

BS EN 795:2012



BSI Standards Publication

# Personal fall protection equipment — Anchor devices

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**National foreword**

This British Standard is the UK implementation of EN 795:2012. It supersedes BS EN 795:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/5, Personal Fall Protection.

A list of organizations represented on this committee can be obtained on request to its secretary.

The introduction to BS EN 795:2012 states, 'Requirements and test methods for multi-user anchor devices, i.e. anchor devices that allow more than one user to be attached at any one time, are provided in a separate CEN Technical Specification.' This Technical Specification is CENTS 16415:2012.

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

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EUROPEAN STANDARD

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July 2012

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English Version

**Personal fall protection equipment - Anchor devices**Équipement de protection individuelle contre les chutes -  
Dispositifs d'ancragePersönliche Absturzschutzausrüstung -  
Anschlageinrichtungen

This European Standard was approved by CEN on 9 June 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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## Contents

Page

Foreword.....	5
Introduction .....	6
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions.....	7
4 Requirements .....	14
4.1 General.....	14
4.2 Materials.....	14
4.2.1 Metal parts .....	14
4.2.2 Rope and webbing .....	14
4.2.3 Connectors .....	15
4.3 Design and ergonomics .....	15
4.4 Specific requirements .....	15
4.4.1 Type A anchor devices .....	15
4.4.2 Type B anchor devices .....	15
4.4.3 Type C anchor devices .....	15
4.4.4 Type D anchor devices .....	16
4.4.5 Type E anchor devices .....	16
4.5 Marking and information .....	17
5 Test methods.....	17
5.1 General.....	17
5.2 Test arrangement and apparatus .....	18
5.2.1 Test lanyard and determination of free fall distance .....	18
5.2.2 Dynamic strength and integrity test apparatus for types A, B, C and D anchor devices .....	19
5.2.3 Static strength test apparatus .....	19
5.2.4 Dynamic performance test apparatus for type E anchor devices .....	19
5.3 Type A anchor devices.....	20
5.3.1 General.....	20
5.3.2 Deformation.....	20
5.3.3 Dynamic strength and integrity.....	20
5.3.4 Static strength.....	21
5.4 Type B anchor devices.....	21
5.4.1 General.....	21
5.4.2 Deformation.....	21
5.4.3 Dynamic strength and integrity.....	21
5.4.4 Static strength.....	24
5.5 Type C anchor devices.....	26
5.5.1 General.....	26
5.5.2 Deformation.....	27
5.5.3 Dynamic strength and integrity.....	27
5.5.4 Static strength.....	31
5.6 Type D anchor devices.....	31
5.6.1 General.....	31
5.6.2 Deformation.....	31
5.6.3 Dynamic strength and integrity.....	31
5.6.4 Static strength.....	33
5.7 Type E anchor devices .....	33
5.7.1 Deformation.....	33
5.7.2 Dynamic performance .....	33
5.7.3 Post arrest suspension .....	34

5.7.4	Static strength .....	34
5.8	Corrosion resistance.....	34
6	Marking.....	35
7	Information supplied by the manufacturer .....	35
<b>Annex A</b>	(informative) <b>Information on installation documentation and periodic examination</b> .....	<b>37</b>
<b>A.1</b>	<b>Information on installation to be supplied by the manufacturer</b> .....	<b>37</b>
<b>A.2</b>	<b>Guidance on documentation to be supplied after an installation</b> .....	<b>37</b>
<b>A.3</b>	<b>Guidance on periodic examination procedure</b> .....	<b>40</b>
<b>Annex B</b>	(informative) <b>Significant technical changes between this European Standard and the previous edition EN 795:1996 and EN 795:1996/A1:2001</b> .....	<b>41</b>
<b>Annex ZA</b>	(informative) <b>Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC</b> .....	<b>43</b>
	<b>Bibliography</b> .....	<b>44</b>

## Figures

Figure 1	— Examples of anchor systems that include an anchor device .....	8
Figure 2	— Examples of anchor systems that are not covered by this European Standard .....	9
Figure 3	— Example of a type A anchor device with a structural anchor .....	11
Figure 4	— Example of a type A anchor device with a fixing element .....	11
Figure 5	— Examples of type B anchor devices .....	12
Figure 6	— Example of a type C anchor device.....	13
Figure 7	— Example of a type D anchor device.....	13
Figure 8	— Example of a type E anchor device .....	13
Figure 9	— Bowline knot .....	18
Figure 10	— Test lanyard for dynamic strength and integrity tests and dynamic performance tests .....	19
Figure 11	— Example of a dynamic performance test apparatus for type E anchor devices .....	20
Figure 12	— Dynamic test for type B anchor devices with legs (e.g. a tripod) and an anchor point(s) not on a leg .....	23
Figure 13	— Dynamic test for type B anchor devices with legs (e.g. a tripod) and an anchor point on a leg .....	24
Figure 14	— Static strength test for type B anchor device with legs (e.g. a tripod) and a central anchor point .....	25
Figure 15	— Static strength test for type B anchor device with legs (e.g. a tripod) and an anchor point on a leg.....	26
Figure 16	— Example of a single-span type C anchor device test arrangement.....	28
Figure 17	— Example of a multi-span type C anchor device test arrangement without a corner.....	30
Figure 18	— Example of a multi-span type C anchor device test arrangement with a corner.....	30
Figure 19	— Example of a type D anchor device test arrangement including a cantilever.....	32

Figure 20 — Example of a type D anchor device test arrangement including a rigid anchor line joint or junction and a corner anchor..... 33

Figure A.1 — Example of an installation plan..... 39

Figure A.2 — Example of periodic examination procedure ..... 40

**Tables**

Table B.1 — Significant technical changes ..... 41

Table ZA.1 — Correspondence between this European Standard and Directive 89/686/EEC..... 43

## Foreword

This document (EN 795:2012) has been prepared by Technical Committee CEN/TC 160 "Protection against falls from height including working belts", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2013, and conflicting national standards shall be withdrawn at the latest by January 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 795:1996.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 89/686/EEC.

For relationship with EU Directive 89/686/EEC, see informative Annex ZA, which is an integral part of this document.

For details of the significant changes made since EN 795:1996 please refer to Annex B.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Introduction

A reliable anchor device is an essential component of any personal fall protection system.

This European Standard is intended to act as a complementary standard for existing European Standards covering other components used in personal fall protection systems.

The scope and the requirements are based on the philosophy that anchor devices are rated to sustain the maximum dynamic force generated in a fall from a height by the mass of one person, including any equipment carried. The static strength tests are based on a minimum factor of safety of two. To allow for foreseeable misuse of equipment, this European Standard provides requirements and test methods for anchor devices used in personal fall protection systems in accordance with EN 363, even if their intended use is for restraint.

Requirements and test methods for multi-user anchor devices, i.e. anchor devices that allow more than one user to be attached at any one time, are not addressed in this document but advice is provided in a separate CEN Technical Specification.

This European Standard is intended for the type testing of new products before placing them on the market and gives only minimum performance requirements. It is essential that anchor devices 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. Manufacturers may wish to bear these points in mind when deciding on the actual performance of their products.



## 1 Scope

This European Standard specifies requirements for performance and associated test methods for single-user anchor devices which are intended to be removable from the structure. These anchor devices incorporate stationary or travelling (mobile) anchor points designed for the attachment of components of a personal fall protection system in accordance with EN 363.

This European Standard also gives requirements for marking and instructions for use, and guidance on installation.

This European Standard is not applicable to:

- anchor devices intended to allow more than one user to be attached at any one time;
- anchor devices used in any sports or recreational activity;
- equipment designed to conform to EN 516 or EN 517;
- elements or parts of structures which were installed for use other than as anchor points or anchor devices, e.g. beams, girders;
- structural anchors (see 3.3).

## 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.

EN 360, *Personal protective equipment against falls from a height — Retractable type fall arresters*

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

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

EN 364:1992, *Personal protective equipment against falls from a height — Test methods*

EN 365, *Personal protective equipment against falls from a height — General requirements for instructions for use, maintenance, periodic examination, repair, marking and packaging*

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

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

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

## 3 Terms and definitions

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

### 3.1

#### **anchor system**

system intended for use as part of a personal fall protection system that incorporates an anchor point or points and/or an anchor device and/or an element and/or a fixing element and/or a structural anchor (see Figure 1)

Note 1 to entry: Anchor systems that are not intended to be removed from the structure are not covered by this European Standard. See Figure 2.

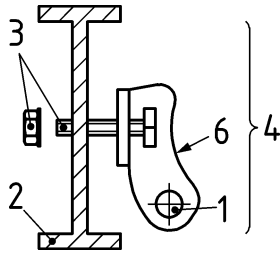


Figure 1a

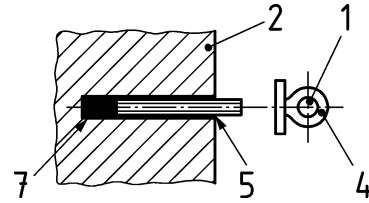


Figure 1b

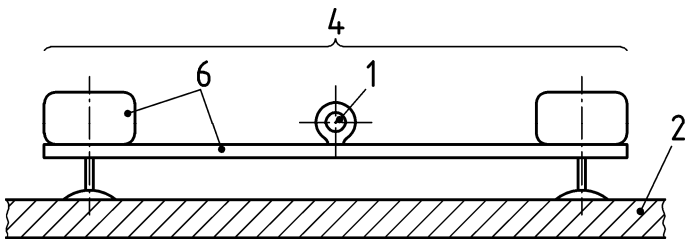


Figure 1c

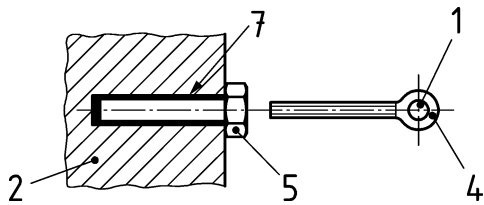


Figure 1d

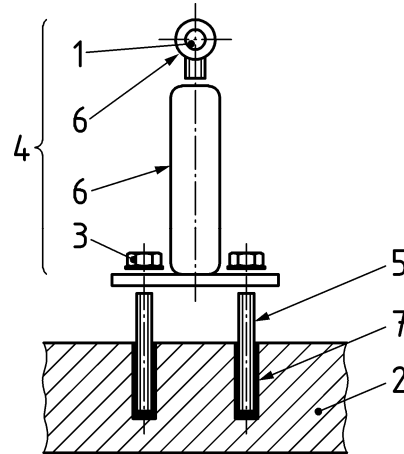
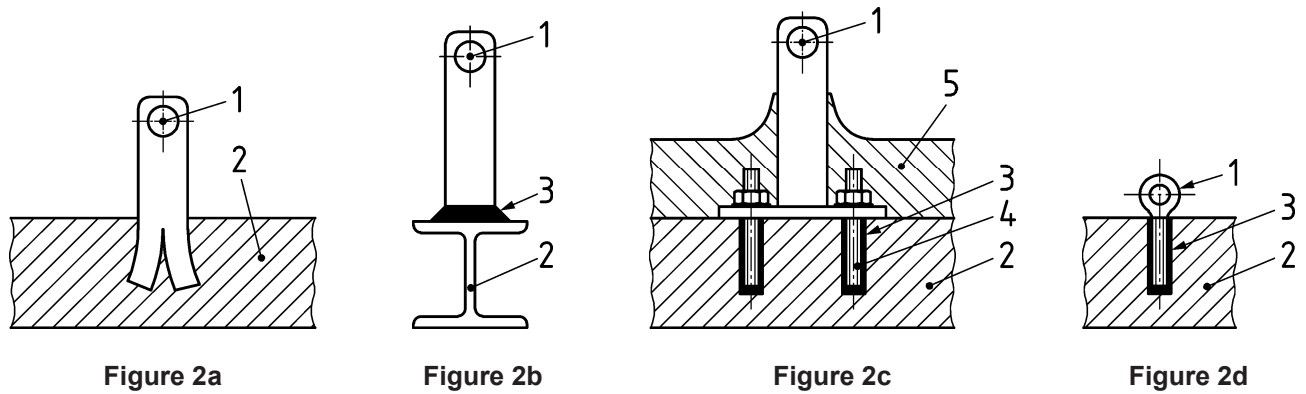


Figure 1e

**Key**

- |   |   |
|---|---|
| 1 anchor point                              | 4 anchor device                                     |
| 2 structure (not part of the anchor device) | 5 structural anchor (not part of the anchor device) |
| 3 fixing element                            | 6 element   |
|   | 7 permanent fixation (e.g. resin bonding)           |

**Figure 1 — Examples of anchor systems that include an anchor device**



### Key

- 1 anchor point
- 2 structure
- 3 permanent fixation (e.g. studded, screwed, riveted, welded, resin bonded)
- 4 structural anchor
- 5 concrete, insulation or other covering

**Figure 2 — Examples of anchor systems that are not covered by this European Standard**

### 3.2 anchor device

assembly of elements which incorporates one or more anchor points or mobile anchor points that can include a fixing element, is intended for use as part of a personal fall protection system, is intended to be removable from the structure and to be part of the anchor system

#### 3.2.1

##### **type A anchor device**

anchor device with one or more stationary anchor points, while in use, and with the need for a structural anchor(s) or fixing element(s) to fix to the structure (see Figures 3 and 4)

Note 1 to entry: Anchor points may rotate or swivel when in use, where they are designed to do so.

#### 3.2.2

##### **type B anchor device**

anchor device with one or more stationary anchor points without the need for a structural anchor(s) or fixing element(s) to fix it to the structure (see Figure 5)

#### 3.2.3

##### **type C anchor device**

anchor device employing a flexible anchor line which deviates from the horizontal by not more than 15° (when measured between the extremity and intermediate anchors at any point along its length) (see Figure 6)

#### 3.2.4

##### **type D anchor device**

anchor device employing a rigid anchor line which deviates from the horizontal by not more than 15° (when measured between the extremity and intermediate anchors at any point along its length) (see Figure 7)

#### 3.2.5

##### **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 (see Figure 8)

### 3.3

#### **structural anchor**

element or elements which are designed for use in conjunction with a personal fall protection system and to be permanently incorporated into a structure

Note 1 to entry: A structural anchor is not part of the anchor device.

Note 2 to entry: An example of a structural anchor is where an element is welded or bonded by resin to the structure.

### 3.4

#### **fixing element**

element or elements used to connect/fix the anchor device to the structure and which is/are removable from the structure

### 3.5

#### **element**

part of an anchor system or anchor device

### 3.6

#### **anchor point**

point on an anchor system where personal fall protection equipment is intended to be attached

### 3.7

#### **extremity anchor**

element which connects the extremity of a flexible anchor line or rigid anchor line onto the structure

### 3.8

#### **intermediate anchor**

element located between the extremity anchors, which connects a flexible anchor line or a rigid anchor line onto the structure

Note 1 to entry: Intermediate supports, e.g. a flexible anchor line guide, which are not intended to withstand the load, are not intermediate anchors.

### 3.9

#### **mobile anchor point**

element with an anchor point which is intended to travel along an anchor line

### 3.10

#### **flexible anchor line**

flexible line between extremity anchors to which personal fall protection equipment can be attached either directly by a connector or through a mobile anchor point

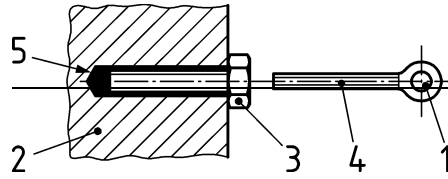
Note 1 to entry: A flexible anchor line can be cable (wire rope), fibre rope, or webbing.

### 3.11

#### **rigid anchor line**

rigid line between extremity anchors to which personal fall protection equipment can be attached either directly by a connector or through a mobile anchor point

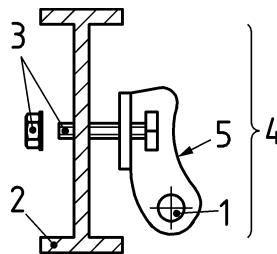
Note 1 to entry: A rigid anchor line can be a rigid profile e.g. a rigid tube or rigid rail.



**Key**

- |   |                   |   |                    |
|---|-------------------|---|--------------------|
| 1 | anchor point      | 5 | permanent fixation |
| 2 | structure         |   |                    |
| 3 | structural anchor |   |                    |
| 4 | anchor device     |   |                    |

**Figure 3 — Example of a type A anchor device with a structural anchor**



**Key**

- |   |                |   |               |
|---|----------------|---|---------------|
| 1 | anchor point   | 4 | anchor device |
| 2 | structure      | 5 | element       |
| 3 | fixing element |   |               |

**Figure 4 — Example of a type A anchor device with a fixing element**

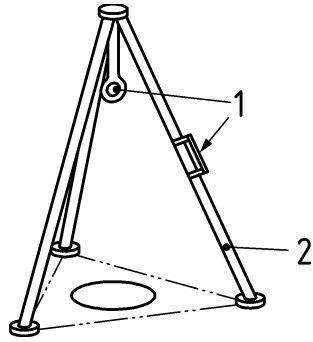


Figure 5a – Tripod

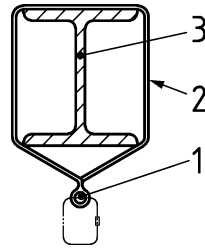


Figure 5b – Sling

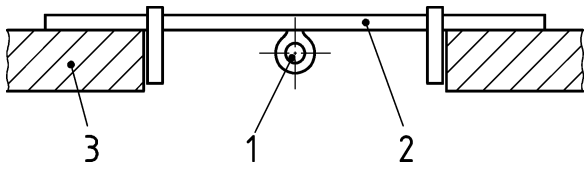


Figure 5c – Door anchor

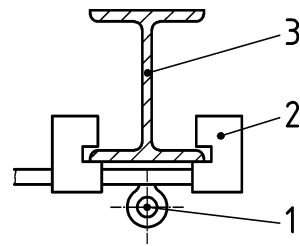
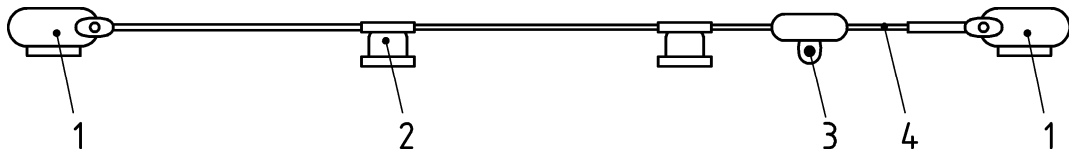


Figure 5d – Beam anchor

**Key**

- 1 anchor point
- 2 anchor device
- 3 structure

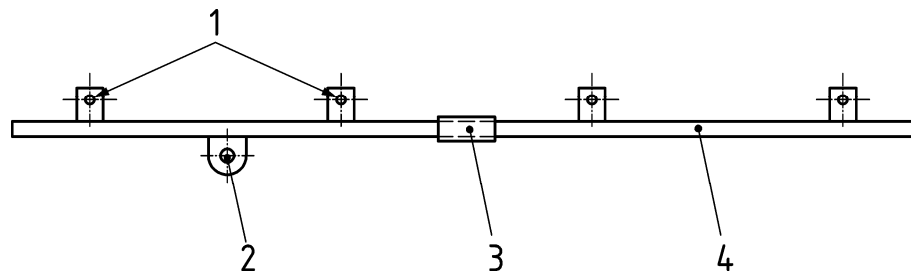
Figure 5 — Examples of type B anchor devices



**Key**

- 1 extremity anchor
- 2 intermediate anchor
- 3 mobile anchor point
- 4 flexible anchor line

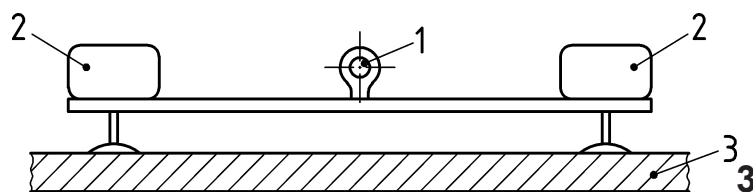
**Figure 6 — Example of a type C anchor device**



**Key**

- 1 extremity or intermediate anchor
- 2 mobile anchor point
- 3 rigid anchor line joiner
- 4 rigid anchor line

**Figure 7 — Example of a type D anchor device**



**Key**

- 1 anchor point
- 2 mass
- 3 structure

**Figure 8 — Example of a type E anchor device**

## 4 Requirements

### 4.1 General

- 4.1.1** When checked in accordance with 5.1.7, anchor devices shall be designed in such a way that they can be removed from the structure, without damaging the structure or the anchor device, thus allowing its reuse e.g. for periodic examination.
- 4.1.2** When checked in accordance with 5.1.7, U-bolt clamps shall not be used to form terminations in any part of an anchor device.
- 4.1.3** When checked in accordance with 5.1.7, it shall not be possible for elements with an anchor point to become detached unintentionally. If the element or mobile anchor point can be removed, it shall be designed such that it can only be detached after executing two separate, consecutive and deliberate manual actions.
- 4.1.4** When checked in accordance with 5.1.7, anchor devices shall be of such a design and size to allow connectors to rotate freely and sit in the anchor point in the preferred load-bearing position.
- 4.1.5** When checked in accordance with 5.1.7, for anchor devices comprising more than one element and for anchor devices with elements that can be adjusted, the design shall be such that those elements cannot appear to be positively locked together when incorrectly assembled or adjusted.
- 4.1.6** When checked in accordance with 5.1.7, the mass of any element of an anchor device that is intended to be transported by a single person shall not exceed 25 kg.
- 4.1.7** If the anchor device is equipped with a fall indicator, the indicator shall clearly indicate a fall has occurred after the dynamic strength and integrity test(s).
- 4.1.8** When an anchor device consists of a combination of several types, it shall be tested for each relevant type and for the combination, e.g. a combination of type C and type E anchor devices.
- 4.1.9** Where the information provided by the manufacturer permits loading in more than one direction (e.g. in tension and in shear) (see 7 c)), anchor devices shall be tested in each safety critical direction.

### 4.2 Materials

#### 4.2.1 Metal parts

**4.2.1.1** After testing in accordance with 5.8, there shall be no corrosion of the base material. The presence of tarnishing and white scaling is acceptable. Metal parts of anchor devices shall show no evidence of corrosion that would affect their functional operation, e.g. the correct operation of moving elements.

NOTE Conformity to this requirement does not imply suitability for use in a marine environment.

**4.2.1.2** If steel wire ropes are galvanised, the galvanisation shall be in accordance with ISO 2232.

#### 4.2.2 Rope and webbing

**4.2.2.1** Fibre ropes, webbing and sewing threads shall be made from virgin filament or multi-filament synthetic fibres.

NOTE Examples of suitable materials for use in rope and webbing are polyamide, polyester and mixtures of polyamide and polyester.

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



### 4.2.3 Connectors

Connectors shall conform to EN 362.

## 4.3 Design and ergonomics

When checked in accordance with 5.1.7, anchor devices shall not have sharp edges or burrs that may cause injury to the user or that may cut, abrade or otherwise damage itself or any part of the personal fall protection equipment that may come into contact with it.

NOTE It is recommended that exposed edges or corners of elements are relieved either with a radius of at least 0,5 mm or a chamfer of at least 0,5 mm x 45°.

## 4.4 Specific requirements

### 4.4.1 Type A anchor devices

**4.4.1.1** When tested in accordance with 5.3.2 (deformation test), no part of a type A anchor device which is intended to deform, e.g. to absorb energy, shall demonstrate permanent deformation of more than 10 mm in the direction of loading.

**4.4.1.2** When tested in accordance with 5.3.3 (dynamic strength and integrity test), the anchor device shall not release the rigid test mass and the rigid test mass shall be held clear of the ground.

**4.4.1.3** When tested in accordance with 5.3.4 (static strength test), the anchor device shall hold the load.

### 4.4.2 Type B anchor devices

**4.4.2.1** When tested in accordance with 5.4.2 (deformation test), no part of a type B anchor device, excluding rope and webbing slings manufactured from man-made fibres, which is intended to deform, e.g. to absorb energy, shall demonstrate permanent deformation of more than 10 mm in the direction of loading.

**4.4.2.2** When tested in accordance with 5.4.3 (dynamic strength and integrity test), the anchor device shall not release the rigid test mass and the rigid test mass shall be held clear of the ground.

**4.4.2.3** When tested in accordance with 5.4.4 (static strength test), the anchor device shall hold the load.

**4.4.2.4** Where the information provided by the manufacturer permits use in more than one configuration, each configuration, e.g. a tripod or quadpod with anchor points at the head and on a leg, shall be tested. Each configuration tested shall meet the requirements of 4.4.2.1 to 4.4.2.3.

NOTE If a type B anchor device (e.g. a tripod) is intended to be used with a rescue lifting device (see EN 1496), it is recommended that the whole unit should meet the following requirements: 4.1 *General*, 4.2 *Materials*, 4.3 *Design and ergonomics* and 4.4.2 *Type B anchor devices*.

### 4.4.3 Type C anchor devices

**4.4.3.1** When tested in accordance with 5.5.2 (deformation test), no part of the extremity anchors, intermediate anchors or mobile anchor point which is intended to deform, e.g. to absorb energy, shall demonstrate permanent deformation of more than 10 mm in the direction of loading.

**4.4.3.2** Performance predictions based on calculations or test results shall be available for configurations of the anchor device agreed in 5.5.1.2, including information on:

- a) the maximum deflection of the mobile anchor point(s);
- b) the maximum load applied to the extremity anchor and those intermediate or corner units that are considered to be in-line fittings. Alternatively, for devices that do not incorporate an extremity anchor, e.g. a circular device, the maximum load in the anchor line.

**4.4.3.3** When tested in accordance with 5.5.3.1 (single-span dynamic strength and integrity test) and 5.5.3.2 (multi-span dynamic strength and integrity test), the values at the extremities and the maximum dynamic deflection of the flexible anchor line shall not vary by more than  $\pm 20\%$  from those predicted.

**4.4.3.4** When tested in accordance with 5.5.3, (dynamic strength and integrity tests), the anchor device shall not release the rigid test mass and the rigid test mass shall be held clear of the ground. No part of the anchor device shall break.

**4.4.3.5** When tested in accordance with 5.5.4 (static strength tests) with the mobile anchor point

- immediately adjacent to an extremity anchor,
- on an intermediate anchor,
- on a corner anchor,
- on an entry/exit line fitting and on a joint in the flexible anchor line,

where these are part of the anchor device, the anchor device including all load-bearing elements, flexible anchor lines, line fittings and terminations (e.g. swaged connections, sewn loops, spliced terminations) shall hold a load of  $(12 \begin{smallmatrix} +1,0 \\ 0 \end{smallmatrix})$  kN. For non-metallic elements, if evidence of durability is not provided, the static load shall be 18 kN.

**4.4.3.6** When tested in accordance with 5.5.3 and 5.5.4, the mobile anchor point shall not become detached from the flexible anchor line.

**4.4.3.7** Where the flexible anchor line is fixed in the intermediate or corner anchor (i.e. the intermediate and corner anchors effectively become extremity anchors), multi-span anchor devices shall be tested as single-span anchor devices.

#### **4.4.4 Type D anchor devices**

**4.4.4.1** When tested in accordance with 5.6.2 (deformation test), no part of the anchor device which is intended to deform, e.g. to absorb energy, shall demonstrate permanent deformation of more than 10 mm in the direction of loading.

**4.4.4.2** When tested in accordance with 5.6.3 (dynamic strength and integrity test), the anchor device shall not release the rigid test mass and the rigid test mass shall be held clear of the ground.

**4.4.4.3** When tested in accordance with 5.6.4 (static strength test), all load bearing elements, including mobile anchor points, rigid anchor lines, rigid anchor line fixings, rigid anchor line joints, junctions and terminations (e.g. welded connections, bolted terminations) shall hold a load of  $(12 \begin{smallmatrix} +1,0 \\ 0 \end{smallmatrix})$  kN. For non-metallic elements, if evidence of durability is not provided, the static load shall be 18 kN.

**4.4.4.4** When tested in accordance with 5.6.3 and 5.6.4, the mobile anchor point shall not become detached from the rigid anchor line.

**4.4.4.5** If the manufacturer permits installation of the rigid anchor line at an angle of between  $5^\circ$  and  $15^\circ$  from the horizontal, the anchor device shall be tested in accordance with 5.6.3 at the maximum angle permitted. During this test, the mobile anchor point shall not travel along the rigid anchor line more than 1 m.

#### **4.4.5 Type E anchor devices**

**4.4.5.1** When tested in accordance with 5.7.1 (deformation test), no part of the anchor device which is intended to deform, e.g. to absorb energy, shall demonstrate permanent deformation of more than 10 mm in the direction of loading.

**4.4.5.2** When tested in accordance with 5.7.2 (dynamic performance test), the anchor device shall not release the rigid test mass and the rigid test mass shall be held clear of the ground. 3 min after the drop test, the displacement  $L$  of the leading edge of the anchor device shall not exceed 1 000 mm and the anchor device shall remain stationary. The displacements  $L$  and  $H$  shall be recorded (see Figure 11).

**4.4.5.3** The test described in 5.7.2 shall be carried out at the maximum angle up to 5° which the manufacturer permits, under each worst-case condition, with regard to the type of surface and site conditions.

**4.4.5.4** The test described in 5.7.2 shall be repeated for each critical direction in which an arrest force could foreseeably be applied in practice.

**4.4.5.5** Where the manufacturer permits the use of the anchor device with retractable type fall arresters, this combination shall be tested in accordance with 5.7.2 for each retractable fall arrest device permitted. The anchor device and the retractable type fall arrester shall not release the rigid test mass. The displacement  $L$  of the leading edge of the anchor device shall not exceed 1 000 mm and the displacement  $H$  shall not exceed 2 400 mm. These measurements shall be taken ( $3^{+0,5}_0$ ) min after completion of the dynamic performance test.

NOTE Where retractable type fall arresters might be used in combination with a type E anchor device in anything other than a vertical plane, it is recommended that this should be approved by the manufacturer of the retractable type fall arrester.

**4.4.5.6** When tested in accordance with 5.7.3 (post-arrest suspension test), the leading edge of the anchor device where it is in contact with the surface shall not displace more than 10,0 mm after a period of 3 min after which it shall remain stationary.

**4.4.5.7** When tested in accordance with 5.7.4 (static strength test), the anchor point shall hold the load.

## 4.5 Marking and information

**4.5.1** Marking shall be in accordance with Clause 6.

**4.5.2** Information shall be supplied with the anchor device in accordance with Clause 7.

## 5 Test methods

### 5.1 General

**5.1.1** Install the anchor device in accordance with the manufacturer's instructions.

**5.1.2** Apply static and dynamic loads in each principal configuration(s) and direction(s) that may occur in service necessary to ensure that the anchor device is safe, taking into account foreseeable misuse.

**5.1.3** Where there is no requirement for one test to follow another, a new anchor device may be used for each test.

**5.1.4** When tested statically and dynamically, anchor devices may yield, deform or elongate.

**5.1.5** Use a new test lanyard for each dynamic test.

**5.1.6** Determine the mass of any element of an anchor device that is intended to be transported by a single person by weighing or calculation provided by the manufacturer.

**5.1.7** Verify by checking appropriate documentation and/or by visual and/or tactile examination and/or by weighing of the anchor device that it meets the requirements of 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.1.6, 4.2.2, 4.2.3 and 4.3.

## 5.2 Test arrangement and apparatus

### 5.2.1 Test lanyard and determination of free fall distance

**5.2.1.1** Prepare a test lanyard using an unused sample of 11 mm single mountaineering rope which conforms to EN 892. The mountaineering rope shall have an impact force of  $(9 \pm 1,5)$  kN in the first dynamic test as described in EN 892 (refer to the information supplied by the rope manufacturer).

**5.2.1.2** Terminate the rope in loops produced by tying bowline knots (see Figure 9) and ensure the length of the each termination loop is a maximum of 200 mm.

**5.2.1.3** Adjust the length so that when measured within 10 s of applying a load by suspending a mass of  $(100 \text{ }_0^{+1})$  kg on the test lanyard, the length of the test lanyard, including the termination loops, is  $(2\ 000 \text{ }_0^{+100})$  mm (see Figure 10). Ensure the end of the rope does not slip through the knot.

**5.2.1.4** Using a rigid test mass of  $(100 \pm 1)$  kg in accordance with EN 364:1992, 4.5, determine the free fall distance of the rigid test mass required to generate a fall arrest load of  $(9 \text{ }_0^{+0,5})$  kN in the dynamic strength and integrity tests by carrying out a test using an anchor point fixed to the structure. When testing over pulleys, the free fall distance may need to be adjusted to achieve the load of  $(9 \text{ }_0^{+0,5})$  kN.

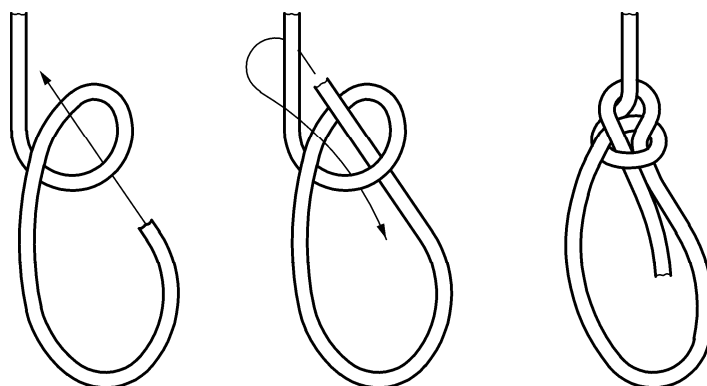
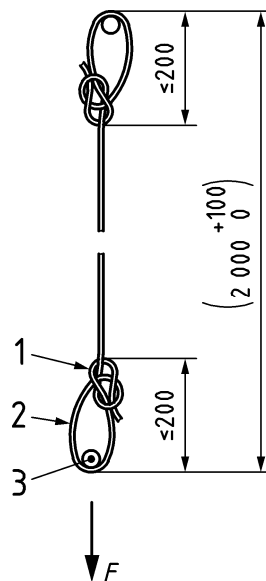


Figure 9 — Bowline knot



### Key

- F load equivalent to  $(100 \pm 1)$  kg
- 1 bowline knot
- 2 termination loop
- 3 attachment point

**Figure 10 — Test lanyard for dynamic strength and integrity tests and dynamic performance tests**

### 5.2.2 Dynamic strength and integrity test apparatus for types A, B, C and D anchor devices

**5.2.2.1** Use a rigid anchorage structure so constructed that its natural frequency (of vibration) in the vertical axis at the anchorage point is not less than 100 Hz and so that the application of a load of 20 kN on the anchorage point does not cause a deflection greater than 1 mm.

**5.2.2.2** Use a test lanyard as described in 5.2.1 and a rigid test mass of  $(100 \pm 1)$  kg in accordance with EN 364:1992, 4.5.

**5.2.2.3** In the dynamic strength and integrity tests for type B anchor devices with legs, use a connecting line made of steel wire cable 8 mm diameter of a  $7 \times 19$  construction and fitted with swaged eyelet terminations.

### 5.2.3 Static strength test apparatus

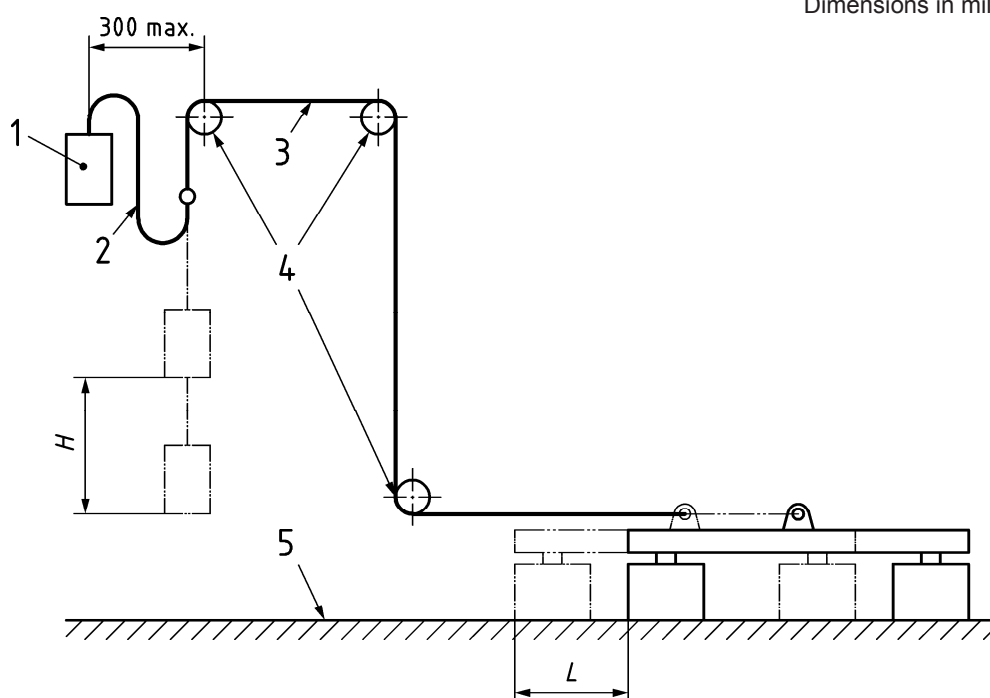
**5.2.3.1** Use a static strength apparatus in accordance with EN 364:1992, 4.1.

**5.2.3.2** In the static strength and tests for type B anchor devices with legs, use a connecting line made of steel wire cable 8 mm diameter of a  $7 \times 19$  construction and fitted with swaged eyelet terminations.

### 5.2.4 Dynamic performance test apparatus for type E anchor devices

Use a connecting line between the test lanyard and the anchor device made of steel wire cable 8 mm diameter of a  $7 \times 19$  construction and fitted with swaged eyelet terminations. Use a test lanyard as described in 5.2.1 and a rigid test mass of  $(100 \pm 1)$  kg in accordance with EN 364:1992, 4.5. An example of a dynamic performance test apparatus is shown in Figure 11.

Dimensions in millimetres



### Key

- 1 rigid test mass
- 2 test lanyard
- 3 connecting line
- 4 pulleys
- 5 test surface
- $H$  displacement of rigid test mass
- $L$  displacement of anchor device

Figure 11 — Example of a dynamic performance test apparatus for type E anchor devices

## 5.3 Type A anchor devices

### 5.3.1 General

Install the anchor device in or on the test apparatus, as appropriate, in accordance with the information supplied by the manufacturer. Where relevant, use a construction fixing as recommended in the information supplied by the manufacturer, into or onto a sample of construction material(s), also recommended in the information supplied by the manufacturer.

### 5.3.2 Deformation

Apply to the anchor point a static test load equal to  $(0,7 \begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix})$  kN for  $(1 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Remove the test load and observe and record the permanent deformation.

### 5.3.3 Dynamic strength and integrity

**5.3.3.1** Attach a load cell to the anchor point. Attach one end of the test lanyard (see 5.2.1) to the load cell by means of a connector and the other end of the test lanyard, also by means of a connector, to the rigid test mass. Attach a quick release device to the rigid test mass.

**5.3.3.2** Move the rigid test mass downwards until the test lanyard holds the mass. Then raise the rigid test mass to the free fall distance determined in 5.2.1.4 and hold it at a maximum of 300 mm horizontally from the anchor point.

**5.3.3.3** Release the rigid test mass and observe and record whether the rigid test mass is arrested and is held clear of the ground. Record the peak load at the anchor point, the deflection of the anchor device and the displacement of the anchor point. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.3.3.4** Increase the mass on the anchor device to 300 kg for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check whether the rigid test mass is held clear of the ground.

#### **5.3.4 Static strength**

Install the anchor device in or on the static test apparatus specified in 5.2.3. Apply a static load of  $(12 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min; or, where any load bearing element or component is made from non-metallic material(s) and where evidence of durability is not provided by the manufacturer,  $(18 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check that the anchor device holds the load.

### **5.4 Type B anchor devices**

#### **5.4.1 General**

Install the anchor device in or on the test apparatus, as appropriate, in accordance with the information supplied by the manufacturer, where relevant using a sample of the structure as recommended for use by the manufacturer.

#### **5.4.2 Deformation**

Apply to the anchor point a static test load equal to  $(0,7 \begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix})$  kN for  $(1 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Remove the test load and observe and record the permanent deformation.

#### **5.4.3 Dynamic strength and integrity**

##### **5.4.3.1 Anchor devices without legs**

**5.4.3.1.1** Attach a load cell to the anchor point. Attach one end of the test lanyard (see 5.2.1) to the load cell by means of a connector and the other end of the test lanyard, also by means of a connector, to the rigid test mass. Attach a quick release device to the rigid test mass.

**5.4.3.1.2** Move the rigid test mass downwards until the test lanyard holds the mass. Then raise the rigid test mass to the free fall distance determined in 5.2.1.4 and hold it at a maximum of 300 mm horizontally from the anchor point.

**5.4.3.1.3** Release the rigid test mass and observe whether the rigid test mass is arrested and is held clear of the ground. Record the peak load at the anchor point, the deflection of the anchor device and the displacement of the anchor point. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.4.3.1.4** Increase the mass on the anchor device to 300 kg for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check whether the rigid test mass is held clear of the ground.

#### 5.4.3.2 Anchor devices with legs and an anchor point(s) not on a leg

**5.4.3.2.1** For anchor devices with legs, e.g. tripods or quadpods, where the manufacturer permits an anchor point(s) not on a leg, proceed as described in 5.4.3.2.2 to 5.4.3.2.5.

**5.4.3.2.2** Extend the legs of the anchor device to the maximum length permissible. Attach a load cell to the anchor point. Attach the connecting line (see 5.2.2.3) to the load cell (see Figure 12). Attach one end of the test lanyard (see 5.2.1) by means of a connector to the free end of the connecting line. Connect the other end of the test lanyard, also by means of a connector, to the rigid test mass and attach a quick release device to the rigid test mass.

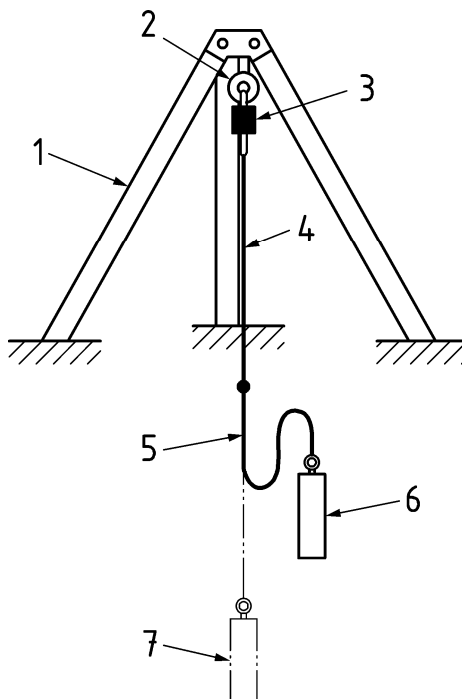
**5.4.3.2.3** Move the rigid test mass downwards until the test lanyard holds the mass. Then raise the rigid test mass to the free fall distance determined in 5.2.1.4 and hold it at a minimum of 300 mm horizontally from the anchor point but within the radius of the legs.

**5.4.3.2.4** Release the rigid test mass and observe whether the rigid test mass is arrested and held clear of the ground, and whether the anchor device remains stable. Record the peak load at the anchor point, the deflection of the anchor device and the displacement of the anchor point. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.4.3.2.5** Increase the load on the anchor device to 300 kg for  $(3^{+0,25}_0)$  min. Check that the rigid test mass is held clear of the ground and the anchor device remains stable.

**5.4.3.2.6** If the manufacturer permits differential adjustment for uneven surfaces, test the anchor device at the maximum permitted differential adjustment.





**Key**

- |   |                              |   |                                |
|---|------------------------------|---|--------------------------------|
| 1 | tripod                       | 5 | test lanyard                   |
| 2 | anchor point(s) not on a leg | 6 | rigid test mass before release |
| 3 | load cell                    | 7 | rigid test mass after release  |
| 4 | connecting line              |   |                                |

**Figure 12 — Dynamic test for type B anchor devices with legs (e.g. a tripod) and an anchor point(s) not on a leg**

**5.4.3.3 Anchor devices with legs and an anchor point on a leg**

**5.4.3.3.1** Where the manufacturer permits an anchor point on a leg, e.g. for attaching a retractable type fall arrester conforming to EN 360, proceed as described in 5.4.3.3.2 to 5.4.3.3.5.

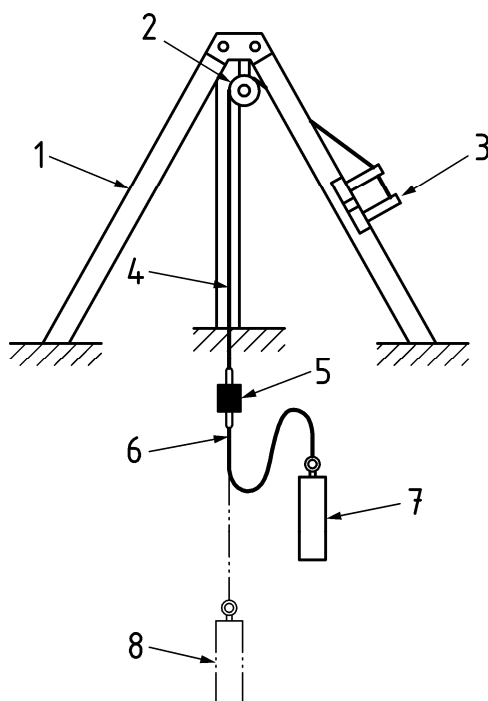
**5.4.3.3.2** Extend the legs of the anchor device to the maximum length permissible. Attach the connecting line (see 5.2.2.3) to the anchor point on the leg of the anchor device (see Figure 13). Pass the connecting line around the apex pulley. Attach a load cell to the free end of the connecting line. Attach one end of the test lanyard (see 5.2.1) by means of a connector to the load cell. Connect the other end of the test lanyard, also by means of a connector, to the rigid test mass and attach a quick release device to the rigid test mass.

**5.4.3.3.3** Move the rigid test mass downwards until the test lanyard holds the mass. Then raise the rigid test mass to the free fall distance determined in 5.2.1.4 and hold it at a minimum of 300 mm horizontally from the apex pulley but within the radius of the legs.

**5.4.3.3.4** Release the rigid test mass and observe whether the rigid test mass is arrested and held clear of the ground, and that the anchor device remains stable. Record the peak load at the anchor point, the deflection of the anchor device and the displacement of the anchor point. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.4.3.3.5** Increase the mass on the anchor device to 300 kg for  $(3^{+0,25}_0)$  min. Check whether the rigid test mass is held clear of the ground and the anchor device remains stable.

**5.4.3.3.6** If the manufacturer permits differential adjustment for uneven surfaces, test the anchor device at the maximum permitted differential adjustment.



**Key**

- |   |                 |   |                                |
|---|-----------------|---|--------------------------------|
| 1 | tripod          | 5 | load cell                      |
| 2 | apex pulley     | 6 | test lanyard                   |
| 3 | anchor point    | 7 | rigid test mass before release |
| 4 | connecting line | 8 | rigid test mass after release  |

**Figure 13 — Dynamic test for type B anchor devices with legs (e.g. a tripod) and an anchor point on a leg**

**5.4.4 Static strength**

**5.4.4.1 Anchor devices without legs**

Install the anchor device in or on the static test apparatus specified in 5.2.3. Apply a static test load of  $(12 \text{ }_0^{+1})$  kN for  $(3 \text{ }_0^{+0,25})$  min; or, where any load bearing element or component is made from non-metallic material(s) and where evidence of durability is not provided by the manufacturer,  $(18 \text{ }_0^{+1})$  kN for  $(3 \text{ }_0^{+0,25})$  min. Check that the anchor device holds the load.

**5.4.4.2 Anchor devices with legs and a central anchor point**

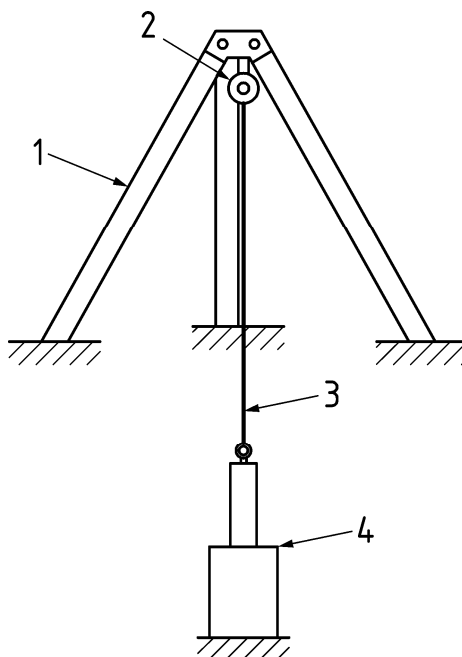
**5.4.4.2.1** For anchor devices with legs, e.g. tripods or quadpods, where the manufacturer permits a central anchor point, e.g. for attaching a retractable type fall arrester conforming to EN 360, proceed as described in 5.4.4.2.2 to 5.4.4.2.5.

**5.4.4.2.2** Extend the legs of the anchor device to the maximum length permissible. Attach a connecting line to the central anchor point of the anchor device (see Figure 14).

**5.4.4.2.3** Connect the connecting line to the static strength apparatus in accordance with 5.2.3.

**5.4.4.2.4** Apply the test load (see 5.4.4.1) to the connecting line. Observe that the anchor device holds the load, and that the anchor device remains stable.

**5.4.4.2.5** If the manufacturer permits differential adjustment for uneven surfaces, test the anchor device at the maximum permitted differential adjustment.



#### Key

- 1 tripod
- 2 central anchor point
- 3 connecting line
- 4 static test apparatus

**Figure 14 — Static strength test for type B anchor device with legs (e.g. a tripod) and a central anchor point**

#### **5.4.4.3 Anchor devices with legs and an anchor point on a leg**

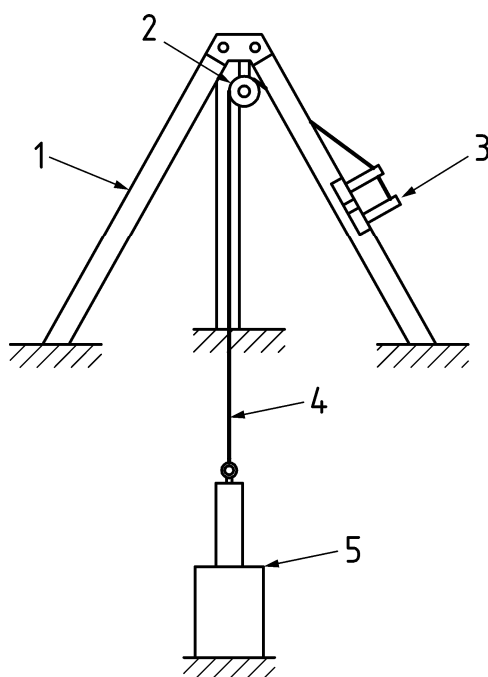
**5.4.4.3.1** Where the manufacturer permits an anchor point on a leg, e.g. for attaching a retractable type fall arrester conforming to EN 360, proceed as described in 5.4.4.3.2 to 5.4.4.3.5.

**5.4.4.3.2** Extend the legs of the anchor device to the maximum length permissible. Attach a connecting line to the anchor point on the leg of the anchor device (see Figure 15).

**5.4.4.3.3** Pass the connecting line around the apex pulley and connect to the static strength apparatus in accordance with 5.2.3.

**5.4.4.3.4** Apply the test load (see 5.4.4.1) to the connecting line. Observe that the anchor device holds the load, and that the anchor device remains stable.

**5.4.4.3.5** If the manufacturer permits differential adjustment for uneven surfaces, test the anchor device at the maximum permitted differential adjustment.



**Key**

- 1 tripod
- 2 apex pulley
- 3 anchor point
- 4 connecting line
- 5 static test apparatus

**Figure 15 — Static strength test for type B anchor device with legs (e.g. a tripod) and an anchor point on a leg**

## 5.5 Type C anchor devices

### 5.5.1 General

**5.5.1.1** Install the extremity and intermediate anchor in or on the test apparatus, as appropriate, in accordance with the information supplied by the manufacturer, horizontally with a tolerance of  $\pm 3^\circ$ . Where relevant, use a construction fixing as recommended in the information supplied by the manufacturer, into or onto a sample of construction material(s) also recommended in the information supplied by the manufacturer.

**5.5.1.2** Arrange the test configuration(s) taking into account the following:

- a) the loading directions in use (e.g. intermediate and extremity anchors mounted on a wall, ceiling, roof or ground);
- b) the span length;

NOTE A span equals the distance between flexible anchor line fixings, e.g. extremity anchor and intermediate anchor.

- c) corners (internal and external corners, maximum deviation);

d) types and combinations of components, e.g. energy absorber(s), terminations, intermediate anchors, mobile anchor point, flexible anchor line(s).

**5.5.1.3** If the anchor device does not have a mobile anchor point, use a connection as specified in the information supplied by the manufacturer (see 7 j) i)).

**5.5.1.4** Where the intermediate anchor and corner anchor of the flexible anchor line do not permit articulation of the mobile anchor point with the direction of loading that could be applied in service, carry out the static strength test described in 5.5.4 in directions both in line and perpendicular to the intermediate anchor and corner anchor mounting bolts.

**5.5.1.5** If the flexible anchor line can be installed with no intermediate anchor(s), configure the system in accordance with 5.5.3.1.

**5.5.1.6** If the flexible anchor line can be installed with an intermediate anchor(s), configure the system in accordance with 5.5.3.2.

## **5.5.2 Deformation**

Apply to the extremity, intermediate, corner anchors and mobile anchor point a static test load equal to  $(0,7 \begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix})$  kN for  $(1 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min in the direction or directions of use in service. Remove the test load and observe and record the permanent deformation.

## **5.5.3 Dynamic strength and integrity**

### **5.5.3.1 Single span**

**5.5.3.1.1** Install the manufacturer's longest permissible single-span anchor device in accordance with the information supplied by the manufacturer.

**5.5.3.1.2** Attach a load cell to each end of the flexible anchor line so that the tension at the extremity anchors can be measured.

**5.5.3.1.3** Attach a load cell to the mobile anchor point. Attach the test lanyard (see 5.2.1) by means of a connector to the load cell and position the mobile anchor point at the centre of the span of the flexible anchor line. Attach the rigid test mass, also by means of a connector, to the free end of the test lanyard and a quick release device to the rigid test mass.

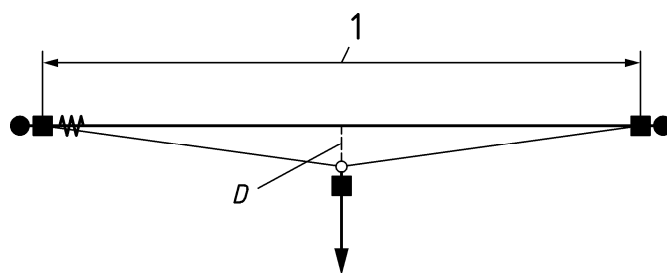
**5.5.3.1.4** Move the rigid test mass downwards until the test lanyard holds the mass. Remove the load until the flexible anchor line returns to its natural position. From this point, raise the rigid test mass to a height which provides the free fall distance determined in 5.2.1.4. Hold the rigid test mass at a maximum of 300 mm horizontally.

**5.5.3.1.5** Release the rigid test mass. Measure and record the maximum load at the extremity anchors and at the mobile anchor point. Also measure and record the maximum dynamic deflection of the flexible anchor line at the mobile anchor point (e.g. by high speed video, displacement transducer).

**5.5.3.1.6** Check that the mobile anchor point does not become detached from the flexible anchor line and that the rigid test mass is held clear of the ground. Record the result. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.5.3.1.7** Increase the mass on the anchor device to 300 kg for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check whether the rigid test mass is held clear of the ground.

**5.5.3.1.8** Install the manufacturer's shortest permissible single-span anchor device (see Figure 16) in accordance with the information supplied by the manufacturer. Carry out the test described in 5.5.3.1.2 to 5.5.3.1.7.



### Key

1	longest/shortest span	■	load cell
<i>D</i>	dynamic deflection	→	direction of load
		⌘	energy absorber (if fitted)
		●	extremity anchor
		○	mobile anchor point

**Figure 16 — Example of a single-span type C anchor device test arrangement**

**5.5.3.1.9** Where there are entry/exit line fittings or a joint in the line, carry out the dynamic strength and integrity test at these positions.

### 5.5.3.2 Multi-span

#### 5.5.3.2.1 General

Install, in accordance with the information supplied by the manufacturer, a flexible anchor line including three spans, of which a span of the longest length permitted by the manufacturer is at one end of the installed flexible anchor line and where the other two spans are of the shortest length permitted by the manufacturer (see Figure 17). Install load cells at both extremities of the flexible anchor line. If the manufacturer offers a corner(s) as an option for the anchor device, include a 90° corner between the shortest and longest straight spans (see Figure 18). Carry out the tests described in 5.5.3.2.2 and/or 5.5.3.2.3, as appropriate.

#### 5.5.3.2.2 Test at the centre of the longest span

**5.5.3.2.2.1** Position the mobile anchor point at the centre of the longest span, unless the device incorporates energy absorbing elements at only one end of the installed flexible anchor line, in which case locate the mobile anchor point at the end of the longest span that meets with the shortest span.

**5.5.3.2.2.2** Attach a load cell to the mobile anchor point; attach the test lanyard (see 5.2.1) by means of a connector to the load cell; attach the rigid test mass, also by means of a connector, to the free end of the test lanyard and a quick release device to the rigid test mass.

**5.5.3.2.2.3** Move the rigid test mass downwards until the test lanyard holds the mass. Remove the load until the flexible anchor line returns to its natural position. From this point, raise the rigid test mass to a height which provides the free fall distance determined in 5.2.1.4. Hold the rigid test mass at a maximum of 300 mm horizontally.

**5.5.3.2.2.4** Release the rigid test mass. Measure and record the maximum load at the extremity anchor and at the mobile anchor point. In addition, measure and record the maximum dynamic deflection of the flexible anchor line at the mobile anchor point (e.g. by high speed video, displacement transducer).

**5.5.3.2.2.5** Check that the mobile anchor point does not become detached from the flexible anchor line and that the rigid test mass is held clear of the ground. Record the result. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.5.3.2.2.6** Increase the mass on the anchor device to 300 kg for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check whether the test mass is held clear of the ground.

#### **5.5.3.2.3 Test at the centre of the shortest span**

Repeat the tests in 5.5.3.2.2 at the centre of the shortest span.

#### **5.5.3.2.4 Test on an intermediate anchor, at a corner, entry/exit line fitting and joint in the anchor line**

**5.5.3.2.4.1** Position the mobile anchor point on the intermediate anchor. Attach a load cell to the mobile anchor point; attach the test lanyard (see 5.2.1) by means of a connector to the load cell; attach the rigid test mass, also by means of a connector, to the free end of the test lanyard and a quick release device to the rigid test mass.

**5.5.3.2.4.2** Move the rigid test mass downwards until the test lanyard holds the mass. Remove the load until the flexible anchor line returns to its natural position. From this point, raise the rigid test mass to a height which provides the free fall distance determined in 5.2.1.4. Hold the rigid test mass at a maximum of 300 mm horizontally.

**5.5.3.2.4.3** Release the test rigid test mass. Measure and record the maximum load at the extremity anchor and at the mobile anchor point. In addition, measure the maximum deflection at the mobile anchor point.

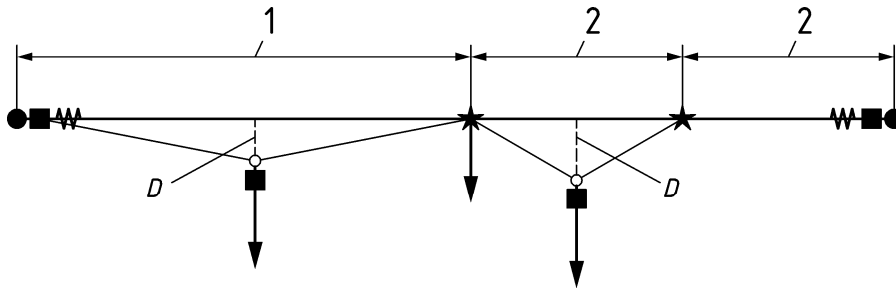
**5.5.3.2.4.4** Check that the mobile anchor point does not become detached from the flexible anchor line and that the rigid test mass is held clear of the ground. Record the result. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.5.3.2.4.5** Increase the mass on the anchor device to 300 kg for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check whether the test mass is held clear of the ground.

**5.5.3.2.4.6** Where there is a corner in the flexible anchor line, carry out the tests described in 5.5.3.2.4.1 to 5.5.3.2.4.5 with the mobile anchor point positioned at the centre of the corner.

**5.5.3.2.4.7** Where there is an entry/exit line fitting in the flexible anchor line, with the mobile anchor point positioned on the entry/exit line fitting, carry out the tests described in 5.5.3.2.4.1 to 5.5.3.2.4.5.

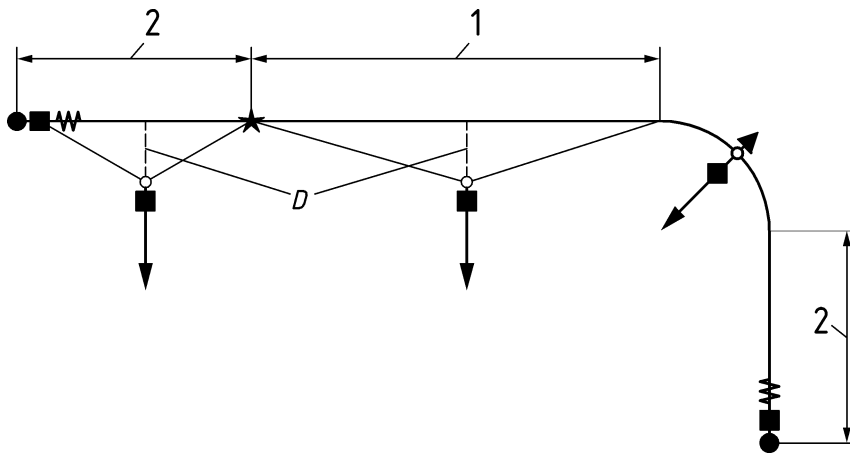
**5.5.3.2.4.8** Where there is a joint in the flexible anchor line, with the mobile anchor point positioned on the joint, carry out the tests described in 5.5.3.2.4.1 to 5.5.3.2.4.5.



**Key**

- |          |  |   |                             |
|----------|--|---|-----------------------------|
| 1        | longest span                           | ■ | load cell                   |
| 2        | shortest span                          | ★ | intermediate anchor         |
| <i>D</i> | dynamic deflection (dependent on span) | → | direction of load           |
|          |  | ⌘ | energy absorber (if fitted) |
|          |  | ● | extremity anchor            |
|          |  | ○ | mobile anchor point         |

Figure 17 — Example of a multi-span type C anchor device test arrangement without a corner



**Key**

- |          |  |   |                             |
|----------|--|---|-----------------------------|
| 1        | longest span                           | ■ | load cell                   |
| 2        | shortest span                          | ★ | intermediate anchor         |
| <i>D</i> | dynamic deflection (dependent on span) | ▲ | corner anchor               |
|          |  | → | direction of load           |
|          |  | ⌘ | energy absorber (if fitted) |
|          |  | ● | extremity anchor            |
|          |  | ○ | mobile anchor point         |

Figure 18 — Example of a multi-span type C anchor device test arrangement with a corner



#### 5.5.4 Static strength

**5.5.4.1** Use the same configuration and test positions as those used for the dynamic strength and integrity tests described in 5.5.3.1 and 5.5.3.2. Apply a static test load of  $(12 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min; or, where any load bearing element or component is made from non-metallic material(s) and where evidence of durability is not provided by the manufacturer,  $(18 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check that the anchor device, including the mobile anchor point, holds the load.

**5.5.4.2** Where the flexible anchor line carrying components of the intermediate anchor and corner anchor do not permit articulation of the mobile anchor point with the direction of loading that could be applied in service, carry out the static strength test in directions both in line and perpendicular to the intermediate anchor and corner anchor mounting bolts.

### 5.6 Type D anchor devices

#### 5.6.1 General

**5.6.1.1** Install the extremity and intermediate anchor(s) in or on the test apparatus, as appropriate, in accordance with the information supplied by the manufacturer. Install horizontally, with a tolerance of  $\pm 3^\circ$  and, where relevant using a construction fixing as recommended in the information supplied by the manufacturer, into or onto a sample of construction material(s) also recommended in the information supplied by the manufacturer.

**5.6.1.2** Arrange the test configuration(s) taking into account the following:

- a) the loading directions in use (e.g. intermediate and extremity anchors mounted on a wall, ceiling, roof or ground);
- b) the longest span length and maximum permitted cantilever distance;

NOTE A span equals the distance between rigid anchor line fixings, e.g. extremity anchor and intermediate anchor.

- c) corners (internal and external corners, maximum deviation);
- d) types and combinations of components, e.g. end stops, intermediate anchors, mobile anchor point, rigid anchor line joint or junction.

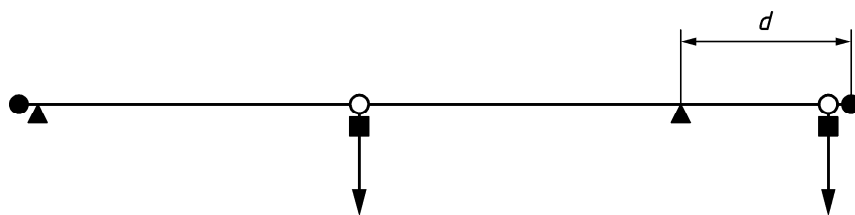
**5.6.1.3** If the anchor device does not have a mobile anchor point, use a connection as specified in the information supplied by the manufacturer (see 7 j i)).

#### 5.6.2 Deformation

Apply to the anchor point a static test load equal to  $(0,7 \begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix})$  kN for  $(1 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min in the direction or directions of use in service. Remove the test load and observe and record the permanent deformation.

#### 5.6.3 Dynamic strength and integrity

**5.6.3.1** Install in accordance with 5.6.1 and the information supplied by the manufacturer, a rigid anchor line with the longest span and the maximum cantilever distance  $d$  permitted by the manufacturer (see Figure 19).



**Key**

- load cell
- ▲ rigid anchor line fixing
- load direction
- end stop
- mobile anchor point
- d* cantilever distance

**Figure 19 — Example of a type D anchor device test arrangement including a cantilever**

**5.6.3.2** If the manufacturer offers a corner(s) as an option for the device, include a corner with the largest internal corner radius as permitted by the manufacturer between the two spans (see Figure 20).

**5.6.3.3** Attach a load cell to the mobile anchor point. Attach the test lanyard (see 5.2.1) by means of a connector to the load cell and position the mobile anchor point at the centre of the span of the rigid anchor line. Attach the rigid test mass, also by means of a connector, to the free end of the test lanyard and a quick release device to the rigid test mass.

**5.6.3.4** Move the rigid test mass downwards until the test lanyard holds the mass. Then raise the rigid test mass to the free fall distance determined in 5.2.1.4 and hold it at a maximum of 300 mm horizontally from the mobile anchor point.

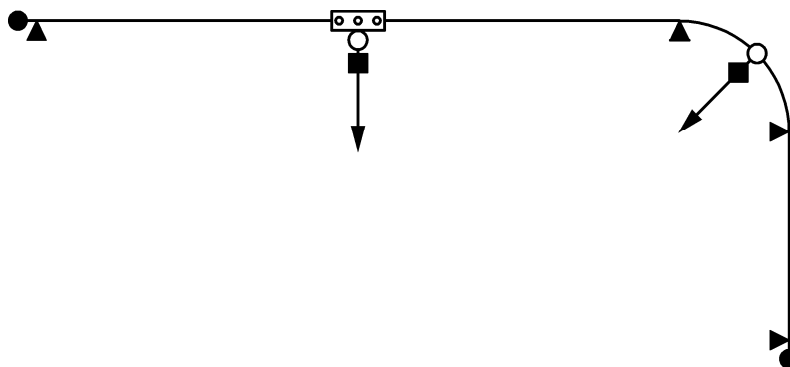
**5.6.3.5** Release the rigid test mass. Record the peak load at the anchor point, the deflection of the anchor device and the displacement of the anchor point measured from its initial position to its point of rest.

**5.6.3.6** Check that the mobile anchor point does not become detached from the rigid anchor line and does not release the rigid test mass. Record the result. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

**5.6.3.7** Increase the mass on the anchor device to 300 kg for  $(3^{+0,25}_0)$  min. Check whether the rigid test mass is held clear of the ground.

**5.6.3.8** Repeat the dynamic and integrity test in all directions the load can be applied in service at different rigid anchor line fixings, e.g. extremity anchor, intermediate anchor, at the centre of a corner, rigid anchor line joint or junction, end stop.

**5.6.3.9** If a cantilever is permitted by the manufacturer, repeat the test at the maximum cantilever distance. Observe and record the maximum deflection of the rail and mobile anchor point. Check that the mobile anchor point does not become detached from the rigid anchor line and does not release the rigid test mass. Record the result.



### Key

- load cell
- ▲ rigid anchor line fixing
- load direction
- end stop
- mobile anchor point
- ▭ rigid anchor line joint or junction

**Figure 20 — Example of a type D anchor device test arrangement including a rigid anchor line joint or junction and a corner anchor**

## 5.6.4 Static strength

**5.6.4.1** Use the same configuration test positions as those used in the test described in 5.6.1 and 5.6.3. Apply a static test load of  $(12 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min; or, where any load bearing element or component is made from non-metallic material(s) and where evidence of durability is not provided by the manufacturer,  $(18 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check that the anchor device, including the mobile anchor point, holds the load.

**5.6.4.2** Where the rigid anchor line carrying components of the intermediate anchor and corner anchor do not permit articulation of the mobile anchor point with the direction of loading that could be applied in service, carry out the static strength test described in 5.6.4.1 in directions both in line and perpendicular to the intermediate anchor and corner anchor mounting bolts.

## 5.7 Type E anchor devices

### 5.7.1 Deformation

Apply to the anchor point a static test load equal to  $(0,7 \begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix})$  kN for  $(1 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min in the direction or directions of use in service. Remove the test load and observe and record the permanent deformation.

### 5.7.2 Dynamic performance

**5.7.2.1** Install the anchor device on the dynamic performance test apparatus (see 5.2.4), in accordance with the information supplied by the manufacturer, on typical samples of the surface materials and site conditions (e.g. dry, minimum and maximum ambient temperatures, angle of surface) for which the manufacturer claims suitability. For wet conditions see 5.7.2.4.

**5.7.2.2** Attach a quick release device to the rigid test mass. Move the rigid test mass downwards until the test lanyard holds the mass. Then raise the rigid test mass to the free fall distance determined in 5.2.1.4 and hold it at a maximum of 300 mm horizontally from the pulley (see Figure 11).

**5.7.2.3** Release the rigid test mass. Measure displacements  $L$  and  $H$  both immediately following the arrest of the rigid test mass and again after 15 min. Check that the rigid test mass is held clear of the ground. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

NOTE Displacement  $H$  can be used to determine ground clearance for the user.

**5.7.2.4** When testing for wet conditions, before assembling the type E anchor device on the test surface, and no more than 0,5 h before the rigid test mass is released, apply water in the temperature range 10 °C to 25 °C at the rate of 0,5 l/m<sup>2</sup> of the test surface so that the test surface is wet.

**5.7.2.5** Immediately before releasing the rigid test mass, apply more water so the test surface is wet.

**5.7.2.6** Release the rigid test mass within 2 min of the second application of water and measure displacements  $L$  and  $H$  both immediately following the arrest of the rigid test mass and again after 15 min. Check that the rigid test mass is held clear of the ground. If the anchor device is equipped with a fall indicator, check whether it indicates that a fall has occurred.

NOTE Displacement  $H$  can be used to determine ground clearance for the user.

**5.7.2.7** If the anchor device has more than one anchor point, repeat the test for each anchor point.

### 5.7.3 Post arrest suspension

**5.7.3.1** Carry out the dynamic performance test as described in 5.7.2 with the type E anchor device positioned on the type of surface for which the greatest displacement  $L$  was recorded in the dynamic performance tests specified in 5.7.2.

**5.7.3.2** Without reducing the tension in the wire rope, within 5 min increase the rigid test mass to  $(300 \pm 3)$  kg and apply further water around and over the anchor device at the rate described in 5.7.2.4, keeping the rigid test mass suspended for a period of  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min.

**5.7.3.3** Measure the displacement of the anchor device at its leading edge where it is in contact with the surface.

### 5.7.4 Static strength

Install the anchor device in or on the static test apparatus specified in 5.2 by fixing the anchor device directly to the test apparatus (e.g. by bolting, by constructing a barrier), as appropriate. Apply, in each critical direction of use permitted by the information supplied by the manufacturer, a static load of  $(12 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Where any load bearing element or component is made from non-metallic material(s) and where evidence of durability is not provided by the manufacturer, apply  $(18 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix})$  kN for  $(3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix})$  min. Check whether the anchor device holds the load.

## 5.8 Corrosion resistance

Expose representative samples of the metal parts of the anchor device to the neutral salt spray test in accordance with EN ISO 9227 for a period of  $(24 \begin{smallmatrix} +0,5 \\ 0 \end{smallmatrix})$  h. Dry for  $(60 \begin{smallmatrix} +5 \\ 0 \end{smallmatrix})$  min at  $(20 \pm 2)$  °C. Then repeat the procedure, so that the anchor device is subjected in total to  $(24 \begin{smallmatrix} +0,5 \\ 0 \end{smallmatrix})$  h exposure and  $(60 \begin{smallmatrix} +5 \\ 0 \end{smallmatrix})$  min drying plus another  $(24 \begin{smallmatrix} +0,5 \\ 0 \end{smallmatrix})$  h exposure and  $(60 \begin{smallmatrix} +5 \\ 0 \end{smallmatrix})$  min drying. Examine the anchor device and verify that it meets the requirements of 4.2.1. When it is necessary to gain visual access to the internal elements, dismantle the anchor device.

## 6 Marking

Marking of the anchor device shall conform to EN 365 and, in addition, shall include that the anchor device shall be for the use of one user only.

## 7 Information supplied by the manufacturer

The information supplied by the manufacturer shall be provided in at least the language(s) of the country of destination. It shall conform to EN 365 and, in addition, shall include at least the following advice or information:

- a) that the anchor device is for the use of one person only;
- b) that when the anchor device is used as part of a fall arrest system, the user shall be equipped with a means of limiting the maximum dynamic forces exerted on the user during the arrest of a fall to a maximum of 6 kN;
- c) the maximum loads(s) that could be transmitted in service from the anchor device to the structure and the directions of loading relevant to the type of fixing and structure;
- d) the maximum value of deflection of the anchor device and displacement of the anchor point that can occur in service;
- e) for anchor devices intended to deform during deployment, guidance on their suitability for use in different types of personal fall protection systems, e.g. rope access, rescue;
- f) for non-metallic elements or components of the anchor device, information on the materials from which they are made;
- g) that it is recommended the anchor device is marked with the date of the next or last inspection;
- h) for type B anchor devices such as tripods and quadpods, advice on the need for stability of the anchor device, guidance on how to achieve it and whether the manufacturer permits differential adjustments;
- i) for type C anchor devices:
  - i) the maximum angle at which the anchor line should enter or exit intermediate supports, e.g. intermediate anchors, or corner anchors;
  - ii) a statement to indicate whether the anchor device may be used in conjunction with retractable type fall arresters, and if allowed, descriptions, model numbers and any other information to clearly indicate which specific retractable type fall arresters are allowed;
  - iii) the potential dangers that arise when type C anchor devices are combined with retractable type fall arresters (EN 360) or guided type fall arresters including a flexible anchor line (EN 353-2), which have not been tested together;
- j) for types C and D anchor devices:
  - i) the maximum angle allowed from the horizontal for the anchor device;
  - ii) where the manufacturer permits direct connection to the anchor line without the need for a mobile anchor point (e.g. where a lanyard or connector is attached directly to the anchor line), a statement informing the user of the type(s) of connection that may be used;
  - iii) where the mobile anchor point cannot pass through a discontinuity in the anchor line without removing it from the anchor line, e.g. at corners or at intermediate anchors, a description of suitable measures for the safe transfer of the mobile anchor point;

- k) for type E anchor devices:
  - i) the maximum angle from horizontal of each type of surface permitted for the anchor device;
  - ii) on the recommended safety distance of the anchor device from any edge, opening or other fall hazard;
  - iii) that type E anchor devices should not be positioned in areas where water could accumulate and create a hazard;
  - iv) that type E anchor devices should not be used when there is risk of frost, or in freezing conditions where frost or freezing conditions create a hazard;
  - v) guidance on the use of the anchor device where there is contamination of the surface and/or anchor device, e.g. by oil, grease, algae;
  - vi) the types of surface, e.g. roofs, on which the anchor device may be used (i.e. those on which it has been tested);
  - vii) that type E anchor devices should not be used in combination with retractable type fall arresters (EN 360), unless they have been tested together;
  - viii) the potential dangers that arise when type E anchor devices are combined with energy absorbing lanyards (EN 355), which have not been tested together;
  - ix) that where users intend to combine any personal fall protection equipment for fall arrest with type E anchor devices, they should seek guidance on its suitability from the manufacturer of that personal fall protection equipment before doing so;
  - x) advice that where the type E anchor device is to be used on a surface, e.g. a roof, that is covered with stone chippings, all loose stones should be removed (e.g. by sweeping with a hard brush) before assembly of the anchor device;
- l) documentation after installation and periodic examination (see Annex A);
- m) that the anchor device should only be used for personal fall protection equipment and not for lifting equipment;
- n) for anchor devices that include a fall indicator, information on how to inspect the fall indicator.

## Annex A (informative)

### Information on installation documentation and periodic examination

#### A.1 Information on installation to be supplied by the manufacturer

Information supplied by the manufacturer on installation should be provided in at least the language(s) of the country of destination. It should include at least advice or information, as appropriate, as follows:

- a) that the anchor devices should be installed only by competent persons or competent organizations;
- b) that the installation should be verified appropriately, e.g. by calculation or testing;
- c) on the suitability of base materials, structural anchor, or fixing element if applicable, by taking into account the loads recorded on the anchor device during the dynamic strength and integrity tests;
- d) that if the marking of the anchor device is not accessible after installation, additional marking near the anchor device is recommended;
- e) for type B anchor devices such as tripods and quadpods, advice on the need for stability of the anchor device and guidance on how to achieve it;
- f) for type C anchor devices:
  - i) the distance caused by the deflection of the flexible horizontal anchor line under the conditions of use, including the arrest of a fall or restraint;
  - ii) a warning that type C anchor devices should be installed such that, in the event of arresting a fall, the deflection of the anchor line will not bring it into contact with a sharp edge or any other article that may cause damage to the anchor line;
  - iii) the maximum angle at which the anchor line is permitted to enter or exit intermediate supports or corner anchors;
- g) for type E anchor devices, the anchor device should be positioned at a recommended safe distance from an edge, opening or other fall hazard.

#### A.2 Guidance on documentation to be supplied after an installation

**A.2.1** For the user, the installation documentation provides evidence that the installation has been carried out properly. Moreover, it is the essential basis for future examination of the anchor device, given that in many cases the fixing of the anchor devices is not visible or accessible.

**A.2.2** After installation, copies of the installation documentation should be handed over to the user. This documentation should be kept in the building for the purpose of subsequent examinations of the anchor device.

The installation documentation should contain at least the following information:

- address and location of installation;
- the name and address of the installation company;

- the name of the person in charge of the installation;
- product identification (manufacturer of the anchor device, type, model/article);
- fixing device (manufacturer, product, permissible tensile and transverse forces);
- schematic installation plan, e.g. of the roof, and relevant user information, such as where the anchor points are located (e.g. relevant in case of snow).

This schematic plan should be affixed to the building so as to be visible or available for everybody (e.g. at the roof access point) (see Figure A.1).

**A.2.3** Declarations given by the installer in charge should be undersigned by him/her and should contain at least information that the anchor device:

- was installed in accordance with the manufacturer's installation instructions;
- was carried out according to the plan;
- was fixed to the specified substrate;
- was fixed as specified (e.g. number of bolts, correct materials, correct position/location);
- was commissioned in accordance with the manufacturer's information;
- was supplied with photographic information/documentation, especially where fixings (e.g. bolts) and the underlying substrate are no longer visible after completing the installation.

Figure A.1 gives an example of an installation plan.

**A.2.4** It is recommended that, where more than one anchor point is to be photographed for identification, the anchor devices are marked with numbers and that this numbering is incorporated into the anchor device inspection records and the schematic ground plan of the installation area.



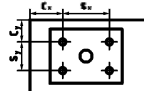
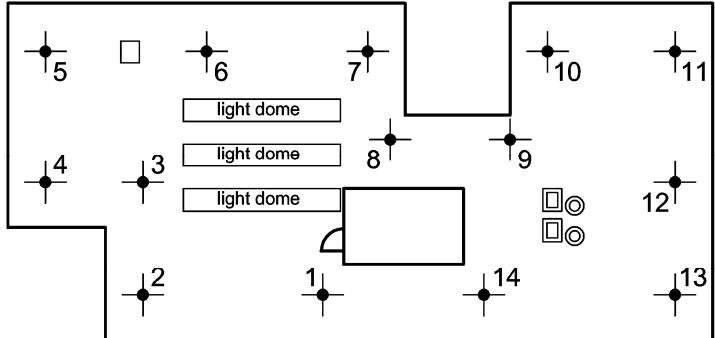
Schematic installation plan			
<b>Building/Structure</b>			
Address:	Remarks:	Order no.: Building type: Roof shape: Anchor device:	
<b>Customer</b>			
Name:	Address:	Contact person:	
		Phone:	
<b>Installer</b>			
Name:	Address:	Chief installer:	
		Phone:	
<b>Anchor device</b>			
Manufacturer: Model/type identification:			
<b>Building component</b>			
Component 1:	e.g. concrete ceiling	Minimum thickness:	e.g. 250mm
Component 2:	e.g. concrete column	Minimum thickness:	e.g. 500mm
Building mat'l:	e.g. reinforced concrete	Quality:	e.g. min. C25/30
<b>Fixings/Dowels</b>		<b>Manufacturer:</b>	
<input type="checkbox"/> <u>Fixing data</u>	Drill-hole diamt : _____ mm		Type: _____
<input type="checkbox"/> data not required if through fixed	Drill-hole depth : _____ mm		Material: _____
	Torque : _____ Nm		Min. edge distance (c): _____
Real situation:	Edge distance Cx: _____	Cy: _____	Min. axial spacing (s): _____
	Axial spacing Sx: _____	Sy: _____	Min. component thickness: _____
			Permissible tensile force: _____
			Permissible shear force: _____
Remarks: _____			
Drilling method:	<input type="checkbox"/> Hammer	<input type="checkbox"/> Drill-hole cleaning	Impact System <input type="checkbox"/> yes <input type="checkbox"/> no
Testing device:	<input type="checkbox"/> Rotary	<input type="checkbox"/> Fixing test device	<input type="checkbox"/> wet <input type="checkbox"/> dry
	<input type="checkbox"/> Torque controlled spanner		<input type="checkbox"/> yes <input type="checkbox"/> no
<b>CHECK LIST:</b>			
<input type="checkbox"/> Substrate as expected (no doubt on capacity) <input type="checkbox"/> Installation complies with manufacturer's instructions <input type="checkbox"/> Recommended fixings used <input type="checkbox"/> All fixings photographed with identification number <input type="checkbox"/> Fixings exposed <input type="checkbox"/> Installation plan placed on site → <input type="checkbox"/> Screw securing by through hole fixing technology <input type="checkbox"/> Additional information _____			
<b>Roof ground plan:</b> 			
<b>Required pull-out force (kN), required torque [Nm] achieved?</b>			
Anchor point 1 _____	Anchor point 5 _____	Anchor point 9 _____	Anchor point 13 _____
Anchor point 2 _____	Anchor point 6 _____	Anchor point 10 _____	
Anchor point 3 _____	Anchor point 7 _____	Anchor point 11 _____	
Anchor point 4 _____	Anchor point 8 _____	Anchor point 12 _____	
Additional fixings: _____			
Remarks by the chief installer: _____			
Date: _____ Signature: _____			

Figure A.1 — Example of an installation plan

### A.3 Guidance on periodic examination procedure

Figure A.2 provides an example of a periodic examination procedure.

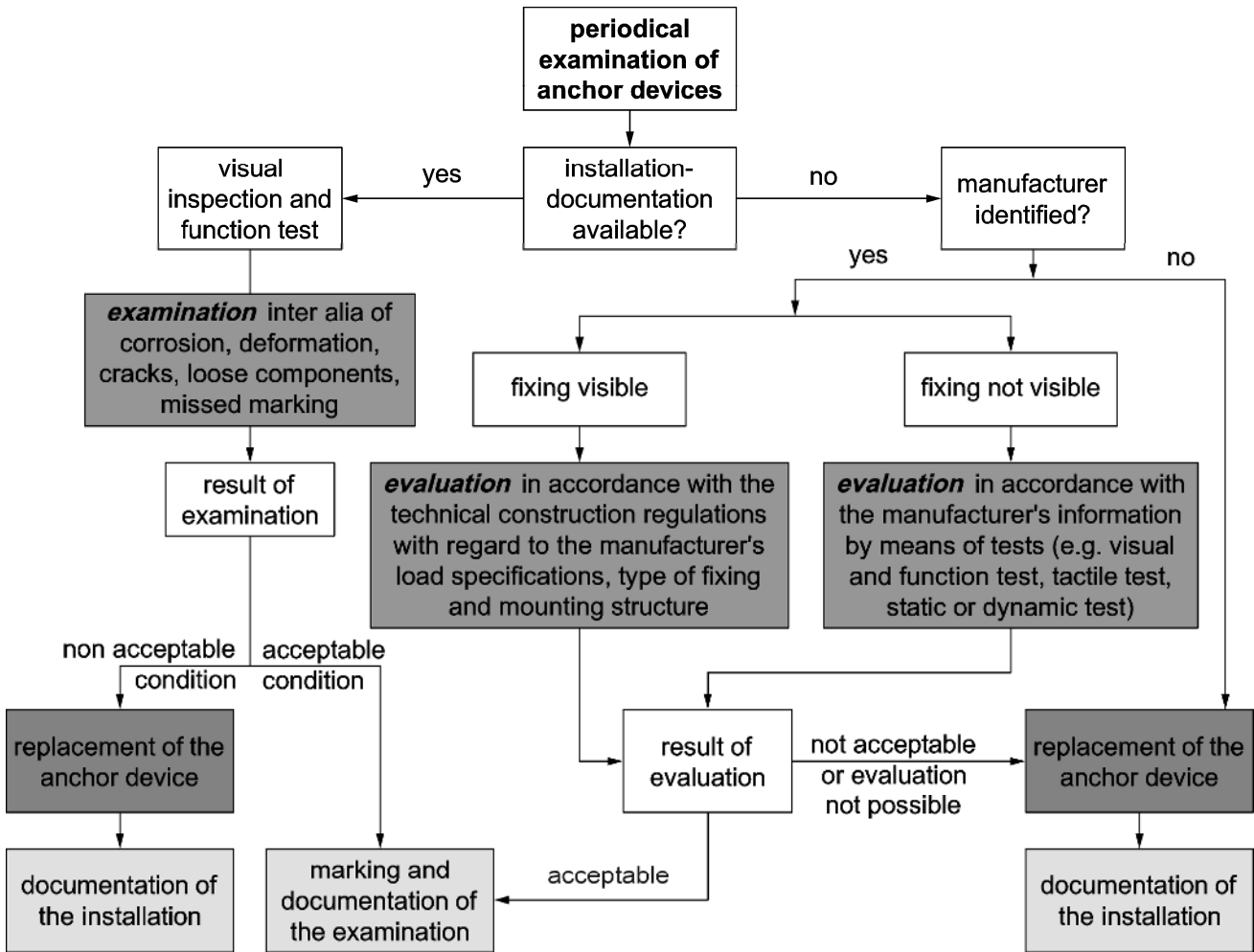


Figure A.2 — Example of periodic examination procedure

**Annex B**  
(informative)

**Significant technical changes between this European Standard and the previous edition EN 795:1996 and EN 795:1996/A1:2001**

Table B.1 — Significant technical changes

Clause/paragraph/table/figure	Change
Introduction	<p>The standard is based on the philosophy that anchor devices are rated to sustain the maximum dynamic force generated in a fall from a height by the mass of one person, including any equipment carried. The static strength test is based on a minimum factor of safety of two. To allow for foreseeable misuse of equipment, it also requires that all anchor devices be tested even if their intended use is for restraint.</p>
1 Scope	<p>The scope has been modified: This European Standard specifies requirements for performance and associated test methods for single-user anchor devices which can be removed from the structure.</p> <p>It is not applicable to:</p> <ul style="list-style-type: none"> <li>— anchor devices intended to allow more than one user to be attached at any one time;</li> <li>— anchor devices used in any sports or recreational activity;</li> <li>— equipment designed to conform to EN 516 or EN 517;</li> <li>— elements or parts of structures which were installed for use other than as anchor points or anchor devices, e.g. beams, girders;</li> <li>— structural anchors.</li> </ul>
2 Normative references	Updated.
3 Terms and definitions	<p>Terms and definitions updated giving examples of anchor devices covered by this standard and examples of anchors that are not covered by this standard.</p> <p>Classes of anchor devices e.g. class A, B, C, etc. have been replaced by types of anchor devices e.g. type A, B, C, etc. to identify more clearly the differences between the various anchor devices.</p>

Clause/paragraph/table/figure	Change
4 Requirements	Requirement were rewritten to include requirements for materials, corrosion resistance, rope/webbing, connectors and design and ergonomics. Specific requirements were also rewritten.
5 Test method	Types A, B, C and D anchor devices now tested for deformation, dynamic strength and integrity and static strength. Type E anchor devices now tested for deformation, dynamic performance, post arrest suspension and static strength. Dynamic tests now require use of a test lanyard manufactured from rope conforming to EN 892 with the 100 kg rigid test mass set to generate 9 kN at the point of arrest. Static strength tests now require that metallic anchor devices sustain a load of 12 kN. Anchor devices that contain non-metallic load-bearing parts, for which evidence of durability is not provided, shall sustain a load of 18 kN. All test methods were rewritten and restructured.
6 Marking	All anchor devices to be marked for the use of one user only.
7 Information supplied by the manufacturer	Rewritten and additional requirements added.
Annex A A.1 Information on installation to be supplied by the manufacturer A.2 Guidance on documentation to be supplied after installation A.3 Guidance on periodic examination	New. New. New.
Figures	All new figures.

## Annex ZA (informative)

### Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission to provide a means of conforming to Essential Requirements of the New Approach Directive 89/686/EEC.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

**Table ZA.1 — Correspondence between this European Standard and Directive 89/686/EEC**

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 89/686/EEC	Qualifying remarks/Notes
4.1.2 to 4.1.6	1.2.1 Absence of risks and other 'inherent' nuisance factors	
4.3	1.2.1.2 Satisfactory surface condition of all PPE parts in contact with the user	
4.2.1	1.3.2 Lightness and design strength	Clause 4.2.1 of this standard addresses only the second part ER 1.3.2 with regard to "withstanding the effects of ambient phenomena"
7	1.4 Information supplied by the manufacturer	
4.1.3 & 4.1.5	2.1 PPE incorporating adjustment systems	
7	2.8 PPE for use in very dangerous situations	
6	2.12 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety	
4.4	3.1.2.2 Prevention of falls from a height	An anchor device is a part of a fall arrest system and can meet ER 3.1.2.2 only when used in conjunction with a compatible body harness and attachment system, as specified in the manufacturer's information.

**WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.**

## Bibliography

- [1] EN 516, *Prefabricated accessories for roofing — Installations for roof access — Walkways, treads and steps*
- [2] EN 517, *Prefabricated accessories for roofing — Roof safety hooks*
- [3] EN 1496, *Personal fall protection equipment — Rescue lifting devices*



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