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Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
3.1 Terms relevant to application	2
3.2 Terms relevant to components	2
3.3 Terms relevant to personal fall-arrest systems	5
3.4 Terms relevant to performance of personal fall-arrest systems	8
4 Classification and usage conditions of personal fall-arrest systems	9
4.1 Classification	9
4.2 Usage conditions of personal fall-arrest systems	14
5 Structures, shapes and dimensions	15
5.1 General matters of structure	15
5.2 Structure of each class	15
5.3 Structure of each part	17
5.4 Structures and dimensions of lanyard, auxiliary rope and work positioning rope	20
5.5 Connection method of each part	21
6 Performances	23
6.1 Strength of personal fall-arrest systems	23
6.2 Strength of work-positioning systems	24
6.3 Strength of ring	25
6.4 Impact-resisting property and relevant performance	25
6.5 Shake-resistance of fastening buckle	28
7 Materials	28
8 Tests	28
8.1 Tensile test and yield strength test of components	28
8.2 Tensile test of connecting part	31
8.3 Tests of impact-resisting property and relevant performances	35
8.4 Shake-resistance test of fastening buckle	49
9 Inspections	49
9.1 Inspections of structures, shapes and dimensions	49
9.2 Performance inspection	49
10 Marking	49
10.1 Marking on products	49

10.2 Marking on components 49

11 Operation manual 51

12 Packaging 51

Annex JA (informative) Comparison table between JIS and corresponding
International Standards 52

Foreword

This Japanese Industrial Standard has been revised by the Minister of Health, Labour and Welfare and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Safety Appliances Association (JSAA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS T 8165:2012** is replaced with this Standard.

However, **JIS T 8165:2012** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until December 24, 2019.

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Personal fall-arrest systems

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 10333-1:2000**, Edition 1 and Amendment 1:2002, **ISO 10333-2:2000**, Edition 1, **ISO 10333-5:2001**, Edition 1 and **ISO 10333-6:2004**, Edition 1 with some modifications of the technical contents to meet the circumstances in Japan. The amendment to the said Standard has been compiled in this Standard.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard specifies the requirements for the personal fall-arrest systems and relevant accessories for business use to prevent the workers from an accidental fall, working at high places of construction sites, civil engineering work sites, mines and quarries, poles or steel towers for telecommunication cable work, manufacturing sites, manufacturing facilities, buildings, constructions, and the like.

NOTE The International Standards corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 10333-1:2000 *Personal fall-arrest systems—Part 1: Full-body harnesses and Amendment 1:2002*

ISO 10333-2:2000 *Personal fall-arrest systems—Part 2: Lanyards and energy absorbers*

ISO 10333-5:2001 *Personal fall-arrest systems—Part 5: Connectors with self-closing and self-locking gates*

ISO 10333-6:2004 *Personal fall-arrest systems—Part 6: System performance tests* (overall evaluation: MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 8812 *Link chain for chain hoists*

JIS G 3535 *Wire ropes for aircraft control*

3 Terms and definitions

3.1 Terms relevant to application

3.1.1

personal fall-arrest systems

systems designed to arrest a fall of worker from height in order to avoid the collision with ground, and to hold the fallen person in a suitable post-fall attitude

NOTE The personal fall-arrest systems have the full-body harness type and the body-strap type.

3.1.2

work-positioning systems

systems for holding the work position of the body of worker by the tension of rope, etc. under U-shape suspension condition

The work-positioning systems are not intended for the fall-arrest.

3.2 Terms relevant to components

3.2.1 Components of full-body harness type of personal fall-arrest systems

3.2.1.1

full-body harness

consists of a shoulder strap, thigh strap, fastening buckle, etc. to support the load exerted on the body of person during the fall-arrest at several positions such as shoulders, waist and thighs

3.2.1.2

primary strap

strap of full-body harness, such as a shoulder strap and thigh strap, which mainly receives the force in the vertical direction during the fall-arrest

Depending on the structure, the chest strap is included.

3.2.1.3

secondary strap

strap of full-body harness, which does not mainly receive the force during the fall-arrest

3.2.1.4

shoulder strap

strap of full-body harness to support the both shoulders of the body of worker during the fall-arrest

3.2.1.5

thigh strap

strap of full-body harness to support the thigh parts of the body of worker during the fall-arrest

3.2.1.6

fastening buckle

two-part system to facilitate the wearing and removing of strap, and to adjust the length

3.2.1.7

ring

system to connect a strap with a lanyard, etc.

3.2.1.8

snap hook

hook-shaped system, which is a component of lanyard etc., designed to connect a lanyard, etc. with a rigid anchor structure or a ring connected to a strap

3.2.1.9

dedicated karabiner

ring-shaped system intended for the fall-arrest systems only, which is a component of lanyard, etc., designed to connect a lanyard, etc. with a rigid anchor structure or a ring connected to a strap

3.2.1.10

connector

generic term of snap hooks and dedicated karabiners

3.2.1.11

lanyard

consists of a rope or strap, connector, energy absorber, winder, etc., designed to connect a full-body harness, etc. with the rigid anchor structure

NOTE In **ISO 10333** series, energy absorbers and a connectors are separately specified in respective standards, and lanyard is specified without including them, however, this Standard covers both the energy absorbers and the connectors. In this Standard, a lanyard refers to that incorporated with an energy absorber and a connector. Also, the term “lanyard” in this Standard refers to that intended for the fall-arrest only.

3.2.1.12

rope or strap

component of lanyard, etc., consisting of a fibre rope, a wire rope, textiles, a chain, etc.

3.2.1.13

energy absorber

component of lanyard or full-body harness, which reduces the impact generated during the fall-arrest

3.2.1.14

cushion ring

metal ring, etc. having the function to reduce the impact load during a fall

3.2.1.15

winder

component of lanyard, designed to wind up a rope or strap of lanyard

The winder equipped with a lock function, which instantly stops the feeding from a lanyard during the fall-arrest, is called a winder with locking device. The winder not equipped with a lock function is called a winder without locking device.

The winder with locking device includes the components such as a cushion ring. This lock function is not the function to stop the winding force at an arbitrary position, but the function to stop it instantly.

3.2.1.16

waist strap

strap to be fitted around the body of worker, designed to be connected with the full-body harness for prevention of its looseness

This strap is not intended for the fall-arrest.

3.2.2 Components of body-strap type of personal fall-arrest systems

3.2.2.1 Components common to full-body harness type

Shall satisfy 3.2.1.

3.2.2.2

body strap

belt-like strap to be fitted on the body of worker, intended for the fall-arrest or the hold of a work posture at the waist

3.2.2.3

auxiliary strap

belt-like auxiliary strap to be attached to the body strap, having the reinforcement to avoid twist or a crease of body strap, used to protect a worker from the impact force during the fall-arrest or to support the force necessary to hold the weight of worker via the wider area of the body

3.2.2.4

auxiliary rope

short rope, strap, etc. used before the re-hook of a main lanyard to the next rigid anchor structure to keep the condition in which a worker is always connected with a structure during the movement

3.2.3 Components of work positioning systems

3.2.3.1 Components common to body-strap type

Shall satisfy 3.2.2.

3.2.3.2

backside strap

belt-like strap attached to support buttocks

Both sides are equipped with rings.

3.2.3.3

angular ring

system to connect a body strap with an expansion regulator

3.2.3.4

work positioning rope

rope, etc. wound around a rigid anchor structure, used to hold the work position of the body of worker by the tension of rope, etc. under the U-shape suspension condition using an expansion regulator

When used as an auxiliary rope, the length shall be adjusted by the expansion regulator to the minimum necessary length.

3.2.3.5

expansion regulator

component of work positioning rope to be attached to the rope, for the length adjustment of rope

3.2.3.6

8-shaped ring

8-shaped component of work positioning rope, to connect the connector with the rope, etc. when a work positioning rope is wound around a rigid anchor structure

3.3 Terms relevant to personal fall-arrest systems

3.3.1

free-fall distance

vertical distance of the height of the part connecting a full-body harness or a body strap to a lanyard minus the height of rigid anchor structure, etc. for connector plus the length of lanyard, when a worker wears a full-body harness or a body strap (see Figure 1 and Figure 2)

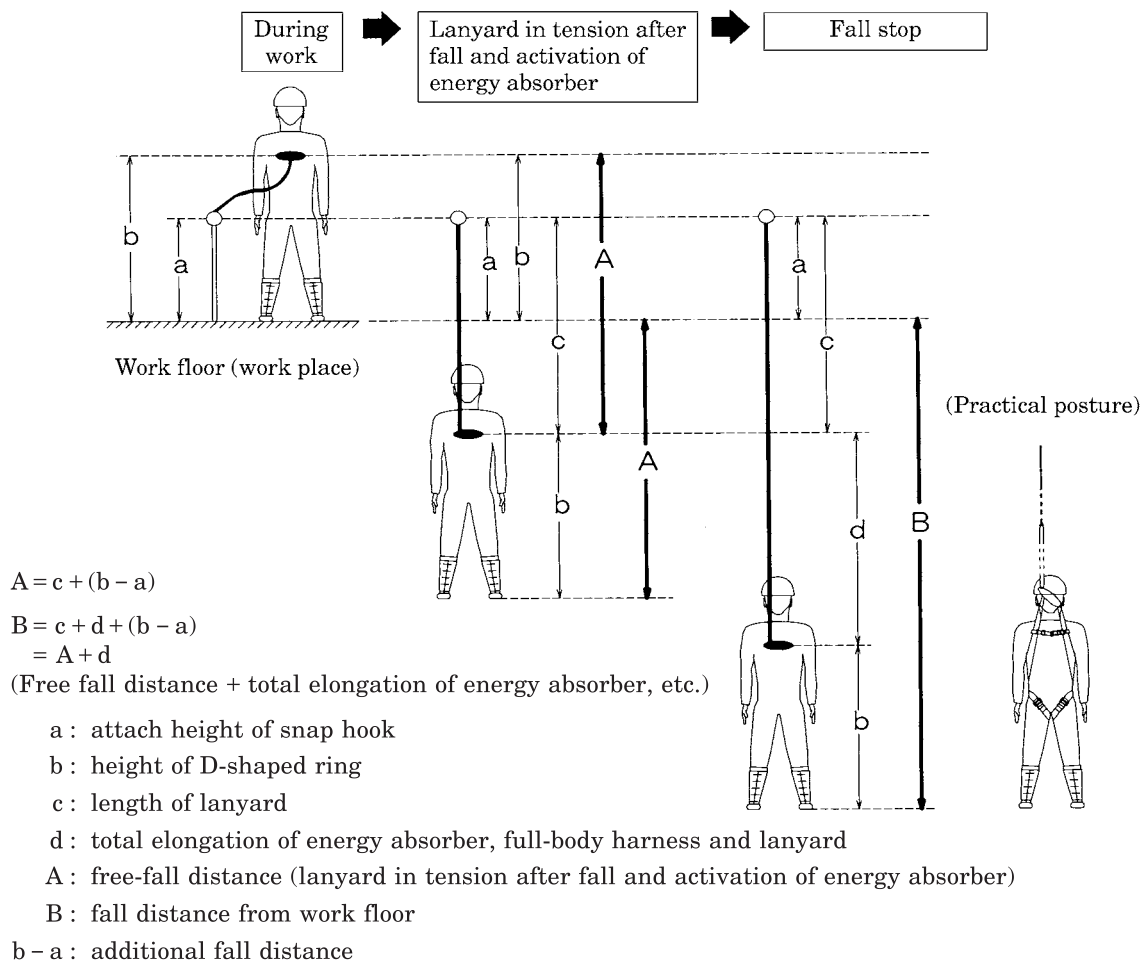


Figure 1 Overview of free-fall distance etc. of full-body harness type

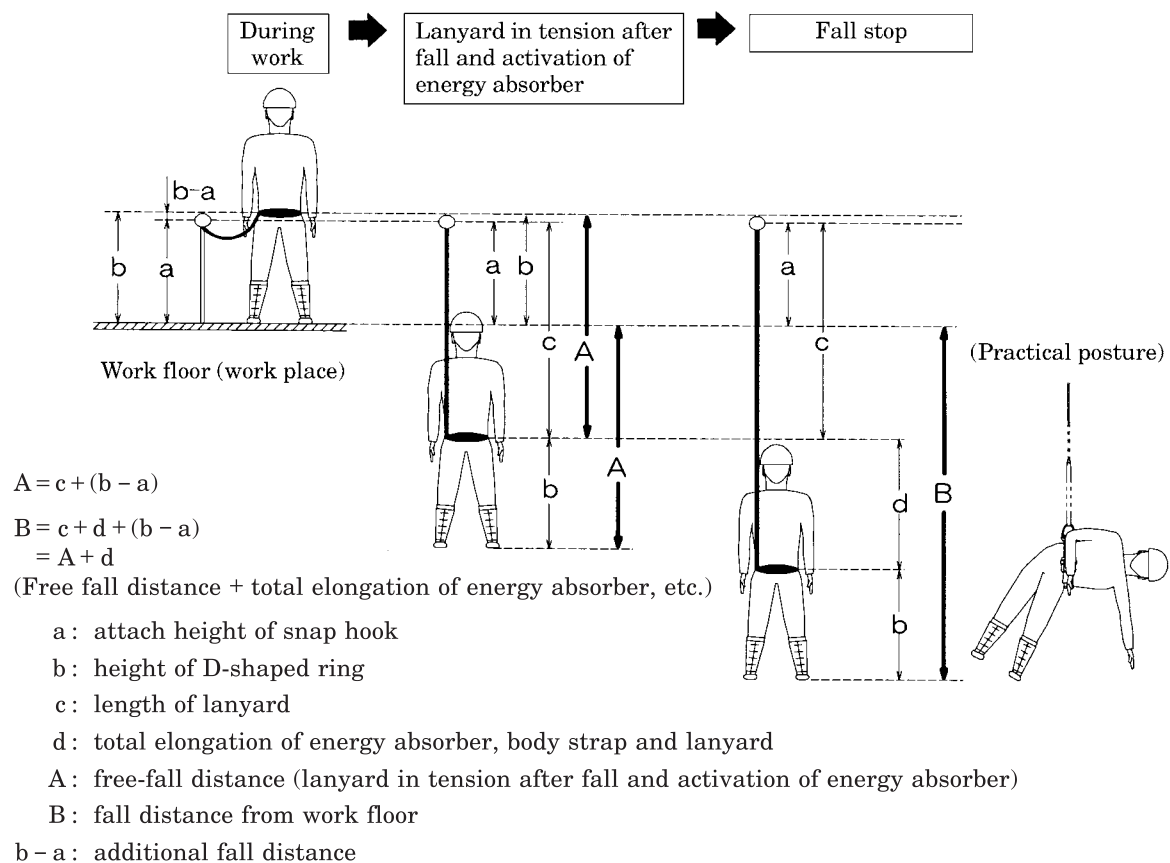


Figure 2 Overview of free-fall distance of body-strap type

The length of lanyard pulled-out in the case of the winding-type lanyard with locking device shall be half the full length (maximum pull-out length).

3.3.2

fall distance

distance obtained by adding the free-fall distance to the elongation of lanyard during the fall-arrest of a worker, the elongation of a full-body harness or a body strap, and the like

The difference in height between the rigid anchor structure to which a connector is hung and the ring to which a lanyard is connected is called the additional fall distance.

3.3.3

rigid anchor structure

structure, etc. to which a personal fall-arrest systems, etc. are attached to arrest a fall or to hold the body of worker to the work position

3.3.4

fall arrest

system designed to arrest a fall from a high place, to minimize the impact of fall-arrest forces, to control the total fall distance in order to avoid collision with the ground or other obstacle, and to hold the fallen person in a suitable post-fall posture, by hooking the connector at the tip of lanyard to a structure, etc.

3.3.5

work positioning

hold of the work posture of body of worker by the tension of rope etc. by applying the weight to a strap, for the purpose of stable hold of the work posture in such a way that a connector is hooked on a ring after a rope of which one end is connected to an angular ring via an expansion regulator is wound around a structure, etc.

3.3.6

full length of lanyard, auxiliary rope and work positioning rope

maximum length of lanyard, etc. including the mounting part of connector, measured when it is placed linearly on a horizontal floor (see Figure 10 to Figure 13)

If it is an expandable type, the fully expanded length shall be measured.

3.4 Terms relevant to performance of personal fall-arrest systems

3.4.1

torso test mass

human-trunk-shaped weight used in a drop test and tensile test of full-body harness

3.4.2

sandbag

weight of bag filled with sand to be dropped in a drop test with a body strap fitted, which may be used instead of a torso test mass

3.4.3

test mass

weight made of iron, dropped in a drop test

3.4.4

test lanyard

wire rope or link chain connected to a torso test mass or a test mass in a drop test

3.4.5

test connector

snap hook, etc. by which the rigid anchor structure, torso test mass or test mass and the test lanyard are connected in a drop test

3.4.6

permanent extension

difference in the lengths of an energy absorber before and after the drop test

4 Classification and usage conditions of personal fall-arrest systems

4.1 Classification

4.1.1 Class of energy absorber

An energy absorber of Class 1 refers to that which can arrest the fall by the free-fall distance 1.8 m with the impact load 4.0 kN or under. An energy absorber of Class 2 refers to that which can arrest the fall by the free-fall distance 4.0 m with the impact load 6.0 kN or under.

NOTE The mean value, not smaller than a fixed value, shall be used for the impact load of energy absorber.

4.1.2 Type of lanyard

A lanyard of Type 1 refers to that equipped with an energy absorber of Class 1, and Type 2 with an energy absorber of Class 2.

4.1.3 Type of winding-type lanyard

The winding-type lanyard with locking device and the winding-type lanyard without locking device are available.

NOTE The winding-type lanyard without locking device corresponds to the rope- or strap-type lanyard, because it does not have a lock function.

4.1.4 Types of personal fall-arrest systems and relevant accessories

Shall be in accordance with Table 1 and Table 2.

NOTE Examples of types of personal fall-arrest systems, etc. are shown in Figure 3 to Figure 9.

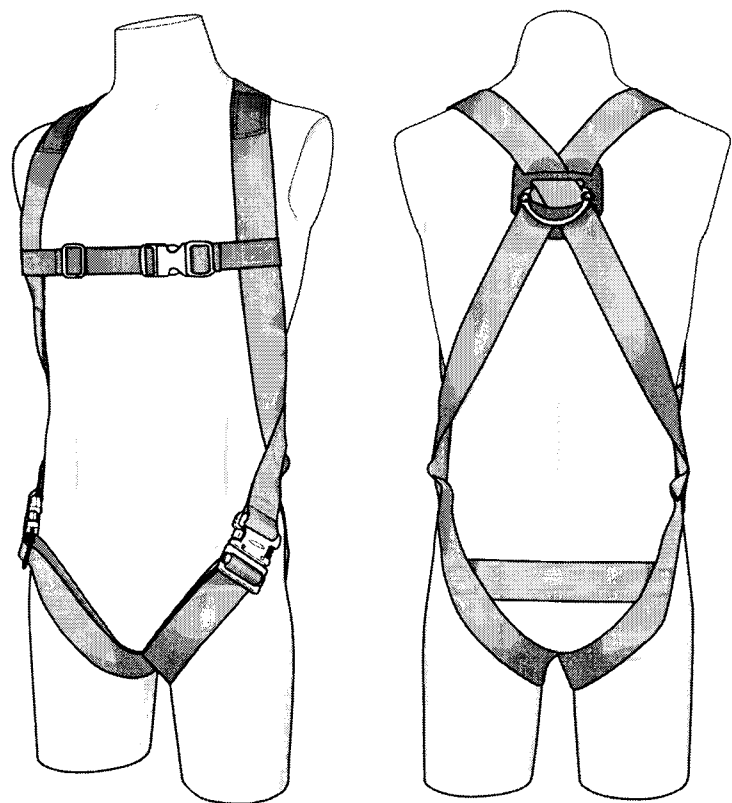
Table 1 Types of personal fall-arrest systems

Class	Classification according to application	Type		Remarks
Class A	Personal fall-arrest systems	Full-body harness type	Type 1	Lanyards of Type 1 or Type 2 are available according to the performance of energy absorber.
			Type 2	
Class B		Body-strap type		Mainly used in the case where the full-body harness type is insufficient to avoid the collision of worker with the ground.

Table 2 Types of relevant accessories

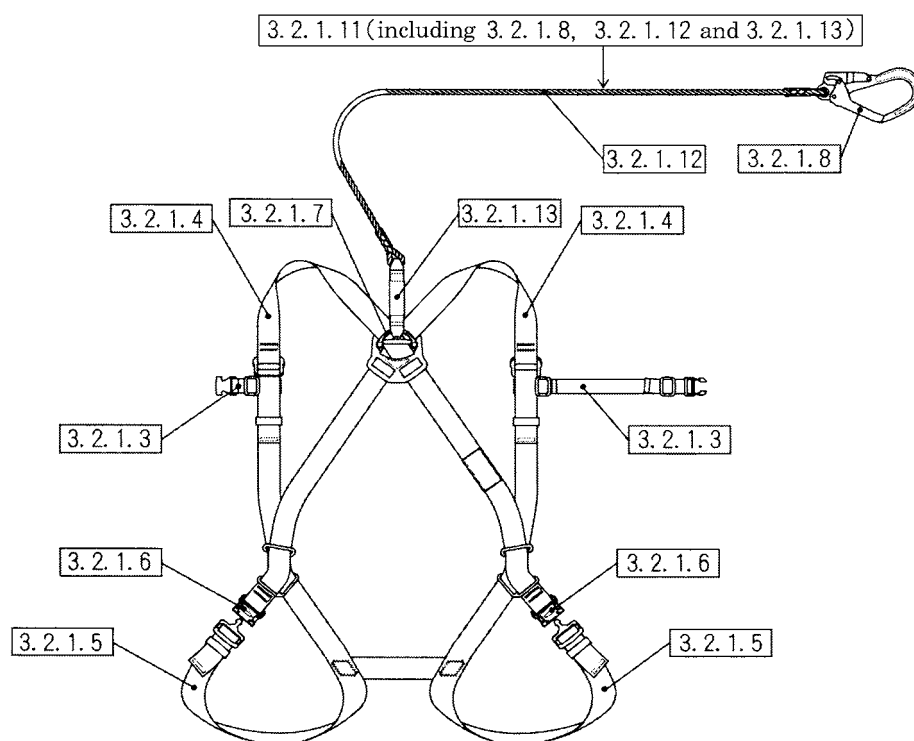
Class	Classification according to application	Type	Remarks
—	Relevant accessories	Work-positioning systems	Work-positioning rope, etc. are available.
—		Auxiliary rope	Short rope or strap used during movement of worker.

All the lanyards connected to a full-body harness are equipped with an energy absorber function; therefore, an auxiliary rope refers to that connected only to a body strap. A lanyard refers to a rope or a strap for fall-arrest and does not refer to relevant accessories.

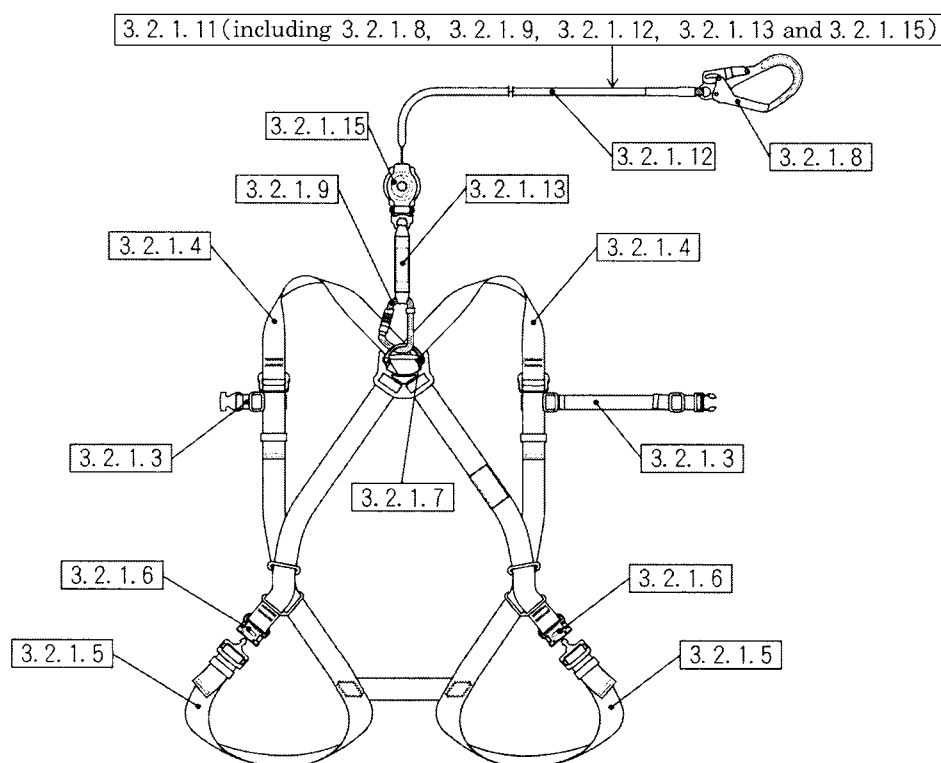


a) Overview

Figure 3 Class A (example)



b) With rope-type lanyard



c) With winding-type lanyard

Figure 3 (concluded)

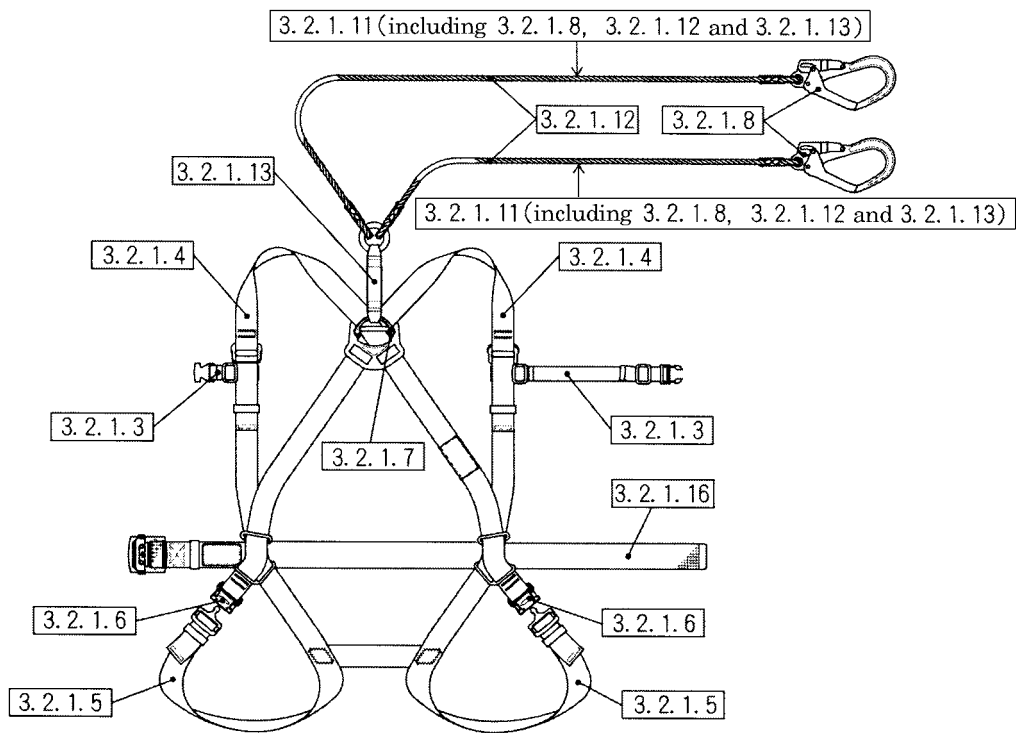


Figure 4 Equipped with two lanyards of Class A and waist strap (example)

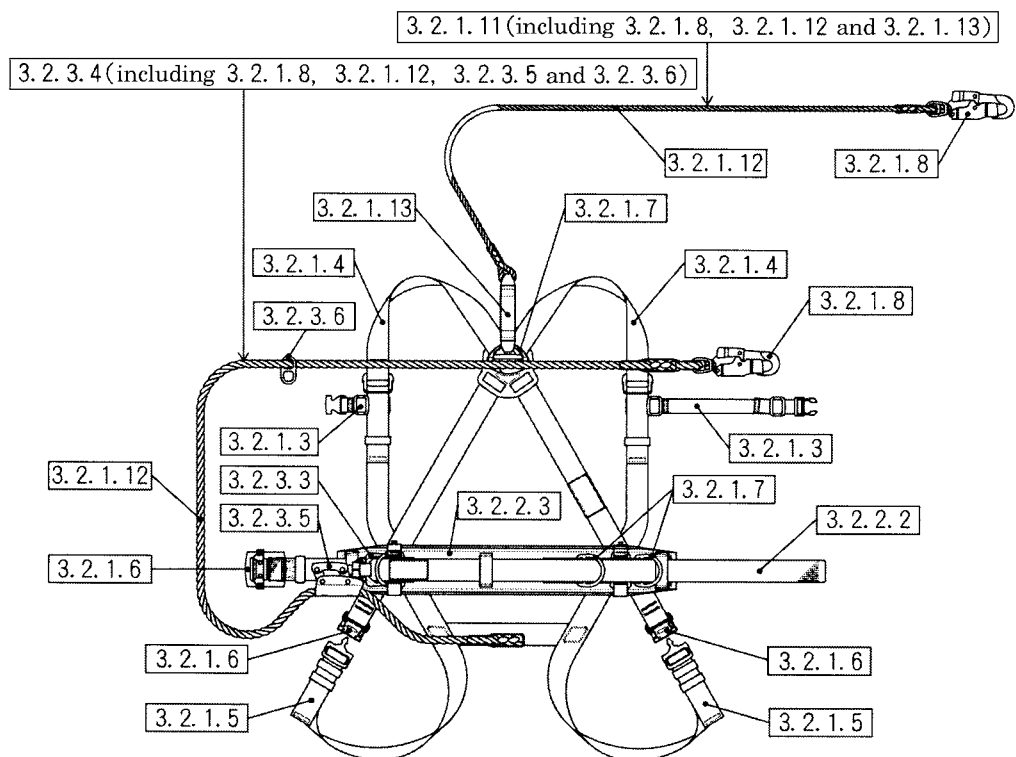
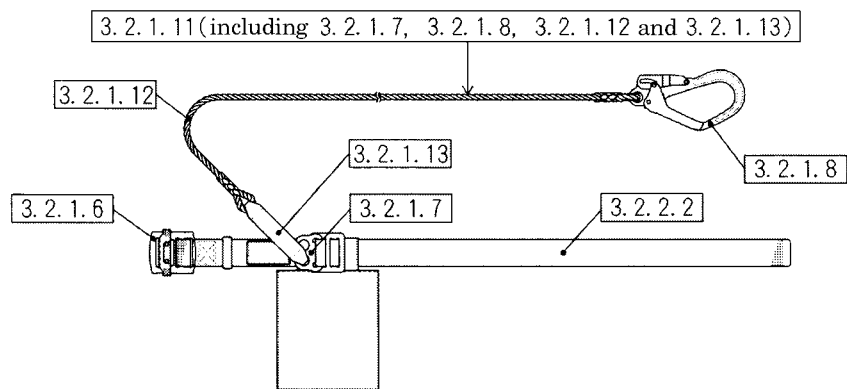
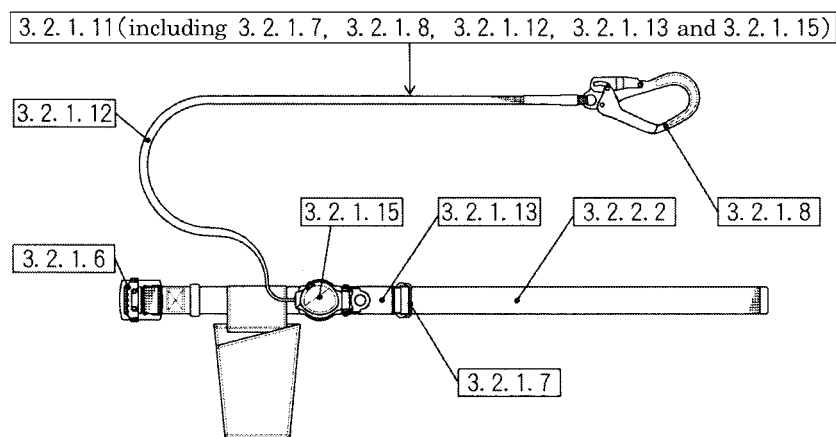


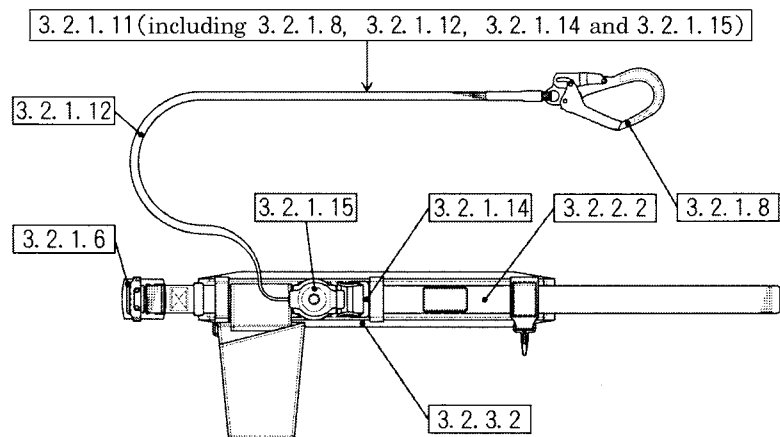
Figure 5 Equipped with full-body harness of Class A and work-positioning system (example)



a) Body-strap type



b) Body-strap type (equipped with winder and energy absorber, example)



c) Body-strap type (equipped with winder and cushion ring, example)

Figure 6 Class B (example)

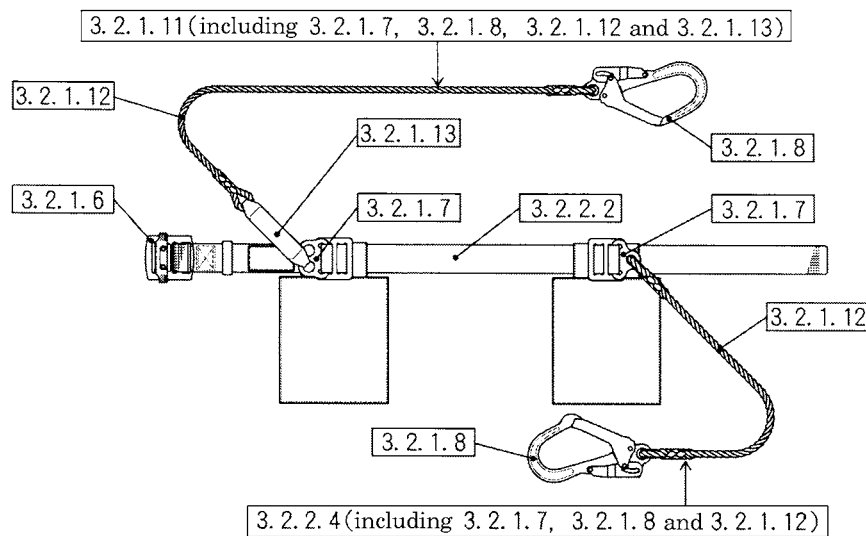


Figure 7 Class B equipped with auxiliary rope (example)

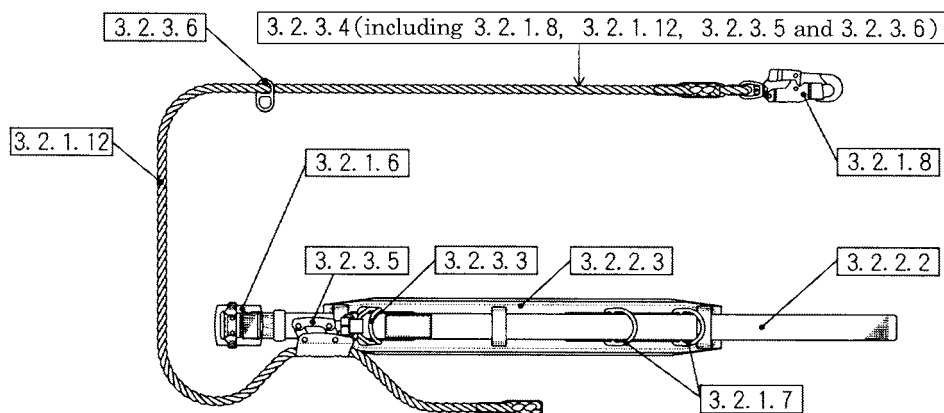


Figure 8 Work positioning system (example)

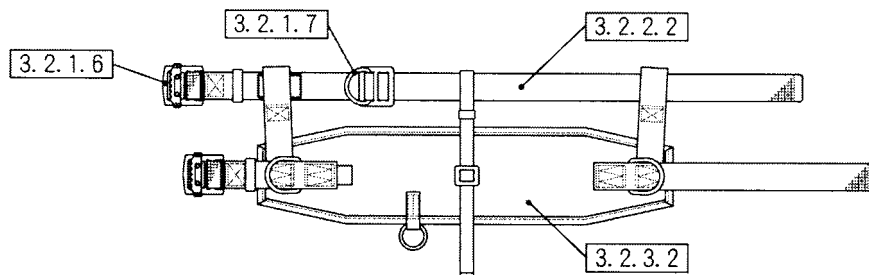


Figure 9 Work positioning system (equipped with backside strap, example)

4.2 Usage conditions of personal fall-arrest systems

4.2.1 General usage conditions

Shall be as follows.

- a) The fall distance of personal fall-arrest system shall be smaller than the height of rigid anchor structure at a work place.
- b) The personal fall-arrest system of full-body harness type shall be used at a place of a height exceeding the value obtained by adding 1 m to the total of the maximum free-fall distance and the permanent extension.

4.2.2 Total mass limit

The total mass limit (total of the weight of worker and the mass of harness equipment) of personal fall-arrest system shall not exceed the mass of the falling object (sand-bag, torso test mass or test mass) subjected to the impact resistance test and the relevant performance test. The mass of the falling object subjected to the said impact resistance test and the relevant performance test shall be 85 kg or 100 kg. Also, the falling object exceeding 100 kg, intended for a heavy person, may be used.

4.2.3 Usage conditions of lanyard

Shall be as follows.

- a) When a connector is hooked at the waist height and used, the lanyard of Type 1 shall be used in principle. Also, the lanyard subjected to the impact resistance test and relevant performance test of an energy absorber shall be used, in which they are tested at the height not less than the test fall distance H ($H=L+D$) obtained by adding the additional fall distance D to the length of lanyard L according to the height (height difference compared to a ring) of the rigid anchor structure to which a connector is hung.
- b) When a connector is hooked at the foot height and used, the personal fall-arrest system of full-body harness type and the lanyard of Type 2 shall be used.

5 Structures, shapes and dimensions

5.1 General matters of structure

Shall be as follows.

- a) A full-body harness and a body strap shall have a fastening buckle, etc. used for fitting on/removing from the body of worker, and the length adjustment. The construction shall facilitate the easy fitting/removing.
- b) A lanyard shall have a connector to rigid anchor structure or ring to make the attachment easy.
- c) A connector shall have a structure that a wearer can unhook it only by at least two successive operations.
- d) The portions of full-body harness and body strap in contact with the body of wearer shall have a structure to have no projections, and shall be finished smoothly.

5.2 Structure of each class

5.2.1 Class A

The structure of Class A (full-body harness type) shall be as follows.

- a) Class A shall have a structure in which a lanyard for fall-arrest is connected with a full-body harness for fit-on and hold of body. Also, the full-body harness can be appropriately connected with a lanyard at the centre of both blade bones in the case of backside, or on the centreline of chest at the breast bone height in the case of chest side.
- b) The full-body harness shall consist of thigh straps and shoulder straps, and have a structure to support the load exerted on the body of wearer during the fall-arrest at several positions such as waist, shoulders and thighs. Also, the combination of straps located around the pelvis, legs and backside shall be included. A dedicated waist strap may be integrated.
- c) The full-body harness shall have a structure in which the load after and under the fall-arrest shall not concentrate on the crotch by the strap, etc. located around the pelvis.
- d) The full-body harness shall have a structure in which the straps are adjustable to fit to the body, etc. of wearer. Also, each strap shall have a fastening buckle, etc. to be fitted on a wearer suitably. If a fastening buckle, etc. of either a shoulder strap or a thigh strap enables the full-body harness to be fitted on a wearer suitably, each strap does not necessarily have a fastening buckle, etc.
- e) The full-body harness shall have a configuration such that the surface of metal part and the contact face with a strap are smoothly finished to ensure the safety. The straps constituting the full-body harness shall be sewed or have the structure to avoid easy misalignment.
- f) The colour of sewing thread used for full-body harness shall be different from that of the strap to facilitate the visual check.
- g) The fastening buckle shall be appropriately coupled and shall not be easily detached. Also, it shall not be slipped, loosened, etc. easily.
- h) The full-body harness may be incorporated into cloths, provided that the visual inspection is feasible.
- i) The lanyard shall be selected from that of Type 1 or Type 2 according to the usage conditions.
- j) The connecting part such as a ring, etc., if it is made of fibre loop, shall be so processed as to avoid the abrasion.

5.2.2 Class B

The structure of Class B (body-strap type) shall be as follows.

- a) Class B shall have a structure in which a lanyard for fall-arrest is connected with a body strap for fit-on and hold of body. The body strap shall be capable of fitting to the wearer appropriately.
- b) The structure shall be such that the body part of wearer is appropriately supported by the body strap during the fall-arrest.
- c) The lanyard shall be connected.
- d) To ease the burden on the waist, an auxiliary strap may be used together.