

CARLISLE SURE-WELD® REINFORCED TPO MEMBRANE (Standard and HS)

GENERAL:

Sure-Weld membrane is a heat-weldable single-ply thermoplastic polyolefin (TPO) sheet designed for new roof construction and reroofing applications. Sure-Weld HS membrane is formulated with additional flame retardant (compared to Standard) for higher slope fire code approvals. Sure-Weld membrane is based on advanced polymerization technology that combines the durability and weatherability of ethylene-propylene (EP) rubber with the heat weldability of polypropylene. The membrane is specifically formulated for long-term weather resistance without the use of either polymeric or liquid plasticizers.

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 provide Sure-Weld reinforced membranes with high breaking strength, tearing strength and puncture resistance. The relatively smooth surface of Sure-Weld membrane produces a total surface fusion weld that creates a consistent, watertight monolithic roof assembly.

Sure-Weld Standard and HS products are available in white (highly reflective), tan and gray 45-mil and 60-mil nominal thicknesses. (See Sure-Weld EXTRA bulletin for 72-mil and 80-mil thicknesses). Special colors are also available and Carlisle can duplicate most paint colors with a 6-8 week lead time. Available widths are 4, 5 and 6 ft perimeter sheets and 8, 10 and 12 ft field sheets. The membrane is environmentally friendly and safe to install.

Carlisle's Sure-Weld tan and white TPO membranes are LEED™ (Leadership in Energy and Environmental Design) compliant. The U.S. Green Building Council (USGBC) designed the LEED Green Building Rating System. Tan and white Sure-Weld are ENERGY STAR® and California Title 24 rated roof products.

Reinforced Sure-Weld membrane is also available in 6" widths for use as reinforced flashing. This product is typically used for stripping in rows of fasteners and plates or to complete butt splices on FleeceBACK® TPO membrane systems.

FEATURES:

- Wide window of weldability
- Outstanding puncture resistance
- Chlorine-free with no halogenated flame retardants
- Plasticizer-free, does not contain liquid or polymeric plasticizers
- Excellent low temperature impact resistance
- Excellent chemical resistance to acids, bases, and restaurant exhaust emissions
- Exceptional resistance to solar UV, ozone, and oxidation
- Low water vapor permeance and water absorption
- Hot melt extrusion processed for complete scrim encapsulation
- Warp knitted fabric (not woven) for smooth surface and greater thickness-over-scrim
- Polyester reinforcing fabric which is resistant to degradation by bacteria, mildew and fungi
- Consistent color with Special Colors available
- Sure-Weld is 100% recyclable (refer to Carlisle's Recyclability Statement)

TYPICAL PROPERTIES AND CHARACTERISTICS:

See table that is attached for basic properties and supplemental section on page 4. Typical weights are 0.23 lb/ft² (1.1 kg/m²) for 45-mil and 0.29 lb/ft² (1.4 kg/m²) for 60-mil membrane.

CAUTIONS AND WARNINGS:

- Sunglasses which filter out ultraviolet light are strongly recommended since tan and white surfaces are highly reflective to sunlight. Roofing technicians should dress appropriately and wear sunscreen to protect skin from the sun.
- Surfaces may promote slippery conditions due to frost and ice build-up. Exercise caution during cold conditions to prevent falls.
- 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.
- 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 Sure-Weld membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. Sure-Weld membrane that has been exposed to the weather for approximately 7 days or longer must be prepared with Weathered Membrane Cleaner prior to hot air welding.

INSTALLATION:

Sure-Weld Roofing Systems are fast to install since minimal labor and few components are required. The systems may be installed utilizing labor-saving devices that make sheet welding fast, clean, consistent, and easy to learn, while reducing strain on the roofing technician.

The Carlisle Mechanically-Fastened Roof System installation starts with the insulation fastened with a minimum of 5 fasteners per 4 by 8 ft. board. The Sure-Weld reinforced membrane is mechanically fastened to the deck using HP-X™ Fasteners and Piranha Plates™ or HP-XTRA Fasteners and Piranha XTRA Plates. Adjoining sheets of Sure-Weld membrane are overlapped over the fasteners and plates and joined together with a minimum 1-1/2 inch (4 cm) wide hot air weld.

The Carlisle Fully-Adhered Roofing System application begins with the insulation fastened at the required density (max.1 every 2 sq ft) necessary to resist the appropriate wind load. The substrate and membrane are coated with Sure-Weld Bonding Adhesive and the membrane is rolled into place.

Contact your Carlisle Manufacturer's Representative for the specific design requirements and installation procedures for these two systems.

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LEED is a trademark of the U.S. Green Building Council
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Printed in USA 5/07F

SURE-WELD® 45 & 60-MIL THICK REINFORCED TPO SHEET

BASIC PROPERTIES AND CHARACTERISTICS (Standard and HS)

Physical Property	Test Method	Property Of Unaged Sheet	Property After ASTM D573 aging ¹ 28 days @ 240 °F
Tolerance on nominal thickness, %	ASTM D751	± 10	
Thickness over scrim, in. (mm) 45-mil 60-mil	ASTM D6878 Optical Method (avg. of 3 areas)	typical 0.018 (0.457) ± 10% 0.024 (0.610) ± 10%	
Breaking strength, lbf (kN)	ASTM D751 Grab Method	225 (1.0) min. 45-mil 320 (1.4) typical 45-mil 250 (1.1) min. 60-mil 360 (1.6) typical 60-mil	225 (1.0) min. 45-mil 320 (1.4) typical 45-mil 250 (1.1) min. 60-mil 360 (1.6) typical 60-mil
Elongation at break of fabric, %	ASTM D751	25 typical	25 typical
Tearing strength, lbf (N) 8 by 8 in. specimen	ASTM D751 B Tongue Tear	55 (245) min. 130 (578) typical	55 (245) min. 130 (578) typical
Brittleness point, °F (°C)	ASTM D2137	- 40 (- 40) max. - 50 (- 46) typical	
Linear Dimensional Change (shrinkage), % After 6 hours at 158 °F (70 °C)	ASTM D1204	+/- 0.5 max. - 0.2 typical	
Ozone resistance, 100 pphm, 168 hours	ASTM D1149	No cracks	No cracks
Resistance to water absorption After 7 days immersion 158 °F (70 °C) Change in mass, %	ASTM D471 (top surface only)	4.0 max. 2.0 typical	
Resistance to microbial surface growth, rating (1 is very poor, 10 is no growth)	ASTM D3274 2 yr S. Florida	9-10 typical	
Field seam strength, lbf/in. (kN/m) Seam tested in peel	ASTM D1876	25 (4.4) min. 60 (10.5) typical	
Water vapor permeance, Perms	ASTM E96	0.10 max. 0.05 typical	
Puncture resistance, lbf (kN) (see supplemental section for additional puncture data)	FTM 101C Method 2031	250 (1.1) min. 45-mil 325 (1.4) typical 45-mil 300 (1.3) min. 60-mil 350 (1.6) typical 60-mil	
Resistance to xenon-arc weathering ² Xenon-Arc, 17,640 kJ/m ² total radiant exposure, visual condition at 10X	ASTM G155 0.70 W/m ² 80 °C B.P.T.	No cracks No loss of breaking or tearing strength	

¹ Aging conditions are 28 days at 240 °F (116 °C) equivalent to 400 days at 176 °F (80 °C) for breaking strength, elongation, tearing strength, ozone and puncture resistance

² Approximately equivalent to 14,000 hours exposure at 0.35 W/m² irradiance B.P.T. is black panel temperature

SUPPLEMENTAL APPROVALS, STATEMENTS AND CHARACTERISTICS:

1. Sure-Weld TPO meets or exceeds the requirements of **ASTM D6878¹** Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
2. **Radiative Properties** for ENERGY STAR®, Cool Roof Rating Council (CRRC) and LEED™

	TEST METHOD	WHITE TPO	TAN TPO	GRAY TPO
ENERGY STAR initial solar reflectance	Solar Spectrum Reflectometer	0.87	0.68	n/a
ENERGY STAR solar reflectance after 3 years	Solar Spectrum Reflectometer (after cleaning)	0.83	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	pending	pending
CRRC initial thermal emittance	ASTM C1371	0.90	0.86	0.90
CRRC thermal emittance after 3 years	ASTM C1371 (uncleaned)	0.86	pending	pending
LEED thermal emittance	ASTM E408	0.95	0.95	0.95
SRI (Solar Reflectance Index)	ASTM E1980	110	88	55

An ENERGY STAR compliant low slope roof product must have an initial solar reflectance of at least 0.65 and a 3 year aged solar reflectance of at least 0.50. Cleaning of the aged roof surface is permitted by the ENERGY STAR test protocol.

The Cool Roof Rating Council (CRRC) does not specify minimums for reflectance or emittance but they do require specific protocols for testing and reporting. Cleaning of the aged roof surface is **not** permitted for determination of radiative properties after 3 years.

A LEED “point” may be earned if a roof material is ENERGY STAR qualified **and** has a thermal emittance of at least 0.90 as determined by ASTM E408.

California Title 24 requires an initial minimum reflectance of 0.70 and emittance of 0.75 as determined by CRRC test protocol.

Solar Reflectance Index (SRI) is calculated per ASTM E 1980. 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.

For additional information on Carlisle products and ENERGY STAR, CRRC, LEED and California Title 24 see www.carlisle-syntec.com and select Guide to Building Green.

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SUPPLEMENTAL APPROVALS, STATEMENTS AND CHARACTERISTICS (continued):

3. Sure-Weld 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. Sure-Weld reinforced 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)