SLOVENSKI STANDARD
SIST EN 14809:2006

01-marec-2006

Podloge za ġportne dejavnosti ï Ugotavljanje navpiļ ne deformacije

Surfaces for sports areas - Determination of vertical deformation

Sportböden - Bestimmung der vertikalen Verformung

Sols sportifs - Détermination de la déformation verticale

Ta slovenski standard je istoveten z: EN 14809:2005

ICS:

97.220.10	Športni objekti	Sports facilities

SIST EN 14809:2006 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14809

December 2005

ICS 97.220.10

English Version

Surfaces for sports areas - Determination of vertical deformation

Surfaces de sols sportifs - Détermination de la déformation verticale

Sportböden - Bestimmung der vertikalen Verformung

This European Standard was approved by CEN on 28 November 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14809:2005: E

Contents

Foreword

This European Standard (EN 14809:2005) has been prepared by Technical Committee CEN/TC 217 “Surfaces for sports areas”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by June 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

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

1 Scope

This European Standard specifies a method for the determination of the vertical deformation of sports surfaces.

NOTE The method specified is commonly known as the Artificial Athlete (Stuttgart) method.

2 Normative references

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

EN 12229, *Surfaces for sports areas — Procedure for the preparation of synthetic turf and textile test pieces*

ISO 6487, *Road Vehicles — Measurement techniques in impact tests — Instrumentation*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
area-elastic sports surface
sports surface, to which the application of a point force causes deflection over a relatively large area around the point of application of the force

3.2
point-elastic sports surface
sports surface, to which the application of a point force causes deflection only at or close to the point of application of the force

3.3
combination-elastic sports surface
area-elastic sports surface with a point-elastic top layer, to which the application of a point force causes both localized deflection and deflection over a wider area

3.4
mixed-elastic sports surface
point-elastic sports surface with an area-stiffening component

NOTE A mixed-elastic sports surface has deflection characteristics between those of an area-elastic surface and a point-elastic surface.

3.5
vertical deformation
deformation of the surface to an applied normalized load

4 Principle

A weight is allowed to fall onto a spring placed on the test piece; the maximum deformation applied is recorded.

5 Test piece

For area-elastic and combined-elastic sports surfaces, the test piece shall be a sample of the complete surfacing system measuring 3,5 m by 3,5 m, assembled and installed in accordance with the manufacturer's stated method, on a substrate complying with the manufacturer's requirements.

For point-elastic and mixed-elastic sports surfaces, the test piece shall be a piece of the surface of minimum size 1,0 m by 1,0 m, in combination with the supporting layers to be used in service and using the recommended method of attachment in accordance with the manufacturer's instructions.

Laboratory test pieces of either synthetic turf or textile materials shall be prepared in accordance with EN 12229.

6 Conditioning and test temperature

For tests in the laboratory, condition the test piece for a minimum of 40 h at a temperature of (23 ± 2) °C.

Tests on site shall be carried out at the prevailing ambient temperature and humidity, which shall be recorded and reported.

7 Apparatus

7.1.1 The principle of the apparatus is shown in Figure 1 and consists of the components specified in 7.1.2 to 7.1.11.

7.1.2 Falling weight having a mass of (20 ± 0,1) kg with a hardened striking surface guided so that it is allowed to fall smoothly and vertically with minimum friction.

7.1.3 Spiral spring, having a diameter of (69 ± 1) mm, whose characteristic, when mounted in the assembly described, is linear with a spring rate of (40 ± 1,5) N/mm over the range 0,1 kN to 1,6 kN with a hardened upper plate. The spring should have three or more coaxial coils which shall be rigidly fixed together at their ends. This may be achieved, for instance, by milling the spring from a single piece of steel.

7.1.4 Adjustable supporting feet, at least 250 mm from the point of application of the load for a point elastic sports surface and at least 600 mm from the point of application of the load for an area elastic sports surface.

7.1.5 Steel base plate, having a flat lower side, an edge radius of 1 mm, a diameter of (70,0 ± 0,1) mm and a minimum thickness of 10 mm.

7.1.6 Metal guiding tube having an internal diameter of (71,0 ± 0,1) mm.

7.1.7 Two horizontal projections on the testing foot for the sensors.

7.1.8 Testing foot, consisting of the steel base plate, force sensing device, spring and the upper plate (minimum thickness 20 mm, measured at the centre of the plate) together, guided in the guiding tube. The total mass of the testing foot (without guiding tube) shall be (3,5 ± 0,35) kg.

7.1.9 Two sensors, e.g. electronic pick-ups with a measuring range of ± 10 mm and an uncertainty no greater than 0,05 mm. The distance between the sensors and the axis of the apparatus shall be ≤ 125 mm. The sensors shall be symmetrically positioned around the central axis of the apparatus.

7.1.10 Means of supporting the weight, allowing it to be set to the drop height with an uncertainty no greater than ± 0,25 mm.

7.1.11 Means of conditioning and recording the signal from the force sensing device and the sensors and a means of displaying the record.

The channel frequency class of the conditioning amplifier, in accordance with ISO 6487, shall be ≥ 1 kHz.

The conditioning amplifier shall be followed by or shall incorporate a low-pass filter having a 2nd order Butterworth characteristic with a -3 dB frequency of 120 Hz. Filtration may be implemented in hardware or software. The response of the system at any given frequency shall be within ± 0,5 dB of the expected response, calculated on the basis of the Butterworth function.

The system should be able to record the peak value of single force pulse signals of 10 ms duration with an uncertainty of no greater than ± 2 %.

If digital recording techniques are used, the word length shall be ≥ 12 bits, the amplitude of the signal shall be no less than 25 % of the equipment full scale and the sampling frequency shall be ≥ 2 kHz or twice the upper frequency response limit of the amplifier/filter system preceding the digital system, whichever is the greater.

8 Procedure

8.1 Set up the apparatus so that it is vertically positioned on the test piece such that the weight falls at least 20 cm from the edge, for point-elastic and mixed-elastic sports surfaces, or at least 1 m from the edge, for area-elastic and combination-elastic sports surfaces.

8.2 Adjust both sensors (e.g. deformation pick-ups) on the connecting line of the sensors through the falling weight axis with the same distance to the falling weight axis on a separate stand (total distance between the sensors ≤ 125 mm). Depending on the type of sports floor, the minimum distance between the supporting feet on the stand and the falling weight axis shall be given in the appropriate specifications.

8.3 Before carrying out measurements, the deformation pick-ups shall contact the horizontal projections on the test foot. Activate the recording device before releasing the falling weight.

8.4 Set the height of the lower face of the falling weight so that it is (120 ± 0,25) mm above the testing foot. The testing foot gives a pre-loading of the surface and a corresponding deformation of the surface. This is the zero position. Allow the weight to fall onto the testing foot once only.

8.5 Record the force applied to the surface and the resulting deformation in the course of the impact. Within 5 s of the impact, lift and re-attach the falling weight to its support mechanism so that the surface can recover before the following impact.

8.6 Unless otherwise specified, repeat the procedure described in 8.4 twice at intervals of 1 min giving a total of three impacts. Record the mean value of the deformation from the second and third impacts. If further tests are to be carried out on the same sample, each test shall be carried out at a new location, no test position being less than 100 mm from any other.

9 Expression of results

9.1 Calculate the vertical deformation, D, from the following equation.

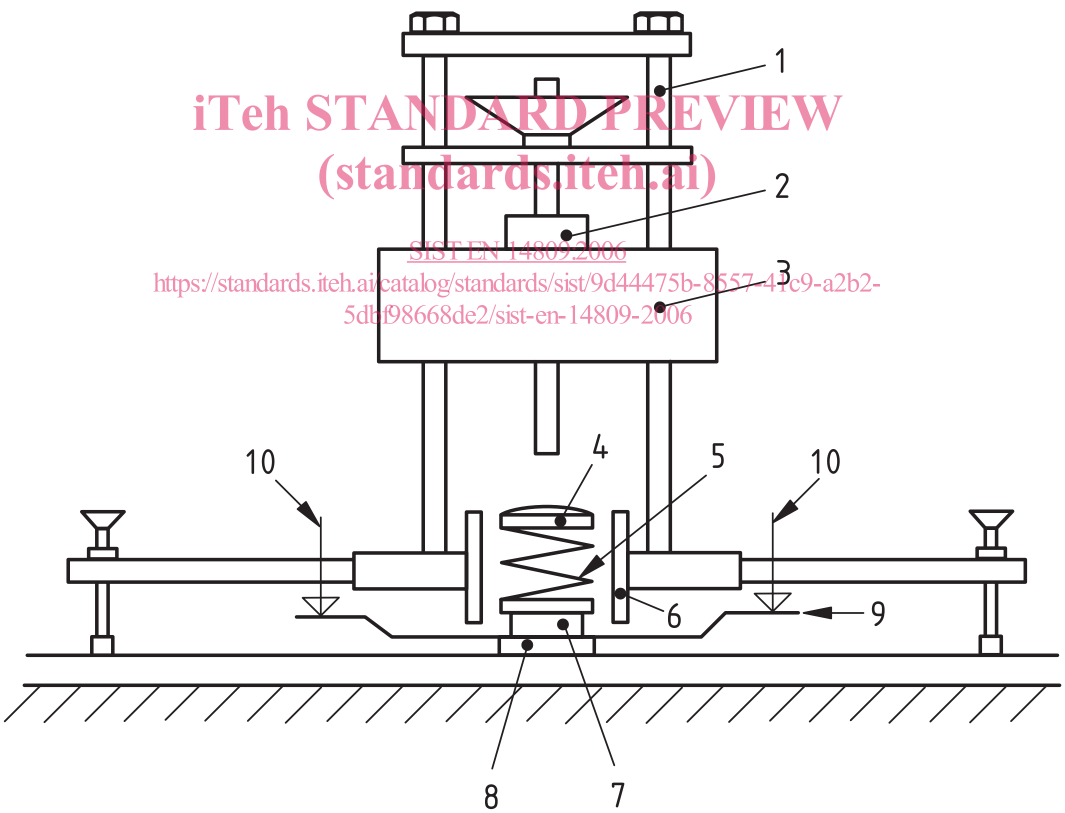
$$D = \left(\frac{1\,500 \text{ N}}{F_{\text{max}}} \right) \times f_{\text{max}}$$

where

f_{max} is the maximum deformation of the sports floor in the falling weight axis, expressed in millimetres (mm) (mean maximum of the pick-up values at each time);

F_{max} is the maximum force (peak value), expressed in Newtons (N).

9.2 Calculate the vertical deformation of a single testing spot as the mean of the vertical deformation results of the last two impacts, unless otherwise specified, and report the result to the nearest 0,1 mm.



Key

1 guide for the falling weight
2 electromagnet
3 falling weight
4 upper plate
5 spring
6 guiding tube
7 force sensing device
8 base plate
9 horizontal projections
10 sensors (pick up)

Figure 1 — Artificial athlete apparatus