



GEOMEMBRANES

PRODUCT DATA

FOR MORE INFORMATION

The specification charts have been provided 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).

GMA
 1801 County Rd B West
 Roseville, MN 55113-4061 USA
 +1 651 225 6956
 fax +1 651 631 9334
 lpassus@ifai.com
 www.gmanow.com

PUBLISHER'S NOTE

All information included in this Specifier's Guide was compiled from information submitted by firms in the geosynthetics industry. Specifications were submitted voluntarily and their 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 Specifier's Guide is intended as a guide, and *Geosynthetics* and IFAI encourage readers to contact the companies listed for further information.

These products are engineered to help 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.

Several methods are used to join 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 signed a certificate of compliance verifying the accuracy of this data.

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 %						
AgruAmerica Inc. www.agruamerica.com														
Agru Drain Liner®	LLDPE structured	7.0/91.434 (23/300')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	note [4]	CL, SIL, LL, LC, LPL, DL
Agru Grip Liner®	LLDPE structured	7.0/91.434 (23/300')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	note [4]	CL, SIL, LL, LC, LPL, DL
Agru Microspike® Liner	LLDPE-T	7.0/283.47 (23/710')	NA	1.0 (40)	0.939 max.	NA	20 (112)	NA/400	0.22 (50)	0.11 (25)	-60 (-83)	2-3	note [4]	CL, LC, TL, LPL, DL
Agru Microspike® Liner	LLDPE-T	7.0/216.41 (23/505')	NA	1.5 (60)	0.939 max.	NA	29 (168)	NA/400	0.31 (70)	0.16 (36)	-60 (-83)	2-3	note [4]	CL, LC, TL, LPL, DL
Agru Microspike® Liner	LLDPE-T	7.0/117.35 (23/385')	NA	2.0 (80)	0.939 max.	NA	39 (224)	NA/400	0.40 (90)	0.22 (50)	-60 (-83)	2-3	note [4]	CL, LC, TL, LPL, DL
Agru Smooth® Liner	LLDPE-S	7.0/254.51 (23/835')	1.0 (40)	NA	0.939 max.	NA	28 (160)	NA/800	0.26 (60)	0.11 (25)	-60 (-83)	2-3	note [4]	CL, LC, TL, LPL, DL
Agru Smooth® Liner	LLDPE-S	7.0/164.59 (23/540')	1.5 (60)	NA	0.939 max.	NA	42 (240)	NA/800	0.40 (90)	0.16 (37)	-60 (-83)	2-3	note [4]	CL, LC, TL, LPL, DL
Agru Smooth® Liner	LLDPE-S	7.0/126.49 (23/415')	2.0 (80)	NA	0.939 max.	NA	56 (320)	NA/800	0.53 (120)	0.21 (48)	-60 (-83)	2-3	note [4]	CL, LC, TL, LPL, DL
Agru Super Gripnet® Liner	LLDPE structured	7.0/91.435 (23/300')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	note [4]	CL, SIL, LL, LC, LPL, DL
Agru ClosureTurf™ Liner/Turf	LLDPE O/C structured-turf	7.0/91.435 (23/300')	NA	1.5 (60)	0.939 max.	NA	22 (126)	NA/300	0.31 (70)	0.18 (40)	-60 (-83)	2-3	note [4]	CL, SIL, LL, LC, LPL, DL
Atarfil S.L. www.atarfil.com														
ATARFIL LLD smooth	LLDPE	width: 6.0/ 6.3/ 7.5m length: 70 to 280m	0.5 to 4.0 mm	NA	≤ 0.940	NA	13-104	NA/≥700	0.15-1.2	0.05-0.39	-75	2-2.5	1-2	CL, SIL, DP, RP
ATARFIL LLDS colored smooth	LLDPE	width: 6.0/ 6.3/ 7.5m length: 70 to 280m	0.5 to 4.0 mm	NA	≤ 0.940	NA	13-104	NA/≥700	0.15-1.2	0.05-0.39	-75	2-2.5	1-2	CL, SIL, DP, RP
ATARFIL LLDE conductive	LLDPE	width: 6.0/ 6.3/ 7.5m length: 70 to 280m	0.5 to 4.0 mm	NA	≤ 0.940	NA	13-104	NA/≥700	0.15-1.2	0.05-0.39	-75	≥2	1-2	CL, SIL, DP, RP
ATARFIL LLD TM/ TMT® (single/ double textured structured) asperity 0.9mm	LLDPE	width: 6.0m length: 90 to 200m	0.5 to 4.0 mm	NA	≤ 0.940	NA	13-104	NA/≥700	0.15-1.2	0.05-0.39	-75	2-2.5	1-2	LC
ATARFIL LLD TM/ TMT® (single/ double textured structured) asperity 0.6mm	LLDPE	width: 6.0/ 6.3/ 7.5m length: 90 to 200m	0.5 to 4.0 mm	NA	≤ 0.940	NA	13-104	NA/≥700	0.15-1.2	0.05-0.39	-75	2-2.5	1-2	LC
ATARFIL LLD TM/TMT® S colored (single/ double textured structured) asperity 0.6mm	LLDPE	width: 6.0/ 6.3/ 7.5m length: 90 to 200m	0.5 to 4.0 mm	NA	≤ 0.940	NA	13-104	NA/≥700	0.15-1.2	0.05-0.39	-75	2-2.5	1-2	LC
◇ Tensile, Puncture and Tear Properties: Values obtained from the smooth part of geomembrane ◇◇ Any Atarfil product can be colaminated 1 or 2 faces with GTX of any weight														

- [1] CX = Coextruded
- CX-T = Coextruded, textured
- EIA = Ethylene interpolmer 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 geosynthetics
- 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
- LPL = Leach pad liner
- LC = Landfill cover
- TL = Tunnel liner
- RP = Reserve pit
- DL = Dam liner
- SIC = Surface impoundment cover
- LL = Landfill liner
- DP = Decorative pond
- SIL = Surface impoundment liner
- 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 %						
Atarfil S.L. www.atarfil.com														
ATARFLEX smooth	VLDPE	width: 2.0/ 6.0m length: 20 to 200m	0.75–2.0mm	NA	≤ 0.920	NA	12–36	NA/≥700	0.25–0.75	0.05–0.16	-70	2–2.5	1–2	SIL, TL
ATARFLEX TM/ TMT* (single/ double textured structured) asperity 0.9mm	VLDPE	width: 6.0m length: 90 to 200m	0.75–2.0mm	NA	≤ 0.920	NA	12–36	NA/≥700	0.25–0.75	0.05–0.16	-70	2–2.5	1–2	SIL
ATARFLEX S colored smooth	VLDPE	width: 2.0/ 6.0m length: 20-40/ 90-200m	0.75–2.0	NA	≤ 0.920	NA	12–36	NA/≥700	0.25–0.75	0.05–0.16	-70	2–2.5	1–2	SIL, TL
ATARFLEX TW tunnels	VLDPE	width: 2.0 length: 20-40m	1.5–3.0	NA	≤ 0.920	NA	16–33	NA/≥700	0.33–1.0	0.06–0.13	-70	NA	NA	TL
ATARTEC Roofing	TPO/ FPO	width: 2.0 length: 20-40m	0.75–2.5	NA	NP	NA	8.3–41.5	NA/≥700	NP	EN12310-2= 54-270	-70	2–2.5	1–2	roofing
ATARFIL COLAMINATED◊◊	any (HD/LLDPE/ VLDPE/PP)	max. 6m width	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
◊ Tensile, Puncture and Tear Properties: Values obtained from the smooth part of geomembrane ◊◊ Any Atarfil product can be colaminated 1 or 2 faces with GTX of any weight														
Brawler Industries LLC www.brawler.com														
SuperGeo 12 Smooth LLDPE	LLDPE	5.79/564 (19/1,850)	0.30 (12)	NA	0.92	NA	7 (43)	800	0.070 (16)	0.026 (6)	-70 (-94)	2	1, 2, 3	all
SuperGeo 20 Smooth LLDPE	LLDPE	5.79/366 (19/1,200)	0.50 (20)	NA	0.92	NA	13 (76)	800	0.124 (28)	0.050 (11)	-70 (-94)	2	1, 2, 3	all
SuperGeo 30 Smooth LLDPE	LLDPE	6.7/332 (22/1,090)	0.75 (30)	NA	0.939	NA	20 (114)	800	0.190 (42)	0.070 (16)	<-70 (<-94)	2–3	1, 2, 3	all
SuperGeo 40 Smooth LLDPE	LLDPE	6.7/248 (22/815)	1.00 (40)	NA	0.939	NA	27 (152)	800	0.250 (56)	0.100 (22)	<-70 (<-94)	2–3	1, 2, 3	all
SuperGeo 60 Smooth LLDPE	LLDPE	6.7/165 (22/540)	1.50 (60)	NA	0.939	NA	40 (228)	800	0.370 (84)	0.150 (33)	<-70 (<-94)	2–3	1, 2, 3	all
SuperGeo 30 Textured LLDPE	LLDPE-CX-T	6.6/296 (21.5/970)	NA	0.75 (30)	0.939	NA	9 (45)	250	0.150 (33)	0.070 (16)	<-70 (<-94)	2–3	1, 2, 3	all
SuperGeo 40 Textured LLDPE	LLDPE-CX-T	6.6/229 (21.5/750)	NA	1.00 (40)	0.939	NA	11 (60)	250	0.200 (44)	0.100 (22)	<-70 (<-94)	2–3	1, 2, 3	all
SuperGeo 60 Textured LLDPE	LLDPE-CX-T	6.6/158 (21.5/520)	NA	1.50 (60)	0.939	NA	16 (90)	250	0.300 (66)	0.150 (33)	<-70 (<-94)	2–3	1, 2, 3	all

- [1] CX = Coextruded
- CX-T = Coextruded, textured
- EIA = Ethylene interpolmer alloy
- EPDM = Ethylene propylene diene monomer
- FP = 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 geosynthetics
- 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
- LPL = Leach pad liner
- LC = Landfill cover
- TL = Tunnel liner
- RP = Reserve pit
- DL = Dam liner
- SIC = Surface impoundment cover
- LL = Landfill liner
- DP = Decorative pond
- SIL = Surface impoundment liner
- 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 %						

Engineered Polymer Technologies (EPT) | www.epttech.com

EPT Xtrm Ply TPU	TPU (Ester or Ether based Polyurethane)	width 60" to 120"	20 to 120 mils *data listed is min. value for 20 mil product	NA	NA	NA	NA	NA	NA	NA	-40	NA	NA	SIL, SIC, SR, SC, LC, TL
-------------------------	---	-------------------	--	----	----	----	----	----	----	----	-----	----	----	--------------------------

GSE Environmental | www.gseworld.com

GSE Ultraflex Smooth	LLDPE	6.86/265 (22.5/870)	1.0 (40)	NA	0.939	NA	27 (152)	NA/800	0.250 (56)	0.100 (22)	<-70 (<-94)	2-3	1, 2, 3	all
GSE Ultraflex Smooth	LLDPE	6.86/171 (22.5/560)	1.5 (60)	NA	0.939	NA	40 (228)	NA/800	0.370 (84)	0.150 (33)	<-70 (<-94)	2-3	1, 2, 3	all
GSE Ultraflex Textured	LLDPE-CX-T	6.86/213 (22.5/700)	NA	1.0 (40)	0.939	NA	11 (60)	NA/250	0.200 (44)	0.100 (22)	<-70 (<-94)	2-3	1, 2, 3	all
GSE Ultraflex Textured	LLDPE-CX-T	6.86/158 (22.5/520)	NA	1.5 (60)	0.939	NA	16 (90)	NA/250	0.300 (66)	0.150 (33)	<-70 (<-94)	2-3	1, 2, 3	all
High Performance GSE Ultraflex Smooth	LLDPE	6.86/265 (22.5/870)	1.0 (40)	NA	0.939	NA	29 (170)	NA/900	0.311 (70)	0.100 (22)	<-70 (<-94)	2-3	1, 2, 3	all
High Performance GSE Ultraflex Smooth	LLDPE	6.86/171 (22.5/560)	1.5 (60)	NA	0.939	NA	42 (240)	NA/900	0.444 (100)	0.150 (33)	<-70 (<-94)	2-3	1, 2, 3	all
High Performance GSE Ultraflex Smooth	LLDPE	6.86/131 (22.5/430)	2.0 (80)	NA	0.939	NA	56 (320)	NA/900	0.578 (130)	0.200 (44)	<-70 (<-94)	2-3	1, 2, 3	all
High Performance GSE Ultraflex Textured	LLDPE-CX-T	6.86/158 (22.5/520)	NA	1.5 (60)	0.939	NA	29 (168)	NA/500	0.422 (95)	0.169 (38)	<-70 (<-94)	2-3	1, 2, 3	all
High Performance GSE Ultraflex Textured	LLDPE-CX-T	6.86/122 (22.5/400)	NA	2.0 (80)	0.939	NA	39 (224)	NA/500	0.556 (125)	0.222 (50)	<-70 (<-94)	2-3	1, 2, 3	all

All of GSE Geomembranes are available with black, white or green surface layers.

Huikwang Corp. | www.huitex.com

Huitex VF	LLDPE CX	7/84-420 (23/276-1378)	0.50-2.50 (20-100)	NA	<0.939	NA	13-66 (76-380)	NA/800	0.12-0.62 (27-140)	0.05-0.25 (11-56)	-70 (-94)	2-3	1 or 2	all
Huitex VX	LLDPE CX-T	7/76-225 (23/249-738)	NA	0.75-2.50 (30-100)	<0.939	NA	9-26 (45-150)	NA/250	0.15-0.50 (33-110)	0.07-0.25 (16-55)	-70 (-94)	2-3	1 or 2	all

- [1] CX = Coextruded
- CX-T = Coextruded, textured
- EIA = Ethylene interpolmer alloy
- EPDM = Ethylene propylene diene monomer
- FPF = 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
- LPL = Leach pad liner
- LC = Landfill cover
- TL = Tunnel liner
- RP = Reserve pit
- DL = Dam liner
- SIC = Surface impoundment cover
- LL = Landfill liner
- DP = Decorative pond
- SIL = Surface impoundment liner
- 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 %						

Layfield Geosynthetics & Industrial Fabric Ltd. | www.layfieldgroup.com

Enviro Liner 6030HD	O/C	3.75/457 (12.3/1250)	0.76 (30)	NA	NA	NA	25 (141)	1000%	0.24 (53)	NA	-70	2-3	pass	all
Enviro Liner 6040HD	O/C	3.75/305 (12.3/1000) 6.86/229 (22.5/750)	1.0 (40)	NA	NA	NA	31 (180)	1000%	0.30 (67)	NA	-70	2-3	pass	all
Enviro Liner 6050HD	O/C	6.86/182 (22.5/600)	1.27 (50)	NA	NA	NA	38 (220)	1000%	0.33 (75)	NA	-70	2-3	pass	all
Enviro Liner 6060HD	O/C	6.8/158 (22.5/520)	1.50 (60)	NA	NA	NA	44.5 (255)	1000%	0.40 (90)	NA	-70	2-3	pass	all
Enviro Liner 6080HD	O/C	6.8/122 (22.5/400)	2.0 (80)	NA	NA	NA	53 (304)	800%	0.50 (112)	NA	-70	2-3	pass	all
Enviro Liner 6140HD Textured	O/C	3.75/305 (12.3/1000) 6.8/171 (22.5/560)	NA	0.97 (38)	NA	NA	11 (60)	250%	0.20 (44)	0.100 (22)	-70	2-3	pass	all
Enviro Liner 6160HD Textured	O/C	6.8/134 (22.5/440)	NA	1.45 (57)	NA	NA	16 (90)	250%	0.30 (66)	0.150 (33)	-70	2-3	pass	all
Enviro Liner 7040	O/C	3.75/305 (12.3/1000) 6.86/229 (22.5/750)	1.0 (40)	NA	NA	NA	29 (164)	700%	0.25 (56)	0.10 (22)	-70	2-3	pass	all
Enviro Liner 7050	O/C	6.86/182 (22.5/600)	1.27 (50)	NA	NA	NA	35 (200)	700%	0.31 (70)	0.12 (27)	-70	2-3	pass	all
Enviro Liner 7060	O/C	6.8/158 (22.5/520)	1.5 (60)	NA	NA	NA	42 (240)	700%	0.37 (84)	0.15 (33)	-70	2-3	pass	all
HAZGARD 635FR	O/C	3.75/305 (12.3/1000)	0.88 (35)	NA	NA	NA	22.8 (130)	1000%	0.218 (49)	NA	-70	red	NA	SC (Secondary Containment)

Plásticos Agrícolas y Geomembranas de México S.A. de C.V. | www.pqa.com.co

PQA LLDPE SMOOTH GM17	LLDPE	7.0/225 (22/738)	1.0 (40)	NA	0.939	NA	38 (218)	NA/800	0.375 (82)	0.121 (26)	NP	2-3	1, 2, 3	all
PQA LLDPE SMOOTH GM17	LLDPE	7.0/150 (22/492)	1.5 (60)	NA	0.939	NA	59 (337)	NA/800	0.550 (123)	0.184 (40)	NP	2-3	1, 2, 3	all
PQA LLDPE SMOOTH GM17	LLDPE	7.0/110 (22/360)	2.0 (80)	NA	0.939	NA	64 (365)	NA/800	0.61 (137)	0.280 (63)	NP	2-3	1, 2, 3	all
PQA LLDPE TEXTURED GM17	LLDPE	7.0/120 (22/393)	1.5 (60)	NA	0.939	NA	30 (175)	NA/500	0.45 (101)	0.17 (38)	NP	2-3	1, 2, 3	all
PQA LLDPE TEXTURED GM17	LLDPE	7.0/90 (22/295)	2.0 (80)	NA	0.939	NA	40 (228)	NA/500	0.55 (123)	0.25 (56)	NP	2-3	1, 2, 3	all

Raven Industries Inc. | www.ravengeo.com

Rufco 2000B	LLDPE	4600 (50,000 ft ²)	0.50 (20)	NA	≤0.939	NA	13 (76)	800	0.13 (30)	0.05 (11)	-70 (-57)	2	note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Rufco 3000B	LLDPE	3500 (35,000 ft ²)	0.75 (30)	NA	≤0.939	NA	22 (125)	800	0.20 (45)	0.07 (16)	-70 (-57)	2	note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Rufco 4000B	LLDPE	2300 (25,000 ft ²)	1.00 (40)	NA	≤0.939	NA	32 (180)	800	0.27 (60)	0.10 (22)	-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	14.9 (85)	300	0.33 (71)	0.09 (19)	-40 (-40)	2	note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC

ILC = Interim landfill cover
RSC = Rain shed cover

- [1] CX = Coextruded
CX-T = Coextruded, textured
EIA = Ethylene interpolmer 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 geosynthetics
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
NP = Not provided by manufacturer
NA = Not applicable, per manufacturer

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

GEOMEMBRANES | POLYETHYLENE | NON-HDPE

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 %						
Absolute Barrier Y40BAC	LLDPE/EVOH	2300 (25,000 ft ²)	1.00 (40)	NA	≤0.924	NA	16 (90)	350	0.33 (75)	0.10 (22)	-40 (-40)	2	note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Absolute Barrier X40BAL	HDPE/EVOH	1600 (19,200 ft ²) LF Mill Rolls	1.00 (40)	NA	≥0.940	NA	19.1 (109)	411	0.41 (91)	0.14 (32)	-40 (-40)	2	note [4]	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)	NA	≥0.940	NA	29.2 (166.5)	404	0.63 (138)	0.22 (49)	-40 (-40)	2	note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC
Rufco V30B	VLDPE	3500 (35,000 ft ²)	0.75 (30)	NA	≤0.914	NA	24 (135)	1000	0.21 (48)	0.04 (9)	-40 (-40)	2	note [4]	CL, LPL, LC, TL, RP, SIC, DP, SIL, RSC

ILC = Interim landfill cover
RSC = Rain shed cover

Solmax International Inc. | www.solmax.com

Solmax LLDPE Smooth Green/Black	LLDPE-CX-S	6.8-8.0/97-427 (22.3-26.2/320-1400)	0.5-2.5 (20-100)	NA	<0.939	NA	13-66 (75-377)	800	0.12-0.62 (28-140)	0.05-0.25 (11-56)	-75 (-103)	2-3	1 or 2	DL, LC, TL, DP
Solmax LLDPE Textured Green/Black	LLDPE-CX-T	6.8-8.0/97-305 (22.3-26.2/320-1000)	NA	0.75-2.5 (20-100)	<0.939	NA	9-26 (52-150)	250	0.15-0.50 (34-112)	0.07-0.25 (16-56)	-75 (-103)	2-3	1 or 2	DL, LC, TL, DP
Solmax LLDPE Smooth Reflective/Conductive	LLDPE-CX-S	6.8-8.0/97-427 (22.3-26.2/320-1400)	0.5-2.5 (20-100)	NA	<0.939	NA	13-66 (75-377)	800	0.12-0.62 (28-140)	0.05-0.25 (11-56)	-75 (-103)	2-3	1 or 2	DL, LC, TL, DP
Solmax LLDPE Textured Reflective/Conductive	LLDPE-CX-T	6.8-8.0/97-305 (22.3-26.2/320-1000)	NA	0.75-2.5 (20-100)	<0.939	NA	9-26 (52-150)	250	0.15-0.50 (34-112)	0.07-0.25 (16-56)	-75 (-103)	2-3	1 or 2	DL, LC, TL, DP
Envirox Smooth	O/C-CX-S	8.0/140-420 (26.2/460-1375)	0.5-1.5 (20-60)	NA	NA	NA	16.5-44.5 (95-255)	1000*	0.18-0.40 (41-90)	0.05-0.16 (11-35)	-70 (-94)	2-3	1 or 2	DL, LC, TL, DP
Envirox Textured	O/C-CX-T	8.0/140-250 (26.2/460-820)	NA	0.75-1.5 (30-60)	NA	NA	9-16 (45-90)	250	0.15-0.29 (33-65)	0.07-0.15 (16-34)	-70 (-94)	2-3	1 or 2	DL, LC, TL, DP

*Based on a gauge length of 1.5"

Sotrafa | www.sotrafa.com

ALVATECH LLDPE	LLDPE	w: 7.5 l: 260	0.75 mm	NP	0.939-0.925	NP	23 (≥20)	≥800	290 (≥190)	90 (≥70)	NP	2.0-3.0	1-2	reservoirs, floating covers, landfills, environmental works, underground works
ALVATECH LLDPE	LLDPE	w: 7.5 l: 200	1 mm	NP	0.939-0.925	NP	32 (≥27)	≥800	370 (≥250)	120 (≥100)	NP	2.0-3.0	1-2	reservoirs, floating covers, landfills, environmental works, underground works
ALVATECH LLDPE	LLDPE	w: 7.5 l: 130	1.5 mm	NP	0.939-0.925	NP	49 (≥40)	≥800	515 (≥370)	180 (≥150)	NP	2.0-3.0	1-2	reservoirs, floating covers, landfills, environmental works, underground works
ALVATECH LLDPE	LLDPE	w: 7.5 l: 100	2 mm	NP	0.939-0.925	NP	61 (≥53)	≥800	630 (≥500)	240 (≥200)	NP	2.0-3.0	1-2	reservoirs, floating covers, landfills, environmental works, underground works
ALVATECH LLDPE FIX	LLDPE	w: 7.5 l: 175/165	1.5 mm	NP	0.925-0.939	NP	23 (≥16)	400 (≥250)	540 (≥300)	190 (≥150)	NP	2.0-3.0	1-2	reservoirs, floating covers, landfills, environmental works, underground works
ALVATECH LLDPE FIX	LLDPE	w: 7.5 l: 135/130	2 mm	NP	0.925-0.939	NP	33 (≥21)	430 (≥250)	630 (≥400)	260 (≥200)	NP	2.0-3.0	1-2	reservoirs, floating covers, landfills, environmental works, underground works

- [1] CX = Coextruded
CX-T = Coextruded, textured
EIA = Ethylene interpolmer 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
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/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	High Pressure OIT	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 %											
Agru America Inc. www.agruamerica.com																			
Agru Drain Liner®	HDPE Structured	7.0/91.434 (23/300)	1.5 (60)	0.94	23 (132)	23 (132)	13	300	0.42 (95)	0.18 (40)	2-3	Note [5]	300	100	400	55	80	50	CL, SIL, LL, LC, LPL, DL
Agru Grip Liner®	HDPE Structured	7.0/91.434 (23/300)	1.5 (60)	0.94	23 (132)	23 (132)	13	300	0.42 (95)	0.18 (40)	2-3	Note [5]	300	100	400	55	80	50	CL, SIL, LL, LC, LPL, DL
Agru Smooth® Liner	HDPE-S	7/316.99 (23/835)	1.0 (40)	0.94	15 (88)	28 (160)	13	700	0.36 (80)	0.13 (30)	2-3	Note [5]	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Smooth® Liner	HDPE-S	7/164.59 (23/540)	1.5 (60)	0.94	23 (132)	42 (240)	13	700	0.53 (120)	0.20 (45)	2-3	Note [5]	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Smooth® Liner	HDPE-S	7.0/102.109 (23/415)	2.0 (80)	0.94	31 (176)	56 (320)	13	700	0.71 (160)	0.27 (60)	2-3	Note [5]	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Micro Spike® Liner	HDPE-T	7.0/253.47 (23/710)	1.0 (40)	0.94	15 (88)	15 (88)	13	350	0.40 (90)	0.13 (30)	2-3	Note [5]	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Micro Spike® Liner	HDPE-T	7.0/216.41 (23/505)	1.5 (60)	0.94	23 (132)	23 (132)	13	350	0.53 (120)	0.20 (45)	2-3	Note [5]	1000	160	800	55	80	80	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Micro Spike® Liner	HDPE-T	7.0/117.35 (23/385)	2.0 (80)	0.94	31 (176)	31 (176)	13	350	0.66 (150)	0.27 (60)	2-3	Note [5]	1000	160	800	55	80	50	CL, SIL, SIC, LL, LC, LPL, TL, DL, DP
Agru Super Gripnet® Liner	HDPE Structured	7.0/91.434 (23/300)	1.50 (60)	0.94	23 (132)	23 (132)	13	200	0.40 (90)	0.18 (40)	2-3	Note [5]	300	100	400	55	80	50	CL, SIL, LL, LC, LPL, DL
Atarfil S.L. www.atarfil.com																			
ATARFIL HD smooth	HDPE	width: 6.0/ 6.3/ 7.5m length: 70 to 280m	0.5 to 4.0 mm	≥ 0,942	8.0-64	13-104	>9	≥ 700	0.16-1.28	0.06-0.54	2-2.5	1,2	≥1500	100	≥400	55	80	70	CL, SIL, LL, CL, LPL, RP
ATARFIL HDS colored smooth	HDPE	width: 6.0/ 6.3/ 7.5m length: 70 to 280m	0.5 to 4.0 mm	≥ 0,942	8.0-64	13-104	>9	≥ 700	0.16-1.28	0.06-0.54	2-2.5	1,2	≥1500	100	≥400	55	80	70	DP, DL, RP, CL, SIL
ATARFIL HDE conductive	HDPE	width: 6.0/ 6.3/ 7.5m length: 70 to 280m	0.5 to 4.0 mm	≥ 0,942	8.0-64	13-104	>9	≥ 700	0.16-1.28	0.06-0.54	2-2.5	1,2	≥1500	100	≥400	55	80	70	CL, SIL, LL, CL, LPL, RP

*Tensile, Puncture and Tear Properties: Values obtained from the smooth part of geomembrane

- [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.

- [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	Base Polymer [1]	Dimensional Properties			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]	Density ASTM D1505/D792 (min.) (g/cm ³ min.)	Strength		Elongation							Standard OIT	High Pressure OIT	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 TM-TMT* (single/double textured structured) asperity 0.9mm	HDPE	width: 6.0m length: 90 to 200m	0.5 to 4.0 mm	≥ 0,942	8.0-64	13-104	>9	≥ 700	0.16-1.28	0.06-0.54	2-2.5	1, 2	≥1500	100	≥400	55	80	70	LC
ATARFIL TM-TMT* (single/double textured structured) asperity 0.6mm	HDPE	width: 6.0/ 6.3/ 7.5m length: 90 to 200m	0.5 to 4.0 mm	≥ 0,942	8.0-64	13-104	>9	≥ 700	0.16-1.28	0.06-0.54	2-2.5	1, 2	≥1500	100	≥400	55	80	70	LC
ATARFIL TM-TMT* S colored (single/double textured structured) asperity 0.6mm	HDPE	width: 6.0/ 6.3/ 7.5m length: 90 to 200m	0.5 to 4.0 mm	≥ 0,942	8.0-64	13-104	>9	≥ 700	0.16-1.28	0.06-0.54	2-2.5	1, 2	≥1500	100	≥400	55	80	70	LC
ATARLOCK CPL	HDPE	width: 2m length: 20m	2.0-5.0mm	≥ 0,942	16-80	NA	NA	≥ 400	NA	NA	2-2.5	1, 2	≥1500	100	≥400	55	80	70	concrete protection

*Tensile, Puncture and Tear Properties: Values obtained from the smooth part of geomembrane

Brawler Industries LLC | www.brawler.com

SuperGeo 20 Smooth HDPE	HDPE	5.79/366 (19/1,200)	0.50 (20)	0.940	7 (42)	13 (76)	12	700	0.251 (34)	0.059 (13)	2-3	1, 2, 3	300	100	400	55	80	50	all
SuperGeo 30 Smooth HDPE	HDPE	6.7/332 (22/1,090)	0.75 (30)	0.940	11 (63)	20 (114)	12	700	0.240 (54)	0.093 (21)	2-3	1, 2, 3	300	100	400	55	80	50	all
SuperGeo 40 Smooth HDPE	HDPE	6.7/248 (22/815)	1.00 (40)	0.940	15 (84)	27 (152)	12	700	0.320 (72)	0.125 (28)	2-3	1, 2, 3	300	100	400	55	80	50	all
SuperGeo 60 Smooth HDPE	HDPE	6.7/165 (22/540)	1.50 (60)	0.940	22 (126)	40 (228)	12	700	0.480 (108)	0.187 (42)	2-3	1, 2, 3	300	100	400	55	80	50	all
SuperGeo 30 Textured HDPE	HDPE-CX-T	6.6/296 (21.5/970)	0.75 (30)	0.940	11 (63)	8 (45)	12	100	0.200 (45)	0.093 (21)	2-3	1, 2, 3	300	100	400	55	80	50	all
SuperGeo 40 Textured HDPE	HDPE-CX-T	6.6/229 (21.5/750)	1.00 (40)	0.940	15 (84)	10 (60)	12	100	0.267 (60)	0.125 (28)	2-3	1, 2, 3	300	100	400	55	80	50	all
SuperGeo 60 Textured HDPE	HDPE-CX-T	6.6/158 (21.5/520)	1.50 (60)	0.940	22 (126)	16 (90)	12	100	0.400 (90)	0.187 (42)	2-3	1, 2, 3	300	100	400	55	80	50	all

[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	Base Polymer [1]	Dimensional Properties			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]	Density ASTM D1505/D792 (min.) (g/cm ³ min.)	Strength		Elongation							Standard OIT	High Pressure OIT	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 %											
GSE HD Leak Location Liner Smooth	HD-CX-S	6.86/171 (22.5/560)	1.5 (60)	0.940	22 (126)	40 (228)	12	700	0.480 (108)	0.187 (42)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Leak Location Liner Smooth	HD-CX-S	6.86/131 (22.5/430)	2.0 (80)	0.940	29 (168)	53 (304)	12	700	0.640 (144)	0.249 (56)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Leak Location Liner Textured	HD-CX-T	6.86/158 (22.5/520)	1.5 (60)	0.940	22 (126)	16 (90)	12	100	0.400 (90)	0.187 (42)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Leak Location Liner Textured	HD-CX-T	6.86/122 (22.5/400)	2.0 (80)	0.940	29 (168)	21 (120)	12	100	0.534 (120)	0.249 (56)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Smooth	HD-S	6.86/265 (22.5/870)	1.0 (40)	0.940	15 (84)	27 (152)	12	700	0.320 (72)	0.125 (28)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Smooth	HD-S	6.86/171 (22.5/560)	1.5 (60)	0.940	22 (126)	40 (228)	12	700	0.480 (108)	0.187 (42)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Smooth	HD-S	6.86/131 (22.5/430)	2.0 (80)	0.940	29 (168)	53 (304)	12	700	0.640 (144)	0.249 (56)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Textured	HD-C-T	6.86/213 (22.5/700)	1.0 (40)	0.940	15 (84)	10 (60)	12	100	0.267 (60)	0.125 (28)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Textured	HD-C-T	6.86/158 (22.5/520)	1.5 (60)	0.940	22 (126)	16 (90)	12	100	0.400 (90)	0.187 (42)	2-3	1, 2, 3	300	100	400	55	80	50	all
GSE HD Textured	HD-C-T	6.86/122 (22.5/400)	2.0 (80)	0.940	29 (168)	21 (120)	12	100	0.534 (120)	0.249 (56)	2-3	1, 2, 3	300	100	400	55	80	50	all
High Performance GSE HD Smooth	CX-S	6.86/171 (22.5/560)	1.5 (60)	0.940	23 (132)	42 (243)	13	800	0.556 (125)	0.187 (42)	2-3	1, 2, 3	1000	160	800	NA	80	80	all
High Performance GSE HD Smooth	CX-S	6.86/131 (22.5/430)	2.0 (80)	0.940	31 (177)	57 (327)	13	800	0.711 (160)	0.257 (58)	2-3	1, 2, 3	1000	160	800	NA	80	80	all
High Performance GSE HD Textured	CX-T	6.86/158 (22.5/520)	1.5 (60)	0.940	23 (132)	20 (115)	13	200	0.578 (130)	0.200 (45)	2-3	1, 2, 3	1000	160	800	NA	80	80	all
High Performance GSE HD Textured	CX-T	6.86/122 (22.5/400)	2.0 (80)	0.940	31 (177)	27 (155)	13	200	0.711 (160)	0.266 (60)	2-3	1, 2, 3	1000	160	800	NA	80	80	all

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

- [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.

- [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	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	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	High Pressure OIT (min. age.) % retained after 1600 hrs [10]	
Huikwang Corp. www.huitex.com																			
Huitex HD, HP	HDPE CX-S	7-8/70-420 (23-26.2/ 230-1378)	0.50-3.00 (20-120)	0.94	9-44 (52-252)	14-80 (80-456)	13	700	0.17-0.96 (36-216)	0.07-0.37 (16-85)	2-3	1 or 2	300	100	400	55	80	50	all
Huitex HX	HDPE CX-T	7-8/65-225 (23-26.2/213-738)	0.75-3.0 (30-120)	0.94	11-45 (63-252)	8-32 (45-180)	13	100	0.240-0.800 (45-180)	0.098-0.374 (21-84)	2-3	1 or 2	300	100	400	55	80	50	
Layfield Geosynthetics & Industrial Fabric Ltd. 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)	2-3	Note [5]	300	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)	2-3	Note [5]	300	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)	2-3	Note [5]	300	100	400	55	80	50	all
Layfield HDPE 80 Textured	HDPE	6.86/134 m (22.5/440 ft)	1.93 (76)	0.94	29 (168)	21 (120)	12	100	0.534 (120)	0.249 (56)	2-3	Note [5]	300	100	400	55	80	50	all
Plásticos Agrícolas y Geomembranas de México S.A. de C.V. www.pqa.com.co																			
PQA HDPE SMOOTH GM13	HDPE-CX-S	7.0/225 (22/738)	1.0 (40)	0.94	15 (84)	30 (169)	15	730	0.41 (92)	0.13 (29)	2-3	1, 2, 3	500	120	680	NA	80	80	all
PQA HDPE SMOOTH GM13	HDPE-CX-S	7.0/150 (22/492)	1.5 (60)	0.94	23 (131)	44 (250)	15	750	0.52 (117)	0.197 (44)	2-3	1, 2, 3	500	120	680	NA	80	80	all
PQA HDPE SMOOTH GM13	HDPE-CX-S	7.0/110 (22/360)	2.0 (80)	0.94	34 (196)	64 (367)	16	800	0.71 (159)	0.278 (62)	2-3	1, 2, 3	500	120	680	NA	80	80	all
PQA HDPE TEXTURED GM13	HDPE-CX-T	7.0/120 (22/393)	1.5 (60)	0.94	24 (137)	26 (146)	14	450	0.51 (115)	0.197 (44)	2-3	1, 2, 3	500	120	680	NA	80	80	all
PQA HDPE TEXTURED GM13	HDPE-CX-T	7.0/90 (22/295)	2.0 (80)	0.94	31 (176)	35 (200)	14	450	0.65 (147)	0.27 (60)	2-3	1, 2, 3	500	120	680	NA	80	80	all

[1] HDPE = High density polyethylene T = Textured
CX = Coextruded 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 DL = Dam liner
SIL = Surface impoundment liner LPL = Leach pad liner
SIC = Surface impoundment cover LC = Landfill cover
LL = Landfill liner TL = Tunnel liner
DP = Decorative pond RP = Reserve pit
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/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 %											
Solmax International Inc. www.solmax.com																			
Solmax HDPE Smooth Green/Black	CX-S	6.8-8.0/81-427 (22.3-26.2/265-1400)	0.5-3.0 (20-120)	0.940	7-44 (40-250)	13-80 (74-457)	12	700	0.16-0.96 (36-216)	0.06-0.37 (13-83)	2-3	1 or 2	400	100	400	NA	80	50	all
Solmax HDPE Textured Green/Black	CX-T	6.8-8.0/81-305 (22.3-26.2/265-1000)	0.75-3.0 (30-120)	0.940	11-44 (66-251)	11-44 (66-251)	12	150	0.26-0.80 (60-180)	0.10-0.37 (23-83)	2-3	1 or 2	400	100	400	NA	80	50	all
Solmax HDPE Smooth Reflective/Conductive	CX-S	6.8-8.0/81-427 (22.3-26.2/265-1400)	0.5-3.0 (20-120)	0.940	7-44 (40-250)	13-80 (74-457)	12	700	0.16-0.96 (36-216)	0.06-0.37 (13-83)	2-3	1 or 2	400	100	400	NA	80	50	all
Solmax HDPE Textured Reflective/Conductive	CX-T	6.8-8.0/81-305 (22.3-26.2/265-1000)	0.75-3.0 (30-120)	0.940	11-44 (66-251)	11-44 (66-251)	12	150	0.26-0.80 (60-180)	0.10-0.37 (23-83)	2-3	1 or 2	400	100	400	NA	80	50	all
Solmax Premium HD Smooth	CX-S	6.8-8.0/85-280 (22.3-26.2/280-920)	0.75-2.5 (30-100)	0.940	11-37 (63-212)	21-72 (120-410)	12	750	0.26-0.87 (60-196)	0.10-0.33 (21-73)	2-3	1 or 2	1000	160	800	NA	80	80	all
Solmax Premium HD Textured	CX-T	6.8-8.0/85-225 (22.3-26.2/280-738)	0.75-2.5 (30-100)	0.940	11-40 (63-228)	11-40 (63-228)	12	200	0.29-0.85 (65-190)	0.10-0.33 (21-73)	2-3	1 or 2	1000	160	800	NA	80	80	all
Sotrafa www.sotrafa.com																			
ALVATECH 5002	HDPE	w: 5.8 / 7.5 l: 260	0.75 mm	>0.940	12 (≥11)	23 (≥20)	13 (≥12)	730 (≥700)	340 (≥240)	100 (≥93)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	reservoirs, manure from livestock farms, landfills, environmental works, underground works
ALVATECH 5002	HDPE	w: 5.8 / 7.5 l: 200	1 mm	>0.940	17 (≥15)	29 (≥27)	13 (≥12)	800 (≥700)	360 (≥320)	150 (≥125)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	reservoirs, manure from livestock farms, landfills, environmental works, underground works
ALVATECH 5002	HDPE	w: 5.8 / 7.5 l: 130	1.5 mm	>0.940	23 (≥22)	44 (≥40)	15 (≥12)	800 (≥700)	550 (≥480)	225 (≥187)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	reservoirs, manure from livestock farms, landfills, environmental works, underground works
ALVATECH 5002	HDPE	w: 5.8 / 7.5 l: 100	2 mm	>0.940	31 (≥29)	58 (≥53)	16 (≥12)	800 (≥700)	670 (≥640)	290 (≥249)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	reservoirs, manure from livestock farms, landfills, environmental works, underground works
ALVATECH 5002	HDPE	w: 5.8 / 7.5 l: 80	2.5 mm	>0.940	38 (≥37)	82 (≥67)	16 (≥12)	800 (≥700)	830 (≥800)	360 (≥311)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	reservoirs, manure from livestock farms, landfills, environmental works, underground works
ALVATECH FIX	HDPE	w: 7.5 l: 175 / 165	1.5 mm	≥0.940	24 (≥22)	18 (≥16)	13 (≥12)	120 (≥100)	500 (≥400)	200 (≥187)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	channels, closure and landfill basin
ALVATECH FIX	HDPE	w: 7.5 l: 135 / 130	2 mm	≥0.940	32 (≥29)	23 (≥21)	13 (≥12)	140 (≥100)	600 (≥534)	270 (≥249)	2-3	1-2	≥500	≥100	≥400	≥55	≥55	≥50	channels, closure and landfill basin

[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.

[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 »

GEOMEMBRANES POLYPROPYLENE

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 PP smooth	PP	40-1260m ² (width: 2/6m)	1.00-2.50	≥ 0.88	±1.50	0.13-0.32	0.06-0.15	NA	12-38	NA	≥700	-40	NP	NP	2-2.5	CL, SIC, LPL, LC, RP, SIL
ATARPOL PPS colored smooth	PP	40-1260m ² (width: 2/6m)	1.00-2.50	≥ 0.88	±1.50	0.13-0.32	0.06-0.15	NA	12-38	NA	≥700	-40	NP	NP	2-2.5	CL, SIL, SIC, DP, RP
ATARPOL PP TM/TMT* (single/double textured structured) asperity 0.9mm	PP	540-1260m ² (width: 6m)	1.0/ 1.5/ 2.0	≥ 0.88	±1.50	0.13-0.26	0.06-0.12	NA	12-30	NA	≥700	-40	NP	NP	2-2.5	SIC, LPL, LC, RP, SIL
* Tensile, Puncture and Tear Properties: Values obtained from the smooth part of geomembrane																
Carlisle Syntec Inc. www.carlislegeomembrane.com																
Geo PolyPro (Reinforced) tan, white, black 36 mil	fPP	3.66 x 183 (12 x 600)	0.92 (36)	0.95 min.	+/- 1.0 max.	0.489 (110) typ	0.578 (130) typ	NA	0.889 (200)	NA	NA	-40 max.	0.889 (200)	.133 (30)	2.75 black only	CL, SIL, SIC, LC, DL, LPL, TL
Geo PolyPro (Reinforced) tan, white, black 45-mil	fPP	3.66 x 183 (12 x 600)	1.14 (45)	0.95 min.	+/- 1.0 max.	0.489 (110) typ	0.712 (160) typ	NA	1.11 (250)	NA	NA	-40 max.	225	0.133 (30)	2.75 black only	CL, SIL, SIC, LC, DL, LPL, TL
Geo PolyPro (Reinforced) tan, white, black 60-mil	fPP	3.66 x 122 (12 x 400)	1.5 mm (60.0)	0.95 min.	+/- 1.0 max.	0.533 (120) typ	0.712 (160) typ	NA	1.11 (250)	NA	NA	-40 max.	1.00 (225)	0.133 (30)	2.75 black only	CL, SIL, SIC, LC, DL, LPL, TL
GeoFlashing (Non-reinforced) tan, white, black 40-mil	fPP	3.66 x 61 (12 x 200)	1mm (40)	0.95 min.	+/- 1.0 max.	0.133 (30) typ	0.08 (18) typ	NA	12.6 (72) min.	NA	700 min.	-40 max.	breaks outside weld	breaks outside weld	2.75 black only	CL, SIL, SIC, LC, DL, LPL, TL
GeoFlashing (Non-reinforced) tan, white, black 60-mil	fPP	3.66 x 61 (12 x 200)	1.37 (60)	0.95 min.	+/- 1.0 max.	0.133 (30) typ	0.08 (18) typ	NA	12.6 (72) min.	NA	700 min.	-40 max.	breaks outside weld	breaks outside weld	2.75 black only	CL, SIL, SIC, LC, DL, LPL, TL
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 to 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

[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

« 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 %					
Engineered Polymer Technologies (EPT) www.epttech.com																
EPT Xtrm Ply fPP	fPP	width 60" to 120"	20 to 120 mils*	0.9	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	0.9	15**	1	350**	70**	200**	400**	-40	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																
Firestone Building Products Co. www.firestonebpco.com																
fPP Geomembrane	PP	465 m ² (5000ft ²)	1.01mm (0.040")	0.896	3	110N (25lb)	45N (10lb)	NA	10.5 kN/m (60lb/in)	NA	600	-40	10.5 kN/m (60 lb/in).	NA	3% typical	NP
Raven Industries Inc. www.ravengeo.com																
Rufco PP40	Flexible PP	2,300 (25,000)	0.91 (36)	0.9	±2	0.18 (41)	0.058 (13)	NA	14 (82)	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

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

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)			
Carlisle Syntec Inc. www.carlislegeomembrane.com											
Geo-EPDM	EPDM	15.24 x 60.96 (50 x 200)	45 mil	1.1	+/- 1	0.040 (9)	9.6 (55 lb/in)	9.6 (55 lb/in)	NA	-67	CL, SC, LC, DL, LPL, TL, SIL
Geo-EPDM	EPDM	15.24 x 45.72 (50 x 150)	60 mil	1.1	+/- 1	0.050 (12)	11.4 (65 lb/in)	11.4 (65 lb/in)	NA	-67	CL, SC, LC, DL, LPL, TL, SIL
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
Engineered Polymer Technologies (EPT) www.epttech.com											
EPT Xtrm Ply fPVC	PVC - GP, NSF 61 and/or ASTM-7176	width: 60" to 120"	20 to 120 mils *data listed is min. value for 20 mil product.	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 to 120 mils *data listed is min. value for 20 mil product.	1.2	0.5	10*	50*	50*	80*	-40	CL, SIL, SIC, SR, SC, LC, LPL, TL
Firestone Building Products Co. www.firestonebpco.com											
EPDM Geomembrane	EPDM	3.05-15.25 x 15.25-61 (10-50 x 50-200)	1.15-1.5 (0.045"-0.060")	1.15	±1%	0.040 kN (9lb) min ave for 45 mil	9.6 kN/m (55lb/in)	9.6 kN/m (55lb/in)	551 kPa (80psi)	-45	CL, SC, LC, DL, SIL
PondGard	EPDM	3.05-15.25 x 15.25-61 (10-50 x 50-200)	1.15 (0.045")	1.15	±1%	0.040kN (9lb) min ave for 45 mil	9.6 kN/m (55lb/in)	9.6 kN/m (55lb/in)	551 kPa (80psi)	-45	CL, SC, LC, DL, SIL
Layfield Geosynthetics & Industrial Fabric Ltd. www.layfieldgroup.com											
Arctic Liner	O/C	1.83/261 (6/855)	0.76 (30)	1.15	4	0.027 (6)	9.98 (57)	8.93 (51)	420 (61)	-54	SC, SR
SealEco www.sealeco.com											
Elastoseal EPDM	EPDM/TPE	1.7/100 (5.5/330)	0.8, 1.0, 1.2, (31, 39, 47)	1.16	±1	30	10/400 (57/400)	10/400 (57/400)	610	-50	CL, LC, TL, DL
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°F)	CL, SIL, SIC, LL, LC, LPL, DL
Solmax 220 FG	PVC - fish grade	1.83/384 (6.00/1,260)	0.50 (20)	NP	NP	0.017 (4)	5.3 (30)	5.3 (30)	NP	NP	CL, SIL, SIC, LL, LC, LPL, DL
Solmax 260 PG	PVC - potable grade	1.55/128 (5.08/420)	1.50 (60)	1.2	4	0.044 (10)	17.5 (100)	17.5 (100)	621 (90)	-20 (-4°F)	CL, SIL, SIC, LL, LC, LPL, DL

[1] CX = Coextruded
 CX-T = Coextruded, textured
 EIA = Ethylene interpolmer 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 = Tunner 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 »

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)	
Atarfil S.L. www.atarfil.com															
ATARPOL PPR	PP	PP/PES	width: 2.00 length: 20-25m	1.0/ 1.2/ 1.5	≈ 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 length: 15-25m	1.2/ 1.5/ 2.0	NP	NP	≤0.3	NA	NA	NA	NA	-40	NA	NA	roofing
ATARFLEX R	TPO/FPO	PP/PES	width: 2.00 length: 20-25m	1.0/ 1.2/ 1.5	≤ 0.920	NP	±0.5	NA	NA	NA	NA	-40	NA	NA	CL, DP
Brawler Industries LLC www.brawler.com															
SuperScrim 12 mil	LLDPE	PET	4,070 (43,800)◇	0.25 (10)	NA	NA	NA	1.290 (290)◇◇	0.178 (40)	445 (100)◇◇◇◇	NA	<-40	NA	NA	all
SuperScrim 20 mil	LLDPE	PET	2,453 (26,400)◇	0.43 (17)	NA	NA	NA	1.601 (360)◇◇	0.236 (53)	507 (114)◇◇◇◇	NA	<-40	NA	NA	all
SuperScrim 25 mil	LLDPE	PET	1,950 (21,000)◇	0.56 (22)	NA	NA	NA	0.222 (50)◇◇◇	0.222 (50)	579 (130)◇◇◇◇	NA	<-40	NA	NA	all
SuperScrim 30 mil	LLDPE textured or smooth	PET	1,615 (17,400)◇	0.69 (27)	NA	NA	NA	0.245 (55)◇◇◇	0.334 (75)	801 (180)◇◇◇◇	NA	<-40	NA	NA	all
SuperScrim 36 mil	LLDPE textured or smooth	PET	1,340 (14,400)◇	0.81 (32)	NA	NA	NA	0.267 (60)◇◇◇	0.400 (90)	935 (210)◇◇◇◇	NA	<-40	NA	NA	all
◇ Based upon 2,700 lb rolls for roll stock. Fabricated panels in excess of 8,000 lb also available ◇◇◇ ASTM D 4833, Puncture Resistance kN (lb) ◇◇◇◇ ASTM D 6241, CBR Puncture Strength kN (lb) ◇◇◇◇◇ ASTM D 7004, Tensile Properties N (lb)															
Burke Industries www.burkeind.com															
M283	CSPE	PET	NP	36	NP	-8	NA	(240)*	(100)**	-275	(405)[3]	-45 F [5]	NA	NA	NP
M284	CSPE	PET	NP	45	NP	-10	NA	(250)*	(105)**	-280	(415)[3]	-45 F [5]	NA	NA	NP
Carlisle Syntec Inc. www.carlislegeomembrane.com															
Geo PolyPro (Reinforced) tan, white, black 36 mil	fPP	nylon	3.66 x 183 (12 x 600)	0.92 (36)	0.95 min.	0.088 (20)	+/- 1.0 max.	1.11 (250)	0.578 (130) typ	0.889 (200)	1.77 (400) typ	-50 typ	0.889 (200)	0.133 (30)	CL, SIL, SIC, LC, DL, LPL, TL
Geo PolyPro (Reinforced) tan, white, black 45 mil	fPP	nylon	3.66 x 183 (12 x 600)	1.14 (45)	0.95 min.	0.088 (20)	+/- 1.0 max.	1.334 (300)	0.712 (160) typ	1.11 (250)	2.00 (450) typ	-50 typ	225	0.133 (30)	CL, SIL, SIC, LC, DL, LPL, TL
Geo PolyPro (Reinforced) tan, white, black 60 mil	fPP	nylon	3.66 x 122 (12 x 400)	1.5 mm (60.0)	0.95 min.	0.088 (20)	+/- 1.0 max.	1.334 (300)	0.712 (160) typ	1.11 (250)	2.22 (500) typ	-50 typ	1.00 (225)	0.133 (30)	CL, SIL, SIC, LC, DL, LPL, TL
Cooley Group www.cooleygroup.com															
CoolGuard FTL30	EIA	PET	width up to 150 in (3.8 m)	0.91 (36)	NP	2.6 (15)	1	1.45 (325)	0.13 (30)	2.7 x 2.7 (600 x 600)	6897 (1,000)	-34	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolGuard FTL40N	EIA	PET	width up to 150 in (3.8 m)	1.17 (46)	NP	3.5 (20)	1	2.45 (550)	0.22 (50)	4.4 x 4.4 (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)	1.1 x 0.9 (250 x 200)	2413 (350)	-34	NP	NP	SIL, SIC, SR, SC, LC, TL

- [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 = Interim landfill cover
 LLC = Landfill cover
 LL = Landfill liner
 LPL = Leach pad liner
 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

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

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)	
Cooley Group www.cooleygroup.com															
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)	2.8 x 2.7 (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)	1.1 x 0.9 (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)	1.1 x 0.9 (250 x 200)	2413 (350)	-29	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolPro 45	PP	PET	width: 78 or 150 in (2.0 or 3.8 m)	1.14 (45)	0.9	3.5 (20)	1	1.33 (300)	0.31 (70)	1.3 x 1.1 (300 x 250)	2413 (350)	-40	NP	NP	CL, SIL, SIC, LL, DL, LPL, LC, TL
CoolPro 60	PP	PET	width: 78 or 150 in (2.0 or 3.8 m)	1.52 (60)	0.9	3.5 (20)	1	1.33 (300)	0.31 (70)	1.3 x 1.1 (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)	1.8 x 1.6 (400 x 350)	3447 (500)	-43	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L1023DEP	Urethane	PET	width: 60 to 68 in (1.5 to 1.7 m)	0.76 (30)	NP	3.0 (17.5)	2	NP	0.71 (160)	1.6 X 1.3 (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)	1.4 x 1.1 (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)	4.9 x 4.9 (1,100 x 1,100)	4138 (600)	-46	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolThane L4490NESU	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)	5.3 x 4.9 (1,200 x 1,100)	4138 (600)	-46	NP	NP	SIL, SIC, SR, SC, LC, TL
CoolShield 45E	PVDF	PET	width: 60 to 68 in (1.5 to 1.7 m)	1.10 (45)	NP	4.4 (25)	2	NP	0.45 (100)	1.3 x 1.1 (300 x 250)	2413 (350)	-29	NP	NP	SIL, SIC, SR, SC, LC, TL
Engineered Polymer Technologies (EPT) www.epttech.com															
EPT XTRM Ply TPU	TPU – Ester or Ether	PET* or Nylon	60" – 120"	30* to 120	1.1* – 1.2	15*	2	400*	75*	200*	450*	-40	NP	NP	SIL, SIC, SR, SC, LC, TL
EPT Xtrm Ply PVC	PVC – GP, NSF 61 or ASTM 7176	PET	60" – 120"	20* to 120	1.3	15*	0.5	350*	70*	200*	400*	-30	NP	NP	CL, SIL, SIC, LL, LPL, DL, SR, SC, LC, TL
EPT Xtrm Ply PVC Geocomposite	PVC – 2-Ply Composite (Film & NonWoven back), NSF 61 or ASTM 7176	PET	60" – 120"	30* to 120	1.2	12*	2	75	25	75	200	-15	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL
EPT Xtrm Ply KEE/EIA	KEE/EIA – GP, NSF 61 or ASTM 7176	PET	60" – 120"	20* to 120	1.2	12*	0.5	350*	70*	200*	400*	-35	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL
EPT Xtrm Ply KEE/EIA HP	KEE/EIA – GP, NSF 61 or ASTM 7176	PET	60" – 120"	30* to 120	1.2	12*	0.5*	550*	140*	475*	750*	-35	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL
EPT Xtrm Ply KEE/EIA Geocomposite	KEE/EIA – 2-Ply Composite (Film & NonWoven back), NSF 61 or ASTM 7176	PET	60" – 120"	30* to 120	1.2	15*	2	75	25	75	200	-15	NP	NP	CL, SIL, SIC, SR, SC, LC, LPL, TL

*data listed is min. value for 30 mil products

- [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
- 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

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

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)	
Firestone Building Products Co. www.firestonebpc.com															
fPP-R Geomembrane	fPP	PET	279 m ² (3,000 ft ²)	0.75 mm (30)	0.9	3.5kN/m (20 lb/in)	+ / - 1%	NP	0.22 kN (50lb)	NP	1758 kN (255psi) min ave	-40	NP	NP	NP
fPP-R Geomembrane	fPP	PET	465 m ² (5,000 ft ²)	0.9mm (36)	0.9	3.5kN/m (20 lb/in)	+ / - 1%	0.33 kN (75 lb)	0.25 kN (55lb)	NP	2812 kN (400psi) min ave	-40	NP	NP	NP
fPP-R Geomembrane	fPP	PET	372 m ² (4,000 ft ²)	1.15 mm (45)	0.9	3.5kN/m (20 lb/in)	+ / - 1%	0.38 kN (50lb)MD	0.25 kN (55lb)	NP	2812 kN (400 psi) min ave	-40	NP	NP	NP
fPP-R Geomembrane	fPP	PET	279 m ² (3,000 ft ²)	1.52 mm (60)	0.9	3.5kN/m (20 lb/in)	+ / - 1%	0.53 kN (118lb)	0.25 kN (55lb)	NP	2812 kN (400 psi) min ave	-40	NP	NP	NP
EPDM-R Geomembrane	EPDM	PET	3.0 x 30 (10 x 100)	1.15mm (45)	1.15	1.2kn/m (7lb/in)	+ / - 1%	1.20 kN (270 lb)	0.58 kN (130lb)	0.85 kN (190lb)	NP	-45	NP	NP	NP
EPDM-R Geomembrane	EPDM	PET	3.0 x 30 (10 x 100)	1.5 mm (60)	1.15	1.2kn/m (7lb/in)	+ / - 1%	1.56 kN (350 lb)	0.75 kN (168lb)	0.98 kN (220lb)	NP	-45	NP	NP	NP
TPO Geomembrane	TPO	PET	3.0 x 30 (10 x 100)	1.15mm (45)	1.04	3.5kN/m (20 lb/in)	+ / - 1%	NP	0.38kN (86lb)	1.56kN (350lb)	NP	-45	NP	NP	NP
InterTape Polymer www.itape.com															
Aquamaster NovaLiner 12	LDPE	HDPE	3.65m ² 1800m (12ft ² 6000ft) 6600m ² (72000ft ²)	0.30 (12)	NA	NA	-3.6% MD -2.4% CD	0.34 (76) [◇]	0.22 (50) MD 0.22 (50) CD	24.9 (140) MD 17.8 (100) CD	900 (130)	-40 ^{◇◇}	19.9 (110) MD 14.2 (80) CD	0.8 (5)	CL, DP, RSC, ILC, SIC
Aquamaster NovaLiner 20	LDPE	HDPE	3.65m ² 900m (12ft ² 3000ft) 3300m ² (36000ft ²)	0.51 (20)	NA	NA	-4.3% MD -1.8% CD	0.68 (154) [◇]	0.31 (70) MD 0.31 (70) CD	31.1 (175) MD 40.8 (230) CD	957 (139)	-65 ^{◇◇}	24.9 (140) MD 32.6 (184) CD	0.8 (5)	CL, DP, RSC, ILC, SIC
Aquamaster NovaLiner 24	LDPE	HDPE	3.65m ² 900m (12ft ² 3000ft) 3300m ² (36000ft ²)	0.61 (24)	NA	NA	-3.8% MD -2.4% CD	0.6 (135) [◇]	0.44 (100) MD 0.44 (100) CD	39.1 (220) MD 32.9 (185) CD	2756 (400)	-65 ^{◇◇}	31.3 (176) MD 26.3 (148) CD	0.8 (5)	CL, DP, RSC, ILC, SIC, RP
Aquamaster NovaLiner 30	LDPE	HDPE	3.65m ² 450m (12ft ² 1500ft) 1650m ² (18000ft ²)	0.76 (30)	NA	NA	-4.4% MD -2.4% CD	0.7 (165) [◇]	0.29 (65) MD 0.38 (85) CD	37.3 (210) MD 45.9 (258) CD	2917 (423)	-65 ^{◇◇}	29.8 (168) MD 36.7 (206) CD	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster ArmorLiner 24	LDPE	HDPE	3.65m ² 900m (12ft ² 3000ft) 3300m ² (36000ft ²)	0.61 (24)	NA	NA	-4.2% MD -3.7% CD	0.81 (182) [◇]	0.49 (110) MD 0.49 (110) CD	43.5 (245) MD 44.4 (250) CD	2927 (425)	-65 ^{◇◇}	34.8 (196) MD 35.5 (200) CD	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster ArmorLiner 30	LDPE	HDPE	3.65m ² 450m (12ft ² 1500ft) 1650m ² (18000ft ²)	0.76 (30)	NA	NA	-2.8% MD -1.5% CD	0.9 (202) [◇]	0.22 (50) MD 0.24 (55) CD	41.7 (235) MD 53.3 (300) CD	4196 (610)	-65 ^{◇◇}	33.4 (188) MD 42.6 (240) CD	0.8 (5)	CL, DP, SIL, SIC, LC, RP
Aquamaster ArmorLiner 40	LDPE	HDPE	3.05m ² 450m (10ft ² 1500ft) 1370m ² (15000ft ²)	1.02 (40)	NA	NA	-3.8% MD -1.8% CD	1.54 (347) [◇]	0.67 (150) MD 0.69 (155) CD	81.7 (460) MD 79.9 (450) CD	4723 (685)	-65 ^{◇◇}	65.3 (368) MD 63.9 (360) CD	0.8 (5)	CL, DP, SIL, SIC, LC, TL, LPL
[◇] ASTM D4833 ^{◇◇◇} Without Non-Woven layers ^{◇◇} ASTM D2136															

- [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
 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

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

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)	
InterTape Polymer www.itape.com															
Aquamaster ArmorLiner 45	LDPE	HDPE	3.05m ² 450m (10ft ² 1500ft) 1370m ² (15000ft ²)	1.14 (45)	NA	NA	-2.1% MD -3.1% CD	1.69 (380) [◇]	0.4 (90) MD 0.4 (90) CD	68.4 (385) MD 63.9 (360) CD	6063 (880)	-50 ^{◇◇}	54.7 (308) MD 51.1 (288) CD	0.8 (5)	CL, DP, SIL, SIC, LC, TL, LPL
Aquamaster ArmorLiner 30SFL	LDPE / LLDPE	HDPE	3.05m ² 450m (10ft ² 1500ft) 1370m ² (15000ft ²)	0.76 (30)	NA	NA	-2.9% MD -1% CD	0.8 (180) [*]	0.44 (100) MD 0.44 (100) CD	40 (225) MD 37.3 (210) CD	4375 (635)	-65 ^{◇◇}	32 (180) MD 29.8 (168) CD	0.8 (5)	CL, DP, SIL, SIC, LC, TL, LPL
Aquamaster ArmorPad 3NWL	LDPE + PP Non-Woven	HDPE	3.05m ² 450m (10ft ² 1500ft) 1370m ² (15000ft ²)	0.61 (24) ^{◇◇◇}	NA	NA	-3.6% MD -2.5% CD	1 (225) [◇]	0.44 (100) MD 0.44 (100) CD	44.4 (250) MD 35.6 (200) CD	2756 (400)	NA	35.5 (200) MD 28.5 (160) CD	0.8 (5)	CL, DP, RP
Aquamaster ArmorPad 3NWL D	LDPE + PP Non-Woven	HDPE	3.05m ² 450m (10ft ² 1500ft) 1370m ² (15000ft ²)	0.61 (24) ^{◇◇◇}	NA	NA	-3.6% MD -2.5% CD	1 (225) [◇]	0.44 (100) MD 0.44 (100) CD	44.4 (250) MD 35.6 (200) CD	2756 (400)	NA	35.5 (200) MD 28.5 (160) CD	0.8 (5)	CL, DP, RP
◇ ASTM D4833 ◇◇ Without Non-Woven layers ◇◇◇ ASTM D2136															
InterWrap www.interwrap.com															
RhinoSkin 12	LDPE	HDPE	up to 80,000 ft ² /144" wide	12 mil	0.971	NA [◇]	0.5% x 0.3%	156lb	60lb x 55lb	175lb x 210lb	340psi	-60	CD 172 lb/in	3.0lb/in	pit, pond & canal liners; secondary containment
RhinoSkin 16	LDPE	HDPE	up to 65,000 ft ² /144" wide	16 mil	0.970	NA [◇]	0.5% x 0.2%	210lb	75lb x 70lb	230lb x 210lb	400psi	-60	CD 172 lb/in	4.0lb/in	pit, pond & canal liners; secondary containment
RhinoSkin 20	LDPE	HDPE	up to 55,000 ft ² /144" wide	20 mil	0.970	NA [◇]	0.3% x 0.3%	270lb	100lb x 90lb	330lb x 286lb	600psi	-60	CD 235 lb/in	5.0lb/in	pit, pond & canal liners; secondary containment
RhinoSkin 24	LDPE	HDPE	up to 50,000 ft ² /144" wide	24 mil	0.972	NA [◇]	0.4% x 0.2%	275lb	95lb x 85lb	350lb x 300lb	680psi	-60	CD 246 lb/in	5.5lb/in	pit, pond & canal liners; secondary containment
RhinoSkin 30	LDPE	HDPE	up to 40,000 ft ² /144" wide	30 mil	0.970	NA [◇]	0.4% x 0.2%	305lb	95lb x 85lb	375lb x 315lb	720psi	-60	CD 258 lb/in	6.5lb/in	pit, pond & canal liners; secondary containment
RhinoMat 300	LLDPE	HDPE	up to 65,000 ft ² /108" wide	15 mil	0.967	NA [◇]	0.6% x 0.2%	164lb	50lb x 50lb	180lb x 215lb	345psi	-60	CD 176 lb/in	15lb/in	pit, pond & canal liners; secondary containment
RhinoMat 500	LLDPE	HDPE	up to 50,000 ft ² /108" wide	24 mil	0.970	NA [◇]	0.6% x 0.3%	305lb	70lb x 70lb	330lb x 300lb	700psi	-60	CD 246 lb/in	20lb/in	berms, pit, pond & canal liners; primary containment
RhinoMat 750	LLDPE	HDPE	up to 40,000 ft ² /108" wide	30 mil	0.970	NA [◇]	0.5% x 0.9%	340lb	60lb x 60lb	385lb x 385lb	800psi	-60	CD 315 lb/in	24lb/in	berms, pit, pond & canal liners; primary containment
◇ Membrane could not be pulled off in one piece in order to conduct the test															
Layfield Geosynthetics & Industrial Fabric Ltd. www.layfieldgroup.com															
HAZGARD 1000	O/C	PET	2,300m ² (25,000ft ²)	0.68 (27)	NA	2.6 (15)	2	1.25 (280)	0.40 (90)	1.55 kN (350 lb)	3100 (450)	-40	26.3 (150)	2.6 (15)	SC
HAZGARD 5000 HT	O/C	PET	1,250m ² (13,000ft 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

- [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
 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

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

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)	
Raven Industries www.ravengeo.com															
Dura-Skrim K30B	LLDPE	PET	3700m ² (40,000ft ²)	0.69 (27)	NP	3 (17)	<1%	0.38 (109)***	0.80 (214)	28 (165)****	NP	<-40	9.6 (55)	7 (40)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim K36B	LLDPE	PET	2800m ² (30,000ft ²)	0.81 (32)	NP	3.6 (21)	<1%	0.49 (129)***	0.62 (115)	29 (178)****	NP	<-40	13 (75)	8 (45)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim K45B	LLDPE	PET	2400m ² (26,000ft ²)	1.01 (40)	NP	4.2 (24)	<1%	0.58 (130)***	0.49 (104)	30 (182)****	NP	<-40	17 (95)	8.7 (50)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim R24BV	LLDPE	PET	4600m ² (50,000ft ²)	0.43 (17.0)	NP	NA	NP	NP	0.29 (60)	0.34 (77)****	1034 (150)**	<-40	NP	NP	ILC, SIL, SIC, RP
Dura-Skrim R20BDV	LLDPE	PET	5300m ² (57,000ft ²)	0.33 (13.0)	NP	NA	NP	NP	0.25 (55)	0.27 (60)	772 (112)**	<-40	NP	NP	ILC, SIL, SIC, RP
Dura-Skrim R12BV	LLDPE	PET	7600m ² (82,000ft ²)	0.28 (11.0)	NP	NA	NP	NP	0.13 (30)	10.5 (60)****	621 (90)**	<-40	NP	NP	ILC, RSC, RP
Dura-Skrim R12WB	LLDPE	PET	7600m ² (82,000ft ²)	0.28 (11.0)	NP	NA	NP	NP	0.13 (30)	10.5 (60)****	621 (90)**	<-40	NP	NP	ILC, RSC, RP
Dura-Skrim R8BV	LLDPE	PET	11000m ² (120,000ft ²)	0.18 (7.2)	NP	NA	NP	NP	0.09 (20)	9.6 (55)****	485 (70)**	<-40	NP	NP	ILC, RSC, RP
Dura-Skrim R8WB	LLDPE	PET	11000m ² (120,000ft ²)	0.18 (7.2)	NP	NA	NP	NP	0.09 (20)	9.6 (55)****	485 (70)**	<-40	NP	NP	ILC, RSC, RP
Dura-Skrim KQ36B	fPP	PET	2800m ² (30,000ft ²)	0.81 (32)	NP	3.5 (20)	<1%	0.48 (100)***	0.68 (160)	27 (183)****	NP	<-40	13 (75)	7.0 (40)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim KQ45B	fPP	PET	2400m ² (26,000ft ²)	1.02 (40)	NP	3.8 (22)	<1%	0.51 (106)***	0.79 (148)	30 (175)****	NP	<-40	18 (100)	8.7 (50)	CL, SIL, SIC, LPL, TL, LC, DP
Dura-Skrim K36BT1	LLDPE Textured 1-Side	PET	1200m ² (13,000ft ²)	0.76 (30)	NP	5.4 (31)	<1%	0.55 (129)	0.66 (157)	29 (165)	NP	<-40	13 (75)	8 (45)	
Dura-Skrim K40BT2	LLDPE Textured 2-Side	PET	1200m ² (13,000ft ²)	0.91 (36)	NP	5.4 (31)	<1%	0.56 (130)	0.72 (169)	31 (175)	NP	<-40	13 (75)	8 (45)	
Dura-Skrim K45BT1	LLDPE Textured 1-Side	PET	1200m ² (13,000ft ²)	1.02 (40)	NP	5.6 (32)	<1%	0.53 (133)	0.61 (145)	32 (184)	NP	<-40	17 (95)	8.7 (50)	
Dura-Skrim K45BT2	LLDPE Textured 2-Side	PET	1200m ² (13,000ft ²)	1.02 (40)	NP	5.6 (32)	<1%	0.61 (144)	0.65 (170)	32 (181)	NP	<-40	17 (95)	8.7 (50)	
Seaman Corporation www.xr-technology.com															
6730 XR-5	EIA	PET	1400m ² (15,000ft ²)	0.75 (30)	1.2 app.	2.63 (15)	0.5	NP	70	2.46 (550)	5520	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, LL, DL
8130 XR-3 PW	EIA	PET	1400m ² (15,000ft ²)	0.75 (30)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, DL
8130 XR-5	EIA	PET	1400m ² (15,000ft ²)	0.75 (30)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, LL, DL
8138 XR-5	EIA	PET	1200m ² (13,000ft ²)	1.0 (40)	1.2 app.	2.63 (15)	0.5	350	125	2.46 (550)	5520	-35	2.46 (550)	3.50 (20)	CL, SIL, SIC, LL, DL
8228 XR-3	EIA	PET	1400m ² (15,000ft ²)	0.75 (30)	1.2 app.	2.10 (12)	5	205	50	0.89 (200)	2070	-32	1.11 (250)	1.75 (10)	CL, SIL, SIC, LC, LPL
8142 XR-5 PW	EIA	PET	1200m ² (13,000ft 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

- [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
 LLC = Landfill cover
 LL = Landfill liner
 LPL = Leach pad liner
 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

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