
**Personal protective equipment for
protection against falls from a height —
Flexible horizontal lifeline systems**

*Équipement de protection individuelle contre les chutes de hauteur —
Systèmes de ligne de vie horizontale flexible*

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Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	1
4 Design requirements	5
4.1 General.....	5
4.2 Flexible horizontal lifelines.....	6
4.3 Anchor connectors	6
4.4 Mobile attachment devices	7
4.5 Lifeline energy absorber	7
5 Performance requirements	7
5.1 Acceptance criteria.....	7
5.2 Dynamic performance	8
5.3 Static residual strength	8
5.4 Lifeline fittings static strength	8
5.5 Intermediate anchor connector strength.....	8
5.6 Corrosion resistance	8
6 Testing	8
6.1 Test equipment	8
6.2 Verification tests	9
6.3 In-line fitting static strength	11
6.4 Intermediate anchor connector strength.....	11
6.5 Corrosion	11
7 Labelling and instructions	11
7.1 User's instructions	11
7.2 Marking	12
Annex A (informative) Sample test procedure	13
Bibliography	14

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 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 16024 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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Introduction

In cases of work where the hazard of falling from a height exists and where, for technical reasons or for work of a short duration, safe access cannot be provided, it is necessary to consider the use of personal fall protection systems. Such use should never be improvised and its adoption should be specifically provided for in the appropriate formal provisions for safety in the work place.

Flexible horizontal lifeline systems conforming to this International Standard satisfy ergonomic requirements and are only be used if the work allows means of connection to suitable anchor devices of demonstrated strength and can be implemented without compromising the safety of the user. Personnel are to be trained and instructed in the safe use of the equipment and be observant of such training and instructions. The end-user organization is to have a rescue plan and the means at hand to implement it.

This International Standard has been prepared in response to user and industry requirements for an International Standard to cover flexible horizontal lifeline systems. It is based on current knowledge and practice concerning the use of personal fall protection systems and equipment specified in the ISO 10333 series of International Standards and other ISO personal fall protection standards. While this International Standard covers flexible horizontal lifeline systems from anchor connector to anchor connector, it does not cover the anchor or anchors themselves.

This International Standard presumes that the manufacturer of the personal fall protection system, subsystem or components used in a flexible horizontal lifeline system operates a quality management system which conforms to national and regional regulations in force at the time. Guidance on the form that this quality management system may take can be found in ISO 9000.

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Personal protective equipment for protection against falls from a height — Flexible horizontal lifeline systems

1 Scope

This International Standard specifies design and performance requirements, test methods, user instructions, marking and labelling as appropriate, of flexible horizontal lifeline systems for use at any one time by up to three persons, exclusively for the attachment of personal protective equipment for protection against falls from a height. It does not stipulate designs for flexible horizontal lifelines, except for design limitations that are necessary for safe and durable service.

This International Standard does not cover rigid rail systems, nor is it intended to cover flexible guardrails, hand lines and work-positioning anchor lines.

2 Normative references

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

ISO 9227, *Corrosion test in artificial atmospheres — Salt spray tests*
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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 10333-4, *Personal fall-arrest systems — Part 4: Vertical rails and vertical lifelines incorporating a sliding-type fall arrester*

ISO 10333-5, *Personal fall-arrest systems — Part 5: Connectors with self-closing and self-locking gates*

ISO 10333-6, *Personal fall-arrest systems — Part 6: Systems performance tests*

3 Terms and definitions

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

3.1

component

integral assembly of interconnected elements (parts) intended to perform one or more functions in the system

NOTE A mobile attachment device is an example of a component.

3.2
configuration

defined layout of a flexible horizontal lifeline system in terms of numbers, arrangements and lengths of spans together with defined requirements for flexible horizontal lifeline materials and strength of end anchors and intermediate anchors

3.4
element

integral part of a constituent, component, hybrid component, subsystem or system, which is generally not sold separately to users (e.g. webbing)

3.5
end anchor

structural member located at each end of the flexible horizontal lifeline

See Figure 1.

NOTE End anchors are outside the scope of this International Standard.

3.6
end anchor connector

component with means specifically for coupling the flexible horizontal lifeline to an end anchor

See Figure 1.

3.7
fall arrest system

assembly of components joined together so that, when connected to a suitable anchor point with sufficient clearance from the ground or other obstacles, it operates as a complete arrangement of equipment able to fulfil its function in use of arresting a fall

3.8
flexible horizontal lifeline system

flexible lifeline supported by two or more anchors such that the slope of a straight line joining any two adjacent anchors does not deviate from the horizontal by more than 15°

3.9
flexible lifeline

line comprising wire rope, fibre rope or webbing

3.10
free fall distance

vertical displacement of the harness fall arrest attachment point between the onset of the fall and at the point just before the system begins to react by applying force to arrest the fall

See Figure 2.

NOTE This distance excludes deceleration distance, but includes any fall arrester activation distance before fall arrest forces occur.

3.11
in-line fittings

fittings incorporated in the line between the flexible horizontal lifeline terminations and anchor connectors

3.12
intermediate anchor

structural member supporting a flexible horizontal lifeline at location(s) other than at its ends

See Figure 1.

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3.13**intermediate anchor connector**

component with means specifically for coupling the flexible horizontal lifeline to an intermediate anchor

NOTE An intermediate anchor connector guides and supports the flexible horizontal lifeline and does not restrict the longitudinal movement of the line.

3.14**lifeline energy absorber**

device connected to a flexible horizontal lifeline to dissipate energy and reduce the forces in the line resulting from a fall arrest

3.15**lifeline termination**

fixture at the end of a flexible horizontal lifeline that allows connection to the end anchor or anchor connector

EXAMPLE Splice, ferrule, or swage.

3.16**maximum arrest force**

peak force and measured at the full body harness attachment point during a dynamic test

3.17**maximum arrest load**

peak force and measured at the end anchor of a flexible horizontal lifeline during a dynamic test

3.18**minimum clearance**

minimum distance from the anchor point required to ensure that a user would not strike the ground or obstacle in the event of a fall

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See Figure 2.

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NOTE This would include total fall distance, the height of the worker and a safety margin.

3.19**mobile attachment device**

device, either designed and built or adapted for the purpose, for the connection of personal fall arrest equipment to a flexible horizontal lifeline, and which can slide along the lifeline

NOTE Mobile attachment devices are not generally interchangeable between systems from different manufacturers, or between different models of system from the same manufacturer.

3.20**multi-span flexible horizontal lifeline system**

flexible horizontal lifeline system that is supported at points along its length by intermediate anchors and intermediate anchor connectors

See Figure 1.

3.21**single span flexible horizontal lifeline system**

flexible horizontal lifeline system without intermediate anchors

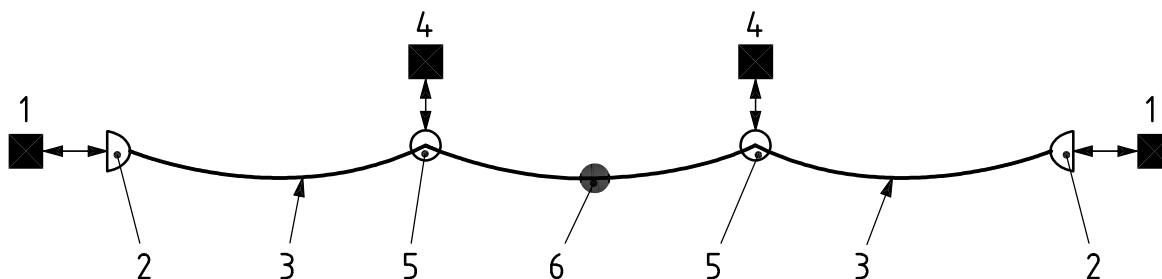
NOTE The system is only supported by the two end anchors.

3.22

total fall distance

maximum vertical distance between the person's fall arrest attachment to the flexible horizontal lifeline at the onset of a free fall and after the fall is arrested, including dynamic deflection of the flexible horizontal lifeline, free fall distance and component/s extension, e.g. energy absorber/harness stretch

See Figure 2.



Key

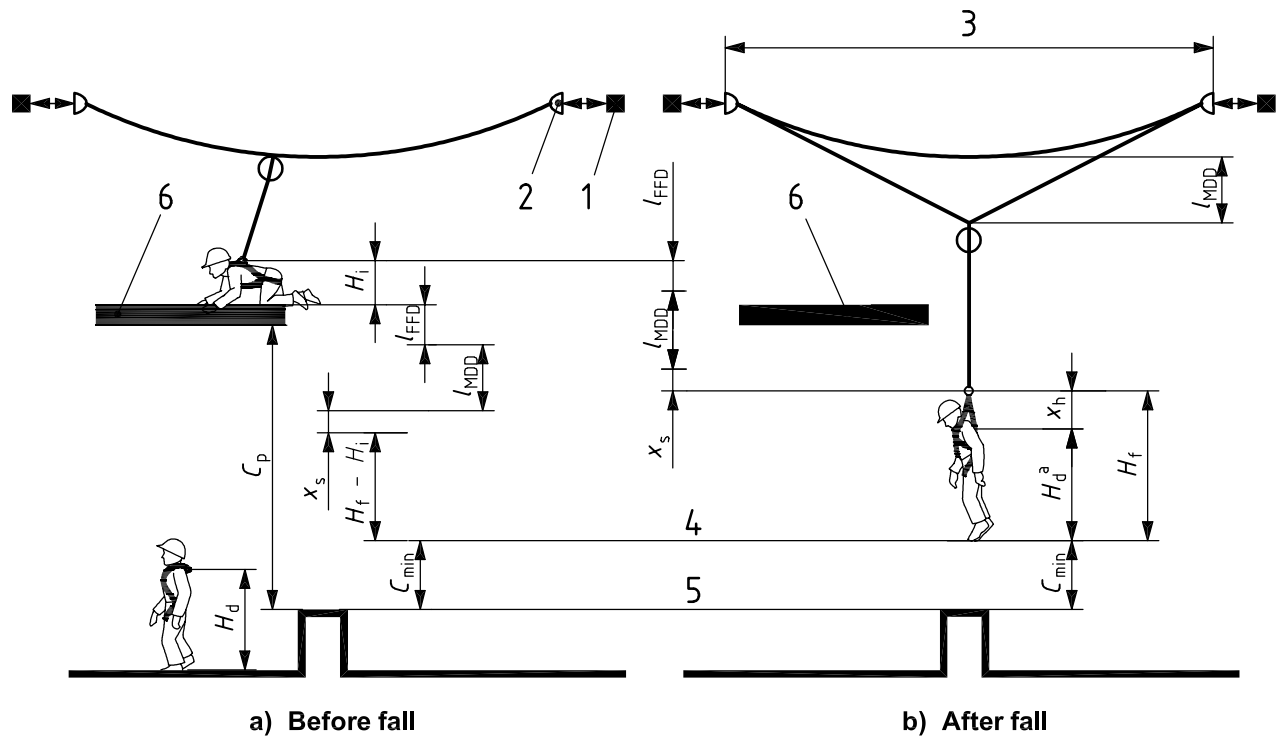
- 1 end anchor
- 2 end anchor connector
- 3 horizontal lifeline
- 4 intermediate anchor
- 5 intermediate anchor connector
- 6 mobile attachment device

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Figure 1 — Horizontal lifeline components



Key

- 1 end anchor
 - 2 end anchor connection
 - 3 total span
 - 4 lowest point of fall
 - 5 highest obstacle
 - 6 platform
- C_p required minimum clearance below the platform
- C_{min} minimum post-fall clearance of at least 1 m
- l_{FFD} free-fall distance
- H_d height of D-ring above the platform when the worker is standing
- H_f height of D-ring above the worker's toes at fall arrest
- H_i height of D-ring above the worker's toes at start of fall ($H_i = H_d$ when the worker is standing)
- l_{MDD} maximum deflection distance
- x_h harness stretch
- x_s extension of energy absorber (and/or lanyard stretch)
- a The value of $H_d = 1,5$ m may be assumed for a user 1,8 m tall.

Figure 2 — Fall and safety distances from platform

4 Design requirements

4.1 General

4.1.1 This International Standard sets criteria for the acceptance of flexible horizontal lifeline systems, whose design, layout and performance is traceable to test results and has been verified by tests over the intended range of installed configurations. If performance calculations are used, those calculations shall be backed up with test data from a similar configuration. All performance of systems shall be verified by traceable test documentation.