CARLISLE SURE-FLEX™ REINFORCED FRS PVC MEMBRANE

GENERAL:

Sure-Flex Reinforced FRS PVC membrane is a heat-weldable single-ply thermoplastic Poly (Vinyl Chloride) sheet designed for new roof construction and re-roofing **Fully Adhered** applications. Sure-Flex FRS 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.

Dimensional stability of the membrane is enhanced by fiberglass that is encapsulated between the PVC based top and bottom plies. The combination of the fiberglass and PVC plies provide Sure-Flex FRS PVC membranes with enhanced dimensional stability for fully adhered roof systems using liquid applied bonding adhesives. The relatively smooth surface of Sure-Flex FRS 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 FRS 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	0.362
60-mil	81 in. by 80 ft	40.5 in. by 80 ft	0.434
80-mil	81 in. by 65 ft	40.5 in. by 65 ft	0.524

FEATURES:

- Wide window of weldability
- Good 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
- Fully encapsulated fiberglass for added dimensional stability in fully adhered applications
- 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 0.362 lb/ft^2 (1.77 kg/m^2) for 50-mil, 0.434 lb/ft^2 (2.12 kg/m^2) for 60-mil and 0.524 lb/ft^2 (2.56 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 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.

Printed in USA 9/07F

SURE-FLEX™ REINFORCED FRS 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 D638	± 10	
Thickness over fiber, in. (mm) 50-mil & 60-mil 80-mil	ASTM D4434 Optical Method (avg. of 3 areas)	0.016 (0.406) min. 0.025 (0.635) min.	
Tensile strength, psi (MPa) (machine & cross-machine direction)	ASTM D638	1500 (10.4) min. 1900 (13.1) typical	90% min. retention of original tensile strength
Elongation at break, % Machine direction Cross-machine direction	ASTM D638	250 min. (270 typical) 220 min. (250 typical)	90% min. retention of original elongation
Tear resistance, lbf (N)	ASTM D1004	10 (45) min. 12 (53) typical	
Low temperature bend at –40°F (-40°C)	ASTM D2136	pass	
Linear Dimensional Change (shrinkage), % After 6 hours at 176 °F (80 °C)	ASTM D1204	+/- 0.1 max. 0.05 typical	
Ozone resistance, 100 pphm, 168 hours	ASTM D1149	No cracks	
Resistance to water absorption After 7 days immersion 158 °F (70 °C) Change in mass, %	ASTM D570	3.0 max. 0.5 typical	
Seam strength, % of tensile strength	ASTM D638	75 min. 80 typical	
Water vapor permeance, Perms	ASTM E96	0.10 max. 0.05 typical	
Puncture resistance (see supplemental section for additional puncture data)			
Resistance to xenon-arc weathering Xenon-Arc, 12,600 kJ/m^2 total radiant exposure, visual condition at 10X (ASTM D4434 light & spray cycle)	ASTM G155 0.35 W/m^2 63 °C B.P.T. (10,000 hours)	No cracks (none) No crazing (none)	

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

SUPPLEMENTAL APPROVALS, STATEMENTS AND CHARACTERISTICS:

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

2. Sure-Flex Reinforced FRS 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 10.0 J (7.4 ft-lbf) which passes the ASTM D4434 requirement.

3. Sure-Flex Reinforced FRS 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.