

Playground equipment and surfacing —

Part 1: General safety requirements and test methods

ICS 97.200.40

National foreword

This British Standard is the UK implementation of EN 1176-1:2008. It supersedes BS EN 1176-1:1998 which will be withdrawn on 31 May 2009.

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

Attention is drawn to BS EN 1176-1:2008, Clause 4.2.8.5.2 Note 1 and the use, within the UK, of natural grass as playground surfacing. The UK committee, following representation from the national Play Safety Forum, offer the subsequent guidance. This guidance is drawn from the experiences of the UK committee, and the experiences of other European organizations, in the application of BS EN 1176-1:1998 over the past ten years.

Grass is a low cost, readily available and environmentally friendly surface that is liked by children. It is visually attractive, easy to maintain and importantly for children, can, by increasing the uninterrupted playing surface of a playground, enhance opportunities for incidental and unstructured play.

Grass can, on playgrounds with a low intensity of use, be successfully used below and around play equipment, removing the necessity to install specialist Impact Attenuating Surfaces. The suitability of grass has to be determined locally by risk assessment. The following criteria can form part of this assessment and will provide guidance as to whether grass is suitable for use.

- The maximum fall height of the equipment is less than 1,5 m.
- It should be assessed whether the grass has at least 150 mm of soil beneath it. (A reasonable evaluation may be made by pushing vertically by hand into the ground a thin probe, such as a screwdriver, to a depth of 150 mm, at regular and frequent locations, without it being impeded by a high proportion of solids, such as stone, brick or tree roots.)
- It should be ensured that the grass remains throughout the year and does not become mud or bare earth. Its impact absorbency is dependent upon the roots maintaining an uncompacted soil structure. This will need to be continually assessed following installation of equipment.

Following completion of a satisfactory risk assessment including the three principal criteria above, grass is suitable for use. However, operators may want to use other criteria they believe necessary to ensure the suitability of grass.

Grass, even in low usage playgrounds, will not sustain intensive use; for example: beneath the central arc of a swing; the run out area of a slide; below a fire fighters’ pole; around the outside of a carousel; equipment access and exit points. For these relatively small high-wear areas, in order to meet the requirements of this standard, other surfaces to replace or prevent erosion of the grass are needed, taking care that no trip points or hard edges occur.

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Amendments/corrigenda issued since publication

Date	Comments
30 September 2008	Correction to national foreword

Operators and providers are advised that equipment conforming to EN 1176 require regular maintenance. Guidance on this and appropriate inspection, maintenance and operation schedules are contained within BS EN 1176-7:2008.

National standards have been published by BSI on children's playground equipment since BS 3178 was first issued in 1959, this standard concentrated on specifications for specific types of equipment. It was replaced in 1979 by BS 5696 which switched focus to a design and safety approach.

With the increasing introduction of overseas equipment BSI led the way by calling for a European Standard to address the conflicting safety advice and standards from other countries. This was published in 1999 as BS EN 1176 and further focused on the safety of playground equipment.

All standards published by BSI are regularly assessed and this revision is part of the process, it takes into account new design concepts and the operating experience available to the standards committees.

It is advised that the previous version of BS EN 1176 will not be withdrawn until 31 May 2009 to give manufacturers time to amend their product lines.

Playground equipment not complying with this revision 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.

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

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

Compliance with a British Standard cannot confer immunity from legal obligations.

English Version

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

Equipements 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 25 April 2008.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 1176-1:2008) 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 November 2008, and conflicting national standards shall be withdrawn at the latest by May 2009.

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

This document supersedes EN 1176-1:1998.

This European Standard consists of a number of parts as follows:

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

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

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

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

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

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

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

EN 1176-10, *Playground equipment and surfacing — Part 10: Additional specific safety requirements and test methods for fully enclosed play equipment*

EN 1176-11, *Playground equipment and surfacing — Part 11: Additional specific safety requirements and test methods for spatial network*

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

EN 1177:2008, *Impact attenuating playground surfacing — Determination of critical fall height*.

For inflatable play equipment see:

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

The principal changes from the previous edition of this part of EN 1176 are as follows.

- a) This part of EN 1176 now includes requirements for surfacing based on those that were previously specified in EN 1177.

- b) The inclusion of additional requirements for barriers and steep play elements.
- c) The requirements relating to entrapment are now for all age groups and the test for partially bound openings has been clarified, with new requirements included dependent on the angle of insertion.

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

Introduction

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 by 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 may 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 may 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, for example, head and neck entrapment and protection against inadvertent falls, have been written with this in mind. It is also recognised 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 size of the head (e.g. hydrocephalus or Downs Syndrome) or wearing helmets.

1 Scope

This part of EN 1176 specifies general safety requirements for 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, but excluding adventure playgrounds. 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 and the Toys Safety Directive.

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 he or she may be unable to foresee when using the equipment as intended, or in a manner that can be reasonably anticipated.

2 Normative references

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

EN 335-2:2006, *Durability of wood and wood-based products — Definition of use classes — 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 351-1:2007, *Durability of wood and wood-based products — Preservative-treated solid wood — Part 1: Classification of preservative penetration and retention*

EN 636, *Plywood — Specifications*

EN 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 2307:2005)*

EN ISO 9554, *Fibre ropes — General specifications (ISO 9554:2005)*

3 Terms and definitions

For the purposes of this European standard, the following terms and 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 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 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

playing surface

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

3.5

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)

3.6

free height of fall

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

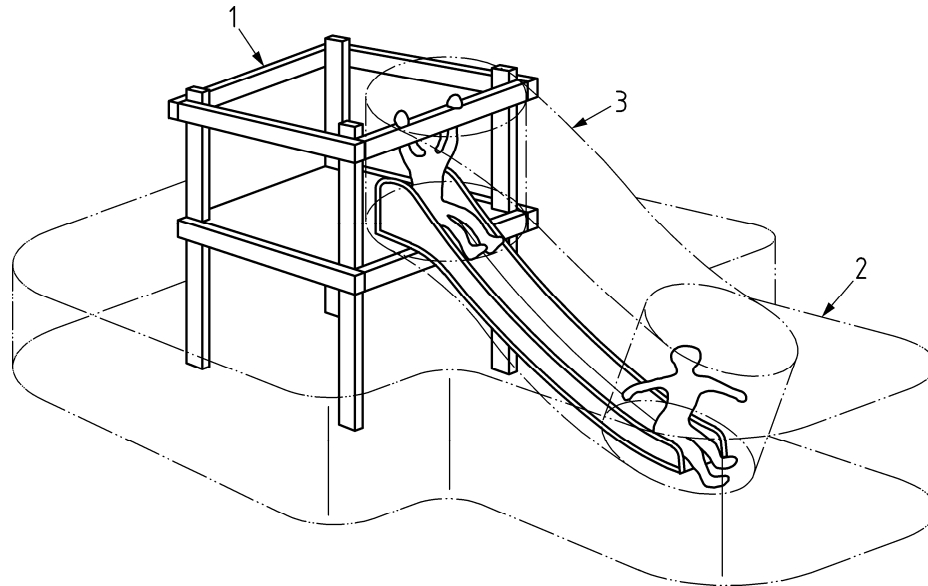
NOTE The intended body support includes those surfaces to which access is encouraged.

3.7

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 (see Figure 1)

NOTE The falling space commences at the free height of fall.



Key

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

Figure 1 — Spaces

3.8

minimum space

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

3.9

collective use

use by more than one user at the same time

3.10

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

3.11

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

3.12
ladder

means of access incorporating rungs or steps on which a user can ascend or descend with the aid of the hands (see Figure 2)

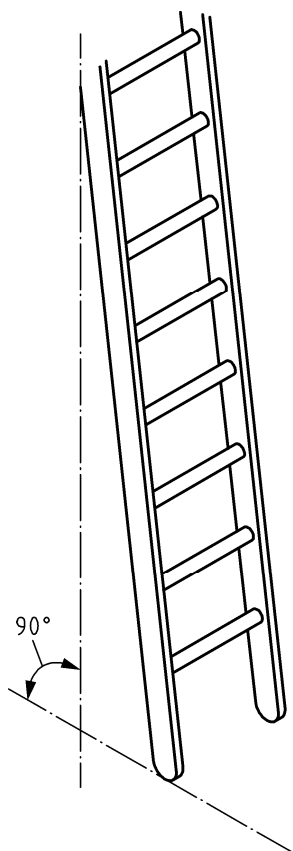


Figure 2 — Example of a ladder

3.13
stairs

means of access incorporating treads on which a user can ascend or descend (see Figure 3)

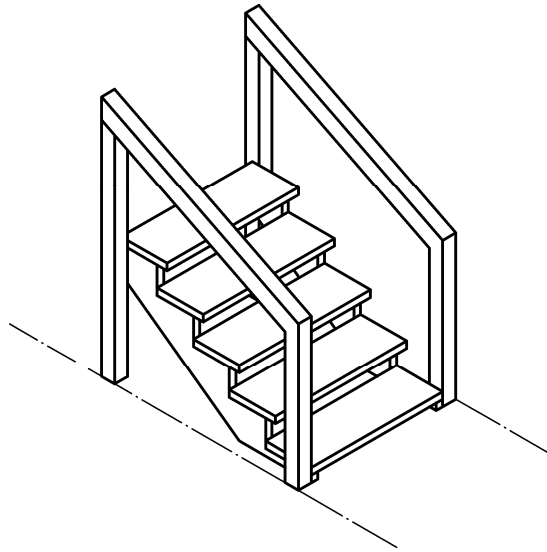


Figure 3 — Example of stairs

3.14
ramp

means of access incorporating an inclined surface on which a user can ascend or descend (see Figure 4 and 4.2.9.3 first sentence)

NOTE For maximum inclination see 4.2.9.3.

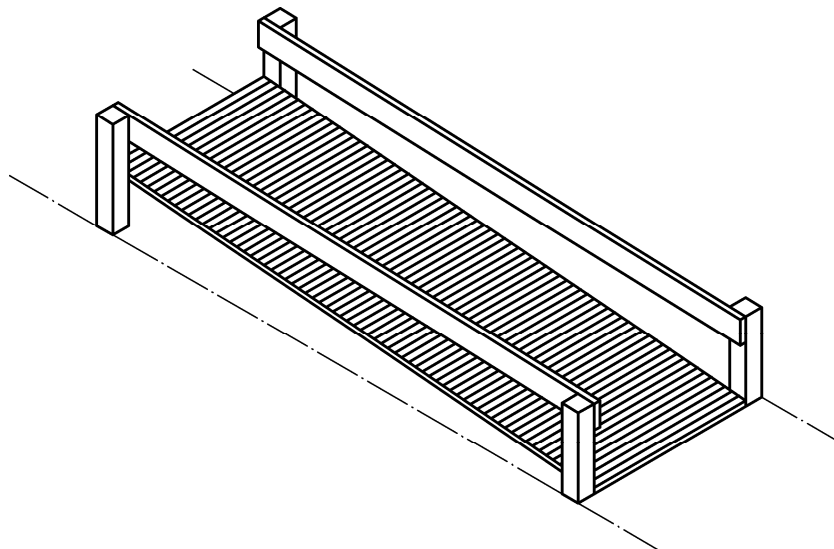


Figure 4 — Example of a ramp

3.15

grip

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

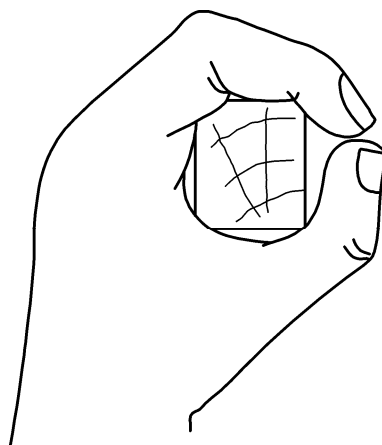


Figure 5 — Grip

3.16

grasp

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

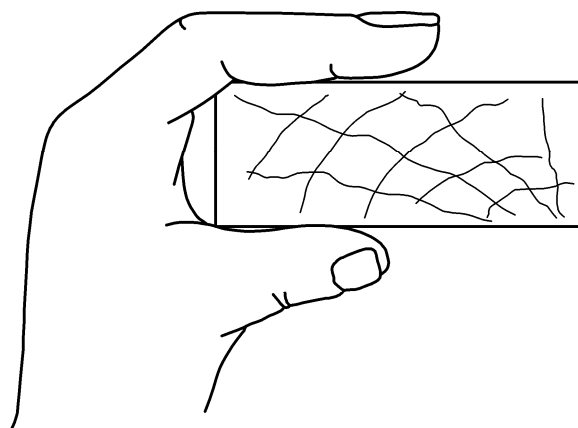


Figure 6 — Grasp

3.17

entrapment

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

NOTE This part of EN 1176 only considers certain types of entrapment where the user is not able to free him/herself and injury is caused by the entrapment.

3.18
obstacle

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

NOTE 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.

3.19
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, e.g. trail of stepping stones

3.20
platform

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

NOTE 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.

3.21
handrail

rail intended to assist the user to balance

3.22
guardrail

rail intended to prevent a user from falling

3.23
barrier

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

3.24
easily accessible

requiring only basic skills to access the equipment, allowing users to move freely and quickly onto/within the equipment

3.25
routine visual inspection

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

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

3.26

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.

3.27

annual main inspection

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

3.28

steep play element

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

3.29

tiered platforms

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

NOTE Stairs are not considered to be tiered platforms.

3.30

critical fall height

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

NOTE The critical fall height is determined according to the lowest test result obtained in accordance with EN 1177.

3.31

surface flash

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

4 Safety requirements

4.1 Materials

4.1.1 General

Materials shall conform to 4.1.2 to 4.1.5.

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 1 EN 1176-7 gives recommendations on maintenance inspections.

Materials should be manufactured in a workmanlike manner.

NOTE 2 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 surface coatings to avoid potential toxic hazards.

The choice of materials should be appropriate where extreme climatic or atmospheric conditions are to be expected.

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 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 350-2:1994, 4.2.2;
- b) construction methods, e.g. post shoe;
- c) use of timber treated with wood preservatives in accordance with EN 351-1:2007, Figure A.1 and in accordance with EN 335-2:2006, use 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 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 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 through ultraviolet influences.

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 the Dangerous Substances Directive 76/769/EEC and its successive modifications. Prohibited materials include but are not limited to, asbestos, lead, formaldehyde, coal tar oils, carbolineums and polychlorinated biphenyls (PCBs).

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:
 - guardrails (4.2.4.3);
 - 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.

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) 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).

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

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:

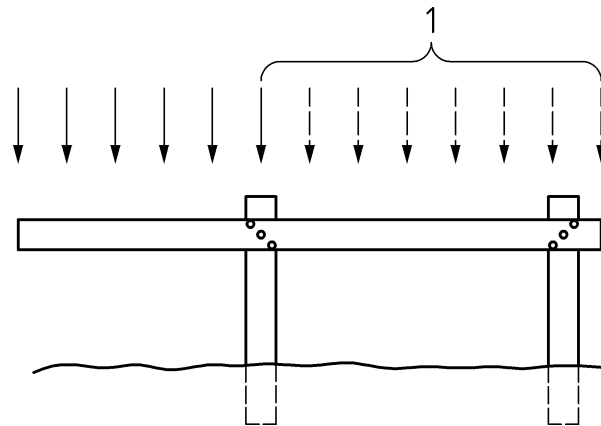
- minimize rotting or corrosion in parts relevant for stability;
- allow for controlling degradation and the need for decommissioning;
- be used without collapse within the foreseen inspection period when maintained correctly.

NOTE 1 No allowance for accidental loads, i.e. loads produced by fire, collision by vehicles or earthquake, need 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.

Structural parts shall resist the worst case loading condition.

NOTE 3 To achieve this, it may 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.

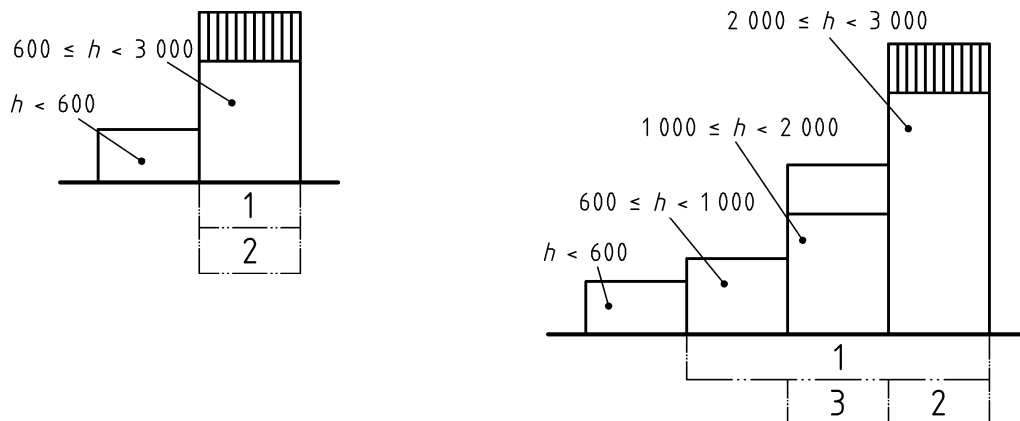
4.2.4 Protection against falling

4.2.4.1 Types of protection

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

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

Dimensions in millimetres



a) Equipment easily accessible to all ages

b) Equipment not easily accessible

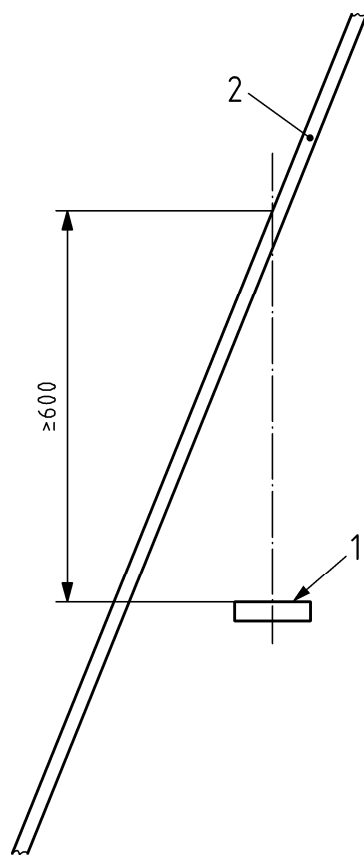
Key

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

Figure 8 — Protection against falling

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. 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. 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, unless a guardrail is provided across the opening (see Figure 10 b and c). 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 small probe C.

For easily accessible equipment barriers shall be provided when the platform is more than 600 mm above the playing surface.

For equipment other than easily accessible, barriers shall be provided when the platform 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.

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 10 c).

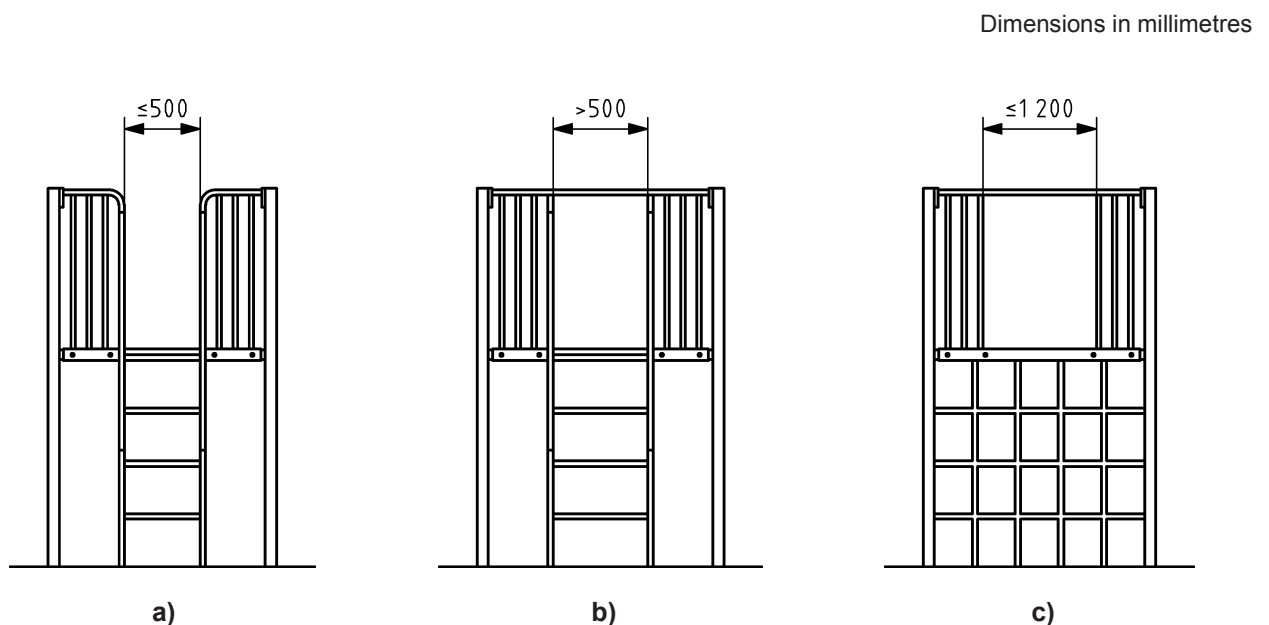


Figure 10 — Entrance and exit openings in barriers

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 (see 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 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. All welds shall be ground smooth.

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.

Dimensions in millimetres

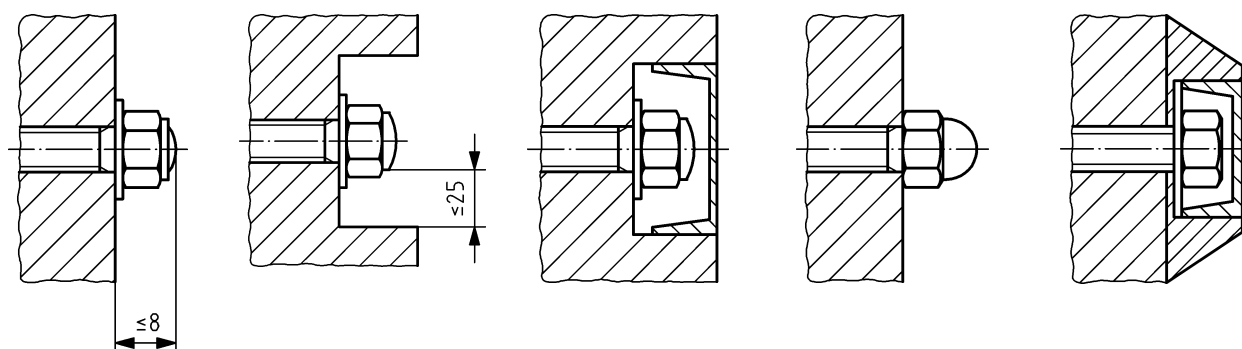


Figure 11 — Examples of protection for nuts and bolts

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 to the ground.

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°.

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 may 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 ground 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.

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:

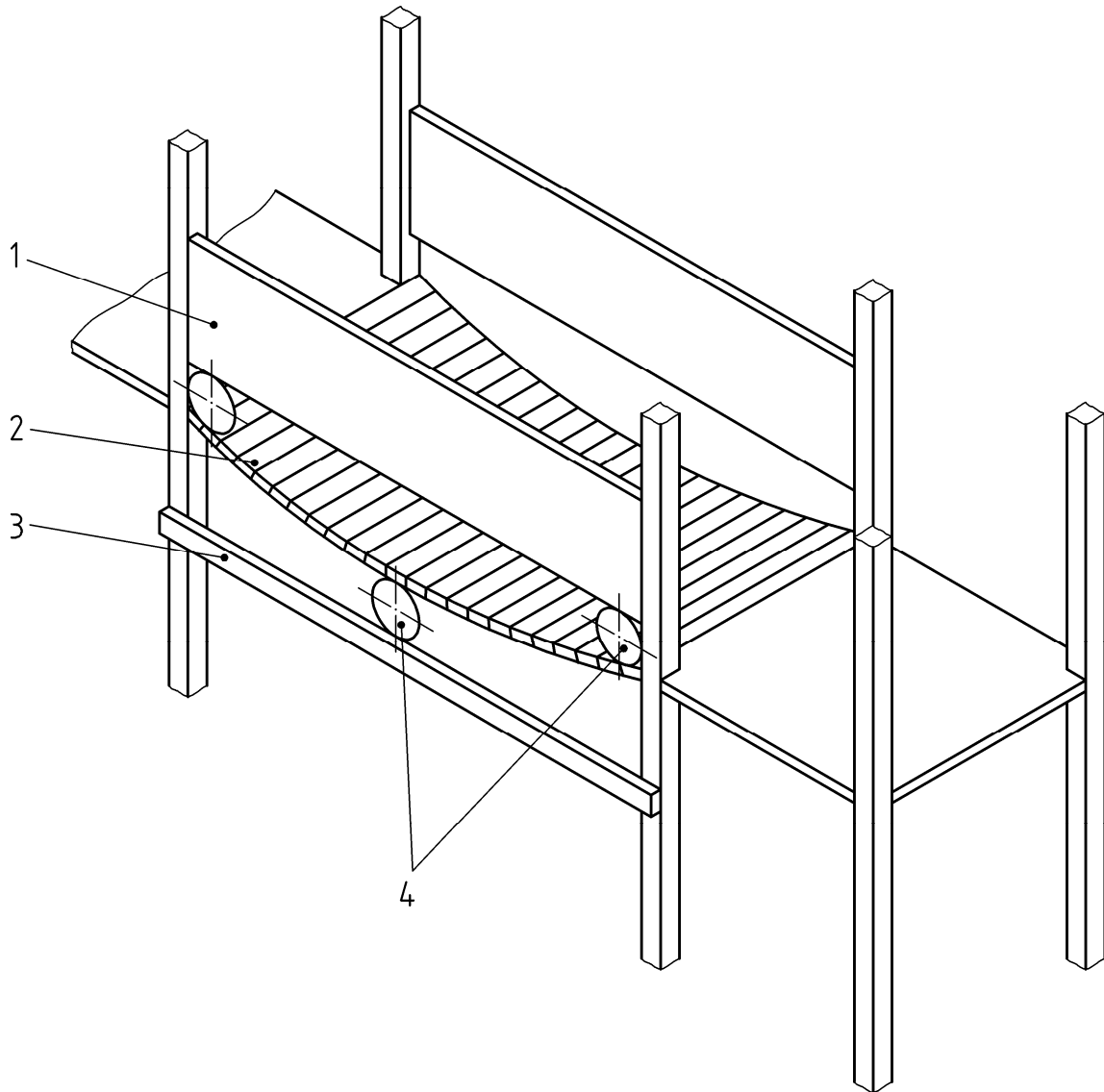
- 1) opening is not accessible when tested in accordance with D.2.2; or
- 2) if accessible at a position of 600 mm or more above ground when tested in accordance with D.2.2, depending on the angular orientation range of the opening (see Figure D.4), shall conform to the following:
 - Range 1: (template 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 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:

- 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 can be encountered are not created.

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 might 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 conform to the requirements given in Table 1.

Table 1 — Requirements for tunnels

Linear dimensions in millimetres

	Open one end	Open both ends			
Inclination	≤ 5° and upwards only when entering	≤ 15°			> 15°
Minimum internal dimension ^a	≥ 750	≥ 400	≥ 500	≥ 750	≥ 750
Length	≤ 2 000	≤ 1 000	≤ 2 000	None	None
Other requirements	None	None	None	None	Provision for climbing e.g. steps or handles
NOTE For tunnel slides, see EN 1176-3.					
^a 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 might 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.