

Key Criteria for High-Performance Roofing

BALANCE THE FACTORS THAT DRIVE YOUR RETURN ON INVESTMENT

BY JERRY BEALL

YOU MAY NOT SEE IT OR HEAR IT — and probably don't want to — but there is a lot of activity happening on your roof, which represents one of the larger investments that owners have in their buildings.

The fact is that a roof is subjected to a barrage of impacts from chemicals, wind, foot traffic, sunlight, temperature and moisture. And although it seems that a roofing system is stolid and silent, it is responding continuously to these impacts. The complex chemistry and materials behind a roof membrane are major factors in their long-term performance and return on investment.

When evaluating roofing systems, commercial building owners will profit from a quick overview of a few material and installation principles.

SYSTEM TYPES, INSTALLATION AND BEHAVIOR

It's useful to recognize the major types of roofing systems, not only for the behavior of their materials but also to identify their manufacturing and installation components.

Bituminous roofing is a category of **built-up roofing (BUR)** consisting of asphalt distilled from crude oil or tar distilled from coal. Both materials are installed in the field, often by heating them to high temperatures and applying with a mop or mechanical spreader. Cold-applied versions of asphalt do not require heating, and so they avoid the potential danger of high temperatures (450 degrees F. plus). **Modified bitumen** materials consist of asphalt or coal tar materials that have been modified with polymeric materials and manufactured as roll sheet. The sheets may be installed in multiple layers with heat, flame torches or cold materials.

Single-ply roofs consist of a flexible membrane that is factory fabricated, thus diminishing installation errors that can affect field fabrication of built-up roofs. As roll materials, single plies are seamed in the field. **Thermoplastic** single plies are seamed by a heat weld in the field while the material in **thermoset** single plies is "set" and must be seamed with adhesives or tapes by the contractor. **EPDM membranes** consist of a thermoset material (ethylene propylene diene monomer).

Thermoplastic single plies consist of various materials with quite different properties, including TPO (thermoplastic polyolefin), PVC (polyvinyl chloride), and KEE (ketone ethylene ester). Manufacturing of KEE materials begins with a flexible material, while PVC is an inflexible material that requires the addition of other chemicals to make it flexible. The molecules in these added chemicals tend to break down when subject to heat, ultraviolet light, and some chemicals, all of which shorten their service life compared to KEE.

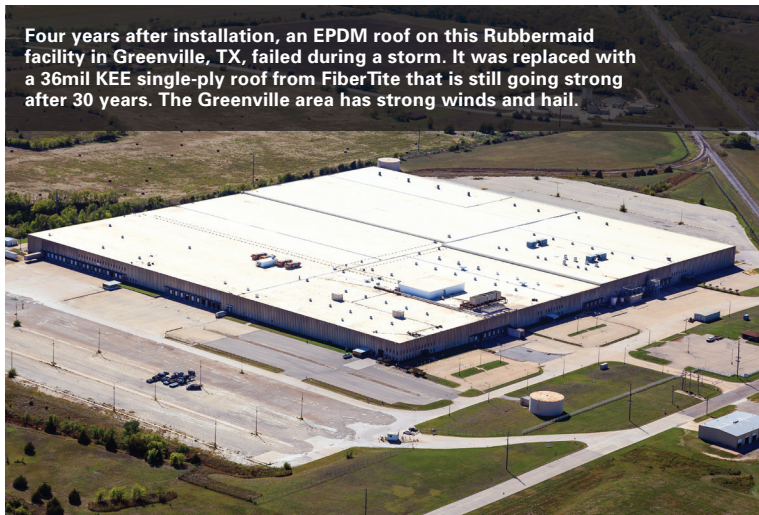
For long life, roofing materials must resist a number of degrading factors, and each roofing material tends to respond in its own way. (See "Material Factors for High Performance" at right.)

NAVIGATING THE EVALUATION AND PURCHASE PROCESS

Given the range of materials and factors, building owners need to narrow down their options — but without oversimplifying them — in order to get the best possible return on investment. There are no magic bullets in the process.

Keep in mind that you should investigate existing roofs on buildings in your climate zone. Performance as measured by lab tests can be valuable, but they are limited; you must evaluate real-world weathering. Another key principle is the expertise of the contractor. As we have seen from the survey of roofing systems,

Four years after installation, an EPDM roof on this Rubbermaid facility in Greenville, TX, failed during a storm. It was replaced with a 36mil KEE single-ply roof from FiberTite that is still going strong after 30 years. The Greenville area has strong winds and hail.



different systems have varying degrees of factory vs. field fabrication. The contractor should have the expertise necessary to install a given system.

It can be tempting for owners to overemphasize the importance of warranties when they are narrowing their roof options. However, as important as they are, warranties are not a guarantee of performance. I've been in the industry for 40 years, and I have never seen a warranty keep water out of a building.



Jerry Beall is a Product & Technical Specialist at Seaman Corporation's FiberTite roofing division.

For more information, watch a free roofing webinar entitled "5 Critical Roofing Performance Considerations" presented by Jerry at www.buildings.com. He can be reached at jbeall@seamancorp.com.

MATERIAL FACTORS FOR HIGH PERFORMANCE

A safe and long-lasting roof must provide solid resistance to the following inescapable factors:

1) Ultraviolet light UV is the No. 1 enemy of asphaltic and modified bitumen roofs. Both need some kind of granular surfacing or cap sheet to protect the underlying membrane from UV, whereas EPDM membranes resist UV very well. The stabilizers for heat and fire in TPO membranes (and to a lesser degree in PVC membranes) degrade their UV resistance, and manufacturers continue to work on a performance balance. KEE membranes have excellent UV resistance and stabilization due to their versatile polymeric engineering.

2) Punctures and impact Due to their mass and surface aggregate, built-up roofs can have good puncture resistance but it degrades over time. Modified bitumens have similar puncture performance. Reinforcing fabric in single-ply membranes provide impact strength. Because of their densely knitted reinforcement, KEE membranes offer very good inherent resistance to impact and punctures.

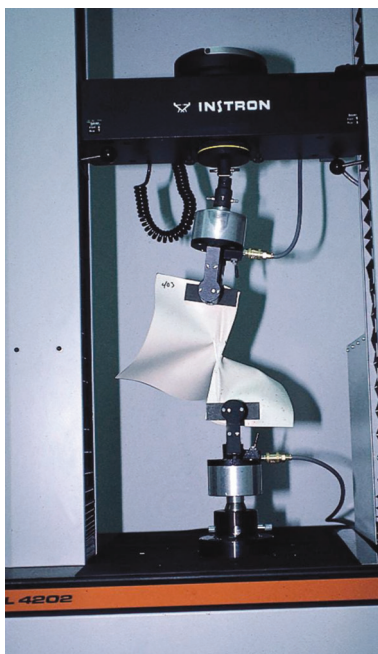
3) Chemicals Whether you can see them or not, chemicals attack all roofs. These include chemicals from upwind vegetation, aircraft fuel, and pollutants in rain, which can turn into chemical soup when ponding. Asphalt has limited resistance to greases, fats and oils; TPOs and EPDMs offer selective resistance to some chemicals. Flexible PVC can be challenged by chemicals that cause plasticizers to migrate. KEE membranes compliant with *ASTM D6754* inherently resist chemicals.

4) Wind uplift To resist wind damage, proper engineering is critical for each attachment option: adhered, ballasted and mechanically attached. My personal preference is mechanically attached, but all methods can perform well when detailed correctly.

5) Fire Roofing assemblies (rather than membranes alone) receive fire ratings. That said, membranes have varying fire resistance. Modified bitumens and EPDMs need special flame retardants to meet UL requirements; TPOs have poor resistance. Asphalt has some resistance, particularly on low-incline roofs. KEE and PVC membranes provide excellent fire resistance.



(Top) UV light has caused alligatoring on this bituminous roof.



(Left) Lab tests can provide useful roofing data but they are no substitute for evaluating real-world weathering.

(Below) UV light has broken down the stabilizers in this TPO membrane.

