



GEOMEMBRANE TEST RESULTS

TRI Client: Gecat Plastic Factory

Project: MQA

Material: 2mm Double Sided Textured Geomembrane

TRI Log No.: A16-281

Sample Date(s): 23/11/2016

Test Date(s): 24-11-2016 - 30-01-2017

Sample conditioning for tests that require specific conditions

Thickness (ASTM D 5199)

Thickness (ASTM D 5994)

Asperity Height (ASTM D 7466)

Tensile (ASTM D 6693)

Puncture Strength (ASTM D 4833)

Tear Resistance (ASTM D 1004)

Standard		Laboratory	
t (°C)	RH (%)	t (°C)	RH (%)
21 ± 2	60 ± 10	22	46
21 ± 2	60 ± 10	22	46
21 ± 2	60 ± 10	22	46
21 ± 2	n/a	22	46
21 ± 2	65 ± 5	22	46
23 ± 2	50 ± 10	22	46

The laboratory temperature and relative humidity measurement is an average over the period during which the conditioning and testing was carried out.

All samples have been conditioned for a minimum of 24 hours unless otherwise stated.

Note

ASTM D6693-2010, Page 2 Note 5 states — *A humidity requirement has intentionally been left out of the test conditions due to the fact that polyolefins are not significantly affected by large fluctuations in humidity thereby making such a restriction unnecessary.*

Tests were performed as directed in each individual standard, unless otherwise stated.



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ACCREDITATION No.: 19267

#REF!

Project: MQA

Material: 2mm Double Sided Textured Geomembrane

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Sample Identification: 3766 DS 2/3

PARAMETER	TEST REPLICATE NUMBER										MEAN	GRI GM13
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 5994)												
Thickness (mm)	1.925	1.875	1.975	1.950	1.900	1.975	1.825	1.975	1.975	2.000	1.950	≥1.9
											1.825	<< min ≥1.7
Equipment used: AEI TG3.											STD. DEV.	0.06
Sample dimensions: 125mm circle.											CV.	3.0%
Asperity Height (ASTM D 7466)												
Asperity Height (mm) - Side A	0.850	0.550	0.575	0.525	0.725	0.625	0.775	0.600	0.800	0.575	0.650	≥0.4
											STD. DEV.	0.12
											CV.	18.0%
Asperity Height (mm) - Side B	0.400	0.350	0.500	0.625	0.550	0.275	0.475	0.400	0.375	0.400	0.425	≥0.4
											STD. DEV.	0.10
											CV.	24.2%
Equipment used: AEI TG3.												
Density (ASTM D 1505 @ 23°C)												
Density (g/cm ³)	0.949	0.949	0.949								0.949	≥0.94
Carbon Black Content (ASTM D 4218)												
% Carbon Black	2.11	2.06									2.09	2 - 3
Carbon Black Dispersion (ASTM D 5596, Method: Microtome)												
Rating* - 1st field view	1	1	1	1	1							≥ 90%
Rating* - 2nd field view	1	1	1	1	1							1 - 2
												≤ 10%
* PCN: 12-0455960-38 - Carbon dispersion classification chart for geosynthetics was used to rate agglomerate size range.												3



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											GRI	
PARAMETER	TEST REPLICATE NUMBER										MEAN	GM13
	1	2	3	4	5	6	7	8	9	10		
Tensile Properties (ASTM D 6693)											Test speed: 50 mm/min	
MD Yield Strength (N/mm)	36.9	34.9	37.9	36.2	37.9						36.8	≥22
											STD. DEV.	1.26
TD Yield Strength (N/mm)	36.9	38.1	38.4	37.1	37.9						37.7	≥22
											STD. DEV.	0.65
MD Break Strength (N/mm)	54.2	49.4	53.8	61.8	61.1						56.1	≥29
											STD. DEV.	5.27
TD Break Strength (N/mm)	46.5	53.1	50.8	44.1	41.9						47.3	≥29
											STD. DEV.	4.63
MD Yield Elongation (%)	14	15	17	16	17						16	≥12
TD Yield Elongation (%)	16	16	16	14	16						16	≥12
MD Break Elongation (%)	632	607	620	714	703						655	≥100
TD Break Elongation (%)	585	644	608	558	519						583	≥100
Puncture Resistance (ASTM D 4833)												
Puncture Strength (N)	768	767	807	804	789	808	791	799	772	811	792	≥534
											STD. DEV.	17.14
											CV.	2.2%
Tear Resistance (ASTM D 1004)											Machine Used: AEI TM2-TRI 5-Station	
MD Tear Strength (N)	300	305	300	302	296	292	297	301	310	306	301	≥249
											STD. DEV.	5.16
TD Tear Strength (N)	299	288	298	296	313	317	299	311	299	296	301	≥249
											STD. DEV.	9.11
Oxidative Induction Time (ASTM D 3895)												
OIT (minutes)	232	239									235.5	≥100
High Pressure Oxidative Induction Time (ASTM D 5885)												
HPOIT (minutes)	1299										1299	≥400
MD Machine Direction	TD Transverse Direction											

MD Machine Direction TD Transverse Direction



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PARAMETER											TEST REPLICATE NUMBER										MEAN	GRI GM13									
											1	2	3	4	5	6	7	8	9	10											
SP-NCTL Stress Crack Resistance (ASTM D 5397, App)																															
SURFACTANT:		CO-630										DATE TEST STARTED: 6-Jan-17																			
EXPOSURE PERIOD:		Failure										TEST TEMPERATURE: 50°C																			
Machine direction yield stress:		17.8 (MPa)										Mechanical Advantage										5									
x 30%		5.34 (x 0.30)										Lever Weight										1.469 (N)									
x hinge thickness (mm)		1.626 (80% of thickness)										Grip Weight										0.401 (N)									
x specimen width		3.15 (3.18 mm)																													
Load		27.38 (N)																													
Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage =		5.26 N																													
												= 537 grams																			
Replicate No.:		1 2 3 4 5																													
No. Hours to Failure:		>1900 >1900 >1900 >1900 >1900																				>1900	≥500								
Oven Aging (ASTM D 5721)																															
The geomembrane was exposed to 90 days of elevated temperature exposure in an air oven maintained at 85°C ± 0.5°C in accordance with ASTM D 5721, Standard Practice for Air-Oven Aging of Polyolefin Geomembranes. Oxidative Induction Time (OIT) was tested after exposure and compared to values generated for unexposed material. The results are provided below.																															
OIT (minutes) - Baseline		157 172																				164.5									
OIT (minutes) - After Oven Aging		90 92																				91	55								
HPOIT (minutes) - Baseline		953																				953									
HPOIT (minutes) - After Oven Aging		919																				919	96								
Note: No surface cracking was observed.																															
UV Resistance (ASTM D 7238)																															
The resistance to degradation due to exposure to ultraviolet light and moisture was determined in accordance with GRI-GM11, Accelerated Weathering of Geomembranes Using a Fluorescent UVA Device. This standard covers the basic principles for using the QUV apparatus to accelerate the weathering of geomembranes using UVA bulbs and condensation. To comply with specification GRI GM13, the sample was exposed to 1600 hours of UV exposure composed of 80 cycles of UVA at 75°C for 20 hours followed by condensation at 60°C for 4 hours. The High Pressure Oxidative Induction Time (HPOIT) was evaluated before and after the exposure and results were as follows.																															
HPOIT (minutes) - Baseline		953																				953									
HPOIT (minutes) - After QUV Aging		950																				950	100								
Note: No surface cracking was observed.																															
MD Machine Direction TD Transverse Direction																															

End of Report

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The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

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