



## Firestone Reinforced Polypropylene (fPP-R) Geomembrane

### Firestone Item Number

Various: See Attached Page

### DESCRIPTION:

Firestone fPP-R Geomembrane is a reinforced polypropylene geomembrane that is produced with a 9 x 9 polyester weft inserted scrim reinforcement. This heat weldable fPP-R geomembrane is available in 0.91 mm (0.036"), 1.14 mm (0.045") and 1.52 mm (0.060") thicknesses. It is available in black, white, patina, tan and grey, all with a black backing. All colors are available in 3.05 m (10.0') widths. Black 0.91 mm (0.036") and 1.14 mm (0.045") are also available in 3.78 m (12.4') widths

### PREPARATION OF SUBSTRATES:

1. Substrates must be dry, smooth, and free of sharp edges, loose or foreign materials, oil, grease, and other materials which may damage the geomembrane.
2. All rough surfaces or voids which could damage the geomembrane shall be repaired prior to installing the geomembrane, as specified.

### METHOD OF APPLICATION:

1. Firestone fPP-R Geomembrane is installed as a continuous layer. Rolls or panels made from rolls are overlapped (Side Laps and End Laps) prior to the heat welding of the seam areas.
2. All cut scrim areas must be sealed with Firestone extrusion weld bead.
3. Install Firestone fPP-R Geomembrane in accordance with current Firestone Specialty Products specifications and details.

### STORAGE:

1. Store away from sources of punctures and physical damage.
2. Store away from ignition sources as geomembrane will burn when exposed to open flame.

This sheet is meant only to highlight Firestone's products and specifications. Information is subject to change without notice. Firestone takes responsibility for furnishing quality materials, which meet Firestone's published product specification. As neither Firestone itself nor its representatives practice design, Firestone offers no opinion on and expressly disclaims any responsibility for the soundness of any project on which its products may be applied. If questions arise as to the soundness of a project, or its ability to support a planned installation properly, the Owner should obtain opinions of competent design engineers before proceeding. Firestone accepts no liability for any failure or for resultant damages, and no Firestone Representative is authorized to vary this disclaimer.



## PRODUCT DATA

### PACKAGING:

Thickness	Weight
0.91 mm (0.036")	0.83 kg/m <sup>2</sup> (0.17 lb/ft <sup>2</sup> )
1.14 mm (0.045")	1.03 kg/m <sup>2</sup> (0.21 lb/ft <sup>2</sup> )
1.52 mm (0.060")	1.22 kg/m <sup>2</sup> (0.25 lb/ft <sup>2</sup> )

See attached page for available length, width and color options.

### PRECAUTIONARY DATA:

1. Take care when moving, transporting, handling, etc. to avoid sources of punctures and physical damage.
2. Isolate waste products, such as petroleum products, greases, oils (mineral and vegetable) and animal fats from the geomembrane. Contact Firestone Specialty Products for specific recommendations regarding chemical compatibility.
3. Refer to Material Safety Data Sheets (MSDS) for safety information.

### LEED INFORMATION:

Post Consumer Recycled Content:	0%
Post Industrial Recycled Content:	10%
Manufacturing Locations:	Wellford, SC Muscle Shoals, AL

### Firestone Specialty Products

250 West 96th Street, Indianapolis, Indiana 46260  
Specialty Products (800) 428-4442  
Internet Address: <http://www.firestonesp.com>

## Firestone Reinforced Polypropylene (fPP-R) Geomembrane

### PHYSICAL PROPERTIES

Physical Property	Test Method	Property Of Unaged Sheet	Property After Aging 672 hrs (28 days) @ 116°C (240°F)
Tolerance on nominal thickness, %	ASTM D 5199	0.91 mm (0.036") ± 10 1.14 mm (0.045") ± 10 1.52 mm (0.060") ± 10	
Thickness over scrim, mm (inches) 0.91 mm (0.036") 1.14 mm (0.045") 1.52 mm (0.060")	ASTM D 4637 Optical Method	0.254 (0.010) min. 0.330 (0.013) min. 0.762 (0.030) min.	
Mass per unit area, kg/m <sup>2</sup> (g/ft <sup>2</sup> ) (lb/ft <sup>2</sup> ) 0.91 mm (0.036") 1.14 mm (0.045") 1.52 mm (0.060")	ASTM D 5261	0.83 (77) (0.17) typical 1.03 (95) (0.21) typical 1.22 (117) (0.25) typical	
Breaking strength, kN (lbf) (grab tensile at strain rate of 12 in./min.) 0.91 mm (0.036"), 1.14 mm (0.045") & 1.52 mm (0.060")	ASTM D 7004	0.9 (200) min. 260 typ. 1.1 (250) min. 300 typ.	0.9 (200) min. 260 typ. 1.1 (250) min. 300 typ.
Elongation at break of fabric, %	ASTM D 7004	25 typical	25 typical
Tearing strength, N (lbf) (50.8 mm (2") / min. strain rate) 0.91 mm (0.036"), 1.14 mm (0.045") & 1.52 mm (0.060")	ASTM D 5884 (max. load)	356 (80) min. 578 (130) typ. 445 (100) min. 712 (160) typ.	
Low temperature flexibility, °C (°F)	ASTM D 2136 1/8 in. mandrel 4 hour @ temp.	- 40 (- 40) max. - 46 (- 50) typical	
Linear Dimensional Change (shrinkage), % 6 h @ 70°C (158°F) or 1 h @ 100°C (212°F)	ASTM D 1204	+/- 1.0 max. - 0.5 typical	
Ozone resistance, 100 pphm, 168 hours	ASTM D 1149	No cracks	
Resistance to water (distilled) absorption After 30 days immersion 50 °C (122 °F) Change in mass, %	ASTM D 471 (coating compound only)	1.0 max. 0.5 typical	
Hydrostatic resistance, MPa (lbf/in. <sup>2</sup> or psi) (Mullen burst) 0.91 mm (0.036") 1.14 mm (0.045") 1.52 mm (0.060")	ASTM D 751 Procedure A	2.4 (350) min. 2.8 (400) typical 3.1 (450) typical 3.4 (500) typical	2.4 (350) min. 2.8 (400) typical 3.1 (450) typical 3.1 (500) typical
Field seam strength, kN/m (lbf/in.) Seam tested in peel after weld	ASTM D 413 1 in. wide	3.9 (22) min. 7.9 (45) typical peak load	
Water vapor permeance, Perms	ASTM E 96	0.10 max. 0.05 typical	
Puncture resistance, N (lbf) 0.91 mm (0.036") 1.14 mm (0.045") 1.52 mm (0.060")	ASTM D 4833 (index puncture)	378 (85) min. 489 (110) typical 534 (120) typical 525 (118) typical	
Resistance to xenon-arc weathering <sup>1</sup> Xenon-Arc, 15,120 kJ/m <sup>2</sup> total radiant exposure, visual condition at 10X	ASTM G 155 0.70 W/m <sup>2</sup> 80°C B.P.T.	No cracks No loss of breaking or tearing strength	
Potable Water Accepted	NSF-61	Passes	
Chronic Toxicity Screening	EPA/600/4-89/ 001 ASTM E-729 Method 1000.0	Passes	Passes

<sup>1</sup>Equivalent to 12,000 hours exposure at 0.35 W/m<sup>2</sup> irradiance B.P.T. is black panel temperature.  
Note: Factory Seams are not a normal condition of the supplied sheet described in this chart.



# Firestone fPP-R Geomembrane Panel Sizes

<b>Dimensions</b>		<b>Packaging Type</b>	<b>Part Number</b>	<b>Gauge</b>	<b>Color</b>	<b>Coverage</b>		<b>Weight (typical max weight)</b>	
<b>SI Units (Meters)</b>	<b>Eng Units (Feet)</b>					<b>SI Units (Sq Meters)</b>	<b>Eng Units (Sq Feet)</b>	<b>SI Units (kg)</b>	<b>Eng Units (lbs)</b>
3.05 x 152.40	10 x 500	Roll	W56VB39950	0.91 mm (0.036")	Black	464.52	5,000	467	1029
3.05 x 121.92	10 x 400	Roll	W56VB49940	1.14 mm (0.045")	Black	371.61	4,000	461	1017
3.05 x 91.44	10 x 300	Roll	W56VB69930	1.52 mm (0.060")	Black	278.71	3,000	413	910
3.78 x 152.40	12.4 x 500	Roll	W56VB39W50	0.91 mm (0.036")	Black	576.00	6,200	569	1254
3.78 x 121.92	12.4 x 400	Roll	W56VB49W40	1.14 mm (0.045")	Black	460.80	4,960	562	1240
3.05 x 152.40	10 x 500	Roll	W56VW39950	0.91 mm (0.036")	White	464.52	5,000	467	1029
3.05 x 121.92	10 x 400	Roll	W56VW49940	1.14 mm (0.045")	White	371.61	4,000	461	1017
3.05 x 91.44	10 x 300	Roll	W56VW69930	1.52 mm (0.060")	White	278.71	3,000	413	910
3.05 x 152.40	10 x 500	Roll	W56VP39950	0.91 mm (0.036")	Patina	464.52	5,000	467	1029
3.05 x 121.92	10 x 400	Roll	W56VP49940	1.14 mm (0.045")	Patina	371.61	4,000	461	1017
3.05 x 91.44	10 x 300	Roll	W56VP69930	1.52 mm (0.060")	Patina	278.71	3,000	413	910
3.05 x 152.40	10 x 500	Roll	W56VT39950	0.91 mm (0.036")	Tan	464.52	5,000	467	1029
3.05 x 121.92	10 x 400	Roll	W56VT49940	1.14 mm (0.045")	Tan	371.61	4,000	461	1017
3.05 x 91.44	10 x 300	Roll	W56VT69930	1.52 mm (0.060")	Tan	278.71	3,000	413	910
3.05 x 152.40	10 x 500	Roll	W56VG39950	0.91 mm (0.036")	Grey	464.52	5,000	467	1029
3.05 x 121.92	10 x 400	Roll	W56VG49940	1.14 mm (0.045")	Grey	371.61	4,000	461	1017
3.05 x 91.44	10 x 300	Roll	W56VG69930	1.52 mm (0.060")	Grey	278.71	3,000	413	910



## Firestone Unsupported Polypropylene (fPP) Geomembrane

**Firestone Item Number:**  
**Various: See Attached Page**

### DESCRIPTION:

Firestone fPP Unsupported Geomembrane is made from a non-reinforced polypropylene/rubber-based geomembrane and is designed to be used in geo applications. Available in black, white, patina, tan and grey all with a black backing.

### PREPARATION OF SUBSTRATES:

1. Substrates must be dry, smooth, free of sharp edges, loose or foreign materials, oil, grease, and other materials which may damage the geomembrane
2. All rough surfaces or voids which could damage the geomembrane shall be repaired prior to installing the geomembrane, as specified.
3. All surface voids greater than 6.3 mm (0.25") wide shall be properly filled with an acceptable fill material.

### METHOD OF APPLICATION:

Install the Firestone fPP Unsupported Geomembrane material with the appropriate heat welding equipment in accordance with current Firestone specifications and details.

### STORAGE:

1. Store material in its original unopened packaging away from sources of physical damage or chemical contamination.
2. Store away from ignition sources as geomembrane will burn when exposed to open flame.

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## PRODUCT DATA

### PACKAGING:

Thickness	Weight
1.02 mm (0.040")	0.93 kg/m <sup>2</sup> (0.19 lb/ft <sup>2</sup> )
1.52 mm (0.060")	1.32 kg/m <sup>2</sup> (0.27 lb/ft <sup>2</sup> )

See attached page for available length, width and color options.

### PRECAUTIONARY DATA:

1. Take care when moving, transporting, handling, etc. to avoid sources of punctures and physical damage.
2. Isolate waste products, such as petroleum products, greases, oils (mineral and vegetable) and animal fats from the geomembrane. Contact Firestone Specialty Products for specific recommendations regarding chemical compatibility.
3. Refer to Material Safety Data Sheets (MSDS) for safety information.

### LEED INFORMATION:

Post Consumer Recycled Content:	0%
Post Industrial Recycled Content:	10% max.
Manufacturing Locations:	Wellford, SC Muscle Shoals, AL

**Firestone Specialty Products**  
250 West 96th Street, Indianapolis, Indiana 46260  
Specialty Products (800) 428-4442  
Internet Address: <http://www.firestonesp.com>

S723-SPP-113

## Firestone fPP Unsupported Geomembrane

### PHYSICAL PROPERTIES

Physical Property	Test Method	Specification
Thickness, lowest individual reading, non-reinforced	D 5199	0.92 mm (0.036")
Tensile strength, kN/m	D 6693	10.5kN/m (60 lbs/in)
Ultimate elongation %, minimum	D 6693	600 %
Tear resistance, minimum	D 1004	45 N (10 lbs)
Low-temperature bend	D 2136	-40°C (-40°F)
Properties after heat aging & Weathering	D 573, G151, G155	
<ul style="list-style-type: none"> <li>670 hrs at 116°C, heat aging</li> <li>15,210 kJ/(m<sup>2</sup>.nm) at 80°C @ 70 W/(m<sup>2</sup>.nm), weathering</li> </ul>		
Retention of tensile strength		85 %
Retention of ultimate elongation, %		85 %
Retention of tear resistance, minimum		60 %
Visual inspection no cracks or crazing (10X)		Pass
Linear dimensional change, maximum change	D1204	3%
Puncture resistance non- reinforced, min	D4833	110 N (25 lbs)
Factory prepared, ply adhesion strength, min	D6636	NA
Potable Water Accepted	NSF-61	Passes
Chronic Toxicity Screening	EPA/600/4-89/ 001 ASTM E-729 Method 1000.0	Passes

## Firestone fPP Unsupported Geomembrane Panel Sizes

Dimensions		Packaging Type	Part Number	Gauge	Color	Coverage		Weight (typical max weight)	
SI Units (Meters)	Eng Units (Feet)					SI Units (Sq Meters)	Eng Units (Sq Feet)	SI Units (kg)	Eng Units (lbs)
3.05 x 152.40	10 x 500	Roll	W56VBA1050	1.02 mm (0.040")	Black	464.52	5,000	521	1148
3.05 x 91.44	10 x 300	Roll	W56VBB1030	1.52 mm (0.060")	Black	278.71	3,000	445	982
3.05 x 152.40	10 x 500	Roll	W56VWA1050	1.02 mm (0.040")	White	464.52	5,000	521	1148
3.05 x 91.44	10 x 300	Roll	W56VWB1030	1.52 mm (0.060")	White	278.71	3,000	445	982
3.05 x 152.40	10 x 500	Roll	W56VPA1050	1.02 mm (0.040")	Patina	464.52	5,000	521	1148
3.05 x 91.44	10 x 300	Roll	W56VPB1030	1.52 mm (0.060")	Patina	278.71	3,000	445	982
3.05 x 152.40	10 x 500	Roll	W56VTA1050	1.02 mm (0.040")	Tan	464.52	5,000	521	1148
3.05 x 91.44	10 x 300	Roll	W56VTB1030	1.52 mm (0.060")	Tan	278.71	3,000	445	982
3.05 x 152.40	10 x 500	Roll	W56VGA1050	1.02 mm (0.040")	Grey	464.52	5,000	521	1148
3.05 x 91.44	10 x 300	Roll	W56VGB1030	1.52 mm (0.060")	Grey	278.71	3,000	445	982



## TPO Geomembrane

### Firestone Item Number

<b>W56TPMPL99:</b> (Patina Green)	3.04 m x 60.96 m (10' x 200') rolls
<b>W56TPM3L99G:</b> (White)	3.04 m x 60.96 m (10' x 200') rolls
<b>W56TPMTL99G:</b> (Tan)	3.04 m x 60.96 m (10' x 200') rolls

### DESCRIPTION:

Firestone TPO Geomembrane is a flexible thermoplastic polyolefin membrane that is produced with polyester weft inserted reinforcement. This heat weldable TPO membrane is suitable for a variety of exposed geomembrane applications. It is available in a 1.5 mm (60 mil) thickness and in a 3.05 m (10' width). The membrane is available in patina green, white and tan

### PREPARATION OF SUBSTRATES:

1. Substrates must be dry, smooth, free of sharp edges, loose or foreign materials, oil, grease, and other materials which may damage the geomembrane.
2. All rough surfaces or voids which could damage the geomembrane shall be repaired prior to installing the geomembrane, as specified.

### METHOD OF APPLICATION:

1. Firestone TPO Geomembrane is installed as a continuous geosynthetic layer. Rolls are overlapped (Side Laps and End Laps) prior to the heat welding of the seam areas.
2. All cut scrim areas must be sealed with Firestone extrusion weld bead.
3. Install Firestone TPO Geomembrane in accordance with current Firestone Specialty Products specifications and details.

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### PRODUCT DATA

<u>Gauge</u>	<u>Width</u>	<u>Length</u>
1.5 mm (0.060")	3.05 m (10.0')	60.1 m (200')

### STORAGE:

1. Store away from sources of punctures and physical damage.
2. Store away from ignition sources as geomembrane will burn when exposed to open flame.

### PRECAUTIONARY DATA:

1. Take care when moving, transporting, handling, etc. to avoid sources of punctures and physical damage.
2. Isolate waste products, such as petroleum products, greases, oils (mineral and vegetable) and animal fats from the geomembrane. Contact Firestone Specialty Products for specific recommendations regarding chemical compatibility.
3. Refer to Material Safety Data Sheets (MSDS) for safety information.

### LEED INFORMATION:

Post Consumer Recycled Content:	0%
Post Industrial Recycled Content:	15%
Solar Reflective Index	
Manufacturing Locations:	Wellford, SC Las Vegas, NV Tuscumbia, AL



Subject to the conditions of Approval  
when installed as described in the current  
edition of the FM Approval Guide



Cool Roof Rating Council Product  
Identification Number: 0608-0008  
(For White Membrane)



Membrane for Roofing Systems  
As to an External Fire Exposure Only  
61P2  
See UL Directory of Products  
Certified for Canada  
And UL Roofing Materials  
And Systems Directory  
R9516

### Firestone Specialty Products

250 West 96th Street, Indianapolis, Indiana 46260  
Specialty Products (800) 428-4442

Internet Address: <http://www.firestonesp.com>

# Firestone TPO Geomembrane

**PHYSICAL PROPERTIES PER ASTM D 6878**

<u>Physical Property</u>	<u>Test Method</u>	<u>Nominal</u>
<b><u>UNAGED PROPERTIES:</u></b>		
Thickness, min. in (mm) Sheet Overall	ASTM D 751	0.060" (1.52 mm) +/- 10%
Thickness Over Scrim: 1.5 mm (0.060") Membrane	ASTM D 4637 (optical method)	0.609 mm (0.024")
Breaking Strength	ASTM D 751	1560 N (350 lbf)
Elongation at Reinforcement break	ASTM D 751	30%
Tearing Strength	ASTM D 751 20.32 cm x 20.32 cm (8" x 8") specimen	382 N (86 lbf)
Brittleness Point	ASTM D 2137	-46°C (-50°F)
Linear Dimension Change	ASTM D 1204 6 hrs @ 70° C (158° F)	±0.15%
Ozone Resistance	ASTM D 1149	PASS (no cracks)
Factory Seam Strength	ASTM D751	289 N (65 lbf)
Puncture Resistance	FTM 101C Method 2031	1174 N (265 lbf)
<b><u>HEAT AGED PROPERTIES:</u></b>		
Breaking Strength	ASTM D 751	1628 N (366 lbf)*
Elongation at Reinforcement break	ASTM D 751	30%*
Tearing Strength	ASTM D 751 20.32 cm x 20.32 cm (8" x 8") specimen	382 N (86 lbf)*
Weight Change (Membrane)	ASTM D 471	1% (change in mass)
*ASTM D 6878 requires retained values of 90% or original breaking strength and elongation and 60% for tearing strength.		
<b><u>AGED PROPERTIES:</u></b>		
Ozone Resistance	ASTM D 1149	PASS (No cracks)
Weather resistance (Retained Values)	ASTM G 151/ G 154	
Visual Inspection		PASS
Breaking Strength, % min.		90 % retained
Elongation at Reinforcement Break	ASTM D 751	90 % retained
Resistance to Xenon-Arc Weathering	ASTM G 151/ G 155	PASS