# CARLISLE SURE-FLEX™ REINFORCED PVC MEMBRANE

Distributed by: BEST MATERIALS LLC, Phoenix AZ
800-474-7570 602-272-8128 www.BestMaterials.com
Email: Sales@BestMaterials.com

**GENERAL:**

Sure-Flex Reinforced PVC membrane is a heat-weldable single-ply thermoplastic Poly (Vinyl Chloride) sheet designed for new roof construction and re-roofing applications. Sure-Flex PVC membrane is based on poly (vinyl chloride) resin in amounts greater than 90% of the total polymer content suitably compounded with plasticizers, stabilizers, pigments and other ingredients to exceed the physical property requirements and accelerated durability tests of ASTM D4434[1] Standard Specification for Poly(Vinyl Chloride) Sheet Roofing. The membrane is specifically formulated for long-term weather resistance with low volatility plasticizer and superior outdoor grade titanium dioxide pigment.

Physical properties of the membrane are enhanced by a strong, polyester fabric that is encapsulated between the PVC based top and bottom plies. The combination of the fabric and PVC plies provide Sure-Flex PVC reinforced membranes with high breaking strength, tearing strength and puncture resistance. The relatively smooth surface of Sure-Flex PVC membrane produces a total surface fusion weld that creates a consistent, watertight monolithic roof assembly.

Carlisle's Sure-Flex white PVC membranes are LEED™ (Leadership in Energy and Environmental Design) compliant. The U.S. Green Building Council (USGBC) designed the LEED Green Building Rating System. White Sure-Flex is an ENERGY STAR® and California Title 24 rated roof product.

Sure-Flex Reinforced PVC membrane is available in highly reflective white 50-mil, 60-mil and 80-mil nominal thicknesses. Special colors (including tan and gray) are also available and Carlisle can duplicate most paint colors with an 8 to 10 week lead-time. Available sheet sizes and square foot weights are as follows:

| THICKNESS | FIELD SHEET | PERIMETER SHEET | WEIGHT lb/ft$^2$ |
|---|---|---|---|
| 50-mil | 81 in. by 100 ft | 40.5 in. by 100 ft | 0.324 |
| 60-mil | 81 in. by 80 ft | 40.5 in. by 80 ft | 0.395 |
| 80-mil | 81 in. by 65 ft | 40.5 in. by 65 ft | 0.547 |

**FEATURES:**

- Wide window of weldability
- Excellent puncture resistance
- Low volatility plasticizer
- Excellent low temperature impact resistance
- Excellent chemical resistance to acids, bases, restaurant oils and greases
- Exceptional resistance to solar UV, ozone, and oxidation
- Low water vapor permeance and water absorption
- Hot melt laminated 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

## TYPICAL PROPERTIES AND CHARACTERISTICS:

See table that is attached for basic properties and supplemental section on page 4. Typical weights are 0.324 lb/ft$^2$ (1.58 kg/m$^2$ ) for 50-mil, 0.395 lb/ft$^2$ (1.93 kg/m$^2$) for 60-mil and 0.547 lb/ft$^2$ (2.67 kg/m$^2$) for 80-mil membrane.

## CAUTIONS AND WARNINGS:

- Sunglasses which filter out ultraviolet light are strongly recommended since the white surface is highly reflective to sunlight. White surfaces reflect heat and light. Roofing technicians should dress appropriately and wear sunscreen to protect skin from the sun.
- Smooth 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 materials.
- Exercise caution when walking on wet membrane. Membranes may be slippery when wet.
- Store Sure-Flex membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. Sure-Flex membrane that has been exposed to the weather or contaminated with dirt must be prepared with PVC Membrane Cleaner prior to hot air welding.

## INSTALLATION:

**Sure-Flex 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 and consistent. The installation learning curve is short and issues with poor installation are minimal.

**The Carlisle Mechanically-Fastened Roof System** installation starts with approved insulation being fastened with a minimum of 5 fasteners per 4 by 8 ft. board. The Sure-Flex reinforced membrane is then mechanically fastened to the deck using HP-X™ Fasteners and Piranha Plates™ or HP-XTRA Fasteners and Piranha XTRA Plates. Adjoining sheets of Sure-Flex 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 approved insulation being fastened at the required density (max. 1 fastener every 2 sq ft) necessary to resist the appropriate wind load. The substrate and membrane are coated with an approved Sure-Flex Bonding Adhesive and the membrane is rolled into place. Adjoining sheets of Sure-Flex membrane are overlapped covering the fasteners and plates and joined together with a minimum 1-1/2 inch (4 cm) wide hot air weld.

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

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# SURE-FLEX™ REINFORCED PVC SHEET

## BASIC PROPERTIES AND CHARACTERISTICS

| Physical Property | Test Method | Property Of Unaged Sheet | Property After ASTM D3045 aging 56 days @ 176 °F |
|---|---|---|---|
| Tolerance on nominal thickness, % | ASTM D751 | ± 10 | |
| Thickness over scrim, in. (mm)<br>50-mil & 60-mil<br>80-mil | ASTM D4434<br>Optical Method<br>(avg. of 3 areas) | 0.016 (0.406) min.<br>0.025 (0.635) min. | |
| Breaking strength, lbf/in. (kN/m) | ASTM D751<br>Grab Method | 200 (35) min.<br>300 (53) typical | 90% min. retention of original breaking strength |
| Elongation at break of fabric, % | ASTM D751 | 15 min.<br>25 typical | 90% min. retention of original elongation |
| Tearing strength, lbf (N) 8 by 8 in. specimen | ASTM D751<br>B Tongue Tear | 45 (200) min.<br>100 (445) typical | |
| Low temperature bend, °F (°C) | ASTM D2136 | - 40 (- 40) max.<br>- 50 (- 46) typical | |
| Linear Dimensional Change (shrinkage), %<br>After 6 hours at 176 $^{O}$F (80 $^{O}$C) | ASTM D1204 | +/- 0.5 max.<br>- 0.3 typical | |
| Ozone resistance, 100 pphm, 168 hours | ASTM D1149 | No cracks | |
| Resistance to water absorption<br>After 7 days immersion 158 °F (70 °C)<br>Change in mass, % | ASTM D570 | 3.0 max.<br>2.0 typical | |
| Field seam strength, lbf/in. (kN/m)<br>Seam tested in peel after welding | ASTM D1876 | 25 (4.4) min.<br>60 (10.5) typical | |
| Water vapor permeance, Perms | ASTM E96 | 0.10 max.<br>0.05 typical | |
| Puncture resistance, lbf (N)<br>(see supplemental section for additional puncture data) | FTM 101C<br>Method 2031 | 250 (1110) min.<br>280 (1245) typical 50-mil<br>320 (1423) typical 60-mil<br>380 (1690) typical 80-mil | |
| Resistance to xenon-arc weathering<br>Xenon-Arc, 12,600 kJ/m$^2$ total radiant exposure, visual condition at 10X<br>(ASTM D4434 light & spray cycle) | ASTM G155<br>0.35 W/m$^2$<br>63 °C B.P.T.<br>(10,000 hours) | No cracks<br>No crazing | |

B.P.T. is black panel temperature 6/07

## SUPPLEMENTAL APPROVALS, STATEMENTS AND CHARACTERISTICS:

1. Sure-Flex PVC meets or exceeds the requirements of **ASTM D4434**[1] Standard Specification for Poly(Vinyl Chloride) Sheet Roofing. Sure-Flex is classified as type III as defined by ASTM D4434.

2. Sure-Flex reinforced PVC was tested for **dynamic puncture resistance** per ASTM D5635-04 using the most recently modified impact head. 50-mil thick membrane was watertight after an impact energy of 22.5 J (16.6 ft-lbf) which passes the ASTM D4434 requirement.

3. Sure-Flex reinforced PVC was tested for **static puncture resistance** per ASTM D5602-98 and exceeded 33 lbf (145 N) which passes the ASTM D4434 requirement.

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

| | TEST METHOD | WHITE PVC | TAN PVC | GRAY PVC |
|---|---|---|---|---|
| **ENERGY STAR** initial solar reflectance | Solar Spectrum Reflectometer | 0.87 | pending | n/a |
| ENERGY STAR solar reflectance after 3 years | Solar Spectrum Reflectometer (uncleaned) | 0.61 | pending | n/a |
| | | | | |
| **CRRC** initial solar reflectance | ASTM C1549 | 0.87 | pending | pending |
| CRRC solar reflectance after 3 years | ASTM C1549 (uncleaned) | 0.61 | pending | pending |
| CRRC initial thermal emittance | ASTM C1371 | 0.95 | pending | pending |
| CRRC thermal emittance after 3 years | ASTM C1371 (uncleaned) | 0.86 | pending | pending |
| | | | | |
| **LEED** thermal emittance | ASTM E408 | 0.94 | 0.94 | 0.94 |
| **SRI** (Solar Reflectance Index) | ASTM E1980 | 110 | pending | pending |

An ENERGY STAR qualified 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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