.5.2.2</a> | <a href="#">5.6.2.1</a><br><a href="#">5.6.2.2</a><br><a href="#">5.6.2.3</a>                            |
| Type C1 Restraint – non-load-limiting – multi-span                                               | Anchor device deformation<br>Anchor system static strength<br>Anchor device static strength                                      | <a href="#">4.5.2.2</a> | <a href="#">5.6.3.1</a><br><a href="#">5.6.3.2</a><br><a href="#">5.6.3.3</a>                            |
| Type C2 Fall arrest – non-load-limiting – single-span                                            | Anchor device:deformation<br>Anchor system dynamic performance<br>Anchor system static strength<br>Anchor device static strength | <a href="#">4.5.2.3</a> | <a href="#">5.6.4.1</a><br><a href="#">5.6.4.2</a><br><a href="#">5.6.4.3</a><br><a href="#">5.6.4.4</a> |
| Type C2 Fall arrest – non-load-limiting – multi-span                                             | Anchor device deformation<br>Anchor system dynamic performance<br>Anchor system static strength<br>Anchor device static strength | <a href="#">4.5.2.3</a> | <a href="#">5.6.5.1</a><br><a href="#">5.6.5.2</a><br><a href="#">5.6.5.3</a><br><a href="#">5.6.5.4</a> |
| Type C5 Rescue – remotely or self-operated – direct attachment – non-load-limiting – single-span | Anchor device deformation                                                                                                        | <a href="#">4.5.2.3</a> | <a href="#">5.6.4.1</a>                                                                                  |

<sup>A)</sup> As rescue is a secondary function of an application code 2 anchor system, application code 5 anchor systems have to meet the dynamic performance requirements of application code 2 anchor systems.

Table 3 (continued)

| Anchor system                                                                                   | Test type                                       | Requirements            | Test method             |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------|-------------------------|
|                                                                                                 | Anchor system dynamic performance <sup>A)</sup> |                         | <a href="#">5.6.4.2</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.4.3</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.4.4</a> |
| Type C5 Rescue – remotely or self-operated – direct attachment – non-load-limiting – multi-span |                                                 | <a href="#">4.5.2.3</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.5.1</a> |
|                                                                                                 | Anchor system dynamic performance <sup>A)</sup> |                         | <a href="#">5.6.5.2</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.5.3</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.5.4</a> |
| <b>Type C Load-limiting</b>                                                                     |                                                 |                         |                         |
| General                                                                                         |                                                 | <a href="#">4.6.2.1</a> | <a href="#">5.6.1</a>   |
| Type C1L Restraint – load-limiting – single-span                                                |                                                 | <a href="#">4.6.2.2</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.6.1</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.6.2</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.6.3</a> |
| Type C1L Restraint – load-limiting – multi-span                                                 |                                                 | <a href="#">4.6.2.2</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.7.1</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.7.2</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.7.3</a> |
| Type C2L Fall arrest – load-limiting – single-span                                              |                                                 | <a href="#">4.6.2.3</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.8.1</a> |
|                                                                                                 | Anchor system dynamic performance               |                         | <a href="#">5.6.8.2</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.8.3</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.8.4</a> |
| Type C2L Fall arrest – load-limiting – multi-span                                               |                                                 | <a href="#">4.6.2.3</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.9.1</a> |
|                                                                                                 | Anchor system dynamic performance               |                         | <a href="#">5.6.9.2</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.9.3</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.9.4</a> |
| Type C5L Rescue – remotely or self-operated – direct attachment – load-limiting – single-span   |                                                 | <a href="#">4.6.2.3</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.8.1</a> |
|                                                                                                 | Anchor system dynamic performance <sup>A)</sup> |                         | <a href="#">5.6.8.2</a> |
|                                                                                                 | Anchor system static strength                   |                         | <a href="#">5.6.8.3</a> |
|                                                                                                 | Anchor device static strength                   |                         | <a href="#">5.6.8.4</a> |
| Type C5L Rescue – remotely or self-operated – direct attachment – load-limiting – multi-span    |                                                 | <a href="#">4.6.2.3</a> |                         |
|                                                                                                 | Anchor device deformation                       |                         | <a href="#">5.6.9.1</a> |

<sup>A)</sup> As rescue is a secondary function of an application code 2 anchor system, application code 5 anchor systems have to meet the dynamic performance requirements of application code 2 anchor systems.

Table 3 (continued)

| Anchor system                                                                      | Test type                                                           | Requirements            | Test method                                                                   |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------|
|                                                                                    | Anchor system dynamic performance <sup>A)</sup>                     |                         | <a href="#">5.6.9.2</a>                                                       |
|                                                                                    | Anchor system static strength                                       |                         | <a href="#">5.6.9.3</a>                                                       |
|                                                                                    | Anchor device static strength                                       |                         | <a href="#">5.6.9.4</a>                                                       |
| <b>Type D Non-load-limiting</b>                                                    |                                                                     |                         |                                                                               |
| General                                                                            |                                                                     | <a href="#">4.5.3.1</a> | <a href="#">5.7.1</a>                                                         |
| Type D1 Restraint – non-load-limiting                                              | Static strength and deformation                                     | <a href="#">4.5.3.2</a> | <a href="#">5.7.2.1</a>                                                       |
| Type D2 Fall arrest – non-load-limiting                                            | Deformation<br>Dynamic performance<br>Static strength               | <a href="#">4.5.3.3</a> | <a href="#">5.7.3.1</a><br><a href="#">5.7.3.2</a><br><a href="#">5.7.3.3</a> |
| Type D3 Rope access and work positioning – non-load-limiting                       | Deformation<br>Dynamic performance<br>Static strength               | <a href="#">4.5.3.3</a> | <a href="#">5.7.3.1</a><br><a href="#">5.7.3.2</a><br><a href="#">5.7.3.3</a> |
| Type D4 Rescue – accompanied descent – non-load-limiting                           | Deformation<br>Static strength                                      | <a href="#">4.5.3.4</a> | <a href="#">5.7.4.1</a><br><a href="#">5.7.4.2</a>                            |
| Type D5 Rescue – remotely or self-operated – direct attachment – non-load-limiting | Deformation<br>Dynamic performance <sup>A)</sup><br>Static strength | <a href="#">4.5.3.3</a> | <a href="#">5.7.3.1</a><br><a href="#">5.7.3.2</a><br><a href="#">5.7.3.3</a> |
| Type D6 Rescue – remotely operated – redirect attachment – non-load-limiting       | Deformation<br>Static strength                                      | <a href="#">4.5.3.4</a> | <a href="#">5.7.5.1</a><br><a href="#">5.7.5.2</a>                            |
| Type D7 Evacuation – non-load-limiting                                             | Deformation<br>Static strength                                      | <a href="#">4.5.3.4</a> | <a href="#">5.7.6.1</a><br><a href="#">5.7.6.2</a>                            |

<sup>A)</sup> As rescue is a secondary function of an application code 2 anchor system, application code 5 anchor systems have to meet the dynamic performance requirements of application code 2 anchor systems.

**NOTE** See [4.1](#), [4.2](#), [4.3](#) and [4.4](#) for pre-testing and verification and recording requirements.

## 4.3 Materials

### 4.3.1 Metal elements of the anchor system excluding the base material

#### COMMENTARY ON 4.3.1

*This requirement is to detect design flaws. Conformity to this requirement does not imply any design life or suitability for use in a harsh environment, e.g. marine environment, high chlorine environment.*

- 4.3.1.1** After testing in accordance with [5.8](#), there shall be no corrosion of the base metal from which the metal element is made that would affect the functional operation of the anchor system.

*NOTE 1 The presence of tarnishing and white scaling is acceptable.*

*NOTE 2 Care should be taken by the manufacturer to ensure different metals are not combined in such a way that there could be an adverse galvanic reaction.*

- 4.3.1.2** Wire ropes shall be made from stainless steel, or galvanized steel conforming to BS EN 12385-4.

- 4.3.1.3** Galvanizing of steel wire ropes shall be in accordance with ISO 2232. Other steel elements shall be galvanized in accordance with BS EN ISO 1461.

#### **4.3.2 Textile elements**

- 4.3.2.1** Load-bearing textile elements shall only be used if the manufacturer can demonstrate through documented evidence that they incorporate sufficient protection against ultraviolet degradation for their foreseeable life.

- 4.3.2.2** The manufacturer shall provide documented evidence that textile elements are made from virgin mono-filament or multi-filament synthetic fibres.

*NOTE Examples of textile elements are fibre ropes, webbing and sewing threads.*

- 4.3.2.3** The manufacturer shall provide documented evidence that the breaking tenacity of synthetic fibres is a minimum of 0.6 N/tex.

- 4.3.2.4** Threads used for sewing shall be a contrasting shade or colour when compared to the rope or webbing to facilitate visual inspection.

#### **4.3.3 Connectors**

Where connectors are supplied with the anchor system, they shall conform to BS EN 362.

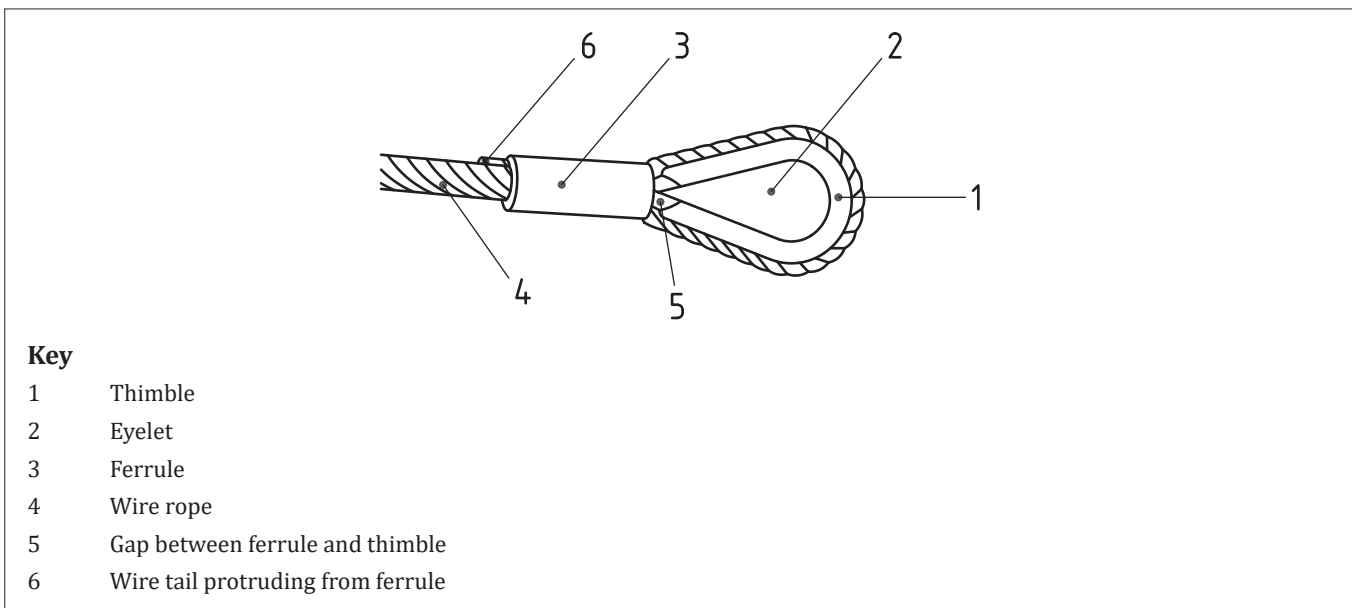
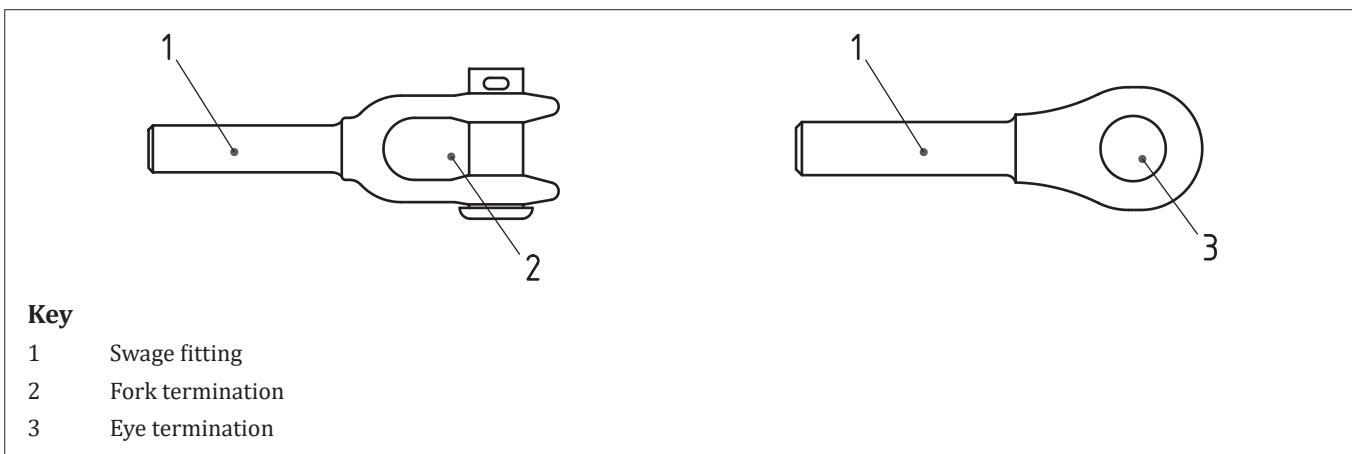
#### **4.3.4 Wire rope terminations**

- 4.3.4.1** Wire rope terminations (see [Figure 11](#) and [Figure 12](#)) shall not include U-bolt wire rope grips in any part of the anchor system. Any eyelet terminations shall include a compatible thimble. Where a swaged ferrule is used to manufacture the termination:

- a) there shall be a gap between the thimble points and ferrule after the swaging operation; and
- b) the tail of the wire rope shall protrude from the ferrule after the swaging operation by a minimum amount,

in accordance with the information supplied by the ferrule manufacturer.

- 4.3.4.2** Materials used for the wire rope termination shall be compatible with the materials used for the wire rope, e.g. copper ferrule and stainless-steel wire rope.

**Figure 11** — Example of wire rope eyelet termination**Figure 12** — Examples of swaged terminations

#### 4.4 Design and ergonomics

**4.4.1** The load-bearing edges of anchor points shall have a minimum radius of 1 mm.

**4.4.2** Anchor systems shall not have sharp edges or burrs that might cause injury to the user. Exposed edges or corners shall be relieved either with a minimum radius of 0.5 mm or a chamfer of no less than 0.5 mm × 45°.

**4.4.3** Anchor points shall not allow inadvertent release of any personal fall protection equipment.

*NOTE* An open loop or hook are not considered to be anchor points for the purposes of this British Standard.

**4.4.4** The deformation requirements within this British Standard shall apply before the intentional movement or deformation of those elements, where elements of anchor systems are intended to move or deform permanently, e.g. for correct alignment while arresting a fall; the functioning of a fall indicator.

## 4.5 Non-load-limiting anchor systems

### 4.5.1 Type A — non-load-limiting

#### 4.5.1.1 Type A1

##### COMMENTARY ON 4.5.1.1

*Type A1 covers restraint – non-load-limiting (see Table 1).*

- 4.5.1.1.1 The maximum number of users permitted shall be in accordance with the information supplied by the manufacturer, but shall be no more than two (see also [Clause 6](#) and [Clause 7](#)).
- 4.5.1.1.2 Anchor devices used as part of a type A1 anchor system shall conform to the static strength requirements of BS EN 795:2012, 5.3.4, which shall be confirmed by documented evidence from a test laboratory in accordance with [5.1](#).
- 4.5.1.1.3 When tested in accordance with [5.5.1](#) and the relevant static strength and deformation test listed in Table 3, with the load applied to each anchor point, the anchor system shall hold the load and no part of the anchor system shall demonstrate permanent deformation of more than 10 mm.

#### 4.5.1.2 Type A2, type A3 and type A5

##### COMMENTARY ON 4.5.1.2

*Type A2 covers fall arrest – non-load-limiting (see Table 1).*

*Type A3 covers rope access and work-positioning – non-load-limiting (see Table 1).*

*Type A5 covers rescue – remotely or self-operated – direct attachment – non-load-limiting (see Table 1).*

*As rescue is a secondary function of a fall arrest system, type A5 anchor systems have to meet the deformation, dynamic performance and static strength requirements of type A2 anchor systems (i.e. fall arrest), plus additional dynamic performance test(s) to cater for the possibility of a second fall during a rescue. Therefore, these two types have been combined into this sub-clause. Type A3 anchor systems have the same deformation, dynamic performance and static strength requirements as type A2 anchor systems and, therefore, have been combined in this sub-clause also.*

- 4.5.1.2.1 The maximum number of users permitted shall be in accordance with the information supplied by the manufacturer, but shall be no more than two (see also [Clause 6](#) and [Clause 7](#)).
- NOTE The number of users includes a rescuer, where relevant.*
- 4.5.1.2.2 When tested in accordance with [5.5.1](#) and the relevant deformation test listed in Table 3, with the load applied to each anchor point, the anchor system shall hold the load and no part of the anchor system shall demonstrate permanent deformation of more than 10 mm.
  - 4.5.1.2.3 When tested in accordance with [5.5.1](#) and the relevant dynamic performance test listed in Table 3, with the load applied to each anchor point, the anchor system shall hold the test mass clear of the ground.
  - 4.5.1.2.4 When tested in accordance with [5.5.1](#) and the relevant static strength test listed in Table 3, with the load applied to each anchor point, the anchor system shall hold the load.

#### 4.5.1.3 Type A4, type A6 and type A7

##### COMMENTARY ON 4.5.1.3

*Type A4 covers rescue – accompanied descent – non-load-limiting (see Table 1).*

*Type A6 covers rescue – remotely operated – redirect attachment – non-load-limiting (see Table 1).*

*Type A7 covers evacuation – non-load-limiting (see Table 1).*

- 4.5.1.3.1** The maximum number of users permitted shall be in accordance with the information supplied by the manufacturer, but shall be no more than one for type A6 anchor systems and no more than two for type A4 and type A7 anchor systems (see also [Clause 6](#) and [Clause 7](#)).

*NOTE 1 The number of users includes a rescuer, where relevant.*

*NOTE 2 For type A4 anchor systems, by default, the number of users is two.*

*NOTE 3 For type A6 anchor systems, the number of users is one plus a rescuer who is not directly attached to the anchor system (see [Figure 9](#)).*

- 4.5.1.3.2** When tested in accordance with [5.5.1](#) and the relevant deformation test listed in Table 3, with the load applied to each anchor point, the anchor system shall hold the load and no part of the anchor system shall demonstrate permanent deformation of more than 10 mm.
- 4.5.1.3.3** When tested in accordance with [5.5.1](#) and the relevant static strength test listed in Table 3, with the load applied to each anchor point, the anchor system shall hold the load.

## **4.5.2 Type C — non-load-limiting**

### *COMMENTARY ON 4.5.2*

*In addition to the requirements for type C non-load-limiting anchor systems, this subclause includes requirements for specific anchor devices that are part of the anchor system, i.e. those anchor devices that are to be tested for deformation and for static strength.*

### **4.5.2.1 General**

- 4.5.2.1.1** Performance data based on calculations or test results shall be supplied by the manufacturer to the test laboratory (see [5.1](#)) in accordance with the relevant tests in [5.6](#), including data on:
- the maximum number of users permitted;
  - the maximum deflection of the flexible anchor line at the mid-span position;
  - the maximum load applied to the extremity anchor;
  - the maximum load applied to the intermediate anchors, where fitted;
  - the maximum load applied to the corner anchors, where fitted; and
  - the maximum load in the flexible anchor line for continuous anchor systems that do not incorporate an extremity anchor.
- 4.5.2.1.2** When tested in accordance with the relevant anchor system dynamic performance tests and anchor system static strength tests as listed in Table 3:
- the anchor system shall hold the load;
  - the test mass shall be held clear of the ground; and
  - the traveller shall not become detached from the flexible anchor line.
- 4.5.2.1.3** Where the flexible anchor line is fixed to an intermediate anchor or corner anchor (i.e. the intermediate anchor or corner anchor effectively becomes an extremity anchor), multi-span anchor systems shall be tested as single-span anchor systems.
- 4.5.2.1.4** When tested in accordance with the relevant single-span or multi-span anchor system static strength test for restraint listed in Table 3, as appropriate:
- the maximum load ( $T_{max}$ ) measured and recorded at the extremity anchor shall not exceed 50% of the minimum material breaking strength of the flexible anchor line (e.g. wire rope, fibre rope or webbing) as specified in [7.1 v](#)); and