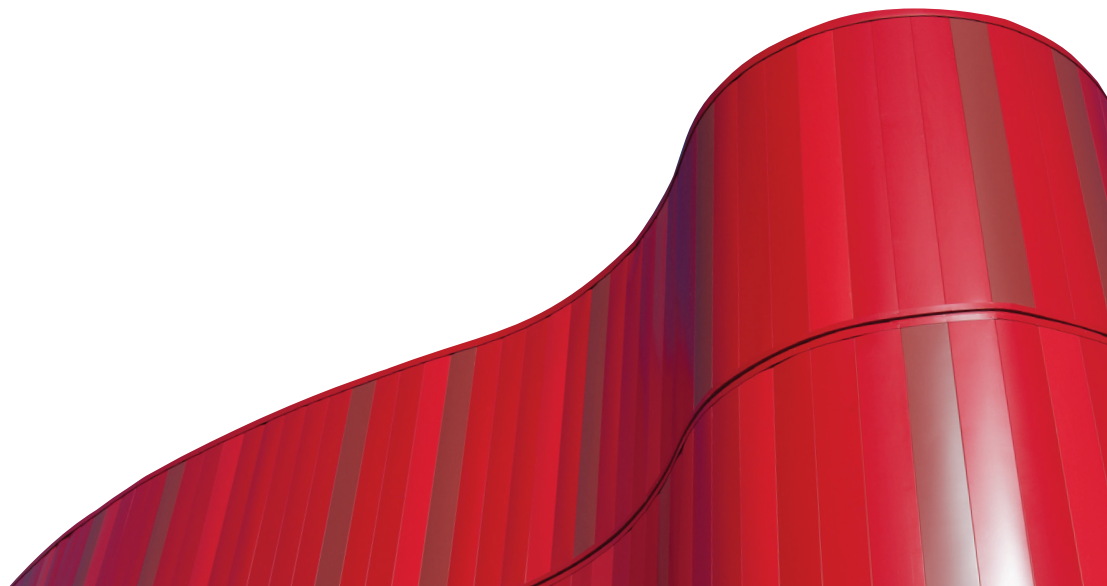
INCREASING DAMAGE RESISTANCE FOR ARCHITECTURAL COATINGS

SHERWIN-WILLIAMS COIL COATINGS
FLUROPON® EXTREME COATING

EVOLUTION OF FLAGSHIP COATING DELIVERS FIELD RUGGEDNESS IN A SMOOTH FINISH

Product Paper



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Accessibility Statement

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EVOLUTION OF FLAGSHIP COATING DELIVERS FIELD RUGGEDNESS IN A SMOOTH FINISH

High-performance architectural coatings deliver outstanding beauty and durability to monumental high-rise structures, pre-engineered buildings, and high-end residential homes. These architectural coatings provide excellent resistance to ultraviolet (UV) rays and other weathering elements for buildings to continuously look beautiful for decades.

Sherwin-Williams Coil Coatings (formerly Valspar) first introduced its flagship architectural coating more than 50 years ago when it launched Fluropon®. Since then, premium fluoropolymer coatings containing 70% polyvinylidene fluoride (PVDF) have become the AAMA 2605 standard for high-performance coatings.

As coating science continued to advance over time, coil coaters and building contractors began asking manufacturers to enhance the abrasion resistance of architectural coatings. They wanted more protection against inevitable wear and tear on painted metal building panels, roofing, and components that occurs during manufacturing and installation.

Sherwin-Williams scientists tackled this challenge. After several years of research, formulation, and testing, the Sherwin-Williams Fluropon® Extreme coating system solved that issue. Fluropon Extreme provides all of the qualities of traditional Fluropon, with increased damage resistance for the toughest projects. This product paper provides an overview of advancements in damage resistance, the science of tribology, and the development of Fluropon Extreme.

HISTORY OF FLUROPON 70% ARCHITECTURAL COATING SYSTEM

Fluropon® 70% PVDF coil coating is Sherwin-Williams' flagship product for the architectural market. This solidly designed two-coat system has endured the test of time since its introduction over 50 years ago. This coating set the standard for performance, long-lasting color, and durability when it launched, and continues to be a leader in the industry. Fluropon is field-tested and time-proven to deliver enduring beauty. These coatings protect thousands of buildings around the world, from the iconic Willis Tower – previously known as the Sears Tower – in Chicago to the shimmering, color-shifting Eser Residence in Woodland, California.

PVDF has one of the strongest chemical bonds known and makes Fluropon resistant to many elements found in the environment, including air pollution, acid rain, and general airborne dirt. Fluropon provides powerful protection against harsh outdoor elements – UV rays, dirt and stains, chemicals, heat, humidity, and corrosion.

All coatings within the Fluropon family are ideal for application on exterior roof and wall panels used on commercial, industrial, and agricultural buildings, pre-engineered buildings, monumental structures, and high-end residential homes. In addition to strong performance in the field, these coatings all provide excellent flexibility, formability, and color consistency during the manufacturing process.

Innovation continued following the launch of Fluropon. This leading coating system evolved and grew over the years to offer a wide range of colors, sheens, gloss levels, and special effects. For example, within the Sherwin-Williams Fluropon® Special Effects coating family, Kameleon™ delivers pearlescent hues with active color shifts. Nova creates rich colors with an intense silver or gold sparkle that has never been achieved until now. Rustica features natural and polychromatic colors with a weathered antique look.

Fluropon is also available in a Solar Reflective (SR) formulation, delivering an eco-friendly way to resist heat absorption from the sun, lower energy cooling costs, and keep buildings more comfortable. This coating meets all ENERGY STAR®, LEED, and CRRC performance requirements.

RESIN SYSTEM PERFORMANCE FOR POTENTIAL IMPROVEMENTS

While 70% PVDF high-performance architectural coatings provide rugged weathering capabilities, they typically offer less abrasion resistance than non-PVDF coatings. Damage due to abrasion can occur on the loading dock, throughout transportation on the road, and on the job site during installation.

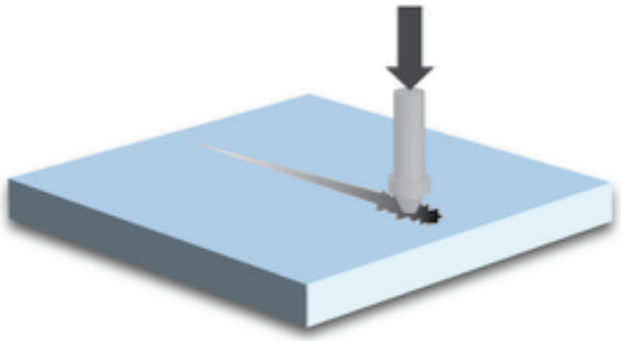
The base polymer is what determines, in part, the durability of a coating. The primary function of the polymer is to bind coating components together, and is an important source of a coating's durability and physical properties. The base polymer increases the physical strength and chemical resistance of the coating film, and plays a critical role in the paint curing process. When combined with high-performance pigments and additives, Fluropon® PVDF coatings take advantage of the exceptional strength supplied by the resin technology. Even though Fluropon provides exterior durability expected by the architectural industry, it is less resistant to abrasion than non-PVDF coatings.

The ideal 70% PVDF coating would use the creation of an ultra-performing resin, providing added damage resistance and other durability characteristics. For more than 20 years, coating manufacturers attempted without success to deliver on this customer need. Sherwin-Williams scientists approached the challenge using the science of tribology – the study of wear, friction, and lubrication of interacting surfaces in motion. This scientific approach covers the myriad of ways a coating can be damaged during formation, transportation, handling, and installation.

GARNERING KEY INSIGHTS FROM WEATHERXL™ COATING DESIGN

When Sherwin-Williams' team of scientists set out to design an enhanced version of Fluropon, they turned to innovations already achieved in another coating line: WeatherXL™. Using tribology, researchers took the science of damage resistance to a whole new level. They evolved the already rugged WeatherX coating into the more durable formulation of WeatherXL, which features a silicone-modified polyester (SMP) resin system.

After developing the WeatherXL coating, scientists used rigorous, objective lab tests and customer field trials over several years to prove its excellent damage performance, as compared to the WeatherX coating.



Micro Scratch Damage-Resistance Test

MICRO SCRATCH DAMAGE RESISTANCE TEST

Sherwin-Williams scientists used tribology testing to evaluate the WeatherXL coatings' resistance to damage. This objective testing, using a Micro Scratch Tester instrument, is a proven methodology applied by researchers in many industries to achieve repeatable, controlled damage results. Tribology testing is more effective to check for damage resistance than the non-scientific pencil test historically used in the coatings industry.

The Result: Through detailed testing with the Micro Scratch Tester instrument, scientists validated that the WeatherXL coating consistently demonstrated better damage resistance than WeatherX.

MULTIPLE COATER AND CUSTOMER FIELD TRIALS

Although scientific testing was important, validation from customers was also critical for success. Several customers tested the coating on their products in the field to provide performance feedback.

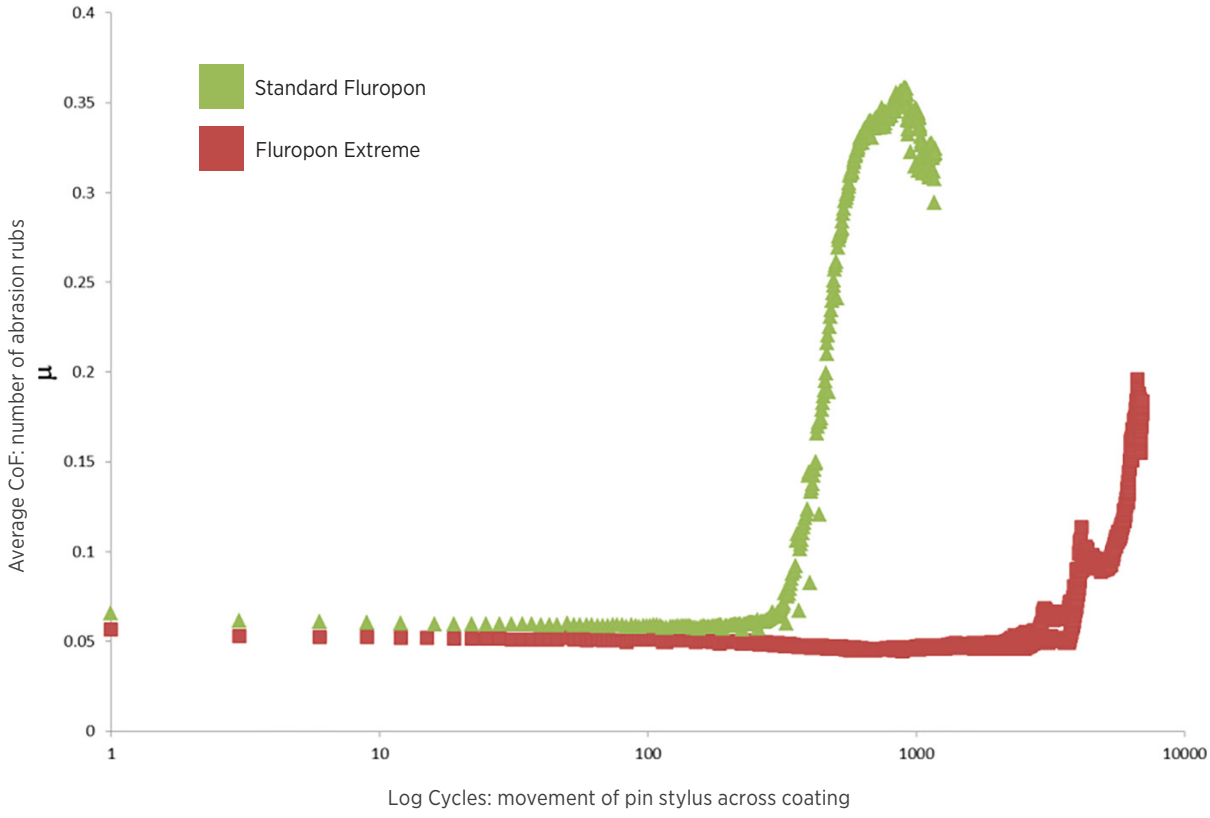
The Result: Customers found that WeatherXL delivered and proved much more resistant to damage than WeatherX.

THE SCIENCE OF ABRASION RESISTANCE: TRIBOLOGY AND FLUROPON® EXTREME

The combination of key learnings from developing WeatherXL™, with the science of tribology and abrasion resistance helped develop the Fluropon® Extreme coating. While customers said they wanted a harder coating, Sherwin-Williams recognized that what they were really asking for was a more damage-resistant version of the Fluropon® coating to withstand rigorous field environments.

The Sherwin-Williams team set about to optimize wear properties of Fluropon for improved performance, using experimental design to isolate factors that impacted the coating. They conducted work with the University of Florida's Engineering Department – one of the world's leading tribology experts – to design the coating parameters.

After several years of formulating, testing, and refining the coating, Sherwin-Williams scientists achieved what they set out to do. Their innovation of Fluropon Extreme builds on the history of this flagship product and delivers even more durability in the field when it comes to damage resistance. In abrasion lab tests, they demonstrated that Fluropon Extreme performs significantly better than a standard PVDF coating.



This abrasion resistance lab study demonstrates that Fluropon Extreme performs significantly better than the standard PVDF product.

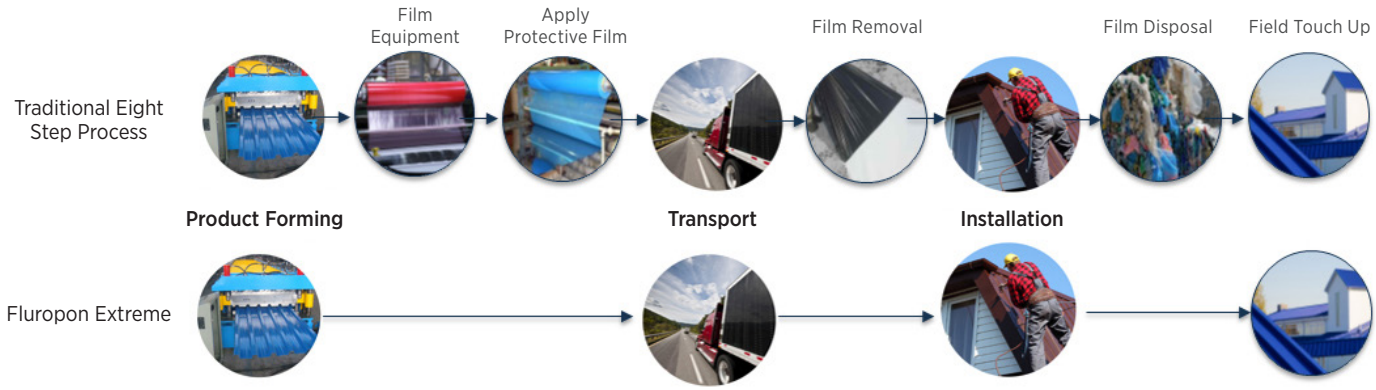
ABRASION RESISTANCE LAB STUDY

Based on lab results, the team moved on to testing Fluropon® Extreme in the field with customers. The type of stresses that coated metal panels and components are put under in the field are significant.

Parts are typically stacked on trucks and transported to job sites. The metal-on-metal rubbing during transport can damage the panel. Most applicators use a protective film to prevent transport damage, which costs additional money and time. Once at the job site, metal panels are moved around, stepped on during installation, hoisted up onto the building, and joined together in the seaming operation using hard metal tools and fasteners. All of these construction processes increase the chances of damage to the painted metal.

Results of field tests consistently confirmed that the Fluropon Extreme coating was more resistant to damage. When transported over the road on trucks, the metal panels coated in Fluropon Extreme showed no more wear than panels coated with Fluropon® and a protective film. This improved field performance allowed manufacturers to eliminate the use of protective film on metal components – saving time and money.

By eliminating steps in the production process, Fluropon Extreme delivers total cost savings. Metal coaters do not have to apply a protective film to safeguard the finish during transport, which eliminates wrapping, removal, and disposal of the film. For coaters that didn't use film, there is no need for coating touch-ups for scratches that occurred during transit.



Fluropon Extreme eliminates process steps from Product Forming to Installation

CONCLUSION

Sherwin-Williams Coil Coatings achieved its innovative goal with the Fluropon® Extreme high-performance architectural coating, which delivers a highly desired smooth finish and enhanced damage resistance. Fluropon Extreme helps prevent abrasion that happens at key points in the process — formation, transportation, and installation. By eliminating application and removal of protective film, Fluropon Extreme saves time and money, and reduces touch-up. Building on the Fluropon® legacy, Fluropon Extreme provides powerful resistance to environmental elements and maintains high-quality appearances for architectural structures.

SOURCE

TECHNICAL AUTHOR

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SOURCES

Sherwin-Williams Coil Coatings Technical Team and coil.sherwin.com

University of Florida Engineering Department

AAMA Coating Specifications

ASTM Testing Standards

SHERWIN-WILLIAMS Coil Coatings

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