SLOVENSKI STANDARD
SIST EN 1069-1:1998

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Water slides over 2 m height - Part 1: Safety requirements and test methods

Water slides over 2 m height - Part 1: Safety requirements and test methods

Wasserrutschen ab 2 m Höhe - Teil 1: Sicherheitstechnische Anforderungen und Prüfverfahren

Toboggans aquatiques d'une hauteur à partir de 2 m - Partie 1: Prescriptions de sécurité et méthodes d'essai

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English version

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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.

The European Standards exist 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
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Europäisches Komitee für Normung

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Contents

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 136 "Sports, playground and other recreational equipment", the secretariat of which is held by DIN.

This standard consists of 2 parts: Waterslides over 2 m height -

- Part 1: Safety requirements and test methods
- Part 2: Instructions

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of an identical text or by endorsement, at the latest by July 1996, and conflicting national standards shall be withdrawn at the latest by July 1996.

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

Introduction

The market for water slides is extremely wide and specific, and still developing. It is impossible to define an all-embracing safety specification, including dimensions and design requirements as required by a standard, without limiting the design possibilities and preventing innovative and new but safe products.

This European Standard is intended to establish safety requirements and design guidance rules to serve anyone involved with waterslides, especially designers, manufacturers, operators and users, to ensure safe and more efficient products. This means that for certain aspects of design, manufacturing, installation, operation and use only specific guidelines are given, without any technical specification. These safety guidelines should be taken into consideration and fulfilled in order to ensure safety for operators and end users.

1 Scope

This European Standard is applicable to all water slides over 2 m in height from water level.

This standard may also be applicable to other types, not described in this standard, provided the safety requirements are fulfilled.

This standard specifies general requirements to all types of waterslides and accessories and specific requirements to defined types of water slides. These requirements concern safety and the technical rules for design, calculation and testing of water slides.

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 294 Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs

prEN 1176-1 Playground equipment — Part 1: General safety requirements and test methods

3 Definitions

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

3.1 water slide: Piece of equipment with an inclined sliding surface, down which the user descends by sliding usually under the influence of gravity, and with water as the friction-reducing medium, either freely or with the use of ride enhancement devices, if so designed.

3.1.1 type 1: Straight individual slide with an average inclination of max. 70%, not exceeding 3 m in height above water level and 2,70 m above ground;

3.1.2 type 2: Individual slide with an average inclination between 11 % and 18 % , excluding the final part, not exceeding 3 m in height above water level and 2,70 m above ground;

3.1.3 type 3: Individual slide, not restricted in height with an average inclination of max. 13 %, excluding the final part. The user can achieve an average speed of 5 m/s and a maximum speed of 7 m/s;

3.1.4 type 4: Speed individual slide with an average inclination between 13 % and 20 %, excluding the final part. The user can achieve an average speed of 10 m/s and a maximum speed of 14 m/s;

3.1.5 type 5: High speed individual slide with an average inclination of at least 20 %, excluding the final part. The user can achieve a maximum speed of more than 14 m/s;

3.1.6 type 6: Multi-track slide with separate parallel tracks (straight or curved), one beside the other over full length. The user can achieve an average speed of 8 m/s and a maximum speed of 14 m/s.

3.1.6.1 type 6.1: Multi-track slide in the form of type 3.

3.1.6.2 type 6.2: Multi-track slide in the form of type 4.

3.2 platform: Area providing access to the start section.

3.3 start section: Area at which the user enters the slide proper.

3.4 slide proper: Area intended for sliding.

3.5 final part: Part of the slide proper with an downward inclination of less than 5 %, designed to prepare the user for landing.

3.6 catch unit: Integral part of a water slide, not part of the slide proper, which brings the rider to a halt on the sliding surface.

3.7 splashdown area: Either a specific pool or an area which is part of a general purpose pool, in which the rider is brought to a halt in the water.

3.8 drop: Length of the slide proper, tilted with an inclination greater than those of adjacent sections.

3.9 tube: Closed section, not necessarily circular in cross-section, of a water slide, with a fully utilisable sliding surface.

3.10 cover: Device to enclose an open slide, not intended for sliding.

3.11 riser: Extension for the slide proper, intended for sliding.

3.12 wave screen: Device, placed within the clearance zone, to control spilling water.

3.13 ride enhancement device: Device to slide on or in, designed for a particular water slide.

3.14 guardrail: A device to restrict users from falling over, under or through it.

3.15 average inclination: Inclination calculated with the formula

$$x = \frac{h \times 100}{l} \%$$

where:

- h is the height between start section and beginning of final part in metres;
- l is the actual length of the slide proper excluding the final part in metres.

3.16 clearance zone: Space around the slide proper, free from obstacles.

4 General

Water slides should be treated as structures and attention is drawn to the statutory requirements e.g. with regard to means of access and means of support.

The shape of a water slide does not need to be the same as in the figures.

5 Materials

Any material may be used for the construction of water slides, supports and ride enhancement devices provided it fulfills the requirements of this standard.

6 Design loads

6.1 General

Proof of structural integrity/stability shall be obtained by the use of calculation, component tests or by a combination of both methods signed by an engineering expert.

NOTE: In some European countries, a certificate on the correct construction of the water slide by a technical expert can be required to certify that the entire construction of the water slide and the way it is erected complies with all relevant standards and laws.

The component tests should be carried out on slide sections of the same dimensions and design, with comparable supporting conditions and joints. In addition to the relevant single component test, a test on a minimum of two adjacent elements joined together shall be made.

6.2 Dead load

For every component of the slide, the dead load shall be determined by an engineering expert, by calculation and/or testing of the material/component used to construct the water slide.

6.3 Water load

For the purpose of calculation, the water load shall be twice the designed amount of water flowing on the slide. For the defined types, taking into consideration the flow rate as given in 8.4, the water load where the inclination is bigger than 5 % shall conventionally be as follows:

- type 1: the water load is too small to be taken into account;
- type 2: 0,1 kN/m;
- types 3 to 5: 0,2 kN/m;
- type 6: 0,1 kN/m per track.

If the inclination is less than 5 %, the real load of the water contained in the slide shall be used.

6.4 Sliding person load

Measurements shall be as given in table 1.

Table 1: Measurements to be considered

Type	Sliding person load kN/m	Length of load m	Conventional speed for calculation m/s	Data for calculating the centrifugal forces[1])			
				User speed m/s	Length of application m	Point of application above bottom m	Direction
1	0,8	—	—	—	—	—	—
2	0,8	5,0	3,5	3,5	5,0	0,1	horizontal
3	1,5	5,0	7,0**)	3,5 (7,0)**)	5,0 (1,0)**)	0,1	horizontal
4	1,5	1,0	12,0	12,0	1,0	0,35	horizontal
5	1,5	1,0	16,0	16,0	1,0	0 0,35	vertical/ horizontal
6.1	1,5	5,0	7,0**)	3,5*) (7,0)**)	5,0*) (1,0)**)	0,1	horizontal
6.2	1,5	1,0	12,0**)	12,0	1,0	0,35	—

[1]) Centrifugal forces see 7.7.2

*) chain sliding

**) single person

6.5 Effects of impact

The effects of impact shall be considered, e.g. in the start section, or where a drop is fitted.

6.6 Stationary persons

The load of stationary persons shall only be taken into account where the inclination is less than 20 %. In this case, the load shall be 0,8 kN/m for types 1 and 2 and 1,5 kN/m for other types.

6.7 Wind load

The wind load for all types of water slides shall be calculated in accordance with the relevant standards until a specific European Standard is available.

If an open slide is used during windy weather, an action of centrifugal force plus 30 % of the maximum wind load shall be taken into account.

6.8 Snow load

The snow load for all types of water slide shall be calculated in accordance with the relevant standards until a specific European Standard is available.

For open slides, not in use during the winter, it shall be taken into account that the whole cross-section can be full of snow.

6.9 Temperature

For slides installed outdoors, a minimum of ± 30 K shall be taken into account as the limit of mean temperature variations for the calculation of the longitudinal deformation of the slides, unless the deformation can be compensated by the design.

For tubes, a temperature difference in the cross sections of ± 20 K shall be taken into account.

6.10 Load combinations

Calculation shall take into account the combination of loads corresponding to the most severe conditions possible, even though they may not occur together.

7 Safety requirements for all types of water slides

7.1 General

Various risks can be involved in using a water slide, e.g. ejection from the slide, impacts, falls, burns, entrapment. The following requirements are given to reduce such risks and to be applied as appropriate.

Material and components shall not cause additional hazards taking into account the swimming pool environment.

If a special feature has been incorporated in the design, e.g. special water effects, then the user shall be notified prior to use of the slide.

It is a general safety recommendation that the user should remain in contact with the slide proper throughout its length unless made aware prior to use of the possibility of becoming involuntarily airborne.

7.2 Entrapment

To prevent risk of entrapment the requirements of prEN 1176-1 and EN 294 shall be taken into consideration.

7.3 Surfaces

7.3.1 General

Surfaces in reach by staff and the public should be protected or constructed in such a way as to prevent injuries.

The surface within the clearance zone (see 8.5) shall have no apertures except those for water or specific features.

7.3.2 Surface of the slide proper

The surface of the slide proper shall form a smooth, continuous surface, free from irregularities; a difference in level is permitted where two elements are joined together but this shall not be against the sliding direction and should not cause discomfort to the rider. This surface includes the returns on the top edges.

7.4 Corners and edges

Corners and edges within the clearance zone shall be rounded to a radius of at least 3 mm, and edges of cuts and holes should be suitably protected.

7.5 Access to water slides

7.5.1 General

Access to water slides shall be constructed in accordance with relevant regulations. If stepladders are used they shall have handrails on both sides, which shall merge into the guardrail of the platform. Steps shall be flat.

7.5.2 Surface of steps

Corners and edges shall be rounded with a radius of at least 3 mm.

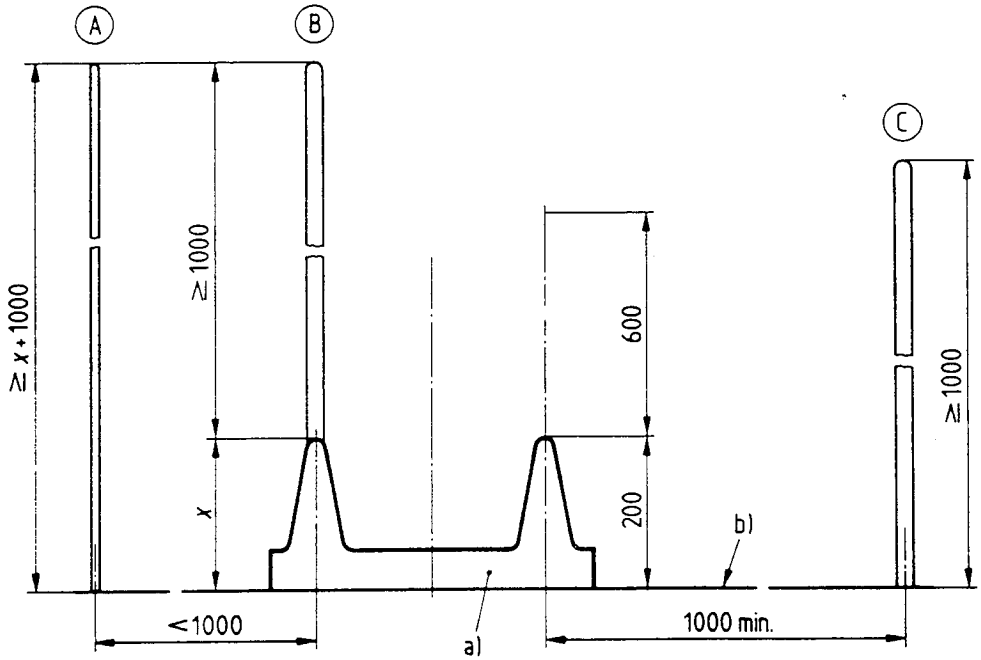
The surface shall inhibit slipping.

Testing shall be carried out in wet conditions.

7.5.3 Platform

At the end of the means of access there shall be platforms of at least 500 mm in depth in front of the entrance to the start section, to prevent users from falling backwards. The platforms shall have guardrails of at least 1 000 mm in height. When the fall exceeds 12 000 mm, the guardrails shall be at least 1 200 mm in height. Their height shall be measured from the highest point on which a person can stand within 1 000 mm from the guardrails (see figure 1). They shall be designed in such a way as to prevent climbing.

Dimensions in millimetres



A, B, C are different possibilities for placing guardrails
A is the guardrail within 1 000 mm from a higher standpoint
B is the guardrail on a side of a start section
C is the guardrail outside 1 000 mm from a higher standpoint
a) is the start section
b) is the platform
x is the height of highest point on which a person can stand

Figure 1: Height of the guardrails

7.6 Start section

If a start section is not part of a platform it shall have guardrails of the same height and characteristics as stated under 7.5.3.

The start section shall be fitted with a seamless transition from the top of the guardrail to the sides of the slide proper in the sliding direction.

The start section shall be constructed in such a way that the user cannot be directly forced onto the slide proper by people coming from behind. This can be achieved by installing a raised start section or by interposing one step up between the access and the start section itself.

Except for type 1, water slides shall have a crossbar situated 800 mm to 1 100 mm, above the surface of the slide between the start section and the slide proper. This is to prevent the user entering the slide standing up and to aid the user sitting down and sliding in accordance with the instructions.

7.7 Slide proper

7.7.1 General

The top edges of both outer sides of a slide shall be made in such a way that in normal use the user cannot touch or reach the outer parts of the slide. The individual components of the slide proper shall be arranged or designed in such a way that the slider is contained at all times within the slide and that his natural progression is safe.

Practical test according to 9.2.