INTERNATIONAL STANDARD

ISO 8124-4

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Safety of toys —

Part 4: Swings, slides and similar activity toys for indoor and outdoor family domestic use

Sécurité des jouets —

Partie 4: Balançoires, glissoires et jouets à activité similaire à usage domestique familial intérieur et extérieur

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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 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 8124-4 was prepared by Technical Committee ISO/TC 181, *Safety of toys*.

ISO 8124 consists of the following parts, under the general title *Safety of toys.*

— *Part 1: Safety aspects related to mechanical and physical properties*

— *Part 2: Flammability*

— *Part 3: Migration of certain elements*

— *Part 4: Swings, slides and similar activity toys for indoor and outdoor family domestic use*

Introduction

This part of ISO 8124 is largely based upon existing standards in the European Union (EN 71-8) and in the United States (ASTM F1148).

However, it should not be construed that a toy manufactured in compliance with this part of ISO 8124 will be in full compliance with relevant national toy safety requirements in the market where the product is intended to be distributed. The user of this part of ISO 8124 is therefore advised to be aware of relevant national requirements.

Compliance with the requirements of this part of ISO 8124 will minimize potential hazards associated with toys resulting from their use in their intended play modes (normal use) as well as unintended play modes (reasonable foreseeable abuse).

This part of ISO 8124 will not, nor is it intended to, eliminate parental responsibility in the appropriate selection of toys. In addition, this part of ISO 8124 will not eliminate the need for parental supervision in situations where children of various ages may have access to the same toy(s).

Safety of toys —

Part 4:
Swings, slides and similar activity toys for indoor and outdoor family domestic use

1 Scope

See A.1.

This part of ISO 8124 specifies requirements and test methods for activity toys for domestic family use intended for children under 14 years to play on or in.

Products covered by this part of ISO 8124 include swings, slides, seesaws, carousels, rocking toys, climbing frames, fully enclosed toddler swing seats and other products intended to bear the mass of one or more children.

Products not included within the scope of this part of ISO 8124 are:

a) fitness and sporting equipment unless attached to the activity toy;

b) equipment intended for use in schools, day care centres, kindergartens, public playgrounds, restaurants, shopping centres and similar public places;

c) juvenile care products such as, but not limited to, infant swings, playpens/enclosures, beds or furniture including picnic tables, cradle rockers and products specifically designed for therapeutic use.

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 amendment) applies.

ISO 8124-1, *Safety of toys — Part 1: Safety aspects related to mechanical and physical properties*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 8124-1 and the following apply.

3.1
activity toy
toy intended for family domestic use, intended to bear the mass of one or more children, often attached to or incorporating a crossbeam and intended for children to play on or in

EXAMPLES Swings, slides, carousels and climbing frames (see Figure 1).

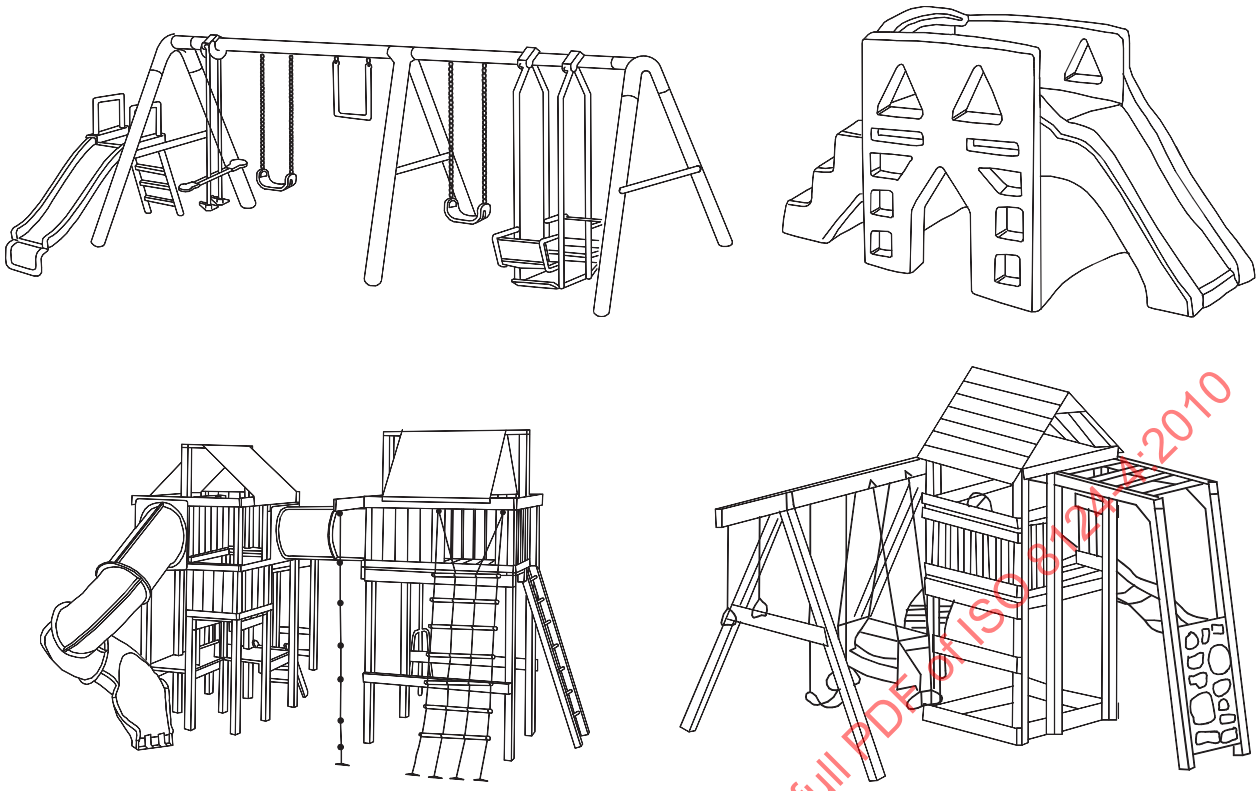


Figure 1 — Examples of activity toys (not to scale)

3.2
anchor
device used to fix the toy to the ground surface

3.3
attachment slide
slide for which access to the starting section is possible only by passing via other equipment or parts of other equipment

3.4
barrier
device intended to prevent children from falling from elevated surfaces

3.5
crossbeam
bar or beam which forms a main load-bearing part of the toy

3.6
entrapment
condition in which a body, part of a body or clothing becomes caught and impedes withdrawal

3.7
forced movement
movement where the direction and the extent of the child's movement is determined by the operation of the equipment, for example swinging, sliding, rocking or revolving

3.8
free height of fall
greatest vertical distance from the intended body support, for example from the seat of a swing to the impact area below

3.9
free space
space in, on or around the activity toy that can be occupied by a user undergoing a forced movement by the equipment, for example swinging, sliding, rocking or revolving

NOTE The definition of free space does not include the three-dimensional area in which a falling movement takes place.

3.10
fully enclosed toddler swing seats
fully enclosed single occupancy swing intended for young children who can sit upright unaided

NOTE A seat is considered fully enclosed when a containment system is employed to support the child on all sides and in between the legs (see Figure 2).

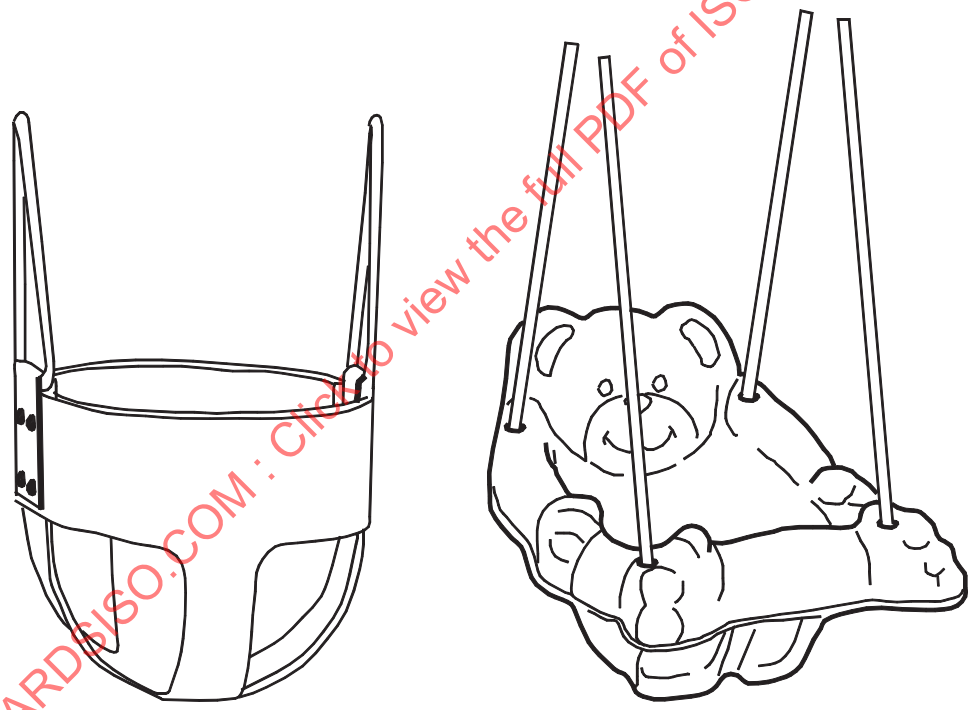


Figure 2 — Illustration of fully enclosed toddler swing seat

3.11
impact area
area of a swing element that comes into contact with the test mass during an impact test in accordance with 6.4.

3.12
infant swing
stationary unit with a frame and a powered mechanism enabling an infant to swing in a seated position

NOTE An infant swing is intended for use with infants from birth until the child is able to sit upright unassisted.

3.13
handrail
rail intended to assist the users to balance or steady themselves

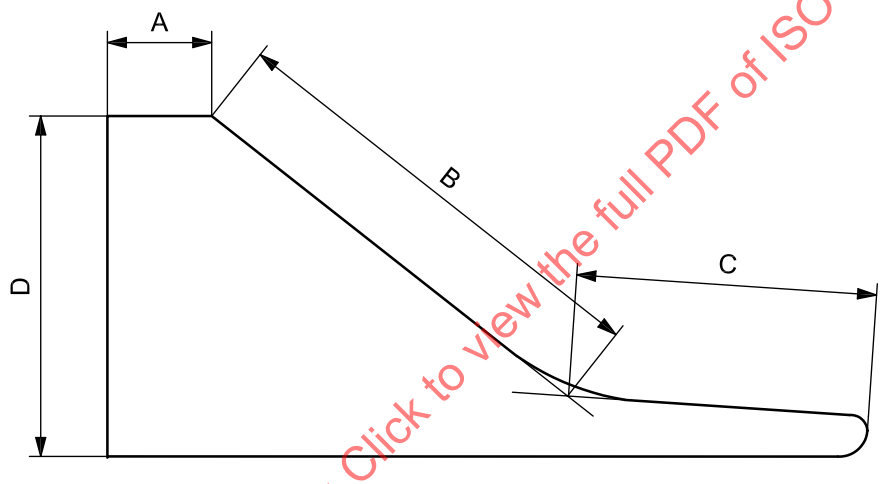
3.14
platform
any elevated substantially horizontal surface intended to be used by a child as a place for play or as a transition between components

NOTE Slide starting sections less than 129 000 mm^2 are not considered platforms.

3.15
slide
structure with inclined surface(s) on which the user slides in a defined track

See Figure 3.

NOTE Inclined planes, designed primarily for other purposes, such as roofs and ramps, do not constitute slides.



Key

A	starting section
B	sliding section
C	run-out section
D	height of slide
B + C	slide length

NOTE The dimensions A, B, and C are measured at the centreline of the sliding surface. Each of these sizes represents one of the zones of the sliding surface. Each zone of the sliding surface is determined by the intersection of the curve of the sliding surface (taken at the bottom of the sliding surface) and the bisecting line of the angle formed between the zones of the sliding surfaces.

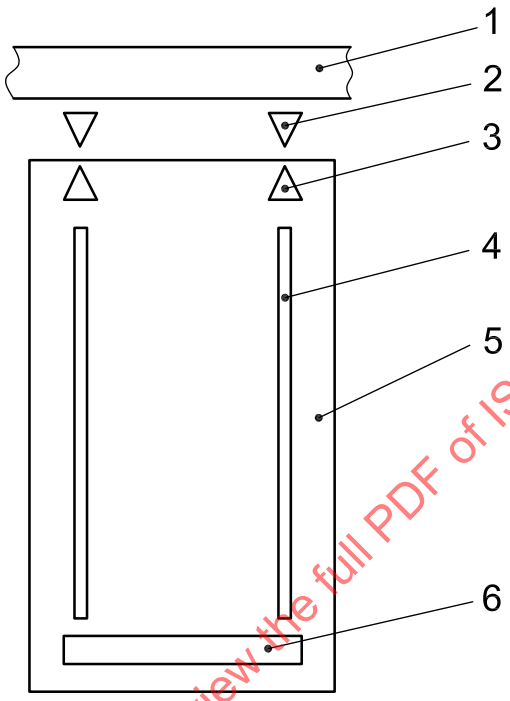
Figure 3 — Diagrammatic representation of a slide

3.16
suspension connector
device that forms the direct contact between a crossbeam and the swing device

See Figure 4.

3.17
swing
structure, normally intended to be attached to or incorporating a crossbeam, suspension connectors and a swing device with swing element, means of suspension and suspension coupling

See Figure 4.



Key
1 crossbeam/support member
2 suspension connector
3 means of suspension
4 suspension coupling
5 swing device
6 swing element (e.g. seat, rings, bar, gondola)

Figure 4 — Diagrammatic representation of a swing

4 Requirements

4.1 General

See A.4.1.

4.1.1 Static strength

Activity toys, other than swings, shall not collapse when tested in accordance with 6.2.1. After testing, the toy shall continue to comply with the relevant requirements of this part of ISO 8124. Requirements for swings are given in 4.7.

4.1.2 Maximum height

See A.4.1.2.

There shall be no part of the activity toy designed to encourage the child to climb, sit on or stand on, with a height of 2 500 mm or more when measured from the ground.

This does not include barriers, roofs, etc., that are not intended to be climbed, sat on or stood on.

Barriers, roofs, etc., that are not intended to be climbed shall be designed in such a way that climbing is not encouraged.

4.1.3 Corners and edges

See A.4.1.3.

Exposed corners and edges shall be rounded.

Corners and exposed edges on moving parts shall have a minimum radius of 3 mm. This does not apply to swing elements with a mass of 1 000 g or less, the corners and edges of which shall be rounded.

4.1.4 Protruding parts

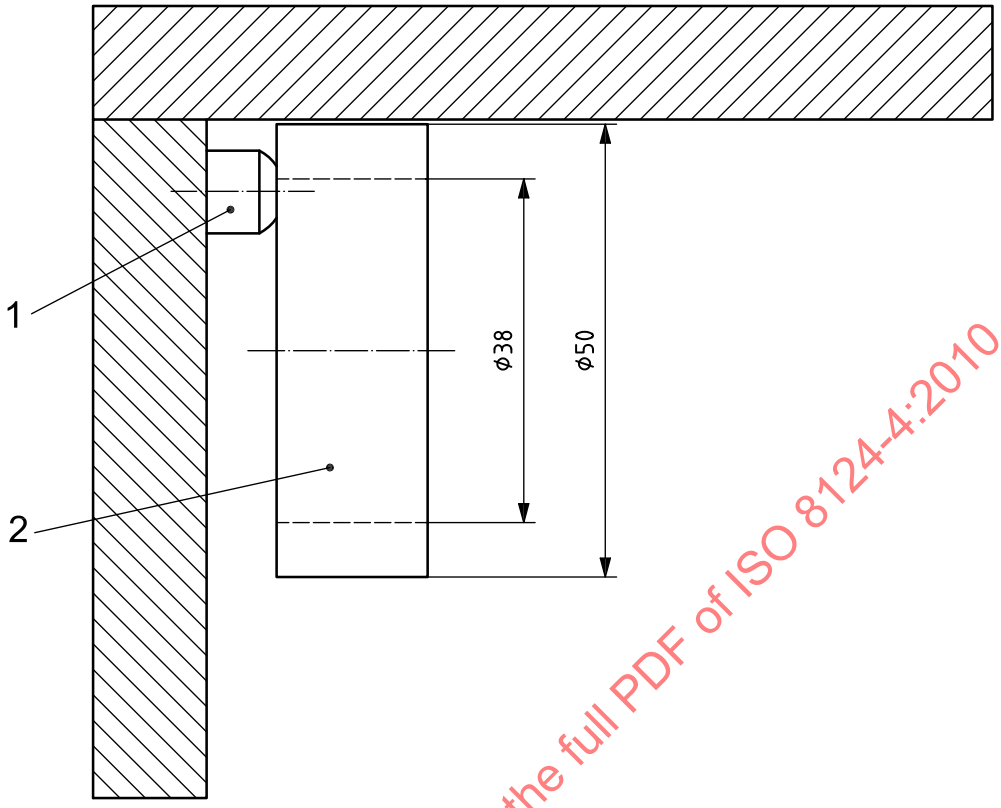
4.1.4.1 General

Protruding parts (such as bolt ends and nuts) shall be recessed or be protected in such a way that they do not constitute an entrapment hazard or other hazard to users.

If protrusions cannot be placed within the 50 mm outside diameter test gauge defined in 6.7.1, they are considered to be inaccessible and are exempted from these requirements (see Figure 5).

Rope protrusions are specifically exempted from the requirements of 4.1.4.

Dimensions in millimetres



Key

1 inaccessible protrusion (excluded)

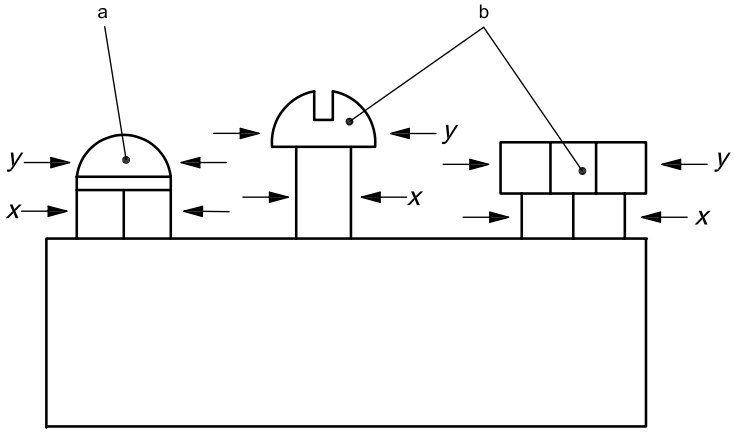
2 test gauge (50 mm diameter)

Figure 5 — Example of excluded protrusion

4.1.4.2 All protrusions

No protrusion shall extend beyond the full depth of the test gauges when tested in accordance with 6.7.1.

No protrusion may terminate in a dimension greater than that of the base dimension (see Figure 6). In the case of hardware, the base dimension shall be defined as the major dimension of the attachment nut or bolt head.



a Pass ($y \leqslant x$).

b Fail ($y > x$).

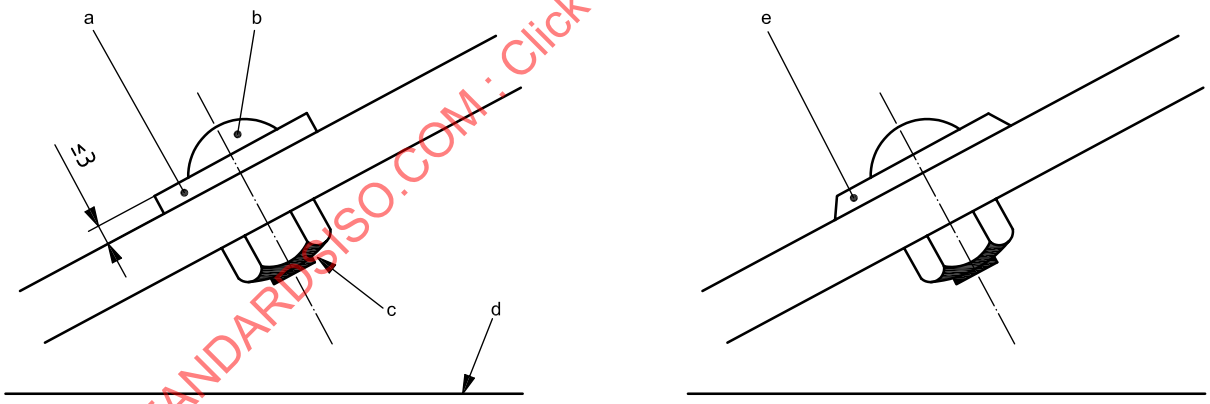
Figure 6 — Examples of protrusion configurations

4.1.4.3 Upright protrusions

Protrusions that fit within any of the gauges defined in 6.7.1 and that project upwards from a horizontal plane shall have no projection perpendicular or at an acute angle to the plane of the initial surface extending more than 3 mm in height (see Figure 7).

For example, the hemispherical ends of bolts are exempt from this requirement because they do not project perpendicular to the plane of the initial surface.

Dimensions in millimetres



a Protrusions that project perpendicular or at an acute angle to the plane of the initial surface with the axis inclined upward from the horizontal plane shall comply with the 3 mm maximum requirement.

b Hemispherical end exempted from the 3 mm maximum requirement.

c Protrusions with axis horizontal or below horizontal shall not extend beyond the face of the test gauges defined in 6.7.1.

d Horizontal plane.

e Protrusions that project at an obtuse angle to the plane of the initial surface are exempt from the 3 mm maximum requirement.

Figure 7 — Upright protrusion test

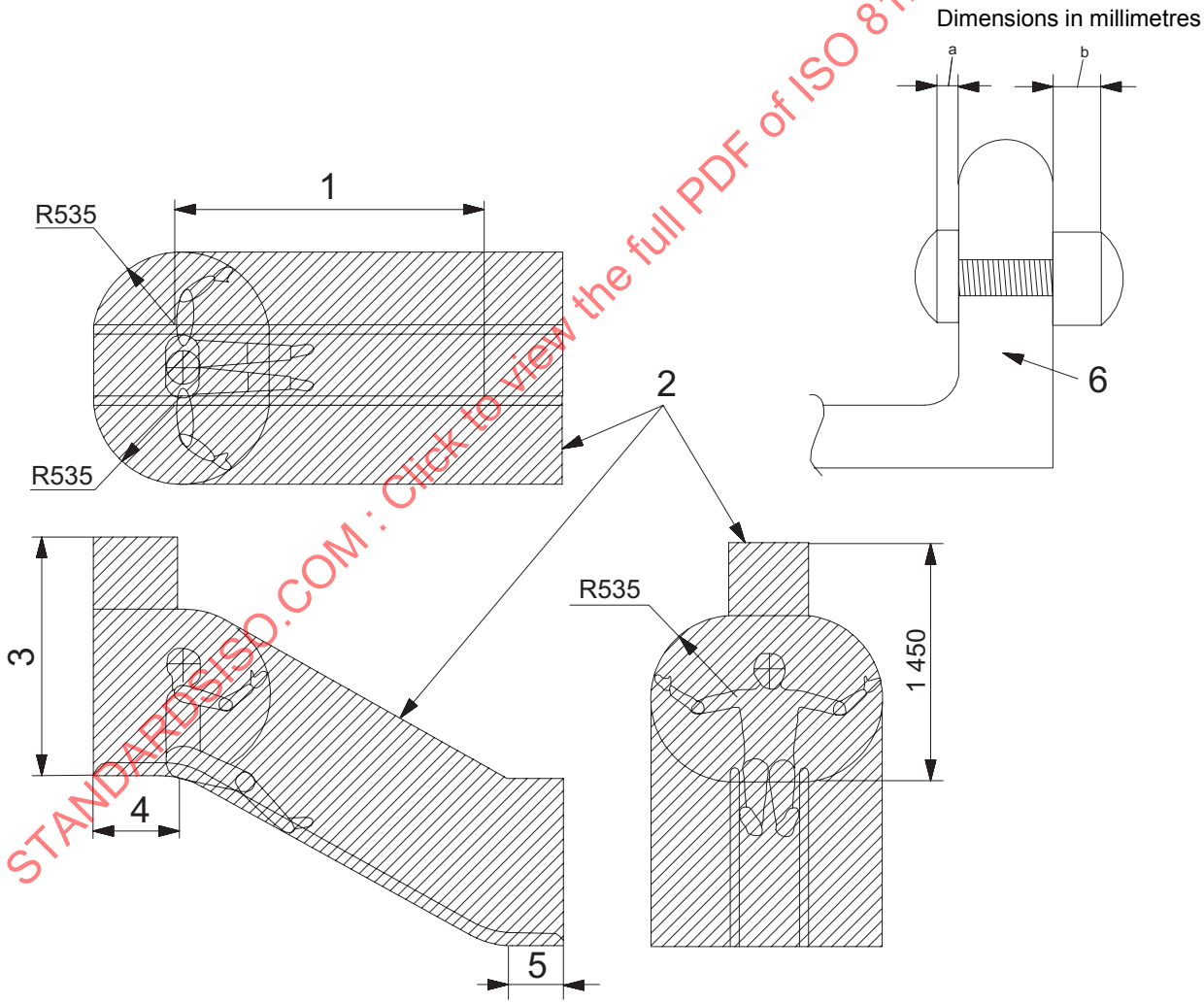
4.1.4.4 Motion rides

Protrusions on the front and rear surfaces of suspended members of swinging elements and those on the interior surface of slides shall not protrude beyond the full depth of the test gauge when tested in accordance with 6.7.2.

4.1.4.5 Slides

Slides, including protective barriers and their means of attachment, and transition areas pose a greater risk of entrapment than other areas of play equipment. Therefore, the following requirements apply to slides and sliding devices.

Any accessible protrusion that allows the 76 mm test gauge defined in 6.7.2 to pass over it shall have no projection perpendicular or at an acute angle to the plane of the initial surface extending more than 3 mm. The areas subject to this requirement are outlined in Figure 8. The outside surface of tunnel slides that are completely enclosed are exempt from this requirement.



Key

1 sliding surface
2 shaded areas representing non-entrapment/protrusion zone
3 standing height
4 starting section
5 run-out section
6 slide side rail

[a] Pass (3 mm or less).
[b] Fail (more than 3 mm).

Figure 8 — Non-entrapment/protrusion zone and protrusion examples

Slides shall be constructed in such a way as to provide a smooth continuous sliding surface with no gaps or spaces that might create an entrapment hazard such as, but not limited to, the space created between sidewalls when two single slides are combined to create a doubly wide slide, or the point where a hood is attached to the sidewalls of a slide. Roller slides are exempt from the requirements of this subclause. See 4.6.4 for specific requirements for roller slides.

4.1.5 Climbing and swinging ropes, chains and cables

See A.4.1.5.

A suspended climbing rope, chain or cable shall be secured at both ends to prevent the rope, chain or cable from being looped back on itself creating a loop with an interior perimeter of 130 mm (diameter 41,4 mm) or more.

A rope, chain or cable used to support a swing seat is exempt from these requirements.

4.1.6 Open tubing

All open tubing ends that are not resting on the ground or otherwise covered shall be provided with caps or plugs that have a smooth finish and are tight-fitting. The protective cap or cover shall not become detached when tested in accordance with the torque test and the tension test for protective components specified in ISO 8124-1.

4.2 Barriers

See A.4.2.

Any platform intended for sitting or standing 760 mm or more above the ground shall be equipped with a barrier on all sides that face outward from the toy.

Openings in barriers to give access to slides, climbing frames and ladders are allowed.

Barriers for platforms from 760 mm to 1 000 mm above the ground shall have a minimum height of 630 mm.

Barriers for platforms greater than 1 000 mm and up to 1 830 mm above the ground shall have a minimum height of 720 mm.

Barriers for platforms more than 1 830 mm above the ground shall have a minimum height of 840 mm.

Barriers for platforms from 760 mm to 1 000 mm above the ground shall have a maximum vertical opening of 610 mm between the lowermost member of the barrier and the platform that it surrounds.

Barriers for platforms more than 1 000 mm above the ground shall be designed to minimize the likelihood of climbing. Openings within these barriers or between the barrier and the platform surface shall not permit the passage of the torso probe defined in 6.5.1.

For barriers with an uneven top design, a straightedge of 200 mm ± 5 mm shall be used for measuring minimum height. Place the straightedge horizontally on top of the barrier. Measure the vertical distance between the platform and the bottom of the straightedge. The distance shall in no place be less than the minimum heights specified in this part of ISO 8124.

NOTE Special requirements apply to slides (see 4.6.2 and 4.6.3).

When tested in accordance with 6.3, no part of the barrier or handrail shall collapse, such that the toy does not comply with the relevant requirements of this part of ISO 8124.

4.3 Rung ladders, stepladders and stairways

These requirements do not apply to toys with a platform height of 600 mm or less.

Rung ladders, stepladders and stairways shall comply with the following requirements.

a) The rung or tread shall have a substantial horizontal stepping surface with a lateral width of 240 mm or more (see Figure 9).

b) The distance between the upper surface of the rungs or treads on rung ladders or stepladders shall not be more than 310 mm and on stairways not more 230 mm when measured vertically in accordance with Figure 9.

c) The surface of the tread shall not be slippery.

NOTE This can be achieved by corrugation of the tread or by use of non-slip materials.

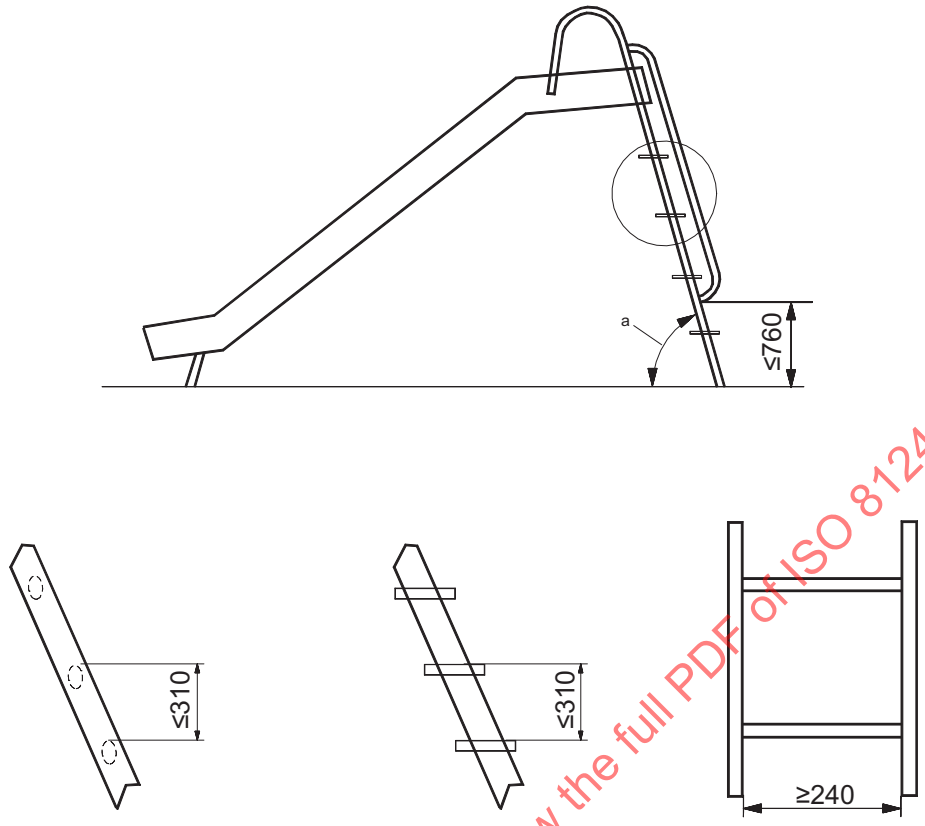
d) The diameter or cross-sectional dimension of the rungs on rung ladders shall be at least 16 mm but not more than 45 mm. Care should be taken when using designs other than circular cross-sections to ensure that gripping potential is not seriously impaired.

e) The depth of treads on stepladders with closed risers or stairways shall be 180 mm or more.

f) The inclination of stairways shall not be more than 50°. The inclination of stepladders shall not be less than 65° and not more than 75°. The inclination of rung ladders shall not be less than 60° and not more than 90°.

g) Stairways and stepladders with a height of 1 200 mm or more above the ground shall be provided with a means of continuous hand support from a height of 760 mm (see Figure 9).

Dimensions in millimetres



[a] Angle of inclination:
for stepladders ⩾ 65° and ⩽ 75°;
for rung ladders ⩾ 60° and ⩽ 90°.

Figure 9 — Dimensions of ladders

4.4 Entrapment

See A.4.4.

4.4.1 Head and neck entrapment

These requirements do not apply to openings where the ground forms the lower boundary.

Activity toys shall be constructed so that no openings create head and neck entrapment hazards either by head first or feet first passage.

NOTE Hazardous situations in which this type of entrapment can be encountered include the following:

- completely bound openings through which a user can slide head first or feet first;
- partially bound or V-shaped openings;
- shearing and moving openings.

When choosing materials, the manufacturer shall take into account the entrapment hazards that can occur due to distortion of material during use.

a) Accessible completely bound openings shall also allow passage of probe D (Figure 23) if they allow passage of probe C (Figure 22) when tested in accordance with 6.5.1.

b) Accessible rigid openings shall not allow the passage of probe E (Figure 24) unless they also allow the passage of probe D when tested in accordance with 6.5.1.

c) Partially bound and V-shaped openings shall be constructed so that either:

1) the opening is not accessible as illustrated in Figure 26 and when tested in accordance with 6.5.2.3 a)

or

2) the tip of the template contacts the base of the opening when tested in accordance with 6.5.2.3 b).

d) Openings between flexible parts of suspended bridges and any rigid side members shall allow the passage of probe D (Figure 23) under the worst-case condition of loading. Both loaded and unloaded situations shall be tested.

e) Non-rigid members (e.g. ropes) shall not overlap if by doing so they create openings that do not comply with the requirements in a).

f) A shield intended to make inaccessible any opening that would otherwise fail the requirements of a) to e) shall

1) be constructed of a rigid material;

2) not fracture, fail or be displaced in a manner that will allow the opening to become accessible when impacted by a 127 mm diameter steel ball with 27 J at a point within 25 mm of the geometric centre of the shield;

3) not fracture, fail or be displaced in a manner that will allow the opening to become accessible when tested in accordance with the torque and tension tests of ISO 8124-1.

4.4.2 Entrapment of clothing and hair

Hazardous situations in which clothing or hair can be entrapped may be created by:

a) gaps or V-shaped openings in which parts of clothing can become entrapped while or immediately before the user undergoes a forced movement;

b) protrusions;

c) rotating parts.

Slides, fireman's poles and roofs shall be constructed in such a way that the toggle or chain is not entrapped when tested in accordance with 6.6.

NOTE 1 When using elements of circular cross-section, special consideration should be given to avoid clothing and hair entrapment. This can be achieved by using spacers or similar devices.

Slides, fireman's poles and roofs shall be constructed so that openings located within the free space do not entrap the toggle or chain when tested in accordance with 6.6.

Rotating parts (e.g. spindles) shall have means of preventing entanglement of clothing or hair.

NOTE 2 Suitable covering or shields can be used to prevent entanglement of clothing or hair in rotating parts.

4.4.3 Entrapment of feet

Surfaces intended for standing, running or walking shall not contain any gaps likely to cause foot or leg entrapment. There shall be no gaps greater than 30 mm measured in one direction (see Figure 10), unless suitable means of balance is provided.

Dimensions in millimetres

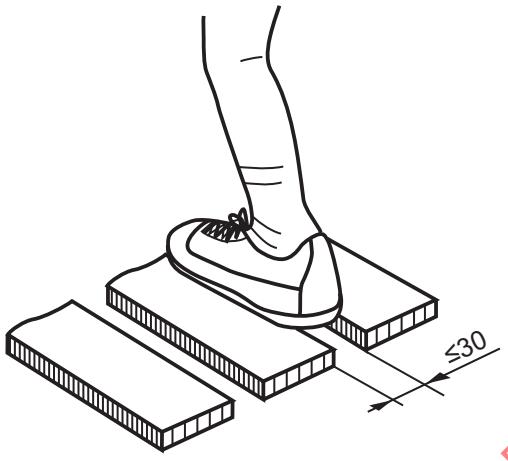


Figure 10 — Measurement of surface gap on running and walking levels

4.4.4 Entrapment of fingers

Activity toys shall be constructed in such a way that holes, slots and gaps do not cause an entrapment hazard to fingers.

Accessible holes, slots and gaps in or between any rigid materials (excluding chains), where the body is in a forced movement, shall also admit a 12 mm diameter rod if they can admit a 5 mm diameter rod to a depth of 10 mm or more.

The requirements in this subclause do not apply to weather-induced dry cracks in solid wood.

4.5 Stability of activity toys other than slides, swings and toys with crossbeams

4.5.1 General

NOTE Stability requirements for slides are given in 4.6.1 and for swings and other activity toys with crossbeams in 4.7.1.

Activity toys supplied with anchors intended to be permanently fixed (e.g. in concrete) when used in accordance with the manufacturer's instructions shall not be subjected to stability tests.

Activity toys supplied with removable ground anchors shall be tested with anchors fixed in accordance with the manufacturer's instructions.

Activity toys not supplied with anchors shall be subjected to stability tests.

4.5.2 Stability of activity toys with a free height of fall of 600 mm or less

Activity toys with a free height of fall of 600 mm or less shall not tip over when tested in accordance with 6.1.1.

4.5.3 Stability of activity toys with a free height of fall of more than 600 mm

Activity toys with a free height of fall of more than 600 mm shall not tip over when tested in accordance with 6.1.2.

4.6 Slides

See A.4.6.

4.6.1 Stability of slides

Slides supplied with anchors intended to be permanently fixed (e.g. in concrete) when in use in accordance with the manufacturer's instructions shall not be subjected to stability tests.

Slides supplied with removable ground anchors shall be tested with anchors fixed in accordance with the manufacturer's instructions.

Slides not supplied with anchors shall be subjected to stability tests.

Slides shall not tip over when tested in accordance with 6.1.3.

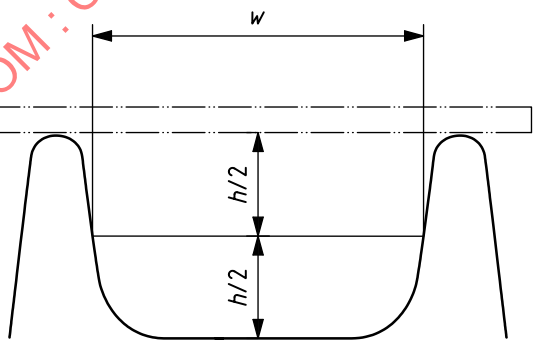
4.6.2 Retaining sides for slides

Retaining sides for slides shall comply with the following requirements (see Figure 11).

a) For slides with a height of more than 1 000 mm above the ground, the height, h, of the retaining sides shall be 100 mm or more.

b) For slides with a height of 1 000 mm or less above the ground, the height, h, of the retaining sides shall be 50 mm or more.

Retaining sides are not required for the run-out section.



Key

h height of the retaining sides

w width of the slide

Figure 11 — Height of retaining sides

4.6.3 Starting, sliding and run-out section on slides

NOTE For attachment slides, the platform may be used as a starting section.

The starting and run-out section on slides shall comply with the following requirements (see Figure 12).

a) The starting section for slides with a height of 1 000 mm or less above the ground shall have:

   — a width greater than the sliding section less 40 mm (see Figure 11 for measurement of width); if, for example, the sliding section has a width of 300 mm, the starting section shall have a width greater than 260 mm;

   — a length of 150 mm or more;

   — an inclination of between 0° and 10° to the horizontal.

b) The starting section for slides with a height of more than 1 000 mm above the ground shall have:

   — a width greater than the sliding section less 40 mm (see Figure 11 for measurement of width); if, for example, the sliding section has a width of 300 mm, the starting section shall have a width greater than 260 mm;

   — a length of 250 mm or more;

   — an inclination of between 0° and 10° to the horizontal.

c) The starting section shall be provided with a means of assistance to the child coming from the stair/ladder into the sitting position, e.g. a handrail. A barrier provided in accordance with 4.2 may also serve as a handrail.

d) The angle of inclination to the horizontal of the sliding section shall not exceed 60° at any point. The inclination of the sliding section shall be measured at the centreline.

e) The run-out section for the slide shall have:

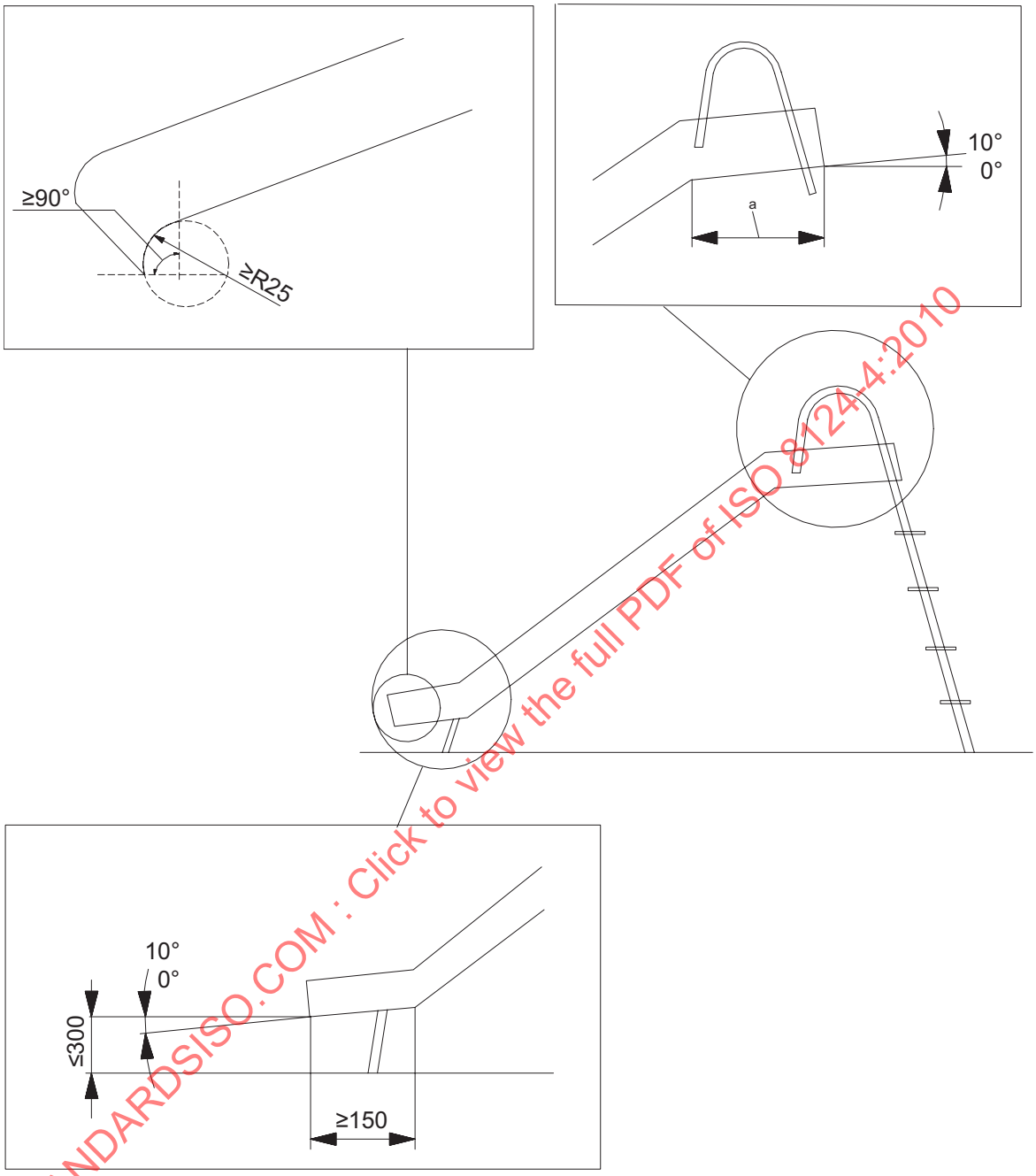
   — a length of 150 mm or more;

   — an inclination of between 0° and 10° to the horizontal;

   — a height of 300 mm or less above the ground at the end of the section.

f) The finishing end of the run-out section shall have a radius of 25 mm or more through at least 90°. This requirement does not apply to slides where the run-out section ends 25 mm or less from the ground.

Dimensions in millimetres



[a] Length of starting section:

⩾ 150 mm for slides with a height of 1 000 mm or less [see 4.6.3 a)];

⩾ 250 mm for slides with a height of more than 1 000 mm [see 4.6.3 b)].

Figure 12 — Requirements for slides

4.6.4 Roller slides

Roller slides shall comply with the requirements for slides in 4.6.1 to 4.6.3.

There shall be no pinch, crush, shear, entrapment or catch points between the junctures of two or more components that could present a hazard during normal use or reasonably foreseeable abuse.

A pinch, crush, shear, entrapment or catch point is any point that will freely admit a 5 mm diameter rod to a depth of 10 mm or more at one or more positions, either between rollers or adjacent segments.

4.7 Swings

See A.4.7.

4.7.1 Stability of swings and other activity toys with crossbeams

4.7.1.1 General

Swings supplied with anchors intended to be permanently fixed (e.g. in concrete) when used in accordance with the manufacturer's instructions shall not be subjected to stability tests.

Swings supplied with removable ground anchors shall be tested with anchors fixed to the standing surface in accordance with the manufacturer's instructions.

Swings not supplied with anchors shall be subjected to stability tests.

4.7.1.2 Swings with crossbeams more than 1 200 mm above the ground

When tested in accordance with 6.1.4.1, the toy shall not tip over.

4.7.1.3 Swings intended for children under 36 months with crossbeams 1 200 mm or less above the ground

When tested in accordance with 6.1.4.2, the toy shall not tip over.

4.7.2 Strength of crossbeams, swing devices, suspension connectors and suspension couplings

See A.4.7.2.

Structures and/or crossbeams shall not collapse when tested in accordance with 6.2.2.

After testing, the toy shall continue to comply with the relevant requirements of this part of ISO 8124.

4.7.3 Swings intended for children under 36 months

4.7.3.1 General

Swing seats shall be provided with a back and a safety device preventing the child from falling off the seat.

NOTE The following have been found appropriate:

- a T-bar or a protective bar with a crotch strap, the horizontal section of which is situated between 200 mm and 300 mm above the seat measured as the distance between the lowest part of the sitting surface area of the seat and the upper surface of the bar;
- a device to fasten the child to the seat, e.g. a belt with a crotch strap.

Frames and/or crossbeams shall not collapse when tested in accordance with 6.2.2.3.2.

After testing, the toy shall continue to comply with the relevant requirements of this part of ISO 8124.

4.7.3.2 Toddler swings without a crossbeam

Toddler swings shall remain stable when tested in accordance with 6.1.5.

4.7.4 Impact from swing elements

When tested in accordance with 6.4, swing elements shall not impart an average peak value of acceleration, measured with a cut-off frequency of 10 kHz, greater than 50 g, and the average surface compression shall not be greater than 90 N/cm^2.

This requirement does not apply to swing elements where the combined mass of the swing element and the means of suspension, as illustrated in Figure 4, is less than 1,0 kg and for which the estimated impact area is larger than 20 cm^2.

4.7.5 Minimum clearance between swing elements, and similar equipment and adjacent structures

These requirements do not apply to single swing elements in swings with a crossbeam height of 1 200 mm or less.

The minimum clearances between adjacent swing elements shall be as given in Table 1 when loaded as they are typically used.

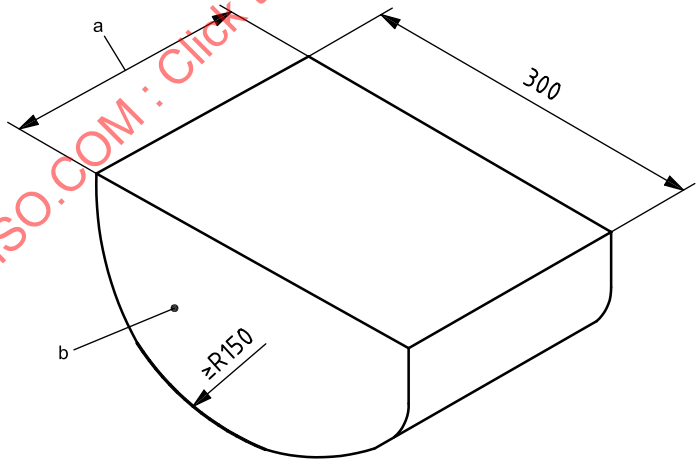
Table 1 — Minimum clearances between swing elements

Dimensions in millimetres

Clearances between	Free swinging elements	Elements excluding free swinging	Adjacent structure of swing device
Free swinging elements	450	450	300
Elements excluding free swinging	450	300	300

For flexible seats, the fixture shown in Figure 13 may be used to simulate a typical load.

Dimensions in millimetres



[a] Dimension ⩾ depth of seat.

[b] Mass of 12 kg.

Figure 13 — Typical load fixture for flexible seats

4.7.6 Lateral stability of swing elements

See A.4.7.6.

This requirement does not apply to swings with rigid means of suspension.

The minimum distance between the suspension points of a swing measured along the crossbeam shall be calculated as follows (see Figure 14):

$$A = 0{,}04\ h + B \quad (1)$$

where

A is the distance between the suspension points along the crossbeam;

B is the distance between the two junction points of the swing element and the means of suspension measured centre to centre;

h is the distance from the ground to the lower side of the crossbeam.

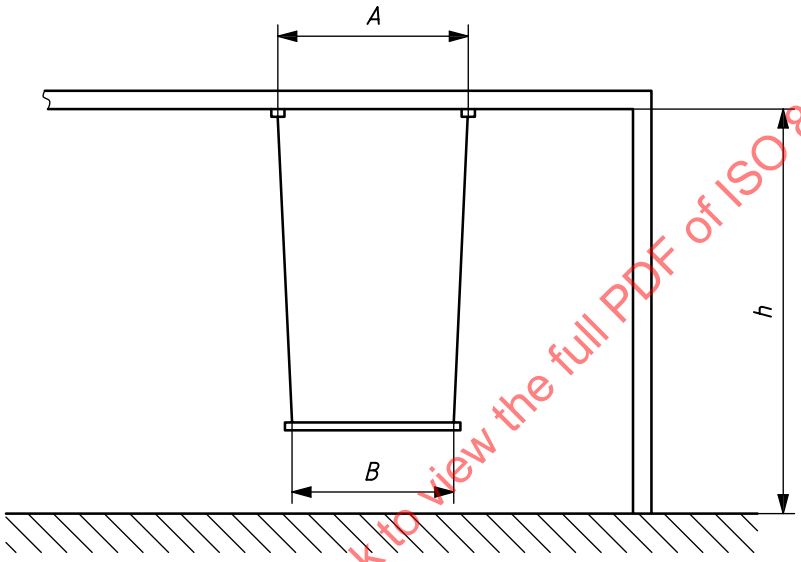


Figure 14 — Minimum distance between suspension points of swings

4.7.7 Minimum clearance between swing elements and the ground

The minimum clearance between swing elements and the ground surface shall be as given in Table 2 when loaded as they are typically used.

Table 2 — Minimum clearances between swing elements and the ground

Swing element	Clearance from the ground surface (mm)
The seating surface of swing elements with flexible means of suspension where the crossbeam height is greater than 1 200 mm	350
The seating surface of swing elements with rigid means of suspension where the crossbeam height is greater than 1 200 mm	400
The seating surface of swing elements where the crossbeam height is 1 200 mm or less	200
Footrests of swing elements	350

For flexible seats, the fixture shown in Figure 13 may be used to simulate a typical load.

4.7.8 Suspension connectors and means of suspension

See A.4.7.8.

a) Suspension connectors on suspended swing elements shall be prefixed when supplied. This requirement does not apply to swings with rigid means of suspension. Methods of attachment requiring the consumer to tie a knot during assembly as the sole means of securing the suspensions to a crossbeam are not permitted.

b) Suspension connectors shall be of a design that will prevent unintentional disconnection.

EXAMPLE Hooks wound over at least 540° or a spring-hook type.

c) Ropes used as means of suspension shall have a minimum diameter of 10 mm (the measurement being the average of five separate measurements taken at representative positions along the rope). Straps and chains shall have a minimum width of 10 mm.

d) Accessible chains shall have an opening of 5 mm maximum in order to prevent fingers from being jammed when loaded (see Figure 15).

e) The need for carrying out checks and maintenance on the main parts at regular intervals shall be drawn to the attention of the users (see 5.3).

f) There shall be no loosening or structural failure of the suspension connectors when tested in accordance with 6.8.

Dimensions in millimetres

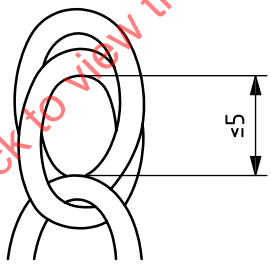


Figure 15 — Maximum openings in chains for swings

4.8 Seesaws

These requirements relate to seesaws in the form of a beam supported on a central pivot point.

The central point of the sitting or standing position of the seesaw shall not exceed a height of 1 200 mm. The sitting or standing position of the seesaw may swing out of the horizontal by a maximum of 30°.

For seesaws where the central point of the sitting or standing position can reach a height of 1 000 mm or more, each end of the seesaw shall be provided with dampening material on the part that touches the ground or shall have a dampening device incorporated in the swing centre.

4.9 Carousels and rocking toys

See A.4.9.

Carousels, rocking toys and similar toys shall comply with the following requirements.

The toy shall not tip over when tested in accordance with 6.1.1.

The toy shall not collapse when tested in accordance with 6.2.1. After testing, the toy shall continue to comply with the relevant requirements of this part of ISO 8124.

When measured from the ground surface to any sitting or standing position, the maximum free height of fall for carousels and rocking toys shall not exceed 600 mm.

5 Warnings and labelling

5.1 Labelling

Labelling shall be permanently and prominently applied to both the toy and the packaging (if supplied). The following information shall be provided:

— that the toy is for domestic use only;

— whether the toy is intended for indoor or outdoor use;

— information as to the mass and/or age of the child for whom the toy is intended;

— if appropriate, the maximum number of children that may safely use the equipment simultaneously;

— identity or contact details of the manufacturer or distributor.

5.2 Assembly and installation instructions

5.2.1 General

Equipment with a designated playing surface of 600 mm or less in height is exempt from the requirements of 5.2.

The information given on the labelling/purchase information shall also be given in the installation instructions.

Activity toys that require assembly by the consumer shall be accompanied by appropriate assembly instructions, including drawings, which shall enable an unskilled layman to correctly assemble the activity toy.

The assembly and installation instructions shall also, when appropriate, include:

— a recommendation to place the activity toy on a level surface at least 1,8 m from any structure or obstruction such as a fence, garage, house, overhanging branches, laundry lines or electrical wires;

— detailed instructions on how anchors shall be installed to prevent overturning or lifting of the support members during normal use or foreseeable misuse, also taking into account the condition of the soil normally encountered;

— instructions that anchors shall be placed level with or under the ground in order to reduce tripping hazards;

— instructions that activity toys (for example swings, slides, climbing frames) should be installed over impact absorbing surfaces such as sand, wood-bark chips, rubber and foam and should not be installed over concrete, asphalt or any hard surface;

— scale drawings of assembly hardware to facilitate the correct length of fasteners being used;

— information to keep assembly and installation instructions for further reference.

5.2.2 Information on playground surfacing materials

5.2.2.1 Maximum fall heights

The instructions shall include the manufacturer's determination of maximum fall height for the product.

Maximum fall heights for products are determined as follows:

— for swings, the maximum fall height is the height of the suspension connector;

— for elevated platforms with barriers, the maximum fall height is the height of the top surface of the barrier;

— for elevated platforms without barriers, the maximum fall height is the height of the top surface of the platform;

— for climbing frames and horizontal ladders, the maximum fall height is the height of the top surface of the component;

— for rocking toys and seesaws, the maximum fall height is the maximum height of the designated play surface normally occupied by a user.

5.2.2.2 Impact attenuating surface

The instructions shall include the “Consumer information sheet for playground surfacing materials” from Annex B or specific surfacing guidelines for the product that are consistent with Annex B.

5.3 Maintenance instructions

Activity toys shall be accompanied by maintenance instructions drawing attention to the need for carrying out checks and maintenance of the main parts (crossbeams, suspensions, anchors, etc.) at regular intervals, pointing out that if these checks are not carried out, the toy could overturn or otherwise become a hazard. Guidelines shall also be provided on how to determine when deterioration has occurred and the requirements for replacing parts when necessary.

The maintenance instructions shall include the wording “Please keep for future reference”.

The maintenance instructions shall, when appropriate, also include the following recommendations pointing out that it is of particular importance that they be followed at the beginning of each season as well as at regular intervals during the usage season:

— check all nuts and bolts for tightness and tighten when required;

— oil all metallic moving parts;

— check all coverings and bolts for sharp edges and replace when required;

— check swing seats, chains, ropes and other means of attachment for evidence of deterioration; replace when required in accordance with the manufacturer's instructions;

— sand rusted areas and tubular members and repaint using a non-lead based paint when required.

6 Test methods

6.1 Stability

6.1.1 Stability of activity toys with a free height of fall of 600 mm or less (see 4.5.2 and 4.9)

6.1.1.1 Principle

The toy is loaded on an incline to simulate a child in an off-centre position.

6.1.1.2 Apparatus

— Loads of mass 50 kg ± 0,5 kg and dimensions as given in Figure 16.

— Loads of mass 25 kg ± 0,2 kg and dimensions as given in Figure 16.

— Inclined plane of 10° ± 1°.

6.1.1.3 Procedure

Load the toy in the most onerous position with a mass of 50 kg ± 0,5 kg on its standing or sitting surface for 5 min.

For toys labelled as not suitable for children 36 months and over, load the toy with a mass of 25 kg ± 0,2 kg.

Place the toy on a 10° ± 1° slope in the most onerous position with respect to stability.

Where the toy is intended to bear the mass of more than one child at a time, load the toy with appropriate masses (25 kg or 50 kg) to represent each child in the most onerous combination of positions that the children may sit or stand.

Observe whether the toy tips over.

6.1.2 Stability of activity toys with a free height of fall of more than 600 mm (see 4.5.3)

6.1.2.1 Principle

A horizontal force is applied at the top of the toy to simulate a child climbing on the toy.

6.1.2.2 Apparatus

— Suitable device(s) to apply a horizontal force of 120 ± 5 N.

— Stops, if needed.

6.1.2.3 Procedure

Assemble the toy in accordance with the manufacturer's instructions and place it on a rigid horizontal surface.

For a free-standing toy, stops may be used to prevent it from slipping on the surface. They shall not, however, prevent the toy from overturning.

Activity toys supplied with removable ground anchors shall be tested with anchors fixed in accordance with the manufacturer's instructions.

Apply a horizontal force of 120 N in the direction most likely to cause the toy to tip over. The force shall be applied at the outermost and highest grippable point. The highest grippable point is, however, limited to 1 500 mm above the highest surface which is of a size that will always support a child.

NOTE 1 1 500 mm is the maximum shoulder height of 95 % of the children aged up to 14.

Apply any number of horizontal forces of 120 N up to the number of children intended to play at the same time on the toy (consult product information). The distance between any two points of application of the force shall be at least 600 mm.

NOTE 2 The most onerous stability condition may occur when less than the maximum number of forces are applied on the toy.

Observe whether the toy tips over.

6.1.3 Stability of slides (see 4.6.1)

6.1.3.1 Principle

The toy is loaded on an incline to simulate a child in an off-centre position.

6.1.3.2 Apparatus

— Loads of mass 50 kg ± 2 kg and dimensions as given in Figure 16.

— Inclined plane of 10° ± 1°.

6.1.3.3 Procedure

Place the toy on a 10° ± 1° slope in the most onerous position with respect to stability.

Slides supplied with removable ground anchors shall be tested with anchors fixed to the standing surface in accordance with the manufacturer's instructions.

Load the geometric centre of each area where a child can sit or stand with a mass of 50 kg ± 2 kg. Such areas include the starting section, ladder, run-out section and sliding section. Secure the load using appropriate means to prevent it from sliding or falling off.

Where the toy is intended to bear the mass of more than one child, masses shall be loaded either simultaneously or individually, depending on which is more onerous.

Observe whether the toy tips over.

6.1.4 Stability of swings and other activity toys with crossbeams (see 4.7.1)

6.1.4.1 Stability of swings and other activity toys with crossbeams more than 1 200 mm above the ground (see 4.7.1.1)

6.1.4.1.1 Principle

A horizontal force is simultaneously applied at each suspension point to simulate the horizontal forces created by pendulum effect.

6.1.4.1.2 Apparatus

— Suitable device(s) to apply a horizontal force from 125 N to (2 000 ± 20) N according to Table 3.

— Stops, if needed.

Table 3 — Examples of horizontal forces

Number of suspension points	1 child	2 children	3 children	4 children
	Force in newtons per suspension point			
1	500	1 000	1 500	2 000
2	250	500	750	1 000
4	125	250	375	500

6.1.4.1.3 Procedure

Assemble the toy in accordance with the manufacturer's instructions and place or fix it on a rigid horizontal surface.

For a free-standing toy, stops may be used to prevent it from slipping on the surface. They shall, however, not prevent the toy from overturning.

Swings and other activity toys with crossbeams supplied with removable ground anchors shall be tested with the anchors fixed to the standing surface in accordance with the manufacturer's instructions.

On the suspension point(s), simultaneously apply horizontal forces of (500 ± 20) N per user in the swinging direction. Where a swing element has multiple suspension points, distribute the load equally between the points (using Table 3 as a guide). Forces on multiple suspension points shall be applied in the same direction simultaneously.

Observe whether the toy tips over.

6.1.4.2 Stability of swings and other activity toys with crossbeams 1 200 mm or less above the ground (see 4.7.1.2)

6.1.4.2.1 Principle

The toy is loaded and operated to simulate its normal use.

6.1.4.2.2 Apparatus

— Loads of mass 25 kg ± 0,2 kg and dimensions as given in Figure 16.

— Blocks, if needed.

6.1.4.2.3 Procedure

Place the toy on a horizontal surface. Blocks shall be used to prevent the front legs from slipping on the surface. They shall, however, not prevent the toy from overturning.

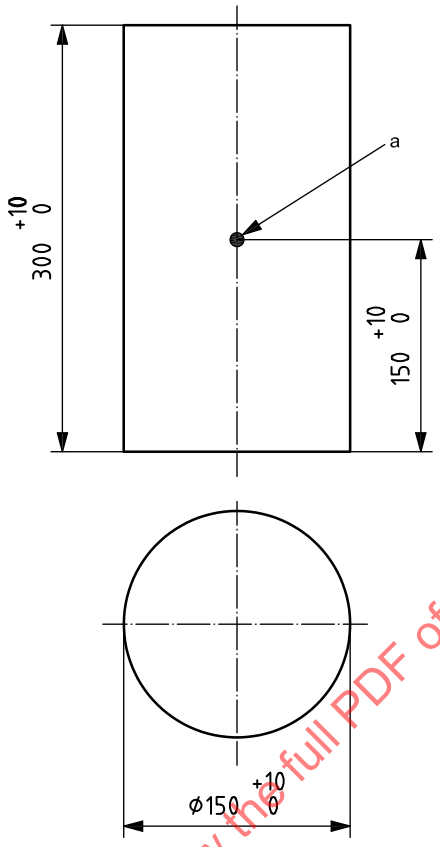
Load the seat with a mass of 25 kg ± 0,2 kg and secure it.

Raise the seat backward to its maximum position, but not exceeding 45° from the vertical, and release it (see Figure 17).

If there is more than one seat, load each seat with a mass of 25 kg ± 0,2 kg and secure it. Raise all seats backward to their maximum position, but not exceeding 45° from the vertical, and release them simultaneously.

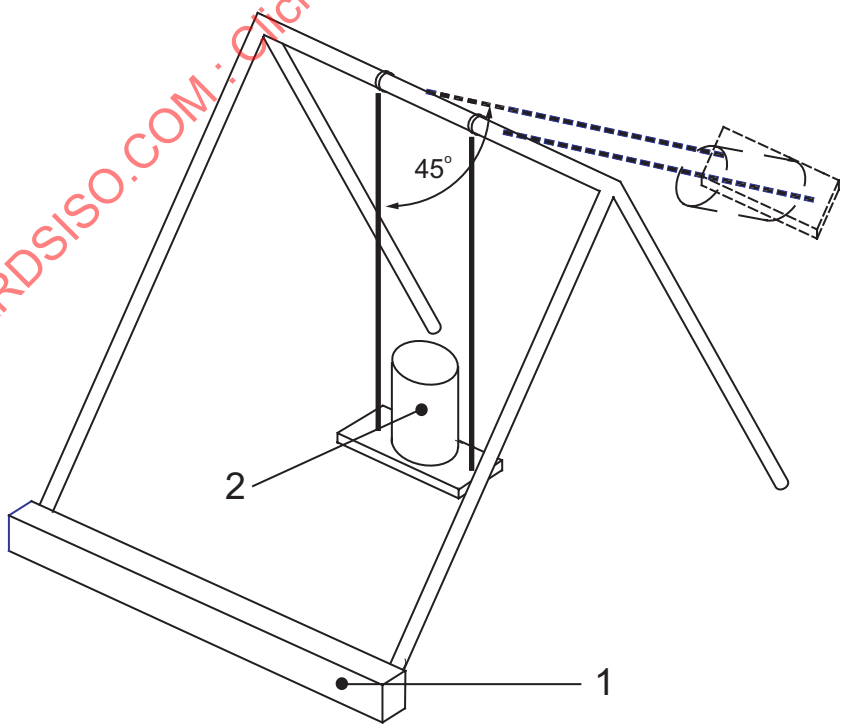
Observe whether the toy tips over.

Dimensions in millimetres



[a] Centre of gravity.

Figure 16 — Load for determination of strength and stability



Key

1 block for the front legs of the swing 2 mass of 25 kg

Figure 17 — Testing of stability of swing sets with crossbeams 1 200 mm **or less above the ground**

6.1.5 Stability of toddler swings (see 4.7.3.2)

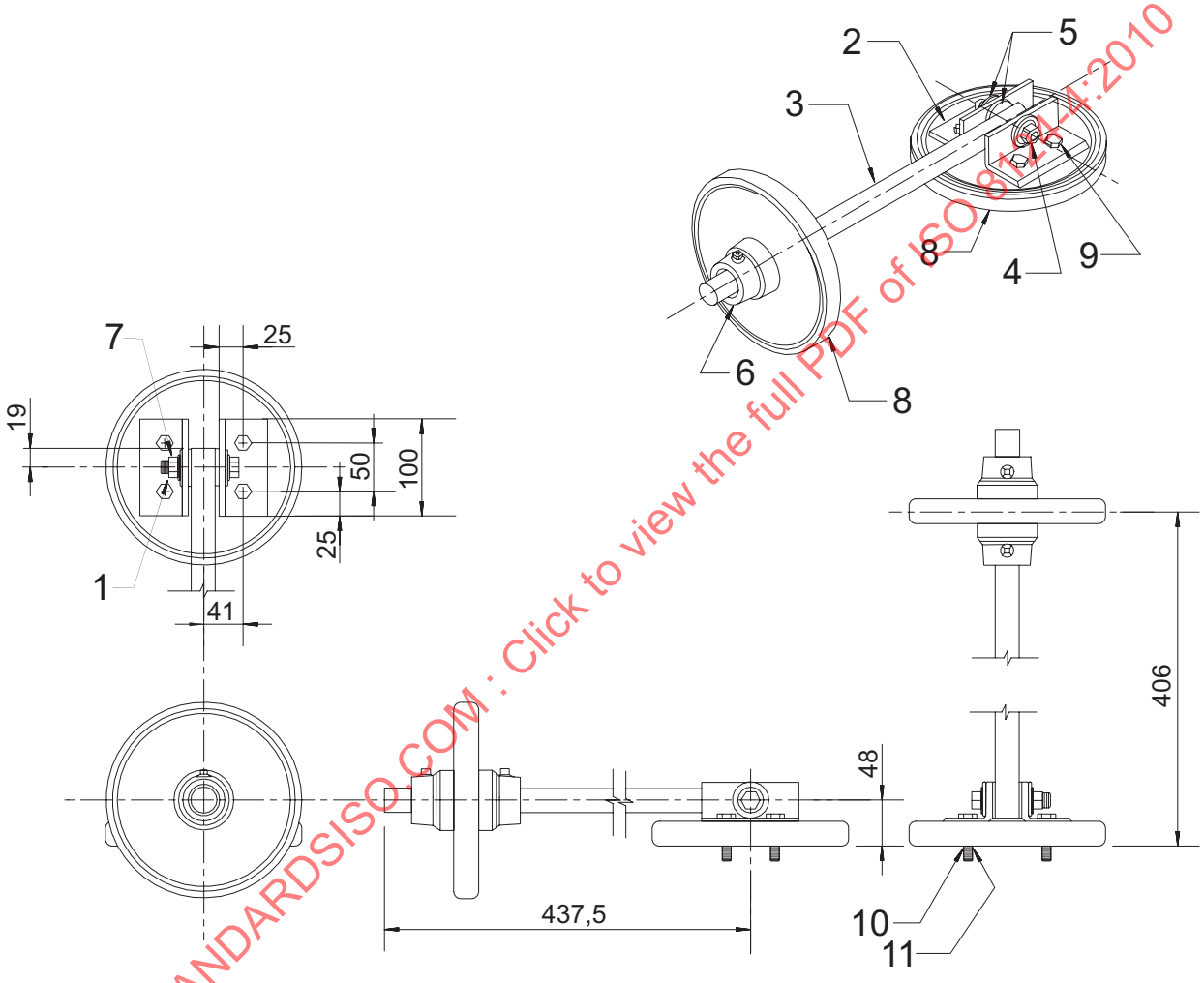
6.1.5.1 Principle

A pendulum is used to simulate a child falling forwards and backwards.

6.1.5.2 Apparatus

Pendulum test apparatus constructed in accordance with dimensions and materials specified in Figure 18.

Dimensions in millimetres



Key

1 bolt assembly with loose fit to allow free movement of pendulum
2 2 × steel angle brackets – 50 × 50 × 100 – 5 mm thick
3 1 × steel tubing – 25 mm CO × 464 mm LG – 1,5 mm wall
4 1 × C/S bolt – 13 UNC – 2A × 64 mm LG
5 4 × C/S washer – 13 × 35 mm OD
6 2 × steel dumbbell collar with set screw – 60 mm OD
7 1 × 13 UNC – 2H hexagonal nut
8 2 × 4,5 kg barbell weight – approximately 30 mm diameter × 25 mm thickness
9 4 × 6 mm threaded bolts – length as needed or assembly
10 4 × 6 mm nuts
11 4 × 6 mm washers

Figure 18 — Pendulum test apparatus for toddler swing

6.1.5.3 Procedure

The pendulum test apparatus consists of a 4,5 kg barbell weight at the top of a freely pivoting bar and a 4,5 kg barbell weight affixed to the bottom of the test apparatus. The barbell weights shall have a maximum diameter of 210 mm. The total mass of the pendulum test apparatus shall not exceed 10,9 kg.

Suspend the toddler swing seat in accordance with the manufacturer's instructions. If the swing height is adjustable, perform the test at both the highest and lowest settings. With the swing at rest, establish a horizontal reference line on the swing seat.

Secure the complete pendulum test apparatus within 13 mm of the geometric centre of the swing seating surface with the direction of travel of the pendulum arm the same as the swing direction.

If the seating area of the toddler swing is made of a flexible material, additional bracing material may be added to the exterior bottom of the swing seat to aid in securing the pendulum test apparatus. Care should be taken to ensure that the additional bracing material does not influence the test results.

The centre of gravity of the top weight of the pendulum test apparatus shall be at a height of 410 mm from the top of the seating surface when the pivot arm is positioned vertically.

NOTE The 410 mm height is based on field testing of swings that were recalled because of tipover and swings that have performed without tipping over.

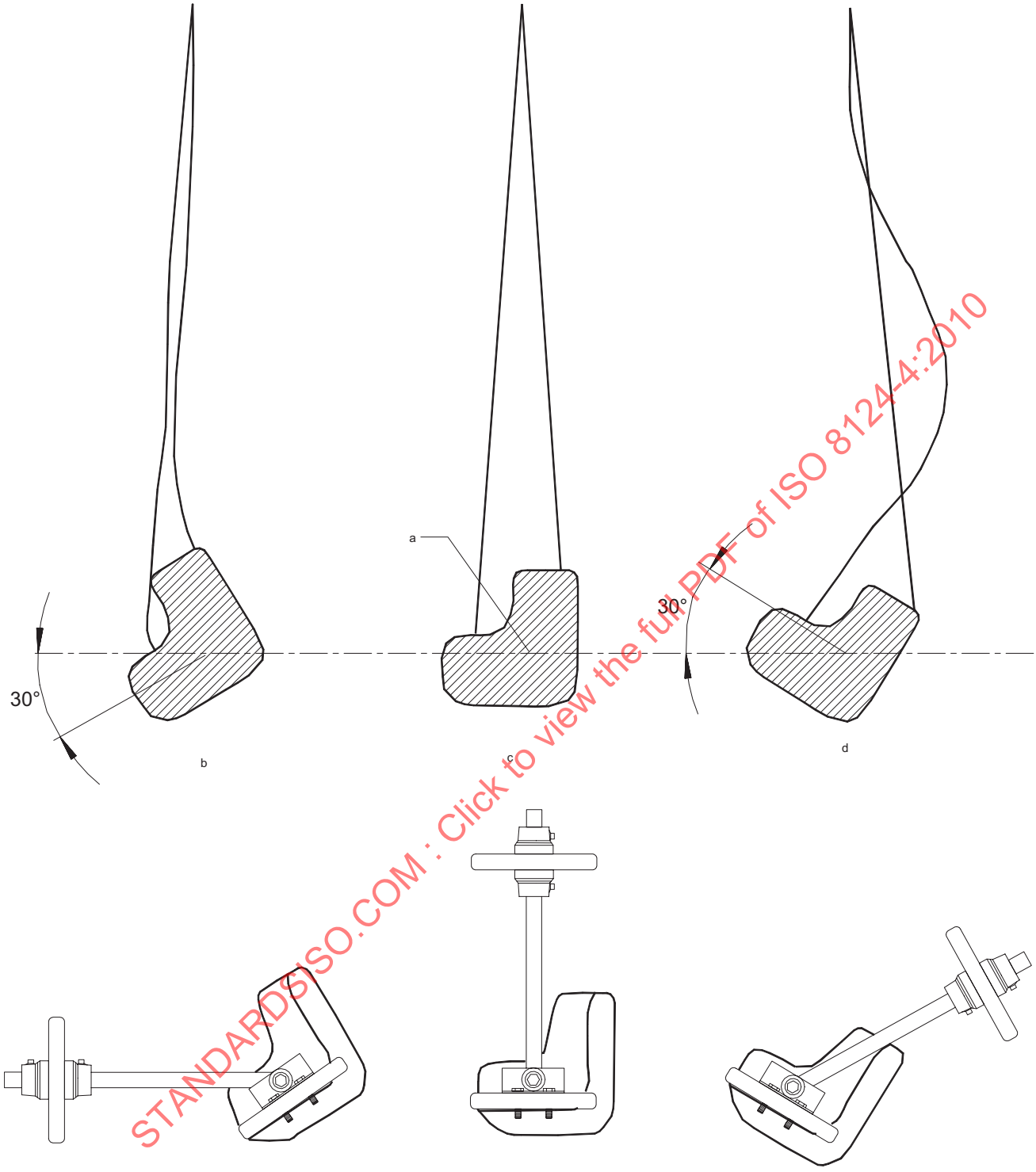
While holding the pendulum test apparatus to the rear of the seat, raise the swing seat in the rear direction to an angle of $60° \, ^{+5}_{-0}$ as measured from vertical to a line that connects the suspension connector pivot point with the geometric centre of the seating surface.

Simultaneously release the swing and pendulum test apparatus and allow it to swing freely until the swing arc is within 15° of vertical in either direction. At this point, stop the swinging motion by slowly returning the swing to its at-rest condition while being careful not to disturb the position of the pendulum test apparatus. Measure the angle of the reference line on the swing seat from the horizontal.

Perform this action three times.

Repeat the test, but with the pendulum test apparatus held in the forward direction.

A swing is considered unstable and fails the requirement of 4.7.3.2 if, during any of the six swing attempts, the pendulum test apparatus tips or falls forward or backward and causes the horizontal reference line of the toddler swing to hang at an angle greater than 30° from its original position (see Figure 19).



a Pivot point.

b 30° forward: fail.

c Horizontal.

d 30° backward: fail.

Figure 19 — Pass/fail criteria for toddler swings

6.2 Static strength

6.2.1 **Strength of toys other than swings** (see 4.1.1 and 4.9)

6.2.1.1 Principle

The toy is loaded so as to simulate the number of children for which it is intended.

6.2.1.2 Apparatus

— Load(s) of mass 50 kg ± 0,5 kg and dimensions as given in Figure 16.

— Load(s) of mass 25 kg ± 0,2 kg and dimensions as given in Figure 16.

6.2.1.3 Procedure

Load the toy in the most onerous position with a mass of 50 kg ± 0,5 kg on its standing or sitting surface. For toys with a crossbeam, apply the load at the centre of the crossbeam. Maintain the load for 5 min.

For toys labelled as not suitable for children over 36 months, load the toy as above with a mass of 25 kg ± 0,2 kg.

Where the toy is intended to bear the mass of more than one child at a time, test every sitting or standing area or centre of a crossbeam simultaneously.

Toys which, due to their design, are inherently unstable shall be supported for the duration of the test. Care should be taken to ensure that any additional support does not influence the load-bearing ability of the toy.

For toys where, by design, the mass of the child is distributed over various positions on the toy, distribute the prescribed load consistent with the recommended use of the toy. In this case, apply other test loads where the number of distribution points has to be taken into account.

Examine whether the toy still complies with the relevant requirements of this part of ISO 8124.

6.2.2 **Strength of swings and similar toys** (see 4.7.2)

6.2.2.1 Principle

The toy is loaded so as to simulate the number of children for which it is intended.

6.2.2.2 Apparatus

a) For swings, except those covered by b):

   — a load with a mass of 200 kg ± 10 kg;

   — loads with a mass of 50 kg ± 2 kg.

b) For swings intended for children under 36 months and with suspension points 1 200 mm or less above the base level:

   — a load with a mass of 66 kg ± 3 kg.

6.2.2.3 Procedure

6.2.2.3.1 Strength of swings intended for children over 36 months (see 4.7.2)

Swings intended for children over 36 months with suspension points more than 1 200 mm above the base level shall be tested as follows.

Assemble the toy in accordance with the manufacturer's instructions and place or fix it on a rigid horizontal surface.

For multi-swings and climbing frames, determine the number of children that are intended to use the toy at the same time (consult the manufacturer's instructions for use).

For swing-boats and suspended seesaws (i.e. a swinging toy with two seats, but only one suspension point), ensure that the load is evenly distributed over the two seats or standing surfaces.

Test a centre swinging pole on a climbing frame as if it were a swing, using the appropriate load.

Apply a load of 200 kg on each standing or sitting surface in turn for a period of 1 h.

Then, apply a load of 50 kg on each standing or sitting surface simultaneously for 1 h.

Determine whether the toy still complies with the relevant requirements of this part of ISO 8124.

6.2.2.3.2 Strength of swings intended for children under 36 months (see 4.7.3)

Swings intended for children under 36 months and with suspension points 1 200 mm or less above the base level shall be tested as follows.

Load the toy with a mass of 66 kg for a period of 1 h.

Ensure that the load is spread evenly over the seat.

NOTE Several methods are possible by using either a framework or by hanging loads from the seat.

Determine whether the swing still complies with the relevant requirements of this part of ISO 8124.

6.3 Dynamic strength of barriers and handrails (see 4.2)

6.3.1 Principle

A sudden horizontal impact stress is applied to the barrier or handrail, through a pad, by a falling load.

6.3.2 Apparatus

— A pad with a length of 200 mm and a height of 50 mm minimum made of textile, leather or similar material and stuffed with suitable material and with a shape that will enable it to be attached to the top of a barrier or handrail.

— A device consisting of a pulley and a 25 kg ± 1 kg mass attached to one end of a non-elastic cord, that will enable a horizontal impact to be applied to the pad on the barrier or handrail by means of a free-falling mass.

An example is given in Figure 20.

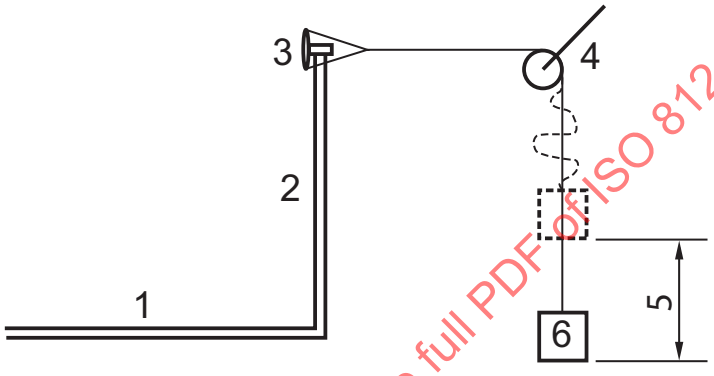
6.3.3 Procedure

Assemble the toy in accordance with the manufacturer's instructions and place or fix it on a rigid horizontal surface.

Place and secure the pad to the top of the barrier or handrail at the most onerous position and without causing any damage to the toy. Attach the free end of the rope to the pad.

Arrange the rope and the pulley so that the load hangs freely. Raise the load vertically 125 mm ± 10 mm and let it drop freely (this will give an impact energy of approximately 30 J). Within 10 s, remove all tension from the barrier.

Observe whether the toy still complies with the relevant requirements of this part of ISO 8124.



Key

1 platform
2 barrier or handrail
3 pad
4 pulley
5 falling height
6 load

Figure 20 — Example of apparatus for dynamic testing of barriers and handrails

6.4 Determination of impact from swing elements (see 4.7.4)

6.4.1 Principle

Swing seats are raised and allowed to swing to strike a test mass. The signal emitted by an accelerometer during each impact is processed (cut-off frequency of 10 kHz) to determine the peak value of acceleration. The impact area between the swing and the test mass is measured and the surface compression is calculated.

6.4.2 Apparatus

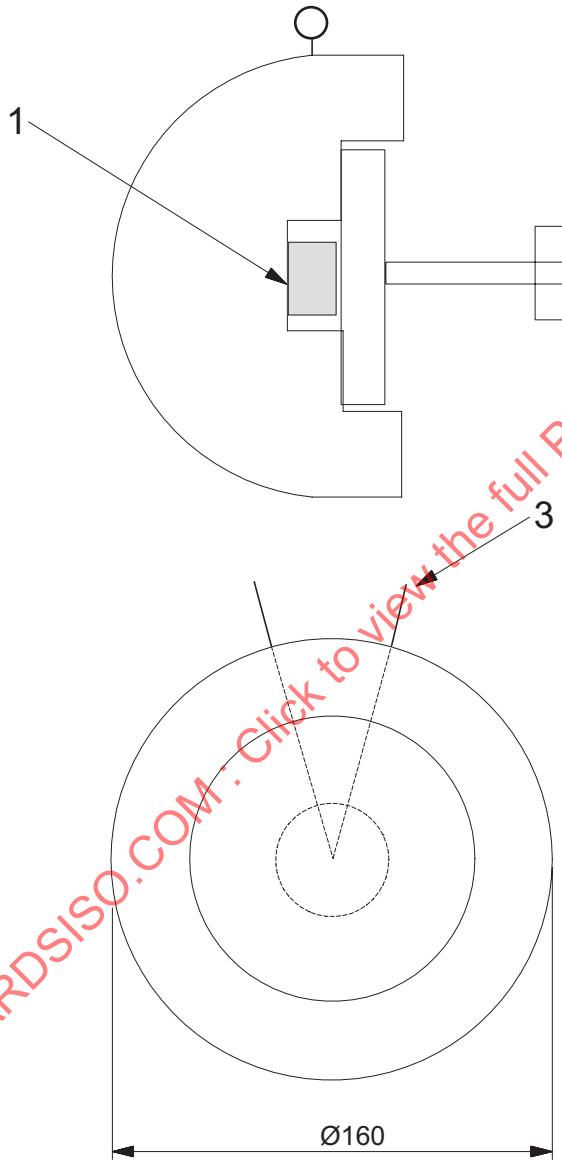
— Test mass, consisting of an aluminium sphere or semi-sphere of radius 80 mm ± 3 mm, and a total mass (including accelerometer) of 4,6 kg ± 0,05 kg. The impacting part between the surface struck and the accelerometer shall be homogeneous and free from voids. Cables connected to the accelerometer shall be placed in such a way that the effect on the mass of the test mass is minimized. An example is given in Figure 21.

— Accelerometer, mounted at the centre of gravity of the test mass assembly with the sensitivity axis aligned to within 2° of the direction of travel of the test mass, capable of measuring acceleration triaxially in the range of ± 500 g with an accuracy of ± 0,1 g and with a frequency range from 0 Hz to 10 000 Hz.

— Amplifier with a sampling frequency of 10 kHz and a cut-off frequency of 10 kHz.

— Two chains where the chain links have a thickness of material (diameter) of 6 mm ± 0,5 mm and an outer major dimension of 47 mm ± 2 mm. The chains shall be of equal length suspended from pivots 600 mm apart at the same height as the suspension connectors, such that they meet at the point of connection to the test mass. The fictive prolongations of the chains shall meet in the centre of the test mass (see Figure 21).

Dimensions in millimetres



Key

1 accelerometer
2 balance weight
3 connection points

Figure 21 — Example of test mass and connection points for chains

6.4.3 Procedure

Assemble and install the swing element to be tested in accordance with the manufacturer's instructions.

Suspend the swing with the means of suspension that has been supplied with the swing and at the maximum height that these permit. If ropes or cables are the means of suspension, they may need to be stretched in order to allow smooth travel when the swing is released during the test. If needed, apply a load of, for example, 5 kg to the end of each rope or cable and leave it for 6 h or until the ropes or cables have been straightened.

Adjust all parts of the set-up so that the suspending chains for the test mass are parallel to the means of suspension for the swing element.

Suspend and adjust the test mass so that the contact point of the swing element and the centre of the test mass are in the same horizontal plane as the centre of gravity of the test mass. Ensure that the chains for test mass are not twisted and that the test mass hangs in a vertical line.

Affix an index mark to the side of swing elements that are supported by chains, ropes, cables or other non-rigid suspending elements. The index mark may be on any part of the suspended member that is immediately below the pivot point in the free-hanging rest position.

Swing elements that are supported by chains, ropes, cables or other non-rigid suspending elements shall be raised along their arc of travel until the side-view projection of a straight line through the pivot point and index mark forms an angle of 60° ± 1° with the vertical. Once the suspended member is raised to the test position, some curvature will be produced in the suspending elements. Adjust the suspended member position to determine that curvature which provides a stable trajectory.

Swing elements that are supported by rigid suspending elements shall be elevated along their arc of travel until the side-view projection of the suspending element, which was vertical in the rest position, is at an angle of 60° ± 1° to the vertical or at the maximum angle attainable, whichever is less.

NOTE Caution should be exercised to prevent damage to the test equipment. If an unusually heavy or hard swing element is to be tested, preliminary tests should be made at lower test angles (for example, 10°, 20°, 30°, etc.). If the requirements are exceeded at a lower test angle than specified above, the member fails and no further tests are necessary.

Support the swing element in the test position by a mechanism that provides release without the application of external forces that would disturb the trajectory of the seat. Prior to release, the swing element and means of suspension shall be motionless. Upon release, the assembly shall travel in a smooth downward arc without any visible oscillations or rotations of the swing element, which will prevent it from striking the test mass at the impact point. If any obvious oscillations or rotations are noted, the test result shall not be registered, but another test shall be performed.

Prior to the start of a series of measurements, it should be ensured that the intended point of impact is achieved. Mark the centre of the test mass, (+), with a chalk marker so that an imprint is obtained on the impact surface of the seat. Check and, if necessary, make fine adjustments of the test mass in the vertical and horizontal directions. Repeat the procedure until repeatability has been obtained for the intended point of impact.

Some seats of a flexible nature will require a brace to maintain the seat configuration during the test procedure. The mass of brace should not exceed 10 % of the mass of the seat. If a brace is used, the requirement for maximum 50 g may be increased by the same percentage as the mass increase caused by the brace (maximum 10 %).

The intended point of impact is defined as the geometrical centre of the impact surface of the swing.

Mark the centre of the test-mass, (+), with a chalk marker so that an imprint is obtained on the impact surface of the element.

Ensure that the test mass is at complete rest and that it is correctly triaxially adjusted.

Elevate the element and release it as specified above so that the swing element collides with the test mass.

Check that the imprint on the impact surface of the element lies within ± 5 mm (vertical direction) and ± 10 mm (horizontal direction) from the intended point of impact.

6.4.4 Results

6.4.4.1 Peak acceleration

Collect data from five impacts (free from obvious oscillations or rotations). Measure the peak acceleration in g for each impact. Calculate the average peak acceleration and check whether the requirement is met. The peak acceleration from one impact shall be calculated as the root-mean-square of the highest values in each direction of measurement:

$$\text{Peak acceleration} = \sqrt{(\text{max. } X)^2 + (\text{max. } Y)^2 + (\text{max. } Z)^2} \quad (2)$$

Note that the maximum value in each direction shall be measured regardless of the time at which it occurs (maximum X may occur at a different moment than maximum Y).

The acceleration, g, shall be registered to one decimal point.

6.4.4.2 Surface compression

In two of the five impact tests, the impact area shall be measured as follows:

— apply chalk to the test mass before the impact test and measure the chalked surface on the swing element after the impact;

— use a transparent celluloid-film (e.g. such as that used for overhead projectors) in order to make a copy of the impact area;

— place a “millimetre paper” under the film and calculate the exact impact area in square centimetres to one decimal place.

Calculate the average impact area for the two tests and thereafter the surface compression in newtons per square centimetre using the equation:

$$\text{Surface compression} = F/A \quad (3)$$

where

A is the average impact area;

F = $m \times a$;

where

m is the test mass (4,6 kg ± 5 %);

a is the average peak acceleration value calculated from the five impact tests.

NOTE 1 If the swing element is deformed during testing, a new sample shall be used for the remaining tests.

NOTE 2 It might be necessary to clean the test mass with spirits between tests.

6.5 Test for head and neck entrapment

6.5.1 Head and neck entrapment in completely bound openings (see 4.2 and 4.4.1)

6.5.1.1 Principle

Test probes are used for assessing completely bound openings for head and neck entrapment.

6.5.1.2 Apparatus

Test probes made of any suitably rigid material and with dimensions as given in Figures 22, 23 and 24.

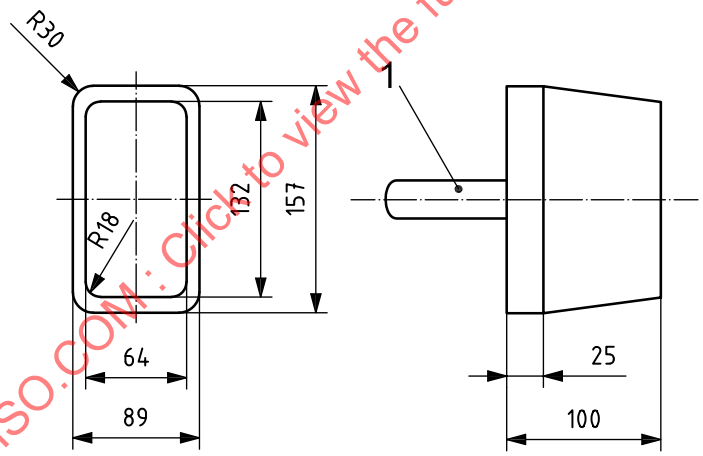
6.5.1.3 Procedure

Insert probe C (Figure 22) into the opening with a force of 220 N. If the opening allows the passage of probe C, determine whether the opening also allows the passage of probe D (Figure 23) when inserted with a force of 100 N.

Insert probe E (Figure 24) into the opening with a force of 100 N. If the opening allows the passage of probe E, determine whether the opening also allows the passage of probe D when inserted with a force of 100 N.

Insert the probes perpendicular to the opening and do not tilt them.

Dimensions in millimetres



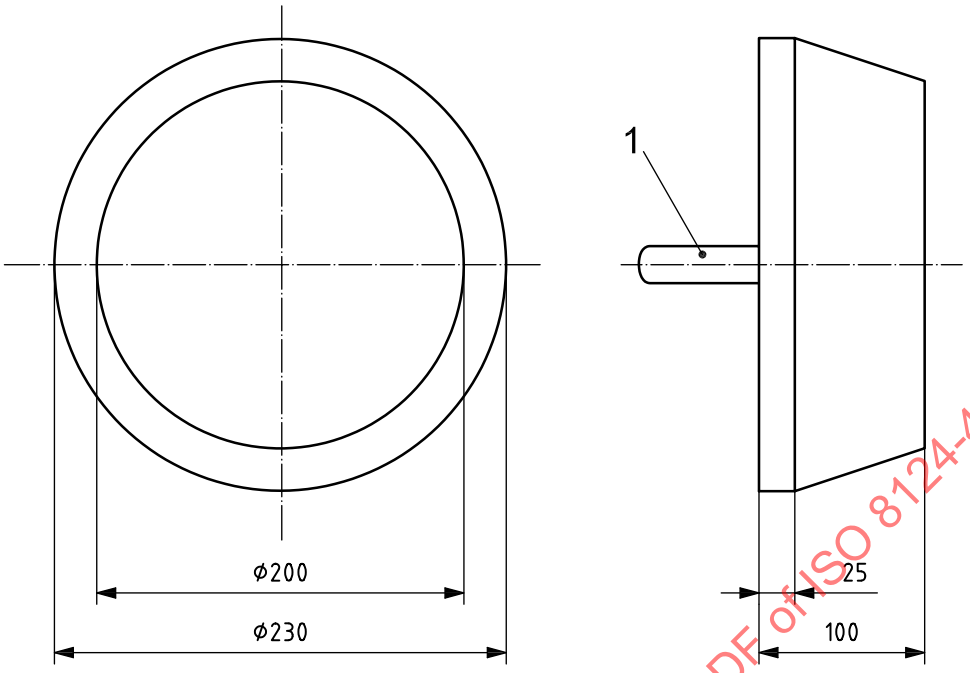
Key

1 handle

NOTE Unless stated otherwise, tolerances on measurements are ± 1 mm for dimensions and ± 1° for angles.

Figure 22 — Probe C (torso) for assessment of completely bound openings

Dimensions in millimetres



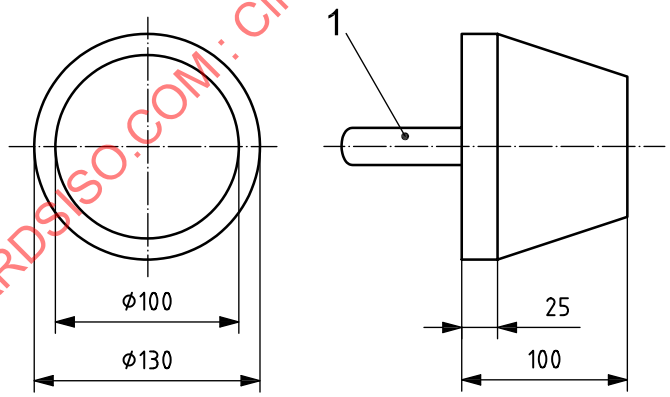
Key

1 handle

NOTE Unless stated otherwise, tolerances on measurements are ± 1 mm.

Figure 23 — Probe D (large head) for assessment of completely bound openings

Dimensions in millimetres



Key

1 handle

NOTE Unless stated otherwise, tolerances on measurements are ± 1 mm.

Figure 24 — Probe E for assessment of completely bound openings

6.5.2 Head and neck entrapment in partially bound and V-shaped openings (see 4.4.1)

6.5.2.1 Principle

A test template is used for assessing partially bound and V-shaped openings for head and neck entrapment.

6.5.2.2 Apparatus

Test template made of any suitable rigid material and with dimensions as given in Figure 25.

6.5.2.3 Procedure

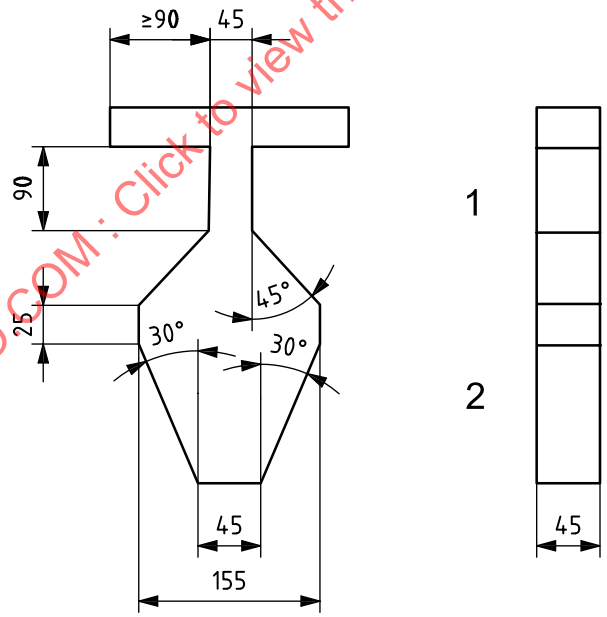
a) Position the "B" portion of the test template between and perpendicular to the boundaries of the opening, as shown in Figure 26.

Observe whether the template fits within the boundaries of the opening or whether it cannot be inserted to its full thickness as indicated in Figure 26.

Determine whether the opening is accessible or not accessible as defined in Figure 26.

b) If the test template can be inserted to a depth greater than the thickness of the template (45 mm) when tested in accordance with a), apply the "A" portion of the test template, so that its centre line is in line with the centre line of the opening. Ensure that the plane of the test template is parallel and applied in line with the opening, as shown in Figure 27.

Dimensions in millimetres



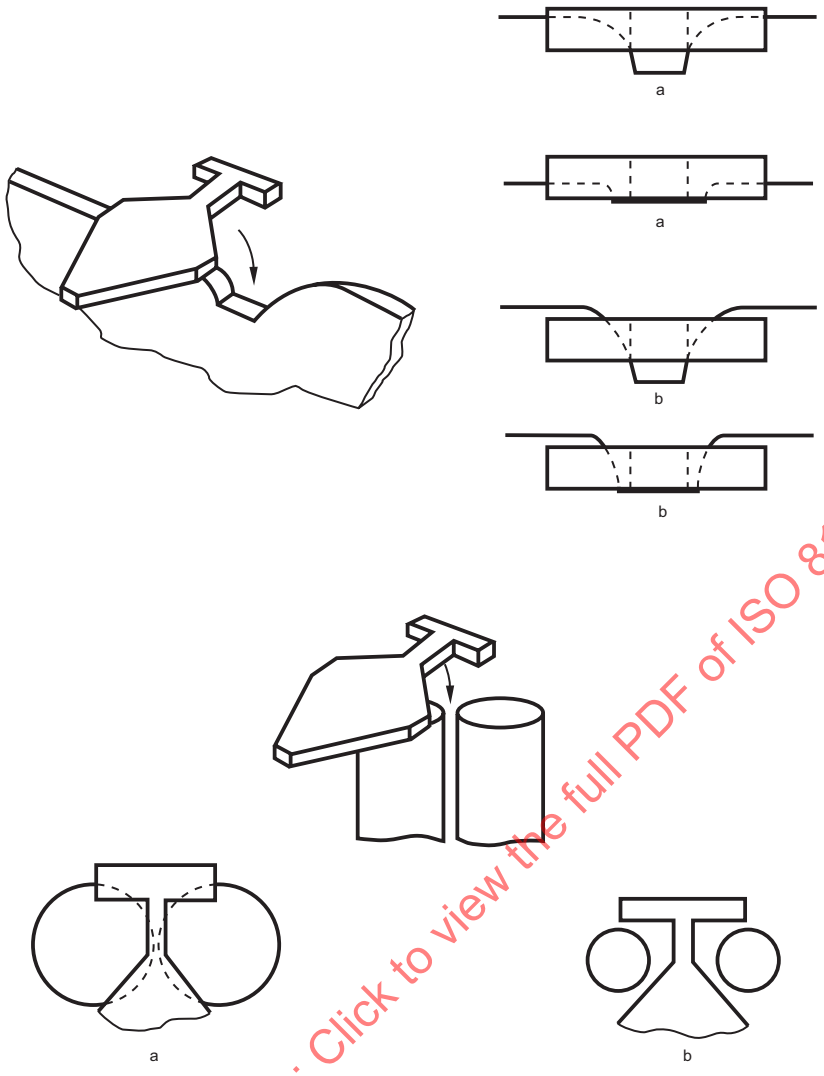
Key

1 portion B

2 portion A

NOTE Unless stated otherwise, tolerances on measurements are ± 1 mm for dimensions and ± 1° for angles.

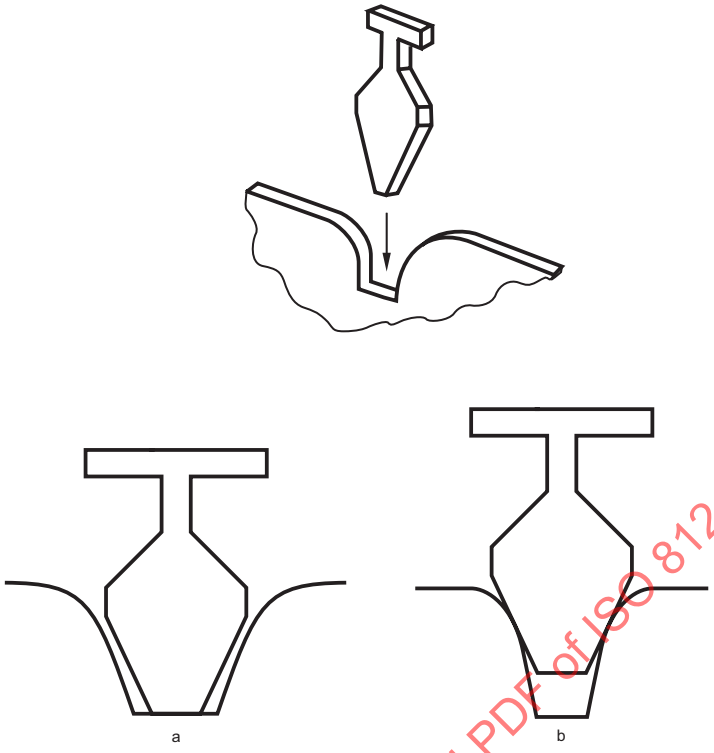
Figure 25 — Test template D for assessment of head and neck entrapment in partially bound and V-shaped openings



a Not accessible.

b Accessible.

Figure 26 — Method of insertion of the “B” portion of the test template



[a] Passes.

[b] Fails.

Figure 27 — Method of insertion of the "A" portion of the test template

Insert the test template along the centre line of the opening until its motion is arrested by contact with the boundaries of the opening or the tip of the template contacts the base.

Observe whether the tip of the template contacts the base of the partially bound or V-shaped opening as indicated in Figure 27.

6.6 Toggle test (see 4.4.2)

6.6.1 Principle

A toggle test device is moved along the direction of a forced movement in order to establish whether there is a potential entrapment hazard.

6.6.2 Apparatus

Toggle test device as shown in Figure 28 a) comprising of:

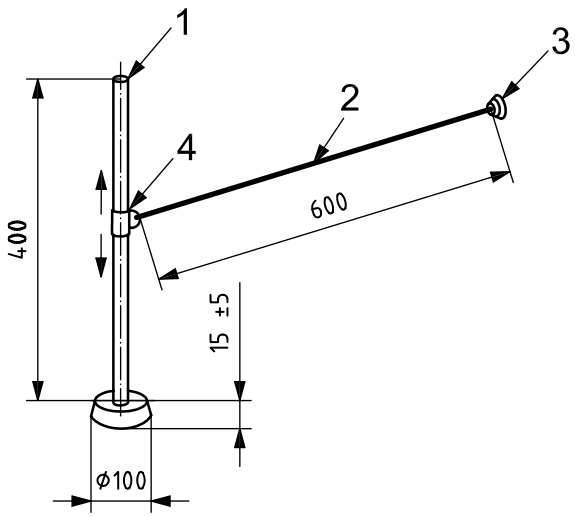
— toggle, as shown in Figure 28 b), made of polyamides (PA) (e.g. nylon) or polytetrafluroethylene (PTFE), which have been found to be suitable materials;

— chain, as shown in Figure 28 c);

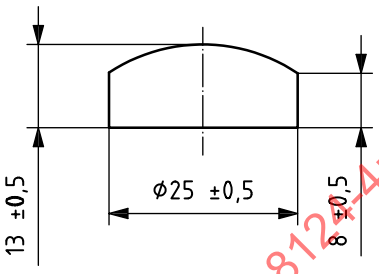
— collar, detachable and with good slip;

— pole.

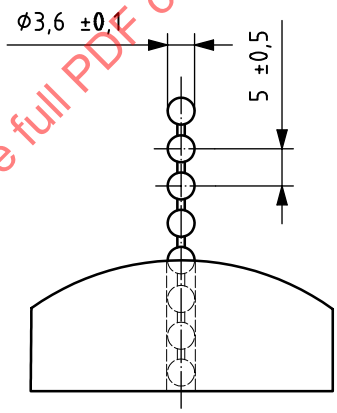
Dimensions in millimetres



a) Complete test device



b) Toggle



c) Chain

Key

1 pole
2 chain
3 toggle
4 collar

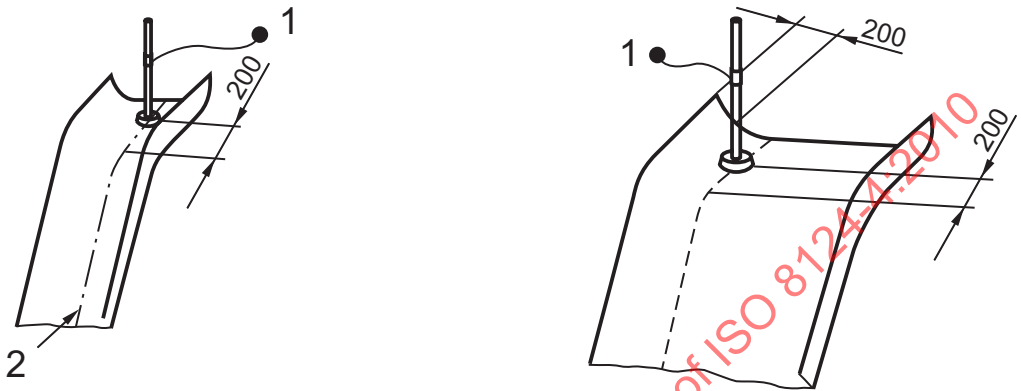
Figure 28 — Toggle test device

6.6.3 Procedure

6.6.3.1 Slides

Position the complete test device vertically 200 mm from the transition point of the starting section of the slide and at the appropriate lateral location, as shown in Figure 29.

Dimensions in millimetres



a) Narrow slide **b) Wide slide**

Key

1 toggle test device

2 centre line

Figure 29 — Positioning of the test device on slides

Apply the toggle and chain to all positions within the range, as follows.

a) Move the complete test device in the direction of the forced movement, ensuring that the pole of the test device remains vertical and that the application of the toggle and chain is influenced solely by its own mass. Do not apply any additional initial force to wedge the toggle or chain in an opening.

b) Where a slide is wider than the width of the test device, carry out the test twice with the base of the pole positioned at both width extremities of the bed way, as shown in Figure 29.

   Observe whether entrapment of the toggle or chain occurs.

6.6.3.2 Fireman's poles

Conduct the test in two different ways, as follows.

a) Position the complete test device vertically at the edge of the platform at the point closest to the fireman's pole.

   Apply the test device to all positions within range, ensuring that the application of the toggle or chain is influenced solely by its own mass. Do not use any additional initial force to wedge the toggle or chain in an opening. If a potential entrapment point is thus identified, move the test device in the direction of the forced movement of a user.

   Observe whether entrapment of the toggle or chain occurs.

b) Detach the toggle and the chain from the complete test device and position it so that it is at a point 1 800 mm above the surface of the adjacent platform, as shown in Figure 30.