SPORTS LABS

TESTING TECHNOLOGY FOR SPORT

Laboratory Analysis Report

Performance Requirements - BS EN 15330-1: 2013 (Football)

Biodolomer® AT

Report Number: 10311/9179

Report Status: Final

Client: GAIA Biomaterials AB

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Sweden

sportslabsconsult

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A SPORTS LABS COMPANY

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REGIONAL LOCATIONS

- USA
- Morocco
- Turkey
- South Africa
- Netherlands
- Belgium
- Norway
- Israel

Foreword

This report has been prepared by Sports Labs Ltd with all reasonable skill, care and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it.

This report is confidential to the Client, and Sports Labs Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

* Not all tests carried out are within our scope of ISO 17025 accreditation.

This report is not an official National Governing Body report and does not imply NGB approval.

Declaration of Conformity

We confirm that the tests described in this report have been carried out in accordance with BS EN 15330-1: 2013 Surfaces for Sports Areas – Synthetic Turf and Needle-punched Surfaces Primarily Designed for Outdoor Use, and this report accurately reflects the outcome of the tests conducted.

Report Written By:	Craig Melrose	**Report Checked By:**	Sean Ramsay
Date:	04/12/2020	**Date:**	04/12/2020
Signed:		**Signed:**	

Test Laboratory

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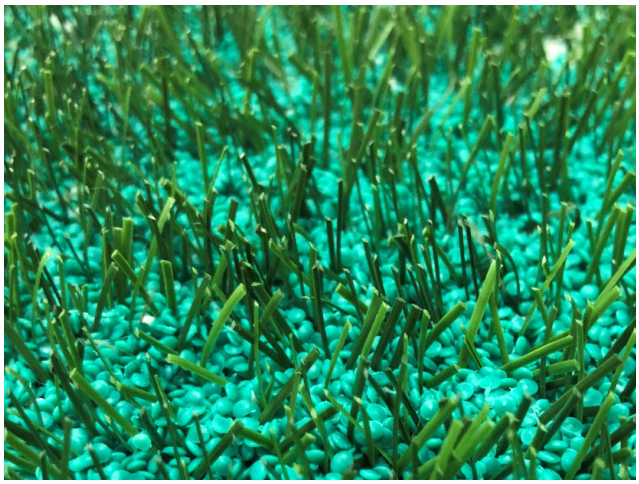
Product Description		
Project Name:	Biodolomer® AT Infill Trial	
Synthetic Turf Name:	Standard 40mm monofilament artificial turf	
Performance Infill:	Biodolomer® AT	6 kg/m2 (approx. 12mm)
Stabilising Infill:	Silica Sand	18 kg/m2 (approx. 12mm)
Shockpad:	ProPlay Sport 20	Prefabricatedfoam shockpad
Substrate:	Concrete	
Number of Conditioning Rolls:	50 Rolls	
Free Pile Height:	16 mm	

Surface Profile Image [Plan View]:	**Surface Profile Image [End Elevation]:**
	

Sample Reference			
Date of Test		22/10/2020 – 13/12/2020	
Laboratory Job No.		10311	**Date Received**
Sample Reference No.	**Synthetic Turf**	Stock	-
	Performance Infill	9179	30/09/2020
	Stabilising Infill	Stock	-
	Shockpad	Stock	-
Test Laboratories are required to store a reference sample of the tested product for a defined period. By checking the box opposite, we confirm that a 200x200mm sample has been placed in storage and will be retained as necessary.		☒ A sample of the tested product has been placed in storage and shall be retained as necessary.	

Performance Results Summary					
Property	**Test Method**	**Test Condition**	**Mean Result**	**Requirement**	**Pass/ Fail**
Ball Rebound	EN 12235: 2013	DRY	**56 %**	45 – 75 %	**PASS**
		WET	**52 %**		
		20,200 Lisport Cycles	**63 %**		
Ball Roll	EN 12234: 2013	DRY	**4.9 m**	4 – 10.0 m	**PASS**
		WET	**5.2 m**		
Shock Absorption	EN 14808: 2005	DRY	**64.6 %**	55 – 70 %	**PASS**
		WET	**64.2 %**		
		20,200 Lisport Cycles	**63.3 %**		
Vertical Deformation	EN 14809: 2005	DRY	**5.4 mm**	4 – 9 mm	**PASS**
		WET	**5.5 mm**		
		20,200 Lisport Cycles	**6.0 mm**		
Rotational Resistance - Studded	EN 15301–1: 2007	DRY	**43 Nm**	25 – 50 Nm	**PASS**
		WET	**38 Nm**		
		20,200 Lisport Cycles	**43 Nm**		
Rotational Resistance - Dimpled	EN 15301–1: 2007	DRY	**31 Nm**	25 – 50 Nm	**PASS**
		WET	**27 Nm**		
Water Permeability	EN 12616: 2013	FILLED TURF	**1440 mm/hr**	≥ 500 mm/hr	**PASS**

Ball Rebound - Overview
A football is released from a height of 2.0m and its rebound from the surface is calculated in accordance with EN 12235 and expressed as a percentage relative to that of a rebound on a concrete substrate. A single drop test is conducted at 5 locations across the sample.

Ball Rebound – Requirements	
Test Method	**EN12235: 2013**
Requirement	45 – 75 %
Ball Rebound – Test Equipment	
SL Equipment Number	SL113, SL198, SL282, SL481
Uncertainty Value	(k=2.52) ± 2.21 %

Ball Rebound – Results						
Test Date:	22/10/2020		05/11/2020		03/12/2020	
Technician:	JQ		JQ		JH	
Air Temperature:	23.4		23.4		23.7	
Surface Temperature:	22.1		21.1		22.2	
Humidity:	45		45		41	
Test Condition	**DRY**		**WET**		**20,200 Lisport Cycles**	
Concrete Value	1.35 m		1.35 m		1.35 m	
RESULTS	**Result (m)**	**Percentage**	**Result (m)**	**Percentage**	**Result (m)**	**Percentage**
Drop 1	0.77	57	0.72	53	0.81	60
Drop 2	0.78	58	0.67	50	0.85	63
Drop 3	0.72	53	0.70	52	0.90	67
Drop 4	0.77	57	0.71	53	-	-
Drop 5	0.74	55	0.70	52	-	-
Mean Result		**56 %**		**52 %**		**63 %**
Requirement	45 – 75 %		45 – 75 %		45 – 75 %	
Pass/Fail	**PASS**		**PASS**		**PASS**	

Ball Roll - Overview
A football is rolled down a 45±2° ramp onto the test surface and the distance the ball rolls is measured. This is repeated 5 times and the mean ball value is calculated. The test is then repeated in the opposite direction to take the lean of the pile into account.

Ball Roll – Requirements	
Test Method	**EN12234: 2013**
Requirement	4 – 10.0 m
Ball Roll – Test Equipment	
SL Equipment Number	SL277, SL061, SL198
Uncertainty Value	(k=2.83) ± 0.05 m

Ball Roll – Results				
Test Date:	03/12/2020		03/12/2020	
Technician:	CM		CM	
Air Temperature:	23.4		23.3	
Surface Temperature:	22.5		22.1	
Humidity:	48		48	
Test Condition	**DRY**		**WET**	
Test Direction	**With Pile**	**Against Pile**	**With Pile**	**Against Pile**
RESULTS	**Result (m)**	**Result (m)**	**Result (m)**	**Result (m)**
Roll 1	4.87	5.09	5.27	5.29
Roll 2	4.71	5.11	5.04	5.34
Roll 3	4.69	4.89	5.11	5.11
Roll 4	5.02	4.91	5.18	5.23
Roll 5	4.87	5.03	5.15	5.27
Mean Result	**4.83**	**5.01**	**5.15**	**5.25**
Overall Mean Result	**4.92 m**		**5.20 m**	
Requirement	4 – 10.0 m		4 – 10.0 m	
Pass/Fail	**PASS**		**PASS**	

Force Reduction - Overview
A mass is allowed to fall onto a spring placed on the test sample and the maximum force applied is recorded. The difference between this value and the maximum force measured on a concrete substrate is reported as the force reduction value. The test is conducted 3 times on the same location, and the mean values of the second and third drops is determined as the force reduction value. The test is conducted on a total of 3 locations across the sample.

Force Reduction – Requirements	
Test Method	**EN14808: 2005**
Requirement	55 – 70 %
Force Reduction – Test Equipment	
SL Equipment Number	SL121, SL281, SL053
Uncertainty Value	(k=2.24) ± 2.13 %

Force Reduction – Results			
Test Date:	05/11/2020	05/11/2020	03/12/2020
Technician:	JQ	JQ	JH
Air Temperature:	23.3	23.4	23.7
Surface Temperature:	22.1	21.0	22.2
Humidity:	45	45	41
Test Condition	**DRY**	**WET**	**20,200 Lisport Cycles**
RESULTS	**Result (%)**	**Result (%)**	**Result (%)**
Location 1	65.0	63.8	63.4
Location 2	64.4	64.6	63.1
Location 3	64.5	64.2	63.4
Mean Result	**64.6 %**	**64.2 %**	**63.3 %**
Requirement	55 – 70 %	55 – 70 %	55 – 70 %
Pass/Fail	**PASS**	**PASS**	**PASS**

Vertical Deformation - Overview
A mass is allowed to fall onto a spring placed on the test sample and the maximum deformation is recorded. The test is conducted 3 times on the same location, and the mean values of the second and third drops is determined as the vertical deformation value. The test is conducted on a total of 3 locations across the sample

Vertical Deformation – Requirements	
Test Method	**EN14809: 2005**
Requirement	4 – 9 mm
Vertical Deformation – Test Equipment	
SL Equipment Number	SL121, SL118, SL053, SL107, SL108
Uncertainty Value	(k=2.00) ± 0.83 mm

Vertical Deformation – Results			
Test Date:	05/11/2020	05/11/2020	03/12/2020
Technician:	JQ	JQ	JH
Air Temperature:	23.3	23.3	23.7
Surface Temperature:	22.2	22.0	22.2
Humidity:	45	43	41
Test Condition	**DRY**	**WET**	**20,200 Lisport Cycles**
RESULTS	**Result (mm)**	**Result (mm)**	**Result (mm)**
Location 1	5.4	5.6	5.9
Location 2	5.5	5.4	5.7
Location 3	5.4	5.4	6.4
Mean Result	**5.4 mm**	**5.5 mm**	**6.0 mm**
Requirement	4 – 9 mm	4 – 9 mm	4 – 9 mm
Pass/Fail	**PASS**	**PASS**	**PASS**

Rotational Resistance - Overview
The force required to initiate rotational movement of a studded or dimpled test sole in contact with the surface is measured. The test is conducted at 5 locations across the sample.

Rotational Resistance – Requirements	
Test Method	**EN15301-1: 2007**
Requirement	25 – 50 Nm
Rotational Resistance – Test Equipment	
SL Equipment Number	SL098, SL194, SL224
Uncertainty Value	(k=2.11) ± 2.89 Nm

Rotational Resistance – Results					
Test Date:	22/10/2020		05/11/2020		03/12/2020
Technician:	JQ		JQ		JH
Air Temperature:	23.4		23.4		23.7
Surface Temperature:	22.1		21.1		22.2
Humidity:	45		45		42
Test Condition	**DRY**		**WET**		**20,200 Lisport Cycles**
RESULTS	**STUDDED**	**DIMPLED**	**STUDDED**	**DIMPLED**	**STUDDED**
Location 1	42	29	38	24	43
Location 2	44	29	41	29	44
Location 3	42	32	39	28	42
Location 4	42	35	35	28	-
Location 5	45	29	39	27	-
Mean Result	**43 Nm**	**31 Nm**	**38 Nm**	**27 Nm**	**43 Nm**
Requirement	25 – 50 Nm		25 – 50 Nm		25 – 50 Nm
Pass/Fail	**PASS**		**PASS**		**PASS**

Water Permeability - Overview
The rate at which water passes vertically through the sample or synthetic turf carpet is measured. A sample is clamped in a single-ring infiltrometer and the time taken for the water to fall by 20mm is recorded. The result in millimetres per hour is calculated, and the test is repeated 5 times to obtain a mean water permeability value.

Water Permeability – Requirements	
Test Method	**EN12616: 2013**
Requirement	≥ 500 mm/hr
Water Permeability – Test Equipment	
SL Equipment Number	SL023, SL071, SL215
Uncertainty Value	(k=2.37) ± 14.3 %

Water Permeability – Results	
Test Date:	03/12/2020
Technician:	JH
Air Temperature:	23.4
Surface Temperature:	22.9
Humidity:	46
Water Temperature:	16.1
Test Condition	**FILLED SAMPLE**
RESULTS	**Result (s)**
Test 1	46.9
Test 2	50.2
Test 3	51.9
Test 4	47.9
Test 5	53.1
Result (mm/h)	**1440 mm/hr**
Requirement	≥ 500 mm/hr
Pass/Fail	**PASS**

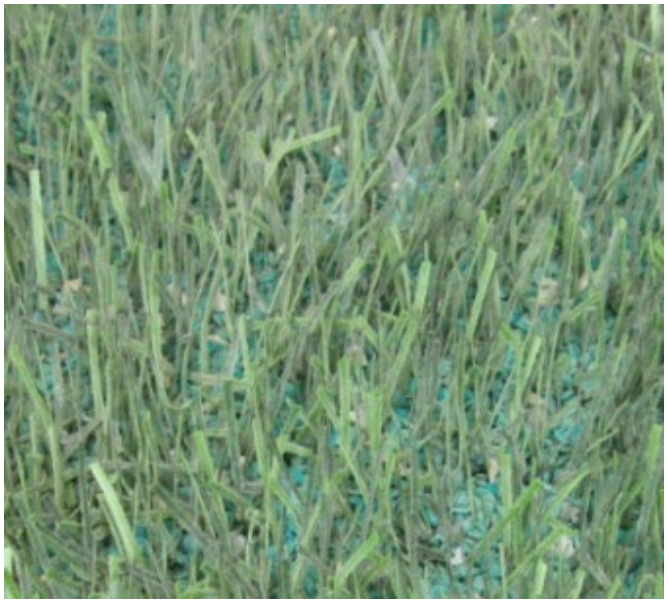
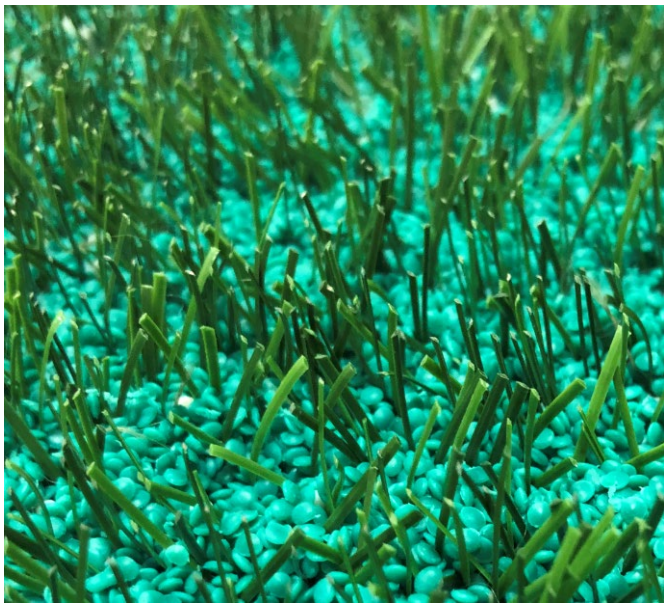
Conclusion

The product submitted was tested in accordance with the performance requirements outlined in EN 15330-1: 2013. We confirm all information presented within this report is accurate and appropriately reflects the performance of the samples submitted. Based upon the test results we consider the product supplied to have:

☒ Met all performance requirements of EN 15330-1: 2013 for surfaces designed primarily for football

☐ Failed to meet some requirements of EN 15330-1: 2013 for surfaces designed primarily for football

Sample Pictures

Pre-Wear	After 20,200 Lisport Cycles
	
	

Appendix A – Test Method, Equipment and Uncertainty Value Summary			
Test Method		**SL Equipment Number**	**Uncertainty Value**
Ball Rebound	EN 12235: 2013	SL113, SL198, SL282, SL481	(k=2.52) ± 2.21 %
Ball Roll	EN 12234: 2013	SL277, SL061, SL198	(k=2.83) ± 0.05 m
Shock Absorption	EN 14808: 2005	SL121, SL281, SL053	(k=2.24) ± 2.13 %
Vertical Deformation	EN 14809: 2005	SL121, SL118, SL053, SL107, SL108	(k=2.00) ± 0.83 mm
Rotational Resistance	EN 15301–1: 2007	SL098, SL194, SL224	(k=2.11) ± 2.89 Nm
Water Permeability	EN 12616: 2013	SL023, SL071, SL215	(k=2.37) ± 14.3 %
* Simulated Use	EN 15306: 2014	SL201	-
Thickness	EN 1969: 2000	SL290	(k=2.00) ± 0.14 mm

(* note: these tests are outwith our scope of ISO 17025 Accreditation)

END OF REPORT