GEOMEMBRANE TEST RESULTS
TRI Client: Gecat Plastic Factory
Project: MQA

Material: 1.5mm 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

	Standard		Laboratory	
	t (°C)	RH (%)	t (°C)	RH (%)
Thickness (ASTM D 5199)	21 ± 2	60 ± 10	22	46
Thickness (ASTM D 5994)	21 ± 2	60 ± 10	22	46
Asperity Height (ASTM D 7466)	21 ± 2	60 ± 10	22	46
Tensile (ASTM D 6693)	21 ± 2	n/a	22	46
Puncture Strength (ASTM D 4833)	21 ± 2	65 ± 5	22	46
Tear Resistance (ASTM D 1004)	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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GEOMEMBRANE TEST RESULTS
TRI Client: Gecat Plastic Factory
Project: MQA

Material: 1.5mm Double Sided Textured Geomembrane
TRI Log No.: A16-281
Sample Identification: 3766 DS 1/3

PARAMETER	TEST REPLICATE NUMBER										MEAN		GRI GM13
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 5994)													
Thickness (mm)	1.500	1.575	1.550	1.500	1.475	1.350	1.475	1.400	1.475	1.475	**1.475**		≥1.425
											1.350	<< min	≥1.275
Equipment used: AEI TG3.										**STD. DEV.**		**0.07**	
Sample dimensions: 125mm circle.										**CV.**		**4.8%**	
Asperity Height (ASTM D 7466)													
Asperity Height (mm) - Side A	0.625	0.600	0.700	0.700	0.700	0.575	0.675	0.650	0.525	0.675	**0.650**		≥0.4
										STD. DEV.		**0.06**	
										CV.		**9.3%**	
Asperity Height (mm) - Side B	0.450	0.375	0.425	0.350	0.350	0.300	0.375	0.425	0.375	0.500	**0.400**		≥0.4
										STD. DEV.		**0.06**	
Equipment used: AEI TG3.										**CV.**		**14.4%**	
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	2.20	2.11									**2.16**		2 - 3
Carbon Black Dispersion (ASTM D 5596, Method: Microtome)													
													≥ 90%
Rating* - 1st field view	1	1	1	1	1								1 - 2
Rating* - 2nd field view	1	1	1	1	1								≤ 10%
* PCN: 12-0455960-38 - Carbon dispersion classification chart for geosynthetics was used to rate agglomerate size range.													3

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Tensile Properties (ASTM D 6693)									Test speed: 50 mm/min				
MD Yield Strength (N/mm)	27.2	27.2	27.8	26.8	26.3						**27.1**		≥22
										STD. DEV.		**0.55**	
TD Yield Strength (N/mm)	27.7	29.8	29.2	29.1	27.9						**28.7**		≥22
										STD. DEV.		**0.90**	
MD Break Strength (N/mm)	44.5	40.6	43.0	41.3	39.2						**41.7**		≥16
										STD. DEV.		**2.07**	
TD Break Strength (N/mm)	34.8	34.7	36.5	43.1	35.0						**36.8**		≥16
										STD. DEV.		**3.59**	
MD Yield Elongation (%)	13	14	14	15	15						**14**		≥12
TD Yield Elongation (%)	13	14	15	14	14						**14**		≥12
MD Break Elongation (%)	668	617	646	640	610						**636**		≥100
TD Break Elongation (%)	561	553	581	669	580						**589**		≥100
Puncture Resistance (ASTM D 4833)													
Puncture Strength (N)	682	664	645	662	644	645	639	653	619	641	**649**		≥400
										STD. DEV.		**17.06**	
										CV.		**2.6%**	
Tear Resistance (ASTM D 1004)									Machine Used: AEI TM2-TRI 5-Station				
MD Tear Strength (N)	223	236	230	219	220	222	217	219	227	229	**224**		≥187
										STD. DEV.		**6.02**	
TD Tear Strength (N)	218	219	218	223	223	220	219	224	225	227	**222**		≥187
										STD. DEV.		**3.12**	
Oxidative Induction Time (ASTM D 3895)													
OIT (minutes)	181	185									**183**		≥100
High Pressure Oxidative Induction Time (ASTM D 5885)													
HPOIT (minutes)	1185										**1185**		≥400

MD Machine Direction TD Transverse Direction

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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: 19.3 (MPa) Mechanical Advantage 5
x 30% 5.79 (x 0.30) Lever Weight 1.469 (N)
x hinge thickness (mm) 1.219 (80% of thickness) Grip Weight 0.401 (N)
x specimen width 3.15 (3.18 mm)
Load 22.22 (N)

Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 4.23 N
= 431 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.

			MEAN	PERCENT RETAINED
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.

		MEAN	PERCENT RETAINED
HPOIT (minutes) - Baseline	953	**953**	
HPOIT (minutes) - After QUV Aging	950	**950**	100

Note: No surface cracking was observed.

End of Report

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