

# Playground equipment —

## Part 1: General safety requirements and test methods

The European Standard EN 1176-1:1998, with the incorporation of amendments A1:2002 and A2:2003, has the status of a British Standard

ICS 97.200.40

National foreword

This British Standard is the English language version of EN 1176-1:1998, including amendments A1:2002 and A2:2003. Together with BS EN 1176-2 to -6, inclusive, it supersedes BS 5696-1:1997, BS 5696-1:1986 and BS 5696-2:1986, which were withdrawn on 31 December 1998.

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

This standard is intended for playground equipment in public parks, schools, commercial facilities (public houses, restaurants), community areas and shopping areas.

The UK participation in its preparation was entrusted to Technical Committee SW/65, Children’s playground equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee is given in National annex NA.

This standard was produced as a result of European discussions in which the UK actively participated to ensure that the UK knowledge and experience in children’s playground safety standards was fully represented.

Annex G of EN 1176-1 applies solely within Germany as a result of their existing national laws and is not to be considered outside that country.

Prior to the publication of this standard, the Play Safety Forum convened by the National Playing Fields Association advised the use of BS 5696 or any other equivalent European Standard, making particular reference to the DIN standard 7926 for playground equipment. EN 1176 attempts to take the best that both standards offer and SW/65 considers that this has been achieved.

After this standard had been written and approved, the Health and Safety Executive representative advised Technical Committee SW/65 of the provisions of the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety Regulations 1992. The intention of safety legislation in this country is to maintain or improve health and safety standards wherever revision offers an opportunity. SW/65 considers that in general EN 1176 and EN 1177 have achieved this.

There remain, however, areas where the previous levels of safety in BS 5696 may be considered to be at variance. The Health and Safety Executive may be able to offer further guidance on this matter.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

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English version

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

(includes amendments A1:2002 and A2:2003)

Equipement d'aires de jeux —  
Partie 1: Exigences de sécurité et méthodes  
d'essai générales  
(inclut les amendements A1:2002 et A2:2003)

Spielplatzgeräte —  
Teil 1: Allgemeine sicherheitstechnische  
Anforderungen und Prüfverfahren  
(enthält Änderungen A1:2002 und A2:2003)

This European Standard was approved by CEN on 24 May 1998. Amendment A1 was approved by CEN on 16 February 2002. Amendment A2 was approved by CEN on 9 January 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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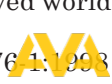
# CEN

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

**Central Secretariat: rue de Stassart 36, B-1050 Brussels**

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## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 136, Sports, playground and other recreational 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 December 1998, and conflicting national standards shall be withdrawn at the latest by December 1998.

It is not the purpose of the requirements of this part of EN 1176 to affect the child's need to play, or to lessen the contribution that playground equipment makes either to the child's development or play that is meaningful from an educational point of view.

This standard consists of a number of parts as follows:

EN 1176-1, *Playground equipment — Part 1: General safety requirements and test methods.*

EN 1176-2, *Playground equipment — Part 2: Additional specific safety requirements and test methods for swings.*

EN 1176-3, *Playground equipment — Part 3: Additional specific safety requirements and test methods for slides.*

EN 1176-4, *Playground equipment — Part 4: Additional specific safety requirements and test methods for runways.*

prEN 1176-5, *Playground equipment — Part 5: Additional specific safety requirements and test methods for carousels.*

EN 1176-6, *Playground equipment — Part 6: Additional specific safety requirements and test methods for rocking equipment.*

EN 1176-7, *Playground equipment — Part 7: Guidance on installation, inspection, maintenance and operation.*

and should be read in conjunction with EN 1177 — *Impact absorbing playground surfacing — Safety requirements and test methods.*

CEN/TC136/SC1 have decided to package EN 1176-1, EN 1176-7 and EN 1177. The dates of withdrawal (dow) of EN 1176-7 and EN 1177 are being aligned with the dow of EN 1176-1, which will be 6 months after the date of availability.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Foreword to amendment A1

This document (EN 1176-1:1998/A1:2002) has been prepared by Technical Committee CEN/TC 136, Sports, playground and other recreational 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 September 2002, and conflicting national standards shall be withdrawn at the latest by September 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Foreword to amendment A2

This document (EN 1176-1:1998/A2:2003) has been prepared by Technical Committee CEN/TC 136, Sports, playground and other recreational equipment, the Secretariat of which is held by DIN.

This amendment to the European Standard EN 1176-1:1998 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

The purpose of amendment 2 to EN 1176-1:1998 is to modify Clause 4.2.7.2, 4.2.8.1.2, Table 2, Figure 16, Clause 4.2.8.4, 4.2.9.1, A.2.6.1 and Annex A.

With resolution 165, CEN/TC 136 agreed to an amendment 2 to EN 1176-1:1998 using the UAP procedure of 4 months.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

This standard specifies general safety requirements for playground equipment. These requirements have been laid down bearing in mind the risk factors based on available data. Additional specific safety requirements for specific pieces of playground equipment are specified in subsequent parts of this standard.

This standard is applicable to playground equipment intended for individual and collective use by children, but excluding adventure playgrounds<sup>1)</sup>. It is also applicable to equipment and units installed as children's playground equipment although they are not manufactured as such, but excludes those items defined as toys in EN 71<sup>2)</sup> and the Toy Directive.

This standard specifies the requirements that will protect the child from hazards that he or she may be unable to foresee when using the equipment as intended, or in a manner that can be reasonably anticipated.

It is not the purpose of this standard to encompass the play value.

NOTE This standard has been drafted with full recognition of the need for supervision of children of 0 to 3 years of age. For additional safety, specific requirements have been included for equipment accessible to children under 36 months. See Note to 4.2.1.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 59, *Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor*.

EN 335-2, *Durability of wood and wood-based products — Definition of hazard classes of biological attack — Part 2: Application to solid wood*.

EN 350-2:1994, *Durability of wood and wood-based products — Natural durability of solid wood — Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe*.

EN 351-1:1995, *Durability of wood and wood-based products — Preservative-treated solid wood — Part 1: Classification of preservative penetration and retention*.

EN 636-3, *Plywood — Specifications — Part 3: Requirements for plywood for use in exterior conditions*.

EN 701, *Fibre ropes for general service — General specification*.

EN 919, *Fibre ropes for general service — Determination of certain physical and mechanical properties*.

EN 1021-1, *Furniture — Assessment of the ignitability of upholstered furniture — Part 1: Ignition source: Smouldering cigarette*.

(ISO 8191-1:1987 modified)

EN 1021-2, *Furniture — Assessment of the ignitability of upholstered furniture — Part 2: Ignition source: Match flame equivalent*.

(ISO 8191-2:1988 modified)

EN 1177:1997, *Impact absorbing playground surfacing — Safety requirements and test methods*.

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

ENV 1991-2-2, *Eurocode 1: Basis of design and actions on structures — Part 2-2: Actions on structures — Actions on structures exposed to fire*.

ENV 1991-2-3, *Eurocode 1: Basis of design and actions on structures — Part 2-3: Actions on structures — Snow loads*.

ENV 1991-2-4, *Eurocode 1: Basis of design and actions on structures — Part 2-4: Actions on structures — Wind actions*.

<sup>1)</sup> Adventure playgrounds are fenced, secured playgrounds, run and staffed according to the pedagogical principles that encourage children's development and often use self-build equipment.

<sup>2)</sup> EN 71, *Safety of toys*.

ISO 1834, *Short link chain for lifting purposes — General conditions of acceptance.*

ISO 5470, *Rubber or plastics coated fabrics — Determination of abrasion resistance.*

ISO 8793, *Steel wire ropes — Ferrule-secured eye terminations.*

### 3 Definitions

For the purposes of this standard, the following definitions apply.

#### 3.1

##### **playground equipment**

equipment and structures, 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 or equipment parts that have no areas on which it is possible to stand unsupported and which, therefore, require the user to hold on with both hands

#### 3.3

##### **playing surface**

surface of a playground from which the use of the playground equipment commences

#### 3.4

##### **free space**

space in, on or around the equipment that can be occupied by a user undergoing a movement forced by the equipment (e.g. sliding, swinging, rocking)

#### 3.5

##### **falling space**

space in, on or around the equipment that can be occupied by a user falling from an elevated part of the equipment (see Figure 1). The falling space commences at the free height of fall (see 3.6)

#### 3.6

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

greatest vertical distance from the clearly intended body support to the impact area below (see Figure 17)

NOTE The intended body support includes those standing surfaces to which access is provided.

#### 3.7

##### **collective use**

use by more than one user at the same time

#### 3.8

##### **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

#### 3.9

##### **shearing point**

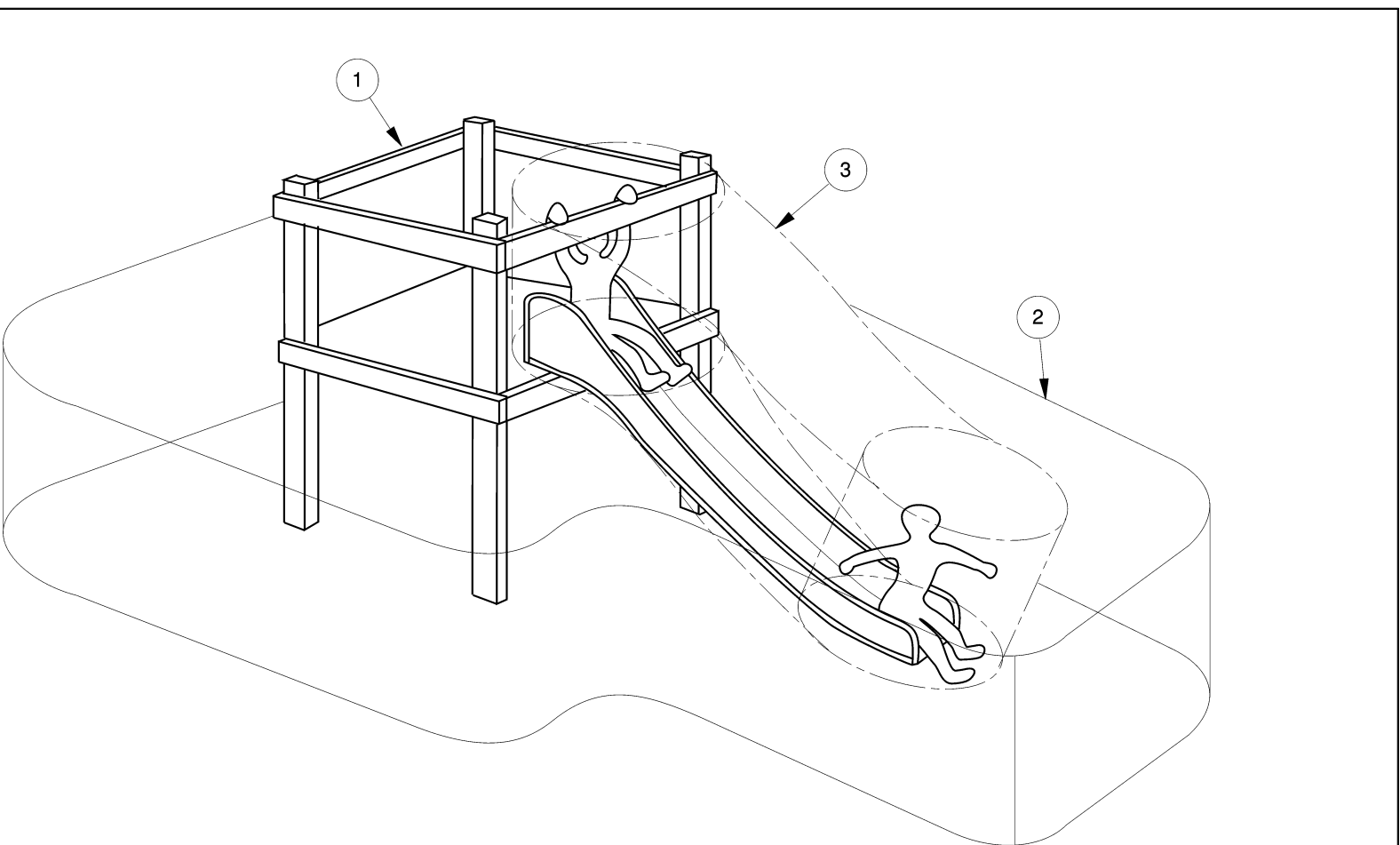
place where part of the equipment can move past a fixed or other moving part, or past a fixed area so that persons, or parts of their body, can be cut

#### 3.10

##### **ladder**

primary means of access incorporating rungs or steps on which a user can ascend or descend

NOTE A ladder is normally inclined at an angle between 60° and 90° to the horizontal (see Figure 2).

**Key**

- 1 Space occupied by equipment
- 2 Falling space
- 3 Free space
- $1 + 2 + 3 = \text{Minimum space}$

**Figure 1 — Minimum space**

**3.11**

**stairs**

primary means of access incorporating steps on which a user can ascend or descend

NOTE Stairs are normally inclined at an angle between 15° and 60° to the horizontal (see Figure 3).

**3.12**

**ramp**

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

NOTE A ramp is normally inclined at an angle of up to 38° to the horizontal (see Figure 4).

**3.13**

**impact area**

area that can be hit by a user after falling through the falling space (see 3.5)

**3.14**

**grip**

holding of the hand round the entire circumference of a support (see Figure 5)

**3.15**

**grasp**

holding of the hand round part of the circumference of a support (see Figure 6)

**3.16**

**entrapment**

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

NOTE The user is not able to free him/herself and injury is caused by the entrapment.

**3.17**

**minimum space**

space required for the safe use of equipment (see Figure 1)

**3.18**

**obstacle**

object, or portion of an object, that protrudes inside the equipment or extends into the path of movement

**3.19**

**family of products**

modular systems or components that can be assembled in different ways

**3.20**

**cluster**

two or more separate pieces of equipment designed to be installed in close proximity to each other to provide continuity of the play activity

**3.21**

**platform**

raised level surface

**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**

guardrail intended to prevent a user passing beneath

**3.25****zone**

two- and three-dimensional spaces occupied by both the playground equipment and the user of the playground equipment

**3.26****not easily accessible**

requiring a degree of difficulty in accessing the equipment

NOTE For children under 36 months, this can be achieved, for example, by ensuring a clearance of 400 mm from the playing surface to the lowest foothold on the equipment or a clearance of 600 mm from the top surface of a platform.

**3.27****routine visual inspection**

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

NOTE Typical hazards can take the form of broken parts or broken bottles.

**3.28****operational inspection**

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

NOTE Typical checks include an examination for wear.

**3.29****annual main inspection**

inspection, at intervals not exceeding 12 months, intended to establish the overall level of safety of equipment, foundations and surfaces

NOTE 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.

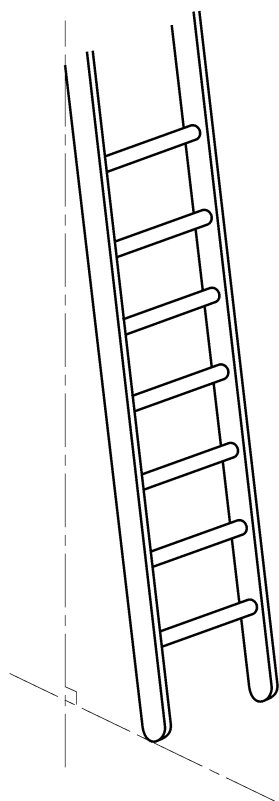


Figure 2 — Example of a ladder

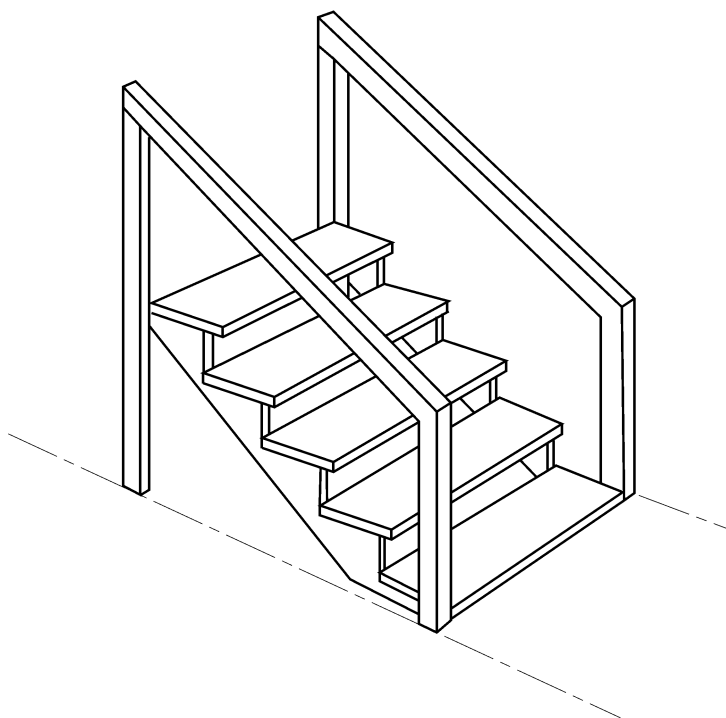


Figure 3 — Example of stairs

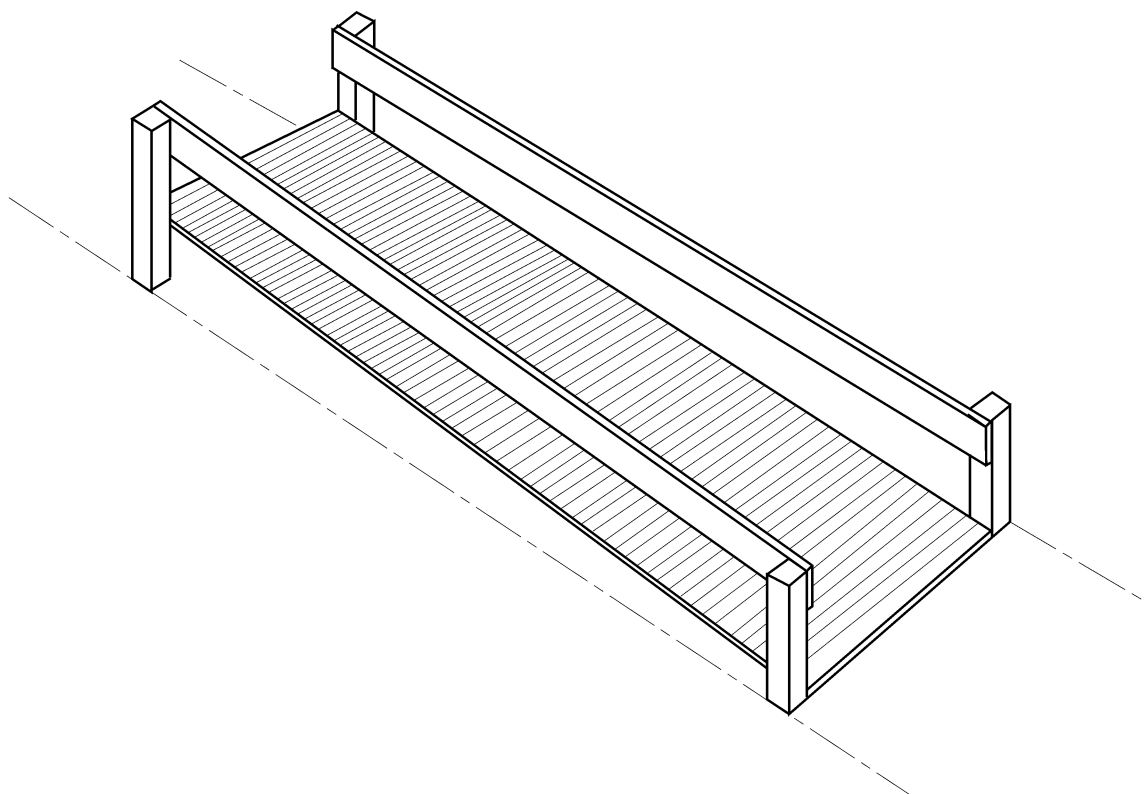


Figure 4 — Example of a ramp

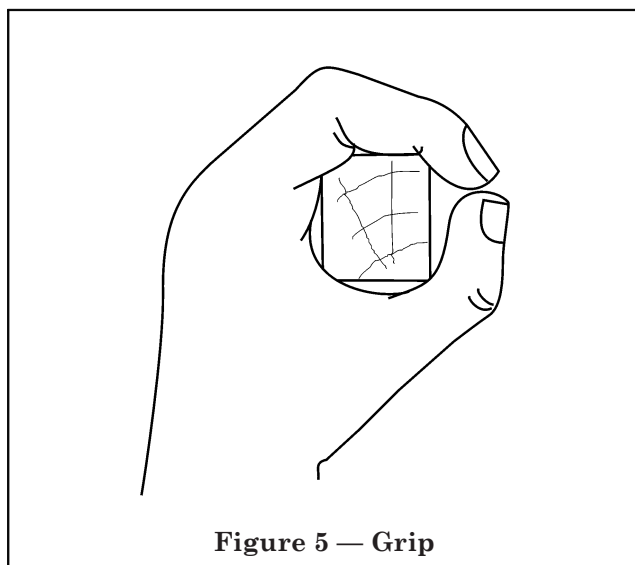


Figure 5 — Grip

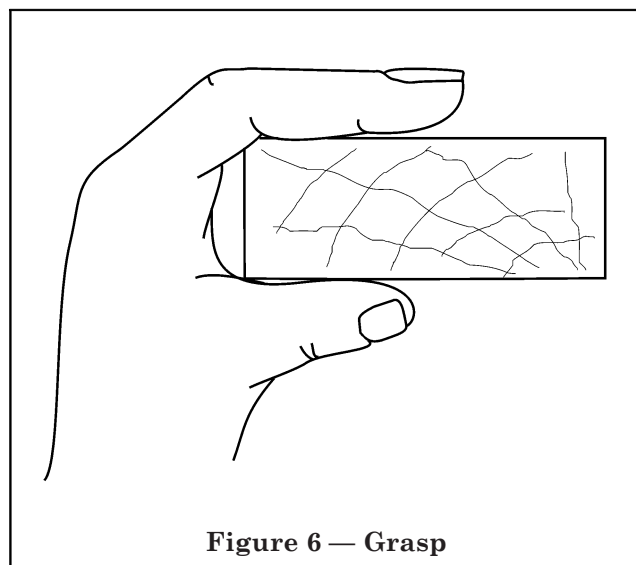


Figure 6 — Grasp

## 4 Safety requirements

### 4.1 Materials

#### 4.1.1 General

Materials shall conform to 4.1.2 to 4.1.6.

Materials should be manufactured in a workmanlike manner.

NOTE 1 The provisions relating to certain materials in this standard do not imply that other equivalent materials are unsuitable in the manufacture of children's playground equipment.

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

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

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

NOTE 2 EN 1176-7 gives recommendations on maintenance inspections.

Particular care should be taken in the choice of materials where equipment is to be used in extreme climatic or atmospheric conditions.

Where very low or very high temperatures can be anticipated care should be taken on material selection to avoid possible hazards through direct skin contact.

In the choice of a material or substance for playground equipment, 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 Surface flash is the rapid spread of flame over the surface of a material without combustion of the basic structure at that time.

When tested according to EN 1021-1 and EN 1021-2 no flaming debris shall fall from the sample during the test.

NOTE 2 Requirements for adequate exits to ensure escape in cases of fire are given in 4.2.3.

NOTE 3 Attention is drawn to national and local building regulations regarding flammability for equipment installed both indoors and outdoors.

NOTE 4 Flammability of materials other than fabrics is of concern, but suitable test methods to cover this are not yet available.

#### 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) the use of timber species with sufficient natural resistance in accordance with classes 1 and 2 of the natural resistance classification given in EN 350-2:1994, **4.2.2**;
- b) construction methods, e.g. post shoe;
- c) use of timber treated with wood preservatives in accordance with EN 351-1:1995, Figure A.1 and in accordance with EN 335-2, hazard class 4.

Consideration should also be given to 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.

Plywood shall be in accordance with EN 636-3 and shall be weatherproofed.

#### 4.1.4 *Metals*

Metal parts shall be weatherproof against atmospheric conditions.

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

#### 4.1.5 *Synthetics*

When tested in accordance with ISO 5470, the layer beneath the gel coat of glass-reinforced plastics shall not become exposed.

NOTE The purpose of this requirement is to ensure that children are not exposed to glass fibres.

When tested in accordance with EN 59, the resin of glass-reinforced plastics surfaces shall achieve the Barcol hardness quoted by the manufacturer.

Synthetic materials should be ultraviolet resistant.

If, in 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 should be replaced.

#### 4.1.6 *Dangerous substances*

Dangerous substances shall not be used in playground equipment 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 Directive 76/769/EEC. Such materials include, for example, asbestos, lead, formaldehyde, coal tar oils, carbolineums and polychlorinated biphenyls (PCBs).

### 4.2 Design and manufacture

#### 4.2.1 *General*

The dimensions and degree of difficulty of the equipment should be suitable for the intended users or age 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 accessible to children under 36 months, specific requirements have been included for the following areas:

- head entrapment (**4.2.7.2** and **D.2**);
- protection against falling;
- guardrails (**4.2.4.3**);
- barriers (**4.2.4.4**);
- stairs (**4.2.9.2**);
- ramps (**4.2.9.3**).

Enclosed spaces, including tunnels, should be designed so that they do not accumulate water.

#### 4.2.2 *Structural integrity*

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

- a) calculation, carried out in accordance with Annex A and Annex 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.

For some equipment, these specific calculations or tests are not always appropriate, but the structural integrity shall be at least equivalent.

For a family of products, the structural integrity for the worst case of the intended combinations shall be proved.

Each structure shall resist both the permanent and variable loads acting on equipment and parts of equipment as described in Annex C.

NOTE 1 No allowance for accidental loads, i.e. loads produced by fire, collision by vehicles or earthquake, need 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 according to **B.2**. Therefore playground equipment in general need not be verified for fatigue.

Structural parts shall resist the worst case loading condition.

NOTE 3 In order to achieve this, it can be necessary to remove that part of the user load causing favourable effects, as shown in Figure 7.

#### 4.2.3 *Accessibility for adults*

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

Equipment that is enclosed, such as tunnels and playhouses, with an internal distance greater than 2 000 mm from an entry point shall only be permitted if there are 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 and exit to ground level by different routes.

#### 4.2.4 *Protection against falling*

##### 4.2.4.1 *General*

Impact attenuating surfacing shall be provided in accordance with the requirements of EN 1177:1997, 4.2.

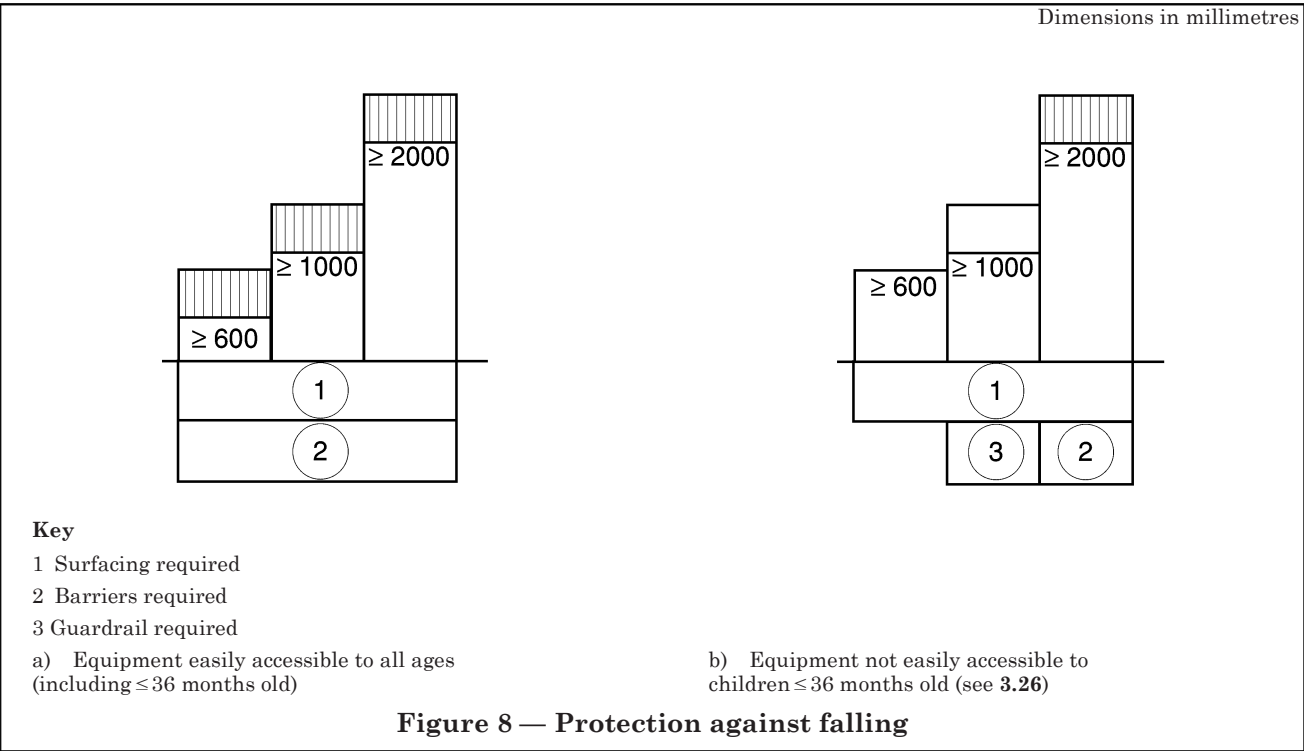
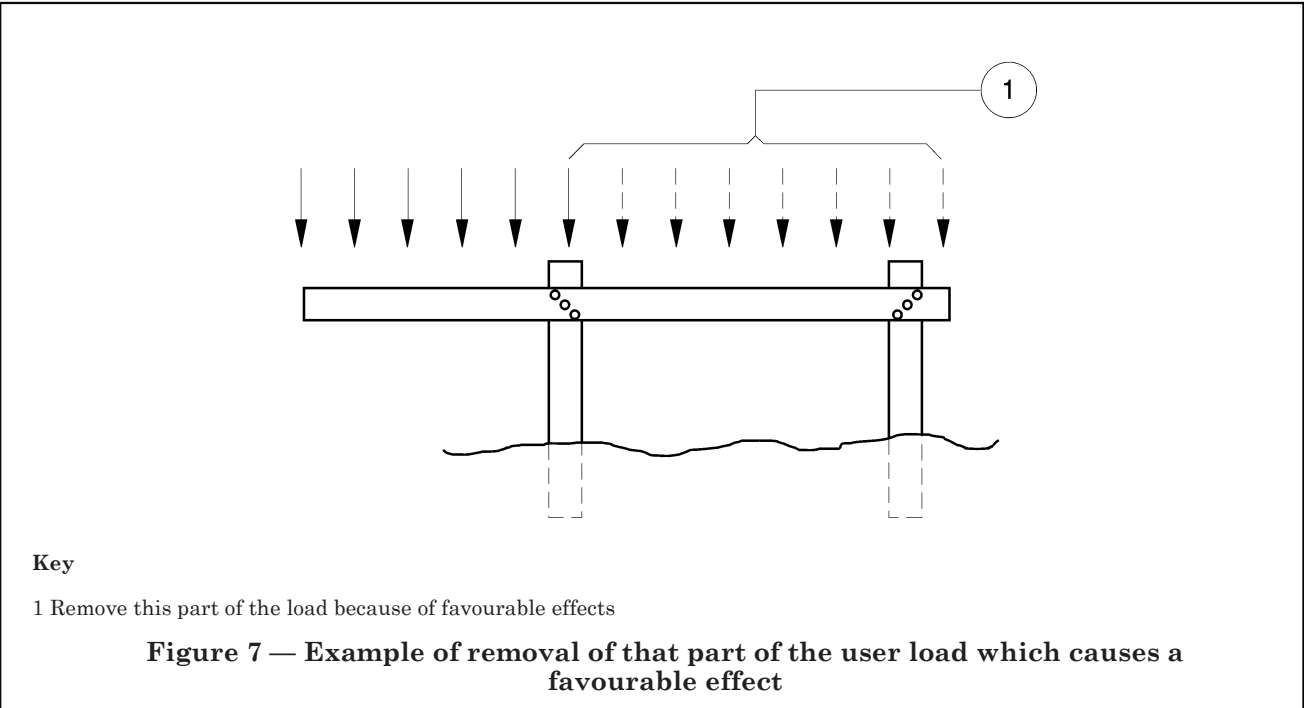
NOTE For impact attenuating materials, refer to EN 1177.

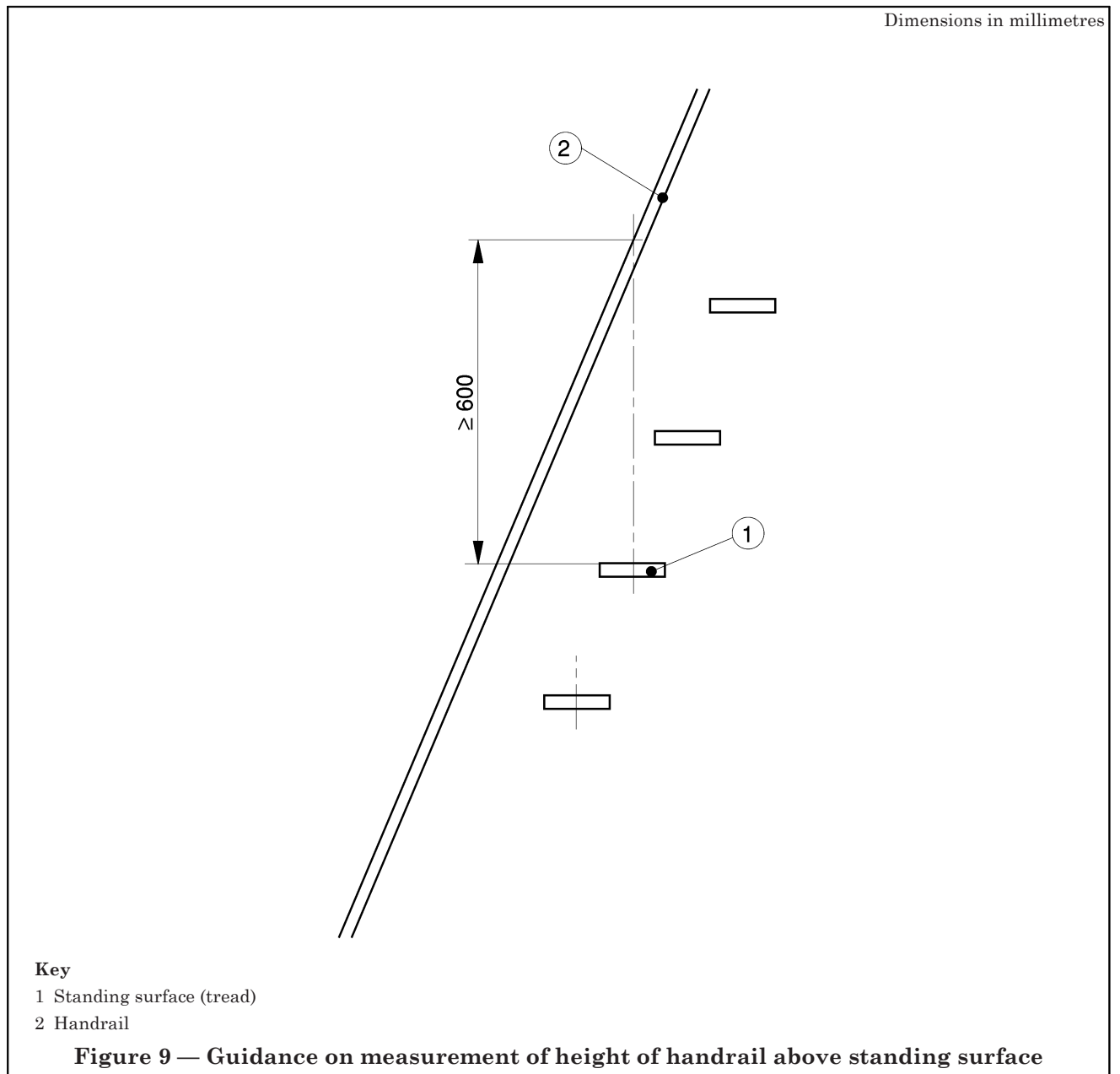
Figure 8 shows the appropriate type of protection with different heights of equipment.

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

##### 4.2.4.2 *Handrails*

Handrails shall be not less than 600 mm and not more than 850 mm above the standing surface (see Figure 9).





#### **4.2.4.3 Guardrails**

For equipment not easily accessible by younger children (less than 36 months) a guardrail shall be provided when the standing surface is 1 000 mm to 2 000 mm above the playing surface. 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. Impact attenuating surfacing shall be provided in accordance with the requirements of EN 1177:1997, 4.2.

#### **4.2.4.4 Barriers**

Barriers for equipment accessible to children under 36 months shall be provided when the standing surface is more than 600 mm above the playing surface. For equipment not easily accessible by younger children (less than 36 months) the barrier shall be provided when the standing surface is more than 2 000 mm above the playing surface. The height to the top of the barrier shall be at least 700 mm measured from the surface of the platform, stairs or ramp. Impact attenuating surfacing shall be provided when the standing surface is more than 600 mm above the playing surface.

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.

#### **4.2.4.5 Strength requirements**

Barriers and guardrails shall fulfil the requirements given in 4.2.2.

#### **4.2.4.6 Grip requirements**

The cross section of any support designed to be gripped (see 3.14 and Figure 5) shall have a dimension of not less than 16 mm nor 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 3.15 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. with dome-headed nuts. Nuts and bolt heads that project less than 8 mm shall be free from burrs. All welds shall be ground smooth.

NOTE Figure 10 shows examples of protection for nuts and bolts.

Corners, edges and projecting parts within any accessible part of the equipment that project 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.

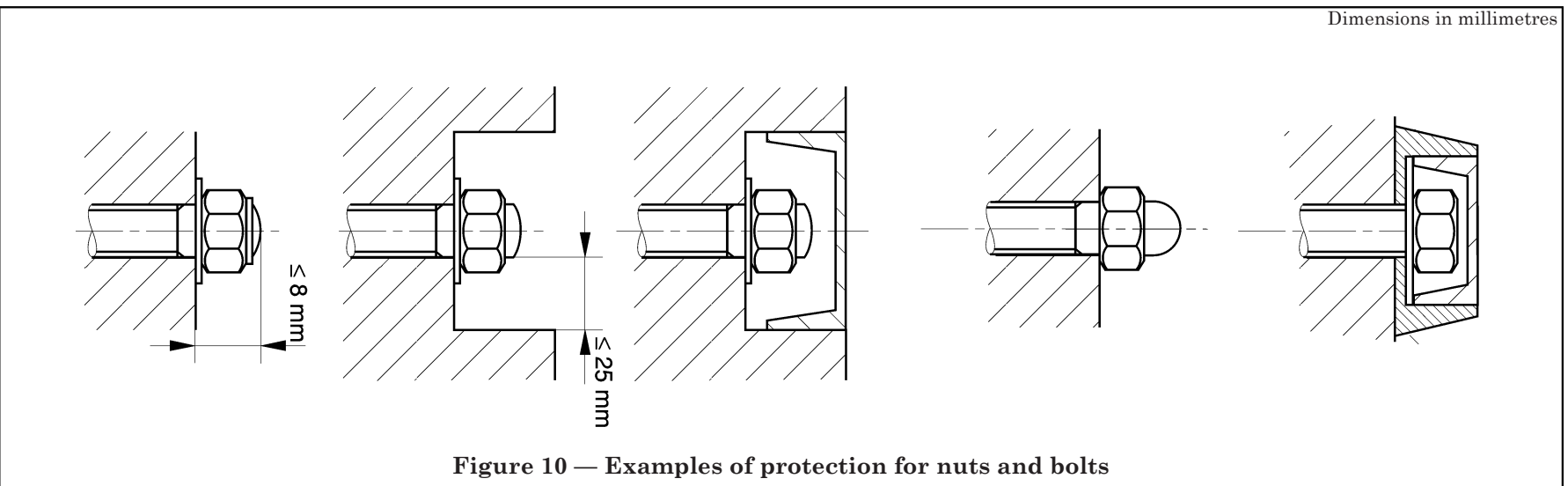
There shall be no hard and sharp-edged parts within any accessible part of the equipment.

#### **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.

Impact forces shall be damped.

There shall be a ground clearance of at least 400 mm below moving equipment suspended above the user by rigid supports.



#### 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 F.

Bound openings should have no parts that converge in the downward direction at an angle of less than 60°.

##### 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 by either head first or feet first passage.

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

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

When tested in accordance with **D.2.1**, if accessible completely bound openings, with a lower edge more than 600 mm above the ground or standing surface, allow passage of the small probe(s), the large probe shall also be able to pass through.

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

- a) the opening is not accessible when tested in accordance with **D.2.2**; or
- b) if accessible when tested in accordance with **D.2.2**:
  - the template apex contacts the base of the opening during the test [see Figure D.4a)]; or
  - the template contacts the sides of the opening at a height of less than 600 mm above the ground [see Figure D.4b)].

**A2** For equipment accessible to children of 0 – 36 months, rigid openings more than 600 mm above the ground or standing surface shall not allow a probe of diameter 130 mm shaped as probe D (see Figure D.1) to pass through unless the opening also allows passage of the large head probe D. **A2**

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.

##### 4.2.7.3 Entrapment of clothing

Equipment should be constructed so that hazardous situations including:

- 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;

in which clothing entrapment particularly concerning strangulation can be encountered are not created.

NOTE 1 The toggle test 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 **3.4**) 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 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**.