



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

**Material: 1.5mm Single 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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Sample Identification: 3766 SS 1/3

PARAMETER	TEST REPLICATE NUMBER										MEAN	GRI GM13
	1	2	3	4	5	6	7	8	9	10		
<b>Thickness (ASTM D 5994)</b>												
Thickness (mm)	1.450	1.550	1.450	1.425	1.500	1.475	1.450	1.400	1.425	1.475	1.450	≥1.425
												<< min ≥1.275
Equipment used: AEI TG3.											STD. DEV.	0.04
Sample dimensions: 125mm circle.											CV.	3.1%
<b>Asperity Height (ASTM D 7466)</b>												
Asperity Height (mm) - Side A	0.725	0.650	0.500	0.550	0.650	0.675	0.700	0.900	0.625	0.650	0.675	≥0.4
												<< min ≥0.4
Equipment used: AEI TG3.											STD. DEV.	0.11
											CV.	15.8%
<b>Density (ASTM D 1505 @ 23°C)</b>												
Density (g/cm <sup>3</sup> )	0.949	0.949	0.949									≥0.94
<b>Carbon Black Content (ASTM D 4218)</b>												
% Carbon Black	2.12	2.11										2 - 3
<b>Carbon Black Dispersion (ASTM D 5596, Method: Microtome)</b>												
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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ACCREDITATION NO.: 19267

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PARAMETER	TEST REPLICATE NUMBER										MEAN	GRI GM13	
	1	2	3	4	5	6	7	8	9	10			
<b>Tensile Properties (ASTM D 6693)</b>													
	Test speed: 50 mm/min												
MD Yield Strength (N/mm)	27.4	27.7	26.3	26.5	26.3							26.8	≥22
												STD. DEV.	0.66
TD Yield Strength (N/mm)	30.1	29.2	30.8	28.9	29.2							29.6	≥22
												STD. DEV.	0.79
MD Break Strength (N/mm)	38.4	35.1	41.6	38.1	40.7							38.8	≥16
												STD. DEV.	2.54
TD Break Strength (N/mm)	38.2	27.5	24.6	33.5	39.1							32.6	≥16
												STD. DEV.	6.41
MD Yield Elongation (%)	14	14	14	17	15							15	≥12
TD Yield Elongation (%)	13	11	13	13	13							13	≥12
MD Break Elongation (%)	575	536	631	593	641							595	≥100
TD Break Elongation (%)	569	406	382	516	605							495	≥100
<b>Puncture Resistance (ASTM D 4833)</b>													
Puncture Strength (N)	674	618	645	639	653	661	669	622	618	646		645	>400
												STD. DEV.	20.44
												CV.	3.2%
<b>Tear Resistance (ASTM D 1004)</b>													
	Machine Used: AEI TM2-TRI 5-Station												
MD Tear Strength (N)	235	232	230	216	232	227	222	225	218	234		227	≥187
												STD. DEV.	6.64
TD Tear Strength (N)	222	218	220	218	217	227	220	223	218	224		221	≥187
												STD. DEV.	3.28
<b>Oxidative Induction Time (ASTM D 3895)</b>													
OIT (minutes)	190	191										190.5	≥100
<b>High Pressure Oxidative Induction Time (ASTM D 5885)</b>													
HPOIT (minutes)	1273											1273	≥400
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			
<b>SP-NCTL Stress Crack Resistance (ASTM D 5397, App)</b>													
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)	1.219 (80% of thickness)					Grip Weight 0.401 (N)							
x specimen width	3.15 (3.18 mm)												
Load	21.84 (N)												
Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 4.15 N													
											= 424 grams		
Replicate No.:	1	2	3	4	5								
No. Hours to Failure:	>2600	>2600	>2600	>2600	>2600							>2600	> 500
<b>Oven Aging (ASTM D 5721)</b>													
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.													
<b>UV Resistance (ASTM D 7238)</b>													
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

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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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