



**HIGH
PERFORMANCE
MATERIALS**

Confidential Report

Our Ref: 10/17129

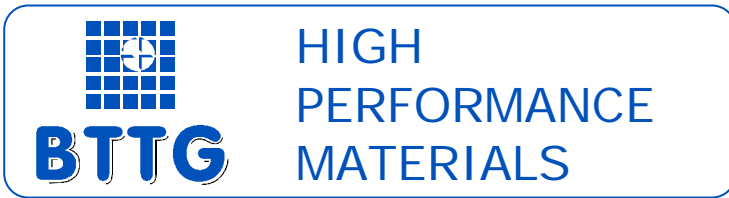
Notified Body
for PPE Directive,
Construction Products Directive
& Marine Equipment Directive
I.D. No. 0338 & 0339

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Date: 29th August 2012
Our Ref: 10/17129/LH
Your Ref: Tests on Brock moulded EPP underlayment

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Client: Brock International BV
Spoorhaven 88
2651 AV Berkel en Rodenrijs
The Netherlands

Job Title: Durability tests on Brock moulded EPP underlayment

Client's Order No: 2259

Date of Receipt: 17th May 2012

Description of Sample(s): Fifteen samples (each approximately 400 x 400mm) of Brock moulded EPP underlayment, BF2055, were received for testing.

Work Requested: We were asked to make the following tests:

Resistance to weathering EN 12224
Resistance to oxidation EN ISO 13438
Resistance to liquids EN 14030



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Conditioning

Where appropriate, the tests were made in Standard Atmosphere (65 ± 5 % RH at 20 ± 2 °C) the sample having been freely and continuously exposed to that atmosphere for at least 24 hours prior to testing.

Resistance to Weathering

The tests were made following the EN 12224: 2000 procedure, "Geotextiles and Geotextile-Related Products – Determination of the Resistance to Weathering".

Five pairs of test and control specimens in each direction were prepared in accordance with the EN 12230: 2003 procedure, "Surfaces for sports areas – Determination of tensile properties of synthetic sports surfaces".

One of each pair of specimens was exposed to an UV light source followed by periods of water spray. The conditions were as given in the table below.

All specimens were allowed to dry and condition before tensile tests were made in accordance with EN 12230: 2003.

Type of Exposure Apparatus	Q-Panel Accelerated Weathering Tester
Model No. of Exposure Apparatus	QUV/SE/spray
Type of light source	UVA-340 lamps
Irradiance set point of lamps	1.00
Total radiant exposure	50 MJ/m ²
Total exposure time	370 hours
Cyclic Conditions	<ul style="list-style-type: none"> • 5 hours dry interval / light exposure at a black standard temperature of 50 ± 3 °C • 1 hour water spray at a black standard temperature of 25 ± 3 °C
Total number of cycles	62

The equipment incorporates a Solar Eye, which maintains the correct irradiance automatically. The controller monitors the UV intensity via four sensors at the sample plane. A four channel feedback loop system compensates for any variability by adjusting the power to the lamps. At fixed intervals the equipment is calibrated using a CR-10 calibration radiometer and the lamps replaced when necessary. The CR-10 radiometer is calibrated annually using instrumentation traceable to the National Institute of Standards and Technology.

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Resistance to Oxidation

The tests were made following the EN ISO 13438: 2004 procedure, "Geotextiles and Geotextile-Related Products – Screening Test Method for Determining the Resistance to Oxidation", except exposure was conducted at 110 °C for 56 days.

Five pairs of test and control specimens in each direction were prepared in accordance with the EN 12230: 2003 procedure, "Surfaces for sports areas – Determination of tensile properties of synthetic sports surfaces".

Five specimens, in each direction, were exposed to an elevated temperature in air for a specified period in a regulated laboratory oven.

Five control specimens, in each direction, were exposed for six hours to the same conditions as in the oven test.

All specimens were allowed to dry and condition before tensile tests were made in accordance with EN 12230: 2003.

Resistance to Liquids

The tests were made following the EN 14030: 2001 procedure, "Geotextiles and Geotextile-Related Products – Screening Test Method for Determining the Resistance to Acid and Alkaline Liquids", except the exposure time was increased from three to twelve 12 days.

Five pairs of test and control specimens in each direction were prepared in accordance with the EN 12230: 2003 procedure, "Surfaces for sports areas – Determination of tensile properties of synthetic sports surfaces".

Five specimens, in each direction, were immersed in test liquids at a temperature of 60 ± 1 °C for a period of twelve days.

The test liquids were:

An inorganic acid: 0.025 M sulphuric acid with 1 mMol ferric sulphate and 1 mMol ferrous sulphate added.
An inorganic base: calcium hydroxide (Ca(OH)₂), used as a saturated suspension.

After exposure all specimens were rinsed thoroughly in accordance with the standard.

The control specimens were immersed in water at 60 ± 1 °C for one hour.

All specimens were allowed to dry and condition before tensile tests were made in accordance with EN 12230: 2003.

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Tensile Properties

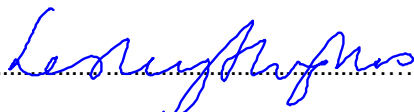
Tensile strength tests were made on the exposed and control specimens based on the EN 12230: 2003 procedure, "Surfaces for sports areas – Determination of tensile properties of synthetic sports surfaces".

The tests were made on a Testometric M500 CRE machine, with the initial distance between the grips set at 100 mm and operating at a speed of 50 mm per minute. Elongation % was calculated from the measured increase in grip separation as a percentage of the original gauge length, i.e. 50 mm. Five specimens were tested in each direction.

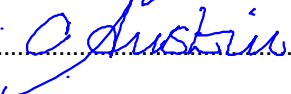
Tensile stress was calculated using the "core thickness" of the sample i.e. the total thickness minus the thickness of the raised circles on one face and the raised squares on the other face.

The mean results obtained are shown in the tables on the following pages.

This report confirms all information given in our Interim Report dated 22nd August 2012.

Reported by: 

Mrs L Hughes
Operational Head

Countersigned by: 

Mrs C Austin
Director

Enquiries concerning this report should be addressed to Customer Services.

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Resistance to Weathering EN 12224

	Control		Exposed		% Retained Strength	% Retained Extension
	Tensile Strength (kPa)	Ext. (%) at max. load	Tensile Strength (kPa)	Ext. (%) at max. load		
L-Way						
Mean	720.80	15.5	538.20	12.2	74.98	79.87
SD	86.75	2.23	76.22	3.01		
CV (%)	12.03	14.47	14.16	24.72		
X-Way						
Mean	715.40	15.6	477.20	10.6	66.66	68.99
SD	48.18	2.54	76.35	1.85		
CV (%)	6.73	16.26	16.00	17.50		

Based on the ten required characteristic standards for CE marking of geosynthetics (EN 13249, 13250, 13251, 13252, 13253, 13254, 13255, 13256, 13257 and 13265), if a geosynthetic for non-reinforcing applications, retains greater than 60% of its strength when tested in accordance with EN 12224, the manufacturer is able to state on the CE declaration that the product may be exposed for a maximum time of 1 month^a after installation.

^a Exposure of up to 4 months may be acceptable depending on the season and on the location in Europe.

Resistance to Oxidation EN ISO 13438 - 56 days at 110 °C

	Control		Exposed		% Retained Strength	% Retained Extension
	Tensile Strength (kPa)	Ext. (%) at max. load	Tensile Strength (kPa)	Ext. (%) at max. load		
L-Way						
Mean	767.60	16.6	639.00	13.5	83.27	82.21
SD	90.17	3.18	82.06	2.15		
CV (%)	11.75	19.11	12.84	15.91		
X-Way						
Mean	719.40	17.6	730.00	16.8	104.53	99.23
SD	115.96	3.23	149.24	5.29		
CV (%)	16.12	18.36	20.44	31.53		

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Resistance to Liquids EN 14030 – Acid (extended exposure)

	Control		Exposed		% Retained Strength	% Retained Extension
	Tensile Strength (kPa)	Ext. (%) at max. load	Tensile Strength (kPa)	Ext. (%) at max. load		
L-Way						
Mean	690.40	15.3	703.80	14.5	102.09	94.91
SD	29.31	0.50	45.75	1.78		
CV (%)	4.24	3.28	6.50	12.28		
X-Way						
Mean	729.20	15.7	719.20	14.4	100.02	94.60
SD	87.55	2.61	32.29	1.23		
CV (%)	12.01	16.61	4.49	8.54		

Resistance to Liquids EN 14030 – Alkali (extended exposure)

	Control		Exposed		% Retained Strength	% Retained Extension
	Tensile Strength (kPa)	Ext. (%) at max. load	Tensile Strength (kPa)	Ext. (%) at max. load		
L-Way						
Mean	690.40	15.3	678.00	14.3	98.42	93.97
SD	29.31	0.50	81.40	1.79		
CV (%)	4.24	3.28	12.01	12.53		
X-Way						
Mean	729.20	15.7	726.60	15.0	100.66	96.54
SD	87.55	2.61	96.96	3.85		
CV (%)	12.01	16.61	13.34	25.60		

Based on the ten required characteristic standards for CE marking of geosynthetics (EN 13249, 13250, 13251, 13252, 13253, 13254, 13255, 13256, 13257 and 13265), if a geosynthetic for non-reinforcing applications, solely made of polypropylene and containing no post-consumer recycled material, retains greater than 50% of its strength when tested in accordance with EN ISO 13438 Method A1 and EN 14030, the manufacturer is able to state on the CE declaration that the product is predicted to be durable for greater than 25 years in natural soils $4 < \text{pH} < 9$. However, the tests for resistance to oxidation and resistance to liquids were extended to cover four complete cycles, therefore the manufacturer is able to state on the CE declaration that the product is predicted to be durable for greater than 100 years in natural soils $4 < \text{pH} < 9$.