



GEOMEMBRANE TEST RESULTS

TRI Client: Gecat Plastic Factory

Project: MQA

Material: 2mm Smooth Geomembrane(s)

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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Sample Identification: 3766 S 3/3

PARAMETER											TEST REPLICATE NUMBER		MEAN	GRI GM13								
											1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 5199, Procedure B)																						
Thickness (mm)	2.14	2.04	2.04	2.00	1.92	1.96	1.96	2.04	2.04	2.02	2.02	1.92	≥2.0									
Equipment used: AEI TG2, 6.35mm foot diameter, 20 kPa pressure applied.											STD. DEV.		0.06	≥1.8								
Sample dimensions: 125mm circle.											CV.		3.2%									
Density (ASTM D 1505 @ 23°C)																						
Density (g/cm³)	0.949	0.949	0.949									0.949	≥0.94									
Carbon Black Content (ASTM D 4218)																						
% Carbon Black	2.07	2.06										2.07	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									
* PCN: 12-0455960-38 - Carbon dispersion classification chart for geosynthetics was used to rate agglomerate size range.													≤ 10%									
													3									
Tensile Properties (ASTM D 6693)											Test speed: 50 mm/min											
TD Yield Strength (N/mm)	36.6	37.2	36.9	35.8	35.6							36.4	≥29									
											STD. DEV.		0.69									
TD Break Strength (N/mm)	69.2	63.0	57.8	69.0	62.8							64.4	≥53									
											STD. DEV.		4.80									
TD Yield Elongation (%)	16	16	16	15	16							16	≥12									
TD Break Elongation (%)	744	694	642	741	691							702	≥700									



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Puncture Resistance (ASTM D 4833)																							
Puncture Strength (N)											845	828	794	806	790	806	825	796	801	808	810	≥640	
																					STD. DEV.	17.46	
																						CV.	2.2%
MD Machine Direction														TD Transverse Direction									
Tear Resistance (ASTM D 1004)														Machine Used: AEI TM2-TRI 5-Station									
MD Tear Strength (N)											301	316	306	299	291	298	319	289	292	283	299	≥249	
																					STD. DEV.	11.58	
TD Tear Strength (N)											298	305	287	297	296	307	310	301	311	295	301	≥249	
																					STD. DEV.	7.52	
Oxidative Induction Time (ASTM D 3895)																							
OIT (minutes)											193	195										194	≥100
High Pressure Oxidative Induction Time (ASTM D 5885)																							
HPOIT (minutes)											1182											1182	≥400
SP-NCTL Stress Crack Resistance (ASTM D 5397, App)																							
SURFACTANT:		CO-630				DATE TEST STARTED: 8-Dec-16																	
EXPOSURE PERIOD:		Failure				TEST TEMPERATURE: 50°C																	
Machine direction yield stress:		18.9 (MPa)				Mechanical Advantage 5																	
x 30%		5.67 (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		28.97 (N)																					
Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 5.58 N																							
														= 569 grams									
Replicate No.:		1	2	3	4	5																	
No. Hours to Failure:		>2600	>2600	>2600	>2600	>2600							>2600	≥500									
MD Machine Direction														TD Transverse Direction									



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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.												
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.												
PERCENT RETAINED												
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