



# FIFA LABORATORY TEST REPORT

Product name	SIT-IN SPORT XWR PSF 45
FIFA Licensee	Radici Pietro Industries & Brands S.p.A. (Italy)
FIFA accredited Test Institute	Labosport Italia S.r.l.
Laboratory Test report number	14-0142IT
Date of test	29.04.2014

# Football Turf Laboratory Test Report

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# Football Turf Laboratory Test Report

## 1 – Introduction / The Process of certification

In order to be certified, football turf fields must reach the performance and quality criteria established to be as close as possible to playing characteristics of natural grass. To this end, each field must undergo four steps as outlined below:

- a thorough composition and resilience test of the product in the laboratory (step 1)
- the installation of the product as declared, applying the outlined procedures (step 2)
- a test of the final installation for the relevant characteristics of the field as a whole system (step 3)
- if successful, certification as FIFA 1 STAR or FIFA 2 STAR field (step 4)

After expiration of the certificate, the field can be retested (step 3/4)

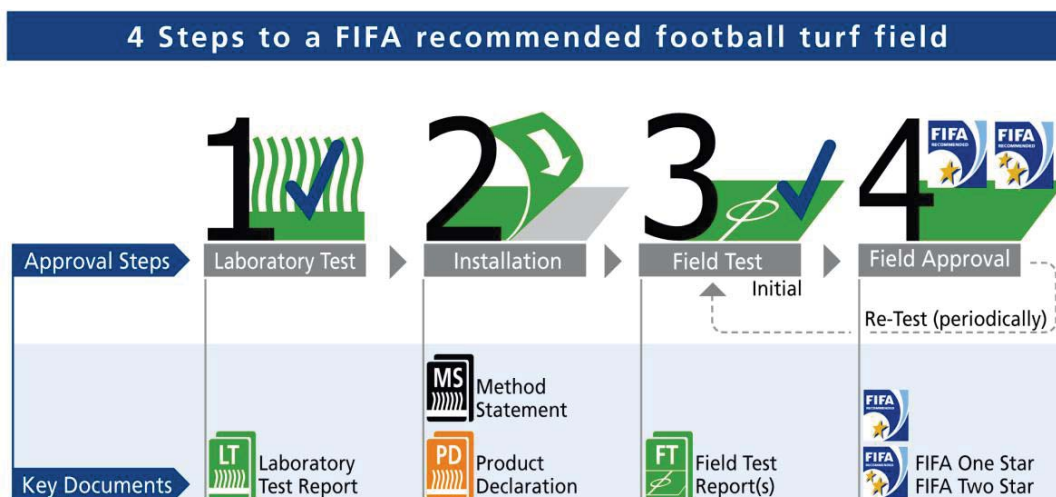
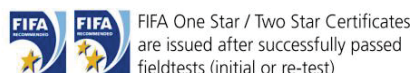


Fig. 1.2 Approval process steps and the related documents / parties

Legend:



### This process is part of the FIFA Quality Concept for Football Turf in order to

- replicate the playing qualities of good quality natural grass,
- create a playing environment that does not increase the risk of injury to players
- achieve adequate durability (providing it is properly maintained)

For more details on *FIFA Quality Concept for Football Turf* see [www.fifa.com](http://www.fifa.com).

### This document covers the complete step 1, FIFA LABORATORY TESTS REPORT. Consider:

- Tests are performed on a representative sample of the manufacturer’s sample delivered to the FIFA accredited test institutes
- The test report is only valid if reproduced in its entirety
- The results are only valid for the complete Football Turf (related product) as stated in 2.1
- The related product is eligible for undergoing a field test on a final installation.

### IMPORTANT:

#### To reach FIFA Recommended Two Star (One Star) field certification, as next steps

- the installation has to comply with the related Product Declaration / Method Statement (step 2)
- a successfully passed subsequent FIELD TEST (step 3/4)

This FIFA LABORATORY TEST REPORT may only be used in relationship to Football Turf fields that are going to be submitted for certification under the *FIFA Quality Concept of Football Turf*. Any other use of this report is a violation of the report’s copy right which is held by FIFA and breaches the terms of the FIFA Quality Concept of Football Turf licensing agreement.


# Football Turf Laboratory Test Report

## 2 – Test Object, Participants

### 2.1 Test Numbers

<b>Report Identification</b>	Laboratory Test report number	14-0142IT
	Test Institute Project number	14-0142IT

### 2.2 Test Objects

	Product Name	SIT-IN SPORT XWR PSF 45
	Product Identification code	M 5PA45VB003T
	Name of the synthetic turf system	SIT-IN SPORT XWR PSF 45
	Performance infill	BLACK SBR
	Stabilising infill	SILICA SAND
	Shock-pad or elastic layer (if applicable)	
	Sub-base composition	Rigid engineered Base

### 2.3 Participants, Addresses

<b>Applicant</b> • FIFA preferred producer • Licensee 	Name	Radici Pietro Industries & Brands S.p.A. (Italy)			
	Address	Radici Pietro Industries & Brands S.p.A. (Italy),			
	Contact	Phone	0039 035724242	email	ruliano@radici.it



<b>FIFA accredited Test Institute</b>	Name	Labosport Italia S.r.l.		
	Address	Labosport Italia S.r.l., CERNUSCO LOMBARDONE		
	Contact	Phone	+39 039 8946215	email

## 3 – Test Conclusion, Product Approval

The presented Football Turf surface satisfies the FIFA LABORATORY TEST requirements of

<b>FIFA One Star</b>	Passed	«passed» or «failed»
<b>FIFA Two Star</b>		«passed» or «failed»

**IMPORTANT: A successfully passed test of the final installation (FIFA FIELD TEST) is mandatory to obtain FIFA One Star / Two Star Certification!**

<b>Report originated by</b>	Name	Davide Giorgini	
	Position	Laboratory responsible	
	Date	29.04.2014	
<b>Report approved by</b>	Name	Roberto Armeni	
	Position	Laboratory director	
	Date	30.04.2014	

# Football Turf Laboratory Test Report

## 4 – Product Information / Specifications

### 4.1 Overview – a typical product composition

The basic structure and composition of artificial turf varies. To reach the goal of defined quality and specific functional performances, a set of the relevant parameters for the products / materials used was defined. Materials / products typically used are as follows:

#### TYPICAL ASSEMBLING PROCESS

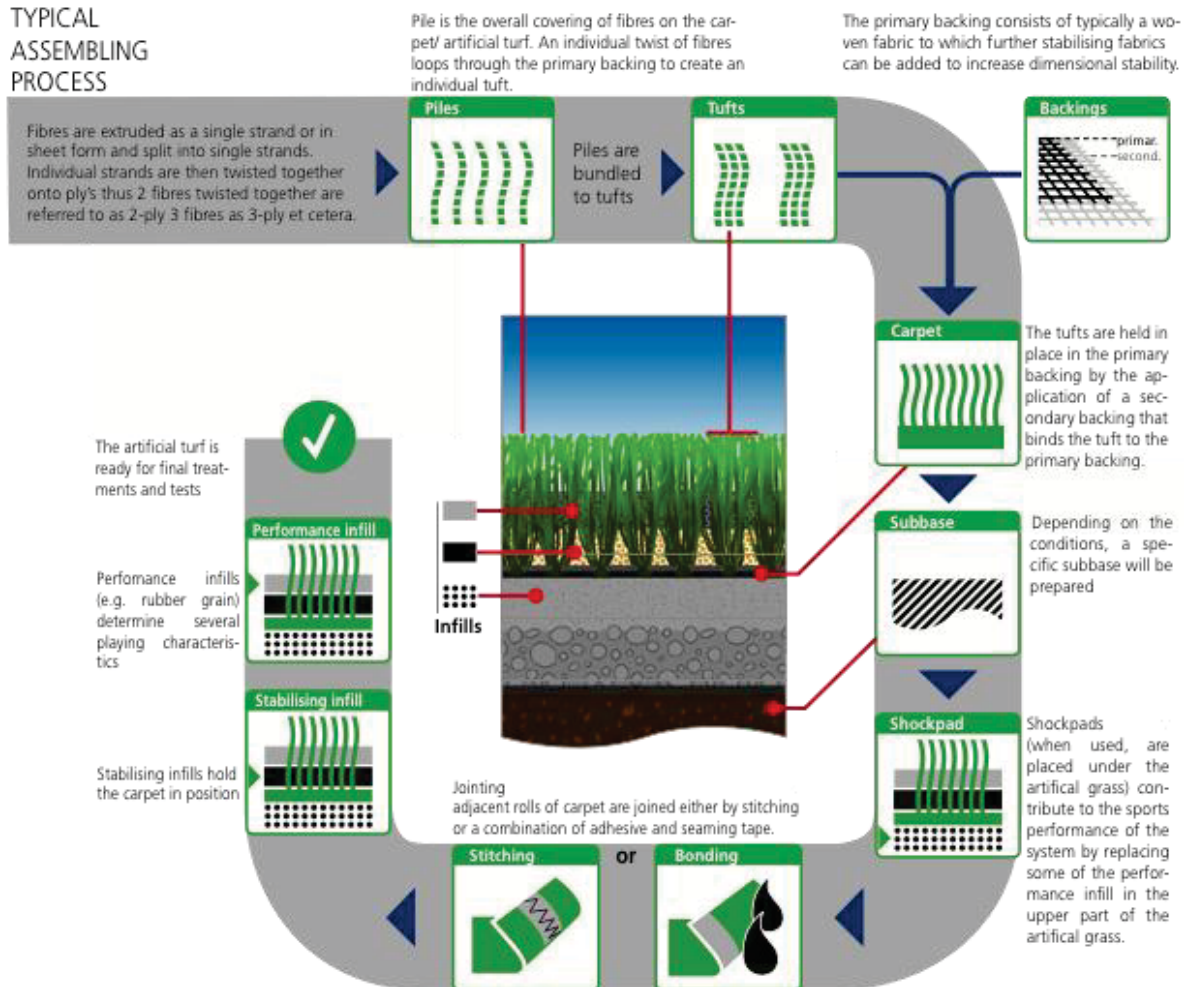


Fig. 1.3 Products / materials used to build up artificial turf

# Football Turf Laboratory Test Report

## 4 – Product Information / Specifications



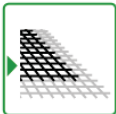
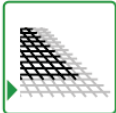



### 4.2 Artificial turf (1/2)

<b>Manufacturer</b>	RADICI PIETRO INDUSTRIES & BRANDS SpA			
<b>Tuft pattern</b>	ZIG-ZAG			
<b>Pile yarns</b>	Yarn A	Yarn B	Yarn C	<b>Standard Test Method</b>
<b>Yarn Manufacturer</b>	tencate			
<b>Product name, code</b>	MS D2 132/6 XWR FIELD			
<b>Pile yarn profile</b>	MONOFILAMENT			–
<b>Pile thickness</b> [ $\mu$ m]	365			–
<b>Pile colour</b> [RAL]	1	6003		–
	2	6025		–
	3			–
<b>Pile width [mm]</b>	1,2			–
<b>No of tufts/m<sup>2</sup></b>	10000			ISO1773
<b>Pile length [mm]</b>	45			ISO 2549
<b>Pile weight [g/m<sup>2</sup>]</b>	1150			ISO 8543
<b>Pile yarn characterization</b>	PE			–
<b>Pile yarn dtex</b>	13700			–

# Football Turf Laboratory Test Report

## 4 – Product Information / Specifications

### 4.2 Artificial turf (2/2)

	<b>Primary backing</b>	Product name / code	K06***3276719
		Manufacturer	TENCATE
	<b>Re- enforcement scrim</b>	Product name / code	
		Manufacturer	
	<b>Secondary backing</b>	Product name / code	SINTERB 230
		Manufacturer	POLIPLAST SpA
		Dry application rate [g/m <sup>2</sup> ]	1250
	<b>Carpet</b>	Minimum tuft withdrawal force [N]	3
		Carpet mass per unit area [g/m <sup>2</sup> ]	2250
	<b>Method of jointing</b>		
	<b>Bonded joints</b>	Adhesive brand name	ULTRABOND TURF PU 2K
		Adhesive manufacturer	MAPEI SpA
		Application rate [g/lm]	400
		Jointing film brand name	HPH 100
Jointing film manufacturer		COVEME	
	<b>Stitched seams</b>	Tread brand name/product code	
		Tread manufacturer	
		Stitch rate [stitch per lm]	

### 4.3 Performance infill

	Specifications	Standard Test Method
<b>Product name / code</b>	PowerFill ECO	
<b>Manufacturer</b>	Elastrade	
<b>Material type</b>	black SBR	
<b>Material grading</b>	SBR	
<b>Particle shape</b>	A3-B2	prEN 14955
<b>Particle size range</b>	0,5mm-2,5 mm	EN 933-Part 1
<b>Bulk density [g/cm<sup>3</sup>]</b>	0,46	EN 1097-3
<b>Application rate [kg/m<sup>2</sup>]</b>	12.0	

# Football Turf Laboratory Test Report

## 4 – Product Information / Specifications


### 4.4 Stabilising infill

	Specifications	Standard Test Method
<b>Product name / code</b>	FOOTBALL SAND DF	
<b>Manufacturer</b>	SABBIE INDUSTRIALI SpA	
<b>Material type</b>	SILICAT SAND	
<b>Material grading</b>	SILICAT SAND	
<b>Particle shape</b>	B2-C3	prEN 14955
<b>Particle size [range]</b>	0,4 mm-1,25 mm	EN 933-Part 1
<b>Bulk density [g/cm<sup>3</sup>]</b>	1,45	EN 1097-3
<b>Application rate [kg/m<sup>2</sup>]</b>	15.0	



### 4.5 Shockpad / elastic layer\*

	Specifications	Standard Test Method
<b>Product name / code</b>		
<b>Manufacturer</b>		
<b>Type</b>		
<b>Composition**</b>		
<b>Bulk density [g/cm<sup>3</sup>]</b>		
<b>Thickness</b>		EN 1979
<b>Shock absorption [%]</b>		FIFA 4a
<b>Deformation</b>		FIFA 5a
<b>Tensile strength [N]</b>		
<b>Mass per unit area [kg/m<sup>2</sup>]</b>		



\* if part of system supplied


\*\* type, rubber granule grading, binder content, etc



# Football Turf Laboratory Test Report

## 4 – Product Information / Specification

### 4.6 Maintenance requirements (recommendations)

Equipment / material		Remarks
<b>Tractor Unit</b>		Purpose - the power unit that pulls the maintenance tools over the field
<b>Drag</b>	Brush	A maintenance attachment that re-distributes the infill and brings the fibres into a more upright position
	Mat	A maintenance tool used to re-distribute infill
<b>Ball roll ramp</b>		A testing device used to assess the speed of a football over the surface
<b>Maintenance logbook</b>		Is used to record all the maintenance activities that take place on the Football Turf Surface
<b>Top up infill materials</b>		to top up penalty spot and corner areas
	...	For further maintenance requirements, please consult the manufacturer's recommendations for your specific system

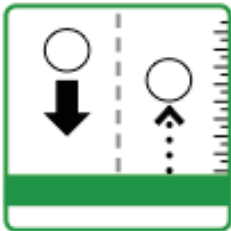

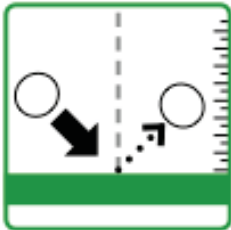




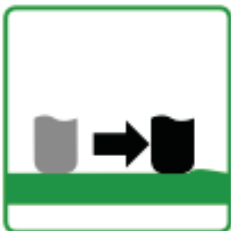
FIFA Licensee's comments / hints

# Football Turf Laboratory Test Report

## 5 – Detailed Laboratory Test Results



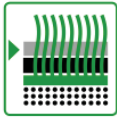
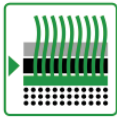
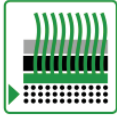
### 5.1 Overview – ball and player to surface interactions

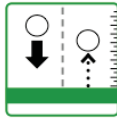
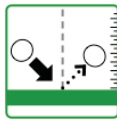
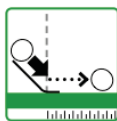
How is the field to play? By means of the following 8 parameters, this question can be answered very well. Furthermore, some values allow conclusions regarding maintenance in order to keep the field in top shape.

Parameter	Comments / hints	Parameter	Comments / hints
<b>1- Vertical ball rebound</b> 	<p>The higher the value the higher the ball will rebound. The ball should not bounce too high or too low.</p> <p>Ball / surface interaction</p>	<b>5- Shock absorption</b> 	<p>Shock absorbency is an indicator of how hard the field feels to the player. A value that is too low indicates a hard field and causes damage to player's joints too soon and the surface is energy sapping resulting in increases in fatigue and over-use injuries.</p> <p>Player / surface interaction</p>
<b>2- Angled ball rebound</b> 	<p>Angled ball rebound is a combination of the hardness of the field and the resistance from the fibres to the ball and thus a high reading can come from a hard surface, or a low grip surface or a combination of both</p> <p>Ball / surface interaction</p>	<b>6- Deformation</b> 	<p>A surface that deforms too much will result in overstretching of ligaments particularly the around the ankle.</p> <p>Player / surface interaction</p>
<b>3- Ball roll</b> 	<p>The higher the value the faster the ball will run over the surface. The ball should not be too fast or too slow.</p> <p>Ball / surface interaction</p>	<b>7.1- Linear friction</b> Stud decelerat. value 	<p>If when stopping, the player's ankle is subject to too high a deceleration, damage to the ankle can occur. Therefore too high a value will result in an increased risk to ankle injuries.</p> <p>Player / surface interaction</p>
<b>4- Rotational resistance</b> 	<p>This simulates the player's ability to alter direction, too high a value and stress can occur across knee ligaments, too low and the player will not be able to grip the surface and may slip causing ligament damage.</p> <p>Player / surface interaction</p>	<b>7.2- Linear friction</b> Stud slide value 	<p>A player needs to accelerate and decelerate rapidly. To achieve this effect the player needs to obtain grip from the surface. Too high a grip will lead to injury too low a grip will result in the boot slipping in the surface and the player cannot accelerate or decelerate safely.</p> <p>Player / surface interaction</p>

# Football Turf Laboratory Test Report

## 5 – Detailed Test Results







5.2 Product identification				
Property	Test result		Image	
				Property
 <b>Artificial Turf</b>	Carpet mass per unit area [g/m <sup>2</sup> ]	2303		
	Tufts per unit area [m <sup>2</sup> ]	9464		
	Pile length above backing [mm]	46.2		
	Pile weight [g/m <sup>2</sup> ]	1259		
	Water permeability of carpet [mm/h]	3125		
	Yarn cross section and thickness		368	
 <b>Performance infill</b>	Particle size range	0.63 - 2.0		
	Particle shape	A2-B3		
	Bulk density [g/cm <sup>3</sup> ]	0.46		
	Thermographic analysis	% organic	63.9	
		% inorganic	36.1	
 <b>Stabilising infill</b>	Particle size range	0.5 - 1.0		
	Particle shape	C1-C2		
	Bulk density [g/cm <sup>3</sup> ]	1.42		
 <b>Shockpad / elastic layer</b> (if part of system supplied)	Shock absorption [%]	-		
	Deformation	-		
	Thickness	-		

5.3 Ball / surface interaction							
Property	Condition		Test Results	FIFA Approval requirements		P = passed F = failed	
				One Star	Two Star	One Star	Two Star
 <b>Vertical ball rebound</b>	Initial, un-aged	Dry	0.75	0.6 – 1m	0.6-0.85 m	Passed	
		Wet	0.70			Passed	
	After simulated wear	5'200 cycles					
		20'200 cycles	0.89	0.6 – 1m		Passed	
 <b>Angled ball rebound</b>	Dry		55	45 – 80%	45 – 80%	Passed	
	Wet		61			Passed	
 <b>Ball roll</b>	Dry		6.8	4 – 10m	4 – 8m	Passed	
	Wet		7.1			Passed	

# Football Turf Laboratory Test Report

## 5 – Detailed Test Results







### 5.4 Player / surface interaction

				FIFA Approval requirements		P = passed F = failed		
Property	Condition		Test Results	One Star	Two Star	One Star	Two Star	
 <b>Shock absorption</b>	Initial, Un-aged	Dry	60	55 – 70%	60 – 70%	Passed		
		Wet	61			Passed		
	After simulated wear	5'200 cycles						
		20'200 cycles	55			Passed		
	40°C		62	55 – 70%	60 – 70%	Passed		
	– 5°C <sup>(1)</sup>		61			Passed		
	 <b>Deformation</b>	Initial	Dry	9.1	4 – 11mm	4 – 10mm	Passed	
Wet			9.2	Passed				
After simulated wear		5'200 cycles						
		20'200 cycles	8.1	4 – 11mm		Passed		
 <b>Rotational resistance</b>		Initial	Dry	35	25–50Nm	30–45Nm	Passed	
	Wet		33	Passed				
	After simulated wear	5'200 cycles						
		20'200 cycles	41	25–50Nm		Passed		
	 <b>Linear friction</b>	Stud deceleration value	Dry	3.6	3.0 – 7.0g	3.0 – 5.5g	Passed	
Wet			4.2	Passed				
Stud slide value		Dry	165	120 – 220	130 – 210	Passed		
		Wet	179			Passed		
 <b>Skin / surface friction</b>		Dry		0.61	0.35 – 0.75 $\mu$	0.35 – 0.75 $\mu$	Passed	
	 <b>Skin abrasion</b>		Dry	18	$\pm$ 30 %	$\pm$ 30 %	Passed	


# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.5 Environmental impact (artificial, light, water)

					FIFA Requirements P= passed F= failed	
Property	Aspect	Condition	Test result		P/F	
	Pile yarns	Colour change	1	Dark green 4-5	≥ Grey scale 3	Passed
			2	Light green 4		Passed
			3			
	Yarn tensile strength	After artificial weathering	1	Dark green 2%	Change ≤ 50%	Passed
			2	Light green 1%		Passed
			3			
	Polymeric infill	Colour change	4-5	≥ Grey scale 3	Passed	
		Visual change in composition	No change	No change	Passed	
	Complete system	Water permeability	N/A	1986	>180 mm/h	Passed
	Stitched joints	Strength	Un-aged		≥ 1000N/100mm	
			Water aged			
	Bonded joints	Strength	Un-aged	83	≥ 25N/100mm	Passed
			Water aged	81		Passed
	Carpet tuft	Withdrawal force	Un-aged	42	≥ 30N	Passed
			Water aged	40		Passed

### 5.6 Miscellaneous

	Shockpad Elastic layer	Tensile strength	Un-aged		≥ 0.15 MPa	
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# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

5.7.1 DSC (Differential Scanning Colorimetry) scans of pile yarn

5.7.2 Performance infill particle grading curve / Stabilising infill particle grading curve

5.7.3 TGA (Thermo Gravimetric Analysis) of performance infill

5.7.4 Composition of unbound sub-base (if tested as part of system) Sub-base particle grading curve

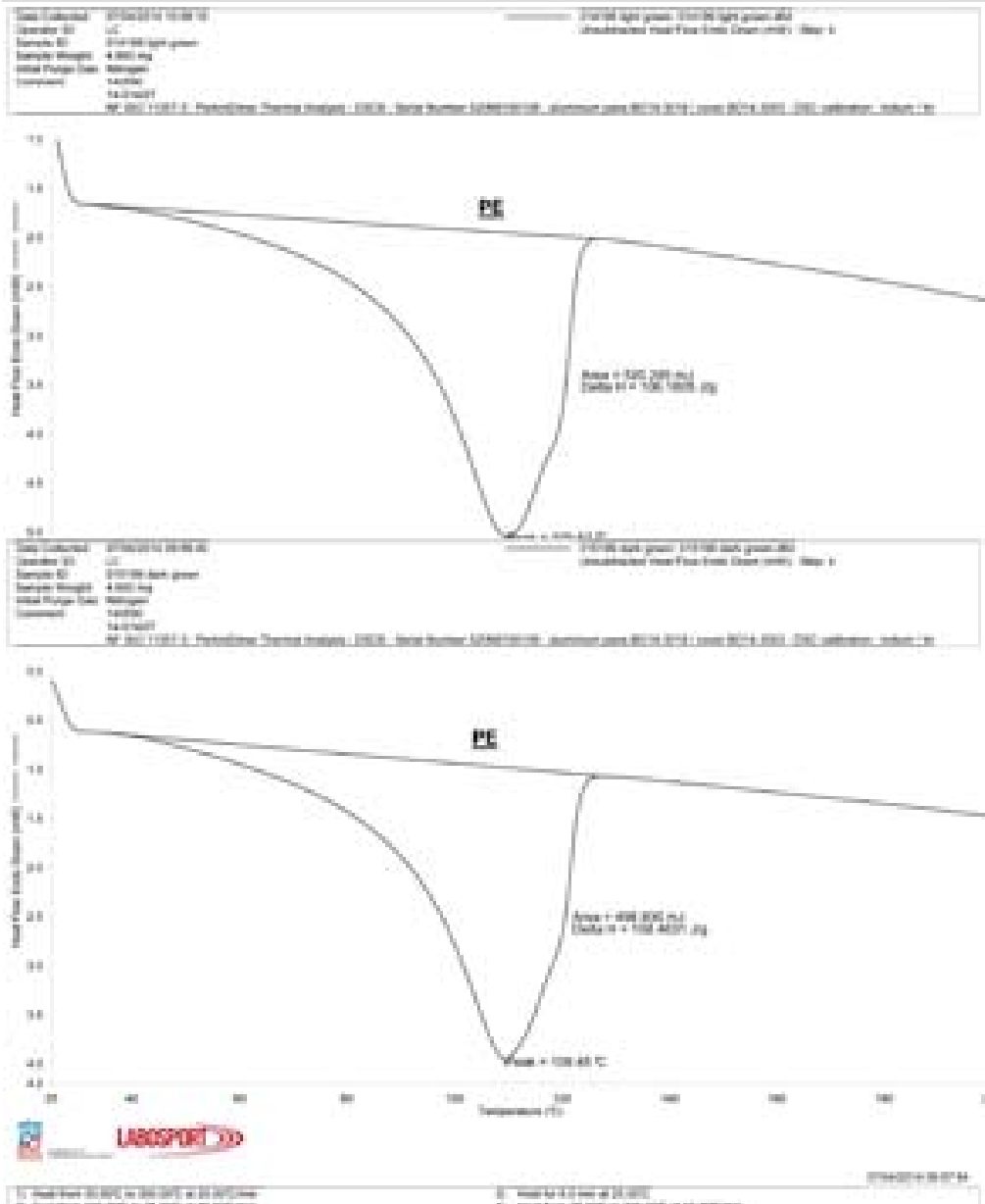
5.7.5 Simulated wear, photos before / after

# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

#### 5.7.1 DSC Differential Scanning Colorimetry scans of pile yarn



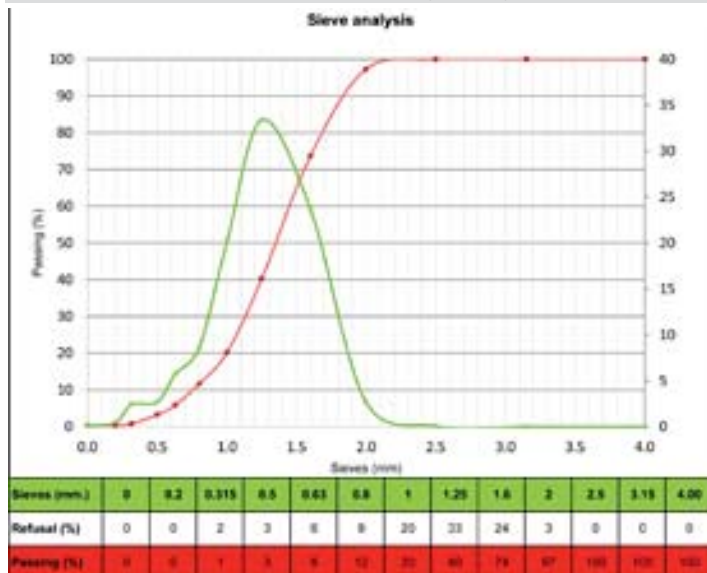
Comments:

# Football Turf Laboratory Test Report

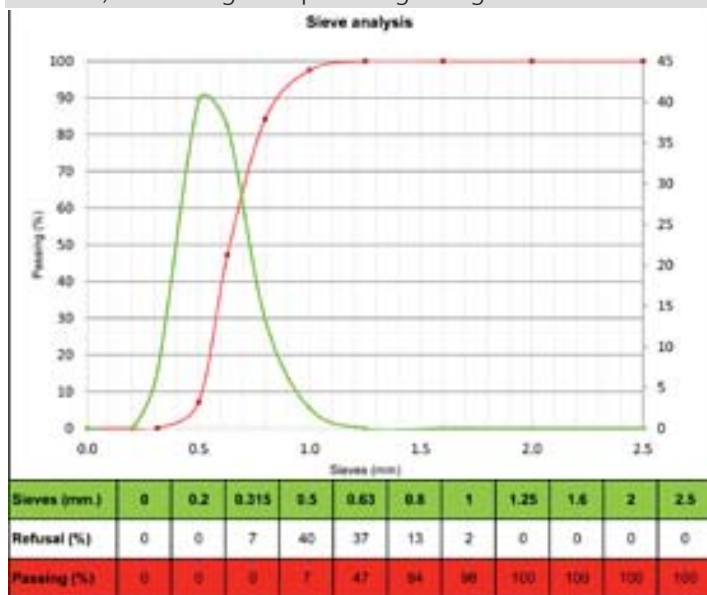
## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

#### 5.7.2 a) Performance infill particle grading curve



#### 5.7.2 b) Stabilising infill particle grading curve



Comments:

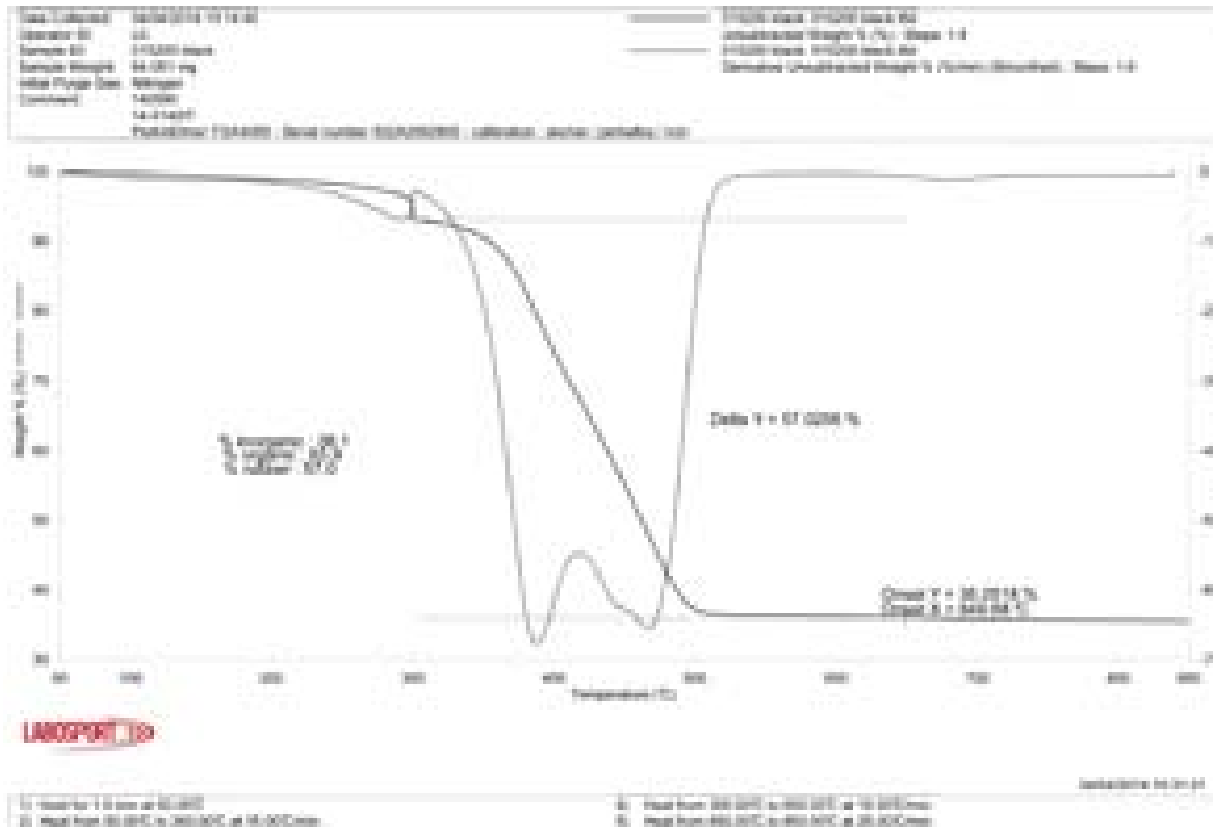


# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

#### 5.7.3 TGA of performance infill




Comments:

# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

#### 5.7.4 Sub base (if tested as part of system)

	Composition	
	Particle size range	
	Particle shape	
	Thickness	
	Compaction & test method	

Sub-base particle grading curve

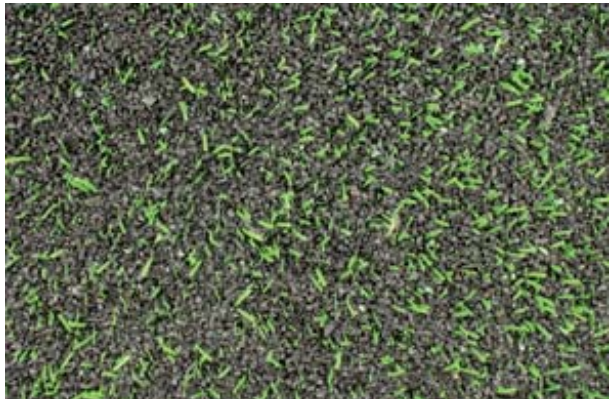
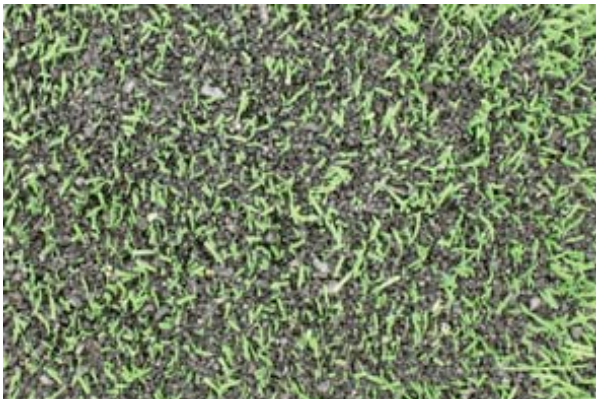


Comments:

# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

5.7.5 Simulated wear (photos before / after wear) Page: 1

Before wear	After wear
	
	

# Football Turf Laboratory Test Report

## 5 – Detailed Test Results

### 5.7 Explanatory graphs / pictures

5.7.5 Simulated wear (photos before / after wear) Page: 2



5.7.6 Photos of performance infill and stabilising infill

