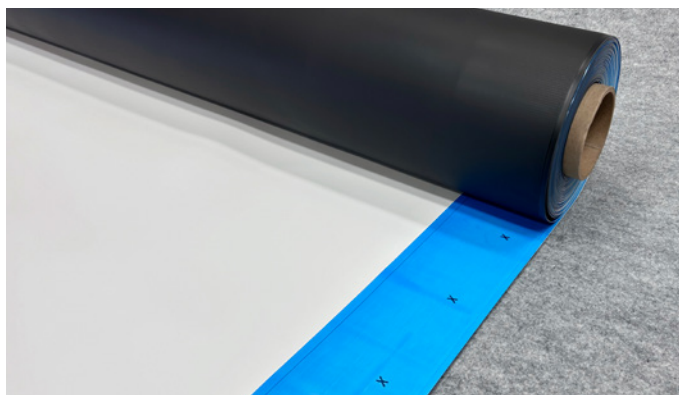


# Sure-Weld® TPO

with SeamShield™ Protective Film



## Overview

Carlisle's Sure-Weld TPO reinforced membrane is a premium, heat-weldable, single-ply thermoplastic polyolefin (TPO) sheet designed for new roof construction and re-roofing applications. Sure-Weld High Slope (HS) membrane is formulated with additional flame retardant for higher-slope fire code approvals. Sure-Weld Extra is 80 mils (2.03 mm) thick for significantly higher strength and weatherability.

Sure-Weld TPO membranes use advanced polymerization technology that combines the flexibility of ethylene-propylene (EP) rubber with the heat weldability of polypropylene. All Sure-Weld TPO membranes include OctaGuard XT™, an industry-leading, state-of-the-art weathering package. OctaGuard XT technology enables Sure-Weld TPO to withstand the extreme weatherability testing that is 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 a consistent, watertight, monolithic roof assembly. The membrane is environmentally friendly and safe to install.

## SeamShield Protective Film

Carlisle's patented SeamShield technology is a factory-applied protective film applied to both the top



and bottom lap area of TPO sheets, serving as a safeguard for the welded areas of the TPO sheet throughout the installation process. SeamShield is crucial in shielding the top and bottom ply seams from bonding adhesives and construction-generated dirt. This ensures a consistent factory-clean seam during the welding process.

- » Protects the TPO seams from construction-generated dirt
  - Eliminates dedicated labor to protect the seam from dirt or adhesive over spray
- » Factory-cleaned and weld-ready seam, eliminating the need for cleaning prior to welding
  - Eliminated variation in the cleaning process
  - Improves consistency of weld and weld strength



## Productivity Boosting Features and Benefits:

- » Labor Savings and Material Savings
  - Elimination of weather membrane cleaner saves on material costs
  - SeamShield film can be removed in 4 minutes, reducing the seam cleaning time by 70%

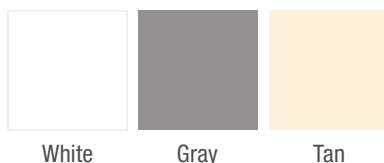


# Sure-Weld TPO

## with SeamShield Protective Film

### Features and Benefits

- » Living Building Challenge “Red List Free” – Declare Label
- » Sure-Weld TPO with SeamShield is available on the following non-fleece products.
  - 10' x 100' White, Gray, Tan 60-, 80-mil
  - 12' x 100' White, Gray, Tan 60-, 80-mil
- » Outstanding puncture resistance and excellent fire resistant assemblies
- » Environmentally friendly and stable formulation
- » Excellent resistance to impact and low temperatures
- » UL 2218 Class 4 hail rating
- » Manufactured with non-halogenated flame retardants
- » Excellent chemical resistance to acids, bases and restaurant exhaust emissions
- » Exceptional resistance to heat, solar UV, ozone and oxidation
- » Manufactured using a hot-melt extrusion process for complete scrim encapsulation
- » Enhanced with the OctaGuard XT weathering package
- » Standard Colors:



White

Gray

Tan



### Sustainable Attributes

Carlisle SynTec Systems' focus has always been innovation – Innovation to solve problems, improve performance, reduce labor, and above all, improve sustainability. Carlisle is committed to driving sustainable and efficient processes in the design and manufacturing of our products.

- » Up to 10% pre-consumer recycled content
- » Membrane fully recyclable when used in mechanically attached systems
- » 3rd-party verified Environmental Product Declaration available
- » NSF P151 certification for rainwater catchment\*\*
- » California Title 24 compliant\*\*\*
- » Free of Living Building Challenge red list chemicals

\*\*White only

\*\*\*White and Tan only

### Installation

Sure-Weld TPO with SeamShield roofing systems are quick to install, as minimal labor and few components are required. The TPO membrane is secured to the substrate using a two-sided bonding adhesive, mechanical fasteners placed within the seam area or secured to induction welding plates using an induction welding tool. Adjoining membrane is overlapped and the seams are completed using an Automatic Heat Welder, making sheet welding fast, clean and consistent, while reducing strain on the roofing technician.

The SeamShield film is easily removed prior to welding, providing a seam area that is free of dirt and other contaminants eliminating the need for any additional cleaning. The contaminant-free membrane surface increases the consistency of the welds, resulting in a monolithic membrane with excellent long-term performance.

**Fully-Adhered** – After adhering the TPO membrane to a suitable substrate utilizing an appropriate bonding adhesive, the SeamShield film is removed from the top and bottom lap areas simultaneously prior to welding.

**Mechanically Fastened** – Place the TPO membrane over a suitable substrate and secure to the roof deck utilizing 2 3/8" PIRANHA Plates and HP-X Fasteners. The fasteners and plates will be placed on the “X marks” in the overlapped membrane area and spaced so the membrane will withstand the design wind loads. Remove the outside section of the blue split SeamShield film as well as the top film, exposing a clean, weldable area.

**Induction-Welded** – Place the TPO membrane over a suitable substrate that has been secured using induction welding plates and mechanical fasteners spaced to withstand the design wind loads. After overlapping adjoining sheets, the SeamShield film is removed from the top and bottom lap areas simultaneously prior to welding.

*Review Carlisle specifications and details for complete installation information.*

# Sure-Weld TPO

## with SeamShield Protective Film

### Precautions

- » 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.
- » Surfaces may become slippery due to frost and ice buildup. Exercise caution during cold conditions to prevent falls. Exercise caution when walking on wet membrane. Membranes may be slippery when wet.
- » 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.
- » 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.
- » 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. Warranties for color membranes do not cover fading of colors.

### SeamShield Protective Film Precautions

- » Do not use razor blades or other sharp tools to cut the SeamShield 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.
- » Remove SeamShield Protective Film by pulling towards the center of the roof. Do not remove the film by pulling towards the roof edge.
- » A static electric charge may develop when removing SeamShield 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.
- » SeamShield Protective Film must be removed from the membrane sheet within 7 days of exposure to the sun.

### 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 (-8°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
<b>ASTM TEST</b> 240°F	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" (50.8 mm by 152.4 mm) piece of 45-mil (1.14 mm) membrane unbacked, placed in circulating hot-air oven.
- » Criterion – no visible cracks after bending aged test specimen around 3" (76.2 mm)-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.

#### Carlisle Testing – Q-Trac

	ASTM D6878 Requirement	Sure-Weld Requirement
<b>ASTM TEST</b> N/A	N/A	Equivalent of 40 years of exposure

# Sure-Weld TPO

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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
- » 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/m<sup>2</sup> (2000 hours at 0.70 W/m<sup>2</sup> irradiance) xenon-arc exposure


\*Test specimen is 2.75" (69.85 mm by 140 mm) 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" (76.2 mm)-diameter mandrel.

### Supplemental Approvals, Statements and Characteristics:

1. Sure-Weld TPO meets or exceeds the requirements of ASTM D6878 Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
2. Sure-Weld TPO membranes conform to requirements of the US E.P.A. Toxic Leachate Test (40 CFR part 136) performed by an independent analytical laboratory.
3. Sure-Weld TPO was tested for dynamic puncture resistance per ASTM D5635-04 using the most recently modified impact head. 60-mil (1.52 mm) was watertight after 22.5 J (16.6 ft-lbf) and 80-mil (2.03 mm) Extra was watertight after an impact energy of 30.0 J (22.1 ft-lbf).
4. All FM approved assemblies have been tested to pass FM 4470 for foot traffic resistance.

### Green Building Information

Pre-Consumer Recycled Content	10%
Post-Consumer Recycled Content	0%
Solar Reflectance Index (SRI)	White – 99 Tan – 86 Gray – 52
Global Warming Potential (GWP)	TPO 45 mils 2.90E+00 TPO 60 mils 3.77E+00 TPO 80 mils 5.28E+00
Volatile Organic Compounds (VOC) Content	N/A
Manufacturing Location(s)	Senatobia, MS Tooele, UT Carlisle, PA
Corporate Sustainability Report (CSR) Availability	Yes
Environmental Product Declaration (EPD) Availability	

### Radiative Properties for Cool Roof Rating Council (CRRC) and LEED

	Test Method	White TPO	Tan TPO	Gray TPO
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	0.85
SRI – Initial (Solar Reflectance Index)	ASTM E1980	99	86	52
SRI – 3 year aged (Solar Reflectance Index)		85	77	49

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## Typical Properties and Characteristics

Physical Property	ASTM D6878 Requirement	60-mil (1.52 mm)	80-mil Extra (2.03 mm)
<b>Tolerance on Nominal Thickness, %</b> ASTM D751 test method	+15, -10	± 10	± 10
<b>Thickness Over Scrim, in. (mm)</b> ASTM D7635 optical method, average of 3 areas	0.015 min (0.380)	0.024 typical (0.610)	0.034 typical (0.864)
<b>Breaking Strength, lbf (kN)</b> ASTM D751 grab	220 (976 N) min	250 (1.1) min 360 (1.6) typical	350 (1.6) min 425 (1.9) typical
<b>Elongation Break of Reinforcement, %</b> ASTM D751 grab method	15 min	15 min 25 typical	15 min 25 typical
<b>Tearing Strength, lbf (N)</b> ASTM D751 proc. B 8 in. x 8 in.	55 (245) min	55 (245) min 130 (578) typical	55 (245) min 130 (578) typical
<b>Brittleness Point, °F (°C)</b> ASTM D2137	-40 (-40) max	-40 (-40) max -50 (-46) typical	-40 (-40) max -50 (-46) typical
<b>Linear Dimensional Change, %</b> ASTM D1204, 6 hours at 158°F	± 1 max	± 1 max -0.2 typical	± 1 max -0.2 typical
<b>Ozone Resistance, no cracks 7X ASTM D1149, 100 pphm, 168 hrs</b>	PASS	PASS	PASS
<b>UV Exposure (Xenon Arc), no cracks 7X ASTM G155, min. exposure 10,080 kJ/m<sup>2</sup> (4,000 hrs - 0.70 W/m<sup>2</sup>)</b>	PASS	PASS	PASS
<b>Water Absorption Resistance, mass %</b> ASTM D471 top surface only 166 hours at 158°F water	± 3.0 max	± 3.0 max 0.90 typical	± 3.0 max 0.90 typical
<b>Factory Seam Strength, lbf (N) ASTM D751 grab method</b>	66 (290) min	66 (290) min	66 (290) min
<b>Field Seam Strength, lbf/in (kN/m)</b> ASTM D1876 tested in peel	No requirement	25 (4.4) min 60 (10.5) typical	40 (7.0) min 70 (12.3) typical
<b>Water Vapor Permeance, perms</b> ASTM E96 proc. B	No requirement	0.10 max 0.05 typical	0.10 max 0.05 typical
<b>Puncture Resistance, lbf (kN)</b> FTM 101C, method 2031 (see supplemental section)	No requirement	300 (1.3) min 350 (1.6) typical	400 (1.8) min 450 (2.0) typical
<b>Properties After Heat Aging</b> ASTM D573, 32 weeks @ 240°F or 8 weeks @ 275°F No cracking when bent around 3" diameter mandrel Weight Change, %	PASS No cracking ± 1.5 max	PASS No cracking 1.0 max	PASS No cracking 1.0 max
<b>Typical Weights lb/ft<sup>2</sup> (kg/m<sup>2</sup>)</b>		0.33	0.45
<b>Air Permeance</b> ASTM E2178	No requirement	PASS	PASS

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.

