

FleeceBACK® FR TPO

Roofing Systems



Overview

Carlisle's FleeceBACK Fire-Rated (FR) TPO membranes are manufactured using a hot-melt extrusion process for complete scrim encapsulation. Once the TPO is reinforced and enhanced with 10-ounce fire-resistant fleece, the total sheet thickness is 115-mils, creating a durable sheet that is quick to install and is ideal for re-roofing or new construction projects.

FleeceBACK FR TPO membranes are intended for use in mechanically fastened roofing systems for direct to combustible deck applications that require a UL Class A fire rating. FleeceBACK FR TPO is chlorine- and plasticizer-free and provides excellent resistance to chemicals, acids, bases, restaurant oils, and greases.

Carlisle's FleeceBACK FR TPO membranes are a highly reflective white color and are available in 5'x75', 5' x 100', 10'x75' and 10' x 100' sizes. Carlisle's white TPO membranes are ENERGY STAR®-qualified, California Title 24 compliant, and can contribute toward LEED® credits.

Features and Benefits

- » UL Class A approved for direct application to combustible deck
- » System installation not restricted by ambient temperature limits
- » 67% fewer seams than modified bitumen
- » Wide window of weldability
- » Fleece reinforcement adds toughness, durability, and enhanced puncture resistance
- » Greater puncture resistance than modified bitumen
- » Chlorine-free, does not contain halogenated flame retardants
- » Plasticizer-free, does not contain liquid or polymeric plasticizers
- » Excellent resistance to impacts, low temperatures, acids, bases, and restaurant exhaust emissions
- » Exceptional resistance to heat, solar UV, ozone, and oxidation
- » 100% recyclable (see Carlisle's Recyclability Statement)
- » Enhanced with the OctaGuard XT™ weathering package
- » VOC- and odor-free
- » Excellent resistance to hail and punctures

Installation (Mechanically Fastened Only)

FleeceBACK FR TPO sheets are mechanically fastened to the combustible deck with Carlisle HP-X Fasteners and PIRANHA™ Plates positioned along the sheet as follows:

Adjoining sheets of FleeceBACK FR TPO are overlapped approximately 5½" along the length of the membrane (at the selvage edge) where fastening plates will be located. At end laps (along the width of the sheet), membranes shall be butted together which will be overlaid with minimum 6"-wide Sure-Weld reinforced membrane hot-air welded on all edges.

Note: To qualify for Carlisle's 2" hail coverage warranty, adjoin the two FleeceBACK FR TPO sheets by overlapping approximately 8"–9" to ensure the fastening plates are covered by the FR fleece. The fleece portion of the membrane must extend a minimum of ¾" past the edge of the plate.

See detail: FR-2

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Perimeter Installation

The membrane shall be secured around the building perimeter utilizing either 5' wide sheets of FleeceBACK FR TPO or additional rows of HP-X Fasteners and Pirahna Plates positioned along the centerline of the 10'-wide sheets as follows:

Sure-Weld Pressure-Sensitive Coverstrip (in conjunction with TPO Primer) or a minimum 6"-wide Sure-Weld Reinforced membrane (hot-air welded) used to overlay the fasteners and plates. Cut edges of TPO membrane shall be sealed with TPO cut edge sealant.

Precautions

- » Sunglasses that filter out ultraviolet light are strongly recommended, as white surfaces are highly reflective. Roofing technicians should dress appropriately and wear sunscreen.
- » Surfaces may become slippery due to frost and ice buildup. Exercise caution during cold conditions to prevent falls.
- » Care must be exercised when working close to a roof edge when the surrounding area is snow-covered, as the roof edge may not be clearly visible.
- » Use proper stacking procedures to ensure sufficient stability of the rolls.
- » Exercise caution when walking on wet membrane. Membranes may be slippery when wet.
- » Store membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. Membrane that has been exposed to the weather must be prepared with Weathered Membrane Cleaner prior to hot-air welding.
- » 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.
- » Maximum sustained temperature not to exceed 160°F (71°C) for TPO membrane.
- » FleeceBACK FR TPO membrane rolls must be tarped and elevated to keep dry prior to installation. If the fleece gets wet, use a wet-vac system to help remove moisture from the fleece. **DO NOT INSTALL MEMBRANE IF FLEECE IS WET.**

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." Carlisle's goal is to

produce TPO that delivers 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 18°F (10°C) increase in roof membrane temperature. Oxidation (reaction with oxygen) is one of the primary chemical degradation mechanisms of roofing materials.

Carlisle Testing – Heat Aging

	ASTM Requirement	Sure-Weld Requirement
ASTM Test 240 ^o	32 weeks**	>128 weeks

**Heat exposure comparable to 3,120 weeks (60 years) at 185°F for 8 hours/day

- » Test specimen is a 2" by 6" piece of 45-mil membrane unbacked, placed in 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. Carlisle requires its Sure-Weld TPO membranes to pass the equivalent of 40 years of exposure in the Q-Trac.

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Carlisle Testing – Q-Trac

	ASTM Requirement	FleeceBACK Requirement
ASTM Test N/A	N/A	Equivalent of 40 years of exposure

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

- » ASTM requirement – none
- » Carlisle EXTREME test*:
 - 10 days heat aging at 240°F (116°C) followed by
 - 5 days water immersion at 158°F (70°C) followed by
 - 5,040 kJ/m² (2000 hours at 0.70 W/m² irradiance) xenon-arc exposure

* Test specimen is 2.75" by 5.5" piece of membrane with edges sealed.

* 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:

- » FleeceBACK FR TPO meets or exceeds the requirements of ASTM D6878 Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
- » Radiative Properties for ENERGY STAR, Cool Roof Rating Council (CRRC) and LEED.
- » FleeceBACK FR TPO membranes conform to requirements of the US E.P.A. Toxic Leachate Test (40 CFR part 136) performed by an independent analytical laboratory.
- » FleeceBACK FR TPO was tested for dynamic puncture resistance per ASTM D5635-04 using the most recently modified impact head. 45-mil was watertight after an impact energy of 12.5 J (9.2 ft-lbf) and 60-mil was watertight after 22.5 J (16.6 ft-lbf). 80-mil EXTRA was water tight after an impact energy of 30.0 J (22.1 ft-lbf).
- » 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 Location	Tooele, UT
Solar Reflectance Index	White: 99

Radiative Properties for ENERGY STAR®*, Cool Roof Rating Council (CRRC) and LEED

Physical Property	Test Method	SPEC. (PASS)
ENERGY STAR – Initial solar reflectance	Solar Spectrum Reflectometer	0.79
ENERGY STAR – Solar reflectance after 3 years	Solar Spectrum Reflectometer (uncleaned)	0.70
CRRC – Initial solar reflectance	ASTM C1549	0.79
CRRC – Solar reflectance after 3 years	ASTM C1549 (uncleaned)	0.70
CRRC – Initial thermal emittance	ASTM C1371	0.90
CRRC – Thermal emittance after 3 years	ASTM C1371 (uncleaned)	0.86
LEED –	C1371	0.90
Solar Reflectance Index (SRI) – Initial	ASTM E1980	99
Solar Reflectance Index (SRI) – Aged 3 Years	ASTM E1980	85

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. *ENERGY STAR recommends that using the Roof Savings Calculator (rsc.ornl.gov), which factors in both heating and cooling costs, to determine whether a cool roof will be an energy efficient choice for your geographic climate and building type.

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Typical Properties and Characteristics

Physical Property	Test Method	SPEC. (PASS)	FleeceBACK FR TPO Typical
Tolerance on Nominal Thickness, %	ASTM D751	±10	±10
Thickness over Fleece, min 115-mil (2.92 mm)	—	—	.060 (1.52)
Weight, lbf/ft ² , 115-mil	—	—	0.33
Breaking Strength, min, lbf (N) 115-mil	ASTM D751 B Tongue Tear	55 (245)	100 (445)
Puncture Resistance, Joules, 115-mil	ASTM D5635	—	17.5
Puncture Resistance, lbf 115-mil	FTM 101C Method 2031	300	350
Brittleness point, max °F (°C)	ASTM D2137	-40 (-40)	-50 (-46)
Linear Dimensional Change, %	ASTM D1204	±1 max	-0.2 typical
Field Seam Strength, lbf/in. (kN/m) ASTM D1876 tested in peel 115-mil	ASTM D1876	25 (4.4)	60 (10.5)
Water Vapor Permeance, Perms	ASTM E96 Proc B	—	0.10 max 0.05 typical
Resistance to Microbial Surface Growth, Rating (1 is very poor, 10 is no growth)	ASTM D3274	—	9-10 typical
Properties after heat aging— ASTM D573, 670 hrs. at 240° F	ASTM D573		
Breaking Strength, % retained	—	—	90 min
Elongation reinf., % retained	—	—	90 min
Tearing Strength, % retained	—	—	60 min
Weight Change, %	—	—	±1 max
Ozone Resistance, no cracks 100 pphm, 168 hours	ASTM D1149	PASS	PASS
Resistance to Water Absorption After 7 days immersion @ 158°F (740°C) Change in mass, max, % (one side)	ASTM D471	± 3.0 max	0.90
Resistance to Outdoor (Ultraviolet) Weathering Xenon-Arc, total radiant exposure at 0.70 W/m ² irradiance, 80°C black panel temp.	ASTM G155	No cracks No loss of breaking or tearing strength	No cracks No loss of breaking or tearing strength
115-mil			20,160 kJ/m ²

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.

