



SLOVENSKI STANDARD

SIST EN 1069-1:2002

01-september-2002

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SIST EN 1069-1:1998

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

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

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Toboggans aquatiques d'une hauteur supérieure ou égale à 2 m - Partie 1: Exigences de sécurité et méthodes d'essai

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Ta slovenski standard je istoveten z EN 1069-1:2000

ICS:

97.220.40	Oprema za športe na prostem in vodne športe	Outdoor and water sports equipment
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1069-1

July 2000

ICS 97.220.40

Supersedes EN 1069-1:1996

English version

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

Toboggans aquatiques d'une hauteur supérieure ou égale à 2 m - Partie 1: Exigences de sécurité et méthodes d'essai

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

This European Standard was approved by CEN on 20 October 1999.

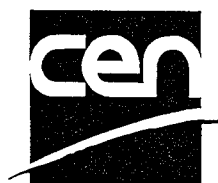
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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same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

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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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 supersedes EN 1069-1:1996.

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 January 2001, and conflicting national standards shall be withdrawn at the latest by January 2001.

The standard EN 1069-1 "Waterslides of 2 m height and more" consists of

Part 1: Safety requirements and test methods

Part 2: Instructions

In relation to EN 1069-1:1996 the following main amendments have been made:

- 1) The English title has been aligned with the French and the German title;
- 2) The description of the types have been taken from clause 3 and put in a new clause 4 "Classification";
- 3) A new type 7 "Wide straight slide" has been added;
- 4) Table 1 has been detailed and type 7 has been added;
- 5) In 6.4 an example for calculation and a new figure 1 for the determination of the radius of a curve and of the application of the centrifugal force has been added;
- 6) Clause 6.9 "Temperature" has been modified;
- 7) The text of the former clause 4 has been put in the beginning of clause 7.1;
- 8) In figure 2 "Height of the guardrail" the unnecessary dimensions 200 and 600 have been deleted;
- 9) In 7.7.1 a last sentence regarding features altering the natural progression has been added;
- 10) 7.7.2 has been modified;
- 11) Figure 3 "Transition" has been improved;
- 12) A new 7.13 has been included;
- 13) 7.14 has been modified;
- 14) 8.1.3 has been modified;
- 15) 8.1.4 has been modified;
- 16) 8.1.7 with a new figure 9 for type 7 has been added;
- 17) 8.3.3 has been more detailed;
- 18) 8.3.4 second paragraph and table 3 have been modified;
- 19) Figure 13 for type 7 has been added;
- 20) In 8.4 a last line regarding type 7 has been added;
- 21) Figure 12 has been deleted figure 11 (now 14) has been modified to include figure 12;
- 22) In 9.2.3 the water bag has been reduced;
- 23) In 10.1 the designation has been modified;
- 24) In 10.2 an example where to put the marking has been added.

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.

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 types, not yet 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.*

EN 1069-2:1999, *Water slides of 2 m height and more – Part 2: Instructions.*

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

EN 22768-1, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1:1989).*

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.

NOTE For classification see clause 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

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3.8**drop**

length of the slide proper, tilted with an inclination greater than those of adjacent sections

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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 height between start section and beginning of final part in metres;
- l 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 Classification**4.1 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;

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4.2 Type 2

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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;

4.3 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;

4.4 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;

4.5 Type 5

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

4.6 Type 6**4.6.1 Type 6.1**

Multi-track in the form of type 3 with separate parallel tracks (straight or curved), one beside the other over full length. The user can achieve an average speed of 5 m/s and a maximum speed of 7 m/s;

4.6.2 Type 6.2

Multi-track in the form of type 4 with separate parallel tracks (straight or curved), one beside the other over full length. The user can achieve an average speed of 10 m/s and a maximum speed of 14 m/s;

4.7 Type 7

Wide straight slide with a maximum inclination of 25 %, not exceeding 8 m in height above water level and 7,7 m above the ground. The user can achieve a maximum speed of 7 m/s.

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 an technical expert may 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.

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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.
- type 7: 0,2 kN/m²

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

6.4 Load of sliding person

Measurements shall be as given in table 1.

Table 1 — Measurements to be considered

Type	Load of sliding person kN/m	Length of load m	Conventional speed for calculation m/s	Data for calculating the centrifugal forces ^a			
				User speed m/s	Length of application m	Point of application above bottom (see figure 1) 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 ^c	3,5 (7,0) ^c	5,0 (1,0) ^c	0 0,1	vertical horizontal
4	1,5	1,0	12,0	12,0	1,0	0 0,35	vertical 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 ^c	3,5 ^b (7,0) ^c	5,0 ^b (1,0) ^c	0 0,1	vertical horizontal
6.2	1,5	1,0	12,0 ^c	12,0	1,0	0 0,35	vertical horizontal
7	1,5 kN/m ² 0,5 kN	^d ^e	5,0	5,0	5,0 —	0	vertical horizontal

^a Maximum acceleration on a sliding person see 7.7.2

^b chain sliding

^c single person

^d over the complete sliding surface

^e point load at side of the slide

In a curve the centripetal acceleration generates centrifugal forces which act radially outwards in the curve and which depend on the mass of the sliding person, the current sliding speed and the radius of the curve. The loads from the centrifugal forces which are to be taken under table 1 are calculated below by way of example.

EXAMPLE:

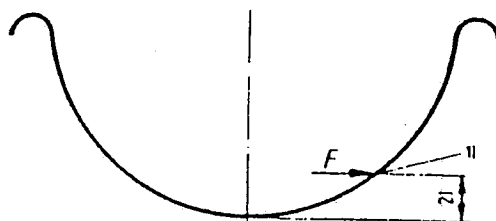
Type of water slide	5	
Load of sliding person	1,5 kN/m	vertical
User speed v	16 m/s	
Length of load application	1 m	radial
Radius of curve r	11,0 m	

Centripetal acceleration $a = v^2/r = 16^2/11 = 23,28 \text{ m/s}^2 = 2,3728 g < 2,6 g$ (see 7.7.2)

By indicating as a multiple of the gravitational acceleration g ($9,81 \text{ m/s}^2$), the load from the centrifugal force can be calculated proportional to the load of the sliding person:

centrifugal force: $2,3728 \times 1,5 = 3,559 \text{ kN/m}$

Dimensions in millimetres



- 1) Point of determination of the radius of a curve
- 2) 100/350

F Centrifugal force

Figure 1 — Point of determination of the radius of a curve and of the application of the centrifugal force

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6.5 Effects of impact

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

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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 types 3 to 6.

For type 7 the load for stationary persons is already included in the load for sliding persons, which has to be calculated over the complete sliding surface.

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 a slide is used during windy weather, a contemporary 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, the limit of mean temperature variations for the calculation of the longitudinal deformation of the slides shall be considered

- when not in use, a minimum of ± 30 K
- when in use a minimum of ± 10 K

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

7.1.1 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.

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

7.1.3 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.

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

7.1.5 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.

7.1.6 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.

7.1.7 Tolerances not being specified in the figures shall conform EN 22768-1—v.

7.2 Entrapment

To prevent risk of entrapment the relevant requirements of EN 1176-1 and EN 294 shall be followed.

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.