



Sel Environmental
Real Innovation.

Document Ref: FS1013-SEL-EX-XX-T-SC-9002

Doc Title: 2G Synthetic Turf System Specification

Revision: P01

Purpose of Issue: S4 - For Stage Approval

(S4) Status A - NO COMMENTS



GRASS SPECIFICATION

Grass Name	SIS Grass Synthetic Xcel		
Premium, sand-dressed hockey surface with a 10-ply texturised polyethylene monofilament fibre.			
Application	Hockey / multi-use		
Colour	Field green / Olive green		
Product Description	Texturised monofilament hockey surface		
Product Benefits	Dense, durable system		
	Excellent ball roll characteristics		
	FIH certified		
Yarn Type	Heavy-metal free, UV stabilised, texturised polyethylene monofilament		
Yarn Structure	10-ply, 8,500 dtex		
Tuft Characteristics			
Pile Weight	1,624g per m2	Pile Height	18mm
Number of Stitches	22.5 per 10cm	Machine Gauge	3/16"
Backing Characteristics			
Primary Backing	Backing structure	Glass-fibre reinforced woven primary	
Secondary Backing			
Compound base	SBR latex		
Colour	Black	Coating Weight	900g per m2
Particulate Infill			
Sand Type	Silica sand at 0.2-0.7mm		
Recommend Infill Ratio	14kg per m2		
Width	4m	Length	Up to 65m
Total Product Weight	2,819g per m2		



Certificate of Product Approval

fih.ch/hockeyturf

FIH

**APPROVED
PRODUCT
NATIONAL**

1

This is to certify that the hockey turf product known as:

SIS Turf Xcel

manufactured by FIH Certified Manufacturer:

SIS Pitches

has been tested by an FIH Accredited Test Institute and shown to satisfy the National 1 category of Product Approval, as specified in the *FIH Hockey Turf and Field Standards: Part 2 Requirements for Hockey Turf Products* (2017 Edition).

DR. NARINDER DHRUV BATRA
PRESIDENT



A National category approved product may be laid on a hockey field or Hockey 5s court that is required to satisfy the National or Multi-sport 1 categories of FIH Field or Court Certification.

FIH Product Approval shows the hockey turf has acceptable performance when tested in the laboratory. This is the first step to ensuring a high-quality hockey facility. The second step is to ensure a competent contractor builds the hockey facility and installs the hockey turf. The FIH recommends that such work are undertaken by FIH Certified Field Builders (including FIH Preferred Suppliers). Following installation, the FIH also recommends the facility is tested to verify the performance and construction criteria, specified in the FIH Hockey Turf and Field Standards: Part 3 (Hockey Fields) or Part 4 (Hockey 5s Courts), have been achieved.

Full details of the hockey turf product tested are given in the Product Approval Test Report, available from the FIH Certified Manufacturer. If any element of the hockey turf changes from that tested, this certificate is no longer applicable.

If the manufacturing company ceases to be an FIH Certified Manufacturer this certificate is no longer valid. An up-to-date list of FIH Certified Manufacturers can be found at www.fih.ch/hockeyturf.

Certificate number:

2019-062a

FIH International Hockey Federation
Fédération Internationale de Hockey



Certificate of Product Approval

fih.ch/hockeyturf

FIH

**APPROVED
PRODUCT**
MULTI-SPORT

1

This is to certify that the hockey turf product known as

SIS Turf Xcel

manufactured by FIH Certified Manufacturer

SIS Pitches

has been tested by an FIH Accredited Test Institute and shown to satisfy the Multi-Sport 1 category of Product Approval, as specified in the *FIH Hockey Turf and Field Standards: Part 2 Requirements for Hockey Turf Products*.

DR. NARINDER DHRUV BATRA
PRESIDENT



A Multi-Sport 1 approved product may be laid on a hockey field or Hockey 5s court that is required to satisfy the Multi-Sport 1 category of FIH Field or Court Certification.

FIH Product Approval shows the hockey turf has acceptable performance when tested in the laboratory. This is the first step to ensuring a high-quality hockey facility. The second step is to ensure a competent contractor builds the hockey facility and installs the hockey turf. The FIH recommends that such work are undertaken by an FIH Preferred Supplier or Certified Field Builder. Following installation, the FIH also recommends the facility is tested to verify the performance and construction criteria, specified in the *FIH Hockey Turf and Field Standards: Part 3 (Hockey Fields) or Part 4 (Hockey 5s Courts)*, have been achieved.

Full details of the hockey turf product tested are given in the Product Approval Test Report, available from the FIH Preferred Supplier. If any element of the hockey turf changes from that tested, this certificate is no longer applicable.

If the manufacturing company ceases to be an FIH Certified Manufacturer this certificate is no longer valid. An up-to-date list of FIH Certified Manufacturers can be found at www.fih.ch/hockeyturf.

Certificate number:

2019-062b

FIH International Hockey Federation
Fédération Internationale de Hockey





Hockey Turf product name	SIS TURF XCEL
Manufacturer	19523/3863

FIH Hockey Turf and Field Standards Hockey Turf Product Assessment Test Report

FIH Hockey Turf and Field Standards Hockey Turf Product Test Report



Please think about the environment before printing this report. If you do require a paper copy please set your printer to print on both sides of the paper.

TEST INSTITUTE DECLARATION

We certify that the tests described in this report have been carried out in accordance with the latest requirements of the *FIH Quality Programme for Hockey Turf* and the report accurately reflects the outcome.

Hockey Turf product name	SIS Turf Xcel
Hockey Turf manufacturer	Support in Sport
Test institute name	Sports Labs Ltd
Project / Report Reference	19523/3863

Based on the results obtained we recommend the Hockey Turf product be approved as follows:

Global	National Class 1	National Class 2
☐	☒	☐
Multi-Sport 1	Multi-Sport 2	Multi-Sport 3
☒	☐	☐

Global category products

The irrigation application rate used during the tests detailed in this report was: mm (l/m²)

Note: Any hockey field surfaced with this product must have an irrigation system that delivers this volume of water in accordance with the *FIH Hockey Turf and Field Standards – Part 3 Requirements for Hockey Fields*.

Name Authorised Signatory (printed)	Sean Ramsay
Authorised Signatory	
Date	05/06/2019

1 INTRODUCTION

A new hockey field is a major investment meaning it is important that it meets the expectations of hockey players, hockey associations and clubs. To help ensure good quality facilities are built for all levels of play, from elite level competition to community development, the FIH has developed its internationally recognised quality-assurance programme - the **FIH Quality Programme for Hockey Turf**. The programme was launched as part of an initiative of the Hockey Revolution - FIH's ten-year strategy for hockey aimed at making hockey a global game that inspires the next generation.

The programme provides consistent and dependable industry standards and ensures the appropriate quality of performance for the intended level of play - whether it is community development, international competition, or anything in between. It is based on the principles of quality assurance, and only companies that meet the demanding standards set by the FIH can participate. The Hockey Turf products they produce are independently tested by internationally recognised test institutes accredited by the FIH. Once installed hockey facilities are also independently tested to verify the construction and performance are as required for the games of hockey and Hockey 5s.

The technical requirements of the programme are detailed in the *FIH Hockey Turf and Field Standards*, which are published in four parts:

Part 1 – Introduction & General Guidance

Part 2 – Requirements for Hockey Turf Products

Part 3 – Requirements for Hockey Fields

Part 4 - Requirements for Hockey 5s Courts

Part 2 of the *FIH Hockey Turf and Field Standards* specifies the sports performance, durability and environmental requirements for Approved Hockey Turf Products. These have been established after consultation with players, national hockey associations, members of the FIH Quality Programme and FIH accredited laboratories. They embrace products upon which hockey can be played safely and comfortably.

The Standard contains a number of different categories of Hockey Turf as described below.

		This type of synthetic turf is designed specifically for hockey and has become the surface of choice for top-level competitions. The surfaces have short, dense, piles that are non-filled. The surface is normally manufactured from monofilament yarns that are texturised to increase the density of the playing surface. To provide the fast, predictable, non-abrasive playing surface players desire, the surface is watered prior to play. This class of hockey turf provides the best playing qualities and are laid on Global Elite and Global category fields, used for top-level international and national competitions. The turfs may also be laid on National or Multi-Sport category fields if they are also shown to have compliant performance under dry conditions.
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FIH Hockey Turf and Field Standards

Hockey Turf Product Test Report

		This type of synthetic turf is also designed specifically for hockey and is quite similar in concept to non-filled turfs. The pile is, however, slightly longer and more open, which allows it to be partly dressed with a sand ballast. This ballast helps allow the surfaces to be used when dry or wet. When wet, most players will find the playing characteristics similar to those of wet non-filled surfaces. When dry, the surfaces are a little slower and a hockey ball may bobble a little more as it rolls across the surface. These types of Hockey Turfs are suitable for lower level international, national, club and community hockey. The turfs may be laid on Multi-Sport category fields if they are also shown to have compliant performance.
		This type of synthetic turf was originally developed in the 1980s as a lower cost alternative to non-filled surfaces. The surfaces normally have straight pile yarns that are longer and less densely spaced than those of non-filled or sand dressed surfaces. The surface is almost totally filled with sand to keep the pile standing upright. This provides a durable surface that can sustain high levels of use, making it particularly suitable as a multi-sport surface. Better skilled players tend to now prefer the greater consistency and comfort sand dressed or non-filled surfaces provide.
		Manufactured using a needle-punch technique that produces a thick fleece-like surface, that is normally filled with sand. The surface provides a durable, relatively fast and consistent playing surface that is used for community and development hockey and Hockey 5s courts.
Recognising that facilities on which hockey is played also often have to be used by other sports, the <i>FIH Quality Programme for Hockey Turf</i> includes three categories of Multi-Sport Surface. Multi-Sport 1 and Multi-Sport 2 surfaces either have similar forms of synthetic turf to those used on National category products or Textile Surfaces, but to accommodate the needs of the other sports they are laid on shockpads that provide slightly wider ranges of performance than those used for hockey surfaces. When considering an FIH Multi-Sport surface, its suitability for other sports should be verified by reference to the appropriate specifications of the relevant sports federations. FIH certification only assesses the suitability of the surface for hockey. The three categories of Multi-Sport surface are:		
	This category is designed to accommodate surfaces that are suitable for a number of sports including recreational & small sided football, tag rugby, lacrosse and general physical education. They still allow a level of hockey that is considered quite acceptable for community fields, multi-sport clubs and educational facilities.	

	This category allows surfaces to be stiffer and more resilient, meaning sports that need a ball to bounce, such as tennis, can also be played. The surfaces allow a level of hockey that is considered quite acceptable for community fields, multi-sport clubs and educational facilities.
	 Known as long pile or 3G synthetic turf surfaces, these types of surface are designed to replicate the playing qualities of natural grass and are primarily used for football and rugby. Some multi-sport forms have been developed to allow football and hockey to be played on the same field. These typically have a curly pile of at least 30mm in height that is partly filled with a mix of sand and rubber granules. Experience is showing that in countries where hockey is predominately now played on Hockey Turf these forms of synthetic turf surfaces are considered slow and somewhat inconsistent. However, in countries where grass or mineral surfaces are still used for hockey, long pile synthetic turf surfaces can provide an acceptable playing surface for community and development level hockey.

When selecting a hockey turf, it is important the correct category is chosen. It needs to meet the requirements of the intended levels of play and activities that will take place on the facility; in many cases this will be specified in the competition rules for games that will take place on the facility. If you are unsure about the specific field certification requirements a facility may need to satisfy you are advised to consult with the relevant national hockey association.

For a Hockey Turf to be approved it must be produced by an FIH Preferred Supplier or FIH Certified Manufacturer.

Installing an FIH Approved Product on your hockey facility is the first step to ensuring a field or court meets expectations. If, however, it is installed incorrectly or laid on a poorly built base the required levels of quality will not be achieved. Therefore, the FIH strongly recommend the construction of the facility be undertaken by an **FIH Preferred Supplier** or an **FIH Certified Field Builder**. These are companies with a proven ability to build hockey facilities to standards the game requires. The FIH also recommends that all new hockey facilities are tested and certified following construction to verify the installation has been undertaken correctly.

Full details of the FIH Quality Programme for Hockey Turf, including a list of the companies who are part of it, their approved products and the hockey fields and Hockey 5s courts that are currently certified can be found at www.fih.ch/hockeyturf. If you have questions please contact us at facilities@fih.ch.



2 PRODUCT DECLARATION

Characteristic	Manufacturer's declaration	Permitted Tolerance	Measured value
Synthetic turf carpets			
Carpet type	Tufted		
Type of pile yarn	Curly mono-filament		
Type of primary backing	Glass-fibre reinforced primary		
Type of secondary backing	SBR latex		
Method of carpet jointing	Bonded		
Method of carpet fitting	Loose laid/Tension & Clamped		
Pile height	18	± 10%	14mm (18mm stretched)
Tufts per unit area	47250	± 10%	46846
Filaments/m ²	945000	± 10%	936924
Pile weight	1624	± 10%	1579
Pile dtex	8500	± 10%	8561
Pile thickness	125	≥ 90%	125
Pile profile / shape	Rectangle		
Pile polymer	LLDPE	Same polymer	Polyethylene
Carpet mass per unit area	2819	± 10%	2865

Based on the classifications given in Section 3 Part 2 of the *Hockey Turf and Field Standards* the product is a:

Non-filled synthetic turf with curly monofilament pile	☐	Non-filled synthetic turf with straight or fibrillated pile	☐	Sand dressed synthetic turf	☒
Sand filled synthetic turf	☐	Semi-filled long pile synthetic turf	☐	Non-filled long pile synthetic turf	☐
Filled textile surface	☐	Dressed textile surface	☐	Unfilled textile surface	☐
None of the above (provide details)					

FIH Hockey Turf and Field Standards
Hockey Turf Product Test Report

Shockpad				
Product name	15mm insitu			
Manufacturer	SIS			
Composition				
	Description	1 – 4 mm SBR Granules + 10% PU Binder		
Characteristic	Manufacturer's declaration	Permitted Tolerance	Measured value	
Thickness	15	Between 90% – 130%	15	
Mass per unit area	10	± 10%	10	
Shock absorption at 23 + 2 °C	50	± 5	48	
Stabilising infill (national and multi-sports surfaces only)				
Type	Silica Sand			
Particle grading	0.315 – 0.8 mm	0.3mm – 1.0mm 60% between d and D	0.315 – 0.8 mm	Pass
Particle shape	Rounded	Similar shape	C2	
Bulk density	1.5	± 15%	1.498	
Application rate (kg/m²)	14			
Performance infill (normally only used in long pile multi-sports surfaces)				
Type				
Particle grading		60% between d and D		
Particle shape		Similar shape		
Bulk density		± 15%		
Application rate (kg/m²)				
Textile surfaces				
Thickness of pile above substrate		≤ 10 %		
Fibre polymer		Same polymer		
Carpet mass per unit area		≤ 10 %		

3 SPORTS TECHNICAL REQUIREMENTS

Hockey turf products are tested under the conditions in which they may be used. As all surfaces may be played on after rain, testing of wet test specimens is mandatory. Testing after irrigation is designed to replicate the watering of Global category surfaces prior to play. The quantity of water applied will depend on the characteristics of the surface and is detailed on page 1 of this report. As the surface will start to dry after the irrigation some tests are repeated after 45 minutes to replicate the playing conditions just prior to half-time. As National and Multi-Sport category hockey turfs do not require irrigation these are also tested in dry conditions.

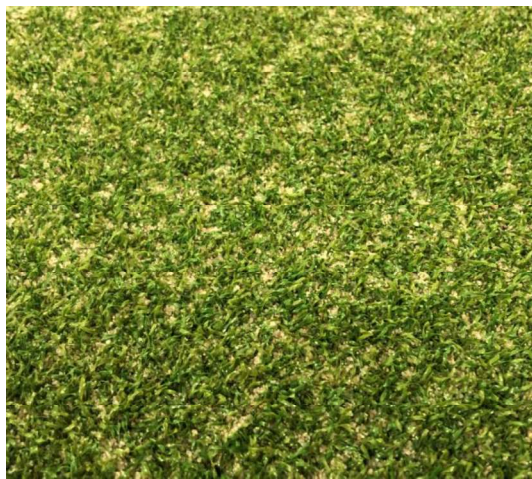
Category	GLOBAL				
Property	Requirement	After irrigation		Wet	Pass or fail
		+ 15 min. (a)	+ 45 min. (b)		
Ball rebound (mm)	100mm – 400mm				
Ball roll (m)	≥ 10.0m				
Ball roll directional consistency	≤ + 10%				
Ball roll consistency after irrigation (% difference)	≤ + 10%				
Ball roll deviation @ 9.5m (m)	≤ 0.50m				
Shock absorption (%)	45% – 60%				
Vertical deformation (mm)	4mm – 9mm				
Shoe / surface friction (Nm)	25Nm – 45Nm				
Skin – surface friction (μ)	≤ 0.75μ				
Category	NATIONAL				
Property	Requirement	Dry	Wet	Pass or fail	
Ball rebound (mm)	100mm – 425mm	301	250	Pass	
Ball roll (m)	≥ 9.0m	13.5	13.2	Pass	
Ball roll directional consistency	≤ + 20%	1.3	0.3	Pass	
Ball roll deviation @ 8.5m (m)	≤ 0.45m	0.09	0.08	Pass	
Shock absorption (%)	40% – 65%	40	40	Pass	
Vertical deformation (mm)	4mm – 9mm	4.7	4.5	Pass	
Shoe / surface friction (Nm)	25Nm – 45Nm	25	25	Pass	

FIH Hockey Turf and Field Standards
Hockey Turf Product Test Report

Category		MULTI-SPORT CLASS 1		
Property	Requirement	Surface condition		Pass or fail
		Dry	Wet	
Ball rebound (mm)	100mm – 450mm	301	250	Pass
Ball roll (m)	≥ 8.0m	13.5	13.2	Pass
Ball roll directional consistency	≤ + 20%	1.3	0.3	Pass
Ball roll deviation @ 7.5m (m)	≥ 0.40m	0.09	0.08	Pass
Shock absorption (%)	40% – 70%	40	40	Pass
Vertical deformation (mm)	4mm – 10mm	4.7	4.5	Pass
Shoe / surface friction (Nm)	25Nm – 45Nm	25	25	Pass
Category		MULTI-SPORT CLASS 2		
Property	Requirement	Dry	Wet	Pass or fail
Ball rebound (mm)	100mm – 500mm			
Ball roll (m)	≥ 8.0m			
Ball roll directional consistency	≤ + 20%			
Ball roll deviation@ 7.5m (m)	≤ 0.40m			
Shock absorption (%)	30% – 65%			
Vertical deformation (mm)	2mm – 9mm			
Shoe / surface friction (Nm)	25Nm – 45Nm			
Category		MULTI-SPORT CLASS 3		
Property	Requirement	Dry	Wet	Pass or fail
Ball rebound (mm)	≥ 75mm			
Ball roll (m)	≥ 5.0m			
Shock absorption (%)	55% – 70%			
Vertical deformation (mm)	4mm – 12mm			
Shoe / surface friction (Nm)	25Nm – 50Nm			

4 DURABILITY
Effects of simulated wear

Property	Requirement	Result	Pass or fail
Ball rebound (mm)	Global: 100mm - 400mm	320	Pass
Shock absorption (m)	Global: 45% - 60%	43	Pass
Vertical deformation (mm)	Global: 4mm - 9mm	5.1	Pass
Shoe / Surface friction (Nm)	Global: 25Nm - 45Nm	25	Pass

Sample before simulated wear conditioning


x 20



x 100

Sample after simulated wear conditioning


x 20



X 100

5 PROPERTIES OF SYNTHETIC TURF / TEXTILE CARPET
Abrasion resistance (only applicable for non-filled, sand dressed and textile surfaces)

Surface type	Requirement	Result	Pass or fail
Non-filled synthetic turf	$\leq 350\text{mg}$		N/A
Sand dressed synthetic turf	$\leq 350\text{mg}$	47	Pass
Textile surfaces	$\leq 2\%$		N/A

Carpet Strength (only applicable for carpets with a mass of less than 3.50kg/m^2)

Surface type		Requirement	Result	Pass, fail or N/A
Synthetic turf	Direction A	$\geq 15\text{N/mm}$	21	Pass
	Direction B		28	Pass
	Variation	$\leq 20\%$ ⁽¹⁾		N/A
Textile surfaces		$\geq 7.5\text{N/mm}$		N/A

 1 Only applicable if the carpet strength in either direction is $< 20\text{N/mm}$
Tuft bind

Surface type	Condition	Requirement	Result	Pass or fail
Synthetic turf	Unaged (a)	$\geq 25\text{N}$	48	Pass
	Water aged	$\geq 25\text{N}$	37	Pass
	% of (a)	$\geq 75\%$	77 %	Pass

Carpet joint strength

Method test	Condition	Requirement	Result	Pass or fail
Tensile	Unaged (a)	$\geq 1000\text{N/mm}$	2520	Pass
	Water aged	$\geq 1000\text{N/mm}$	2609	Pass
	% of (a)	$\geq 75\%$	104 %	Pass
Peel	Unaged (a)	$\geq 50\text{N/mm}$	76	Pass
	Water aged	$\geq 50\text{N/mm}$	83	Pass
	% of (a)	$\geq 75\%$	109 %	Pass

FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

Dimensional Stability

This requirement does not apply to:

			Tick if applicable
Hockey Turf carpets having a mass per unit area $\geq 3.5\text{kg/m}^2$			☐
Hockey Turf carpets that are fully bonded to a shockpad			☐
Hockey Turf carpets containing at least 15 kg/m^2 of infill			☐
Condition	Requirement	Result	Pass, fail or N/A
After water immersion	$\leq + 0.5\%$	- 0.02	Pass
After freezing		- 0.09	Pass
After heat exposure		- 0.24	Pass
After 48 hours recovery		- 0.31	Pass

6 PROPERTIES OF SHOCKPAD

Tensile strength

Type of shockpad	Condition	Requirement	Result	Pass or fail
Homogenous shockpad, less than 25mm thick	Unaged (a)	$\geq 0.15\text{Mpa}$	0.15	Pass
	After air ageing	$\geq 0.15\text{Mpa}$	0.15	Pass
	% reduction from (a)	$\leq 25\%$	0 %	Pass
Homogenous shockpad with thickness of 25mm or greater	Unaged (a)	$\geq 0.08\text{Mpa}$		
	After air ageing	$\geq 0.08\text{Mpa}$		
	% reduction from (a)	$\leq 25\%$		
Shockpad with slots or grooves	Unaged (a)	$\geq 0.10\text{Mpa}$		
	After air ageing	$\geq 0.10\text{Mpa}$		
	% reduction from (a)	$\leq 25\%$		

Resistance to dynamic fatigue

Property	Requirement after dynamic fatigue	Result				Pass or fail
		Before test (a)	After test	Effect of dynamic fatigue		
Shock absorption	≤ ± 5 absolute of (a)	48	47	Difference	1 %	Pass
Thickness	≥ 85% of (a)	15	15	%	100 %	Pass
Physical damage						
Requirement	There shall be no tearing, splitting or delamination of the shockpad.					
Result	No tearing, splitting or delamination observed					Pass

FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

Resistance to bowing and curling

Requirement		Measured result (mm)	Pass or fail	Comments
Maximum degree of bowing or curling	5mm	0	Pass	No bowing or curling observed

7 WATER PERMEABILITY (mm/h)

		Complete system	Pass or fail	Synthetic turf or textile carpet	Pass or fail	Shockpad	Pass or fail
Requirement	≥ 150mm/h	411	Pass	475	Pass	>3000	Pass

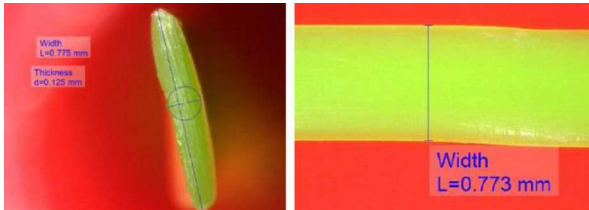
8 PILE YARN / FIBRE TEST RESULTS

Each yarn / fibre colour used on the field of play, perimeter run-offs and all line markings on a field or Hockey 5s court shall be tested and comply with the relevant requirements of the *Hockey Turf and Field Standards*.

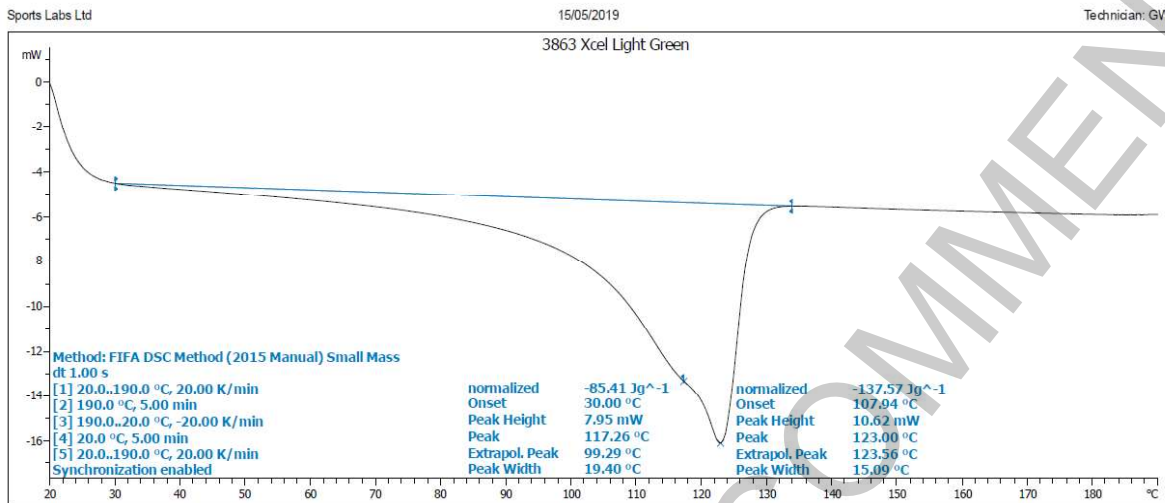
Note

Detailed below are the results obtained on the yarn that formed the test specimens detailed in this report and the white line markings for that Hockey Turf. Tests on additional colours (field or play, perimeter margins and line markings) are detailed in Appendix A. The FIH will incorporate additional colours into Appendix A whenever they received results from one of their accredited Test Institutes. A copy of the latest test report showing all complaint colours for this Hockey Turf can be obtained from the FIH Preferred Supplier / Certified Manufacturer.

Pile yarn / fibre for field of play, perimeter run-offs & secondary line markings

Colour – manufacturer's description	TX Ultra 125 Bright Green
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	4168/5
Yarn / fibre thickness	125 microns
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	

Yarn / fibre polymer characterisation



RAL Colour Range - Classic

RAL 6025

RAL Colour Range - Design

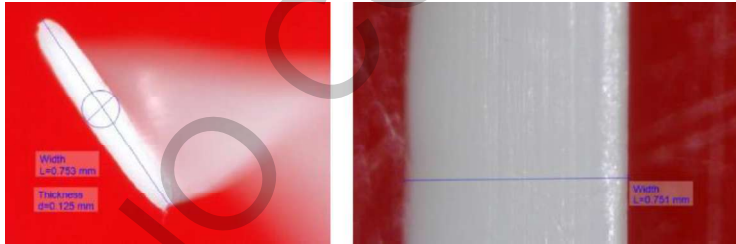
RAL 110 40 30

Blue yarns intended for use on the field of play should be RAL Classic Colour Range 5002 or 5005

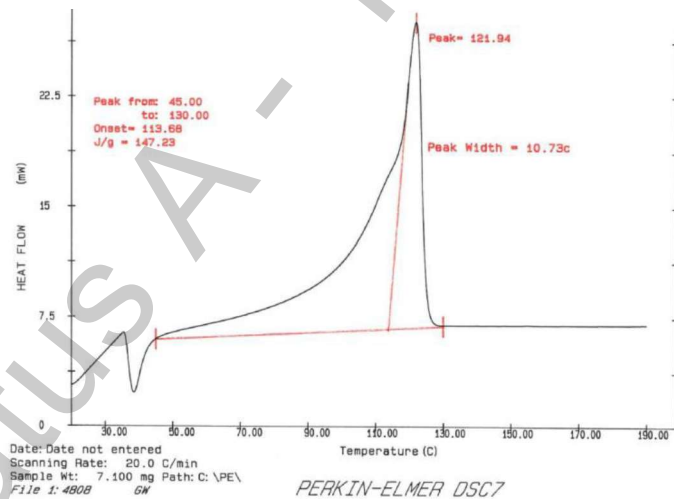
Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail			
			Strength (N)	Tenacity (cN/Tex)				
	Mono-filament yarns	≥ 5N	9.65	11.26	Pass			
	Fibrillated yarns	≥ 30N						
	Textile fibres	≥ 3N						
Effects of artificial weathering	Requirement			Results				Pass / fail
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength (N)	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity	
Mono-filament yarns	≥ 5N	≤ 50%	≤ 50%	8.33	9.44	- 13.7	- 16.2	Pass
Fibrillated yarns	≥ 30N	≤ 50%	≤ 50%					
Textile fibres	≥ 3N	≤ 50%						
Colour change	Grey Scale 3 – 5			4				Pass
Toxicology	Test programme:					EN 71/3		
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass		
	In addition to complying with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold							

FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

Pile yarn / fibre for white line markings

Colour – manufacturer's description	White
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	856
Yarn / fibre thickness	125
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	

Yarn / fibre polymer characterisation



RAL Colour Range - Classic	RAL 9016
RAL Colour Range - Design	RAL 000 10 00

FIH Hockey Turf and Field Standards
Hockey Turf Product Test Report

Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail				
			Strength (N)	Tenacity (Cn/Tex)					
	Mono-filament yarns	≥ 5N	8.57	10.02	Pass				
	Fibrillated yarns	≥ 30N							
	Textile fibres	≥ 3N							
Effects of artificial weathering	Requirement			Results				Pass / fail	
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength (N)	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity		
	Mono-filament yarns	≥ 5N	≤ 50%	≤50%	8.22	9.40	- 4.1	- 6.2	Pass
	Fibrillated yarns	≥ 30N	≤ 50%	≤ 50%					
	Textile fibres	≥ 3N	≤ 50%						
Colour change	Grey Scale 3 – 5			4				Pass	
Toxicology	Test programme:					EN 71/3			
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass			
	In addition to comply with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold								

ADDITIONAL INFORMATION & COMMENTS

Sand Infill Rate = 14 kg/m² (Approx 10mm) = 29% Free Pile

APPENDIX A – yarn colours

For a field to comply with the *FIH Hockey Turf and Field Standards* each colour used to form the field of play, perimeter run-offs and line markings shall be manufactured from the same pile yarn. Each colour shall comply with the resistance to artificial weathering and toxicology requirements of the *FIH Hockey Turf and Field Standards*.

A manufacturer may have additional yarns tested at any time. If they comply with the *FIH Hockey Turf and Field Standards*, they are added to Appendix A of this Report. The table below lists all the colours currently approved for this product.

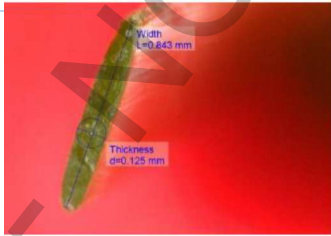
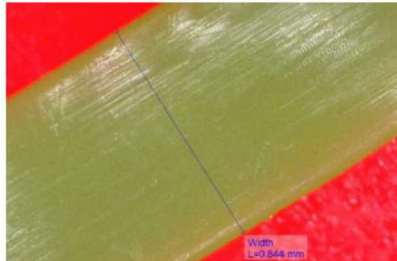
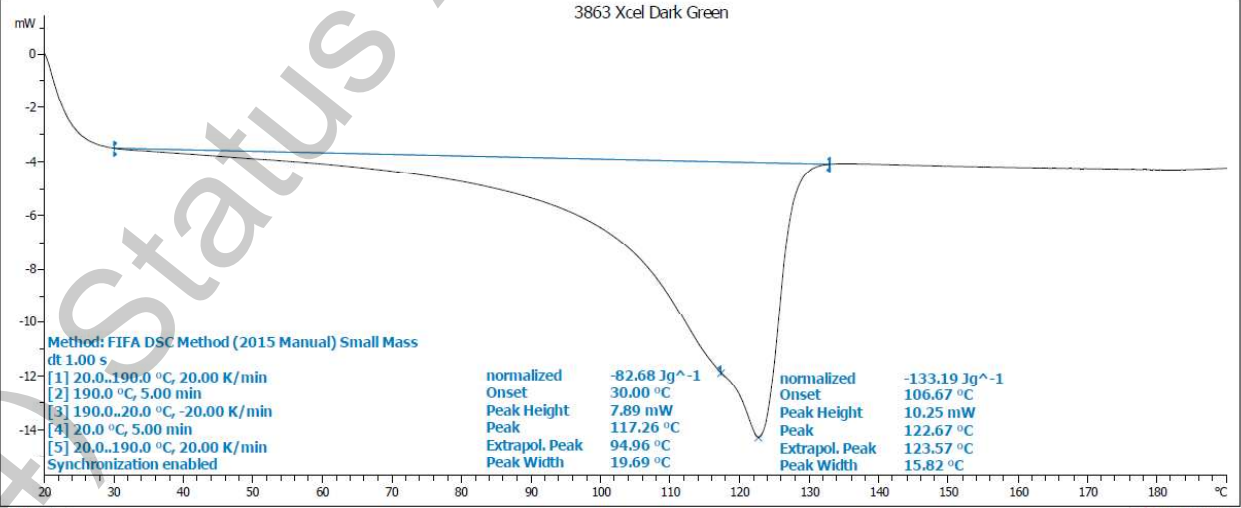
Notes:

1. The RAL Numbers detailed below are based on an assessment of the colour of the pile yarns when they are laid flat. When a yarn is tufted into a carpet it may result in a multi-directional pile that can appear to be a slightly different colour to the flat yarn.
2. Small variations in colour may occur due to the way synthetic turf pile yarns are produced. This should not result in a colour variation across a specific hockey field, providing the Hockey Turf is produced from a single batch of yarn, but it may result in small differences in colour between fields.
3. Hockey line markings should be white, other than on multi-sport fields where hockey is not the principal sport.
4. Fields intended for televised hockey should be a single shade of approved blue (field of play and run-offs).
5. Global Elite fields must not have secondary line markings. For all other categories of field local competition rules should be checked to ensure secondary line markings are permitted.
6. It is recommended logos are only positioned on the perimeters of fields (not within the field of play).
7. It is recommended light colours are not used on run-offs, to avoid discolouration from dirt and algae growth, etc.

Colour	RAL Number		Application			
	Classic	Design	Field of play	Perimeter run-offs	Principal line markings	Secondary line markings & logos
Bright Green	6025	110 40 30	✓	✓		✓
White	9016	000 100 00			✓	✓
Reflex Blue	5002	270 30 40	✓	✓		✓
New Sports Green	6010	120 40 30	✓	✓		✓
Olive Green	6013	110 40 30	✓	✓		✓
Bright Yellow	1026	085 80 80		✓		✓
Cardinal Red	3020	040 40 67		✓		✓

APPENDIX A – ADDITIONAL YARN / FIBRE TEST RESULTS

Each yarn / fibre colour used on the field of play, perimeter run-offs and all line markings on a field or Hockey 5s court shall be tested and comply with the relevant requirements of the *Hockey Turf and Field Standards*.

Colour – manufacturer's description	TX Ultra 125 New Sports Green
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Intended application	Field of play, perimeter run-offs & secondary line markings
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	4393/5
Yarn / fibre thickness	125
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	 
Yarn / fibre polymer characterisation Sports Labs Ltd 15/05/2019 Technician: GW 3863 Xcel Dark Green  Method: FIFA DSC Method (2015 Manual) Small Mass dt 1.00 s [1] 20.0..190.0 °C, 20.00 K/min [2] 190.0 °C, 5.00 min [3] 190.0..20.0 °C, -20.00 K/min [4] 20.0 °C, 5.00 min [5] 20.0..190.0 °C, 20.00 K/min Synchronization enabled normalized Onset Peak Height Peak Extrapol. Peak Peak Width -82.68 Jg⁻¹ 30.00 °C 7.89 mW 117.26 °C 94.96 °C 19.69 °C normalized Onset Peak Height Peak Extrapol. Peak Peak Width -133.19 Jg⁻¹ 106.67 °C 10.25 mW 122.67 °C 123.57 °C 15.82 °C	

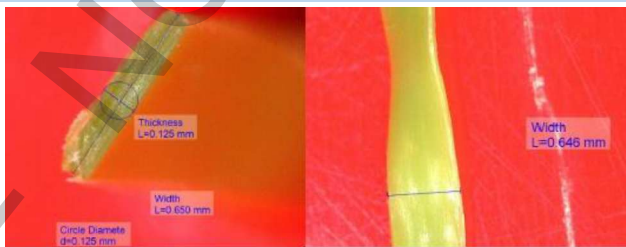
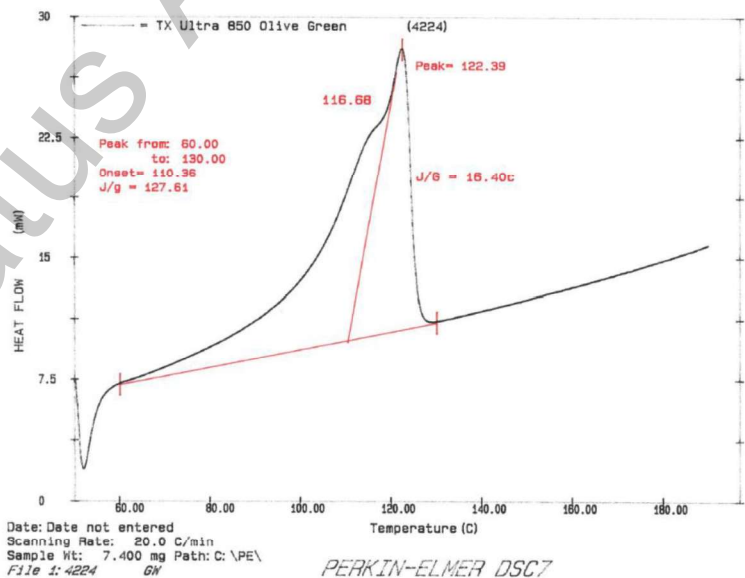
FIH Hockey Turf and Field Standards
Hockey Turf Product Test Report

RAL Colour Range – Classic		RAL 6010		Blue yarns intended for use on the field of play should be RAL Classic Colour Range 5002 or 5005				
RAL Colour Range - Design		RAL 120 40 30						
Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail			
			Strength	Tenacity (cN/Tex)				
	Mono-filament yarns	≥ 5N	9.09	10.02	Pass			
	Fibrillated yarns	≥ 30N						
	Textile fibres	≥ 3N						
Effects of artificial weathering	UV radiation test specimens exposed to: (from 01/06/18) all synthetic turf pile yarns shall be exposed to 9600kJ/m ² /340nm)					9600kJ/m ² /340nm		
	Requirement			Results				Pass / fail
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity	
Mono-filament yarns	≥ 5N	≤50%	≤50%	8.16	9.19	- 10.2	- 8.3	Pass
Fibrillated yarns	≥ 30N	≤50%	≤50%					
Textile fibres	≥ 3N	≤50%						
Colour change	Grey Scale 3 – 5			4				Pass
Toxicology	Test programme:					EN 71/3		
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass		
	In addition to comply with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold							
Test institute name		Sports Labs Ltd						
Project / Report Reference		19523/3863						
Name Authorised Signatory (printed)		Sean Ramsay						
Authorised Signatory								
Date		05/06/2019						

Additional pages to be added for other yarn / fibre colours

APPENDIX A – ADDITIONAL YARN / FIBRE TEST RESULTS

Each yarn / fibre colour used on the field of play, perimeter run-offs and all line markings on a field or Hockey 5s court shall be tested and comply with the relevant requirements of the *Hockey Turf and Field Standards*.

Colour – manufacturer's description	TX Ultra 125 Olive Green
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Intended application	Field of play, perimeter run-offs & secondary line markings
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	815
Yarn / fibre thickness	125
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	
Yarn / fibre polymer characterisation 	

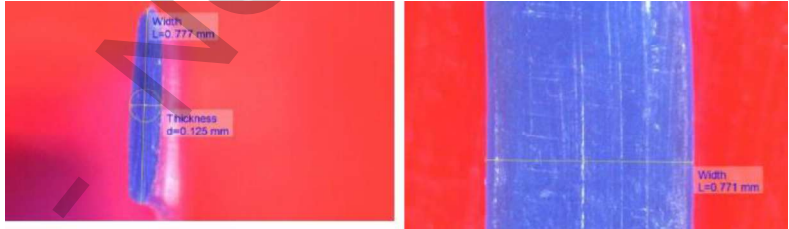
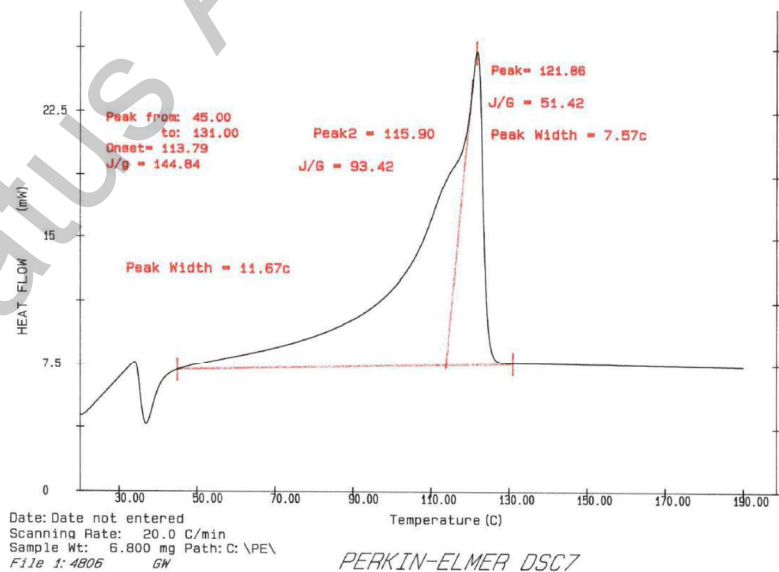
FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

RAL Colour Range – Classic		RAL 6013		Blue yarns intended for use on the field of play should be RAL Classic Colour Range 5002 or 5005				
RAL Colour Range - Design		RAL 110 40 30						
Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail			
			Strength	Tenacity (cN/Tex)				
	Mono-filament yarns	≥ 5N	9.4	11.6	Pass			
	Fibrillated yarns	≥ 30N						
	Textile fibres	≥ 3N						
Effects of artificial weathering	UV radiation test specimens exposed to: (from 01/06/18) all synthetic turf pile yarns shall be exposed to 9600kJ/m ² /340nm)					9600kJ/m ² /340nm		
	Requirement			Results				Pass / fail
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity	
Mono-filament yarns	≥ 5N	≤50%	≤50%	8.7	10.4	- 7	- 10.3	Pass
Fibrillated yarns	≥ 30N	≤50%	≤50%					
Textile fibres	≥ 3N	≤50%						
Colour change	Grey Scale 3 – 5			4 - 5				Pass
Toxicology	Test programme:					EN 71/3		
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass		
	In addition to comply with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold							
Test institute name		Sports Labs Ltd						
Project / Report Reference		19523/3863						
Name Authorised Signatory (printed)		Sean Ramsay						
Authorised Signatory								
Date		05/06/2019						

Additional pages to be added for other yarn / fibre colours

APPENDIX A – ADDITIONAL YARN / FIBRE TEST RESULTS

Each yarn / fibre colour used on the field of play, perimeter run-offs and all line markings on a field or Hockey 5s court shall be tested and comply with the relevant requirements of the *Hockey Turf and Field Standards*.

Colour – manufacturer's description	TX Ultra 125 Reflex Blue
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Intended application	Field of play, perimeter run-offs & secondary line markings
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	877
Yarn / fibre thickness	125
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	
Yarn / fibre polymer characterisation	 Date: Date not entered Scanning Rate: 20.0 C/min Sample Wt: 6.800 mg Path: C: \PE\ File 1: 4806 GN PERKIN-ELMER DSC7

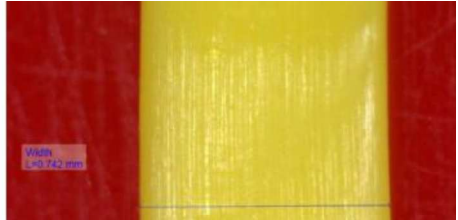
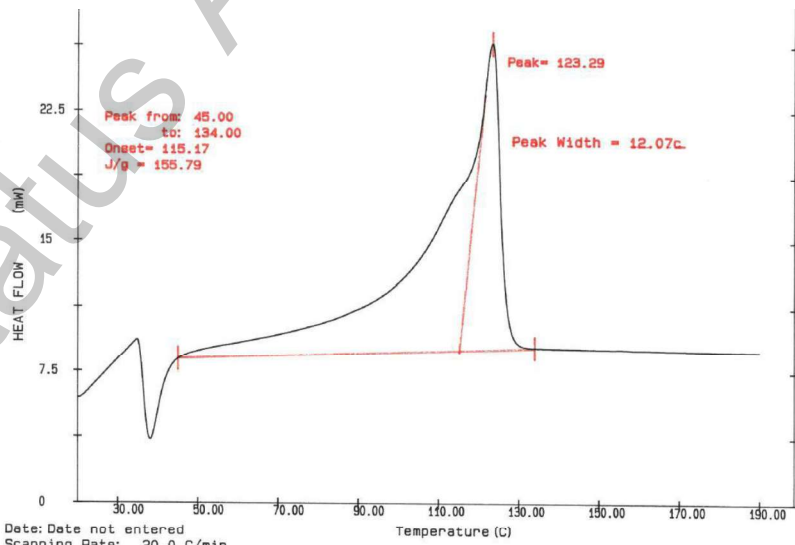
FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

RAL Colour Range – Classic		RAL 5002		Blue yarns intended for use on the field of play should be RAL Classic Colour Range 5002 or 5005				
RAL Colour Range - Design		RAL 270 30 40						
Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail			
			Strength	Tenacity (cN/Tex)				
	Mono-filament yarns	≥ 5N	8.68	9.90	Pass			
	Fibrillated yarns	≥ 30N						
	Textile fibres	≥ 3N						
Effects of artificial weathering	UV radiation test specimens exposed to: (from 01/06/18) all synthetic turf pile yarns shall be exposed to 9600kJ/m ² /340nm)					9600kJ/m ² /340nm		
	Requirement			Results				Pass / fail
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity	
Mono-filament yarns	≥ 5N	≤50%	≤50%	8.08	9.22	- 6.9	- 6.9	Pass
Fibrillated yarns	≥ 30N	≤50%	≤50%					
Textile fibres	≥ 3N	≤50%						
Colour change	Grey Scale 3 – 5			4				Pass
Toxicology	Test programme:					EN 71/3		
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass		
	In addition to comply with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold							
Test institute name		Sports Labs Ltd						
Project / Report Reference		19523/3863						
Name Authorised Signatory (printed)		Sean Ramsay						
Authorised Signatory								
Date		05/06/2019						

Additional pages to be added for other yarn / fibre colours

APPENDIX A – ADDITIONAL YARN / FIBRE TEST RESULTS

Each yarn / fibre colour used on the field of play, perimeter run-offs and all line markings on a field or Hockey 5s court shall be tested and comply with the relevant requirements of the *Hockey Turf and Field Standards*.

Colour – manufacturer's description	TX Ultra 125 Bright Yellow
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Intended application	Perimeter run-offs & secondary line markings
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	830
Yarn / fibre thickness	125
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	 
Yarn / fibre polymer characterisation  Date: Date not entered Scanning Rate: 20.0 C/min Sample Wt: 6.200 mg Path: C:\PE\ File 1: 4809 GW PERKIN-ELMER DSC7	

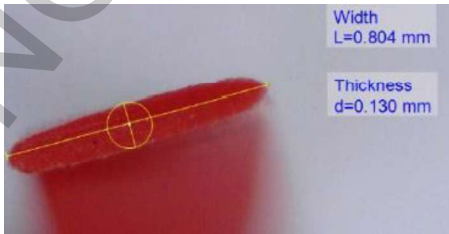
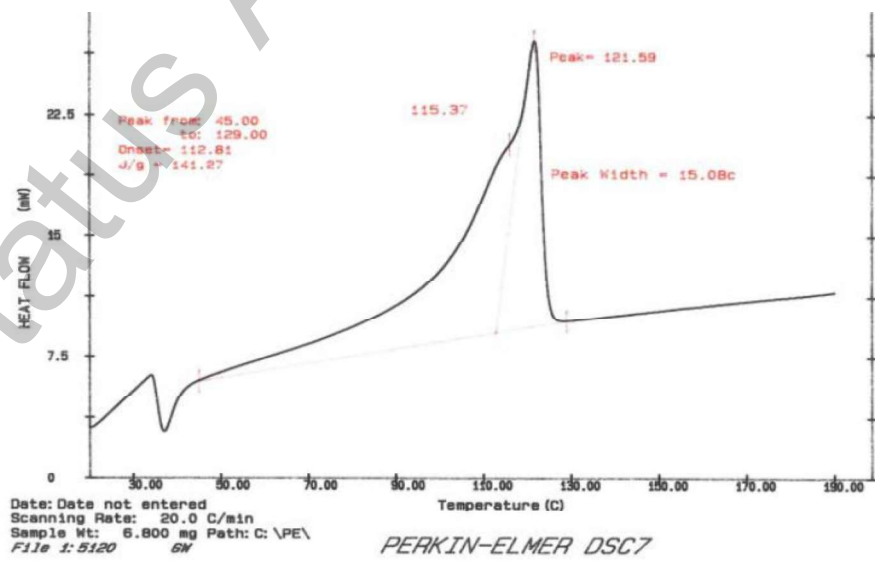
FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

RAL Colour Range – Classic		RAL 1026		Blue yarns intended for use on the field of play should be RAL Classic Colour Range 5002 or 5005				
RAL Colour Range - Design		RAL 085 80 80						
Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail			
			Strength	Tenacity (cN/Tex)				
	Mono-filament yarns	≥ 5N	9.61	11.58	Pass			
	Fibrillated yarns	≥ 30N						
	Textile fibres	≥ 3N						
Effects of artificial weathering	UV radiation test specimens exposed to: (from 01/06/18) all synthetic turf pile yarns shall be exposed to 9600kJ/m ² /340nm)					9600kJ/m ² /340nm		
	Requirement			Results				Pass / fail
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity	
Mono-filament yarns	≥ 5N	≤50%	≤50%	8.16	9.83	- 15.1	- 15.1	Pass
Fibrillated yarns	≥ 30N	≤50%	≤50%					
Textile fibres	≥ 3N	≤50%						
Colour change	Grey Scale 3 – 5			4 - 5				Pass
Toxicology	Test programme:					EN 71/3		
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass		
	In addition to comply with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold							
Test institute name		Sports Labs Ltd						
Project / Report Reference		19523/3863						
Name Authorised Signatory (printed)		Sean Ramsay						
Authorised Signatory								
Date		05/06/2019						

Additional pages to be added for other yarn / fibre colours

APPENDIX A – ADDITIONAL YARN / FIBRE TEST RESULTS

Each yarn / fibre colour used on the field of play, perimeter run-offs and all line markings on a field or Hockey 5s court shall be tested and comply with the relevant requirements of the *Hockey Turf and Field Standards*.

Colour – manufacturer's description	TX Ultra 125 Cardinal Red
Type of yarn /fibre	Curly mono-filament
Yarn / fibre manufacturer	Mattex International SARL
Intended application	Perimeter run-offs & secondary line markings
Yarn / fibre polymer	Polyethylene
Yarn / fibre dtex	848
Yarn / fibre thickness	130
Yarn / fibre profile	Oval
Yarn / fibre profile dimensions	
Yarn / fibre polymer characterisation 	

FIH Hockey Turf and Field Standards Hockey Turf Product Test Report

RAL Colour Range – Classic		RAL 3020		Blue yarns intended for use on the field of play should be RAL Classic Colour Range 5002 or 5005				
RAL Colour Range - Design		RAL 040 40 67						
Tensile strength (unaged test specimen)	Requirement		Result		Pass / fail			
			Strength	Tenacity (cN/Tex)				
	Mono-filament yarns	≥ 5N	8.57	10.11	Pass			
	Fibrillated yarns	≥ 30N						
	Textile fibres	≥ 3N						
Effects of artificial weathering	UV radiation test specimens exposed to: (from 01/06/18) all synthetic turf pile yarns shall be exposed to 9600kJ/m ² /340nm)					9600kJ/m ² /340nm		
	Requirement			Results				Pass / fail
	Tensile strength	% loss of strength	% loss of tenacity	Tensile strength	Tenacity (cN/Tex)	% loss of strength	% loss of tenacity	
Mono-filament yarns	≥ 5N	≤50%	≤50%	8.0	7.80	- 7.0	- 22.8	Pass
Fibrillated yarns	≥ 30N	≤50%	≤50%					
Textile fibres	≥ 3N	≤50%						
Colour change	Grey Scale 3 – 5			4 - 5				Pass
Toxicology	Test programme:					EN 71/3		
	Does the yarn / fibre fully satisfy the requirements of the relevant test programme?					Yes - Pass		
	In addition to comply with the toxicology requirements of the <i>FIH Hockey Turf and Field Standards</i> , a yarn or fibre should comply with all national regulations for the markets in which it is being sold							
Test institute name		Sports Labs Ltd						
Project / Report Reference		19523/3863						
Name Authorised Signatory (printed)		Sean Ramsay						
Authorised Signatory								
Date		05/06/2019						

Additional pages to be added for other yarn / fibre colours

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211million+



watched 2016 Champions Trophy

3,750 hours broadcast
Rights sold to **130+** countries

Ranked **4th** highest Olympic sport across social media



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45million+ minutes watched on YouTube



The national sport of **INDIA**
5th of the world's population

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INCLUSIVE

50/50
male / female sport

Strong continental representation

132
National Associations



Target of **152**
by 2024

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MASTERS

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First played in
London
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Rio 2016 women's final

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Voted by
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Excellent
anti-doping
record

