

Use of Top Finishes for Roofing and Architectural Membranes

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WHITE PAPER

This paper provides a brief history on the three top finishes available in either the roofing and/or architectural market, and how these finishes improve long-term performance. That is followed by a comparison of these three top finishes. In conclusion, we end with a discussion on emerging technology, utilizing a high-performance fluoropolymer top finish on a roofing membrane; the top finish of choice for Standing Seam Metal roofs for over 45 years.

History

For over 40 years, top finishes and coatings have been used for standing-seam metal roofs and architectural membrane structures with great success.

Standing-seam metal roofs have earned a reputation for being tough and providing long-term aesthetics. Architectural structures utilizing coated fabrics (ex: air-supported and tension frame) are affordable and long lasting and are used for sports facilities, warehouse storage, entertainment venues and many other applications that do not require brick and mortar.

Normally, these structures are high-profile structures and require a coating for long-term aesthetics. To date, top finishes have been used very little on PVC roofing membranes.



Shown is a pre-engineered architectural structure that uses fabric with a protective top finish.

Why Are Top Finishes Used?

Top finishes are added to a substrate to provide longer life and long-term aesthetics. Depending on the type, top finishes can provide varying degrees of cleanability, gloss retention and resistance against an array of chemicals, stains and chalking.

The Different Top Finishes

Top finish options generally include: acrylic (good), standard PVDF [polyvinylidene fluoride] (better), and high-performance fluoropolymer (best).

Acrylic (Good)

For providing improved aesthetic properties, acrylics are a good choice as a top finish on architectural structure and PVC roofing membranes. In the case of PVC membranes, acrylic top finishes delay the migration of plasticizer, a modifier that is used to impart flexibility to the inherent rigid nature of PVC resin. Once the plasticizer migrates to the surface, the membrane surface will start collecting dirt while losing its aesthetic qualities. This process is a catalyst for fungal growth on the structure's surface.

The Chemistry

The acrylic resin systems are typically comprised of a blend of polymethyl methacrylate (PMMA), polyvinyl chloride polymers, modifiers, and a carrier. Acrylic resins also contain esters and incorporate other functional groups, which are susceptible to photochemical degradation and hydrolysis; both of which are



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found in environmental exposure. These conditions contribute to the ultimate breakdown of the protective acrylic layer.

Standard PVDF (Better)

PVDF is not used on roofing membranes, but is available and considered a step up from acrylic for architectural structure membranes. Standard PVDF improves hydrolysis resistance and allows ultraviolet wavelengths to pass through it, which increases its weatherability. This leads to better cleanability, color and gloss retention, and resistance to numerous chemicals, stains and chalking.

The Chemistry

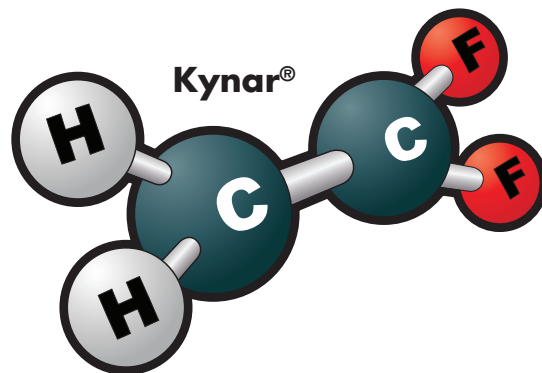
Whereas acrylics include 100% acrylic resin, standard PVDF (polyvinylidene fluoride) are not 100% PVDF resin. Typically, PVDFs include only 30% PVDF and 70% acrylic. Because acrylic resin is the primary polymer in PVDF coatings, the before-mentioned issues of acrylic polymers eventually result in the degradation of the surface coating.

High-Performance Fluoropolymer (Best)

The technology of high-performance coatings was first introduced in 1948, when DuPont™ developed the fluoropolymer, polyvinyl fluoride (PVF), a member of the Teflon® chemical family. Arkema Inc.®, formally Pennsalt, continued the development of fluoropolymers with the introduction of a high-performance fluoropolymer-based product under the name Kynar®. Given Kynar's exceptional chemical resistance, it found a home in many metal markets, eventually becoming the top-finish of choice for standing-seam metal roofs. The unique chemistry of Kynar provides for superior cleanability, color and gloss retention, and resistance to chemicals, stains and chalking.

The Chemistry

Kynar's molecular structure, as well as this high percent of polyvinylidene fluoride, determines its overall performance. Kynar contains carbon-fluorine (C-F) bonds, one of the strongest and most stable chemical bonds. The alternating C-F bond results in a higher polarity on the surface to resist environmental degradation and dirt accumulation. The two fluorine bonds found in Kynar contribute to the superior resistance to chemical, thermal and UV degradation. The very low surface energy and low coefficient of friction of the Kynar resists soiling as compared to standard PVDF finishes. The lack of dirt accumulation and the non-nutrient value of Kynar will not support fungal growth, therefore inhibiting mildew development.



Kynar vs. Other Top Finishes

To better understand the differences between acrylic and a high-performance fluoropolymer, these photographs demonstrate the results of a 14-year testing period during which the samples were left untreated and exposed to the heat, UV light and humidity of Florida. For more information on the history of Kynar, [click here](#).



Roofing Membrane With Kynar

Until recently, acrylics were the only top finishes available for roofing membranes and high-performance fluoropolymer top finishes were only available for standing-seam metal. A high-performance fluoropolymer top finish, branded Kynar, is now being offered by Seaman Corporation's FiberTite® Roofing Systems. This revolutionary roofing product is called FiberTite Brite™.



The introduction of Kynar, as a premium top finish in the roofing membrane market, represents a major technological advancement. When used in conjunction with a high-performance membrane, Kynar provides consultants, architects and building owners with a superior option for a long life, low maintenance and high-aesthetic roof.

For more information on FiberTite Brite with Kynar, including a product sample, brochure, and specifications, please [click here](#).

References:

Arkema, Inc., Personal Communication and General Literature, 2011.

“Creating Coatings for Better Buildings”, Iezzi, Robert A. Ph.D., Elf Atochem North America Inc., Research Center, King of Prussia, PA.

Highly Weatherable Architectural Coatings, Wood, Kurt, et al, Atofina Chemicals, Inc., King of Prussia PA.

For more information about FiberTite Roof Systems please call Seaman Corporation at 800-927-8578, or [click here](#).



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1000 Venture Blvd. • Wooster, Ohio 44691 • (800) 927-8578

www.fibertite.com