

Playground equipment

Part 1. General safety requirements and test methods

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- Association of District Councils
- Association of Play Industries
- BSI Testing
- British Paediatric Association
- British Sports and Allied Industries Federation
- Co-opted experts
- Consumer Policy Committee of BSI
- Convention of Scottish Local Authorities
- Department of National Heritage
- Institute of Leisure and Amenity Management
- Institute of Sport and Recreation Management
- Landscape Institute
- National Playing Fields Association
- Royal College of Paediatrics and Child Health
- Royal Society for the Prevention of Accidents
- Safety Assessment Federation Ltd
- Timber Research and Development Association

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Foreword

This Part of BS 5696 has been prepared by Technical Committee SW/65. It will supersede BS 5696 : Part 1 : 1986 and BS 5696 : Part 2 : 1986, which will be withdrawn 12 months from the date of publication of this revision. It is expected that the publication of a European Standard on playground equipment will coincide with the withdrawal of these standards. This schedule will allow manufacturers, purchasers, installers and operators to convert to the new provisions of this revision and of the forthcoming European Standard. This Part of BS 5696 should be used in conjunction with BS 5696 : Part 3 (for installation and maintenance), BS 7188 (for the testing of impact absorbing surfaces) and PD 6586.

This Part of BS 5696 is a revision of BS 5696 : Part 1 : 1986 and BS 5696 : Part 2 : 1986. In addition, text has been taken from prEN 1176-1, a draft European Standard prepared by the European Committee for Standardization's (CEN) Technical Committee for Children's playground equipment (CEN/TC 136/SC1). The text taken from the CEN document (CEN TC 136/SC1 N299) has not been altered technically.

This Part of BS 5696 can be used until the European Standard (EN) on playground equipment is published. It incorporates those sections of the future EN that the BSI Technical Committee, SW/65, Children's playground equipment, considers will proceed without significant alteration before publication. It is quite probable that the CEN committee responsible for the EN may delete, amend or add to their current proposals. Those using this document should understand that the published EN may not be exactly the same as this Part of BS 5696. Other national standards bodies, e.g. DIN (Germany), DS (Denmark), are similarly revising their own specifications to bring their existing standards in line with the proposed EN 1176.

This Part of BS 5696 has been published in order to give time to adapt before the implementation of the EN (upon publication of which conflicting national standards will be withdrawn within 6 months). Further guidance may be obtained from the Secretary to Technical Committee SW/65 at BSI.

It is recognized that this standard will be used to assess the quality and safety of installed playground equipment. An item manufactured and installed in conformance with the 1986 editions of BS 5696 and which does not conform to this revision of the standard should not be immediately regarded as unsafe.

This Part of BS 5696 does not specify particular materials but care should be exercised in selecting only materials of known quantifiable properties of strength and durability. Experience of equipment under known use is a reliable basis for design, therefore detailed design rules have not been included.

In the absence of detailed statistics it has been necessary to adopt a reasonable attitude in trying to minimize accidents. Typical examples are the choice of height, above which medical evidence indicates that any fall to the ground will almost certainly result in concussion, fractures or other serious injuries, and the choice of clearances between moving parts where heads and limbs may be trapped.

Purchasers of equipment manufactured and tested in accordance with this Part of BS 5696 will be assured that every attempt has been made to reduce potential hazards to a practical minimum even when children use the equipment in an unconventional manner. The assurance cannot be given if a child deliberately attempts to defeat a safety precaution.

It is not the purpose of the requirements of this British Standard 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 British Standard does not cover rollerslides; their use is not advised in a situation where use without supervision is possible

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 50, an inside back cover and a back cover.

Specification

1 Scope

This Part of BS 5696 specifies general safety requirements for playground equipment. These requirements take into account risk factors based on available data.

This Part of BS 5696 applies to playground equipment intended for individual and collective use by children, but excludes adventure playgrounds (see note 3). 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 Toy Directive.

Compliance with this Part of BS 5696 will protect the user from foreseeable hazards when the equipment is used as intended, or is used in a manner that can be reasonably anticipated.

NOTE 1. This Part of BS 5696 has been drafted with full recognition of the need for supervision of children of 0 to 3 years of age. For additional safety equipment accessible to children under 36 months specific requirements have been included.

NOTE 2. This Part of BS 5696 does not take into account factors relating to the value of play such as combinations of equipment, the run of the game, stimulation of contacts, social behaviour and the like.

NOTE 3. Adventure playgrounds are fenced, secured playgrounds, run and staffed in accordance with pedagogical principles, to encourage children's development. They often use self-build equipment.

2 References

2.1 Normative references

This Part of BS 5696 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 on pages 50 and 51. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Part of BS 5696 only when incorporated in the reference by amendment or revision. For undated references the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Part of BS 5696 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this specification are listed on page 51, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 5696, the following definitions apply.

3.1 playground equipment

Equipment and structures, including components and constructional elements, which children can play on,

or with, in the open air or in enclosed spaces, either individually or in groups, according to their own rules or 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. 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.

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, could 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, could be cut.

3.10 ladder

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 1a).

3.11 stairs

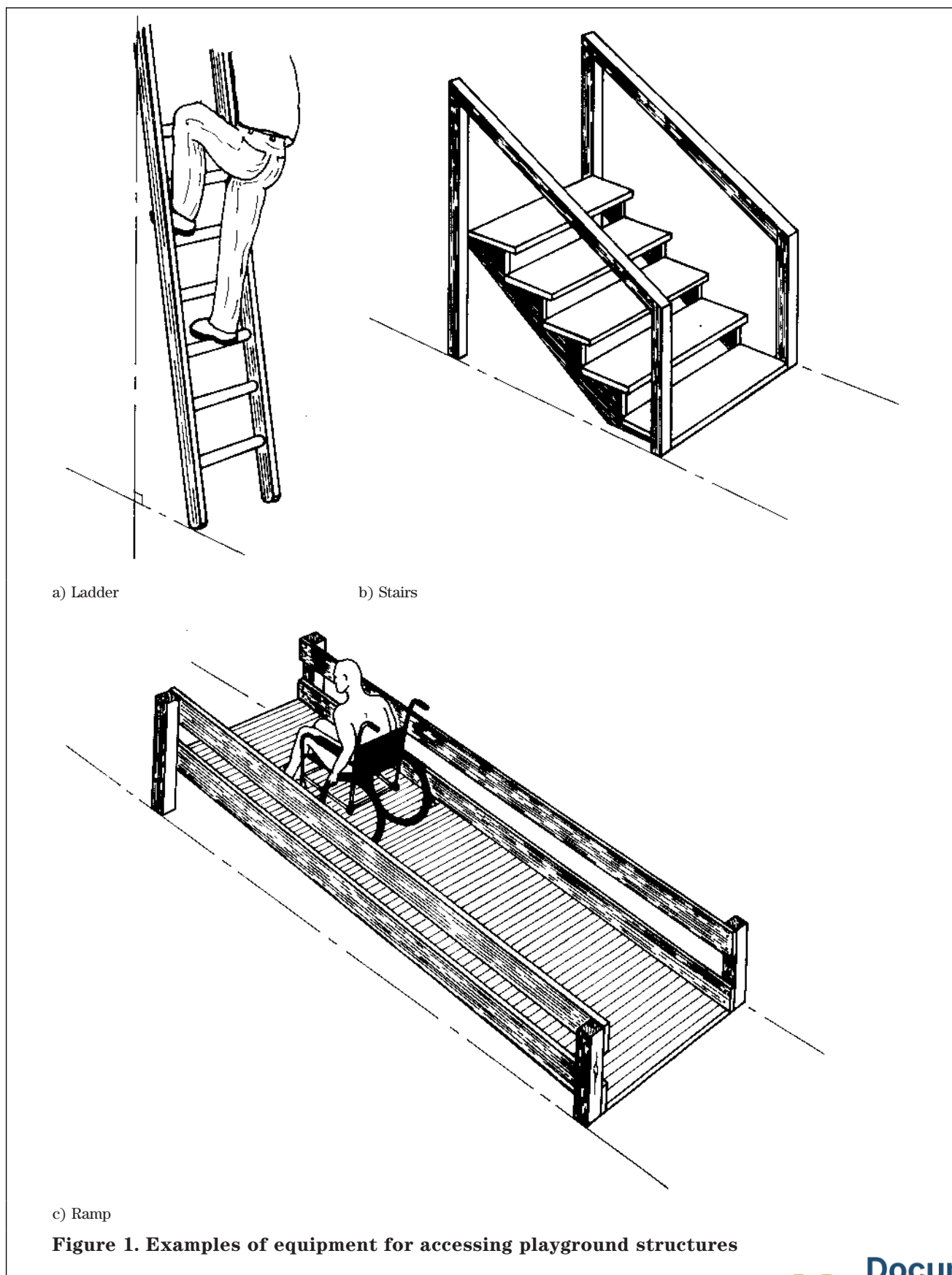
Means of access incorporating steps on which a user can ascend or descend.

NOTE. Stairs are normally inclined at an angle between 15° and 60° to the horizontal (see figure 1b).

3.12 ramp

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 1c).



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 2).

3.15 grasp

Holding of the hand round part of the circumference of a support (see figure 3).

3.16 trap

Hazard presented by the situation in which a body, or part of a body, or clothing is trapped.

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

3.17 obstacle

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

3.18 family of products

Modular systems or components that can be assembled in different ways.

3.19 platform

Raised level surface.

3.20 handrail

Rail intended to assist the user to balance.

3.21 guardrail

Rail intended to prevent a user from falling.

3.22 barrier

In-filled guardrail.

3.23 minimum use zone

Minimum space requirement for equipment (i.e. the space occupied by the item) and the area of operation (i.e. the space occupied by children using the item) together with an allowance for free movement of children between items. (See 4.2.10.1.)

3.24 not easily accessible

Requiring a degree of difficulty in accessing the equipment.

NOTE. This can be achieved by ensuring a clearance of 400 mm from the playing surface to the bottom of a ladder rung or tread of a stair and a clearance of 600 mm from the top surface of a platform or commencement of a ramp.

3.25 routine visual inspection

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

NOTE. Typical hazards include broken parts or broken bottles.

3.26 operational inspection

An 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

An 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.

3.28 wedge trap

Any trap formed by an acute angle between two or more adjacent parts that converge in a downward direction.

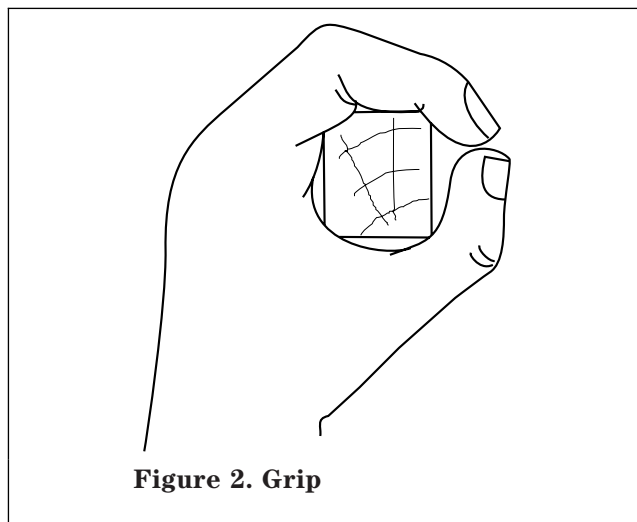


Figure 2. Grip

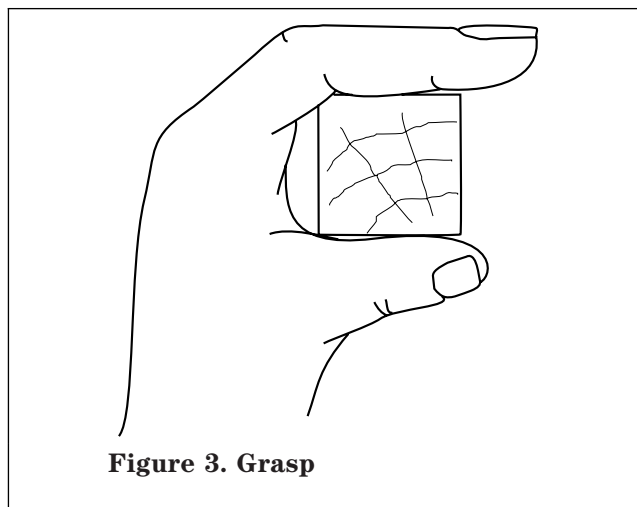


Figure 3. Grasp

4 Safety requirements

4.1 Materials

4.1.1 General

Materials shall conform to 4.1.2 to 4.1.6.

NOTE 1. The provisions relating to certain materials in this Part of BS 5696 do not imply that other equivalent materials are unsuitable in the manufacture of children's playground equipment.

NOTE 2. The selection of materials and their use should be in accordance with appropriate European Standards.

NOTE 3. 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 4. BS 5696 : Part 3 gives recommendations on maintenance inspections.

NOTE 5. Particular care should be taken in the choice of materials where equipment is to be used in extreme climatic or atmospheric conditions.

NOTE 6. 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.

NOTE 7. Where very low or very high temperatures can be anticipated care should be taken in material selection to avoid possible hazards through direct skin contact.

4.1.2 Flammability

To avoid the risk of fire and associated hazards, materials producing surface flash shall not be used. When tested in accordance with Parts 1 and 2 of EN 1021 no flaming debris shall fall from the sample during the test.

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.

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

Where required (e.g. where timber and associated products are in contact with the ground) protection against rot shall be provided by one of the following methods:

- a) the use of timber species with sufficient natural resistance, in accordance with grades 1 and 2 of the natural resistance classification given in EN 350-2;
- b) construction methods;
- c) preservative treatment of timber in accordance with BS 5268 : Part 5 or BS 5589, as appropriate.

NOTE 1. 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).

NOTE 2. 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.

Coal tar oils (e.g. carbolineums) shall not be used to protect timber.

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 to ensure that children are not exposed to glass fibres. When tested in accordance with EN 59, the Barcol hardness of the resin of glass-reinforced plastics surfaces shall be in accordance with that quoted by the manufacturer.

NOTE. 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 Toxic materials

Toxic materials, for example, asbestos, lead, formaldehyde or PCB, shall not be used in the manufacture of playground equipment.

NOTE. EN 71 prescribes acceptable levels of certain hazardous materials.

4.2 Design and manufacture

NOTE 1. The dimensions and degree of difficulty of the equipment should be suitable for the intended users or age group.

NOTE 2. The equipment should be designed so that the risk involved in play is apparent and foreseeable by the child.

4.2.1 Structural integrity

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

- a) calculation, carried out in accordance with annexes A and B (see annex C for worked examples);
- b) physical testing, in accordance with annex D; 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 D, the equipment shall not show any cracks, damage or excessive permanent deformation.

NOTE 1. For some equipment, these specific calculations or tests are not always appropriate, but the structural integrity should be at least equivalent.

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

Each structure shall resist both the permanent and variable loads acting on equipment and parts of equipment in accordance with annex D.

Structural parts shall resist the worst case loading condition.

NOTE 2. No allowance for accidental loads, i.e. loads produced by fire, collision by vehicles or earthquake need be made for playground equipment.

NOTE 3. The loads associated with fatigue are much smaller than the loads in combination with the appropriate load factors when calculated according to **B.2**. Therefore playground equipment need not be verified for fatigue.

NOTE 4. In order to achieve this, it may be necessary to remove that part of the user load causing favourable effects, as shown in figure 4.

4.2.2 Accessibility

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

Equipment with an internal distance greater than 2 m 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.

Owing to the risk of fire, these two openings shall allow the user to leave the equipment and exit to ground level by different routes.

4.2.3 Protection against falling

4.2.3.1 General

Handrails or guardrails shall be provided in all cases where the access to equipment, with the exception of climbing frames, is more than 500 mm above ground level or other adjacent surface. The rails shall conform to 4.2.3.2 to 4.2.3.7 as appropriate.

There shall be no intermediate horizontal or near horizontal rails or bars that can be used as steps by children attempting to climb.

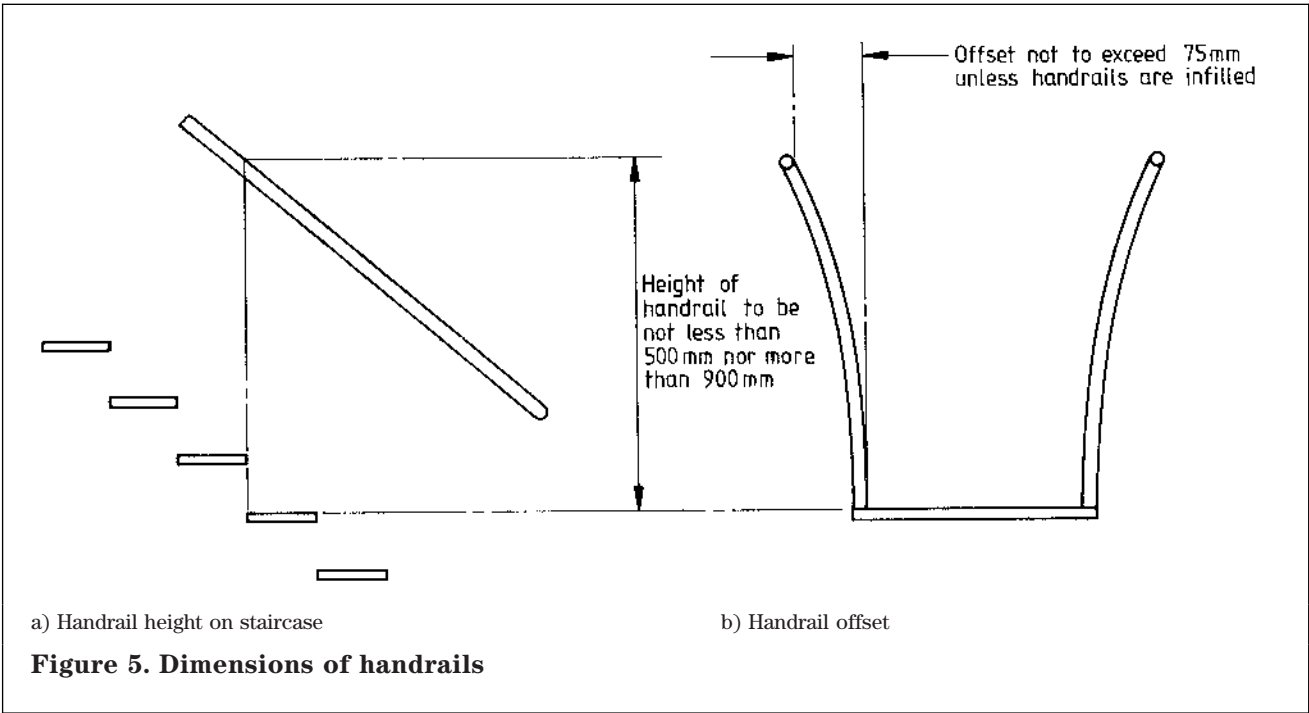
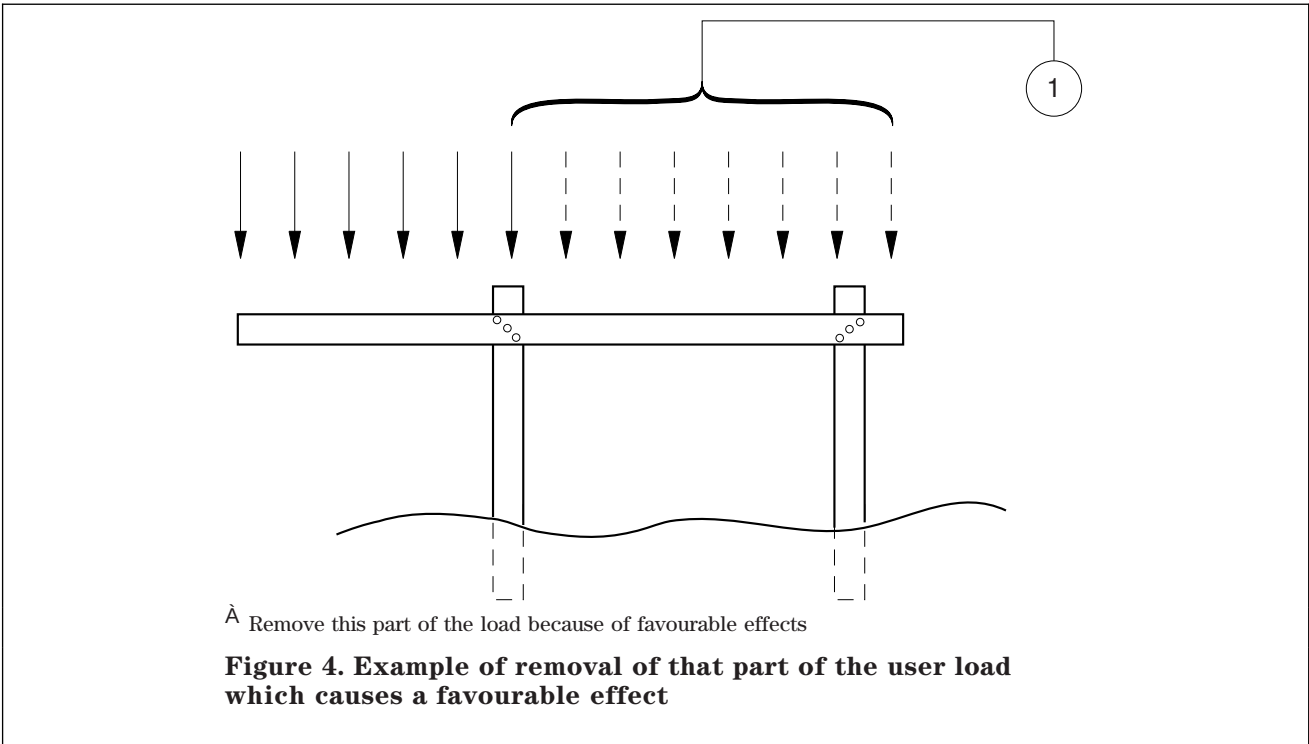
Handrails and guardrails shall have an effective diameter of not less than 18 mm nor more than 40 mm.

4.2.3.2 Handrails

Handrails shall have a height of not less than 500 mm nor more than 900 mm, see figure 5a. Handrails shall be offset by an amount not exceeding 75 mm unless the handrails are infilled, see figure 5b.

4.2.3.3 Guardrails

The height of guardrails above the platform or ramp level shall depend on the platform or ramp height above ground level and shall be not less than shown in figure 6. At a platform or ramp height of more than 1.5 m above ground level, the height of the guardrail shall be not less than 0.9 m.



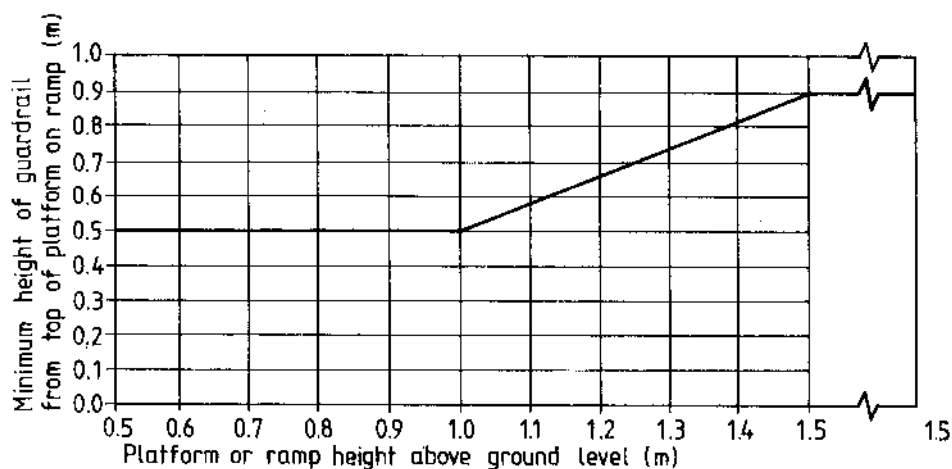


Figure 6. Guardrail heights

4.2.3.4 Barriers

The space contained below guardrails shall be infilled. Where perforated material is used for the infilling it shall have a maximum hole size in any direction of 25 mm and where vertical bars are used they shall have gaps not greater than 89 mm. The infilling shall not form wedge, finger, hand, limb or head traps.

NOTE 1. As far as possible solid infill materials should be shatter resistant.

NOTE 2. This amended dimension results from a conflict between prEN 1176-1 and the 1986 editions of BS 5696; the minimum size head probe specified in prEN 1176-1 has been used in this Part of BS 5696.

4.2.3.5 Strength requirements

Barriers and guardrails shall fulfil the requirements given in 4.2.1 without damage.

4.2.3.6 Grip requirements

The cross-section of any support designed to be gripped (see 3.14 and figure 2) shall have, when measured across its centre, a dimension of not less than 16 mm nor more than 45 mm in any direction.

4.2.3.7 Grasp requirements

The cross-section of any support designed to be grasped (see 3.15 and figure 3) shall have a width not exceeding 60 mm.

4.2.4 Surface 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.

Protruding bolt threads 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. Rough surfaces should not present any risk of injury.

NOTE 2. Figure 7 shows examples of protection for nuts and bolts.

Corners, edges and projecting parts 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.

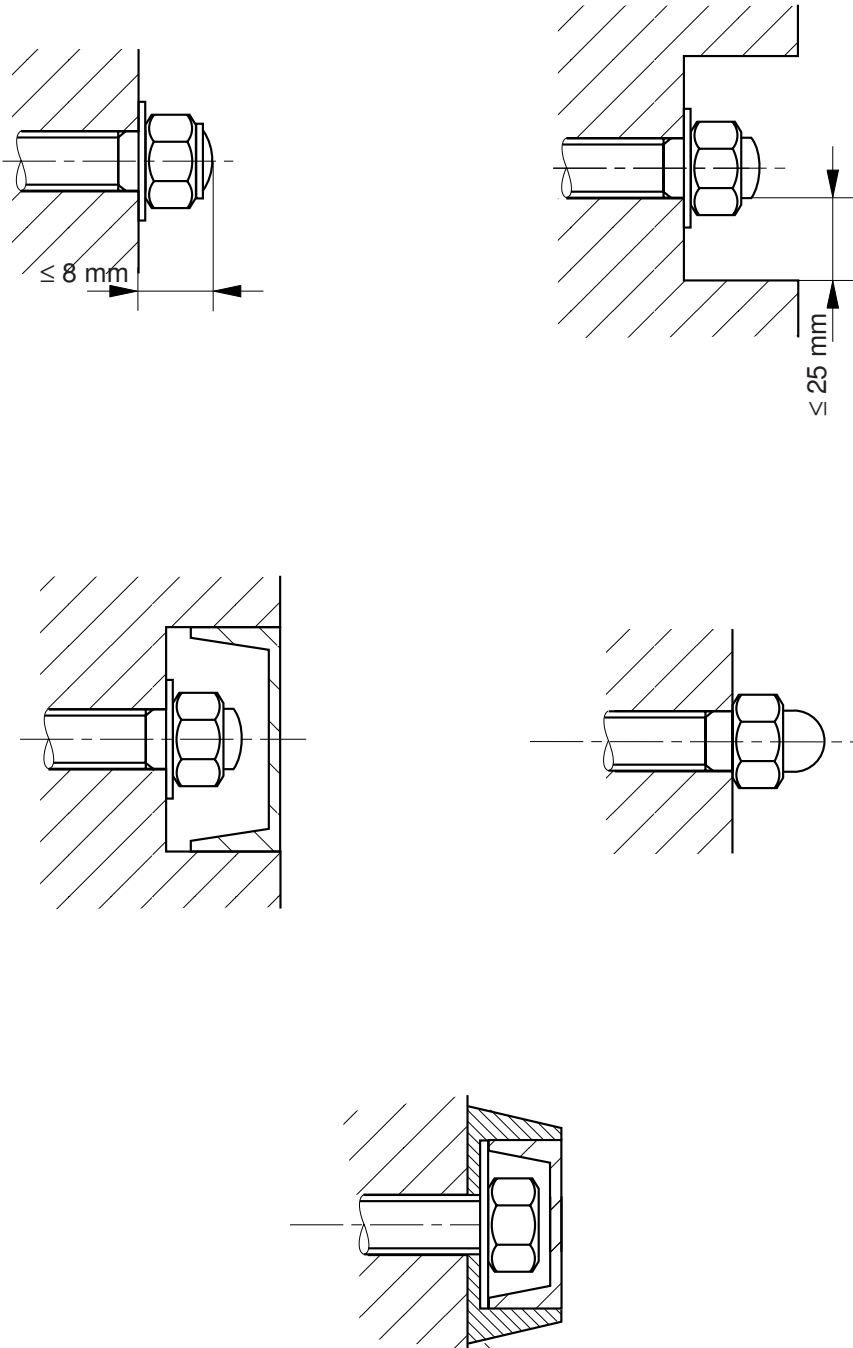


Figure 7. Examples of protection for nuts and bolts

4.2.5 *Parts of the equipment*

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 4.2.9. (Test methods for determining crushing or shearing points for moving equipment are given in annex E.)

Impact forces shall be damped.

4.2.7 *Swinging ropes*

For suspended ropes of less than 2 m in length, the distance between swinging ropes and fixed equipment parts shall be not less than 600 mm and the distance between swinging ropes and swinging equipment shall be not less than 900 mm.

For suspended ropes of between 2 m and 4 m in length, the distance between swinging ropes and other parts of equipment shall be not less than 1 m.

The rope diameter shall be between 25 mm and 45 mm.

4.2.8 *Climbing ropes*

Climbing ropes shall be anchored at both ends and the amplitude of swing shall not exceed 20 % of the length of the rope.

NOTE. This requirement is intended to remove the risk of strangulation.

The rope diameter shall be between 18 mm and 45 mm.

4.2.9 *Entrapment*

NOTE 1. When choosing materials, the manufacturer should take into account the entrapment hazards that can occur through distortion of materials during use.

NOTE 2. Test methods for entrapment are given in annex F.

NOTE 3. Possible entrapment situations are shown in figure 8.

4.2.9.1 *Entrapment of the head and neck*

NOTE 1. Hazardous situations in which this type of entrapment may be encountered include the following:

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

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

When tested in accordance with F.1, no accessible completely bound opening, which has a lower edge more than 600 mm above the ground or standing surface, shall allow passage of the small probe(s) unless the large probe can also pass through.

NOTE 2. Enclosed spaces, including tunnels, should be designed so that they do not accumulate water.

4.2.9.2 *Wedge traps*

When tested (see also PD 6586), there shall be no wedge traps (see 3.28) on any part of the equipment, at or above 1 m above ground level, on which a child can walk or gain access to higher levels.

A wedge trap shall be deemed to exist where:

- a) the minimum separation between the two parts forming the wedge is less than 55 mm; or
- b) the probes cannot be inserted to their full depth (into the parts forming the wedge) and withdrawn after rotation at any angle up to and including 90° (see figure 9).

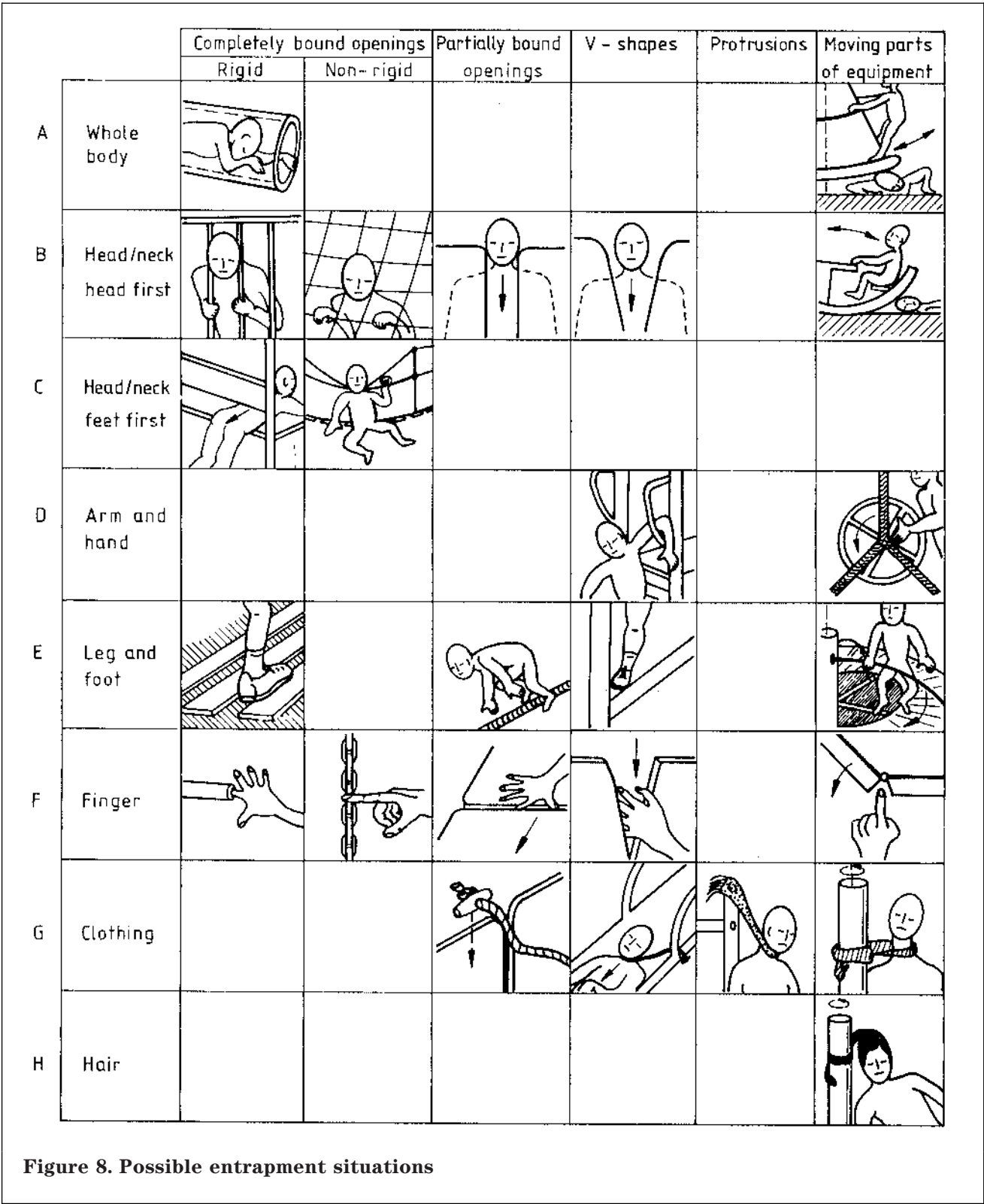
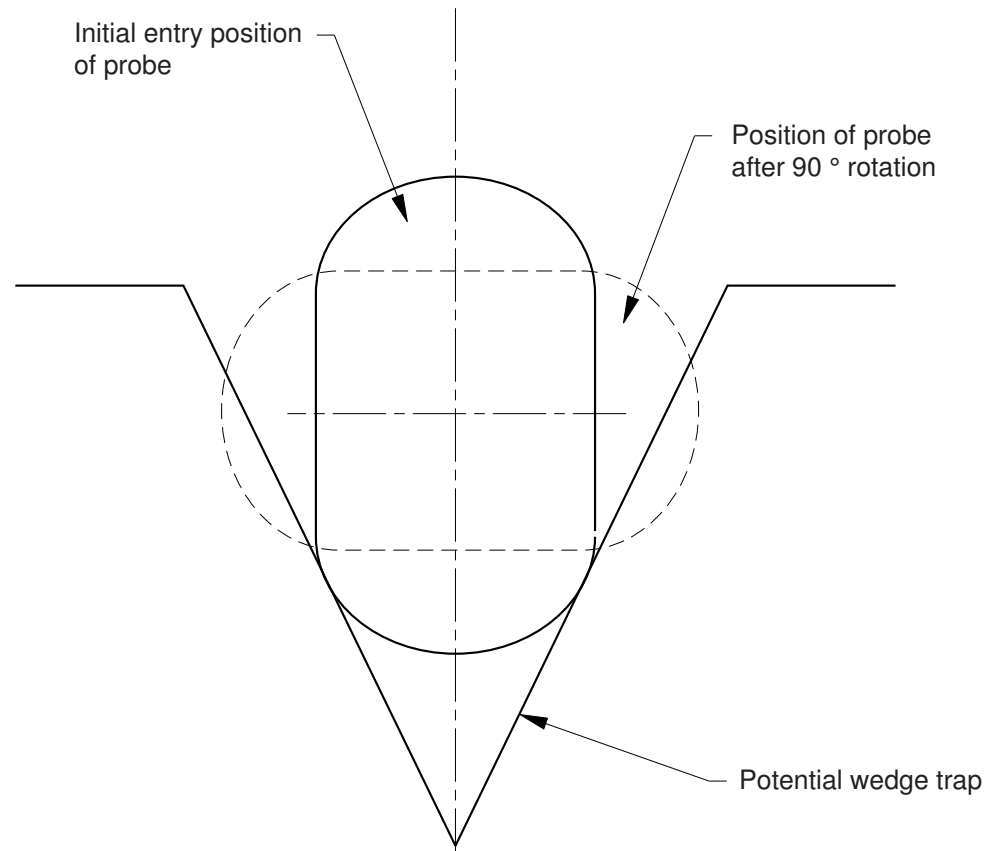


Figure 8. Possible entrapment situations



Opening fails as probe can be entered to its full depth of 100 mm rotated through 90 ° and cannot then be withdrawn

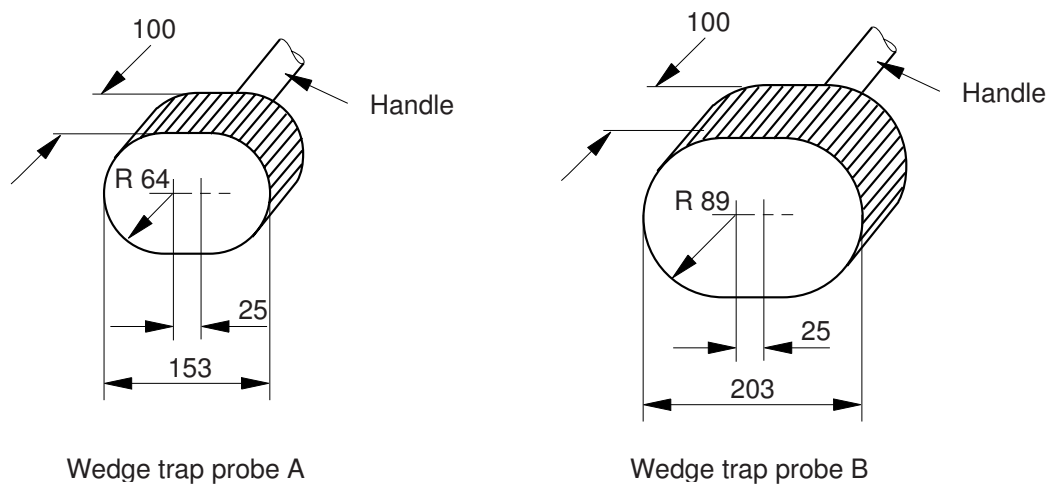


Figure 9. Application of probes to wedge traps

4.2.9.3 Other cases

Rigid circular openings shall not have an internal diameter of between 132 mm and 228 mm.

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 228 mm in diameter under the worst case condition of loading (see 4.2.1). Both loaded and unloaded situations shall be considered.

4.2.9.4 Entrapment of the whole body

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

- 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.

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

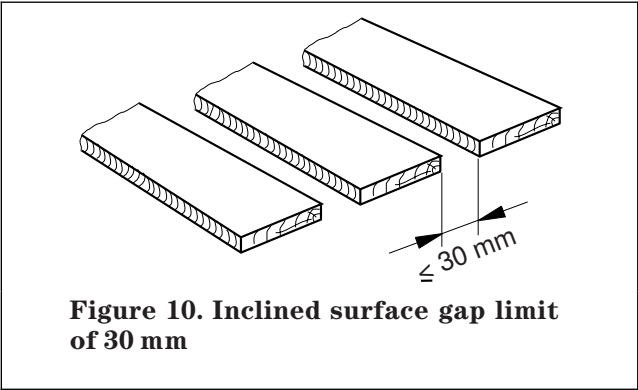
4.2.9.5 Entrapment of the foot or leg

NOTE 1. Hazardous situations in which this type of entrapment can be encountered include the following:

- a) completely bound rigid openings in surfaces on which children can run or climb; and
- b) footholds, handholds, etc. extending from these surfaces. In these cases, the entrapped foot or ankle can be severely injured if the user falls.

Other than for suspension bridges, surfaces inclined at up to 45° shall not contain any gaps greater than 30 mm, when measured in one direction (see figure 10).

NOTE 2. Level surfaces intended for running/walking should not contain any gaps likely to cause foot or leg entrapment.



4.2.9.6 Entrapment of fingers

NOTE 1. Hazardous situations in which this type of entrapment can be encountered include the following:

- a) gaps in which fingers can be trapped whilst the remainder of the body is moving or continues in motion involuntarily, for example sliding, swinging, falling;
- b) open-ended tubes or pipes; and
- c) variable gaps.

Openings within the free space, where the user is subjected to forced movement, and machined holes which have a lower edge more than 1200 mm above the potential impact area, when tested in accordance with F.2 shall conform to one of the following requirements:

- a) the 8 mm finger rod (see figures F.3 and F.4) 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 F.2.2; or
- b) if the 8 mm rod passes through the opening, the 25 mm finger rod (see figures F.3 and F.4) shall also pass through the opening, provided that the opening does not permit access to another finger entrapment site.

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

NOTE 2. The closures should not be removable.

Gaps with dimensions that are subject to change during use of the equipment, including connections of more than two chains, shall have a minimum dimension in any position of 12 mm.

When tested with the 8 mm diameter finger rod described in F.2.1, the rod shall not pass through the openings in chains.

Table 1. Requirements for tunnels				
	Inclination in degrees	Internal diameter mm	Length m	Other requirements
Open one end	<5 upwards (only when entering)	≥750	<2	—
Open both ends	<10	≥500	<2	—
	10 to 15	≥750	—	—
	≥15	≥750	—	Provisions for climbing, e.g. steps or handles