



**BSI Standards Publication**

## **Playground equipment and surfacing**

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Part 1: General safety requirements and test methods

## National foreword

This British Standard is the UK implementation of EN 1176-1:2017+A1:2023. It supersedes BS EN 1176-1:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee SW/65, Children's playground equipment.

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

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1.

Significant changes in the requirements for testing the impact attenuation (absorbing) of playground surfacing have been introduced into this edition of the standard to reflect the national variations in surfacing provision across Europe (see clause 5.2). The UK committee therefore provides a National Annex to comply with clause 5.2. National Annex NA contains the UK requirements to be used instead of Annex H of EN 1176-1:2017; these reflect current UK practice that has proven over the lifetime of the current standard to be reasonable and proportionate.

Operators and providers are advised that playground equipment requires regular maintenance; guidance on this and appropriate inspection, maintenance and operational schedules are contained within BS EN 1176-7:2017. Clause 6.1.4 of this standard provides for inspection and maintenance information and guidance from the manufacturer of the equipment; this is to assist operators in determining their safety management system.

It is appreciated that playgrounds are likely to contain a range of equipment from different manufacturers and installed over a number of years; operators should implement any guidance provided by the manufacturer. Item specific detail is not readily available to Annual Playground inspectors whose report contributes to the operators overall Annual Main Inspection as detailed in this standard.

Playground equipment not complying with EN 1176-1:2017 should not automatically be considered as being unsafe or to require replacement. A risk assessment by competent persons should be used to determine what action, if any, is necessary. Manufacturers and inspectors of the Register of Play Inspectors International (RPII) are amongst those that will be able to assist in this.

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**Amendments/corrigenda issued since publication**

| Date             | Text affected                           |
|------------------|-----------------------------------------|
| 31 May 2019      | Correction to Figure 17 Key             |
| 31 May 2019      | Missing NA added                        |
| 30 November 2023 | Implementation of CEN amendment A1:2023 |



English Version

## Playground equipment and surfacing - Part 1: General safety requirements and test methods

Équipements et sols d'aires de jeux - Partie 1 :  
Exigences de sécurité et méthodes d'essai générales

Spielplatzgeräte und Spielplatzböden - Teil 1:  
Allgemeine sicherheitstechnische Anforderungen und  
Prüfverfahren

This European Standard was approved by CEN on 8 June 2017 and includes Amendment approved by CEN on 1 June 2023.

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## European foreword

This document (EN 1176-1:2017+A1:2023) has been prepared by Technical Committee CEN/TC 136 “Sports, playground and other recreational facilities and equipment”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.

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

**A1** This document supersedes EN 1176-1:2017 **A1**.

This document includes Amendment 1, approved by CEN on 2023-06-01.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**

EN 1176 “Playground equipment and surfacing” consists of the following parts:

- Part 1: *General safety requirements and test methods*
- Part 2: *Additional specific safety requirements and test methods for swings*
- Part 3: *Additional specific safety requirements and test methods for slides*
- Part 4: *Additional specific safety requirements and test methods for cableways*
- Part 5: *Additional specific safety requirements and test methods for carousels*
- Part 6: *Additional specific safety requirements and test methods for rocking equipment*
- Part 7: *Guidance on installation, inspection, maintenance and operation*
- Part 10: *Additional specific safety requirements and test methods for fully enclosed play equipment*
- Part 11: *Additional specific safety requirements and test methods for spatial network*

This part of EN 1176 should be read in conjunction with:

- EN 1177, *Impact attenuating playground surfacing — Determination of critical fall height*;
- CEN/TR 16467:2013, *Playground equipment accessible for all children*;
- CEN/TR 16598:2014, *Collection of rationales for EN 1176*;
- CEN/TR 16396:2012, *Playground equipment for children, replies to requests for interpretation of EN 1176:2008 and its parts*;
- CEN/TR 16879:2016, *Siting of playground and other recreational facilities — Advice on methods for positioning and separation*.

For inflatable play equipment, see EN 14960, *Inflatable play equipment — Safety requirements and test methods*.

The main changes from the previous edition of this standard are as follows:

- a) Reference to CEN/TR 16467:2013, CEN/TR 16598:2014, CEN/TR 16396:2012, CEN/TR 16879:2016 added;
- b) Scope amended to include reference to 'permanently installed' also reference to electricity, water and UV added;
- c) Clause 3.25 definition of easily accessible improved;
- d) New definitions added for impact attenuating surfacing, adequate level of impact attenuation, forced movement, bouncing facilities, suspension bed, one post equipment, post installation inspection, fireman's pole and tunnel;
- e) Clause 4.2.4.1 amended to agree with Figure 8;
- f) Clause 4.2.4.3 and 4.2.4.4 detail of measurement of 500 mm opening added;
- g) Clause 4.2.7.1 new sentence adding reference to Clause 4.2.7.2;
- h) Figure 13 amended to show direction of travel;
- i) Clause 4.2.8.1 cross reference to Table 2 added;
- j) Table 2 amended to clarify distinctions for climbing and hanging fall heights;
- k) Figure 14 amended to include two types of net structure in fall height examples;
- l) Clause 4.2.8.2.5 clarification of overlapping falling spaces added;
- m) Clause 4.2.8.5.2 and Table 4 revised to align with changes to EN 1177;
- n) Clause 4.2.9.5 major rewrite to clarify requirements for easily accessible equipment;
- o) Clause 4.2.12.2 inclusion of reference to use of probe E;
- p) New Clause 4.2.16 giving requirements for bouncing facilities;
- q) Clauses 5.2 and Annex H relating to Impact Attenuating Surfacing added;
- r) Clauses 6.2 amended to give more information on Impact Attenuating Surfacing;
- s) A.2.2, notes 1 and 2 now included as part of requirements;
- t) D.4.2, last paragraph now includes additional test requirement for holes behind holes;
- u) New test (D.5) and Figure (D.13) for testing chain openings added;
- v) New Figure (D.12) showing application of finger probes in test situations;
- w) New test (D.6) for bouncing facilities;

- x) New Annex F showing illustrations of free height of fall;
- y) New Annex G showing illustration of sieve test results and sieve curve;
- z) New Annex H "Procedure for confirming the adequate level of impact attenuation after installation of impact attenuating surfacing" added;
- aa) Annex I "A-Deviations" updated.

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

## Introduction

For the quality of reading and understanding this standard, the following wording is used:

- shall = requirement;
- should = recommendation;
- may = permission;
- can = possibility.

It is not the purpose of the requirements of this standard to lessen the contribution that playground equipment makes to the child's development and/or play, which is meaningful from an educational point of view.

This standard acknowledges the difficulties of addressing safety issues by age criteria alone because the ability to handle risk is based on the individual users' level of skills and not age. Also, users other than the intended age range will almost certainly make use of the playground equipment.

Risk-taking is an essential feature of play provision and of all environments in which children legitimately spend time playing. Play provision aims to offer children the chance to encounter acceptable risks as part of a stimulating, challenging and controlled learning environment. Play provision should aim at managing the balance between the need to offer risk and the need to keep children safe from serious harm.

The principles of safety management are applicable both to workplaces in general as well as to play provision. However, the balance between safety and benefits is likely to be different in the two environments. In play provision, exposure to some degree of risk might be of benefit because it satisfies a basic human need and gives children the chance to learn about risk and consequences in a controlled environment.

Respecting the characteristics of children's play and the way children benefit from playing on the playground with regard to development, children need to learn to cope with risk and this can lead to bumps and bruises and even occasionally a broken limb. The aim of this standard is first and foremost to prevent accidents with a disabling or fatal consequence, and secondly to lessen serious consequences caused by the occasional mishap that inevitably will occur in children's pursuit of expanding their level of competence, be it socially, intellectually or physically.

Refusal of admittance and access as a safety precaution is problematic due to, for example, breach in supervision or help by peers. Requirements of significant importance, such as head and neck entrapment and protection against inadvertent falls, have been written with this in mind. It is also recognized that there is an increasing need for play provision to be accessible to users with disabilities. This of course requires play areas to provide a balance between safety and the offer of the required level of challenge and stimulation to all possible groups of users. However, for the purposes of protection against head and neck entrapment, this standard does not take into account children with an increased head size e.g. hydrocephalus or Down's syndrome or wearing helmets.

For further information about making play provision suitable for less able users a CEN Technical Report is available which discusses the challenges in provision and possible solutions that designers can consider. See the European foreword for details of this document.

In addition to the short-term risks that are associated with a playground, there is a risk that the playing child is overexposed to the ultraviolet radiation of the sun. Too much ultraviolet radiation and sunburns in childhood increase the risk of developing skin cancer later in life. Therefore, the playgrounds should be organized in a way that takes into account of the availability of shade options, and that a part of the playground equipment and recreational areas are placed entirely or partly in shade.

## 1 Scope

This part of EN 1176 specifies general safety requirements for permanently installed public playground equipment and surfacing. Additional safety requirements for specific pieces of playground equipment are specified in subsequent parts of this standard.

This part of EN 1176 covers playground equipment for all children. It has been prepared with full recognition of the need for supervision of young children and of less able or less competent children.

The purpose of this part of EN 1176 is to ensure a proper level of safety when playing in, on or around playground equipment, and at the same time to promote activities and features known to benefit children because they provide valuable experiences that will enable them to cope with situations outside the playground.

This part of EN 1176 is applicable to playground equipment intended for individual and collective use by children. It is also applicable to equipment and units installed as children's playground equipment although they are not manufactured as such, but exclude those items defined as toys in EN 71 and the Toys Safety Directive.

It is not applicable to adventure playgrounds with the exception of those items which have been commercially sourced.

**NOTE** Adventure playgrounds are fenced, secured playgrounds, run and staffed in accordance with the widely accepted principles that encourage children's development and often use self-built equipment.

This part of EN 1176 specifies the requirements that will protect the child from hazards that they might be unable to foresee when using the equipment as intended, or in a manner that can be reasonably anticipated.

The use of electricity in play equipment, either as a play activity or as a motive force, is outside the scope of this standard. The attention of users is drawn to European and local national standards and regulations which are to be complied with when using electricity.

Play equipment placed in water and where water can be seen as impact attenuating surfacing is not fully covered by this standard and additional risks are associated with wet environments.

The risk of exposure to excessive levels of UV radiation is not covered in this standard.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 335, *Durability of wood and wood-based — - Use classes: definitions, application to solid wood and wood-based products*

EN 350:2016, *Durability of wood and wood-based products — Testing and classification of the durability to biological agents of wood and wood-based materials*

EN 351-1:2007, *Durability of wood and wood-based products — Preservative-treated solid wood — Part 1: Classification of preservative penetration and retention*

EN 636, *Plywood — Specifications*

EN 818-2:1996+A1:2008, *Short link chain for lifting purposes — - Safety — Part 2: Medium tolerance chain for chain slings — Grade 8*

EN 818-3:1999+A1:2008, *Short link chain for lifting purposes — Safety — Part 3: Medium tolerance chain for chain slings — Grade 4*

EN 1177, *Impact attenuating playground surfacing — Determination of critical fall height*

EN 1991-1-2, *Eurocode 1: Actions on structures — Part 1— 2: General actions — Actions on structures exposed to fire*

EN 1991-1-3, *Eurocode 1 — Actions on structures — Part 1-3: General actions — Snow loads*

EN 1991-1-4, *Eurocode 1: Actions on structures — Part 1-4: General actions — Wind actions*

EN 13411-3, *Terminations for steel wire ropes — Safety — Part 3: Ferrules and ferrule-securing*

EN 13411-5, *Terminations for steel wire ropes — Safety — Part 5: U-bolt wire rope grips*

EN ISO 2307, *Fibre ropes — Determination of certain physical and mechanical properties (ISO 2307:2019)*

EN ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3:2016)*

EN ISO 9554, *Fibre ropes — General specifications (ISO 9554:2019)*

EN ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (ISO 13934-1:2013)*

### 3 Terms and definitions

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

#### 3.1

##### **playground equipment**

equipment and structure, including components and constructional elements with, or on which, children can play outdoors or indoors, either individually or in groups, according to their own rules or own reasons for playing which can change at any time

#### 3.2

##### **climbing equipment**

playground equipment that only allows the user to move on it or in it by the use of a hand and foot/leg support and requires a minimum of three points of contact with the equipment, one of these being a hand

Note 1 to entry: During movement, it is possible to have only one or two points of contact but this is only during a transition from one rest position to the next.

#### 3.3

##### **impact area**

area that can be hit by a user after falling through the falling space

#### 3.4

##### **impact attenuating surfacing**

surfacing on impact areas intended to reduce the risk of injury when falling onto it

### 3.5

#### **playing surface**

surface of a playground from which the use of the playground equipment commences and which comprises at least the impact area

### 3.6

#### **free space**

space in, on or around the equipment that can be occupied by a user undergoing a movement forced by the equipment

Note 1 to entry: Examples for this are sliding, swinging, rocking, jumping in bouncing facility for several users (specific requirements are dealt with in the additional parts of EN 1176).

Note 2 to entry: See Figures 15, 16 and 19.

### 3.7

#### **free height of fall**

greatest vertical distance from the clearly intended body support to the impact area below

Note 1 to entry: The intended body support includes those surfaces to which access is encouraged.

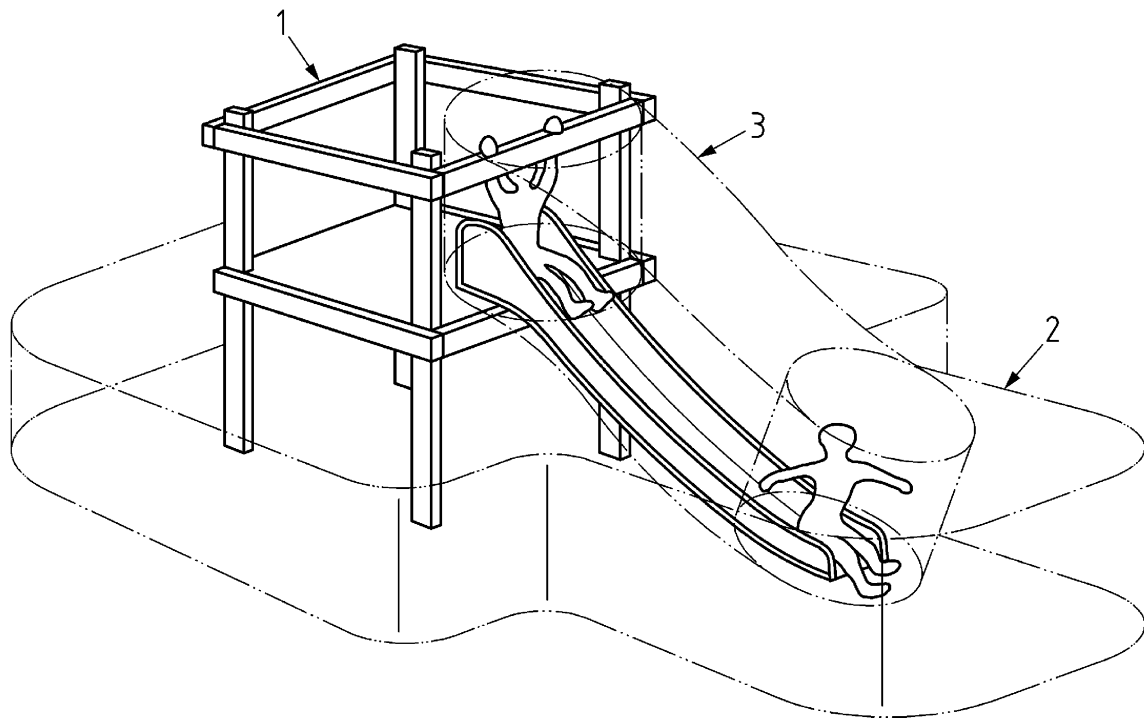
### 3.8

#### **falling space**

space in, on or around the equipment that can be passed through by a user falling from an elevated part of the equipment

Note 1 to entry: The falling space commences at the free height of fall.

Note 2 to entry: See Figure 1.

**Key**

- 1 space occupied by equipment
- 2 falling space
- 3 free space

**Figure 1 — Spaces****3.9****minimum space**

space required for the safe use of equipment, comprising falling space, free space and space occupied by the equipment

**3.10****collective use**

use by more than one user at the same time

**3.11****crushing point**

place where parts of the equipment can move against each other, or against a fixed area so that persons, or parts of their body, can be crushed

**3.12****shearing point**

place where part of the equipment can move past a fixed or other moving part, or past a fixed area so that persons, or parts of their body, can be cut

**3.13****ladder**

means of access incorporating rungs or steps on which a user can ascend or descend with the aid of the hands

Note 1 to entry: See Figure 2.

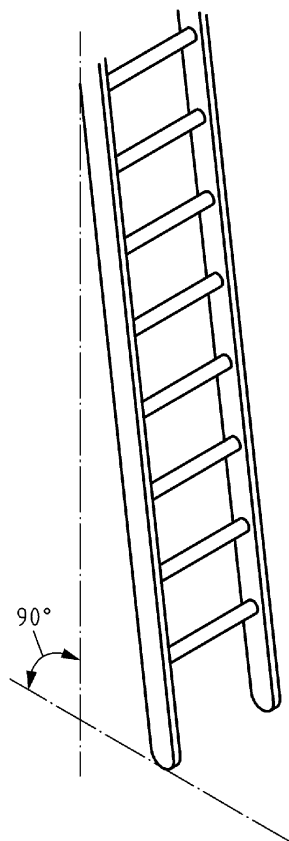


Figure 2 — Example of a ladder

### 3.14

#### stair

<playground equipment>

means of access incorporating three or more risers on which a user can ascend or descend

Note 1 to entry: See Figure 3 and Figure 21.

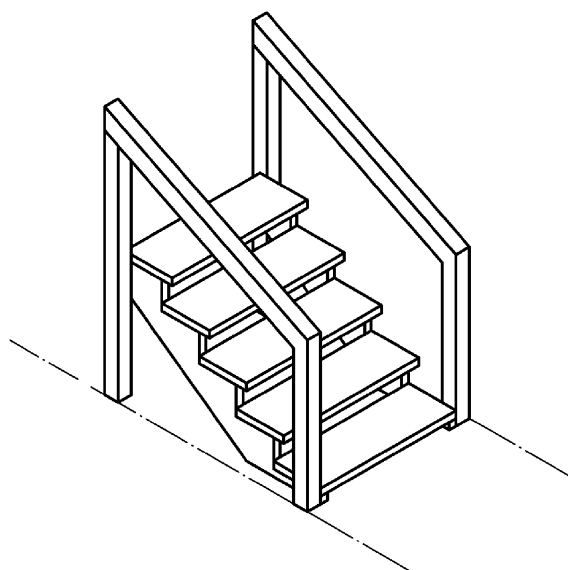


Figure 3 — Example of stairs

**3.15****ramp**

means of access incorporating an inclined surface on which a user can ascend or descend

Note 1 to entry: See Figure 4 and 4.2.9.3.

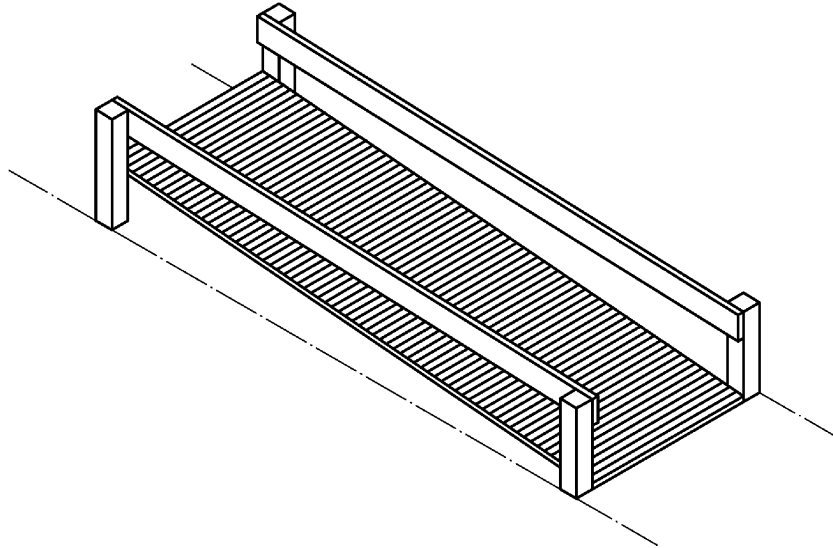


**Figure 4 — Example of a ramp**

**3.16****grip**

holding of the hand round the entire circumference of a support

Note 1 to entry: See Figure 5.

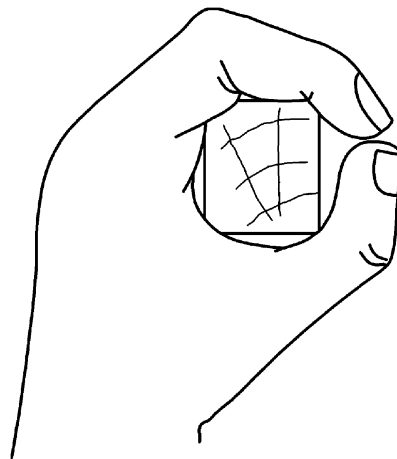


**Figure 5 — Grip**

**3.17****grasp**

holding of the hand round part of the circumference of a support

Note 1 to entry: See Figure 6.

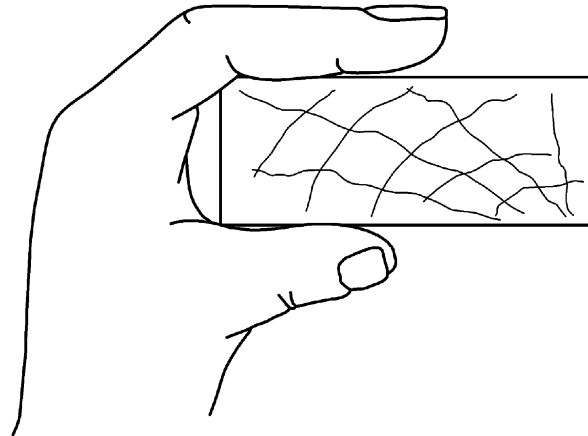


Figure 6 — Grasp

### 3.18

#### **entrapment**

hazard presented by the situation in which a body, or part of a body, or clothing can become trapped

Note 1 to entry: This part of EN 1176 only considers certain types of entrapment where the user is not able to free themselves and injury is caused by the entrapment.

### 3.19

#### **obstacle**

object or portion of object that protrudes inside the space occupied by equipment, the falling space or the free space of a user

Note 1 to entry: The risks associated with obstacles in playground equipment will vary according to its situation in, on or around the equipment e.g.:

- in the free space, something in the path of a user undergoing a forced movement;
- in the falling space, something hard and sharp that a user can hit during a fall from an elevated position;
- for other types of movement, something unexpected with which a user might collide whilst moving in, on or around the equipment.

### 3.20

#### **cluster**

two or more separate pieces of equipment designed to be installed in close proximity to each other to provide continuity in a sequence that is needed for the play activity

Note 1 to entry: An example for a cluster is a trail of stepping stones.

### 3.21

#### **platform**

raised surface where one or more users can stand without the need of hand support

Note 1 to entry: The classification of a platform will vary depending on the function of the playground equipment. Surfaces where the user is only able to stand with the aid of hand supports are not classified as platforms. This may be achieved by a number of means, e.g.:

- reducing the surface area to restrict free movement and encourage holding on;
- incline the surface to encourage holding on;
- introducing movement to the surface to encourage holding on.

**3.22****handrail**

rail intended to assist the user to balance

**3.23****guardrail**

rail intended to prevent a user from falling

**3.24****barrier**

device intended to prevent the user from falling and from passing beneath

**3.25****easily accessible**

requiring only basic skills to access the equipment, allowing users to move freely and quickly onto/within the equipment, without further considerations about the use of hands and feet

Note 1 to entry: Basics skills should control the ability of a child to use a means of access. If the user needs to consider where or how to use their hands and feet when negotiating a means of access the access should generally be considered not easy as it slows down the movement and provides time for intervention.

**3.26****routine visual inspection**

inspection intended to identify obvious hazards that can result from normal use, vandalism or weather conditions

Note 1 to entry: Typical hazards can take the form of broken parts or broken bottles.

**3.27****operational inspection**

inspection, more detailed than routine visual inspection, to check the operation and stability of the equipment

Note 1 to entry: Typical checks include an examination for wear.

**3.28****annual main inspection**

inspection intended to establish the overall level of safety of equipment, foundations and playing surfaces

Note 1 to entry: Typical checks include the effects of weather, evidence of rotting or corrosion and any change in the level of safety of the equipment as a result of repairs made, or of added or replaced components.

**3.29****steep play element**

access/egress play element of a gradient greater than 45 ° from the horizontal

**3.30****tiered platforms**

successive platforms of varying heights allowing the user to ascend or descend on or within the equipment

Note 1 to entry: Stairs are not considered to be tiered platforms.

### 3.31

#### **critical fall height**

maximum free height of fall for which a surface will provide an adequate level of impact attenuation

Note 1 to entry: The critical fall height is determined according to the lowest test result obtained in accordance with EN 1177.

### 3.32

#### **adequate level of impact attenuation**

property of a surface having the necessary impact attenuation for a given free height of fall, which is in compliance with:

- a) Table 4, including sieve test in accordance with EN 933-1;
- b) EN 1177;
- c) other appropriate means of verification e.g. value based judgement for turf/topsoil

### 3.33

#### **surface flash**

rapid spread of flame over the surface of a material without combustion of the basic structure at that time

### 3.34

#### **forced movement**

movement of the user caused by the equipment (e.g. swinging, sliding, carousel rotation etc.) which, once started, cannot be totally controlled by the user

Note 1 to entry: Falls are not considered forced movement as they are not imposed on the user by the equipment but occur for other reasons.

Note 2 to entry: Specific requirements are dealt with in the additional parts of EN 1176.

### 3.35

#### **bouncing facility**

playground equipment or equipment parts that due to their flexible characteristics have the main purpose of allowing users to become airborne by jumping without the aid of other user(s)

Note 1 to entry: In most cases, the bounce effect can be caused by a spring, rope or flexible suspension bed material. However, some structures that have a minor bouncing effect are not considered as bouncing facilities since their intended main use is not bouncing.

Note 2 to entry: Typically, bouncing facilities do not act as trampolines as they do not allow for high jumps or encourage acrobatic jumps, which are more likely to lead to serious injuries or fatalities.

### 3.36

#### **suspension bed**

flexible section of a bouncing facility upon which the user jumps

**3.37****one post equipment**

structurally vulnerable equipment where the failure of one cross-section (either at the foundation or elsewhere in the support post) would be catastrophic

Note 1 to entry: This definition includes not only structures with a single support but also those where stability is provided by two legged members or rows of members (see also note to 4.2.14).

**3.38****post installation inspection**

inspection usually undertaken prior to the opening of a playground for public use, intended to assess the equipment and its environment for the overall level of safety on the playground

**3.39****fireman's pole**

vertical or near vertical tube down which users may glide

Note 1 to entry: The word 'glide' is used here to help distinguish this type of equipment from slides as defined in EN 1176-3.

**3.40****tunnel**

<playground equipment>  
continuous enclosed tube-like opening with a length that requires crawling or kneeling to pass through

**4 Safety requirements****4.1 Materials****4.1.1 General**

Materials shall conform to 4.1.2 to 4.1.6.

Materials shall be selected and protected such that the structural integrity of the equipment or impact attenuating surfacing manufactured from them is not affected before the next relevant inspection and maintenance.

NOTE EN 1176-7 gives recommendations on inspections and maintenance.

The provisions relating to certain materials in this standard do not imply that other equivalent materials are unsuitable in the manufacture of playground equipment.

The selection of materials and their use should be in accordance with appropriate European Standards.

Special attention should be given to surface coatings to avoid potential toxic hazards.

The choice of materials should be appropriate where extreme climatic or atmospheric conditions are to be expected. Care should be taken where direct skin contact is to be expected.

In the choice of a material or substance for playground equipment or impact attenuating surfacing, consideration should be given to the eventual disposal of the material or substance having regard to any possible environmental toxic hazard.

**4.1.2 Flammability**

To avoid the risk of fire and associated hazards, materials known to produce surface flash shall not be used. Particular attention should be given to newly developed products whose properties might not be fully known.

NOTE 1 Requirements for adequate exits to ensure escape in cases of fire are given in 4.2.3.

NOTE 2 Attention is drawn to national and local building regulations regarding flammability for equipment installed both indoors and outdoors.

#### **4.1.3 Timber and associated products**

Timber parts shall be designed in such a way that precipitation can drain off freely and water accumulation shall be avoided.

In cases of ground contact, one or more of the following methods shall be used:

- a) use of timber species with sufficient natural resistance in accordance with classes 1 and 2 of the natural resistance classification given in EN 350:2016, 5.2;
- b) construction methods, e.g. post shoe;
- c) use of timber treated with wood preservatives in accordance with EN 351-1:2007, Figure A.1, and in accordance with EN 335, use class 4.

NOTE It is advised to also consider other factors which can be unsuitable, such as splintering, poisoning etc.

All components made of timber and associated products, other than those species conforming to a), that affect the stability of the structure and are in constant contact with the ground shall be treated in accordance with c).

When selecting metal fastenings, consideration should be given to the species of timber and chemical treatments used as some will accelerate corrosion of metals if there is contact between them.

Plywood shall be in accordance with EN 636 and shall be weatherproofed.

#### **4.1.4 Metals**

Metal parts should be protected against atmospheric conditions and cathodic corrosion.

Metals that produce toxic oxides that scale or flake shall be protected by a non-toxic coating.

#### **4.1.5 Synthetics**

If, during maintenance, it is difficult to determine at what point material becomes brittle, manufacturers shall give an indication of the time period after which the part or equipment or impact attenuating surfacing should be replaced.

It should be possible for the operator of the playground to visually identify excessive wear of the gelcoat of GRP (glass-reinforced plastics) products intended for sliding before the user becomes exposed to the glass fibres.

NOTE This can be achieved for example by the use of different coloured layers in the sliding surface.

Consideration should also be given to degradation of structural components or impact attenuating surfacing through ultraviolet influences.

#### **4.1.6 Dangerous substances**

Dangerous substances shall not be used in playground equipment or impact attenuating surfacing in such a way that they can cause adverse health effects to the user of the equipment.

NOTE Attention is drawn to the provisions of the REACH Regulation (EC) 1907/2006 and its successive modifications. Restricted materials include, but are not limited to, asbestos, lead, formaldehyde, coal tar oils, carbolineums, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAH compounds).

## 4.2 Design and manufacture

### 4.2.1 General

Equipment where the primary play function is augmented by a secondary motion, e.g. rocking and/or rotating, shall conform to the additional parts of EN 1176 relating to both play functions, as appropriate, unless the equipment is specifically covered in just one of the additional parts of EN 1176.

The dimensions and degree of difficulty of the equipment should be suitable for the intended user group. The equipment should be designed so that the risk involved in play is apparent and foreseeable by the child.

**NOTE** For additional safety of equipment that is easily accessible, specific requirements have been included for the following:

- protection against falling:
  - a) guardrails (4.2.4.3);
  - b) barriers (4.2.4.4);
- steep elements (4.2.9.4);
- easily accessible playground equipment (4.2.9.5).

Except when intended for water play, all parts of playground equipment should be designed so that they do not accumulate water e.g. space beneath bouncing facility or carousel flush with the ground.

### 4.2.2 Structural integrity

For playground equipment, the structural integrity for the worst case of the intended combinations shall be proved.

Structural integrity, including stability of the equipment shall be assessed by one of the following:

- a) calculation, in accordance with Annexes A and B;
- b) physical testing, in accordance with Annex C; or
- c) a combination of a) and b).

When calculations are carried out in accordance with Annex B no limit states shall be exceeded at combinations of loads as given in B.2.

When tested in accordance with Annex C, the equipment shall not show any cracks, damage or excessive permanent deformation (see C.1.2). Each structure shall resist both the permanent and variable loads acting on equipment and parts of equipment as described in Annex C.

When playground equipment relies on one post for its stability, the construction should be carried out in order to:

- minimize rotting or corrosion in parts relevant for stability;
- allow for controlling degradation and the need for decommission;
- be used without collapse within the foreseen inspection period when maintained correctly.

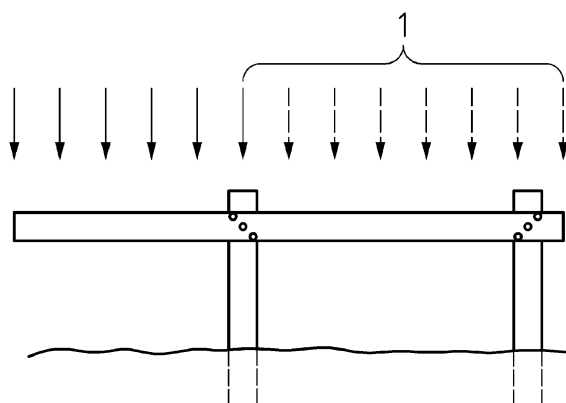
**NOTE 1** No allowance for accidental loads, i.e. loads produced by fire, collision by vehicles or earthquake, need to be made for playground equipment.

NOTE 2 The loads associated with fatigue are in general much smaller than the loads in combination with the appropriate load factors when calculated in accordance with B.2. Therefore, playground equipment in general need not be verified for fatigue.

NOTE 3 For one post equipment at installation stage, it is advised to consider access to foundations to control rotting or degradation; the choice of impact attenuating surfacing material can have implications on inspections to foundations.

Structural parts shall resist the worst case loading condition.

NOTE 4 To achieve this, it can be necessary to remove that part of the user load causing favourable effects, as shown in Figure 7.



#### Key

1 remove this part of the load because of favourable effects

**Figure 7 — Example of removal of that part of the user load which causes a favourable effect**

### 4.2.3 Accessibility for adults

Playground equipment shall be designed to ensure that adults are able to gain access to assist children within the equipment.

Enclosed parts of the equipment such as tunnels and playhouses, with an internal distance greater than 2 000 mm from an entry point shall have at least two access openings that are independent of one another and situated on different sides of the equipment. These openings shall not be capable of being locked and shall be accessible without any additional aids (e.g. a ladder that is not an integral part of the equipment). These access openings shall have no dimension less than 500 mm.

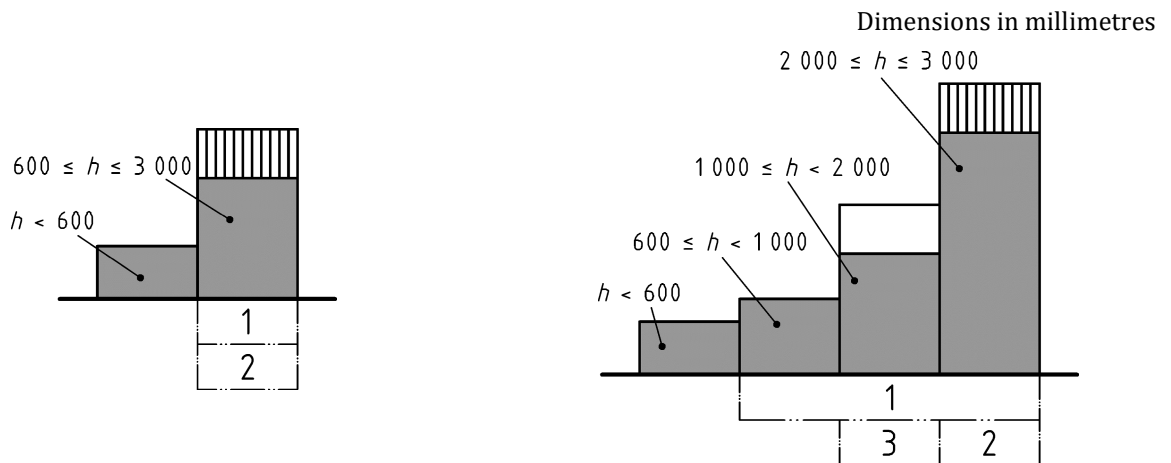
Because of the risk of fire, these two openings shall allow the user to leave the equipment by different routes.

### 4.2.4 Protection against falling

#### 4.2.4.1 General

Different types of protection against falling from elevated platforms are required. The type of protection required will depend on the free height of fall and on the type of equipment, whether it is easily accessible or not (see 4.2.4.3 and 4.2.4.4). See Figure 8 and Annex F.

When installed on ramps or stairs, handrails, guardrails or barriers shall commence at the lowest position on the ramp or stairs.



**a) Protection against falling for easily accessible equipment**

**b) Protection against falling for not easily accessible equipment**

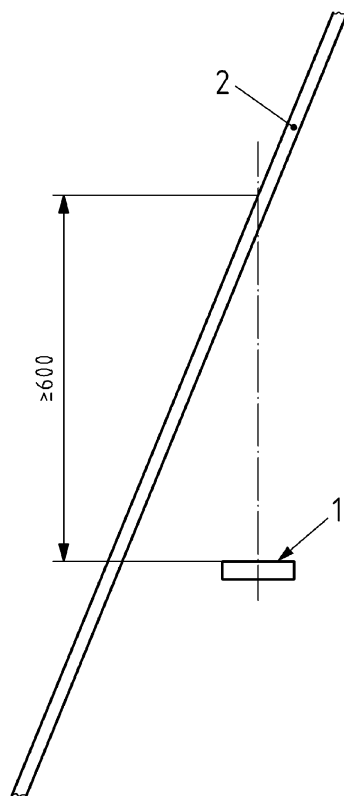
**Key**

- 1 impact attenuating surfacing in accordance with 4.2.8.5
- 2 barriers required
- 3 guardrail required

**Figure 8 — General protection against falling where there is no forced movement**

**4.2.4.2 Handrails**

Handrails shall be not less than 600 mm and not more than 850 mm above the foot position (see Figure 9). As a minimum, handrails shall conform to the requirements for grasp (see 4.2.4.7).

**Key**

- 1 foot position
- 2 handrail

**Figure 9 — Guidance on measurement of height of handrail above foot position**

#### 4.2.4.3 Guardrails

For equipment other than that which is easily accessible, guardrails shall be provided when the platform is 1 000 mm to 2 000 mm above the playing surface (see Figure 8b)). The height to the top of the guardrail shall be not less than 600 mm and not more than 850 mm measured from the surface of the platform, stairs or ramp.

Guardrails shall completely surround the platform except for entrance and exit openings necessary for each play element. The width of entrance and exit openings in guardrails, with the exception of stairs, ramps and bridges, shall have a maximum clear opening of 500 mm, when measured horizontally at a position, with a height between 600 mm to 850 mm from the platform. For stairs, ramps and bridges the width of the exit opening in the guardrail shall be no greater than the width of these elements.

#### 4.2.4.4 Barriers

Except for entrance and exit openings necessary for each play element, barriers shall completely surround the platform. The width of entrance and exit openings in barriers shall have a clear opening of 500 mm maximum, when measured horizontally at any point (see Figure 10a)), unless a guardrail is provided across the opening (see Figure 10b) and Figure 10c)). For stairs, ramps, bridges, etc. that have additional barriers as part of their structure, the width of the exit opening in the barrier shall be no greater than the width of these elements.

There shall be no intermediate horizontal or near horizontal rails or bars that can be used as steps by children attempting to climb. The design of the top of the barriers should not encourage children to stand or sit on them, nor should any infilling encourage climbing.

Openings between the platform surface and the lower edge of the barrier and between any infilling elements shall not allow passage of the probe C.

For easily accessible equipment, barriers shall be provided when the platform is more than 600 mm above the playing surface (see Figure 8a)).

For equipment other than easily accessible, barriers shall be provided when the platform is more than 2 000 mm above the playing surface (see Figure 8b)).

The height to the top of the barrier shall be at least 700 mm measured from the surface of the platform, stairs or ramp.

Openings in the barrier of easily accessible equipment/parts of equipment that give access to steep play elements shall conform to the requirements of 4.2.9.4. For all other equipment, openings in the barrier provided with a guardrail, which give access to steep play elements, shall not be greater than 1 200 mm (see Figure 10c)).

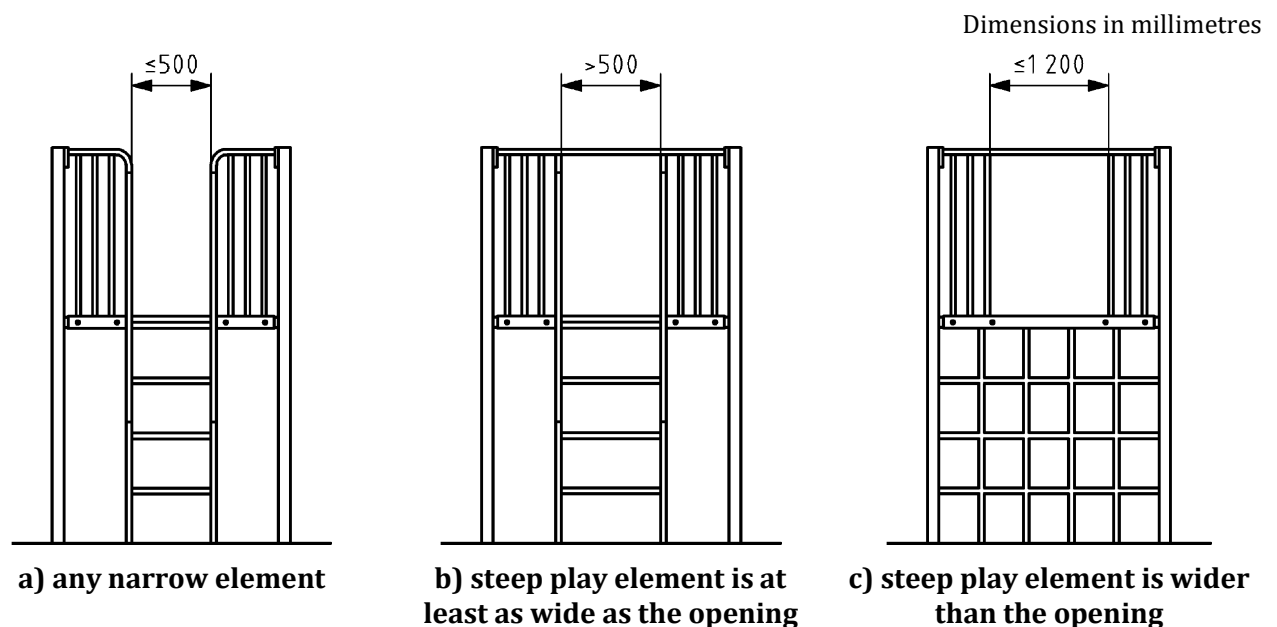


**Figure 10 — Entrance and exit openings in barriers for steep play elements**

#### 4.2.4.5 Strength requirements

Barriers and guardrails shall conform to 4.2.2.

#### 4.2.4.6 Grip requirements

The cross-section of any support designed to be gripped for support of full body weight (see 3.16 and Figure 5) shall have a dimension of not less than 16 mm or more than 45 mm in any direction, when measured across its centre.

#### 4.2.4.7 Grasp requirements

The cross-section of any support designed to be grasped (see 3.17 and Figure 6) shall have a width not exceeding 60 mm.

#### 4.2.5 Finish of equipment

Wooden equipment shall be made of wood with a low susceptibility to splintering. The surface finish of equipment made of other materials (e.g. glass fibre) shall be non-splintering.

There shall be no protruding nails, projecting wire rope terminations or pointed or sharp-edged components. Rough surfaces should not present any risk of injury. Protruding bolt threads within any accessible part of the equipment shall be permanently covered, e.g. dome headed nuts. Nuts and bolt heads that project less than 8 mm shall be free from burrs.

NOTE 1 Figure 11 shows examples of protection for nuts and bolts.

Corners, edges and projecting parts within the space occupied by the user that protrude more than 8 mm, and which are not shielded by adjacent areas that are not more than 25 mm from the end of the projecting part, shall be rounded off. The minimum radius of the curve shall be 3 mm.

NOTE 2 This requirement is intended only to prevent injuries caused by unintended contact with components.

Corners, edges and projections with a radius less than 3 mm may be in other accessible parts of the equipment only if they are not sharp.

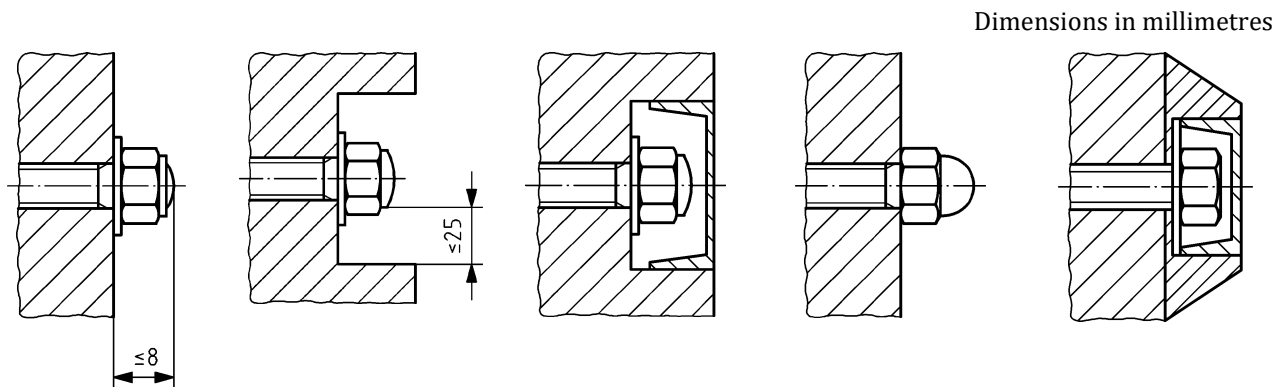


**Figure 11 — Examples of protection for nuts and bolts**

#### 4.2.6 Moving parts

There shall be no crushing points or shearing points between moving and/or stationary parts of the equipment, in accordance with 4.2.7.

Parts from which a high impact force can emanate should have an attenuating construction.

If moving parts of the equipment can endanger the body, there shall be a ground clearance of at least 400 mm.

#### 4.2.7 Protection against entrapment

##### 4.2.7.1 General

When choosing materials, the manufacturer should take into account the entrapment hazards that can occur through distortion of materials during use.

NOTE 1 Test methods for entrapment are given in Annex D.

NOTE 2 Possible entrapment situations are illustrated in Annex E.

Openings shall have no parts that converge in the downward direction at an angle of less than 60° taking into consideration the following conditions (4.2.7.2).

#### 4.2.7.2 Entrapment of the head and neck

Equipment shall be constructed so that any openings do not create head and neck entrapment hazards either by head first or feet first passage.

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

- completely bound openings through which a user can slide feet first or head first;
- partially bound or V-shaped openings;
- other openings (e.g. shearing or moving openings).

##### a) Completely bound openings:

Accessible completely bound openings with a lower edge more than 600 mm above the playing surface (see 3.5) shall be tested in accordance with D.2.1.

Probes C or E shall not pass through any opening unless it also allows the passage of the large head probe D.

NOTE 1 Probe C represents a 'feet first' passage to an opening and probe E represents a 'head first' passage.

##### b) Partially bound and V-shaped openings:

Partially bound and V-shaped openings with an entrance at 600 mm or more above the ground shall be constructed so that either:

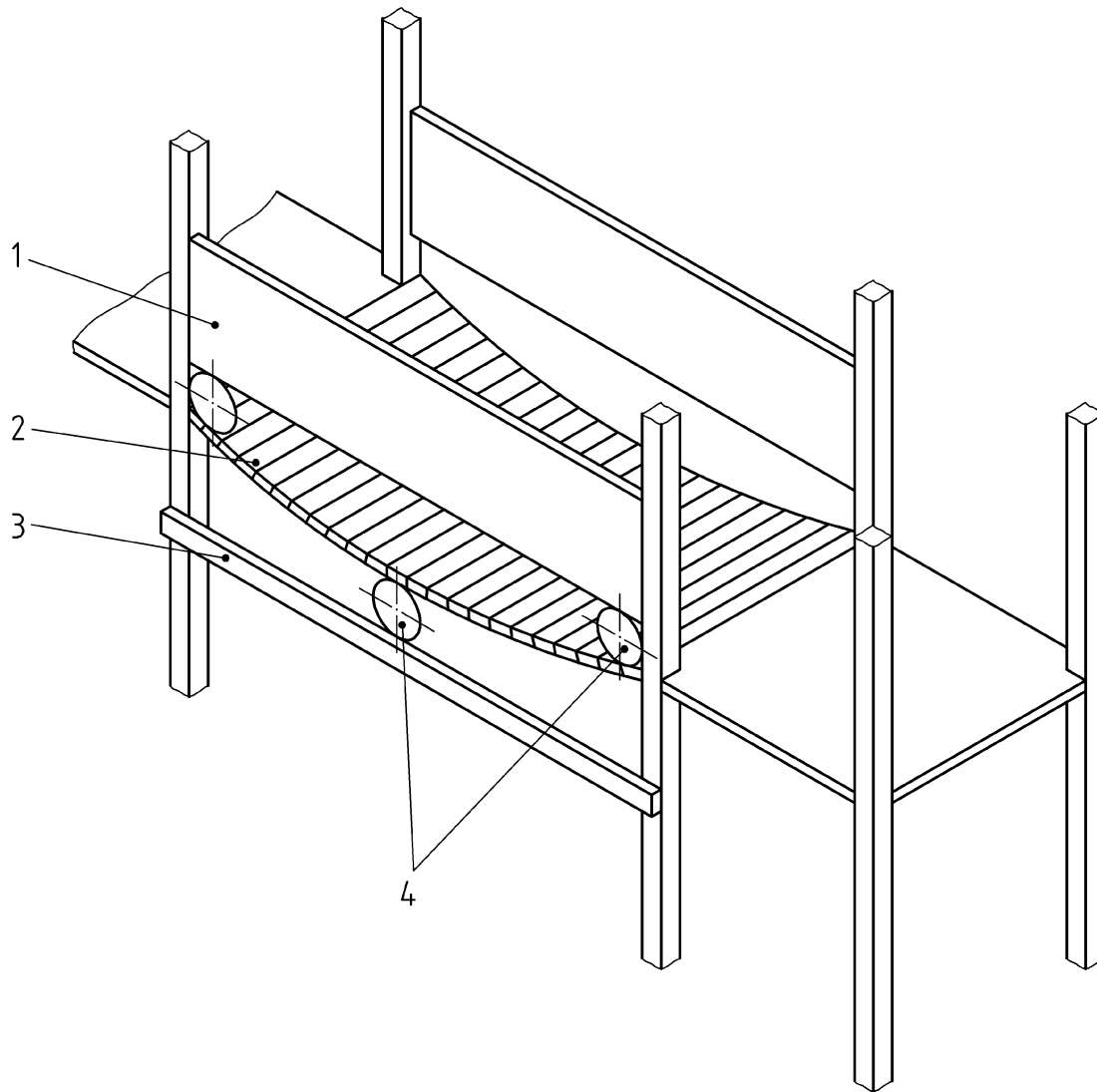
- 1) opening is not accessible when tested in accordance with D.2.2; or
- 2) if accessible at a position of 600 mm or more above ground when tested in accordance with D.2.2, depending on the angular orientation range of the opening (see Figure D.4), shall conform to the following:
  - Range 1: (template centre line  $\pm 45^\circ$  from vertical); when the template apex contacts the base of the opening, the depth of the opening shall be less than the length of the template to the underside of the shoulder section.
  - Range 2: (template centre line from horizontal to  $+ 45^\circ$ ); when the template apex contacts the base of the opening, the depth of the opening shall be less than the 'A' portion of the template. If the depth of the opening is greater than the 'A' portion of the template all parts of the opening above the 'A' portion shall also allow insertion of the shoulder section of the template or probe D.
  - Range 3: No template test requirements.

##### c) Other openings (e.g. shearing or moving openings):

Non-rigid members (for example ropes) shall not overlap if, by doing so, they create openings that do not conform to the requirements for completely bound openings.

Openings between the flexible parts of suspended bridges and any rigid side members shall be not less than 230 mm in diameter under the worst case condition of loading (see 4.2.2). Both loaded and unloaded situations shall be considered.

NOTE 2 This requirement relates to the potential change in dimensions as a result of the stretching of bridge flexible supports (e.g. wire) over time. A typical suspended bridge is illustrated in Figure 12.



**Key**

- 1 rigid side members
- 2 suspended bridge
- 3 rigid side members
- 4 diameter 230 mm minimum

**Figure 12 — Suspended bridge**

**4.2.7.3 Entrapment of clothing/hair**

Equipment should be constructed so that hazardous situations including the following, in which clothing entrapment can be encountered, are not created:

- a) gaps or V-shaped openings in which a part of clothing can become trapped while or immediately before the user is undergoing a forced movement;
- b) protrusions; and
- c) spindles/rotating parts.

NOTE 1 The toggle test (see D.3) is restricted to the free space as practical experience has shown that natural materials and connections between different parts can vary over time. The definition of free space (see 3.5) does not include the three-dimensional area in which the falling movement takes place.

Special consideration should be given when using elements of circular cross-section, e.g. round tubes or poles, to avoid clothing entanglement within the falling space.

NOTE 2 This can be achieved by use of spacers or similar devices.

Slides and fireman's poles shall be constructed so that openings located within the free space do not trap the toggle when tested in accordance with D.3.

Roofs shall be constructed so that they do not trap the toggle when tested in accordance with D.3.

Spindles and rotating parts shall be constructed so as to prevent entanglement of clothing or hair.

NOTE 3 This can be achieved by use of suitable covering or shields.

#### 4.2.7.4 Entrapment of the whole body

Equipment should be constructed so that the following hazardous situations, which can cause entrapment, are not created:

- a) tunnels into which children can crawl with their whole body; and
- b) suspended parts which are heavy or have rigid suspension.

Tunnels shall have a maximum length of 10 000 mm and conform to the requirements given in Table 1.

**Table 1 — Requirements for tunnels**

Dimensions in millimetres

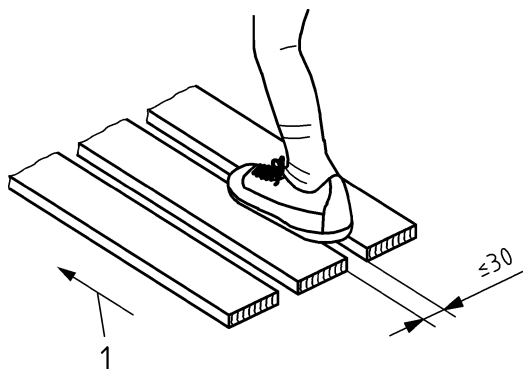
| Requirements                                  | Open one end                                  | Open both ends  |               |                |                                              |
|-----------------------------------------------|-----------------------------------------------|-----------------|---------------|----------------|----------------------------------------------|
| Inclination                                   | $\leq 5^\circ$ and upwards only when entering | $\leq 15^\circ$ |               |                | $> 15^\circ$                                 |
| Minimum internal dimension <sup>a</sup>       | $\geq 750$                                    | $\geq 400$      | $\geq 500$    | $\geq 750$     | $\geq 750$                                   |
| Length                                        | $\leq 2\,000$                                 | $\leq 1\,000$   | $\leq 2\,000$ | $\leq 10\,000$ | $\leq 10\,000$                               |
| Other requirements                            | None                                          | None            | None          | None           | Provision for climbing e.g. steps or handles |
| NOTE For tunnel slides, see EN 1176-3.        |                                               |                 |               |                |                                              |
| <sup>a</sup> Measured at the narrowest point. |                                               |                 |               |                |                                              |

#### 4.2.7.5 Entrapment of the foot or leg

Equipment should be constructed so that the following hazardous situations, which can cause entrapment, are not created:

- a) completely bound rigid openings in surfaces on which children can run or climb; and
- b) footholds, handholds, etc. extending from these surfaces.

NOTE In the case of b) the entrapped foot or ankle can be severely injured if the user falls.

**Key**

1 direction of travel

**Figure 13 — Measurement of gaps limited to 30 mm**

Surfaces intended for running/walking shall not contain gaps likely to cause foot or leg entrapment. Gaps in the main direction of travel shall not be greater than 30 mm when measured across the direction of travel (see Figure 13).

This requirement does not apply to surfaces inclined more than 38° from the horizontal.

#### 4.2.7.6 Entrapment of fingers

Equipment should be constructed so that the following hazardous situations, which may cause entrapment, are not created:

- a) gaps in which fingers can be trapped whilst the remainder of the body is moving or continues in forced movement, for example sliding, swinging; and
- b) variable gaps (excluding chains).

Openings within the free space, where the user is subjected to forced movement, and/or holes which have a lower edge more than 1 000 mm above the potential impact area, when tested in accordance with D.4, shall conform to one of the following requirements:

NOTE 1 Openings include tubes and pipes.

- c) the 8 mm finger rod (see Figure D.10a)) shall not pass through the minimum cross-section of the opening and the profile of the opening shall be such that the rod cannot be locked in any position when set in motion as given in D.4.2; or
- d) if the 8 mm finger rod passes through the opening, the 25 mm finger rod (see Figure D.10b)) shall also pass through the opening, provided that the opening does not permit access to another finger entrapment site.

NOTE 2 Only to be used where there is a potential fall to an impact area below. See also adjacent platforms (4.2.8.5.4).

NOTE 3 The test process D.4.2 for finger entrapment will only be conducted with the presence of free space and/or falling space.

The ends of tubes and pipes shall be closed off to prevent the risk of finger entrapment.

The closures shall not be removable without using tools.

Gaps whose dimensions change during use of the equipment shall have a minimum dimension in any position of 12 mm.

Splits in single pieces of wood shall not be considered as finger entrapment where the gap diminishes towards the centre of the wooden part.

#### 4.2.8 Protection against injuries during movement and falling

##### 4.2.8.1 Determination of free height of fall

Unless stated otherwise, determination of free height of fall shall be as given in Table 2. In determining the free height of fall, the possible movements of the equipment and of the user shall be taken into account. In general, this means that the maximum movement of the equipment shall be taken.

In the case of roofs, or other features not intended for play, it is not required for them to be included in the free height of fall where access has not been encouraged.

EXAMPLE Some examples of features that could encourage access are:

- play feature, which can be accessed from the roof;
- hand and foot holds for climbing;
- arm or leg reach distance;
- inclination of the roof;
- roughness of the roof surface.

The free height of fall ( $h$ ) shall not exceed 3 000 mm (see Figure 14).

For the determination of free height of fall, see Table 2.

**Table 2 — Free height of fall for different types of use**

| Type of use                                                                                                                                                                                                                                                                     | Vertical distance                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Standing                                                                                                                                                                                                                                                                        | From foot support to surface below                                                                                                               |
| Sitting                                                                                                                                                                                                                                                                         | From seat to surface below                                                                                                                       |
| Hanging <sup>a</sup><br>(When full body support is provided by the hands only and the whole body can be lifted up to the hand support)                                                                                                                                          | From hand support height to surface below                                                                                                        |
| Climbing <sup>a</sup><br>(When body support is a combination of feet/legs and hands, e.g. climbing ropes or sliding/climbing poles)                                                                                                                                             | Maximum hand support: 4 000 mm to the surface below (free height of fall measured from maximum hand support minus 1 000 mm to the surface below) |
| Bouncing                                                                                                                                                                                                                                                                        | From suspension bed to the lowest point of falling space plus 900 mm                                                                             |
| <sup>a</sup> Such equipment constructed for use as 'climbing' or 'hanging' shall not encourage access to positions for full body support with a free height of fall of more than 3 000 mm e.g. horizontal net (climbing), horizontal ladder intended for arm walking (hanging). |                                                                                                                                                  |