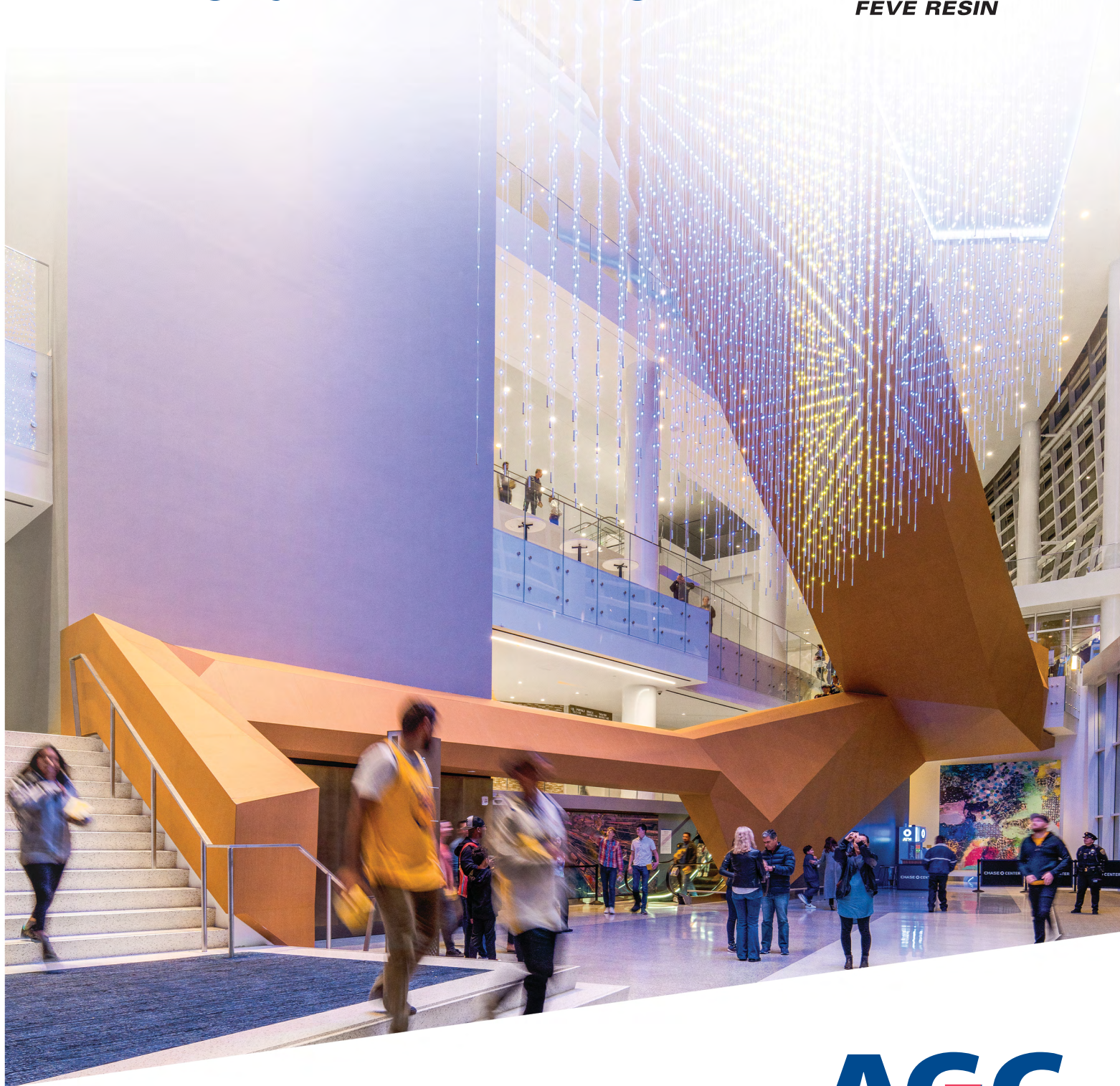


Fluorinated Polymer Resins for Highly Durable Coatings



AGC

Your Dreams, Our Challenge

Fluorinated Polymer Resins for Highly Durable Coatings

AGC developed its solvent-soluble fluoropolymer, LUMIFLON®, a hydroxyl functional polymer (polyol), in 1982. Its unique alternating polymer sub-structure is key in providing ultra-weatherability, which allows LUMIFLON-based coatings to be highly durable and far longer lasting than other coatings. LUMIFLON-systems can be cured at room or at elevated temperatures. LUMIFLON is suitable for use in both field-applied and shop-applied coatings.

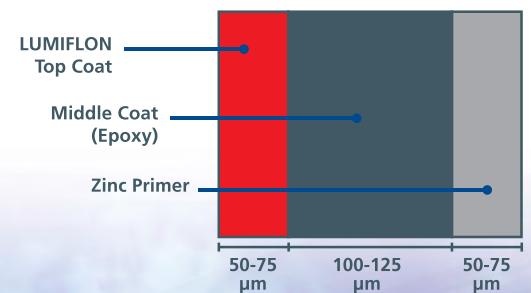
The use of LUMIFLON based coatings help to maintain the original appearance of buildings, vehicles, windmills, aircraft, and bridges for several decades, offering protection against UV rays, oxidation, humidity, corrosion and acid rain. LUMIFLON resins can be formulated into coatings with a wide range of gloss and colors. The use of a topcoat based on LUMIFLON significantly reduces repainting and cleaning costs for the lifetime of the coated structure.

LUMIFLON-based products are used on many iconic structures, such as the Cold Spring Canyon Arch Bridge in California, The Hoover Met in Alabama, The Museum of the Moving Image in New York, as well as the Amazon Spheres in Washington.

Features

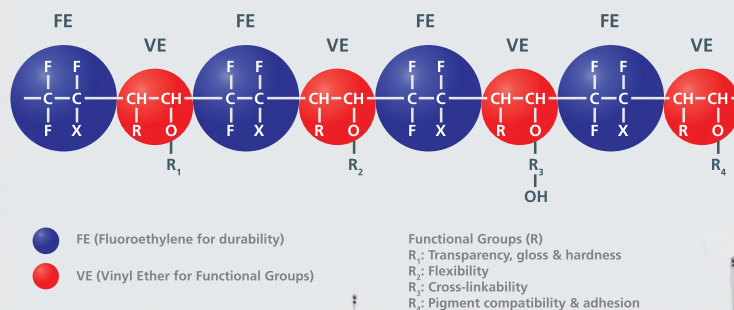
- Fluoropolymers based on fluoroethylene & vinyl ether monomers (FEVE resin)
- Available as solvent borne, water-based & powder / solid grades
- Curable from room temperature to high temperatures – from 10°C to 230°C
- Highly transparent films
- Protects aluminum, steel, fiberglass, concrete, polycarbonate & other materials from sun, corrosion, wind, rain & chemical exposure

Cross Section of a Coating System



The LUMIFLON coating prevents corrosion initiators penetrating the topcoat and degrading the zinc primer below.

Polymer Structure of LUMIFLON Resins



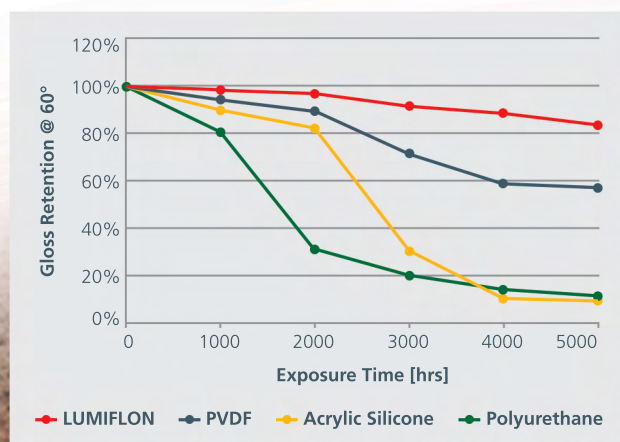
 Asian Art Museum
San Francisco, CA



Benefits of FEVE Coatings

- Aesthetics – wide range of color & gloss achievable; long-lasting color & gloss retention
- Corrosion prevention & chemical resistance
- Minimal erosion of coating thickness over years
- Hydroxyl functional – polyurethane chemistry means standard paint equipment can be used
- Low chalking as a result of outstanding resistance to UV light & weathering
- Low maintenance which minimizes costs
- Sustainable – less paint consumption & reduced emissions
- Extended coating life/long life cycle of up to 60 years
- Curable at both ambient & elevated temperatures – for field or shop-applied coatings
- Can easily pass ISO12944 C5 very high (VH) & CX

Sunshine Weather Meter Test

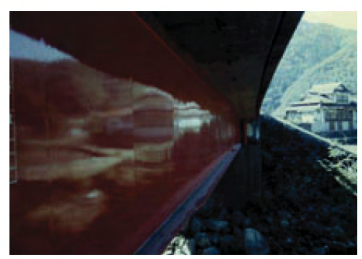


*Cold Spring Canyon Arch Bridge
Santa Barbara County, CA*

Case Study: Tokiwa Bridge

Fluoropolymer topcoats have been used on bridges in Japan for over 30 years. The Tokiwa Bridge in Hiroshima has benefitted from a LUMIFLON based coating since 1988.

Original Application



Five Years Later



Over 25 Years Later



Sustainability

The weatherability, longevity and the ability to formulate low VOC (volatile organic compound) coatings with LUMIFLON resins are all features that contribute to its sustainability attributes. AGC Chemicals' vision for LUMIFLON is "to reduce consumption of non-renewable resources, minimize waste, and create healthy, productive environments".

Consumption Reduction

LUMIFLON coatings are expected to last up to 60 years without fading, reducing life cycle costs related to the maintenance, re-application and/or replacement of underlying surfaces. On existing roofs, a LUMIFLON topcoat can stop the degradation of the underlying reflective coating, thus extending the life and solar reflectance capability of the roof hence minimizing the use of raw materials derived from oil.

Waste Reduction

By extending the life of roof and wall systems, LUMIFLON topcoats reduce waste created from disposal of damaged roofing and walls, avoid energy consumption in the production, transportation and installation of new systems and maintain energy and equipment savings from continued high-performance of the building envelope. In addition, the energy consumed in removing a coating from a building or structure can be avoided through the use of a new paint product containing a LUMIFLON clearcoat with excellent durability and weatherability.

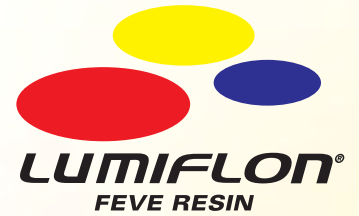
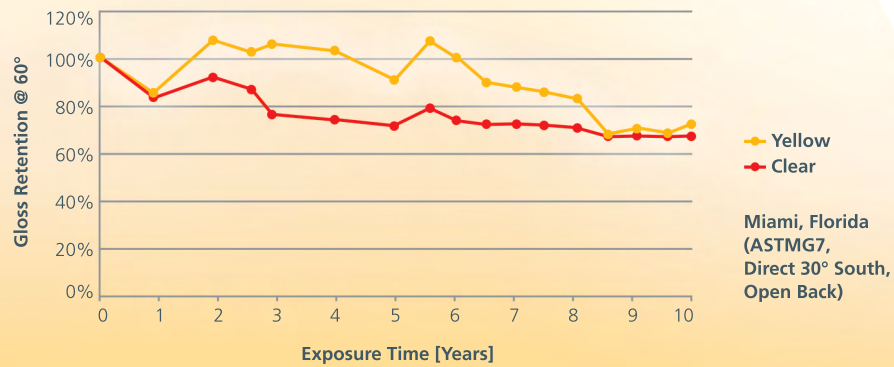
Creation of Healthy, Productive Environments

There are four types of LUMIFLON resins, three of which – solid, powder, and emulsion grades contain either zero volatile organic compounds (VOCs) or can be formulated to contain less than 50 g/L of VOCs, meeting the most stringent green building criteria. Due to its longevity, LUMIFLON reduces the environmental impact associated with production and transportation (such as energy consumed, greenhouse gases emitted), and VOCs off-gassed during the repainting/recoating process.



 **Skydance Bridge**
Oklahoma City, OK

Natural Exposure Test on LUMIFLON LF-200



LUMIFLON Outperforms Conventional Coatings

LUMIFLON-based coatings are used in the construction industry on structures such as buildings, bridges and windmills and in the transport industry on airplanes, cars and ships. Tests and studies have been conducted in laboratories, simulators and real-world environments showing that LUMIFLON outperforms high performance polyesters and other competitive materials.

Hudson Yards
New York City, NY

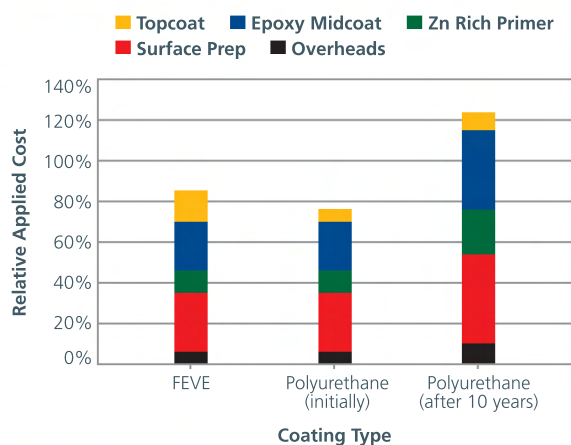




Amazon Spheres
Seattle, WA



**Orlando Health Winnie Palmer Hospital
for Women & Babies, Orlando, FL**



Lower Life Cycle Cost

Initial investment in a LUMIFLON FEVE coating could be 5-10% higher than a standard polyurethane topcoat. However, the lifetime expectation of such a coating is from 30 to over 60 years and a polyurethane topcoat would have required 2-3 repainting cycles during this period.

With the use of LUMIFLON additional costs associated with repainting, such as asset downtime, staging costs, environmental costs and emissions and CO₂ from equipment, can be avoided. Over the lifetime of a project the cost difference can be significant and therefore LUMIFLON offers better long-term value for money.

Chase Center, San Francisco, CA



Haribo Water Tower, Pleasant Prairie, WI

LUMIFLON Product Selection



Powder Grades

Property / Grade	LF710F
Solid Content (%)	100
T _g (°C/F)	52/125
Softening Point (°C/F)	90/194
OH Value (KOH/g)	46
Acid Value (KOH/g)	0
Applications	Architecture, window frames, hydrants

Solid Grades

Property / Grade	LF200F	LF916F
Solid Content (%)	> 98%	> 99%
T _g (°C/F)	35/95	34/93
OH Value (KOH/g)	49	100
Softening Point (°C/F)	119/246	117/242
Applications	General protective coating, heavy duty, industrial maintenance	

Water-based Grades

Property / Grade	FD1000	FE4300	FE4400
Type	Dispersion	Emulsion	Emulsion
Solid Content (%)	40	50	50
OH Value (KOH/g)	85	10	49
Min. Film Forming Temp (°C/F)	29/84	30/86	55/31
Ionic Character	Anionic	Anionic	Anionic
Applications	General protective coating, heavy duty, industrial maintenance		

Solvent Grades

Property / Grade	LF200	LF552	LF600X	LF810	LF910LM	LF9721
Solid Content (%)	60	40	50	45	66	70
T _g (°C/F)	35/95	20/68	20/68	45/113	37/99	-
OH Value (KOH/g)	52	52	57	4	100	160
Acid Value (KOH/g)	0	5	0	0.3	0	-
Solvent	Xylene	Aromatic hydrocarbon solvent / cyclohexane	Xylene	Mineral spirits	Xylene	Ethyl 3-ethoxy propionate
Applications	General protective coating	Factory coil coating	Coil coating	Field application aerosols	Heavy duty aerospace	Aerospace and military

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for a Blue Planet**
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