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Personal protective equipment for protection against falls from a height — Single-point anchor devices

Équipements individuels de protection contre les chutes libres — Dispositifs d'ancrage en un seul point

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 14567 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 4, *Personal equipment for protection against falls*.

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Personal protective equipment for protection against falls from a height — Single-point anchor devices

1 Scope

This International Standard specifies requirements, test methods, and marking, labelling and packaging, as appropriate, of both permanent and temporary single-point anchor devices exclusively for the attachment of personal protective equipment (PPE) for protection against falls from a height for fall arrest, work positioning and travel restriction (work restraint).

It is applicable only to anchor devices for PPEs that conform to ISO 10333-1, ISO 10333-2, ISO 10333-3 and ISO 10333-5.

NOTE 1 Further standards are in preparation for other types of PPE: ISO 10333-6 and ISO 14566 (see bibliography).

Anchor devices are rated to sustain a maximum (dynamic) arresting force of 6,0 kN, and a maximum (static) loading of 1,0 kN (assuming a person of 100 kg mass) in post-fall arrest suspension, work-positioning mode, or restraint mode.

Anchor devices are intended for single person use only. A rescuer should not attach to the same anchor device as a person being rescued, unless the anchor device has been specifically designed for such purposes, and the instructions for use specifically permit this application.

NOTE 2 Vertical rigid or flexible line systems and horizontal lifelines are not within the scope of this International Standard, but are covered in ISO 10333-4 and ISO 16024.

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2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1140, *Ropes — Polyamide — Specification*.

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

ISO 10333-1, *Personal fall-arrest systems — Part 1: Full-body harnesses*.

ISO 10333-2, *Personal fall-arrest systems — Part 2: Lanyards and energy absorbers*.

ISO 10333-3, *Personal fall-arrest systems — Part 3: Self-retracting lifelines*.

ISO 10333-5, *Personal fall-arrest systems — Part 5: Connectors*.

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test*.

EN 10002-2, *Metallic materials — Tensile testing — Part 2: Verification of the force measuring system of the testing machine*.

EN 45001, *General criteria for the operation of testing laboratories*.

3 Terms and definitions

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

3.1

anchor device

component or assembly of components which incorporates one PPE attachment point

See Figures 1 to 5 and 8 to 13 inclusive.

3.2

anchor system

assembly of multiple anchor devices with one or more PPE attachment points

3.3

PPE attachment point

that part of an anchor device or anchor system to which the PPE of one single user may be attached

See Figures 1 to 5 and 8 to 13 inclusive.

NOTE The PPE attachment point may be mobile and/or removable.

3.4

component

part of an anchor device or anchor system at a point of sale by the manufacturers, supplied with packaging, marking and instructions for use

EXAMPLES PPE attachment points and fixings are examples of components.

3.5

fall factor

ratio of free fall distance to the length of the connecting lanyard, including any connectors, both quantities being expressed in the same units of measurement

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free-fall distance

total vertical distance through which a worker could fall from the start of the fall to the onset of the arrest

3.7

free space

uninterrupted vertical distance measured from the anchor device to the ground level, the next lower substantive platform, or nearest significant obstacle

See Figure 6.

3.8

fixings

means by which an anchor device is secured or attached to the structure

See Figures 2 to 5 inclusive.

NOTE Not all anchor devices require such fixings (e.g. tripods, deadweight anchor devices). See Figures 12 and 13.

3.9

anchor

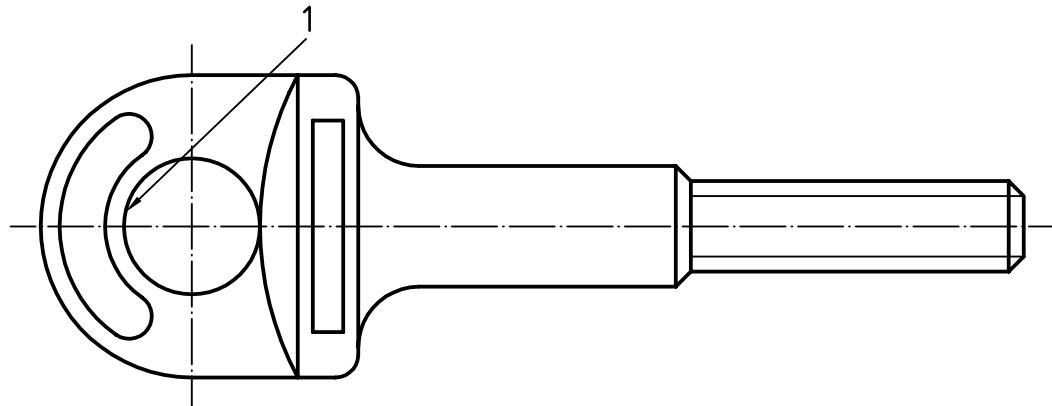
anchor device or anchor system attached to a structure, ready for the attachment of a PPE for protection against falls from a height

See Figures 2 to 5 and 8 to 13 inclusive.

**3.10
structure**

existing load-bearing structure such as the building, ground, roof

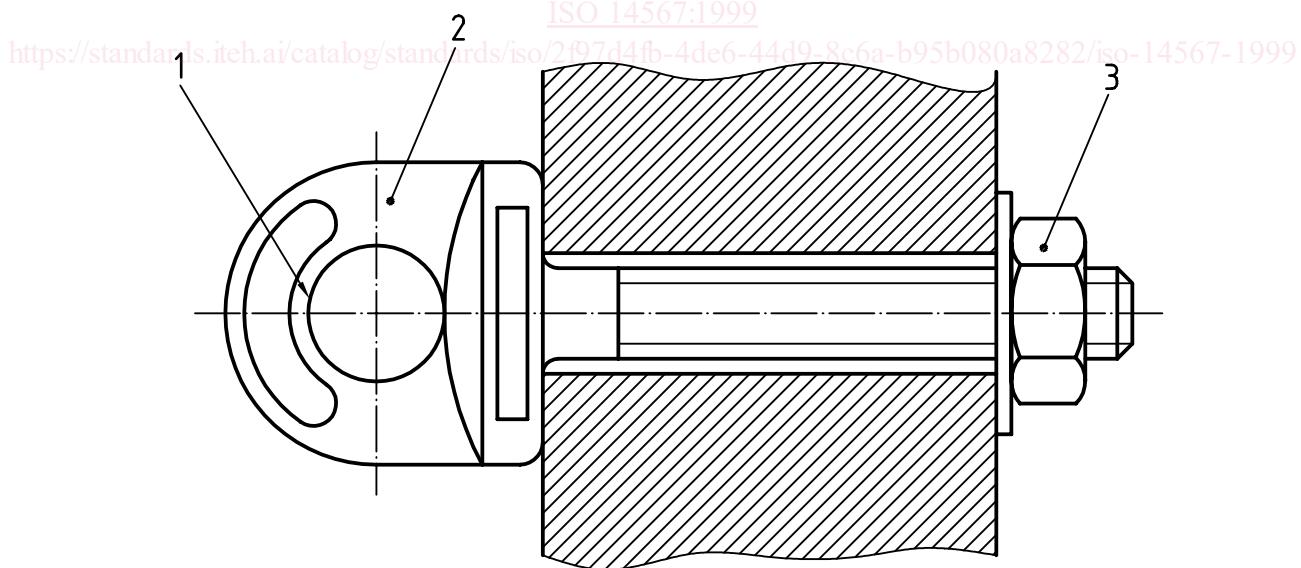
See Figures 2 to 5 inclusive.

**Key**

1 PPE attachment point

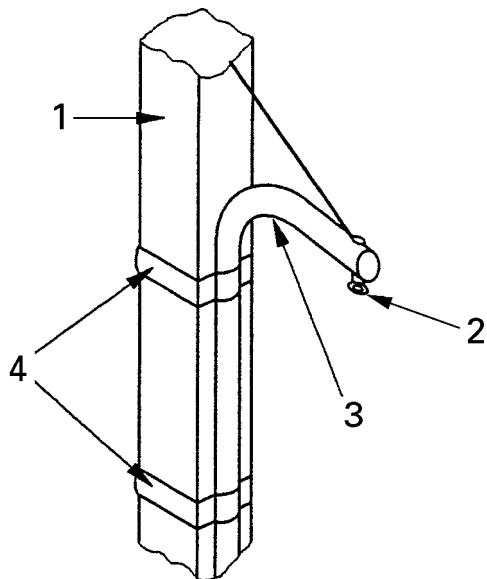
Figure 1 — Example of an anchor device (Eyebolt)

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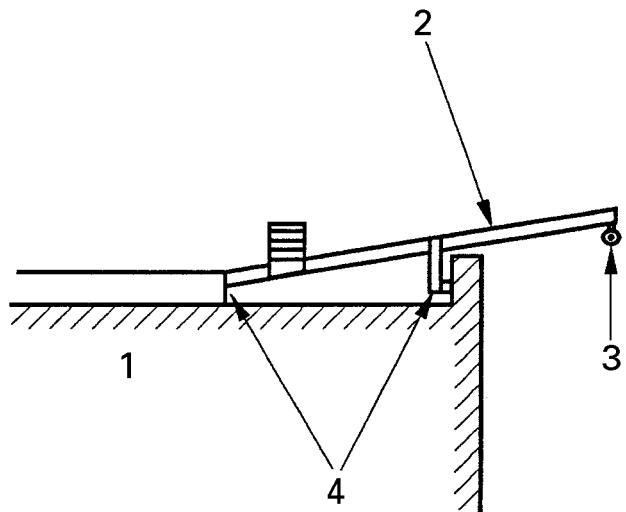
**Key**

1 PPE attachment point
2 Anchor device
3 Fixing

Figure 2 — Example of a PPE anchor (Eyebolt and nut)

**Key**

- 1 Structure
- 2 PPE attachment point
- 3 Anchor device
- 4 Fixings

**Key**

- 1 Structure
- 2 Anchor device
- 3 PPE attachment point
- 4 Fixings

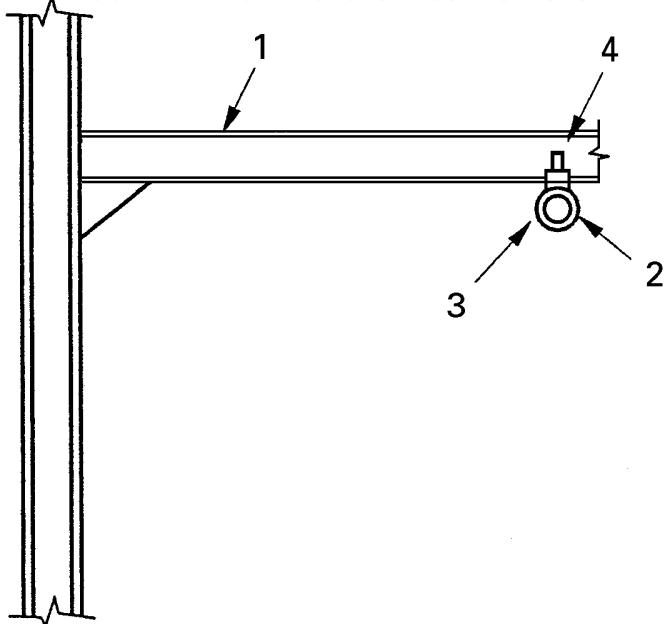
**Figure 3 — Example of a PPE anchor
(Column, davit and brackets)**

**Figure 4 — Example of a PPE anchor
(Deadweight cantilever or outrigger)**

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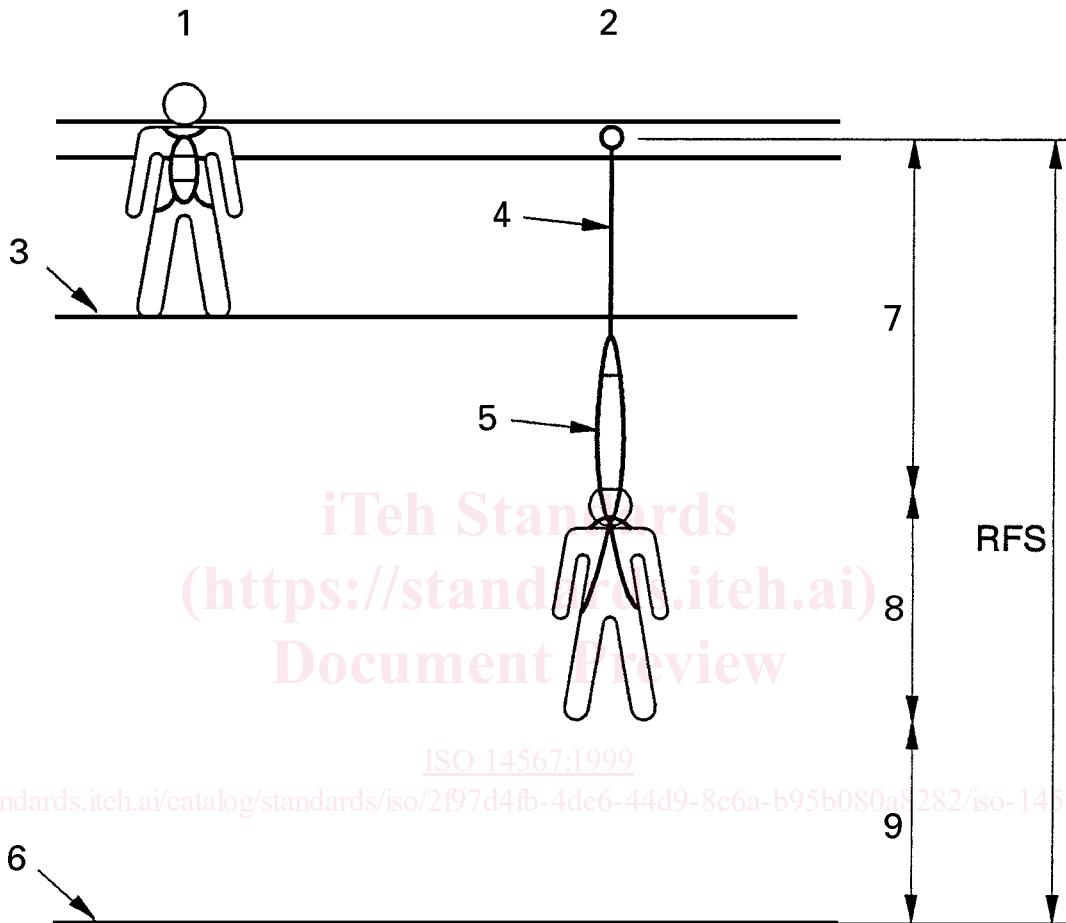
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**Key**

- 1 Structure
- 2 PPE attachment point
- 3 Anchor device
- 4 Fixings

Figure 5 — Example of a PPE anchor (Beam and eyebolt)

**Key**

1	Position A (at the onset of the fall)	6	Ground level/nearest significant obstacle
2	Position B (post-fall suspension)	7	Lanyard length + energy absorber extension
3	Walkway	8	Harness stretch + distance between attachment point and feet
4	Lanyard	9	Safety clearance
5	Energy absorber (extended)		

PPE attachment point shall be at a height greater than or equal to the RFS.

Figure 6 — Example of required free space (RFS) below position of PPE anchor

4 Classes of anchor device and anchor system

4.1 Class A

4.1.1 Class A1

Class A1 comprises anchor devices designed to be secured to vertical, horizontal and inclined surfaces, such as walls, columns and lintels. See Figure 8.

4.1.2 Class A2

Class A2 comprises anchor devices designed to be secured to inclined roofs. See Figure 11.

4.2 Class B

Class B comprises transportable temporary anchor devices. See Figure 12.

NOTE There are no classes 'C' or 'D' in this International Standard. These will be covered in ISO 16024.

4.3 Class E

Class E comprises deadweight anchor devices for use on horizontal surfaces. For the purposes of this International Standard, a horizontal surface is one which does not deviate from the horizontal by more than 5°. See Figure 13.

5 Requirements

5.1 General design requirements

5.1.1 The anchor device shall be designed to withstand a force of at least 12 kN (2 697 lb·f) in all directions in which a force could be applied during a fall arrest.

5.1.2 The PPE attachment point shall be so designed as to accept the personal protective equipment and ensure that it is not possible for correctly connected personal protective equipment to become detached unintentionally.

Particular attention shall be given to the profile of PPE attachment points, to ensure that they are compatible with those types of connector with which they are to be used.

- a) The connector should be capable of free and easy engagement with the anchor point without the need for the application of force.
- b) Where connectors are of the karabiner or hook variety (i.e. they possess a spring-loaded gate mechanism, with an automatic or manual locking facility), there should be sufficient clearance to allow the gate mechanism to fully close and lock after the connection between the anchor point and safety lanyard has been made.

The closure of the gate mechanism and lock should be physically checked after the connection is made to avoid subsequent and unintentional disengagement between the connector and anchor point.

- c) When the connection is fully made with a karabiner or hook-type connector, the connector should be manipulated within the anchor point to ensure that the connector's intended bearing surface bears upon the anchor point's intended bearing surface. The gate mechanism of the karabiner or hook should not bear upon the anchor point. (See Figure 7.)
- d) When the connection is fully made, the connector should be capable of freely aligning in the directions that the safety lanyard could be pulled in as a result of a fall arrest occurrence, to avoid weakening the connector in bending.
- e) Connectors utilising a lanyard retention eye or lanyard retention pin are to be preferred in making connections between anchor points and safety lanyards, to minimize the possibility of roll-out, (mechanical and/or

incompatible component disengagement between the anchor point, connector and safety lanyard), which is capable of occurring during a fall arrest.

- f) Safety lanyards should not be passed through an anchor point and then connected back on themselves (i.e. forming a loop around the anchor point), to avoid weakening the lanyard and the connector in bending, unless the connector and safety lanyard is designed specifically to be attached in such a manner.
- g) Knots should never be used to connect safety lanyards to anchor points;
- h) Only PPEs that conform to ISO 10333-1, ISO 10333-2, ISO 10333-3 and ISO 10333-5 shall be attached.

5.1.3 Where an anchor device comprises more than one component, the design shall be such that those components cannot appear to be correctly assembled without being positively locked together.

5.1.4 Exposed edges or corners shall be relieved either with a radius or chamfer.

5.1.5 All metallic parts of anchor devices shall be capable of satisfying the corrosion test specified in 6.3.3.

5.1.6 Where relevant, anchor devices shall be so designed that, when installed, there are adequate bearing surfaces to minimize bending that would have a detrimental effect on the ability to safely arrest a falling body unless the anchor device is designed specifically to deform at bending (e.g. class A1 anchors; see Figures 2 and 8).

5.1.7 Stress-raising features shall be avoided by:

- a) the provision of a suitable radius between the collar and shank of an eyebolt;
- b) ensuring that the run-out of male threads which are intended to be loaded in shear or bending is a sufficient distance from the bearing surface to ensure that the shear load is borne by the unthreaded portion of the shank.

5.1.8 Where anchor devices, components or elements utilize male and female threads, there shall be adequate engagement between male and female thread. See Figures 2 and 9.

5.1.9 Through-type anchor devices shall utilize a backplate of sufficient surface area and thickness to ensure that the load is adequately distributed. See Figure 9.

5.1.10 Where anchor devices or components are to be installed using chemically bonded fixings, consideration shall be given to the future needs for inspection (e.g. for corrosion). It is recommended that female sockets should be bonded to the structure, so that male anchor devices, components or elements may be locked into them. See Figure 10.

Where anchor devices are cast-in or bonded directly to the substrate material (e.g. concrete), the anchor device shall be made of a suitable material, and the manufacturer should quote life expectancy

5.1.11 The PPE anchor shall be so designed, taking account of anticipated positions of installation and/or use, such that the distance available on site is sufficient to safely arrest the fall [see 9.1.9 d)].

5.1.12 No anchor device or component shall be used that, without the manufacturer's approval, has been adapted or modified from the condition in which it was supplied by the manufacturer.