BS EN 15330-1:2013

BSI Standards Publication

Surfaces for sports areas — Synthetic turf and needle-punched surfaces primarily designed for outdoor use

Part 1: Specification for synthetic turf surfaces for football, hockey, rugby union training, tennis and multi-sports use

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National foreword

This British Standard is the UK implementation of EN 15330-1:2013. It supersedes BS EN 15330-1:2007 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/57, Surfaces for sports areas.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Sportböden - Überwiegend für den Außenbereich hergestellte Kunststoffrasenflächen und Nadelfilze - Teil 1: Festlegungen für Kunststoffrasen für Fußball, Hockey, Rugbytraining, Tennis und multifunktionale Kunststoffrasenflächen

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Foreword

This document (EN 15330-1:2013) has been prepared by Technical Committee CEN/TC 217 “Surfaces for sports areas”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by March 2014, and conflicting national standards shall be withdrawn at the latest by March 2014.

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

This document supersedes EN 15330-1:2007.

Compared with EN 15330-1:2007, the text has been clarified and editorial errors have been corrected.

EN 15330 consists of the following parts, under the general title *Surfaces for sports areas — Synthetic turf and needle-punched surfaces primarily designed for outdoor use*:

— *Part 1: Specification for synthetic turf surfaces for football, hockey, rugby union training, tennis and multi-sports use*;

— *Part 2: Specification for needle-punched surfaces*.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies performance, durability, product identification and facility testing requirements for synthetic turf sports surfaces used primarily outdoors. Five categories of surface are covered, each based on the principal sporting use of the surface, as follows:

— surfaces designed primarily for hockey;

— surfaces designed primarily for association football;

— surfaces designed primarily for rugby union for training purposes;

— surfaces designed primarily for tennis;

— surfaces designed for multi-sports use.

The requirements are intended to apply to surfaces used for community, educational and recreational sport. For professional and elite levels of competition, many sports governing bodies have published their own specifications; the requirements of the sports governing bodies might differ from those detailed in this European Standard and facility developers are advised to ensure that they select surfaces offering the correct level of performance for the level of competition played on the pitch or court.

NOTE Under the Laws of the Game of Rugby Union, surfaces for rugby union matches need to comply with the International Rugby Board's IRB Regulation 22 and associated performance specification for synthetic turf surfaces.

This European Standard has two parts. The first part describes the requirements for product testing of products in the laboratory to ensure they are capable of providing the required levels of sports performance and player/surface interaction required for their intended use and that they are manufactured from materials of acceptable quality. The second section describes the requirements for installed surfaces to ensure that the sports performance and player/surface interaction of a facility is suitable for the intended use.

Some of the surfaces covered by this European Standard are designed to allow users to wear footwear fitted with studs. An example of a typical stud is given in EN 15306. For the purposes of this European Standard, multi-dimpled shoe profiles often found on footwear used on sand-filled or non-filled synthetic turfs are not considered to be studs.

When independent third party testing of synthetic turf sports surfaces is required to assess compliance with this standard, it is recommended the laboratory is certified to EN ISO/IEC 17025 for the relevant test methods specified in this standard.

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 1097-3, *Tests for mechanical and physical properties of aggregates — Part 3: Determination of loose bulk density and voids*

EN 1177, *Impact attenuating playground surfacing — Determination of critical fall height*

EN 1969, *Surfaces for sports areas — Determination of thickness of synthetic sports surfaces*

EN 12228, *Surfaces for sports areas — Determination of joint strength of synthetic surfaces*

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

EN 12230, *Surfaces for sports areas — Determination of tensile properties of synthetic sports surfaces*

EN 12234, *Surfaces for sports areas — Determination of ball roll behaviour*

EN 12235, *Surfaces for sports areas — Determination of vertical ball behaviour*

EN 12616, *Surfaces for sports areas — Determination of water infiltration rate*

EN 13036-7, *Road and airfield surface characteristics — Test methods — Part 7: Irregularity measurement of pavement courses : the straightedge test*

EN 13672, *Surfaces for sports areas — Determination of resistance to abrasion of non-filled synthetic turf*

EN 13744, *Surfaces for sports areas — Procedure for accelerated ageing by immersion in hot water*

EN 13817, *Surfaces for sports areas — Procedure for accelerated ageing by exposure to hot air*

EN 13864, *Surfaces for sports areas — Determination of tensile strength of synthetic yarns*

EN 13865, *Surfaces for sports areas — Determination of angled ball behaviour — Tennis*

EN 14808, *Surfaces for sports areas — Determination of shock absorption*

EN 14809, *Surfaces for sports areas — Determination of vertical deformation*

EN 14836, *Synthetic surfaces for outdoor sports areas — Exposure to artificial weathering*

EN 14955, *Surfaces for sports areas — Determination of composition and particle shape of unbound mineral surfaces for outdoor sports areas*

EN 15301-1, *Surfaces for sports areas — Part 1: Determination of rotational resistance*

EN 15306, *Surfaces for outdoor sports areas — Exposure of synthetic turf to simulated wear*

EN 20105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour (ISO 105-A02)*

EN ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (ISO 13934-1)*

ISO 1763, *Carpets — Determination of number of tufts and/or loops per unit length and per unit area*

ISO 2549, *Textile floor coverings — Hand-knotted carpets — Determination of tuft leg length above the woven ground*

ISO 4919, *Carpets — Determination of tuft withdrawal force*

ISO 8543, *Textile floor coverings — Methods for determination of mass*

ISO 11357-3, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization*

3 Terms and definitions

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

3.1
synthetic turf surface
sports surface comprised of a carpet of tufted, knitted or woven construction whose pile is designed to replicate the appearance of natural grass

Note 1 to entry: Not necessarily in colour.

3.2
non-filled synthetic turf
synthetic turf surface that does not contain any form of unbound particulate fill within the pile of the carpet

3.3
filled synthetic turf
synthetic turf surface whose pile is either totally filled or partly filled with an unbound particulate material, typically sand, rubber or sand and rubber mixes

3.4
short pile synthetic turf
synthetic turf surface whose pile length is less than 30 mm when tested in accordance with ISO 2549

3.5
long pile surfaces
synthetic turf surface whose pile length is equal to or greater than 30 mm when tested in accordance with ISO 2549

3.6
surface for multi-sports
synthetic turf surface designed to be used for more than one sport

Note 1 to entry: For further information see Annex A.

3.7
synthetic turf surfacing system
all components of the surface that influence its sports performance or bio-mechanical characteristics including the synthetic turf carpet, infill and shockpad, together with any supporting layers designed to contribute to the performance of the surface

3.8
infill
particulate materials used to infill the synthetic turf pile to provide support and aid the provision of the required performance characteristics

3.9
shockpads
prefabricated or *in situ* laid sheets or tiles laid beneath the synthetic turf carpet and designed to aid the provision of the required performance

4 Laboratory type approval

4.1 General

When tested in the laboratory, the synthetic turf surface shall comply with the following requirements.

4.2 Material tests

4.2.1 Tensile properties of synthetic turf carpet

When tested in accordance with EN ISO 13934-1, the mean maximum force of synthetic turf carpets designed for football, hockey or tennis shall be greater than 15 N/mm and the difference between the results obtained on samples taken in the direction of manufacturer and across the direction of manufacture shall be no more than 30 % of the higher value.

When tested in accordance with EN ISO 13934-1, the maximum force of synthetic turf carpets designed for rugby shall be greater than 25 N/mm and the difference between the results obtained on samples taken in the direction of manufacturer and across the direction of manufacture shall be no more than 30 % of the higher value.

4.2.2 Tensile strength of synthetic turf pile yarn(s)

When tested in accordance with EN 13864, the minimum tensile strength of the yarn(s) used to form the pile of the synthetic turf carpet shall be greater than 30 N for fibrillated yarns and 8 N for monofilament yarns. Monofilament yarns shall be tested as individual ribbons.

4.2.3 Resistance to artificial weathering of synthetic turf pile yarns

4.2.3.1 Tensile strength

When tested in accordance with EN 13864, following artificial weathering in accordance with EN 14836, the tensile strength of the pile yarn(s) used to form the synthetic turf pile shall be within 50 % of the tensile strength of the unaged pile yarn and no lower than the minimum values detailed in 4.2.2.

4.2.3.2 Colour fastness

When tested in accordance with EN 20105-A02 following artificial weathering in accordance with EN 14836, the colour fastness of the weathered synthetic turf compared with an unaged test specimen of the synthetic turf shall be Grey Scale 3 or greater.

4.2.4 Synthetic turf carpet joint strength

4.2.4.1 Stitched joints

When tested in accordance with Method 1 of EN 12228, the unaged strength of stitched joints shall be equal to or greater than 1 000 N/100 mm.

Following immersion in hot water, in accordance with EN 13744, the aged strength of stitched joints shall be at least 75 % of the unaged value and equal to or greater than 1 000 N/100 mm.

4.2.4.2 Bonded joints

When tested in accordance with Method 2 of EN 12228, the unaged strength of bonded joints shall be equal to or greater than 60 N/100 mm except that, for surfaces intended for rugby, the minimum joint strength shall be 100 N/100 mm.

Following immersion in hot water in accordance with EN 13744, the strength of bonded joints shall be at least 75 % of the unaged value and equal to or greater than the minimum requirements for unaged joints.

4.2.5 Synthetic turf tuft bind

When tested in accordance with ISO 4919, the tuft withdrawal force shall be equal to or greater than 30 N.

Following immersion in hot water in accordance with EN 13744, the tuft withdrawal force shall be at least 75 % of the tuft withdrawal force of the unaged test specimen and equal to or greater than 30 N.

4.2.6 Water permeability of synthetic turf surfacing system

When tested in accordance with EN 12616, the vertical water infiltration rate of surfaces designed to be permeable shall be equal to or greater than 500 mm/h.

In some countries lateral or horizontal water permeability is also important and national requirements may apply.

4.2.7 Tensile strength of shockpads

When tested in accordance with EN 12230, the maximum tensile strength of shockpad used in the synthetic turf surfacing system shall be greater than 0,15 MPa. If the shockpad is greater than 25mm thick, 50mm wide strips shall be tested; and any failures at the point of clamping shall be disregarded.

Following air ageing in accordance with EN 13817, the maximum tensile strength of any shockpad shall be at least 75 % of the unaged value and equal to or greater than 0,15 MPa.

Some forms of prefabricated shockpad have channels and slots incorporated into their structure to provide drainage or to aid dimensional stability. The design of such shockpads might mean it is not possible to obtain fully homogenous tests specimens. In such cases this should be reported along with the mean value of the maximum Force at Rupture. In such cases the mean value should be within 10 % of the manufacturer's declared value.

4.2.8 Abrasion resistance of non-filled short pile synthetic turf surfaces

When tested in accordance with EN 13672, the percentage mass loss after 2 000 cycles shall be equal to or less than 2 %.

4.3 Surfaces designed primarily for hockey

4.3.1 General

Synthetic turf surfaces designed primarily for hockey shall conform to the requirements given in 4.2 and those in 4.3.2 to 4.3.6.

Test pieces shall be prepared in accordance with EN 12229 and the manufacturer's instructions prior to testing.

Wet test pieces shall be prepared in accordance with the procedure given in Annex B.

4.3.2 Vertical ball rebound

When tested in accordance with EN 12235 using a hockey ball under both dry and wet conditions, the vertical ball rebound shall be less than 70 % (0,45 m).

4.3.3 Ball roll

When tested in accordance with EN 12234 using a hockey ball under both dry and wet conditions, the ball roll shall be greater than 8,0 m.

4.3.4 Shock absorption

When tested in accordance with EN 14808 under both dry and wet conditions, the shock absorption shall be at least 40 %.

4.3.5 Vertical deformation

When tested in accordance with EN 14809 under both dry and wet conditions, the vertical deformation shall be between 3 mm and 10 mm.

4.3.6 Rotational resistance

When tested in accordance with EN 15301-1 using the dimpled rubber test sole under both dry and wet conditions, the rotational resistance shall be between 25 Nm and 50 Nm.

4.4 Surfaces designed primarily for football

4.4.1 General

Synthetic turf surfaces designed primarily for football shall conform to the requirements given in 4.2 and those in 4.4.2 to 4.4.7.

Test pieces shall be prepared in accordance with EN 12229 and the manufacturer instructions prior to testing.

Wet test pieces shall be prepared in accordance with the procedure given in Annex B.

4.4.2 Vertical ball rebound

When tested in accordance with EN 12235 using a football under both dry and wet conditions, the vertical ball rebound shall be between 45 % and 75 % (0,60 m and 1,0 m).

4.4.3 Ball roll

When tested in accordance with EN 12234 using a football under both dry and wet conditions, the ball roll shall be between 4,0 m and 10,0 m.

4.4.4 Shock absorption

When tested in accordance with EN 14808 under both dry and wet conditions, the shock absorption shall be between 55 % and 70 %.

4.4.5 Vertical deformation

When tested in accordance with EN 14809 under both dry and wet conditions, the vertical deformation shall be between 4 mm and 9 mm.

4.4.6 Rotational resistance

4.4.6.1 Studded test sole

When tested in accordance with EN 15301-1 using the studded test foot under both dry and wet conditions, the rotational resistance shall be between 25 Nm and 50 Nm.

4.4.6.2 Dimpled test sole

When tested in accordance with EN 15301-1 using the dimpled rubber test foot under both dry and wet conditions, the rotational resistance shall be between 25 Nm and 50 Nm.

4.4.7 Resistance to simulated use

Following simulated use conditioning for 20 200 cycles in accordance with EN 15306 using the studded roller, the dry surface shall conform to the requirements of 4.4.2, 4.4.4, 4.4.5 and 4.4.6.1.

As the size of the test pieces produced by the apparatus described in EN 15306 is smaller than the test pieces specified to be used in EN 12235, EN 14808, EN 14809 and EN 15301-1, the test pieces used shall conform to the requirements given in EN 15306. No test shall be carried out within 50 mm of the edge of the test piece or within 50 mm of where another test has been carried out. Following conditioning, the test specimen shall be tested in the following order:

1) ball rebound;

2) shock absorption;

3) vertical deformation;

4) rotational resistance.

4.5 Surfaces designed primarily for rugby union training areas

4.5.1 General

Synthetic turf surfaces designed primarily for rugby union training areas shall conform to the requirements given in 4.2 and those in 4.5.2 to 4.5.7.

Test pieces shall be prepared in accordance with EN 12229 and the manufacturer's instructions prior to testing.

Wet test pieces shall be prepared in accordance with the procedure given in Annex B.

4.5.2 Vertical ball rebound

When tested in accordance with EN 12235 using a football under both dry and wet conditions, the vertical ball rebound shall be between 45 % and 75 % (0,60 m and 1,0 m).

4.5.3 Critical fall height

When tested in accordance with EN 1177 as a loose particulate material under both dry and wet conditions, the critical fall height of the surface shall be equal to or greater than 1,3 m.

4.5.4 Shock absorption

When tested in accordance with EN 14808 under both dry and wet conditions, the shock absorption shall be between 55 % and 70 %.

4.5.5 Vertical deformation

When tested in accordance with EN 14809 under both dry and wet conditions, the vertical deformation shall be between 4 mm and 10 mm.

4.5.6 Rotational resistance

When tested in accordance with EN 15301-1 using a studded test foot under both dry and wet conditions, the rotational resistance shall be between 30 Nm and 50 Nm.

4.5.7 Resistance to simulated use

4.5.7.1 Following simulated use conditioning for 20 200 cycles in accordance with EN 15306 using the studded rollers, the dry surface shall conform to the requirements of 4.5.2, 4.5.4, 4.5.5 and 4.5.6. As the size of the test pieces produced by the apparatus described in EN 15306 is smaller than the test pieces specified to be used in EN 12235, EN 14808, EN 14809 and EN 15301-1, the test pieces used shall conform to the

requirements given in EN 15306. No test shall be carried out within 50 mm of the edge of the test piece or within 50 mm of where another test has been carried out.

Following conditioning, the test specimen shall be tested in the following order:

1) ball rebound;

2) shock absorption;

3) vertical deformation;

4) rotational resistance.

4.5.7.2 Following simulated use conditioning for 20 200 cycles in accordance with EN 15306 using the studded rollers, the dry Head Injury Criterion (HIC) when measured from a height of 1,0 + 0,05 m shall be no greater than 1 000 HIC. The HIC value shall be measured in accordance with EN 1177; three single drop tests shall be made from a height of 1 000 + 5 mm and the mean result calculated. Each drop test shall be on a separate area of the test specimen. Tests shall be made on a separate test specimen to that used to measure the properties detailed in 4.5.7.1.

4.6 Surfaces designed primarily for tennis

4.6.1 General

Synthetic turf surfaces designed primarily for tennis shall conform to the requirements given in 4.2 and those in 4.6.2 to 4.6.5.

Test pieces shall be prepared in accordance with EN 12229 and the manufacturer instructions prior to testing.

Wet test pieces shall be prepared in accordance with the procedure given in Annex B.

4.6.2 Vertical ball rebound

When tested in accordance with EN 12235 using a tennis ball under both dry and wet conditions, the vertical ball rebound shall be greater than 80 % (1,12 m).

4.6.3 Angled ball behaviour

When tested in accordance with EN 13865 under dry conditions, the angled ball rebound of the surface shall be between 15 and 55 and the surface pace shall be classified as given in Table 1.

Table 1 — Classification based on angled ball behaviour

Angled ball rebound	Surface pace classification
≤ 29	Slow
30 to 34	Medium Slow
35 to 39	Medium
40 to 44	Medium Fast
≥ 45	Fast

4.6.4 Shock absorption

The shock absorption shall be measured in accordance with EN 14808 under both dry and wet conditions, and the results recorded and provided by the manufacturer or supplier.

4.6.5 Rotational Resistance

When tested in accordance with EN 15301-1 using the smooth rubber test sole profile under both dry and wet conditions, the rotational resistance shall be between 25 Nm and 50 Nm.

4.7 Surfaces designed for multi-sports use

4.7.1 General

Synthetic turf surfaces designed primarily for multi-sports use shall conform to the requirements given in 4.2 and those in 4.7.2 to 4.7.8.

Test pieces shall be prepared in accordance with EN 12229 and the manufacturer instructions prior to testing.

Wet test pieces shall be prepared in accordance with the procedure given in Annex B.

4.7.2 Vertical ball rebound

4.7.2.1 General

The surface shall conform to the requirements given below as appropriate, depending on the sports to be played on the surface.

4.7.2.2 Football

4.7.2.2.1 Long pile surfaces

When tested in accordance with EN 12235 using a football under both dry and wet conditions, the vertical ball rebound shall be between 45 % and 75 % (0,60 m and 1,0 m).

4.7.2.2.2 Short pile surfaces

When tested in accordance with EN 12235 using a football under both dry and wet conditions, the vertical ball rebound shall be between 45 % and 90 % (0,60 m and 1,22 m).

4.7.2.3 Hockey

When tested in accordance with EN 12235 using a hockey ball under both dry and wet conditions, the vertical ball rebound shall be less than 70 % (0,45 m).

4.7.2.4 Tennis

When tested in accordance with EN 12235 using a tennis ball under both dry and wet conditions, the vertical ball rebound shall be greater than 80 % (1,12 m).

4.7.3 Ball roll

4.7.3.1 General

The surface shall conform to the requirements given below as appropriate, depending on the sports to be played on the surface.

4.7.3.2 Football

4.7.3.2.1 Long pile surfaces

When tested in accordance with EN 12234 using a football under both dry and wet conditions, the ball roll shall be between 4,0 m and 12,0 m.

4.7.3.2.2 Short pile surfaces

When tested in accordance with EN 12234 using a football under both dry and wet conditions, the ball roll shall be between 4,0 m and 18,0 m.

4.7.3.3 Hockey

4.7.3.3.1 Long pile surfaces

When tested in accordance with EN 12234 using a hockey ball under both dry and wet conditions, the ball roll shall be greater than 5,0 m.

4.7.3.3.2 Short pile surfaces

When tested in accordance with EN 12234 using a hockey ball under both dry and wet conditions, the ball roll shall be greater than 8,0 m.

4.7.4 Shock absorption

When tested in accordance with EN 14808 under both dry and wet conditions, the shock absorption shall be classified as in Table 2.

Table 2 — Classification of shock absorption for multi-sports surfaces

Force reduction (%)	Classification	Typical uses
15 to 24	SA 1	Tennis
25 to 34	SA 2	
35 to 44	SA 3	Hockey, football (short pile surfaces)
45 to 54	SA 4	
55 to 60	SA 5	Football (long pile surfaces)
61 to 80	SA 6	Football, rugby
For general sports training (non-contact) and physical education, the shock absorption should typically be Class SA 3 or S A4.		
NOTE SA = Shock Absorption.		

4.7.5 Vertical deformation

When tested in accordance with EN 14809 under both dry and wet conditions, the vertical deformation shall be between 3 mm and 10 mm.

4.7.6 Rotational resistance

4.7.6.1 Long pile surfaces designed for the use of studded footwear

When tested in accordance with EN 15301-1, using the studded test foot under both dry and wet conditions, the rotational resistance shall be between 25 Nm and 50 Nm.

4.7.6.2 Short pile surfaces not designed for the use of studded footwear

When tested in accordance with EN 15301-1, using the dimpled rubber test sole profile under both dry and wet conditions, the rotational resistance shall be between 25 Nm and 50 Nm.

4.7.7 Angled ball behaviour

The angled ball behaviour of multi-sports surfaces designed for tennis shall be classified in accordance with 4.6.3.

4.7.8 Resistance to simulated use of surfaces designed to allow the use of studded footwear

Following simulated use conditioning for 20 200 cycles in accordance with EN 15306 using the studded rollers, the dry surface shall conform to the requirements as in 4.7.2, 4.7.4, 4.7.5 and 4.7.6.

As the size of the test pieces produced by the apparatus described in EN 15306 is smaller than the test pieces specified in EN 12235, EN 14808, EN 14809 and EN 15301-1, the test pieces used shall conform to the requirements given in EN 15306. No test shall be carried out within 50 mm of the edge of the test piece or within 50 mm of where another test has been carried out. Following conditioning, the test specimen shall be tested in the following order:

1) ball rebound;

2) shock absorption;

3) vertical deformation;

4) rotational resistance.

4.8 Product identification

The physical properties of the components forming the synthetic turf surface shall be characterised using the test methods described in Table 3. The results obtained shall correspond to the manufacturer's product declaration plus/minus the stated tolerance.

When carrying out the tests, condition test pieces for at least 3 h at a temperature of (23 ± 2) °C and carry out the tests within the same temperature range.

Table 3 — Product identification (variation between manufacturer's product declaration and laboratory/site samples)

Component/property	Test method	Permitted deviation from manufacturers product declaration	
		Product Type Test	Field test material identification
Synthetic turf			
Mass per unit area	ISO 8543	≤ 10 %	≤ 10 %
Tufts per unit area	ISO 1763	≤ 10 %	≤ 10 %
Gauge and stitch rate	ISO 1763	≤ 10 %	≤ 10 %
Pile length (above backing)	ISO 2549	≤ 5 %	≤ 5 %

Component/property	Test method	Permitted deviation from manufacturers product declaration	
		Product Type Test	**Field test material identification**
Pile weight (tufted carpets)	ISO 8543	≤ 10 %	≤ 10 %
Pile Dtex	a) below	≤ 10 %	≤ 10 %
Tuft withdrawal force	ISO 4919	≥ 85 % of declaration and ≥ 30 N	≥ 85 % of declaration and ≥ 30 N
Water permeability	EN 12616	≥ 50 % of declaration and ≥ 500 mm/h	≥ 50 % of declaration and ≥ 500 mm/h
Pile yarn(s)	Test method	Product Type Report Laboratory Identification	Field Report Material Identification
Colour (tufted yarn)	Visual – b) below	Similar colour	Similar colour
Polymer characterisation	ISO 11357-3	same number of peaks, same profile ±4 °C (peak)	same number of peaks same profile ±4 °C (peak)
Performance Infill(s)			
Particle size	EN 933–1	Same d and D	60 % to 100 % between d and D (Variation ± 20 %)
Particle shape	EN 14955	Similar shape	Similar shape
Bulk density	EN 1097–3	≤ 10 %	≤ 10 %
Colour	Visual – b) below	Similar colour	Similar colour
Stabilising infill			
Particle size	EN 933–1 and c) below	Same d and D	60 % to 100 % between d and D (Variation ≤ 20 %)
Particle shape	EN 14955	Similar shape	Similar shape
Bulk density	EN 1097–3	≤ 15 %	≤ 15 %
Shockpads			
Shock absorption	EN 14808	≤ 5 %	−5 + 10 %
Thickness	EN 1969	≥ 90 %	≥ 90 %
Tensile strength	EN 12230	≥ 0,15 Mpa	≥ 0,15 Mpa

a) Dtex (g per 10 000 m) shall be calculated from the mean weight (measured to 0,01 g) and mean length (measured to 1 mm) of a minimum of 40 tufts removed from the synthetic turf.

b) Where possible, the colour of pile yarns and polymeric infills should be referenced to standard colour charts issued by RAL.

c) The grading of particulate materials should be defined as follows:

1) d – starting with the smallest sieve, d is the biggest sieve with less than 10 % of the sample passing (between 0 % and 10 % of the infill total weight is smaller than d);

2) D – starting from the biggest sieve, D is the smallest sieve with less than 10 % of the sample being retained (between 0 % and 10 % of the infill total weight is bigger than D).

Comparison to manufacturer's declaration using 'd' and 'D' – Product type approval test samples:

Between 80 % and 100 % of infill is between 'd' and 'D'.

Comparison to manufacturer’s declaration using 'd' and 'D' – Field test samples:

A sample conforms to the manufacturer’s declaration if at least 60 % of the sample is between 'd' and 'D' calculated using (% passing of 'D' sieve) − (% passing of 'd' sieve) = TdD%

TdD% will indicate the infill total weight between 'd' and 'D'.

If TdD% > 60 % the product conforms.

4.9 Test report

The test report shall contain the following information:

1) number and date of this European Standard, i.e. EN 15330-1:2013;

2) product name;

3) description of the components forming the surface;

4) manufacturer’s or supplier’s product declaration; and

5) results of the tests.

5 Site tests

5.1 General

The performance of a synthetic turf surface depends on the components used to manufacture the surface, the way they are installed on site, the intensity of usage a surface is subjected to and the level of maintenance carried out. To ensure a surface is delivering the anticipated acceptable levels of performance it shall be tested throughout its life. Such testing is typically undertaken following installation and then once every two or three years depending on the levels of usage and local regulations. The results obtained shall be as detailed in 5.3, as applicable.

New facilities (12 months old or less) shall satisfy the initial test requirements, facilities tested after 12 months use shall satisfy the re-test requirements, as appropriate.

5.2 Test Conditions

Tests on site should be made under the prevailing meteorological conditions, but within an ambient temperature range of +5 °C to +35 °C. For fields or courts that are normally watered prior to use, tests should

be carried out on wet test locations. For fields or courts that are used both dry and wet, tests should be carried out under the meteorological conditions at the time of test and these conditions shall be reported.

5.3 Performance requirements

5.3.1 Hockey pitches

5.3.1.1 Field test performance requirements

Full-size synthetic turf hockey pitches should be tested in the positions shown in Figure 1. For smaller pitches, position 1, position 3 and position 4 should be used. The performance of the pitch shall be in accordance with Table 4.

Table 4 — performance requirements for synthetic turf hockey fields

Characteristic	Test method	Requirements (initial and field re-tests)	
Vertical ball rebound	EN 12235	≤ 70 % (≤ 0,45 m)	
Ball roll	EN 12234	≥ 8,0 m	
Shock absorption	EN 14808	≥ 40 %	
Vertical deformation	EN 14809	≥ 3 mm to ≤ 10 mm	
Rotational resistance	EN 15301–1 (dimple test sole)	≥ 25N m to ≤ 50 Nm	
Water infiltration rate (where applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 6 mm
		300 mm straight edge	≤ 2 mm

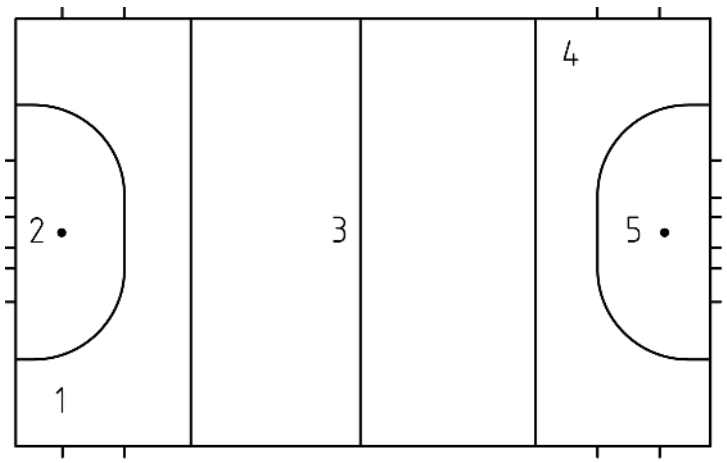

Figure 1 — Test positions for full-size hockey pitches

5.3.1.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory tested and in accordance with the manufacturer's declaration, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0 m) and 3 kg of each infill material shall be supplied for test.

5.3.2 Football pitches

5.3.2.1 Field test performance requirements

Full-size long pile synthetic turf football pitches should be tested in the positions shown in Figure 2. For smaller pitches, position 1, position 3 and position 4 should be used. The performance of the pitch shall be in accordance with Table 5.

Table 5 — Performance requirements for long pile synthetic turf football fields

Characteristic	Test method	Requirement	
Vertical ball rebound	EN 12235	45 % to 75 % (0,60 m to 1,0 m)	
Ball roll	EN 12234	Initial field test	≥ 4 m to ≤ 10 m
		Re-test	≥ 4m to ≤ 12m
Shock absorption	EN 14808	≥ 55 % to ≤ 70 %	
Vertical deformation	EN 14809	≥ 4 mm to ≤ 9 mm	
Rotational resistance	EN 15301–1 (studded test sole)	25 Nm to 50 Nm	
Water infiltration rate (where applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	< 10 mm

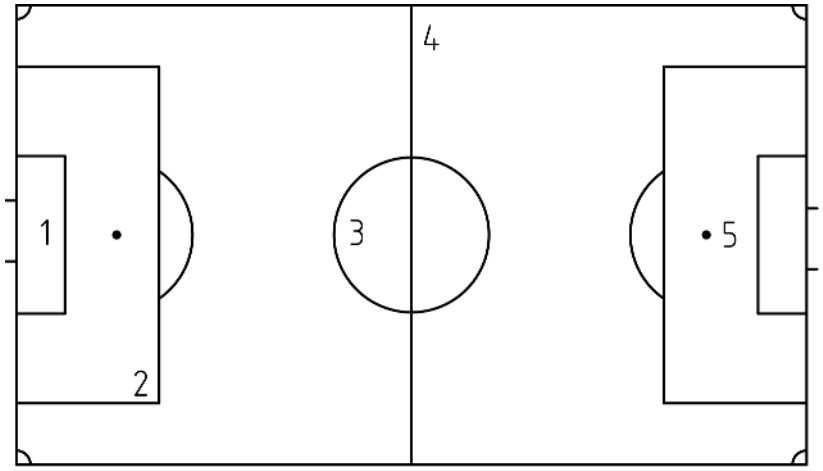

Figure 2 — Test positions for full-size football pitches

5.3.2.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0) and 3 kg of each infill material shall be supplied for test.

5.3.3 Rugby pitches

5.3.3.1 Field test performance requirements

Synthetic turf rugby training pitches should be tested in the positions shown in Figure 3. For smaller pitches, position 1, position 3 and position 4 should be used. The performance of the pitch shall be in accordance with Table 6.

Under the Laws of the Game of Rugby Union, fields used for rugby union matches have to comply with IRB Regulation 22.

Table 6 — Performance requirements for long pile synthetic turf rugby fields

Characteristic	Test method	Requirement	
Vertical ball rebound	EN 12235	45 % to 75 % (0,60 m and 1,0 m)	
Critical Fall Height	EN 1177 (tested as a loose particulate material)	Initial test	≥ 1,3 m
		Re-test	≥ 1,0 m
Shock absorption	EN 14808	≥ 55 % to ≤ 70 %	
Vertical deformation	EN 14809	≥ 4 mm to ≤ 10 mm	
Rotational resistance	EN 15301–1 (studded test sole)	30 Nm to 50 Nm	
Water infiltration rate (when applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 10 mm

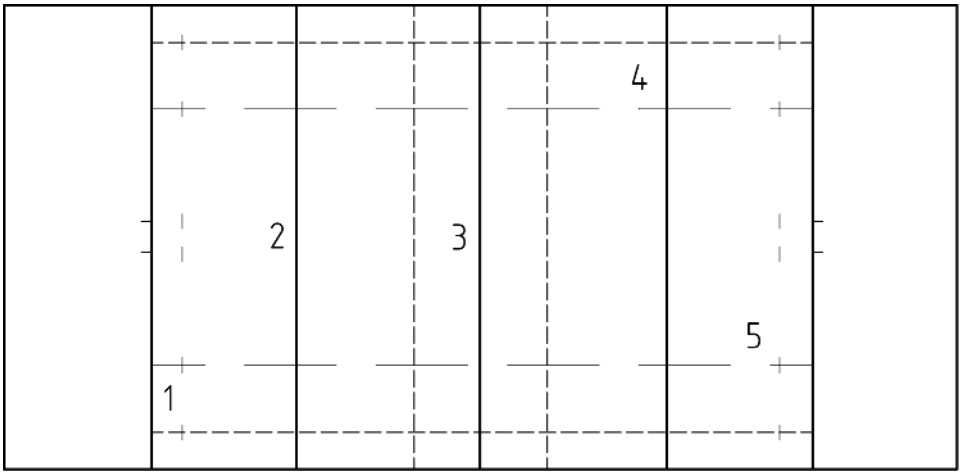

Figure 3 — Test positions for full-size rugby pitches

5.3.3.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0) and 3 kg of each infill material shall be supplied for test.

5.3.4 Tennis courts

5.3.4.1 Field test performance requirements

Synthetic turf tennis courts should be tested in the positions shown in Figure 4. Angle ball and vertical ball rebound is not measured in position 4. If blocks of multiple courts are being assessed, it is not normally necessary to test each court. Typically one court in three should be tested, that court being selected by agreement between all interested parties. The performance of the courts shall be in accordance with Table 7.

Table 7 — Performance requirements for synthetic turf tennis courts

Characteristic	Test method	Requirement	
Angle ball rebound	EN 13865	In accordance with Table 1 as specified by facility designer	
Vertical ball rebound	EN 12235	≥ 80 % (≥ 1,12 m)	
Shock absorption	EN 14808	Class SA 1 or SA 2 as specified by facility designer	
Rotational resistance	EN 15301–1 (dimple test sole)	≥ 25 Nm to ≤ 50 Nm	
Water infiltration rate (where applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 6 mm
		300 mm straight edge	≤ 2 mm

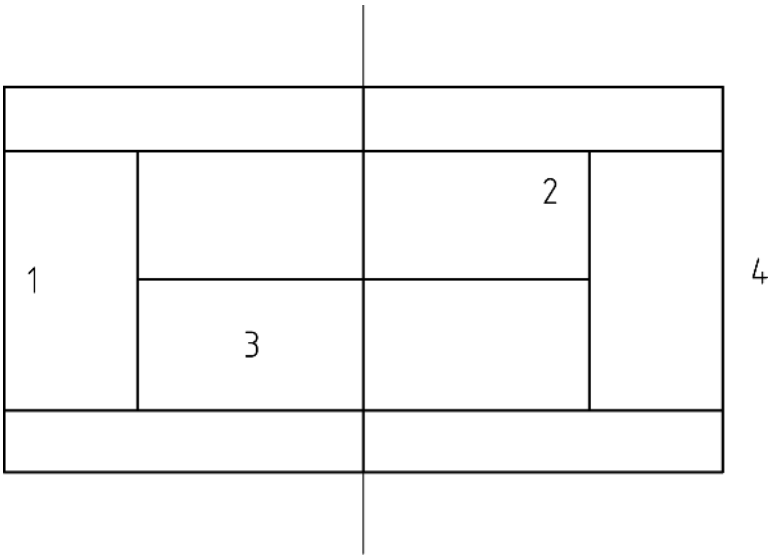

Figure 4 — Test positions for tennis courts

5.3.4.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0 and 3 kg of each infill material shall be supplied for test.

5.3.5 Multi-sports fields

5.3.5.1 Combined use long pile synthetic turf football and hockey pitches

5.3.5.1.1 Field test performance requirements

Full-size synthetic turf combined use football and hockey pitches should be tested in the positions shown in Figure 2. For smaller pitches, position 1, position 3 and position 4 should be used. The performance of the pitch shall be in accordance with Table 8.

Table 8 — Performance requirements for combined use long pile synthetic turf football and hockey pitches

Characteristic	Test method	Requirement	
Vertical ball rebound	EN 12235	Football	45 % to 75 % 0,60 m to 1,0 m
		Hockey	≤ 70 % (≤ 0,48 m)
Ball roll	EN 12234	Football	≥ 4 m to ≤ 12 m
		Hockey	≥ 5 m
Shock absorption	EN 14808	≥ 55 % to ≤ 70 %	
Vertical deformation	EN 14809	≥ 4 mm to ≤ 9 mm	
Rotational resistance	EN 15301–1	Studded test sole	25 Nm to 50 Nm
Water infiltration rate (where applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 6 mm

5.3.5.1.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0 m) and 3 kg of each infill material shall be supplied for test.

5.3.5.2 Combined use short pile synthetic turf hockey and football pitches

5.3.5.2.1 Field test performance requirements

Full-size synthetic turf combined use hockey and football pitches should be tested in the positions shown in Figure 1. For smaller pitches, position 1, position 3 and position 4 should be used. The performance of the pitch shall be in accordance with Table 9.

Table 9 — Performance requirements for combined use short pile synthetic turf hockey and football pitches

Characteristic	Test method	Requirement	
Vertical ball rebound	EN 12235	Hockey	≤ 70 % (≤ 0,48 m)
		Football	≤ 90 % (≤ 1,22 m)
Ball roll	EN 12234	Hockey	≥ 8 m
		Football	≤ 18 m
Shock absorption	EN 14808	≥ 40 % to ≤ 70 %	
Vertical deformation	EN 14809	≥ 3 mm to ≤ 10 mm	
Rotational resistance	EN 15301–1 (dimpled test sole)	25 Nm to 50 Nm	
Water infiltration rate (where applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 6 mm
		300 mm straight edge	≤ 2 mm

5.3.5.2.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0) and 3 kg of each infill material shall be supplied for test.

5.3.5.3 Combined use long pile synthetic turf football and rugby pitches

5.3.5.3.1 Field test performance requirements

Full-size synthetic turf combined use football and rugby pitches should be tested in the positions shown in Figure 3. For smaller pitches, position 1, position 3 and position 4 should be used. The performance of the pitch shall be in accordance with Table 10.

Under the Laws of the Game of Rugby Union, fields used for rugby union matches have to comply with IRB Regulation 22.

Table 10 — Performance requirements for combined use long pile synthetic turf football/rugby fields

Characteristic	Test method	Requirement	
Vertical ball rebound	EN 12235	45 % to 75 % (0,60 m to 1,0 m)	
Ball roll	EN 12334	Initial field test following installation	4 m to 10 m
		Bi-annual re-test (1)	4 m to 12 m
Critical Fall Height	EN 1177 (tested as a loose particulate material)	Initial field test following installation	≥ 1,3 m
		Bi-annual re-test (1)	≥ 1,0 m
Shock absorption	EN 14808	≥ 55 % to ≤ 70 %	
Vertical deformation	EN 14809	≥ 4 mm to ≤ 10 mm	
Rotational resistance	EN 15301–1 (studded test sole)	25 Nm to 50 Nm	
Water infiltration rate (when applicable)	EN 12616	≥ 500 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 10 mm
NOTE As recommended by the International Rugby Board.			

5.3.5.3.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0) and 3 kg of each infill material shall be supplied for test.

5.3.5.4 Combined use short pile synthetic turf hockey and tennis surfaces

5.3.5.4.1 Field test performance requirements

Full-size pitches should be tested in the positions shown in Figure 1 and Figure 4 as appropriate. For smaller pitches, position 1, position 3 and position 4 should be used. If blocks of tennis courts are being assessed, it is not normally necessary to test each court. Typically one court in three should be tested, that court being selected by agreement between all interested parties in the positions shown in Figure 4. The performance of the facility shall be in accordance with Table 11.

Table 11 — Performance requirements for synthetic turf hockey and tennis pitches

Characteristic	Test method	Requirement	
Vertical ball rebound	EN 12235	Hockey ball	≤ 70 % (≤ 0,48 m)
		Tennis ball	≥ 80 % (≥ 1,12 m)
Hockey ball roll	EN 12234	≥ 8,0 m	
Tennis angle ball rebound	EN 13865	In accordance with Table 1 as specified by facility designer	
Shock absorption	EN 14808	25 % to 44 %	
Vertical deformation	EN 14809	≥ 3 mm to ≤ 10 mm	
Rotational resistance	EN 15301–1 (dimple test sole)	≥ 25 Nm to ≤ 50 Nm	
Water infiltration rate (where applicable)	EN 12616	≥ 180 mm/h	
Surface regularity	EN 13036–7	3,0 m straight edge	≤ 6 mm
		300 mm straight edge	≤ 2 mm

5.3.5.4.2 Product verification tests

To ensure the installed synthetic turf surface is the same as that laboratory type tested, product identification tests shall be carried out on samples of the installed materials. The materials shall be identified for the properties detailed in Table 3, as appropriate, and shall be within the specified tolerances detailed in Table 3.

Unless otherwise specified by the site operator/owner one sample of synthetic turf (minimum dimensions 1,0 m x 1,0) and 3 kg of each infill material shall be supplied for test.

5.4 Test report

The test report shall contain the following information:

a) number and date of this European Standard, i.e. EN 15330-1:2013;

b) site name and location;

c) date of test;

d) surface and ambient conditions at time of test (including temperatures and humidity);

e) description of the components forming the surface;

f) manufacturer's or supplier's product declaration;

g) results of the tests; and

h) statement of conformity or failure for each property.

Annex A
(informative)

Selection of the appropriate types of synthetic grass for various sports applications

The diagrams in Table A.1 to Table A.8 are indicative only and show the main generic types of synthetic turf at the time of publication of this European Standard and their primary uses. The diagrams are not to be considered as an exclusive, restrictive or definitive list.

A synthetic turf surface designed for multiple sports use offers a cost-effective solution for schools and other facilities with a wide range of sporting demands. While a multi-sports area is often seen as a 'safe option', it should be recognised that there will almost always be a need for compromise, primarily in terms of the performance of the playing surface, as no one surface is suitable for all types of sport.

While facility operators might be willing to compromise on the playing characteristics of a surface to allow a wider range of sports to be played, compromises on the player/surface interactions are more difficult if players are to be protected from an increased risk of injury. For example, reducing the shock absorption level to increase the ball rebound so that tennis can be played might result in a greater number of injuries to football players who tend to fall onto the surface much more frequently than tennis players. As a general rule, the characteristics of the surface should be designed to satisfy the priority sports for the facility. Where these have conflicting demands, it might be necessary to redefine the potential uses of the facility. If in doubt, when considering the requirements for a multi-sports facility, specialist advice should be sought.

There are many forms of synthetic turf ranging in pile heights from 10 mm to over 70 mm. Some are non-filled, others partly filled and others filled to the top of the pile. An increasingly wide range of fill materials are used. Many synthetic turfs are laid above a shock absorbing layer of various constructions to aid the dynamic response of the surface.

Key (for the following eight Tables):

— ● Low

— ●● Low to medium

— ●●● Medium

— ●●●● Medium to high

— ●●●●● High

Table A.1 — Synthetic Turf — Type 1, normally laid over or incorporating a shock absorbing layer

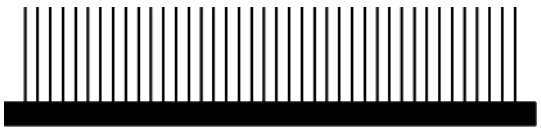

Figure A.1

Primary uses	Hockey
Typical pile height (mm)	10 to 20
Typical level and type of infill	Non-filled
Pile density/number of tufts	High
Infill height, %	—
Suitability for football	●●
Suitability for hockey	●●●●●
Suitability for tennis	●
Suitability for rugby	●
Maintenance requirements	●
Comments	Normally requires a watering system

Table A.2 — Synthetic Turf — Type 2, normally laid over or incorporating a shock absorbing layer

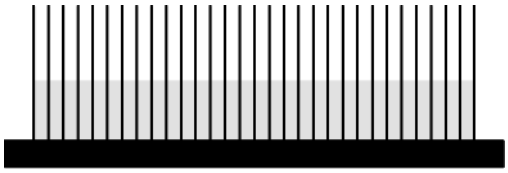

Figure A.2

Primary uses	Hockey
Typical pile height (mm)	10 to 20
Typical level and type of infill	Partly filled, sand
Pile density/number of tufts	High
Infill height, %	Medium
Suitability for football	●●
Suitability for hockey	●●●●●
Suitability for tennis	●●
Suitability for rugby	●
Maintenance requirements	●●
Comments	Might require a watering system

Table A.3 — Synthetic Turf – Type 3, does not normally include a shock absorbing layer when tennis is priority sport

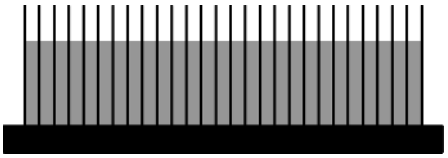

Figure A.3

Primary uses	Tennis
Typical pile height (mm)	10 to 20
Typical level and type of infill	Fully filled, sand
Pile density/number of tufts	High to medium
Infill height, %	90 to 100
Suitability for football	●
Suitability for hockey	●●
Suitability for tennis	●●●●●
Suitability for rugby	●
Maintenance requirements	●●●

Table A.4 — Synthetic Turf — Type 4, normally laid over a shock absorbing layer

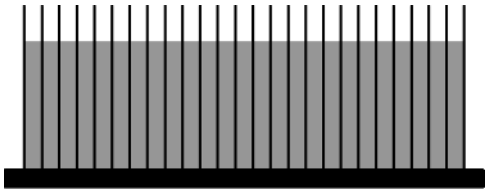

Figure A.4

Primary uses	Multi-sports
Typical pile height (mm)	20 to 35
Typical level and type of infill	Fully filled, sand
Pile density/number of tufts	Medium
Infill height, %	80 to 90
Suitability for football	●●●
Suitability for hockey	●●●
Suitability for tennis	●●
Suitability for rugby	Only suitable for non-contact rugby
Maintenance requirements	●●●

Table A.5 — Synthetic Turf — Type 5, may be laid over a shock absorbing layer

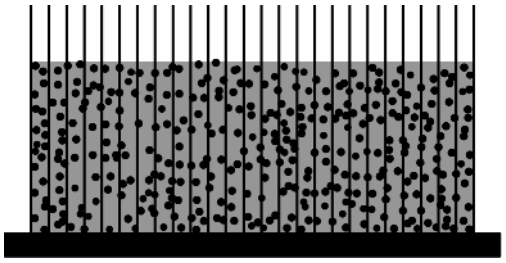

Figure A.5

Primary uses	Football and multi-sports
Typical pile height (mm)	35 to 40
Typical level and type of infill	Partly filled, rubber, sand
Pile density/number of tufts	Moderate
Infill height, %	60 to 80
Suitability for football	●●●●
Suitability for hockey	●●●
Suitability for tennis	Not suitable
Suitability for rugby	●●●
Maintenance requirements	●●●●●

Table A.6 — Synthetic Turf — Type 6, may be laid over a shock absorbing layer

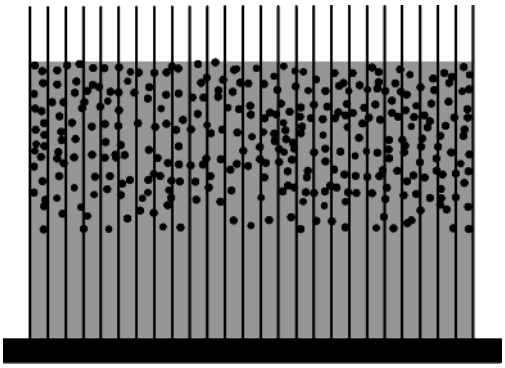

Figure A.6

Primary uses	Football
Typical pile height (mm)	40 to 55
Typical level and type of infill	Partly filled, rubber, sand
Pile density/number of tufts	low
Infill height, %	50 to 80
Suitability for football	●●●●●
Suitability for hockey	●
Suitability for tennis	Not suitable
Suitability for rugby	●●●●
Maintenance requirements	●●●●●

Table A.7 — Synthetic Turf — Type 7, may be laid over a shock absorbing layer

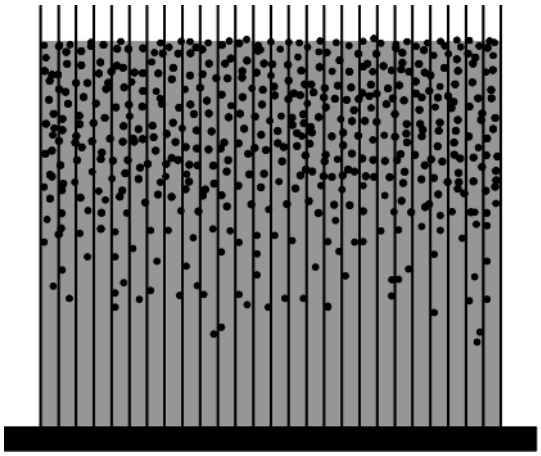

Figure A.7

Primary uses	Football and rugby
Typical pile height (mm)	55 to 70
Typical level and type of infill	Partly filled, rubber, sand
Pile density/number of tufts	Low
Infill height, %	50 to 80
Suitability for football	●●●●●
Suitability for hockey	Not suitable
Suitability for tennis	Not suitable
Suitability for rugby	●●●●●
Maintenance requirements	●●●●●

Table A.8 — Synthetic Turf — Type 8, may be laid over a shock absorbing layer

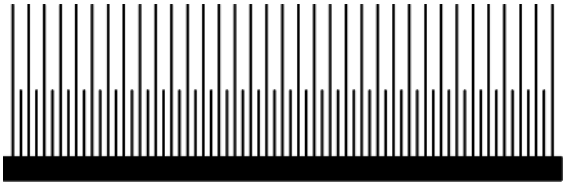

Figure A.8

Primary uses	Football and multi-sports
Typical pile height (mm)	30 to 70
Typical level and type of infill	None filled
Pile density/number of tufts	high
Infill height, %	n/a
Suitability for football	●●●
Suitability for hockey	●●
Suitability for tennis	Not suitable
Suitability for rugby	●
Maintenance requirements	●●●

Annex B
(normative)

Preparation of wet test pieces

Wet test pieces shall be prepared by evenly applying a volume of water that thoroughly soaks the test piece (if in doubt, this should be equal to the volume of the test piece). Following wetting, the test piece shall be allowed to drain for 15 min and the test carried out immediately after.

Annex C
(informative)

Information to be supplied by the manufacturer or supplier regarding maintenance

The maintenance of a synthetic turf surface is of vital importance if the pitch or court is to retain acceptable performance, remain consistent, permeable and long lasting. The manufacturer's guarantee will also usually be contingent on the recommended maintenance requirements being carried out with reasonable diligence. Therefore, it is essential that this vital aspect of the pitch's or court's management is not overlooked.

When offering/installing a pitch or court, the manufacturer or supplier should provide full details of the levels of maintenance required by the surface and details of any specialist equipment required.

Bibliography

[1] EN ISO 23997, *Resilient floor coverings — Determination of mass per unit area (ISO 23997)*

[2] EN 13036-4, *Road and airfield surface characteristics — Test methods — Part 4: Method for measurement of slip/skid resistance of a surface: The pendulum test*

[3] ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

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

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