

# WeatherBond TPO

## Reinforced Membrane



### Overview

WeatherBond TPO reinforced membrane is a premium, heat-weldable, single-ply thermoplastic polyolefin (TPO) sheet designed for new roof construction and re-roofing applications.

WeatherBond TPO membranes use advanced polymerization technology that combines the flexibility of ethylene-propylene (EP) rubber with the heat weldability of polypropylene. All WeatherBond TPO membranes include OctaGuard XT™, an industry-leading, state-of-the-art weathering package. OctaGuard XT enables WeatherBond TPO to withstand extreme weatherability testing intended to simulate exposure to severe climates.

Physical properties of the membrane are enhanced by a strong polyester fabric that is encapsulated between the TPO-based top and bottom plies. The combination of the fabric and TPO plies provides high breaking and tearing strength, as well as excellent puncture resistance. The relatively smooth surface of the membrane produces a total surface fusion weld that results in consistent, watertight, monolithic roof assembly. The membrane is environmentally friendly and safe to install.

WeatherBond TPO is available in highly reflective white, tan and gray, in both 45-mil and 60-mil. Special color WeatherBond HS TPO membranes are also available (see WeatherBond TPO Color Palette brochure). WeatherBond's TPO is offered in 4- and 6-ft perimeter sheets and 8-, 10- and 12-ft field sheets. WeatherBond special color HS TPO membranes are available in limited sizes.

WeatherBond's tan and white TPO membranes are ENERGY STAR®-qualified and California Title 24 compliant and can contribute toward LEED® (Leadership in Energy and Environmental Design) credits.



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### Optional APEEL Protective Film

WeatherBond TPO reinforced membrane is available with APEEL™ Protective Film, saving time and labor by eliminating the need for roof cleaning upon project completion. WeatherBond's innovative APEEL Protective Film can be left in place for up to 90 days without affecting the integrity of the film, guarding the TPO membrane's surface from scuffs and dirt accumulation during installation. Durable and easy to remove, APEEL Protective Film improves aesthetics and long-term reflectivity and is ideal for re-roofing, re-cover, and new construction projects.

### Features and Benefits

- Outstanding puncture resistance
- Excellent fire resistant assemblies
- Environmentally friendly and stable formulations
- Excellent resistance to impact and low temperature
- Excellent chemical resistance to acids, bases and restaurant exhaust emissions
- Exceptional resistance to heat, solar UV, ozone and oxidation
- UL 2218 Class 4 hail rating
- Manufactured using a hot-melt extrusion process for complete scrim encapsulation
- APEEL Protective Film guards the TPO membrane's surface from scuffs and dirt accumulation during installation, improving the roof system's appearance and long-term performance
- APEEL Protective Film can be left in place for up to 90 days without degrading due to its excellent heat and UV-resistance
- WeatherBond TPO is 100% recyclable
- Enhanced with the OctaGuard XT weathering package



### Installation

WeatherBond TPO Roofing Systems are quick to install as minimal labor and few components are required. TPO systems are installed using an automatic heat welder, making sheet welding fast, clean, consistent, and easy to learn, while reducing strain on the roofing technician.

APEEL Protective Film should be removed from within areas that are to be heat-welded together. In areas that do not require heat-welding, the APEEL Protective Film can be left in place for up to 90 days. When the installation of the entire TPO roofing system is complete, remove and discard the APEEL Protective Film.

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**Mechanically Attached Roofing System** installation starts by attaching the insulation with a minimum of 4 fasteners per 4' by 8' board. The membrane is mechanically attached to the deck using HPWX Fasteners and Plates. Adjoining sheets of membrane are overlapped over fasteners and plates and joined together with a minimum 1½"-wide (4 cm) hot-air weld.

**Fully Ahered Roofing System** installation begins by fastening the insulation at the required density necessary to meet the appropriate wind load requirement. The substrate and membrane are coated with an approved WeatherBond TPO Bonding Adhesive and the membrane is rolled into place.

REVIEW CURRENT WEATHERBOND INSTALLATION INSTRUCTIONS FOR SPECIFIC INSTALLATION REQUIREMENTS.

### Precautions

1. Sunglasses that filter out ultraviolet light are strongly recommended as tan and white surfaces are highly reflective. Roofing technicians should dress appropriately and wear sunscreen to protect skin.
2. Surfaces may become slippery due to frost and ice buildup. Exercise caution during cold conditions to prevent falls.
3. Care must be exercised when working close to a roof edge when surrounding area is snow-covered as the roof edge may not be clearly visible.
4. Use proper stacking procedures to ensure sufficient stability of the rolls.
5. Exercise caution when walking on wet membrane. Membranes may be slippery when wet.
6. Store WeatherBond TPO membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. WeatherBond TPO membrane that has been exposed to the weather must be prepared with Weathered Membrane Cleaner prior to hot-air welding.
7. Take care not to stand or place heavy objects on the edge of folded-over membrane, as this could cause a hard crease in the membrane.
8. Maximum sustained temperature not to exceed 160°F (71°C) for TPO membrane.
9. Do not use razor blades or other sharp tools to cut the APEEL Protective Film while it is still adhered to the TPO membrane as damage to the underlying membrane may occur. Pull the protective film away from the membrane prior to cutting.
10. Remove APEEL Protective Film by pulling toward the center of the roof. Do not remove the film by pulling toward the roof edge.

11. A static electric charge may develop when removing APEEL Protective Film from the surface of the membrane sheet. To avoid the possibility of ignition, lids must be closed on any flammable products and a fire extinguisher should be readily available.
12. Color membranes will 'fade' over time mainly due to the ultraviolet portion of sunlight. Since most roof surfaces are exposed to variable sunlight, some areas will be more susceptible to color changes caused by UV fading.

### Extreme Testing for Severe Climates

ASTM Standard D6878 is the material specification for Thermoplastic Polyolefin Based Sheet Roofing. It covers material property requirements for TPO roof sheeting and includes initial and aged properties after heat and xenon-arc exposure. As stated in the scope of the standard, "the tests and property limits used to characterize the sheet are values intended to ensure minimum quality for the intended purpose." WeatherBond's goal is to produce TPO that ensures maximum performance for the intended purpose of roofing membranes. Maximum performance requires the membrane to far exceed the requirements of ASTM D6878.

**Heat Aging** accelerates the oxidation rate that roughly doubles for each 10°C (18°F) increase in roof membrane temperature. Oxidation (reaction with oxygen) is one of the primary chemical degradation mechanisms of roofing materials.

### Extreme Testing - Heat Aging

	ASTM Requirement	WeatherBond TPO Requirement
ASTM Test 240°F	32 weeks	>128 weeks <sup>†</sup>

<sup>†</sup> Heat exposure comparable to 3,120 weeks (60 years) at 185oF for 8 hours/day.

- Test specimen is 2" by 6" piece of 45-mil membrane unbacked, placed in a circulating hot-air oven.
- Criterion - no visible cracks after bending aged test specimen around 3"-diameter mandrel.

**Q-Trac** testing combines accelerated weathering with real world conditions using an array of ten mirrors to reflect and concentrate full spectrum sunlight onto membrane test specimens. The Q-Trac device automatically tracks the sun's path from morning to night. Also, it adjusts to compensate for seasonal changes in the sun's altitude. Eight years in Q-Trac testing is equal to 40 years of real-world exposure. WeatherBond requires its WeatherBond TPO membranes to pass the equivalent of 40 years of exposure in the Q-Trac.

### WeatherBond Test - Q-Trac

	ASTM D6878 Requirement	WeatherBond TPO Results
ASTM Test	N/A	Equivalent of 40 years of exposure



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**Environmental Cycling** subjects the membrane to repeated cycles of heat aging, hot-water immersion and xenon-arc exposure.

- ASTM requirement - none
- WeatherBond EXTREME test<sup>††</sup>:
  - 10 days heat aging at 240°F (116°C) followed by
  - 5 days water immersion at 158°F (70°C) or with another specimen set
  - 5040 kJ/m<sup>2</sup> (2000 hrs at 0.70 W/m<sup>2</sup> irradiance) xenon-arc exposure

<sup>††</sup> Test specimen is 2.75" by 5.5" piece of membrane with edges sealed.

<sup>††</sup> Criterion - after 3 complete cycles, test specimens shall remain flexible and not have any cracking under 10x magnification while wrapped around a 3"-diameter mandrel.

### Supplemental Approvals, Statements and Characteristics

1. WeatherBond TPO meets or exceeds the requirements of ASTM D6878 Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
2. Radiative properties for ENERGY STAR, Cool Roof Rating Council (CRRC) and LEED.
3. WeatherBond TPO membranes conform to requirements of the U.S.E.P.A. **Toxic Leachate Test** (40 CFR part 136) performed by an independent analytical laboratory.
4. WeatherBond TPO reinforced membrane was tested for **dynamic puncture** resistance per ASTM D5635-04 using the most recently modified impact head. 45-mil was watertight after 12.5 J (9.2 ft-lbf). The 80-mil product was watertight after an impact energy of 30.0 J (22.1 ft-lbf).
5. NSF-P151 Certification for rainwater catchment system components.
  - Plant 91/White Only

### LEED Information

Pre-consumer Recycled Content	10%
Post-consumer Recycled Content	0%
Manufacturing Locations	Senatobia, MS Tooele, UT Carlisle, PA
Solar Reflectance Index	White: 99; Tan: 86

### Radiative Properties for ENERGY STAR<sup>®</sup>\*, Cool Roof Rating Council (CRRC) & LEED<sup>®</sup>

	Test Method	White TPO	Tan TPO	Gray TPO
ENERGY STAR initial solar reflectance	Solar Spectrum Reflectometer	0.79	0.71	N/A
ENERGY STAR initial solar reflectance after 3 years	Solar Spectrum Reflectometer (uncleaned)	0.70	0.64	N/A
CRRC initial solar reflectance	ASTM C1549	0.79	0.71	0.46
CRRC solar reflectance after 3 years	ASTM C1549 (uncleaned)	0.70	0.64	0.43
CRRC initial thermal emittance	ASTM C1371	0.90	0.86	0.89
CRRC thermal emittance after 3 years	ASTM C1371 (uncleaned)	0.86	0.87	0.88
LEED thermal emittance	ASTM E408	0.90	0.86	0.86
Solar Reflectance Index (SRI)	ASTM E1980	99	86	53
Solar Reflectance Index (SRI) 3 years aged		85	77	48

### Radiative Properties (Initial) for Special Colors

	Reflectance	Emittance	SRI
Medium Bronze	0.28	0.86	29
Rock Brown	0.25	0.87	26
Slate Gray	0.38	0.87	42
Terra Cotta	0.25	0.86	25
Patina Green	0.25	0.88	25

Solar Reflectance Index (SRI) is calculated per ASTM E1980. The SRI is a measure of the roof's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. Materials with the highest SRI values are the coolest choices for roofing. Due to the way SRI is defined, particularly hot materials can even take slightly negative values and particularly cool materials can even exceed 100.



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## Typical Properties and Characteristics

Physical Property	ASTM D6878 Requirement	45-mil	60-mil	80-mil
Tolerance on nominal thickness, % ASTM D751 test method	+15, -10	± 10	± 10	± 10
Thickness over scrim, in. (mm) ASTM D7635 optical method, average of 3 areas	0.015 min (0.380)	0.018 typ (0.457)	0.024 typ (0.610)	0.034 typ (0.864)
Breaking strength, lbf (kN) ASTM D751 grab method	220 (976 N) min	225 (1.0) min 320 (1.4) typ	250 (1.1) min 360 (1.6) typ	350 (1.6) min 425 (1.9) typ
Elongation break of reinforcement, % ASTM D751 grab method	15 min	15 min 25 typ	15 min 25 typ	15 min 25 typ
Tearing strength, lbf (N) ASTM D751 proc. B 8 in. x 8 in.	55 (245) min	55 (245) min 130 (578) typ	55 (245) min 130 (578) typ	55 (245) min 130 (578) typ
Brittleness point, °F (°C) ASTM D2137	-40 (-40) max	-40 (-40) max -50 (-46) typ	-40 (-40) max -50 (-46) typ	-40 (-40) max -50 (-46) typ
Linear dimensional change, % ASTM D1204, 6 hours at 158°F	± 1 max	± 1 max -0.2 typ	± 1 max -0.2 typ	± 1 max -0.2 typ
Ozone Resistance, no cracks 7X ASTM D1149, 100 pphm, 168 hrs	PASS	PASS	PASS	PASS
Water absorption resistance, mass % ASTM D471 top surface only 166 hours at 158°F water	± 3.0 max	± 3.0 max 0.9 typ	± 3.0 max 0.9 typ	± 3.0 max 0.9 typ
Factory seam strength, lbf (N) ASTM D751 grab method	66 (290) min	66 (290) min	66 (290) min	66 (290) min
Field seam strength, lbf/in (kN/m) ASTM D1876 tested in peel	No requirement	25 (4.4) min 50 (8.8) typ	25 (4.4) min 60 (10.5) typ	40 (7.0) min 70 (12.3) typ
Water vapor permeance, Perms ASTM E96 proc. B	No requirement	0.10 max 0.05 typ	0.10 max 0.05 typ	0.10 max 0.05 typ
Puncture resistance, lbf (kN) FTM 101C, method 2031 (see supplemental section)	No requirement	250 (1.1) min 325 (1.4) typ	300 (1.3) min 350 (1.6) typ	400 (1.8) min 450 (2.0) typ
Properties after heat aging ASTM D573, 32 weeks @ 240°F or 8 weeks @ 275°F Weight change, % No cracking when bent around 3" diameter mandrel	PASS No cracking ±1.5 max	PASS No cracking 1.0 max	PASS No cracking 1.0 max	PASS No cracking 1.0 max
Typical Weights		0.23 lb/ft <sup>2</sup> (1.1 kg/m <sup>2</sup> )	0.29 (1.4)	0.40 (2.0)

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.



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