

WATERSAVER

36 mil Liner

rPP

GEOMEMBRANE LINER ENGINEERING SPECIFICATION GUIDE

POLYPROPYLENE

Reinforced Geomembrane



PROPERTY	TEST METHOD	SPECIFIED VALUES	
		Property of Unaged Sheet	Property After Aging 672 hrs (28 days @ 240°F (116°C))
Tolerance on nominal thickness, %	ASTM D 5199	36 mil (0.91mm) ± 10 45 mil (1.14 mm) ± 10 60 mil (1.52 mm) ± 10	
Thickness over scrim, in (mm) 36-mil (0.91 mm) 45-mil (1.14 mm) 60-mil (1.52 mm)	ASTM D 4637 Optical Method	0.010 (0.254) min. 0.013 (0.330) min. 0.030 (0.762) min.	
Mass per unit area, lb/ft ² (g/ft ²) (kg/m ²) 36-mil (0.91 mm) 45-mil (1.14 mm) 60-mil (1.52 mm)	ASTM D 5261	0.17 (77) (0.83) typical 0.21 (95) (1.03) typical 0.25 (117) (1.22) typical	
Breaking strength, lbf (kN) (grab tensile at strain rate of 12 in./min.) 36-mil (0.91 mm, 45 mil (1.14 mm) & 60-mil (1.52 mm)	ASTM D 7004	200 (0.9) min. 260 typ. 250 (1.1) min. 300 typ.	200 (0.9) min. 260 typ. 250 (1.1) min. 300 typ.
Elongation at break of fabric, %	ASTM D 7004	25 typical	25 typical
Tearing strength, lbf (N) (2 in/min strain rate) 36-mil (0.91mm), 45 mil (1.14mm) & 60-mil (1.52mm)	ASTM D 5884 (max. load)	80 (356) min 130 (578) typ. 100 (445) typ. 160 (712) typ.	
Low temperature flexibility, °F (°C)	ASTM D2136 1/8 in mandrel 4 hour @ Temp.)	-40 (-40) max. -50 (-46) typical	
Linear Dimensional Change (shrinkage), % 6 h @ 158°F (70°C) or 1 hr @ 212°F (100°C)	ASTM D 1204	± 1.0 max. - 0.5 typical	
Ozone resistance, 100 pphm, 168 hrs	ASTM D 1149	No cracks	No cracks
Resistance to water (distilled) absorption After 30 days immersion 122°F (50°C) Change in mass, %	ASTM D 471 (coating compound only)	1.0 max. 0.5 typical	
Hydrostatic resistance, lbf/in ² or psi (MPa) (Mullen burst) 36-mil (0.91 mm) 45-mil (1.14 mm) 60-mil (1.52 mm)	ASTM D 751 Procedure A	350 (2.4) min 400 (2.8) typical 450 (3.1) typical 500 (3.4) typical	350 (2.4) min 400 (2.8) typical 450 (3.1) typical 500 (3.1) typical
Field seam strength, lbf/in. (kN/m) Seam tested in peel after weld 1 in. wide	ASTM D 413	22 (3.9) min. 45 (7.9) typical peak load	
Water vapor permeance, Perms	ASTM E 96	0.10 max. 0.05 typical	
Puncture resistance, lbs (N) 36-mil (0.91 mm) 45-mil (1.14 mm) 60-mil (1.52 mm)	ASTM D 4833 (index puncture)	85 (378) min. 110 (489) typical 120 (534) typical 118 (525) typical	
Resistance to xenon-arc weathering ¹ Xenon-Arc, 10,080 kJ/m ² total radiant exposure, visual condition at 10X	ASTM G 155 0.70 W/m ² 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

¹ Approximately equivalent to 12,000 hours exposure at 0.35 W/m² irradiance B.P.T. is black panel temperature.
NOTE: Factory bonded seam strength is the responsibility of the fabricator.

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WATERSAVER

wcPE 12

12 mil Underlayment

GEOMEMBRANE LINER
ENGINEERING SPECIFICATION GUIDE

12 mil Woven Coated Polyethylene



Construction		10 x 10
Coating Thickness		1.75 mils each ($\pm 10\%$)
Weight	ASTM D-1910	6.2 oz./sq.yd. ($\pm 10\%$)
Tensile Strength	ASTM D-751, Grab*	189 lbs warp x 172 lbs weft
Tear Strength	ASTM D-751, Tongue*	59 lbs. warp x 56 lbs. weft
Thickness		12.0 mils ($\pm 10\%$)

These are typical property values and are intended as guides only. The figures listed do not represent specification limits.

* In-house test results

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Firestone

SPECIALTY PRODUCTS

SAMPLE

GEOMEMBRANE 15 YEAR LIMITED WARRANTY

SAMPLE

Firestone Specialty Products Company, LLC ("Firestone"), located at 250 West 96th Street, Indianapolis, IN 46260 warrants to the owner ("Owner") named below, that Firestone, subject to the terms, conditions, and limitations set forth herein, will provide replacement Firestone Geomembrane sufficient to replace any area of Geomembrane which leaks as a result of normal weathering or due to any manufacturing defects for a period of **15** years on a pro-rated basis from the date of installation under normal use and in approved applications under the terms stated in this Limited Warranty. This Limited Warranty extends only to the Firestone Geomembrane and does not cover the installation of the Firestone Geomembrane, any third party fabrication of the Geomembrane, or any non-Firestone brand materials or accessories furnished or installed in connection with the Geomembrane.

TERMS, CONDITIONS, AND LIMITATIONS

- 1. What Products are covered by this Limited Warranty.** This Limited Warranty covers your Firestone Geomembrane, so long as the products are correctly installed in accordance with Firestone's Technical Specifications.
- 2. What products and services are not Covered by this Limited Warranty.** This Limited Warranty does not cover the installer's workmanship in the installation of the Firestone Geomembrane Products, or any materials or accessories not manufactured or supplied by Firestone. This Limited Warranty does not cover any third party adhesives, sealants, or coatings used on the Firestone Geomembrane.
- 3. How to Submit a Warranty Claim.** If you believe that you have a warranted claim due to a manufacturing defect in a Firestone Geomembrane, you must give notice in writing or by telephone to Firestone within thirty (30) days of such occurrence. Written notice may be sent to Firestone at the street address or fax number shown on the reverse side of this Limited Warranty. The Owner's notice to Firestone will serve as authorization for Firestone or its agent to investigate the claim. Should the required notice not be given, the alleged defect and all further rights under this Limited Warranty shall be deemed waived by the Owner, and this Limited Warranty shall become null and void.
- 4. Investigation of Warranty Claims.** If upon investigation, Firestone determines that the claim is not excluded under the Terms, Conditions and Limitations set forth below and is the result of ordinary exposure to the elements or a manufacturing defect the Owner's sole and exclusive remedy and Firestone's liability will be limited to providing, at its option, materials to repair the Geomembrane, or to replace it on a pro-rata basis based upon the number of months remaining in the original term of the warranty. Firestone shall not be obligated to perform repairs or replacements under this Limited Warranty unless and until the area to be repaired or replaced is accessible, clean, dry and free from all water, dirt, sludge, animal wastes, residuals and/or liquids of any kind. Should the investigation reveal that the claim is excluded under the Terms, Conditions, and Limitations set forth below, the Owner is responsible for payment of the investigation costs and for any repairs effected during the investigation. Failure by the Owner to pay for these costs shall render this Limited Warranty null and void. To the extent repairs that are the responsibility of the Owner are not completed during the investigation, Firestone will advise the Owner of the type and/or extent of repairs required to be made at the Owner's expense that will permit this Limited Warranty to remain in effect for the un-expired portion of its term. Failure by the Owner to properly make these repairs in a reasonable manner and within a reasonable time shall render this Limited Warranty null and void.
- 5. What Claims are Excluded by this Warranty.** Firestone shall have no obligation under this Limited Warranty, or any other liability, now or in the future if a leak, crack, or defect in the Firestone Geomembrane is caused by: (a) Natural forces, disasters, or acts of God including, but not limited to, hurricanes, tornadoes, hail, lightning, earthquakes, atomic radiation, insects, or animals; (b) Act(s), conduct or omission(s) by any person, or act(s) of war, which damages the Firestone Geomembrane or which impairs the product's ability to perform or resist leaks; (c) Failure by the Owner to use reasonable care in maintaining the Firestone Geomembrane, said maintenance to include, but not limited to those items listed on the reverse side of this Limited Warranty; (d) Acid, oil, harmful chemicals, or the reactions between them; (e) any atypical atmospheric conditions or weather, which damages the Geomembrane, or which impairs the Geomembrane's ability to resist leaks; (f) any penetrations, alterations or repairs to the Geomembrane not approved in writing by Firestone; (g) improper site preparation or covering materials, or improper application or installation; (h) excessive pressures or stresses from any source; or (i) any product not furnished by Firestone. The Geomembrane material subject to this Limited Warranty is intended for industrial and commercial uses only and is not a "consumer product" as defined in the Magnuson-Moss Warranty Act or any similar federal, state, or local statute, law or ordinance.
- 6. Exclusive Remedy and Non Assignability.** The Limited Warranty on the Geomembrane herein is given in lieu of all other possible material warranties, either expressed or implied, and by accepting delivery of the Geomembrane Owner waives all other warranties and/or remedies, except those specifically granted hereunder. This Limited Warranty is extended to the Owner and is non-transferable and non-assignable and there are no third-party beneficiaries to this Limited Warranty. This Limited Warranty becomes an obligation of Firestone only upon receipt of full and final payment for the Geomembrane and execution by a duly authorized representative of Firestone.

- 7. **No Waiver.** Firestone's failure to enforce any of the terms or conditions stated herein shall not be construed as a waiver of such provision or of any other terms and conditions of this Limited Warranty.
- 8. **Choice of Law** This Limited Warranty shall be governed and construed in accordance with the laws of the State of Indiana without regard to the conflicts of laws thereof.
- 9. **Handling of Disputes.** In the event of a dispute, controversy, or claim between the Owner and Firestone concerning this Limited Warranty, the Owner and Firestone agree that neither party will commence or prosecute any suit, proceeding, or claim other than in the courts of Hamilton County in the State of Indiana or the United States District Court, Southern District of Indiana, Indianapolis Division. Each party irrevocably consents to the jurisdiction and venue of the above identified courts and waives any rights to challenge or otherwise raise questions of personal jurisdiction or venue in any action commenced or maintained in such courts.

FIRESTONE ONLY WARRANTS GEOMEMBRANE INCORPORATED OR UTILIZED IN THIS INSTALLATION WHICH IT HAS FURNISHED. FIRESTONE'S OBLIGATION OVER THE LIFE OF THIS LIMITED WARRANTY IS LIMITED TO THE OWNER'S ORIGINAL COST OF THE GEOMEMBRANE, PRO-RATED BASED ON THE REMAINING MONTHS OF THE UNEXPIRED WARRANTY. THIS LIMITED WARRANTY SUPERSEDES AND IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES WHETHER WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THIS LIMITED WARRANTY SHALL BE THE OWNER'S SOLE AND EXCLUSIVE REMEDY AGAINST FIRESTONE AND FIRESTONE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INDIRECT, INCIDENTAL OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO, PERSONAL INJURY OR DEATH, PROPERTY DAMAGE, LOST PROFITS, OR ENVIRONMENTAL DAMAGE. THIS LIMITED WARRANTY CANNOT BE AMENDED, ALTERED OR MODIFIED IN ANY WAY EXCEPT IN WRITING SIGNED BY AN AUTHORIZED REPRESENTATIVE OF FIRESTONE. NO OTHER PERSON HAS ANY AUTHORITY TO BIND FIRESTONE WITH ANY REPRESENTATION OR WARRANTY, WHETHER ORAL OR WRITTEN.

PROJECT	<u>Sample</u>	FIRESTONE REPRESENTATIVE	<u>John Vasuta</u>
ADDRESS	<u>Sample</u>	POSITION	<u>Vice President</u>
CITY/ST/ZIP	<u>Sample</u>	SIGNATURE	<u><i>John Vasuta</i></u>
PROJECT SIZE	<u>Sample</u>	OWNERS REPRESENTATIVE	<u>Sample</u>
WARRANTY DATE	<u>Sample</u>	DATE	<u>Sample</u>
WARRANTY NUMBER	<u>Sample</u>		

SAMPLE