Surfaces for sports areas — Determination of tensile properties of synthetic sports surfaces

The European Standard EN 12230:2003 has the status of a British Standard

ICS 97.220.10

British Standards

National foreword

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English version

Surfaces for sports areas - Determination of tensile properties of synthetic sports surfaces

Sols sportifs - Détermination des caractéristiques de traction des surfaces sportives synthétiques

Sportböden - Bestimmung der Zugfestigkeitseigenschaften von Kunststoffflähen

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (EN 12230:2003) 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

This standard is one of a series of methods of test for sports surfaces. It is based on ISO 1926 with modification of the procedure for preparation of the test specimens to take account of the form in which sports surfacing materials are normally produced.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies a method for the determination of the tensile properties of materials used as surfaces for sports areas. It is applicable to elastomeric materials which are used as the upper wearing layer of such areas, and to elastomeric materials used as underlayers in composite sports surfacing systems. It is applicable both to prefabricated sheet materials and to materials formed by casting of liquid systems cured in-situ.

NOTE If the nature of the sports surface is such that a properly representative test piece cannot be prepared in the manner described in this standard, then determination of tensile properties should not be attempted for quality control purposes, or as a predictor of performance in use. With such materials, it might be more appropriate to determine their compressive properties or other dynamic characteristics for these purposes.

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 (including amendments).

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

3 Term and definition

For the purposes of this European Standard, the following term and definition applies.

3.1
peak to valley height
geometric measure of the roughness of the top of the surfacing, being the magnitude of regularly or irregularly recurring vertical deviations of a surface from a reference surface, when the distances between these deviations is a low multiple of their depth

4 Principle

A test specimen of given shape is subjected to a tensile stress transmitted to it by means of a suitable device and the resulting stress-strain curve is plotted, from which various parameters are subsequently deduced.

5 Apparatus

5.1 Test machine

A test machine, such that:

a) the test specimen can be held in the fixing grips of the test apparatus, these fixing grips meeting the following conditions:

— the test specimen can be held sufficiently tightly to avoid slipping;

— no localized pressure that could tear or rupture the ends is exerted on any part of the test specimen;

b) the movable grip can be moved away from the fixed grip at a constant speed of (50 ± 5) mm/min in a direction parallel to the longitudinal axis of the test piece, under no load;

c) the force thus exerted on the test specimen can be read with a maximum error of 1 % and can be recorded;

d) if an extensometer is used, it exerts a minimum force on the test specimen and elongation of the test specimen can be read to an accuracy of 0,1 mm.

5.2 Thickness gauge

Thickness gauge, accurate to 0,01 mm with a plunger with a flat measuring surface nominally 4 mm diameter.

5.3 Dial gauge

Dial gauge capable of reading to 0,1 mm with a plunger having a flat circular contact surface with a diameter of nominally 1,5 mm applied to the surface under a load of (0,9 ± 0,1) N.

6 Test specimens

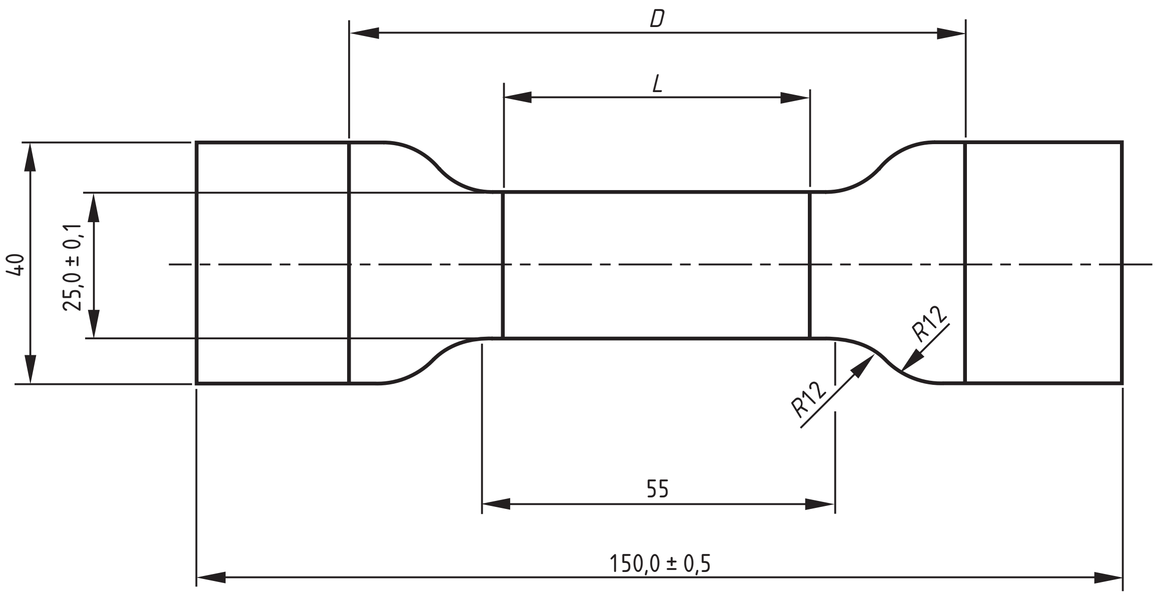
6.1 Dimensions

6.1.1 Profile

Cut the test specimens in accordance with the shape and dimensions shown in Figure 1.

If the distance between the parallel surfaces of the extensometer gauge length varies by more than 5 % (tolerance on parallelism), discard the test specimen and cut a further specimen.

Dimensions in millimetres



Key

D Distance between the grips, 100 mm
L Original gauge length, (50,0 ± 0,1) mm

Figure 1 — Dimensions and shape of a tensile test specimen

6.1.2 Thickness

So that the test specimens remains representative of the installed surfacing ensure that the thickness of the test specimen is the thickness of the installed surfacing, except in the following cases, where further preparation is required:

a) where the thickness of the installed sports surface and/or the sample provided for test is greater than 25 mm, reduce the thickness of the test specimen by machining or cutting to between 20 mm and 25 mm, taking care during this operation that the structure of the material is not altered and the test specimen remains as representative as possible of the installed sports surface;

b) where the material carries a surface texture, emboss or granular finish, prepare the upper surface and underside of the test specimen as described in 6.2.

NOTE Preparation of the underside of the test specimen to remove irregularities is necessary, for example, where a once-liquid system has been removed from a textured or porous substrate.

After preparation, measure the thickness of each test specimen using the thickness gauge (5.2) and a measurement force of between 0,8 N and 1,0 N.

Measure the thickness of the test piece at a minimum of five positions along the extensometer gauge length and calculate the average thickness to the nearest 0,1 mm. If any one reading differs from the average thickness by more than 5 % of the average value, discard the test specimen.

6.2 Preparation and conditioning

6.2.1 Remove any surface emboss or granular texture from the two parallel surfaces of the extensometer gauge length, to enable the thickness of the test specimen to be measured, by grinding the irregular surface with abrasive paper, grain 60, until a peak-to-valley height of (0,5 ± 0,1) mm is achieved, or 50 % of the surface texture height has been abraded or until further rubbing no longer produces any change in the surface condition.

6.2.2 Measure the peak-to-valley height by means of a dial gauge (5.3). Take the reference surface as a flat metal plate, pressed against the test surface under a force of 3 N.

6.2.3 On the prepared area, make measurements at nine evenly distributed points and take the mean of the nine measurements as the peak-to-valley height of the surface being examined.

6.2.4 Where necessary, mark the test specimens to indicate their orientation in relation to the direction of anisotropy.

6.2.5 Condition the test specimens in accordance with one of the standard atmospheres given in ISO 291, for a period of not less than 24 h.

6.2.6 Where the material of the test specimens has been formed by curing or chemical cross-linking of liquid components, prepare the test specimen under conditions which represent as closely as possible the conditions under which the sports surface was, or is to be, installed. Do not test specimens from such materials until at least five days have elapsed from mixing the components.

6.3 Number of test specimens

Carry out the test on at least six test specimens. In the case of prefabricated sheet materials, cut at least three test specimens from the longitudinal (machine) direction and at least three from the transverse direction. For materials formed in-situ, take at least three test specimen from each of the two directions at 90°.

7 Procedure

Carry out the test under the same atmosphere as that used for conditioning the test specimens (see 6.2.5).

Clamp a test specimen in the fixing grips. Mark the original gauge length on the test specimen (see Figure 1).

Apply the force to be exerted on the test specimen so that it is uniformly distributed by means of the movable grip, at a rate of displacement of (50 ± 5) mm/min until rupture occurs.

Reject any test specimen that breaks outside the extensometer gauge length and prepare and test a further specimen so that the number of valid results is not less than six.

If an extensometer is not used, record the elongation corresponding to a given force, at suitable intervals.

Plot the resulting stress-strain curve.

Repeat the procedure for the remaining test specimens until six valid results are obtained.

8 Calculation and expression of results

8.1 Relative elongation

Calculate the relative elongation, E, expressed as a percentage of the original gauge length, from the following equation:

$$E = \frac{\Delta_L \times 100}{L} \tag{1}$$

where

Δ_L is the variation in length corresponding to a given force, measured by the variation in distance between gauge marks, expressed in millimetres (mm);

L is the original gauge length of the test piece, expressed in millimetres (mm).

After determination on the stress-strain curve of the corresponding elongations, calculate

c) the relative elongation, E_m, for the maximum stress, if applicable, as a percentage of the original gauge length;

d) the relative elongation, E_r, at a rupture, as a percentage of the original gauge length.

8.2 Maximum tensile strength

Calculate the maximum tensile stress, O_m, where applicable, expressed in kilopascal, from the following equation:

$$O_m = \frac{F_m \times 10^3}{b \times d} \tag{2}$$

where

O_m is the maximum tensile stress, expressed in kilopascal (kPa);

F_m is the maximum force applied to the test piece during the test, expressed in Newton (N);

b is the original width of the parallel length of the narrow section of the test piece, expressed in millimetre (mm);

d is the original thickness of the parallel length of the narrow section of the test piece, expressed in millimetre (mm).

8.3 Tensile stress at rupture

Calculate the tensile stress at rupture, O_r, expressed in kilopascal, from the following equation:

$$O_r = \frac{F_r \times 10^3}{b \times d} \qquad (3)$$

where

O_r is the tensile stress at rupture, expressed in kilopascal (kPa);

F_r is the force applied to the test piece at the moment of rupture, expressed in Newton (N);

b is the original width of the parallel length of the narrow section of the test piece, expressed in millimetre (mm);

d is the original thickness of the parallel length of the narrow section of the test piece, expressed in millimetre (mm).

9 Test report

The test report shall contain the following information:

e) reference to this European Standard;

f) the type and designation of the material;

g) the conditioning procedure used;

h) the number of test specimens used;

i) where applicable, the direction of the tensile force in relation to the direction of anisotropy;

j) the individual test results calculated using the equations given in clause 8, and their mean values;

k) a typical stress-strain curve from those plotted;

l) the date of the test.

Bibliography

ISO 1926, *Cellular plastics — Determination of tensile properties of rigid materials.*

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