



GEOMEMBRANES PRODUCT DATA

Photograph courtesy Owens Corning

FOR MORE INFORMATION

Geosynthetics magazine has provided information on the geomembrane specification charts for comparative purposes only. Designers should contact manufacturers for additional details and to discuss site-specific considerations.

Information on the use and specification of geomembranes is also available from the Geosynthetic Materials Association (GMA).

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PUBLISHER'S NOTE

Geosynthetics magazine compiled all information included in the 2022 *Geosynthetics Specifier's Guide* from information submitted by firms in the geosynthetics industry. Companies provided specifications voluntarily, and specification accuracy is the responsibility of the manufacturer. The appearance of a listing in this directory is not an endorsement of the company or product by *Geosynthetics* magazine or the Industrial Fabrics Association International (IFAI). The 2022 *Geosynthetics Specifier's Guide* is intended as a guide, and *Geosynthetics* magazine and IFAI encourage readers to contact the companies listed for further information.

Manufacturers engineer these products to provide cost-effective solutions and to meet specific design requirements in fluid barrier, containment and other geotechnical applications.

Geomembranes have been used since the 1950s, and their use has steadily increased as a result of water resource concerns. It is now common to find local and state regulations calling for infrastructure designs that use geomembranes for containment, lining and capping. Whether for potable water or animal waste, these materials have become central to project acceptance and success.

Geomembranes are available in a variety of physical, mechanical and chemical resistance properties designed to meet the requirements of a wide range of applications. For example, the products can be compounded for exposure to ultraviolet light, ozone and microorganisms in soil. Different combinations of these properties exist in various geosynthetic lining materials to cover a wide spectrum of geotechnical applications and designs.

Manufacturers use several methods to bond the geosynthetic lining materials in the factory and in the field. Each material has highly developed quality control techniques that govern its manufacture and installation.

The numbers

Companies that submitted product data chart lines were asked to provide data determined through industry-accepted testing methods. Companies were asked to sign a certificate of compliance verifying the accuracy of this data.

GEOMEMBRANES | POLYETHYLENE | NON-HDPE

Product Name	Base Polymer [1]	Dimensional Properties				Tensile Properties ASTM D6693			Puncture Resistance ASTM D4833 kN (lb)	Tear Resistance ASTM D1004 kN (lb)	Low Temperature Brittleness ASTM D746 °C (°F) [3]	Carbon Black Content ASTM D1603 (%)	Carbon Black Dispersion ASTM D5596 [4]	Manufacturer's Suggested Applications [5]
		Roll Width/Length m (ft)	[2] Thickness ASTM 5199 mm (mils)	[2] Thickness ASTM D5994 mm (mils)	Density ASTM D1505 (g/cm ³)s	Strength Yield kN/m (lb/in)	Strength Break kN/m (lb/in)	Elongation Yield/Break %						
AGRU America Inc. www.agruamerica.com														
Agru Drain Liner*	LLDPE Structured	7.0/152.4 (23/500')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	Cat 1/2	CL, SIL, LL, LC, LPL, DL
Agru Grip Liner*	LLDPE Structured	7.0/152.4 (23/500')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	Cat 1/2	CL, SIL, LL, LC, LPL, DL
Agru Microspike* Liner	LLDPE-T	7.0/283.57 (23/710')	NA	1.0 (40)	0.939 max.	NA	20 (112)	NA/400	0.22 (50)	0.11 (25)	-60 (-83)	2-3	Cat 1/2	CL, LC, TL, LPL, DL
Agru Microspike* Liner	LLDPE-T	7.0/216.4 (23/505')	NA	1.5 (60)	0.939 max.	NA	29 (168)	NA/400	0.31 (70)	0.16 (36)	-60 (-83)	2-3	Cat 1/2	CL, LC, TL, LPL, DL
Agru Microspike* Liner	LLDPE-T	7.0/117.4 (23/385')	NA	2.0 (80)	0.939 max.	NA	39 (224)	NA/400	0.40 (90)	0.22 (50)	-60 (-83)	2-3	Cat 1/2	CL, LC, TL, LPL, DL
Agru Smooth* Liner	LLDPE-S	7.0/254.5 (23/835')	1.0 (40)	NA	0.939 max.	NA	28 (160)	NA/800	0.26 (60)	0.11 (25)	-60 (-83)	2-3	Cat 1/2	CL, LC, TL, LPL, DL
Agru Smooth* Liner	LLDPE-S	7.0/164.6 (23/540')	1.5 (60)	NA	0.939 max.	NA	42 (240)	NA/800	0.40 (90)	0.16 (37)	-60 (-83)	2-3	Cat 1/2	CL, LC, TL, LPL, DL
Agru Smooth* Liner	LLDPE-S	7.0/126.5 (23/415')	2.0 (80)	NA	0.939 max.	NA	56 (320)	NA/800	0.53 (120)	0.21 (48)	-60 (-83)	2-3	Cat 1/2	CL, LC, TL, LPL, DL
Agru Super Gripnet* Liner	LLDPE Structured	7.0/152.4 (23/500')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	Cat 1/2	CL, SIL, LL, LC, LPL, DL
ClosureTurf*	LLDPE O/C Structured -Turf	7.0/152.4 (23/500')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	Cat 1/2	CL, SIL, LL, LC, LPL, DL
Atarfil S.L. www.atarfil.com														
ATARFIL LLD smooth	LLDPE-S	width: 6.0 (19.7) / 6.3 (20.6) / 7.5 (24.6) length: 70 (229) to 280 (918)	0.75 to 3.00 mm (30 to 120 mils)	NA	< 0.940	NA	21 (119)	≥800	0.23 (51)	0.07 (16)	-75	2-2.5	1-2	CL, SIL, DP, RP
ATARFIL LLD TM/TMT* asperity 0.7mm / 30mils	LLDPE CX-T	width: 6.0 (19.7) length: 90 (295) to 263 (864)	NA	1.00 to 4.0 mm (20 to 160 mils)	< 0.940	NA	10 (59)	≥300	0.23 (52)	0.09 (20)	-75	2-2.5	1-2	LC
ATARFIL LLD TM/TMT* asperity 0.5mm / 20 mils	LLDPE CX-T	width: 6.0 (19.7) / 6.3 (20.6) / 7.5 (24.6) length: 90 (295) to 200m	NA	1.00 to 4.0 mm (20 to 160 mils)	< 0.940	NA	12 (68)	≥400	0.24 (54)	0.1 (22.5)	-75	2-2.5	1-2	LC
ATARFLEX smooth	VLDPE	width: 2.0 (6.5) length: 20 (65.6)	0.75 to 2.0 mm (30 to 80mil)	NA	≤ 0.920	NA	12 (36)	≥700	0.25 (0.75)	0.05 (0.16)	-70	2-2.5	1-2	SIL, TL
ATARTEC RSV	TPO/ FPO	PP/PES	width: 2.00 (6.5) Length: 15-25 (49-82)	1.2/ 1.5/ 2.0 mm (47/60/80mil)		NP	± 1.5	NA	NA	NA	-40	2-2.5	NA	roofing
◊Product can be manufactured with single (TM) or double (TMT) structured textured														

- [1] CX = Coextruded
 CX-T = Coextruded, textured
 EIA = Ethylene interpolymer alloy
 EPDM = Ethylene propylene diene monomer
 FPP = Flexible polypropylene
 LLDPE = Linear low density polyethylene
 LLDPE-T = Linear low density polyethylene, textured
 O/C = Other or combination
 TPO = Thermoplastic polyolefin
 T = Textured
 S = Smooth

- [2] ASTM D 5199: Nominal thickness of geosynthetic
 ASTM D 5994: Core thickness of textured geomembrane
 [3] No failures at this temperature.
 [4] Carbon black dispersion for 10 different views:
 • minimum of 9 of 10 in categories 1 or 2
 • all 10 in categories 1, 2, or 3

- [5] CL = Canal liner DL = Dam liner
 LPL = Leach pad liner SIC = Surface impoundment cover
 LC = Landfill cover LL = Landfill liner
 TL = Tunnel liner DP = Decorative pond
 RP = Reserve pit SIL = Surface impoundment liner
 SC = Secondary Containment
 NP = Not provided by manufacturer
 NA = Not applicable, per manufacturer

« Geosynthetics recommends you contact the manufacturers before making any specifying/purchasing decisions »

Product Name	Base Polymer [1]	Dimensional Properties			Density ASTM D1505 (g/cm ³)s	Tensile Properties ASTM D6693			Puncture Resistance ASTM D4833 kN (lb)	Tear Resistance ASTM D1004 kN (lb)	Low Temperature Brittleness ASTM D746 °C (°F) [3]	Carbon Black Content ASTM D1603 (%)	Carbon Black Dispersion ASTM D5596 [4]	Manufacturer's Suggested Applications [5]
		Roll Width/Length m (ft)	[2] Thickness ASTM 5199 mm (mils)	[2] Thickness ASTM D5994 mm (mils)		Strength Yield kN/m (lb/in)	Strength Break kN/m (lb/in)	Elongation Yield/Break %						

e2 – E Squared (formerly EPT) | www.e2techtexiles.com

e2 Xtrm Ply rLLDPE Smooth	LLDPE	120" x 500 yards	30°, 36° & 45 Mil				220°	22°	80°	70°	-25	3°		SIL, SIC, SR, SC, LC, TL
e2 Xtrm Ply rLLDPE Textured	LLDPE	120" x 500 yards	30, 36° & 45 Mil				240°	22°	90°	80°	-25	3°		SIL, SIC, SR, SC, LC, TL

♦Data listed is min. value for 20 mil product.

HUITEX | www.huitex.com

HUITEX Both OIT Series	LLDPE CX	7 (23) 76 (249) ~ 420 (1378)	0.50 (20) ~ 2.50 (100)	0.50 (20) ~ 2.50 (100)	<0.939	NA	9 (52) ~ 66 (378)	NA/250 ~ 800	0.120 (26) ~ 0.620 (136)	0.050 (11) ~ 0.250 (55)		2.0~3.0	cat.1/2	all
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Layfield Environmental Containment | www.layfieldgroup.com

Enviro Liner 6040	O/C	6.8/305 (22.5/1000)	1.0 (40)	NA	≤ 0.939	NA	31 (180)	1000%	0.298 (67)	NA	-70 (-90)	≥2.0	Pass	all
Enviro Liner 6060	O/C	6.8/158 (22.5/520)	1.50 (60)	NA	≤ 0.939	NA	44 (255)	1000%	0.40 (90)	NA	-70 (-90)	≥2.0	Pass	all
Enviro Liner 6080	O/C	6.8/122 (22.5/400)	2.0 (80)	NA	≤ 0.939	NA	53 (304)	800%	0.50 (112)	NA	-70 (-90)	≥2.0	Pass	all
Enviro Liner 6060 Textured	O/C	6.8/134 (22.5/440)	1.50 (60)	1.45 (57)	≤ 0.939	NA	20 (114)	350%	0.355 (80)	0.147 (33)	-70 (-90)	≥2.00	Pass	all
HAZGARD 635FR	O/C	3.14/305 (10.3/1000)	0.88 (35)	NA	NA	NA	22.8 (130)	700%	0.218 (49)	NA	-70 (-90)	Red	NA	SC (Secondary Containment)

Raven Engineered Films Inc. | www.ravengeo.com

HydraFlex Ultra HU30B - Meets GRI-GM17	LLDPE	3500 (35,000 ft ²)	0.75 (30)	NA	≤0.939	NA	22 (126)	800	0.20 (45)	0.08 (17)	-70 (-57)	2	Note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
HydraFlex Ultra HU40B - Meets GRI-GM17	LLDPE	2300 (25,000 ft ²)	1.00 (40)	NA	≤0.939	NA	29 (168)	800	0.27 (60)	0.10 (23)	-70 (-57)	2	Note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Absolute Barrier Y30BAC	LLDPE/EVOH	3500 (35,000 ft ²)	0.75 (30)	NA	≤0.924	NA	15 (85)	300	0.27 (60)	0.08 (18)	-40 (-40)	2	Note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Absolute Barrier Y40BAC	LLDPE/EVOH	2300 (25,000 ft ²)	1.00 (40)	NA	≤0.924	NA	22 (125)	350	0.31 (70)	0.10 (22)	-40 (-40)	2	Note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC

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- LLDPE-T = Linear low density polyethylene, textured
- O/C = Other or combination
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Product Name	Base Polymer [1]	Dimensional Properties				Density ASTM D1505 (g/cm ³) ^s	Tensile Properties ASTM D6693			Puncture Resistance ASTM D4833 kN (lb)	Tear Resistance ASTM D1004 kN (lb)	Low Temperature Brittleness ASTM D746 °C (°F) [3]	Carbon Black Content ASTM D1603 (%)	Carbon Black Dispersion ASTM D5596 [4]	Manufacturer's Suggested Applications [5]
		Roll Width/Length m (ft)	[2] Thickness ASTM 5199 mm (mils)	[2] Thickness ASTM D5994 mm (mils)	Strength Yield kN/m (lb/in)		Strength Break kN/m (lb/in)	Elongation Yield/Break %							
SKAPS Industries www.skaps.com															
SKAPS LLD - 40 Textured	LLDPE	7.16 x 219.45 (23.5 x 720')	1.00 (40 mils)	1.00 (40 mils)	0.939 max	NA	11 (60)	NA/250	200 (44)	100 (22)	NP	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	LC, TL, RP, SIC, DP	
SKAPS LLD - 60 Textured	LLDPE	7.16 x 155.44 (23.5 x 510')	1.50 (60 mils)	1.50 (60 mils)	0.939 max	NA	16 (90)	NA/250	300 (66)	150 (33)	NP	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	LC, TL, SIC, DP	
Solmax International Inc. www.solmax.com															
Solmax LLDPE Series Smooth	LLDPE-S	6.86/170.7 (22.5/560)	1.5 (60)	NA	0.939	NA	44 (252)	800	0.415 (93)	0.150 (33)	<-77 (-106)	2-3	1, 2	all	
Solmax LLDPE Series Smooth White	LLDPE-CX-S	6.86/170.7 (22.5/560)	1.5 (60)	NA	0.939	NA	44 (252)	800	0.415 (93)	0.150 (34)	<-77 (-106)	2-3	1, 2	all	
Solmax LLDPE Leak Location Conductive Smooth White	LLDPE-CX-S	6.86/170.7 (22.5/560)	1.5 (60)	NA	0.939	NA	44 (252)	800	0.415 (93)	0.150 (34)	<-77 (-106)	2-3	1, 2	all	
Solmax LLDPE Series Textured	LLDPE-CX-T	6.86/158.5 (22.5/520)	NA	1.5 (60)	0.939	NA	23 (132)	400	0.375 (84)	0.165 (37)	<-77 (-106)	2-3	1, 2	all	
Solmax LLDPE Series Textured White	LLDPE-CX-T	6.86/158.5 (22.5/520)	NA	1.5 (60)	0.939	NA	23 (132)	400	0.375 (84)	0.165 (37)	<-77 (-106)	2-3	1, 2	all	
Solmax LLDPE Leak Location Conductive Textured White	LLDPE-CX-T	6.71/164.6 (22/540)	NA	1.5 (60)	0.939	NA	23 (132)	400	0.375 (84)	0.165 (37)	<-77 (-106)	2-3	1, 2	all	
Solmax High-Performance LL Series Smooth	LLDPE-CX-S	6.86/171 (22.3/560)	1.5 (60)	NA	0.939	NA	42 (240)	900	0.444 (100)	0.150 (33)	<-77 (-106)	2-3	1, 2	all	
Solmax High-Performance LL Series Smooth White	LLDPE-CX-S	6.86/171 (22.3/560)	1.5 (60)	NA	0.939	NA	42 (240)	900	0.444 (100)	0.150 (33)	<-77 (-106)	2-3	1, 2	all	
Solmax High-Performance LL Series Textured	LLDPE-CX-T	6.86/158 (22.3/520)	NA	1.5 (60)	0.939	NA	29 (168)	500	0.422 (95)	0.169 (38)	<-77 (-106)	2-3	1, 2	all	
LiteEarth™ LLDPE Geomembrane/Synthetic PE Grass Composite	LLDPE-CX-T	4.42/70 (14.5/230)	NA	5.75 (230)	0.939	22.4 (128)	18.5 (106)	21 / 450	0.564 (127)	0.137 (31)	<-77 (-106)	2-3	1, 2	LC, Capping Applications	
Note: All of Solmax Geomembranes are available in a variety of thicknesses, smooth or textured, and with black, white or green surface layers.															
Note: Textured geomembranes are available in high asperity.															
Note: LiteEarth™ density, carbon black content, carbon black dispersion are for geomembrane component.															

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 CX-T = Coextruded, textured
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 LLDPE-T = Linear low density polyethylene, textured
 O/C = Other or combination
 TPO = Thermoplastic polyolefin
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 LPL = Leach pad liner SIC = Surface impoundment cover
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 RP = Reserve pit SIL = Surface impoundment liner
 SC = Secondary Containment
 NP = Not provided by manufacturer
 NA = Not applicable, per manufacturer

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Product Name	Base Polymer [1]	Dimensional Properties		Density ASTM D1505/D792 (min.) (g/cm ³ min.)	Tensile Properties ASTM D 6693 [3]				Puncture Resistance D 4833 (min. avg.) kN (lb)	Tear Resistance ASTM D 1004 (min. avg.) kN (lb)	Carbon Black Content ASTM D 1603 range (%) [4]	Carbon Black Dispersion ASTM D 5596 [5]	Stress Crack Resistance ASTM D 5397 Appendix [6]	Oxidative Induction Time (OIT) (min. avg.) [7]		Oven Aging at 85°C ASTM D 5721 [7], [8]		UV Resistance GM 11 [9]	Manufacturer's Suggested Applications [11]
		Roll Width/Length m (ft)	Thickness ASTM D5199 (smooth) ASTM D5994 (textured) min. avg. mm (mils) [2]		Strength		Elongation							Standard OIT ASTM D 3895	High Pressure OIT ASTM D 5885	ASTM D3895 % retained after 90 days	ASTM D5885 % retained after 90 days		
					Yield Stress kN/m (lb/in)	Break Stress kN/m (lb/in)	Yield Elongation %	Break Elongation %											

AGRU America Inc. | www.agruamerica.com

Agru Drain Liner*	HDPE Structured	7.0/152.4 (23/500)	1.5 (60)	0.94	23 (132)	23 (132)	13	300	0.42 (95)	0.18 (40)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, LL, LC, LPL, DL
Agru Grip Liner*	HDPE Structured	7.0/152.4 (23/500)	1.5 (60)	0.94	23 (132)	23 (132)	13	300	0.42 (95)	0.18 (40)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, LL, LC, LPL, DL
Agru Smooth* Liner	HDPE-S	7.0/317 (23/835)	1.0 (40)	0.94	15 (88)	28 (160)	13	700	0.36 (80)	0.13 (30)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Smooth* Liner	HDPE-S	7.0/164.6 (23/540)	1.5 (60)	0.94	23 (132)	42 (240)	13	700	0.53 (120)	0.20 (45)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Smooth* Liner	HDPE-S	7.0/102.1 (23/415)	2.0 (80)	0.94	31 (176)	56 (320)	13	700	0.71 (160)	0.27 (60)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Micro Spike* Liner	HDPE-T	7.0/253.4 (23/710)	1.0 (40)	0.94	15 (88)	15 (88)	13	350	0.40 (90)	0.13 (30)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Micro Spike* Liner	HDPE-T	7.0/216.4 (23/505)	1.5 (60)	0.94	23 (132)	23 (132)	13	350	0.53 (120)	0.20 (45)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Micro Spike* Liner	HDPE-T	7.0/117.4 (23/385)	20 (80)	0.94	31 (176)	31 (176)	13	350	0.66 (150)	0.27 (60)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Super Gripnet* Liner	HDPE Structured	7.0/152.4 (23/500)	1.50 (60)	0.94	23 (132)	23 (132)	13	200	0.40 (90)	0.18 (40)	2-3	Cat 1/2	1000	160	800	55	80	80	CL, SIL, LL, LC, LPL, DL

- [1] HDPE = High density polyethylene
CX = Coextruded
- [2] Lowest individual of 10 values
- [3] Machine direction (MD) and cross machine direction (XD) average values should be on the basis of 5 test specimens each direction
• Yield elongation calculated with a gage length of 33mm
• Break elongation calculated with a gage length of 50mm
- [4] Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
- T = Textured
S = Smooth

- [5] Carbon black dispersion for 10 different views:
• minimum 9 of 10 in Categories 1 or 2
• all 10 in Categories 1, 2, or 3
- [6] The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
- [7] The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane. It also is recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
- [8]

- [9] The condition of the test should be 20 hr. UV cycle at 75 C followed by 4 hr. condensation at 60 C.
- [10] UV resistance is based on percent retained value regardless of the original HP-OIT value.
- [11] CL = Canal liner
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SIC = Surface impoundment cover
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- DL = Dam liner
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RP = Reserve pit

Product Name	Base Polymer [1]	Dimensional Properties		Density ASTM D1505/D792 (min.) (g/cm ³ min.)	Tensile Properties ASTM D 6693 [3]				Puncture Resistance D4833 (min. avg.) kN (lb)	Tear Resistance ASTM D 1004 (min. avg.) kN (lb)	Carbon Black Content: ASTM D 1603 range (%) [4]	Carbon Black Dispersion ASTM D 5596 [5]	Stress Crack Resistance ASTM D 5397 Appendix [6]	Oxidative Induction Time (OIT) (min. avg.) [7]		Oven Aging at 85°C ASTM D 5721 [7], [8]		UV Resistance GM 11 [9]	Manufacturer's Suggested Applications [11]
		Roll Width/Length m (ft)	Thickness ASTM D5199 (smooth) ASTM D5994 (textured) min. avg. mm (mils) [2]		Strength		Elongation							Standard OIT	High Pressure OIT	ASTM D3895 % retained after 90 days	ASTM D5885 % retained after 90 days		
					Yield Stress kN/m (lb/in)	Break Stress kN/m (lb/in)	Yield Elongation %	Break Elongation %					Standard OIT ASTM D 3895	High Pressure OIT ASTM D 5885			High Pressure OIT (min. age.) % retained after 1600 hrs [10]		
ATARFIL HD smooth	HDPE CX-S	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) L: 202 (663)	1.5 (60)	≥ 0,942	24 (137)	40 (228)	> 13	≥ 700	0.490 (110)	0.202 (45)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55	80	75	All
ATARFIL HD smooth	HDPE CX-S	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) L: 152 (498)	2.0 (80)	≥ 0,942	32 (182)	53 (304)	> 13	≥ 700	0.640 (144)	0.270 (60)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55	80	75	All
ATARFIL TMT ^{◊◊} (asperity height 0.7mm / 30mil)	HDPE CX-T	W: 6.0 (19.7) L: 150 (495)	1.5 (60)	≥ 0,942	24 (137)	15 (90)	> 13	≥ 300	0.409 (92)	0.202 (45)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55	80	75	All
ATARFIL TMT ^{◊◊} (asperity height 0.7mm / 30mil)	HDPE CX-T	W: 6.0 (19.7) L: 131 (432)	2.0 (80)	≥ 0,942	32 (182)	21 (120)	> 13	≥ 300	0.556 (125)	0.270 (60)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55	80	75	All
ATARFIL TMT ^{◊◊} (asperity height 0.5mm / 20mil)	HDPE CX-T	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) L: 100 (328)	1.5 (60)	≥ 0,942	24 (137)	22 (125)	> 13	≥ 400	0.450 (101)	0.202 (45)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55	80	75	All
ATARFIL TMT ^{◊◊} (asperity height 0.5mm / 20mil)	HDPE CX-T	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) L: 80 (262)	2.0 (80)	≥ 0,942	32 (182)	30 (171)	> 13	≥ 400	0.570 (128)	0.270 (60)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55	80	75	All
ATARFIL HD EVO smooth	HDPE CX-S	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) L: 202 (663)	1.5 (60)	≥ 0,942	24 (137)	40 (228)	> 13	≥ 700	0.490 (110)	0.202 (45)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55 ^{◊◊◊}	80 ^{◊◊◊}	75	High demanding applications
ATARFIL HD EVO smooth	HDPE CX-S	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) L: 152 (498)	2.0 (80)	≥ 0,942	32 (182)	53 (304)	> 13	≥ 700	0.640 (144)	0.270 (60)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55 ^{◊◊◊}	80 ^{◊◊◊}	75	High demanding applications
ATARFIL HD EVO TMT ^{◊◊} (asperity height 0.7mm / 30mil)	HDPE CX-T	W: 6.0 (19.7) L: 150 (495)	1.5 (60)	≥ 0,942	24 (137)	15 (90)	> 13	≥ 300	0.409 (92)	0.202 (45)	2-2.5	1, 2	≥ 3000 [◊]	120	500	55 ^{◊◊◊}	80 ^{◊◊◊}	75	High demanding applications

Atarfil S.L. | www.atarfil.com

[1] HDPE = High density polyethylene
CX = Coextruded
[2] Lowest individual of 10 values
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• Yield elongation calculated with a gage length of 33mm
• Break elongation calculated with a gage length of 50mm
[4] Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.

[5] Carbon black dispersion for 10 different views:
• minimum 9 of 10 in Categories 1 or 2
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[6] The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
[7] The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
[8] It also is recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

[9] The condition of the test should be 20 hr. UV cycle at 75 C followed by 4 hr. condensation at 60 C.
[10] UV resistance is based on percent retained value regardless of the original HP-OIT value.
[11] CL = Canal liner
SIL = Surface impoundment liner
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Product Name	Base Polymer [1]	Dimensional Properties			Density ASTM D1505/D792 (min.) (g/cm ³ min.)	Tensile Properties ASTM D 6693 [3]				Puncture Resistance D 4833 (min. avg.) kN (lb)	Tear Resistance ASTM D 1004 (min. avg.) kN (lb)	Carbon Black Content ASTM D 1603 range (%) [4]	Carbon Black Dispersion ASTM D 5596 [5]	Stress Crack Resistance ASTM D 5397 Appendix [6]	Oxidative Induction Time (OIT) (min. avg.) [7]		Oven Aging at 85°C ASTM D 5721 [7], [8]		UV Resistance GM 11 [9]	Manufacturer's Suggested Applications [11]
		Roll Width/Length m (ft)	Thickness ASTM D5199 (smooth) ASTM D5994 (textured) min. avg. mm (mils) [2]	Strength		Elongation		Standard OIT ASTM D 3895	High Pressure OIT ASTM D 5885						ASTM D3895 % retained after 90 days	ASTM D5885 % retained after 90 days	High Pressure OIT (min. age.) % retained after 1600 hrs [10]			
				Yield Stress kN/m (lb/in)		Break Stress kN/m (lb/in)	Yield Elongation %											Break Elongation %		

Atarfil S.L. | www.atarfil.com

ATARFIL HD EVO TMT^{♦♦} (asperity height 0.7mm / 30mils)	HDPE CX-T	W: 6.0 (19.7) / L: 131 (432)	2.0 (80)	≥ 0,942	32 (182)	21 (120)	> 13	≥ 300	0.556 (125)	0.270 (60)	2-2.5	1, 2	≥ 3000 [♦]	120	500	55 ^{♦♦♦}	80 ^{♦♦♦}	75	High demanding applications
ATARFIL HD EVO TMT^{♦♦} (asperity height 0.5mm / 20mils)	HDPE CX-T	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) / L: 100 (328)	1.5 (60)	≥ 0,942	24 (137)	22 (125)	> 13	≥ 400	0.450 (101)	0.202 (45)	2-2.5	1, 2	≥ 3000 [♦]	120	500	55 ^{♦♦♦}	80 ^{♦♦♦}	75	High demanding applications
ATARFIL HD EVO TMT^{♦♦} (asperity height 0.5mm / 20mils)	HDPE CX-T	W: 6.0 / 6.3 / 7.5 (19.7 / 20.6 / 24.6) / L: 80 (262)	2.0 (80)	≥ 0,942	32 (182)	30 (171)	> 13	≥ 400	0.570 (128)	0.270 (60)	2-2.5	1, 2	≥ 3000 [♦]	120	500	55 ^{♦♦♦}	80 ^{♦♦♦}	75	High demanding applications

♦Additional information regarding correlation between Test Methods ISO 18488 (Strain hardening) and ASTM D 5397 (Stress Crack Resistance) available upon request. Test conducted on representative smooth membrane samples.
 ♦♦Product can be manufactured with single (TM) or double (TMT) structured textured.
 ♦♦♦Product retained both Standard OIT (55%) and HP OIT (80%) after 90 days Oven Aging at 80 C ASTM D 5721
 All Atarfil geomembranes are available in different thicknesses (from 0.75 to 4.00mm) and colors. Also an electrically conductive layer can be added upon request.

HUITEX | www.huitex.com

HUITEX Both OIT Series	HDPE CX	7 (23) ~ 8 (26) / 70 (230) ~ 420 (1378)	0.50 (20) ~ 3.00 (120)	0.940	7 (40) ~ 44 (252)	13 (74) ~ 80 (458)	12	100 ~ 700	0.16 (35) ~ 0.96 (211)	0.06 (14) ~ 0.37 (81)	2.0 ~ 3.0	cat.1/2	500	100	400	55	80	50	all
HUITEX Colored Series	HDPE CX	7 (23) ~ 8 (26) / 70 (230) ~ 420 (1378)	0.50 (20) ~ 3.00 (120)	0.940 (black layer)	7 (40) ~ 44 (252)	13 (74) ~ 80 (458)	12	100 ~ 700	0.16 (35) ~ 0.96 (211)	0.06 (14) ~ 0.37 (81)	2.0 ~ 3.0 black layer	cat.1/2 black layer	500	100 black layer	400 black layer	55 black layer	80 black layer	50 black layer	all
HUITEX K-Liner CPL Series	HDPE	2.5 (8.21) ~ 3.0 (9.75) / 60 (197) ~ 70 (230)	2.00 (80) ~ 5.00 (200)	0.940	30 (172) ~ 75 (430)	50 (287) ~ 125 (716)	12	500	0.640 (141) ~ 1.60 (352)	0.25 (55) ~ 0.63 (138)	2.0 ~ 3.0	cat.1/2	500	100	400	NA	NA	NA	Concrete Protection

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- T = Textured
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Product Name	Base Polymer [1]	Dimensional Properties		Density ASTM D1505/D792 (min.) (g/cm ³ min.)	Tensile Properties ASTM D 6693 [3]				Puncture Resistance D4833 (min. avg.) kN (lb)	Tear Resistance ASTM D 1004 (min. avg.) kN (lb)	Carbon Black Content: ASTM D 1603 range (%) [4]	Carbon Black Dispersion ASTM D 5596 [5]	Stress Crack Resistance ASTM D 5397 Appendix [6]	Oxidative Induction Time (OIT) (min. avg.) [7]		Oven Aging at 85°C ASTM D 5721 [7], [8]		UV Resistance GM 11 [9]	Manufacturer's Suggested Applications [11]
		Roll Width/Length m (ft)	Thickness ASTM D5199 (smooth) ASTM D5994 (textured) min. avg. mm (mils) [2]		Strength		Elongation							Standard OIT	High Pressure OIT				
					Yield Stress kN/m (lb/in)	Break Stress kN/m (lb/in)	Yield Elongation %	Break Elongation %								ASTM D3895 % retained after 90 days	ASTM D5885 % retained after 90 days		

Layfield Environmental Containment | www.layfieldgroup.com

Layfield HDPE 60	HDPE	6.86/158.5 m (22.5/520 ft)	1.5 (60)	≥ 0.94	22 (126)	40 (228)	12%	700%	0.48 (108)	0.187 (42)	≥ 2.0%	Note [5]	500	100	400	55%	80%	50%	all
Layfield HDPE 80	HDPE	6.86/122 m (22.5/400 ft)	2.0 (80)	≥ 0.94	29 (168)	53 (304)	12%	700%	0.64 (144)	0.249 (56)	≥ 2.0%	Note [5]	500	100	400	55%	80%	50%	all
Layfield HDPE 60 Textured	HDPE	6.86/171 m (22.5/560 ft)	1.45 (57)	≥ 0.94	22 (126)	16 (90)	12%	100%	0.4 (90)	0.187 (42)	≥ 2.0%	Note [5]	500	100	400	55%	80%	50%	all
Layfield HDPE 80 Textured	HDPE	6.86/134 m (22.5/440 ft)	1.90 (76)	≥ 0.94	29 (168)	21 (120)	12%	100%	0.534 (120)	0.249 (56)	≥ 2.0%	Note [5]	500	100	400	55%	80%	50%	all
HEATGARD 60	HDPE	6.86/158.5 m (22.5/520 ft)	1.5 (60)	≥ 0.94	27 (152)	40 (228)	13%	600%	0.534 (120)	0.2 (45)	≥ 2.0%	CAT1	1000	100	400	55%	80%	50%	High Temperature Containment
HEATGARD 80	HDPE	6.86/122 m (22.5/400 ft)	2.0 (80)	≥ 0.94	36 (204)	53 (304)	13%	600%	0.712 (160)	0.260 (58)	≥ 2.0%	CAT1	1000	100	400	55%	80%	50%	High Temperature Containment
HDPE Conductive	HDPE	6.86/158.5 m (22.5/520 ft)	1.5 (60)	≥ 0.94	22 (126)	40 (228)	12%	700%	0.48 (108)	0.187 (42)	≥ 2.0%	Note [5]	500	100	400	55%	80%	50%	Leak Detection

Megaplast USA Inc. | www.megaplast.in

MegaLiner platinum 100 Smooth	HDPE	23.5 x 840	40	0.94	86	160	13	700	78	28	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner platinum 150 Smooth	HDPE	23.5 x 560	60	0.94	131	246	13	700	112	42	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner Platinum Textured S 100	HDPE	23.5 x 750	40	0.94	86	63	12	150	67	28	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner Platinum Textured S 150	HDPE	23.5 x 550	60	0.94	131	91	12	150	101	42	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner Platinum Textured D 100	HDPE	23.5 x 710	40	0.94	86	63	12	150	67	28	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner Platinum Textured D 150	HDPE	23.5 x 525	60	0.94	131	91	12	150	101	42	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner Platinum 75 Smooth	HDPE	23.5 x 1100	30	0.94	63	120	13	700	54	21	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL
MegaLiner Platinum Textured D 200	HDPE	23.5 x 355	80	0.94	171	120	12	150	135	56	2.0-3.0	NA	500	more than 100	more than 500	55	80	50	CL, LL

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		Roll Width/Length m (ft)	Thickness ASTM D5199 (smooth) ASTM D5994 (textured) min. avg. mm (mils) [2]	Strength		Elongation		Standard OIT	High Pressure OIT						ASTM D3895 % retained after 90 days	ASTM D5885 % retained after 90 days					
				Yield Stress kN/m (lb/in)		Break Stress kN/m (lb/in)	Yield Elongation %										Break Elongation %				

Raven Engineered Films Inc. www.ravengeo.com																			
Absolute Barrier X40BAL	HDPE/ EVOH	1600 (19,200 ft ²) LF Mill Rolls	1.00 (40)	≥ 0.940	15 (84)	11 (60)	12	300	0.32 (72)	0.12 (28)	2	Note [4]	500 hrs	100 min	400 min				CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Absolute Barrier X60BAL	HDPE/ EVOH	1200 (13,600 ft ²) LF Mill Rolls	1.50 (60)	≥ 0.940	22 (126)	16 (90)	12	350	0.45 (108)	0.19 (42)	2	Note [4]	500 hrs	100 min	400 min				CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Absolute Barrier X60BCS	HDPE/ EVOH	1200 (13,600 ft ²) LF Mill Rolls	1.50 (60)	≥ 0.940	22 (126)	16 (90)	12	100	0.40 (90)	0.19 (42)	2	Note [4]	500 hrs	100 min	400 min				CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC

SKAPS Industries www.skaps.com																			
SKAPS HD - 40 Smooth	HDPE	7.16 x 249.93 (23.5 x 820)	1.00 (40 mils)	0.94 min	15 (84)	27 (152)	12	700	320 (72)	125 (28)	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	500 Hr min	100 Min min	400 Min min	55	80	50	CL, LC, TL, RP, SIC, DP, SIL, SC
SKAPS HD - 60 Smooth	HDPE	7.16 x 167.64 (23.5 x 550)	1.50 (60 mils)	0.94 min	22 (126)	40 (228)	12	700	480 (108)	187 (42)	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	500 Hr min	100 Min min	400 Min min	55	80	50	CL, LPL, LC, TL, RP, DL, SIC, LL, DP, SIL, SC
SKAPS HD - 80 Smooth	HDPE	7.16 x 124.96 (23.5 x 410)	2.00 (80 mils)	0.94 min	29 (168)	53 (304)	12	700	640 (144)	249 (56)	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	500 Hr min	100 Min min	400 Min min	55	80	50	LPL, TL, DL, SIL, SC
SKAPS HD - 40 Textured	HDPE	7.16 x 222.50 (23.5 x 730)	1.00 (40 mils)	0.94 min	15 (84)	10 (60)	12	100	267 (60)	125 (28)	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	500 Hr min	100 Min min	400 Min min	55	80	50	CL, LC, TL, RP, SIC, DP, SIL, SC
SKAPS HD - 60 Textured	HDPE	7.16 x 155.44 (23.5 x 510)	1.50 (60 mils)	0.94 min	22 (126)	16 (90)	12	100	400 (90)	187 (42)	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	500 Hr min	100 Min min	400 Min min	55	80	50	CL, LPL, LC, TL, RP, DL, SIC, LL, DP, SIL, SC
SKAPS HD - 80 Textured	HDPE	7.16 x 121.92 (23.5 x 400)	2.00 (80 mils)	0.94 min	29 (168)	21 (120)	12	100	534 (120)	249 (56)	2.0 - 3.0	9 to 10 in categories 1 or 2, max 1 in category 3	500 Hr min	100 Min min	400 Min min	55	80	50	LPL, TL, DL, SIL, SC

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		Roll Width/Length m (ft)	Thickness ASTM D5199 (smooth) ASTM D5994 (textured) min. avg. mm (mils) [2]		Strength		Elongation							Standard OIT	High Pressure OIT	ASTM D3895 % retained after 90 days	ASTM D5885 % retained after 90 days		

Solmax International Inc. | www.solmax.com

Solmax HDPE Series Leak Location Conductive Liner Smooth White	HD-CX-S	6.86/170.7 (22.5/560)	1.5 (60)	0.940	23 (132)	43 (243)	13	700	0.534 (120)	0.187 (42)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Leak Location Conductive Liner Smooth White	HD-CX-S	6.86/131.1 (22.5/430)	2.0 (80)	0.940	31 (176)	57 (324)	13	700	0.695 (156)	0.250 (56)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Leak Location Conductive Liner Textured White	HD-CX-T	6.71/164.6 (22/540)	1.5 (60)	0.940	23 (132)	23 (132)	13	150	0.534 (120)	0.200 (45)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Leak Location Conductive Liner Textured White	HD-CX-T	6.71/128 (22.0/420)	2.0 (80)	0.940	31 (176)	31 (176)	13	150	0.675 (152)	0.265 (60)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Smooth	HD-S	6.86/170.7 (22.5/560)	1.5 (60)	0.940	23 (132)	43 (243)	13	700	0.534 (120)	0.187 (42)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Smooth White	HD-CX-S	6.86/170.7 (22.5/560)	1.5 (60)	0.940	23 (132)	43 (243)	13	700	0.534 (120)	0.187 (42)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Textured	HD-CX-T	6.86/158.5 (22.5/520)	1.5 (60)	0.940	23 (132)	23 (132)	13	150	0.534 (120)	0.200 (45)	2-3	1, 2	500	100	400	55	80	50	all
Solmax HDPE Series Textured White	HD-CX-T	6.86/158.5 (22.5/520)	1.5 (60)	0.940	23 (132)	23 (132)	13	150	0.534 (120)	0.200 (45)	2-3	1, 2	500	100	400	55	80	50	all
Solmax High-Performance HD Series Smooth	HD-CX-S	6.86/171 (22.3/560)	1.5 (60)	0.940	23 (132)	42 (243)	13	800	0.556 (125)	0.187 (42)	2-3	1, 2	1000	160	800	N/A	80	80	all
Solmax High-Performance HD Series Textured	HD-CX-T	6.86/158 (22.3/520)	1.5 (60)	0.940	23 (132)	20 (115)	13	200	0.578 (130)	0.200 (45)	2-3	1, 2	1000	160	800	N/A	80	80	all
Solmax High-Temperature Series Liner	HD-S	7.5/130 (22.3/427)	1.5 (60)	0.940	24.5 (140)	42 (240)	13	650	0.480 (120)	0.190 (45)	2-3	1, 2	600 (A)	160	600	N/A	90	85	High Temperature Applications
Solmax Studliner® Concrete Protection Liner	HD	2.44/75 (8/246)	2.0 (80)	0.940	31 (176)	NA	NA	500	NA	NA	1.5-3.0	1,2,3	500	NA	NA	NA	NA	NA	TL
Solmax High-Temperature Studliner®	HD	2.44/75 (8/246)	2.0 (80)	0.940	31 (176)	NA	NA	500	NA	NA	1.5-3.0	1,2,3	500	NA	NA	NA	NA	NA	TL

Note: All of Solmax Geomembranes are available in a variety of thicknesses and with black, white or green surface layers.

Note: Textured geomembrane available in high aspect.

(A) ASTM D5397 Appendix (SP-NCTL) modified at 80 degrees C (176 degrees F) under a load of 3.4 Mpa (500 psi).

[1] HDPE = High density polyethylene
CX = Coextruded

T = Textured
S = Smooth

[2] Lowest individual of 10 values

[3] Machine direction (MD) and cross machine direction (XD) average values should be on the basis of 5 test specimens each direction

• Yield elongation calculated with a gage length of 33mm
• Break elongation calculated with a gage length of 50mm

[4] Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.

[5] Carbon black dispersion for 10 different views:
• minimum 9 of 10 in Categories 1 or 2
• all 10 in Categories 1, 2, or 3

[6] The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

[7] The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

[8] It also is recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

[9] The condition of the test should be 20 hr. UV cycle at 75 C followed by 4 hr. condensation at 60 C.

[10] UV resistance is based on percent retained value regardless of the original HP-OIT value.

[11] CL = Canal liner
SIL = Surface impoundment liner
SIC = Surface impoundment cover
LL = Landfill liner
DP = Decorative pond
NP = Not provided by manufacturer
NA = Not applicable, per manufacturer

DL = Dam liner
LPL = Leach pad liner
LC = Landfill cover
TL = Tunnel liner
RP = Reserve pit

« Geosynthetics recommends you contact the manufacturers before making any specifying/purchasing decisions »

Product Name	Polymer Type	Dimensional Properties		Specific Gravity ASTM D792	Dimensional Stability ASTM D1204 %	Puncture Resistance ASTM D4833 kN (lb)	Tear Resistance STM D1004 Die C kN (lb)	Tensile Properties ASTM D638				Low Temperature Brittleness ASTM D2136 °C	Suggested Seam Strength ASTM D4545		Carbon Black Content ASTM D1603	Manufacturer's Suggested Applications [1]
		Maximum Panel Size m ² (ft ²)	Thickness ASTM D751 mm (mils)					Strength		Elongation			Shear kN/m (lb/in)	Peel kN/m (lb/in)		
								Yield kN/m (lb/in)	Break kN/m (lb/in)	Yield %	Break %					
Atarfil S.L. www.atarfil.com																
ATARPOL smooth	PP	40 m ² (430 ft ²), width: 2.0 m (6.5 ft)	1.00–2.50 mm (40–100 mils)	≥ 0.88	±1.50	0.13–0.32	0.06–0.15	NA	12–30	NA	≥ 500	-40	NP	NP	2–2.5	CL, SIC, LPL, LC, RP, SIL
ATARPOL COLOUR smooth	PP	40 m ² (430 ft ²), width: 2.0 m (6.5 ft)	1.00–2.50 mm (40–100 mils)	≥ 0.88	±1.50	0.13–0.32	0.06–0.15	NA	12–30	NA	≥ 500	-40	NP	NP	2–2.5	CL, SIL, SIC, DP, RP
Cooley Group www.cooleygroup.com																
CoolPro-UPP30	fPP	width = 65 to 150 in (1.6 to 3.8 m)	0.75 (30)	0.9	1	0.11 (25)	0.04 (10)	NP	10 (54)	NP	700	-40	NP	NP	NP	CL, SIC, SIL, TL, DP, LL, LPL, DL, LC
CoolPro-UPP40	fPP	width = 65 to 150 in (1.6 to 3.8 m)	1.0 (40)	0.9	1	0.13 (30)	0.05 (12)	NP	13 (72)	NP	700	-40	NP	NP	NP	CL, SIC, SIL, TL, DP, LL, LPL, DL, LC
CoolPro-UPP100	fPP	width = 65 to 150 in (1.6 - 3.8 m)	2.5 (100)	0.9	-0.5	0.30 (68)	0.19 (43)	NP	33 (180)	NP	700	-40	NP	NP	NP	CL, SIC, SIL, TL, DP, LL, LPL, DL, LC
e2 – E Squared (formerly EPT) www.e2techtextiles.com																
EPT Xtrm Ply fPP	flexible PP	width: 60–120"	20 to 120 mils [◇]	1.2	0.5	10 lb [◇]	9 lb [◇]	NA	70 [◇]	NA	700	-40	25 [◇]	15 [◇]	>2.5	CL, SIL, SIC, LL, DL, LPL, LC, TL
EPT Xtrm Ply rPP	TPO-PP ^{◇◇}	PET 60–120"	20 to 120 mils [◇]	1.2	0.9	15 [◇]	1	350 [◇]	70 [◇]	200 [◇]	400 [◇]	-40	NP	NP	NP	CL, SIL, SIC, LL, DL, LPL, LC, TL
◇Data listed is min. value for 20 mil product ◇◇Data listed is min. value for 30 mil product																
Raven Engineered Films Inc. www.ravengeo.com																
Hydrflex PP40	Flexible PP	2,300 (25,000)	0.91 (36)	0.9	±2	0.15 (34)	0.05 (12)	NA	13 (75)	NA	700	-40	8.9 (51)	5.6 (32)	2	CL, LPL, SIC, LC, TL, SIL, DP

[1] CL = Canal liner
DL = Dam liner
DP = Decorative Pond
LPL = Leach pad liner

LC = Landfill cover
LL = Landfill liner
TL = Tunnel liner
SIL = Surface impoundment liner
SIC = Surface impoundment cover

[2] Cannot separate
NP = Not provided by manufacturer
NA = Not applicable, per manufacturer

Product Name	[1] Polymer Type	Dimensional Properties		Specific Gravity ASTM D792	Dimensional Stability ASTM D1204 %	Tear Resistance ASTM D1004 Die C kN (lb)	Tensile Properties [2] ASTM D882		Hydrostatic Resistance ASTM D751 Method A kPa (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Manufacturer's Sug- gested Applications [3]
		Roll Width/ Length m (ft)	Thickness ASTM D1593 or D5199 mm (mil)				MD kN/m (lb/in)	XD kN/m (lb/in)			
Cooley Group www.cooleygroup.com											
CoolGuard-UCG40	EIA	width = 65 to 150 in (1.6 to 3.8 m)	1.0 (40)	1.2	5	0.30 (67)	0.09 (20)	NP	13 (72)	NP	350
CoolGuard-UCG80	EIA	width = 65 to 150 in (1.6 to 3.8 m)	2.0 (80)	1.2	5	0.59 (133)	0.18 (40)	NP	25 (144)	NP	350
e2 – E Squared (formerly EPT) www.e2techtexiles.com											
EPT Xtrm Ply fPVC	PVC - GP and/or ASTM-7176	Width 60" to 120"	20°–120 mils	1.3	0.5	10°	50°	50°	80°	-30	CL, SIL, SIC, LL, LPL, DL, SR, SC, LC, TL
EPT Xtrm Ply fEIA	KEE/EIA - GP, NSF 61 and/or ASTM-7176	Width 60" to 120"	20°–120 mils	1.2	0.5	10°	50°	50°	80°	-40	CL, SIL, SIC, SR, SC, LC, LPL, TL
◇Data listed is min. value for 20 mil product.											
Plastatech Engineering Ltd. www.plastatech.com											
Plastatech FG (Fish Grade)	PVC - Fish Grade	76 in. x 480 yd.	20-30 mil	1.20 min.	3-4 max.	6.0 min. - 8.0 min.	48 min. - 73 min.	48 min. - 73 min.	68 min. - 100 min.	Pass at 5°F (-15°C) and -9.4°F (-23°C)	CL, SIL, SC, LL, DL, LPL
Plastatech IG (Industrial Grade)	PVC - Industrial Grade	76 in. x 1,025 yd.	10-30 mil	1.20 min.	3-4 max.	2.5 min. - 8.0 min.	24 min. - 73 min.	24 min. - 73 min.	42 min. - 100 min.	Pass at -9.4°F (-23°C), -14.8°F (-26°C) and -20°F (-29°C)	CL, SIL, SC, LL, DL, LPL
Plastatech OR (Oil Resistant)	PVC - Oil Resistant	76 in. x 300 yd.	30 mil	1.20 min.	3 max.	8.0 min.	73 min.	73 min.	100 min.	Pass at 10.4°F (-12°C)	CL, SIL, SC, LL, DL, LPL
Solmax International Inc. www.solmax.com											
Solmax PGI	PVC	2.16/224-303.6 (7.08/735-996)	0.75-1.00 (30-40)	1.2	3	0.035-0.044 (8-10)	12.8-17.0 (73-97)	12.8-17.0 (73-97)	690-830 (100-120)	-20 (-4)	CL, SIL, SIC, LL, LC, LPL, DL

- [1] CX = Coextruded
 CX-T = Coextruded, textured
 EIA = Ethylene interpolymer alloy
 EPDM = Ethylene propylene diene monomer
 fPP = Flexible polypropylene
 LLDPE = Linear low density polyethylene
 LLDPE-T = Linear low density polyethylene, textured
 O/C = Other or combination
 PVC = Polyvinyl chloride
 PVC-R = Polyvinyl chloride-reinforced
 TPO = Thermoplastic polyolefin

- [2] MD = Machine direction
 XD = Cross-machine direction
- [3] CL = Canal liner
 SC = Secondary containment
 SR = Soil remediation
 SIL = Surface impoundment liner
 SIC = Surface impoundment cover

- LL = Landfill liner
 LC = Landfill cover
 DL = Dam liner
 LPL = Leach pad liner
 TL = Tunnel liner

- NP = Not provided by manufacturer
 NA = Not applicable, per manufacturer

Unless otherwise indicated, these are minimum average roll values (MARV). All claims are the responsibility of the manufacturer.

« Geosynthetics recommends you contact the manufacturers before making any specifying/purchasing decisions »

Product Name	Polymer Type [1] (membrane)	Polymer Type [1] (reinforcement)	Dimensional Properties		Specific Gravity ASTM D792	Ply Adhesion ASTM D413 MD kN/m (lb/in)	Dimensional Stability ASTM D1204 %	Puncture Resistance FTMS 101 C Method 2031 kN (lb)	Tear Resistance ASTM D5884 Method B Tongue Tear kN (lb)	Tensile Strength ASTM D751 [2] kN (lb)	Hydrostatic Resistance ASTM D751 [2] Method A kN/m ² (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Suggested Seam Strength		Manufacturer's Suggested Applications [4]
			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
Atarfil S.L. www.atarfil.com															
ATARPOL RSP	PP	PP/PES	width: 2.00 (6.5) Length: 20-25 (65.6-82)	1.0/1.14/ 1.2/1.5 mm (40/ 44/ 47/ 60 mil)	≥ 0.88	ASTMD 6636 ≥65N	≤0.3	NA	NA	NA	NA	-40	NA	NA	CL, SIL, SIC, DP, RP, roofing
ATARTEC RSP Roofing	TPO/FPO	PP/PES	width: 2.00 (6.5) Length: 15-25 (49-82)	1.2/1.5/ 2.0 mm (47/ 60/ 80 mil)	NP	NP	≤0.3	NA	NA	NA	NA	-40	NA	NA	roofing
BTL Liners www.btl liners.com															
BTL™-30	LDPE	HDPE	65,000 f ²	(30 mil)			MD -2.8% CD -1.5%	202 LB	MD (50) CD (55)	MD (345) CD (420)	610 LB	-65	MD (188) CD (240)	5 LB	CL, DP, ILC, LC, LPL, GC, RP, RSC, SIL, SIC, TL
RPEL-30	LDPE	HDPE	55,000 f ²	(30 mil)			0.5% x 0.9%	325 LB	MD (60) CD (60)	MD (385) CD (385)	600 LB	-65	CD 315 lb/in	24 lb/in	CL, DP, ILC, LC, LPL, GC, RP, RSC, SIL, SIC, TL
BTL™-40	LDPE	HDPE	50,000 f ²	(40 mil)			MD -3.8% CD -1.8%	347 LB	MD (150) CD (155)	MD (460) CD (450)	685 LB	-65	MD (368) CD (360)	5 LB	CL, DP, ILC, LC, LPL, GC, RP, RSC, SIL, SIC, TL
BTL™-60	LDPE	HDPE	33,000 f ²	(60 mil)			NA	380 LB	MD (100) CD (100)	MD (385) CD (360)	881 LB	-85	MD (308) CD (288)	27 LB/IN	CL, DP, ILC, LC, LPL, GC, RP, RSC, SIL, SIC, TL
Burke Industries www.burkeind.com															
M283	CSPE	PET	NP	36	1.45	-8	NA	(240)*	(100)**	-275	(405)[3]	-45 F[5]	NA	NA	NP
M284	CSPE	PET	NP	45	1.45	-10	NA	(250)*	(105)**	-280	(415)[3]	-45 F[5]	NA	NA	NP

[1] PVC = Polyvinyl chloride
 CPE = Chlorinated polyethylene
 CSPE = Chlorosulfonated polyethylene
 EIA = Ethylene interpolymer alloy
 fPP = Flexible polypropylene
 HDPE = High density polyethylene
 HDPE-T = High density polyethylene, textured

LLDPE = Linear low density polyethylene
 LLDPE-T = Linear low density polyethylene, textured
 PET = Polyester
 PP = Polypropylene
 O/C = Other or combination
 TPO = Thermoplastic polyolefin

[2] As modified in NSF 54, appendix A
 Note: NSF 54 has been withdrawn.
 [3] Method A, Procedure I
 [4] CL = Canal liner
 DP = Decorative pond
 ILC = Interim landfill cover
 LC = Landfill cover
 LL = Landfill liner
 LPL = Leach pad liner
 GC = Geofoam Cover
 PT = Pillow Tanks

RP = Reserve pit
 RSC = Rain shed cover
 SIL = Surface impoundment liner
 SIC = Surface impoundment cover
 TL = Tunnel liner
 NP = Not provided by manufacturer
 NA = Not applicable, per manufacturer

* = FTMS 101B
 ** = ASTM D751
 *** = ASTM D4833
 **** = ASTM D7003

GEOMEMBRANES REINFORCED

Product Name	Polymer Type [1] (membrane)	Polymer Type [1] (reinforcement)	Dimensional Properties		Specific Gravity ASTM D792	Ply Adhesion ASTM D413 MD kN/m (lb/in)	Dimensional Strability ASTM D1204 %	Puncture Resistance FTMS 101C Method 2031 kN (lb)	Tear Resistance ASTM D5884 Method B Tongue Tear kN (lb)	Tensile Strength ASTM D751 [2] kN (lb)	Hydrostatic Resistance ASTM D751 [2] Method A kN/m ² (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Suggested Seam Strength		Manufacturer's Suggested Applications [4]
			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
CoolGuard FTL30	EIA	PET	Width up to 61 in (1.5 m)	0.91 (36)	NP	2.6 (15)	1	1.45 (325)	0.13 (30)	105 x 105 (600 x 600)	6897 (1,000)	-34	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolGuard FTL40N	EIA	PET	Width up to 61 in (1.5 m)	1.17 (46)	NP	2.6 (15)	1	2.45 (550)	0.22 (50)	175 x 175 (1,000 x 1,000)	6897 (1,000)	-34	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolGuard HPK80	EIA	PET	Width up to 150 in (3.8 m)	2.03 (80)	NP	1.7 (10)	2.5	0.89 (200)	0.13 (30)	44 x 35 (250 x 200)	2413 (350)	-34	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolGuard HRL36 (PW version available)	EIA	PET	Width up to 150 in (3.8 m)	0.91 (36)	NP	2.1 (12)	2.5	1.67 (375)	0.53 (120)	109 x 105 (625 x 600)	5517 (800)	-40	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolGuard MPK36 (PW version available)	EIA	PET	Width up to 150 in (3.8 m)	0.91 (36)	NP	1.8 (10)	2.5	0.89 (200)	0.18 (40)	44 x 35 (250 x 200)	2413 (350)	-25	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolGuard MPK60 (PW version available)	EIA	PET	Width up to 150 in (3.8 m)	1.52 (60)	NP	1.8 (10)	2	0.89 (200)	0.13 (30)	44 x 35 (250 x 200)	2413 (350)	-29	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolPro 36	PP	PET	Width = 78 or 197 in (2.0 or 5.0 m)	0.91 (36)	0.9	3.5 (20)	1	1.11 (250)	0.31 (70)	48 x 44 (275 x 250)	2413 (350)	-40	NP	NP	CL, SIL, SIC, LL, DL, LPL, LC, TL
CoolPro 45	PP	PET	Width = 78 or 197 in (2.0 or 5.0 m)	1.14 (45)	0.9	3.5 (20)	1	1.33 (300)	0.31 (70)	52 x 44 (300 x 250)	2413 (350)	-40	NP	NP	CL, SIL, SIC, LL, DL, LPL, LC, TL
CoolPro 60	PP	PET	Width = 78 or 197 in (2.0 or 5.0 m)	1.52 (60)	0.9	3.5 (20)	1	1.33 (300)	0.31 (70)	52 x 44 (300 x 250)	2413 (350)	-40	NP	NP	CL, SIL, SIC, LL, DL, LPL, LC, TL
CoolThane FML 87	Urethane	PET	Width = 60 to 68 in (1.5 to 1.7 m)	0.89 (35)	NP	3.5 (20)	2	NP	0.67 (150)	70 x 61 (400 x 350)	3447 (500)	-43	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L1023DEP	Urethane	PET	Width = 61 to 74 in (1.5 to 1.9 m)	0.76 (30)	NP	3.0 (17.5)	2	NP	0.71 (160)	61 X 51 (350 X 300)	2758 (400)	-54	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L1612ESU	Urethane	PET	Width = 60 to 68 in (1.5 to 1.7 m)	0.50 (20)	NP	2.6 (15)	2	NP	0.29 (65)	57 x 44 (325 x 250)	3448 (500)	-43	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L3390NESU	Urethane	PET	Width = 60 to 68 in (1.5 to 1.7 m)	1.3 (50)	NP	2.6 (15)	2	NP	0.18 (40)	193 x 193 (1,100 x 1,100)	4138 (600)	-46	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L4090NESUe	Urethane	Nylon	Width = 60 to 68 in (1.5 to 1.7 m)	1.4 (54)	NP	2.6 (15)	2	NP	0.18 (40)	210 x 193 (1,200 x 1,100)	4138 (600)	-46	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L4090UPW	Urethane	Nylon	Width = 60 to 68 in (1.5 to 1.7 m)	1.4 (54)	NP	2.6 (15)	2	NP	0.16 (35)	88 x 88 (500 x 500)					
CoolShield 45E	PVDF	PET	Width up to 76.5 in (1.9 m)	1.10 (45)	NP	4.4 (25)	2	NP	0.45 (100)	52 x 44 (300 x 250)	2413 (350)	-29	NP	NP	SIL, SIC, SR, SC, LC, TL
Oasis HP	TPA	PET	Width = 150 in (3.8 m)	1.52 (60)	NP	3.5 (20)	2	NP	0.58 (130)	70 x 61 (400 x 350)	4482 (650)	-26	NP	NP	SIL, SIC, SR, SC, LC, TL
Oasis HP	TPA	PET	Width = 196 in (5.0 m)	1.10 (45)	NP	2.6 (15)	2.5	NP	0.24 (55)	44 x 44 (250 x 250)	2413 (350)	-26	NP	NP	SIL, SIC, SR, SC, LC, TL

Cooley Group | www.cooleygroup.com

- [1] PVC = Polyvinyl chloride
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- LLDPE = Linear low density polyethylene
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- [2] As modified in NSF 54, appendix A
 Note: NSF 54 has been withdrawn.

- [3] Method A, Procedure I
 [4] CL = Canal liner
 DP = Decorative pond
 ILC = Interim landfill cover
 LC = Landfill cover
 LL = Landfill liner
 LPL = Leach pad liner
 GC = Geofaam Cover
 PT = Pillow Tanks

- RP = Reserve pit
 RSC = Rain shed cover
 SIL = Surface impoundment liner
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 NP = Not provided by manufacturer
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- * = FTMS 101B
 ** = ASTM D751
 *** = ASTM D4833
 **** = ASTM D7003

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Product Name	Polymer Type [1] (membrane)	Polymer Type [1] (reinforcement)	Dimensional Properties		Specific Gravity ASTM D792	Ply Adhesion ASTM D413 MD kN/m (lb/in)	Dimensional Stability ASTM D1204 %	Puncture Resistance FTMS 101C Method 2031 kN (lb)	Tear Resistance ASTM D5884 Method B Tongue Tear kN (lb)	Tensile Strength ASTM D751 [2] kN (lb)	Hydrostatic Resistance ASTM D751 [2] Method A kN/m ² (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Suggested Seam Strength		Manufacturer's Suggested Applications [4]
			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
e2 Xtrm Ply KEE/EIA	KEE/EIA-GP, NSF 61 or ASTM 7176 [◇]	PET	60" - 120"	20" to 120	1.2	12 [◇]	0.5	350 [◇]	125 [◇]	300 [◇]	700 [◇]	-35	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL
e2 Xtrm Ply KEE/EIA HPL	KEE/EIA-GP, NSF 61 or ASTM 7176 [◇]	PET	60" - 120"	30" to 120	1.2	12 [◇]	0.5 [◇]	400 [◇]	150 [◇]	500 [◇]	800 [◇]	-35	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL
e2 XtrmPly PRG for EPS Geofoam	KEE/EIA-GP, NSF 61 or ASTM 7176 [◇]	PET	120"	38" to 120	1.2	15 [◇]	2	750 [◇]	200 [◇]	650 [◇]	800 [◇]	-25	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL
e2 ER1000	KEE/EIA-GP, NSF 61 or ASTM 7176 [◇]	PET	81"	30	1.2	22	2	800	280	660	900	-40	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL

◇Data listed is min. value for 30 mil products

e2 – E Squared (formerly EPT) | www.e2techtexiles.com

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GEOMEMBRANES REINFORCED

Product Name	Polymer Type [1] (membrane)	Polymer Type [1] (reinforcement)	Dimensional Properties		Specific Gravity ASTM D792	Ply Adhesion ASTM D413 MD kN/m (lb/in)	Dimensional Stability ASTM D1204 %	Puncture Resistance FTMS 101C Method 2031 kN (lb)	Tear Resistance ASTM D5884 Method B Tongue Tear kN (lb)	Tensile Strength ASTM D751 [2] kN (lb)	Hydrostatic Resistance ASTM D751 [2] Method A kN/m ² (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Suggested Seam Strength		Manufacturer's Suggested Applications [4]
			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
Inland Tarp & Liner, LLC www.inlandtarp.com															
ITL® 12	LDPE	HDPE	3,716m ² (100,000ft ²)	.325(12)	<0.97	NP	<-4%	(78***)	(MD56/CD50)**	(MD179/CD154)	(81psi)	-60	(>80)	(>2LB)	CL, DP, ILC, LC, RP, RSC, SIL, SIC
ITL® 17	LDPE	HDPE	3,716m ² (100,000ft ²)	.45(17)	<0.97	NP	<-4%	(95***)	(MD58/CD57)**	(MD191/CD201)	(124psi)	-60	(>80)	(>2LB)	CL, DP, ILC, LC, RP, RSC, SIL, SIC
ITL® 20 LGB	LDPE	HDPE	3,716m ² (80,000ft ²)	.5(20)	<0.97	NP	<-4%	(126***)	(MD59/CD63)**	(MD235/CD225)	(160psi)	-60	(>100)	(>2LB)	CL, DP, ILC, LC, RP, RSC, SIL, SIC
ITL® 30LGB	LDPE	HDPE	3,716m ² (70,000ft ²)	.75(30)	<0.97	NP	<-4%	(167***)	(MD93/CD83)**	(MD431/CD388)	(258psi)	-60	(>150)	(>2LB)	CL, DP, ILC, LC, RP, RSC, SIL, SIC
ITL® 30-3	LDPE	HDPE	3,716m ² (50,000ft ²)	.75(30)◊	<0.97	NP	<-4%	(165***)	(MD80/CD95)**	(MD300/CD325)	(425psi)	-60	(>175)	(>2LB)	CL, DP, ILC, LC, LPL, RP, RSC, SIL, SIC
ITL® 40	LDPE	HDPE	3,716m ² (40,000ft ²)	1(40)	<0.97	NP	<-4%	(200***)	(MD90/CD120)	(MD285/CD350)****	(612psi)	-65	(>200)	(>5LB)	CL, DP, ILC, LC, LPL, RP, RSC, SIL, SIC
ITL® 40 X	LDPE	HDPE	3,716m ² (40,000ft ²)	1(40)	<0.97	NP	<-4%	(291***)	(MD83/CD92)**	(MD453/CD504)	(590psi)	-60	(>200)	(>5LB)	CL, DP, ILC, LC, LPL, RP, RSC, SIL, SIC
ITL® 40 XGL	LDPE	HDPE	3,716m ² (40,000ft ²)	1(40)◊	<0.97	NP	<-4%	(255***)	(MD92/CD137)**	(MD628/CD668)	(542psi)	-60	(>200)	(>5LB)	CL, DP, ILC, LC, LPL, RP, RSC, SIL, SIC
ITL® 60 XGL	LDPE	HDPE	2,787m ² (30,000ft ²)	1.5(60)◊	<0.97	NP	<-4%	(438***)	(MD91/CD144)**	(MD839/CD865)	(523psi)	-60	(>300)	(>5LB)	CL, DP, ILC, LC, LPL, RP, RSC, SIL, SIC

◊ Does not include geotextile top layer

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Product Name	Polymer Type [1] (membrane)	Polymer Type [1] (reinforcement)	Dimensional Properties		Specific Gravity ASTM D792	Ply Adhesion ASTM D413 MD kN/m (lb/in)	Dimensional Stability ASTM D1204 %	Puncture Resistance FTMS 101 C Method 2031 kN (lb)	Tear Resistance ASTM D5884 Method B Tongue Tear kN (lb)	Tensile Strength ASTM D751 [2] kN (lb)	Hydrostatic Resistance ASTM D751 [2] Method A kN/m ² (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Suggested Seam Strength		Manufacturer's Suggested Applications [4]
			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
Aquamaster NovaLiner 12	LDPE	HDPE	3.65 m x 1800 m (12 ft x 6000 ft) 6600 m ² (72000 ft ²)	0.30 (12)	NA	NA	-2.9% MD -2.2% CD	0.27 (60) [◇]	0.20 (45) MD 0.16 (35) CD	24.5 (125) MD 17.5 (80) CD	717 (104)	-40 ^{◇◇}	19.9 (112) MD 14.0 (80) CD	0.8 (5)	CL, DP, RSC, ILC, SIC
Aquamaster NovaLiner 20	LDPE	HDPE	3.65 m x 900 m (12 ft x 3000 ft) 3300 m ² (36000 ft ²)	0.51 (20)	NA	NA	-2.5% MD -1.8% CD	0.53 (120) [◇]	0.22 (50) MD 0.27 (60) CD	28 (160) MD 36.8 (210) CD	772 (112)	-65 ^{◇◇}	24.5 (140) MD 37.8 (216) CD	0.8 (5)	CL, DP, RSC, ILC, SIC
Aquamaster NovaLiner 24	LDPE	HDPE	3.65 m x 900 m (12 ft x 3000 ft) 3300 m ² (36000 ft ²)	0.61 (24)	NA	NA	-2.9% MD -1.8% CD	0.49 (110) [◇]	0.33 (75) MD 0.36 (80) CD	35.9 (205) MD 28.9 (165) CD	1440 (209)	-65 ^{◇◇}	30.8 (176) MD 25.9 (148) CD	0.8 (5)	CL, DP, RSC, ILC, SIC, RP
Aquamaster NovaLiner 30	LDPE	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1650 m ² (18000 ft ²)	0.76 (30)	NA	NA	-2.2% MD -1.6% CD	0.53 (120) [◇]	0.18 (40) MD 0.24 (55) CD	28 (160) MD 33.3 (190) CD	2329 (338)	-65 ^{◇◇}	26.3 (150) MD 31.5 (180) CD	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster NovaLiner 40	LDPE	HDPE	3.65m x 411m (12ft x 1350ft) 1500m ² (18000ft ²)	1.00 (40)	NA	NA	-3.7% MD -2.1% CD	0.76 (170) [◇]	0.31 (70) MD 0.38 (85) CD	45.5 (260) MD 57.8(330) CD	3376 (490)	-65 ^{◇◇}	38.5 (220) MD 49.0 (280) CD*	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster ArmorLiner 24	LDPE	HDPE	3.65 m x 900 m (12 ft x 3000 ft) 3300 m ² (36000 ft ²)	0.61 (24)	NA	NA	-2.7% MD -1.4% CD	0.71 (160) [◇]	0.40 (90) MD 0.40 (90) CD	38.5 (220) MD 39.4 (225) CD	2343 (340)	-65 ^{◇◇}	34.8 (196) MD 35.0 (200) CD	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster ArmorLiner 30	LDPE	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1650 m ² (18000 ft ²)	0.76 (30)	NA	NA	-2.2% MD -1.4% CD	0.71 (160) [◇]	0.16 (35) MD 0.18 (40) CD	35 (200) MD 49 (280) CD	3362 (488)	-65 ^{◇◇}	29.4 (168) MD 34.2 (195) CD	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster ArmorLiner 40L	LDPE	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1642 m ² (18000 ft ²)	1.02 (40)	NA	NA	-2.2% MD -1.2% CD	1.22 (275) [◇]	0.54 (122) MD 0.53 (120) CD	76.1 (435) MD 73.5 (420) CD	3776 (548)	-65 ^{◇◇}	64.5 (368) MD 64.5 (368) CD	0.8 (5)	CL, DP, SIL, SIC, LC, TL, LPL
Aquamaster ArmorLiner 45L	LDPE	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1642 m ² (18000 ft ²)	1.14 (45)	NA	NA	*-2.1% MD -1.5% CD*	1.33 (300) [◇]	0.36 (80) MD 0.36 (80) CD	*61.3 (350) MD 61.3 (350) CD*	4851 (704)	-65 ^{◇◇}	61.0 (348) MD 51.1 (452) CD	0.8 (5)	CL, DP, SIL, SIC, LC, TL, LPL
Aquamaster ArmorLiner 30SFL	LDPE / LLDPE	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1642 m ² (18000 ft ²)	0.76 (30)	NA	NA	-1.9% MD -1.6% CD	0.67 (150) [◇]	0.35 (79) MD 0.36 (81) CD	40.3 (230) MD 35.9 (205) CD	3500 (508)	-65 ^{◇◇}	36.4 (208) MD 36.4 (208) CD	0.8 (5)	CL, DP, SIL, SIC, LC, TL, LPL
Aquamaster ArmorPad 3NWL	LDPE + PP Non-Woven	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1642 m ² (18000 ft ²)	0.61 (24) ^{◇◇◇}	NA	NA	-1.9% MD -1.4% CD	0.62 (140) [◇]	0.40 (90) MD 0.42 (95) CD	35.9 (205) MD 31.5 (180) CD	2205 (320)	NA	35.0 (200) MD 28.0 (160) CD	0.8 (5)	CL, DP, RP
Aquamaster ArmorPad 3NWL D	LDPE + PP Non-Woven	HDPE	3.65 m x 450 m (12 ft x 1500 ft) 1642 m ² (18000 ft ²)	0.61 (24) ^{◇◇◇}	NA	NA	-1.5% MD -1.0% CD	0.111 (250) [◇]	0.36 (80) MD 0.40 (90) CD	35.9 (205) MD 31.5 (180) CD	2205 (320)	NA	35.0 (200) MD 28.0 (160) CD	0.8 (5)	CL, DP, RP

◇ ASTM D4833 ◇◇ ASTM D2136 ◇◇◇ Without non-woven layers

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Layfield Geosynthetics & Industrial Fabrics Ltd. www.layfieldgroup.com															
HAZGARD 5000 HT	O/C	PET	1,250 m ² (13,000 ft ²)	0.76 (30)	NA	2.6 (15)	0.5	NA	NA	2.67 kN (600 lbs)	4140 (800)	-35	36.8 (210)	3.5 (20)	SC
CSPE 36	O/C	CSPE	2,300 m ² (25,000 ft ²)	0.91 (36)	NA	1.22 (7)	2	0.89 (200)	0.31 (70)	1.0 (225)	1.33 (300)	-40	0.89 (200)	Film Tear Bond	SC
CSPE 45	O/C	CSPE	2,135 m ² (23,000 ft ²)	1.14 (45)	NA	1.22 (7)	2	1.0 (225)	0.36 (80)	1.11 (250)	1.56 (350)	-40	1.0 (225)	Film Tear Bond	SC
CSPE 60	O/C	CSPE	1670 m ² (18,000 ft ²)	1.52 (60)	NA	1.22 (7)	2	1.33 (300)	0.36 (80)	1.33 (300)	1.78 (400)	-40	1.2 (270)	Film Tear Bond	SC
Plastatech Engineering Ltd. www.plastatech.com															
Plastatech Tech 5	PVC	PVC	64 in. x 150 yd.	30 mil	NA	NA	-0.7 MD / 0.03 CMD	>180	105 MD / 81 CMD	NA	>660	NA	NA	NA	CL, DP, RP, RSC, SIL
Plastatech Tech 7	PVC	PVC	120 in. x 250 yd.	40 mil	NA	NA	-0.1 MD / 0.1 CMD	416	349 MD / 187 CMD	NA	NA	NA	NA	NA	CL, DP, RP, RSC, SIL

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			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
Dura-Skrim N30B - Meets GRI-GM25	LLDPE	PET	3700M ² (40,000 ft ²)	0.69 (27)	NP	3 (17)	<1%	.36 (80) [◇]	0.33 (70)	38 (220) ^{◇◇}	NP	<-40	9.6 (55)	7 (40)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim N36B - Meets GRI-GM25	LLDPE	PET	2800M ² (30,000 ft ²)	0.81 (32)	NP	3.6 (21)	<1%	.38 (85) [◇]	0.36 (80)	42 (240) ^{◇◇}	NP	<-40	13 (75)	8 (45)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim N45B - Meets GRI-GM25	LLDPE	PET	2400M ² (26,000 ft ²)	1.01 (40)	NP	4.2 (24)	<1%	.48 (108) [◇]	0.45 (100)	48 (275) ^{◇◇}	NP	<-40	17 (95)	8.7 (50)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim R20BV - Meets GRI-GM22	LLDPE	PET	4600M ² (50,000 ft ²)	0.43 (17)	NP	NA	NP	NP	0.29 (65)	24 (135)	1241 (180) ^{◇◇◇}	<-40	NP	NP	ILC, SIL, SIC, RP
Dura-Skrim R12BV - Meets GRI-GM22	LLDPE	PET	7600M ² (82,000 ft ²)	0.28 (11.0)	NP	NA	NP	NP	0.18 (40)	14 (80)	586 (85) ^{◇◇◇}	<-40	NP	NP	ILC, RSC, RP
Dura-Skrim R88V - Meets GRI-GM22	LLDPE	PET	11000M ² (120,000 ft ²)	0.18 (7.2)	NP	NA	NP	NP	0.09 (20)	11 (60) ^{◇◇}	448 (65) ^{◇◇◇}	<-40	NP	NP	ILC, RSC, RP
Dura-Skrim NQ36B - Meets GRI-GM18	Flexible PP	PET	2800M ² (30,000 ft ²)	0.81 (32)	NP	3.5 (20)	<1%	.36 (80) [◇]	0.40 (90)	35 (200) ^{◇◇}	NP	<-40	13 (75)	7.0 (40)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim NQ45B - Meets GRI-GM18	Flexible PP	PET	2400M ² (26,000 ft ²)	1.02 (40)	NP	3.8 (22)	<1%	.38 (85) [◇]	0.40 (90)	44 (250) ^{◇◇}	NP	<-40	18 (100)	8.7 (50)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim N36BT1 - Meets GRI-GM25	LLDPE Textured 1-Side	PET	1200M ² (13,000 ft ²)	0.79 (31)	NP	5.4 (31)	<1%	.38 (85) [◇]	0.36 (80)	42 (240) ^{◇◇}	NP	<-40	13 (75)	8 (45)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim N36BT2 - Meets GRI-GM25	LLDPE Textured 2-Side	PET	1200M ² (13,000 ft ²)	0.79 (31)	NP	5.4 (31)	<1%	.38 (85) [◇]	0.36 (80)	42 (240) ^{◇◇}	NP	<-40	13 (75)	8 (45)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim N45BT1 - Meets GRI-GM25	LLDPE Textured 1-Side	PET	1200M ² (13,000 ft ²)	0.99 (39)	NP	5.6 (32)	<1%	.48 (108) [◇]	0.45 (100)	48 (275) ^{◇◇}	NP	<-40	17 (95)	8.7 (50)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim N45BT2 - Meets GRI-GM25	LLDPE Textured 2-Side	PET	1200M ² (13,000 ft ²)	0.99 (39)	NP	5.6 (32)	<1%	.48 (108) [◇]	0.45 (100)	48 (275) ^{◇◇}	NP	<-40	17 (95)	8.7 (50)	CL, SIL, SIC, LPL, TL, LC, DP
CSPE M284 (45 Mil)	CSPE	PET	1200M ² (13,000 ft ²)	1.14 (45)	1.45	NA	NA	1.11 (250) [◇] FTMS 101B	0.47 (105) ASTM D751	49 (280) ^{◇◇}	3102 (450)	<-40	NP	NP	CL, SIL, SIC, LPL, TL, LC, DP

◇ Puncture Resistance ASTM D4833 ◇◇ Tensile Strength ASTM D7003 ◇◇◇ Mullen Burst ASTM D751

- [1] PVC = Polyvinyl chloride
- CPE = Chlorinated polyethylene
- CSPE = Chlorosulfonated polyethylene
- EIA = Ethylene interpolymer alloy
- fPP = Flexible polypropylene
- HDPE = High density polyethylene
- HDPE-T = High density polyethylene, textured

- LLDPE = Linear low density polyethylene
- LLDPE-T = Linear low density polyethylene, textured
- PET = Polyester
- PP = Polypropylene
- O/C = Other or combination
- TPO = Thermoplastic polyolefin

- [2] As modified in NSF 54, appendix A. Note: NSF 54 has been withdrawn.
- [3] Method A, Procedure I
- [4] CL = Canal liner
- DP = Decorative pond
- LC = Landfill cover
- ILC = Interim landfill cover
- LL = Landfill liner
- LPL = Leach pad liner
- GC = Geofoam Cover
- PT = Pillow Tanks

- RP = Reserve pit
- RSC = Rain shed cover
- SIL = Surface impoundment liner
- SIC = Surface impoundment cover
- TL = Tunnel liner
- NP = Not provided by manufacturer
- NA = Not applicable, per manufacturer

- * = FTMS 101B
- ** = ASTM D751
- *** = ASTM D4833
- **** = ASTM D7003

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GEOMEMBRANES REINFORCED

Product Name	Polymer Type [1] (membrane)	Polymer Type [1] (reinforcement)	Dimensional Properties		Specific Gravity ASTM D792	Ply Adhesion ASTM D413 MD kN/m (lb/in)	Dimensional Stability ASTM D1204 %	Puncture Resistance FTMS 101C Method 2031 kN (lb)	Tear Resistance ASTM D5884 Method B Tongue Tear kN (lb)	Tensile Strength ASTM D751 [2] kN (lb)	Hydrostatic Resistance ASTM D751 [2] Method A kN/m ² (lb/in ²)	Low Temperature Brittleness ASTM D1790 °C	Suggested Seam Strength		Manufacturer's Suggested Applications [4]
			Maximum Panel Size Roll Width/Length m/m (ft/ft)	Thickness ASTM 1593 or D5199 mm (mil)									Shear ASTM D751 [3] kN/m (lb/in)	Peel ASTM D413 kN/m (lb/in)	
9146 XR-5 ULT	EIA	PET	1,200 m ² 13,000 ft ²	1.5 (60)	1.2 app.	2.63 (15)	0.5	700	150	4.0 (900)	6900 (1000)	-50	4.0 (900)	3.50 (20)	CL, SIL, SIC, LL, DL
8130 XR-3 PW	EIA	PET	1,400 m ² 15,000 ft ²	0.75 (30)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520 (800)	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, DL
8130 XR-5	EIA	PET	1,400 m ² 15,000 ft ²	0.75 (30)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520 (800)	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, LL, DL, LC, LPL
8138 XR-5	EIA	PET	1,200 m ² 13,000 ft ²	1.0 (40)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520 (800)	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, LL, DL, LC, LPL
8228 XR-3	EIA	PET	1,400 m ² 15,000 ft ²	0.75 (30)	1.2 app.	2.10 (12)	0.5	205	50	0.89 (200)	2070 (300)	-32	1.11 (250)	1.75 (10)	CL, SIL, SIC, LC, LPL
8142 XR-5 PW	EIA	PET	1,200 m ² 13,000 ft ²	1.13 (45)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520 (800)	-35	2.46 (550)	3.50 (20)	SIC, SIL, CL
9832 XR-5G	EIA	PET	1,400 m ² 15,000 ft ²	0.914 (36)	1.2 app.	2.63 (15)	0.5	440	125	2.90 (650)	5520 (800)	-40	2.90 (650)	3.50 (20)	CL, SIL, SIC, LL, DL, LC, LPL, GC
1936 PTF	TPU	Nylon	1,400 m ² 15,000 ft ²	1.0 (40)	1.2 app.	7.01 (40)	0.5	700	125	4.46 (1,000)	10,340 (1,500)	-50	4.46 (1000)	3.50 (20)	SIL, OB, PT
8130 XR FR	EIA	PET	1,400 m ² 15,000 ft ²	0.75 (30)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520 (800)	-50	2.46 (550)	3.50 (20)	CL, SIL, SIC, LL, DL, LC, LPL

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