

# High Density Polyethylene Smooth Liner™



## Product Data

Property	Test Method	Values				
Thickness (min. ave.), mil (mm)	ASTM D5199*	30 (.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (lowest indiv.), mil (mm)	ASTM D5199*	27 (.68)	36 (.90)	54 (1.35)	72 (1.80)	90 (2.25)
<b>*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)</b>						
Density, g/cc, minimum	ASTM D792, Method B	0.94	0.94	0.94	0.94	0.94
Tensile Properties (ave. both directions)	ASTM D6693, Type IV					
Strength @ Yield (min. ave.), lb/in width (N/mm)	2 in/minute	66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield (min. ave.), % (GL=1.3in)	5 specimens in each direction	13	13	13	13	13
Strength @ Break (min. ave.), lb/in width (N/mm)		120 (21)	160 (28)	240 (42)	320 (56)	400 (70)
Elongation @ Break (min. ave.), % (GL=2.0in)		700	700	700	700	700
Tear Resistance (min. ave.), lbs. (N)	ASTM D1004	23 (102)	30 (133)	45 (200)	60 (267)	72 (320)
Puncture Resistance (min. ave.), lbs. (N)	ASTM D4833	60 (267)	80 (356)	120 (534)	160 (712)	190 (845)
Carbon Black Content (range in %)	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3				
Stress Crack Resistance (Single Point NCTL), hours	ASTM D5397, Appendix	300	300	300	300	300
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O <sub>2</sub>	≥100	≥100	≥100	≥100	≥100
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Oven Aging	ASTM D5721	80	80	80	80	80
with HP OIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O <sub>2</sub>					
UV Resistance	GRI GM11	20hr. Cycle @ 75°C/4 hr. dark condensation @ 60°C				
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O <sub>2</sub>	50	50	50	50	50

These product specifications meet or exceed GRI's GM13

## Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)		Weight (average)*	
mil	mm	ft	m	ft	m	ft <sup>2</sup>	m <sup>2</sup>	lbs	kg
30	.75	23	7	1,040	316.99	23,920	2,222	3,900	1,770
40	1.0	23	7	835	254.51	19,205	1,784	3,900	1,770
60	1.5	23	7	540	164.59	12,420	1,154	3,900	1,770
80	2.0	23	7	415	126.49	9,545	887	3,900	1,770
100	2.5	23	7	335	102.109	7,705	716	3,900	1,770

### Notes:

All rolls are supplied with two slings. All rolls are wound on a 6 inch core. Special lengths are available on request. All roll lengths and widths have a tolerance of ±1%  
\*The weight values may change due to project specifications (i.e. absolute minimum thickness or special roll lengths) or shipping requirements (i.e. international containerized shipments).

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

# Linear Low Density Polyethylene Smooth Liner™



## Product Data

Property	Test Method	Values			
Thickness (min. ave.), mil, (mm)	ASTM D5199*	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (lowest indiv.), mil, (mm)	ASTM D5199*	36 (.90)	54 (1.35)	72 (1.80)	90 (2.25)
<b>*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)</b>					
Density, g/cc, maximum	ASTM D792, Method B	0.939	0.939	0.939	0.939
Tensile Properties (ave. both directions)	ASTM D6693, Type IV				
Strength @ Break (min. ave.), lb/in width (N/mm)	2 in/minute	160 (28.0)	240 (42.0)	320 (56.0)	400 (70.0)
Elongation @ Break (min. ave.), % (GL=2.0in)	5 specimens in each direction	800	800	800	800
Tear Resistance (min. ave.), lbs. (N)	ASTM D1004	25 (111)	37 (165)	48 (214)	62 (276)
Puncture Resistance (min. ave.), lbs. (N)	ASTM D4833	60 (267)	90 (400)	120 (534)	150 (667)
Carbon Black Content (range in %)	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3			
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O <sub>2</sub>	≥100	≥100	≥100	≥100
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0
Oven Aging	ASTM D5721	60	60	60	60
with HP OIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O <sub>2</sub>				
UV Resistance	GRI GM11	20hr. Cycle @ 75°C/4 hr. dark condensation @ 60°C			
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O <sub>2</sub>	35	35	35	35
2% Secant Modulus (max.), lb/in. (N/mm)	ASTM D5323	2400 (420)	3600 (630)	4800 (840)	6000 (1050)
Axi-Symmetric Break Resistance Strain, % (min.)	ASTM D5617	30	30	30	30

These product specifications meet or exceed GRI's GM17

## Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)		Weight (average)*	
mil	mm	ft	m	ft	m	ft <sup>2</sup>	m <sup>2</sup>	lbs	kg
40	1.0	23	7	835	254.51	19,205	1,784	3,900	1,770
60	1.5	23	7	540	164.59	12,420	1,154	3,900	1,770
80	2.0	23	7	415	126.49	9,545	887	3,900	1,770
100	2.5	23	7	335	102.109	7,705	716	3,900	1,770

### Notes:

All rolls are supplied with two slings. All rolls are wound on a 6 inch core. Special lengths are available on request. All roll lengths and widths have a tolerance of ±1%  
\*The weight values may change due to project specifications (i.e. absolute minimum thickness or special roll lengths) or shipping requirements (i.e. international containerized shipments).

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

# Geomembrane Standard Frequency of Testing



## Product Data

Property	Test Method	Frequency of testing (minimum)*
Thickness (min. ave.), mil	ASTM D5994/D5199	per roll
Asperity Height (min. ave.), mil	GRI GM-12 (for textured liner)	per roll, alternating top/bottom for dbl sided textured liner only
Density, g/cc, minimum	ASTM D792, Method B	200,000 lbs (railcar)
Tensile Properties (ave. both directions)	ASTM D6693, Type IV	
Strength @ Yield (min. ave.), lb/in width	2 in/minute	
Elongation @ Yield (min. ave.), % (GL=1.3in)	5 specimens in each direction	20,000 lbs
Strength @ Break (min. ave.), lb/in width		
Elongation @ Break (min. ave.), % (GL=2.0in)		
Tear Resistance, lbs. (min. ave.)	ASTM D1004	45,000 lbs
Puncture Resistance, lbs. (min. ave.)	ASTM D4833	45,000 lbs
Carbon Black Content (range in %)	ASTM D4218	20,000 lbs
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lbs
Stress Crack Resistance (NCTL), hours	ASTM D5397, Appendix	200,000 lbs (railcar)
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O <sub>2</sub>	200,000 lbs (railcar) on finished liner
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	200,000 lbs (railcar) on incoming resin
Low Temperature Brittleness, °C	ASTM D746, -60°C	200,000 lbs (railcar) on finished liner
Oven Aging	ASTM D5721	per resin formulation
with HP OIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O <sub>2</sub>	
UV Resistance	GRI GM11	per resin formulation
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O <sub>2</sub>	
2% Secant Modulus, lb/in. (max.)	ASTM D5323	per resin formulation- <b>for LLDPE liner only</b>
Axi-Symmetric Break Resistance Strain, % (min.)	ASTM D5617	per resin formulation- <b>for LLDPE liner only</b>

**These test frequencies meet or exceed GRI's GM-13**

**\*Theses test frequencies may be changed based on project specifications, and represent the minimum MQC testing performed. Additional costs may be incurred if required testing is greater than listed above**

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.