Støddæmpende legepladsunderlag – Metoder til bestemmelse af støddæmpning

Impact attenuating playground surfacing – Methods of test for determination of impact attenuation

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DS projekt: M330520
ICS: 97.200.40

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EUROPEAN STANDARD EN 1177:2018+AC

NORME EUROPÉENNE

EUROPÄISCHE NORM January 2019

ICS 97.200.40

English Version

Impact attenuating playground surfacing - Methods of test for determination of impact attenuation

Sols d'aires de jeux absorbant l'impact - Méthodes d'essai pour la détermination de l'atténuation de l'impact

Stoßdämpfende Spielplatzböden - Prüfverfahren zur Bestimmung der Stoßdämpfung

This European Standard was approved by CEN on 29 October 2017.

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

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

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Ref. No. EN 1177:2018+AC:2019: E

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European foreword

This document (EN 1177:2018+AC:2019) 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of an identical text or by endorsement, at the latest by July 2019, and conflicting national standards shall be withdrawn at the latest by July 2019.

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

This document includes Corrigendum 1 issued by CEN on 9 January 2019.

This document supersedes 〖AC〉 EN 1177:2018 〈AC〗.

This document includes the corrigendum 1 which corrects item k) in 8.3.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags 〖AC〉 〈AC〗.

European standards for playground equipment and surfacing comprise this European Standard and the EN 1176 series, which consists of a number of parts as follows:

— *Part 1: General safety requirements and test methods*

— *Part 2: Additional specific safety requirements and test methods for swings*

— *Part 3: Additional specific safety requirements and test methods for slides*

— *Part 4: Additional specific safety requirements and test methods for cableways*

— *Part 5: Additional specific safety requirements and test methods for carousels*

— *Part 6: Additional specific safety requirements and test methods for rocking equipment*

— *Part 7: Guidance on installation, inspection, maintenance and operation*

— *Part 10: Additional specific safety requirements and test methods for fully enclosed play equipment*

— *Part 11: Additional specific safety requirements and test methods for spatial network*

This standard should also be read in conjunction with:

— EN 1176:2017 series

— CEN/TR 16467:2013, *Playground equipment accessible for all children*

— CEN/TR 16598:2014, *Collection of rationales forEN 1176- Requirements*

— CEN/TR 16396:2012, *Playground equipment for children, replies to requests for interpretation ofEN 1176:2008and its parts*

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

The principal changes from the previous edition of this European Standard are as follows:

a) European foreword: References to CEN/TRs added.

b) Introduction: Rationale for retaining HIC 1 000 and introducing g_{max} 200 as upper limits for surfacing when assessed in accordance with this standard has been added.

c) Scope: Two methods of impact testing are now provided. Method 1 (as in the previous edition) – Test for determination of Critical Fall Height AND new Method 2 – Test for measurement of impact attenuation on site to enable, upon installation or at periods later in its life, confirmation as required of suitability of the product for that specific site location at the time of the test.

d) Body of standard:

1) change of the order and adding new clauses by implementation of Method 2;

2) adaption of recent technology for requirements on test apparatus and measurements in order to improve accuracy of results (including checks by operators);

3) adapting Annex B and adding new Annexes C, D, E and F.

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

Introduction

This European Standard is based on the safety principles given in EN 1176-1 for playground equipment and provides a method for the assessment of impact attenuation of surfaces intended for use in the impact area as defined in EN 1176-1. This standard (EN 1177) aims to reduce consequences of experiencing risks that are desirable for child development according to the principles set in EN 1176-1.

Injuries arise during the use of playground equipment for a variety of reasons and the great majority are minor. Even the presence of protection features like impact attenuating surfacing is known to affect the behaviour of children, as well as carers and play providers, which in turn can affect the risk. The majority of more serious injuries are attributable to falls and there are many factors that influence injury mechanisms during a fall that are independent of the surfacing, e.g. body orientation, awkwardness of fall, bone density, etc.

The most severe injuries are likely to be injuries to the head. Recent research has indicated that arm and leg injuries are more frequent and could be influenced by the duration of the acceleration pulse. The committee responsible for this European Standard maintains a constant review of research in this area for possible use in a future revision of this standard. The committee recognizes that there is a relationship between the risk of arm and leg injuries and surface type but takes the view that such injuries are not usually in the most severe category. At present the available injury data can be taken into account by limitation of the maximum (peak) acceleration.

Consequently, the committee has chosen to make its priority the reduction of the likelihood of serious head injuries caused by a fall from playground equipment, because even though such injuries are relatively uncommon, they can have the most severe consequences. The severity of injury resulting from an impact to the head can be quantified in terms of Head Injury Criterion (HIC) and the level of HIC = 1 000 together with the upper limit of the peak acceleration of g_{max} = 200g (g for gravity) have been chosen as the upper limits for surfacing when assessed in accordance with this standard.

Limiting the HIC value at a maximum of 1 000 is equivalent to a 3 % chance of a critical head injury (MAIS[1)] 5), an 18 % probability of a severe (MAIS 4) head injury, a 55 % probability of a serious (MAIS 3) head injury, a 89 % probability of a moderate head injury (MAIS 2), and a 99,5 % chance of a minor head injury (MAIS 1), to an average male adult.

Limiting g_{max} to a maximum of 200g as well as limiting HIC to a maximum of 1 000 takes account of impacts of very short duration and follows the current research on arm injuries as a means of improvement to the Standard.

Two methods of impact tests are provided. The first method is for determination of the Critical Fall Height to enable full and detailed confirmation of a product's range of suitability. The second method describes an on-site drop test, without determination of critical fall height to enable, upon installation or at periods later in its life, confirmation as required of the performance of the surfacing in that specific site location at the time of the test.

The EN committee is aware of discussions within ASTM International since 2014 about a reduction in the HIC threshold to 700 in its corresponding standard. The current limiting value of HIC ≤ 1 000 has been used in Europe since 1998 and the EN committee considers that at present, there is insufficient evidence of net overall value to playground users to support a change. It has therefore chosen to retain the value HIC ≤ 1 000 and to provide a second threshold of 200g as the criteria of acceptability in this standard, whilst continuing to monitor research publications on this subject. The same has been decided by ASTM for the time being.

A variety of materials, both natural and synthetic, may be used as impact attenuating surfacing with different attributes and performance. These include grass growing in soil, sand, wood chips, bark, gravel, and various rubber-based products which may be in the form of tiles or continuous coatings or combinations of these materials. Whilst the methods described in this Standard can be used to

1) Maximum Abbreviated Injury Scale, first developed by the Association for the Advancement of Automotive Medicine and used extensively in the automotive industry as an indicator of the severity of head-related injuries.

assess the impact attenuation performance of any of these surfaces, attention of users is drawn that the behaviour of some materials can be highly variable and dependent on prevailing test conditions and that test results will likely vary over time or with climatic conditions.

Impact attenuating playground surfacing – Methods of test for determination of impact attenuation

1 Scope

This European Standard specifies the test apparatus and the impact test methods for determining the impact attenuation of surfacing by measuring the acceleration experienced during impact. Test apparatus in compliance with this standard are applicable to tests carried out in a laboratory or on site by either methods described.

NOTE — The test methods described in this standard are also applicable for impact areas required in other standards than for playground equipment, e.g. for outdoor fitness equipment and parkour equipment.

2 Normative references

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

EN 933-1, *Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method*

EN 1176-1:2017, *Playground equipment and surfacing — Part 1: General safety requirements and test methods*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*