CARLISLE
SYNTEC SYSTEMS

Sure-Flex™ PVC
Roofing Systems

PVC & KEE HP
Changing the Game

Experience the **Carlisle Difference**

In the 1960s, Carlisle SynTec Systems pioneered the single-ply roofing industry with the introduction of its Sure-Seal® EPDM membrane. Since that time, Carlisle has been recognized as the trusted provider of the most dependable and longest-lasting single-ply roof systems on the market.

Today, Carlisle's product offering has expanded to include Sure-Flex PVC, Sure-Flex KEE HP, Sure-Weld® TPO, and FleeceBACK® membranes, as well as a full line of prefabricated accessories. Carlisle also provides insulation, adhesives, roof gardens, metal roofing, coatings, skylights, pavers, and edge metal.

Carlisle's signature products have been installed on a wide range of buildings around the world, including schools, hospitals, restaurants, warehouses, and cold-storage facilities. With tens of billions of square feet of roofing materials sold and installed, Carlisle continues to lead the industry by providing its valued customers with innovative products, services, and warranty options. Whatever your roofing needs, Carlisle has a system – and an answer – for you.

Sure-Flex PVC: **Changing the Game**

For over 50 years, PVC has proven to be a high-performance single-ply roofing membrane. Now Carlisle has taken a proven performer and improved its integrity, flexibility, and weatherability. No other thermoplastic membrane can match the proven long-term performance of Carlisle's Sure-Flex PVC and KEE HP.

HISTORY OF PVC

Carlisle obtained their Sure-Flex PVC formulation in 2003 from a reputable manufacturer with outstanding performance in the PVC market and established in-field performance. The basic formulation of Carlisle's Sure-Flex PVC membrane has been successfully used in low-slope roofing applications since 1978.

Sure-Flex KEE HP membranes are from a formulation first used in 1985 based on the assistance from, and following the formula recommendations of, the DuPont Company. Carlisle uses the HP (high performance) grade of DuPont Elvaloy®, while most other manufacturers use the "standard" grade of Elvaloy. DuPont acknowledges the increased performance of the KEE HP over the standard KEE. Elvaloy-based products have been in the marketplace for over 45 years and have a successful track record. This is the same basic formulation used today.

No other supplier of PVC membranes can provide you with the level of primary manufactured roofing assembly components (membrane, insulation, adhesives) as Carlisle. Carlisle also takes pride in delivering the highest level of technical support, field service, and qualified and trained authorized installers.

Sustainability

PVC IS THE WORLD'S THIRD MOST IMPORTANT PLASTIC!

About 57% of PVC is chlorine. It is obtained via electrolysis from salt water, a resource that is available in virtually unlimited amounts. Yet the presence of chlorine imparts a range of unique technical features in PVC that set it apart from many other polymers. A number of these features are well known and documented, and perhaps this uniqueness makes it a fascinating polymer to study in terms of its potential for sustainability. PVC is flame-retardant, non-poisonous, and resistant to alkalis, acids, and many organic solvents. The addition of plasticizers imparts flexibility and elasticity to the material. With salt being the primary raw material, PVC uses comparatively few non-renewable fossil fuels in its production, offering both an environmental and an economic advantage.

ASTM D4434 Type III vs. Type IV:

Sure-Flex PVC and KEE HP membranes provide higher breaking strength, tear resistance, and elongation properties than ASTM D4434 Type III/IV PVC Specification Standards. This means you are getting the best PVC roofing material available.

	Type III	Type IV	% Increase	Sure-Flex PVC	Sure-Flex KEE HP
Breaking Strength	200	275	38%	330 65 %	320 60 %
Elongation	15	25	66%	25 66 %	30 100 %
Tearing Strength	45	90	100%	130 190 %	125 180 %

JOB PROFILE

West Springfield High School

Project Location: West Springfield, MA

Square Footage: 146,000

Project Duration: 26 months

Roofing Contractor: Titan Roofing, Inc.

Roofing System:

- .060 Sure-Flex PVC
- RhinoBond® membrane attachment system
- ¼"-thick DensDeck® Roof Board
- Two layers 2.5"-thick polyiso insulation

This case study details the installation of a Sure-Flex PVC roofing system on the 146,000-square-foot West Springfield High School in West Springfield, MA. The 60-mil PVC membrane was installed using the RhinoBond membrane attachment system over two layers of 2 ½"-thick polyiso and ¼"-thick DensDeck.

Scan here to see the full case study.

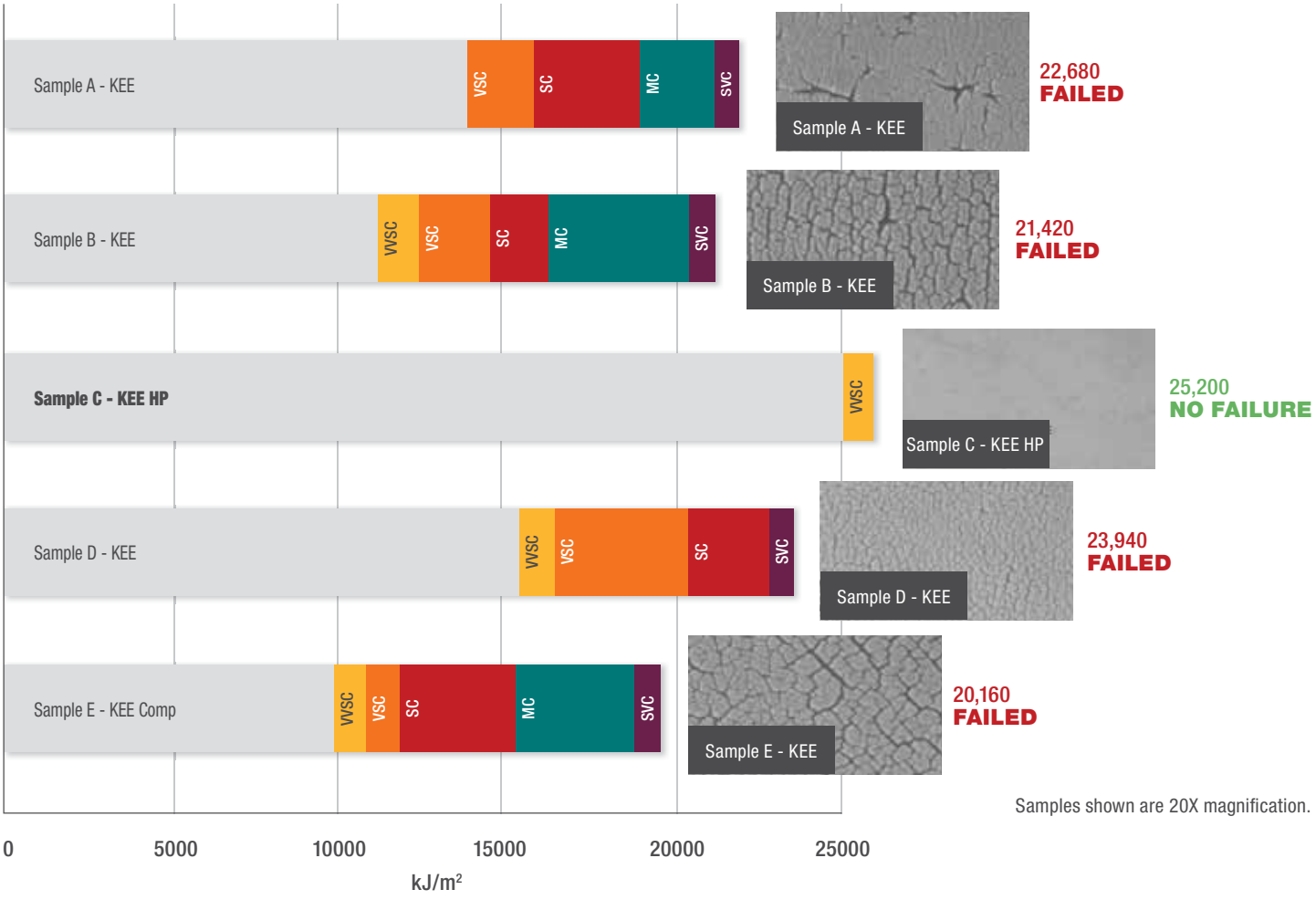
KEE HP

To ensure long-term performance in the most severe climates and conditions, Carlisle's KEE HP membrane, along with other KEE membranes, were exposed to Xenon Arc testing at conditions typically used to test TPO and EPDM membranes, which are more stringent than the conditions traditionally used to test PVC and standard KEE membranes.

A variety of PVC membranes ,which were enhanced with DuPont's Elvaloy standard KEE and KEE HP, were tested. Carlisle's KEE HP, by far, proved to be the best performing membrane, surviving the severe exposure of 25,000 kJ/m^2 with no cracking occurring on the membrane.

XENON ARC AGING (ASTM D7613)

0.70 W/m^2 Exposure @ 340nm, 80°C BPT • Inspected after every 500 hrs



Samples shown are 20X magnification.

VVSC	Very, very slight crazing (just able to observe under 10X)
VSC	Very slight crazing (cannot see with unaided eye, but easily observed under 10X)
SC	Slight crazing (able to observe with unaided eye within 12" from eye)
MC	Moderate crazing (can observe within 24" from eye)
SVC	Severe crazing (can observe from 6 ft away, similar to alligatoring)

POLYESTER VS. FIBERGLASS REINFORCEMENT

Polyester or fiberglass: Which is the better reinforcement for thermoplastic single-ply roof membranes? Today, over 99% of all thermoplastic single-ply roofing membranes use a polyester reinforcement, yet a few holdouts still contend fiberglass reinforcement is better.

Polyester and fiberglass reinforcements both help provide dimensional stability to thermoplastic membranes. Polyester reinforcement, however, offers the added benefits of enhancing the membrane's resistance to tear, breaking, fatigue and punctures. Though polyester-reinforced membranes are traditionally used in mechanically fastened assemblies, they have also been successfully used in adhered systems for many decades. Fiberglass-reinforced membranes, on the other hand, only provide marginal fatigue resistance, limiting their use to fully adhered assemblies or perhaps applications where the membrane is fully protected by a top surfacing material.

LINEAL DIMENSIONAL STABILITY (% DIFFERENCE)

Polyester		Fiberglass
.4%	.38% DIFFERENCE (⅓ of 1%)	.02%

TEARING/BREAKING/PUNCTURE (% INCREASE)

Polyester		Fiberglass
	Tearing Strength	
70 lbf	467% INCREASE	80 lbf/in
	Breaking Strength	
320 lbf/in	400% INCREASE	15 lbf
	Puncture Resistance	
20 Joules	100% INCREASE	10 Joules

PVC & KEE HP Warranty Options

	Sure-Flex PVC Membrane					Sure-Flex KEE HP Membrane				
	10-Year	15-Year	20-Year	25-Year	30-Year	10-Year	15-Year	20-Year	25-Year	30-Year
50-Mil	✘	✘				✘	✘	✘		
60-Mil	✘	✘	✘			✘	✘	✘	✘	
80-Mil	✘	✘	✘	✘		✘	✘	✘	✘	✘

For more specifics or for International warranty programs, contact Carlisle.

JOB PROFILE

Norfolk Harbor Museum

Project Location: Norfolk, VA

Square Footage: 55,000

Roofing Contractor: Roof Services Corporation

Project Duration: 3 months

Engineer: Hentz Engineering, Inc.

Roofing System:

» 115-mil gray FleeceBACK KEE HP membrane fully adhered with FAST Adhesive

Scan here to see the full case study.

This case study that details the installation of a FleeceBACK KEE HP roofing system on the 55,000-square-foot Nauticus building in Norfolk, VA. The 115-mil FleeceBACK KEE HP membrane was fully adhered with FAST Adhesive.

Nauticus Museum, Norfolk, VA

West Springfield High School, West Springfield, MA

CERTIFIED FABRICATED ACCESSORIES

Certified Fabricated Accessories (CFAs) are the only factory-fabricated PVC accessories that meet the stringent quality tolerances required to be included in a Carlisle warranted roofing system. Sure-Flex CFAs can be used on PVC and KEE HP membranes and are made from the KEE HP formulation to protect the roofing system at critical transitions.

PRODUCTIVITY BOOSTERS

Universal Corners

Carlisle's Sure-Flex PVC Universal Corners are quick and easy to apply and provide substantial labor savings compared to field-fabricating corners from non-reinforced flashing.

HydroBond

Carlisle's HydroBond™ PVC Water-Based Adhesive is a wet lay-in, one-sided dispersion adhesive. Compatible with FleeceBACK PVC, KEE HP, and TPO membranes, this product is ideal for bonding only PVC membranes to various porous and non-porous substrates (cannot be used with any KEE HP bareback membranes). HydroBond is used to secure PVC membranes to clean and dry horizontal surfaces with up to a 2:12 slope and as a contact adhesive in vertical applications.

PVC Pressure-Sensitive Cover Strip

Sure-Flex PVC Pressure-Sensitive (PS) Cover Strip is a nominal 35-mil (0.76 mm) non-reinforced KEE HP flashing laminated to a nominal 35-mil (0.76 mm), fully cured, pressure-sensitive, synthetic rubber adhesive. PVC PS Cover Strip is exclusively tested and designed for use on Carlisle Sure-Flex PVC and KEE HP membranes only and is available in white, gray, and tan 6"-wide by 100'-long (152 mm by 30.5 m) rolls. Performance of PVC PS Cover Strip is not guaranteed if used on other manufacturers' membranes. PVC PS Cover Strip is used to strip in flat metal edgings (e.g. drip edge).

TOP 10 REASONS TO CHOOSE PVC

PVC is the oldest thermoplastic in the world and the only thermoplastic that does not use 100% fossil fuels. Over 50% of PVC (chlorine) is derived from the salt in salt water and the remainder of the formulation is from natural gas; both are extremely abundant in the world.

1. **Heat Weldability:** Welded seams become solid and monolithic, which helps to prevent leaks. The welding of PVC roofing membranes has a bleed-out in the weld, which is visual confirmation the weld is good. Other thermoplastics do not have a bleed-out of the weld.
2. **Fire Resistant:** PVC is the most fire-resistant of all roofing membranes. PVC will not support fire like other thermoplastics and is self-extinguishing when the flame source is removed.
3. **Chemical Resistance:** PVC is one of the most chemical-resistant single-ply membranes. It has high resistance to animal fats from restaurants, jet fuels from airports, acids, and various other chemicals that might get on the roof and cause damage to other membranes.
4. **Resistance to Ponding Water:** PVC offers excellent resistance to ponding water and is even used to line swimming pools.
5. **Cold Temperature Flexibility:** KEE HP-modified PVC is flexible in temperatures as low as -56°F (-48°C).
6. **Tolerant to High Temperatures:** PVC is compounded with heat stabilizers, which help make it high temperature-tolerant.
7. **Easy to Work With:** PVC is very flexible and easy to work with, which helps to cut down on installation errors.
8. **Wide Window of Welding:** The temperature range in which PVC can be effectively welded is wide, allowing a better chance for good welds and fewer leaks.
9. **Confidence in Welding:** When welded, the PVC membrane will “bleed out”. The darker-colored bottom ply offers an excellent visual cue to the welder, assuring a better weld.
10. **Shelf Life:** No shelf life, does not start to oxidize or crosslink.

CARLISLE SYNTEC SYSTEMS

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