



DuPont™ Tedlar® PVF film

Long-lasting protection for architectural applications

More than 50 years of proven performance

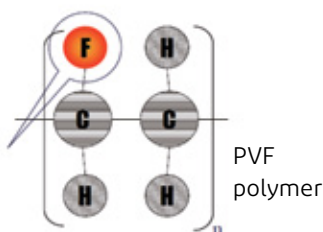


Tedlar® PVF film

Polyvinyl fluoride (PVF) is a fluoropolymer invented by DuPont in the 1940s.

Put into commercial use in 1961, DuPont™ Tedlar® film is a registered trademark of DuPont. For more than 50 years, Tedlar® has been widely used in various fields such as aerospace components, building façades and roofs, solar cell modules, outdoor advertisements and interior surface protection.

Tedlar® film can vary in thickness and can be laminated on a variety of materials, including metals. Compared to paint coating and other film materials, Tedlar® is made up of 100% fluorene PVF and possesses unique properties, including excellent weatherability, ductility, durability, physical stability and resistance to many chemicals, solvents, pollutants and corrosive agents. In addition, Tedlar® film, free of plasticizers such as acrylic acid, comes with excellent aging resistance and maintains toughness and flexibility over a wide temperature range. Its dense film surface is also easy to clean; non-reactive and inert; resistant to stains and fire, as well as fading, chalking and cracking; and safe and environmentally friendly, making it ideal for a wide range of industries and applications.



Industries & applications

Aerospace

Durable, attractive and resistant to stains and chemicals, Tedlar® film is an ideal surface protection for aerospace applications, such as aircraft interior and composite parts.

Architecture

Resistant to fading, cracking, mold and mildew, Tedlar® film can help prolong the life and aesthetics of both interior and exterior constructions in the architectural industry.

It can be used for metal roofing, curtain wall and ceiling, wall exterior and interior, membrane fabric materials and highway sound barriers.

Transportation

An easy-to-clean surface that resists weathering, ultraviolet (UV) rays and harmful chemicals, Tedlar® film keeps vehicles and vessels looking their best. In the transportation industry, it is ideal for use on automobile trim, brake tube coating, fiberglass reinforced plastic (FRP) and aluminum board protection for trucks and trailers.

Signage

Long-lasting and resistant to graffiti and pollution, Tedlar® film preserves the appearance of graphics in even the most harsh environments, making it the perfect choice for various graphics' overlay, outdoor awnings and advertising signage.

Other applications

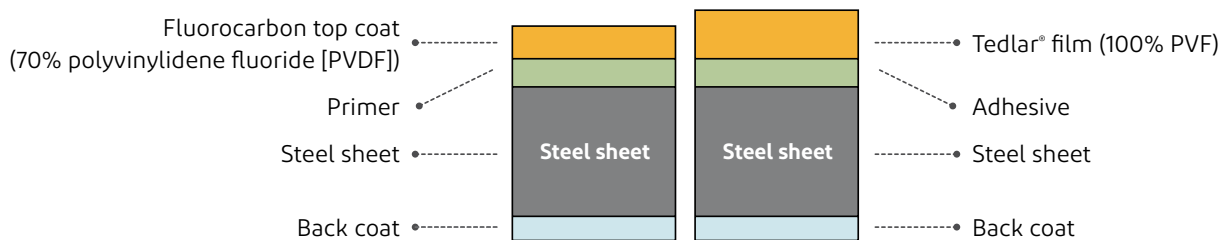
Tedlar® film is applicable in a wide variety of other industries. The high-performance protective film is ideal for photovoltaic module backsheet in solar panels, and for printed circuit boards (PCB), motor winding, transfer printing and composite parts in release film.

Metal lamination

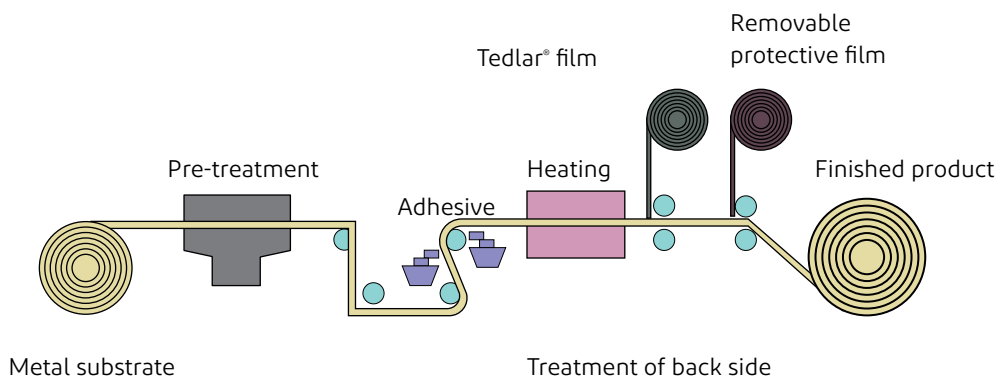
Product structure and processing flow

Tedlar® film is laminated onto a metal substrate using a special adhesive invented by DuPont based on a hot laminating process. The process and product structure are similar to those of a fluorocarbon coil coated metal sheet. The figure below illustrates the differences between Tedlar® film lamination and fluorocarbon baking coating.

Structural comparison of Tedlar® film laminated steel sheet vs. sheet with fluorocarbon baking coating



Metal lamination process of Tedlar® film



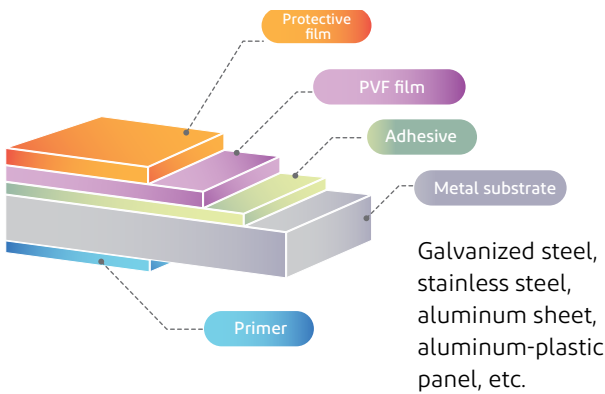
Building solutions

System solutions for building

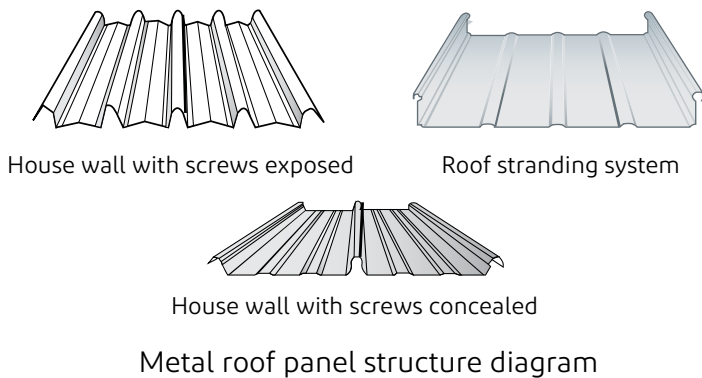
Tedlar® film-based metal lamination

Tedlar® film-based metal lamination provides a guarantee of more than 30 years of service life for the roofing of any new project.

Product structure example



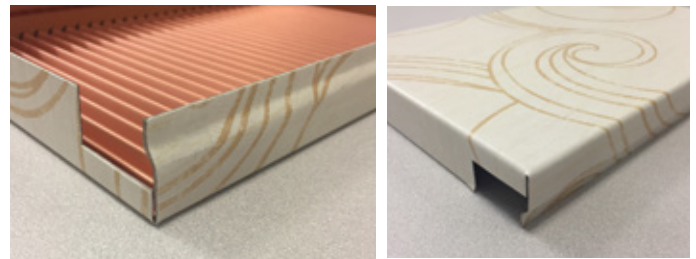
Tedlar® metal lamination product structure



Copyright: Taiwan Lytec Steel

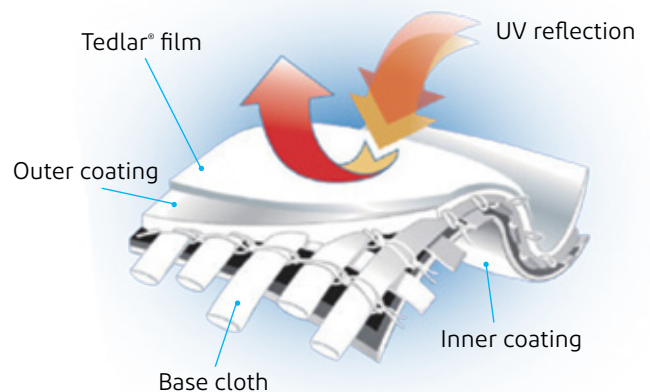
Composite metal sheet with Tedlar® film interior finish

Tedlar® film interior finishes not only have the delicate texture of fabric, but also have excellent properties such as fire-, stain- and corrosion-resistance and ease of cleaning. Organic combination with steel sheet makes the Tedlar® interior finish suitable for medical environments.



Membrane fabric materials laminated with Tedlar® film

Tedlar® film can be laminated with various coated fabrics to form membrane fabric structures at much lower construction costs than steel. With excellent weatherability and dirt-shedding properties, membrane fabric is a cost-effective material for buildings like stadiums, convention centers, commercial facilities and transportation hubs.



Composition of membrane fabric materials

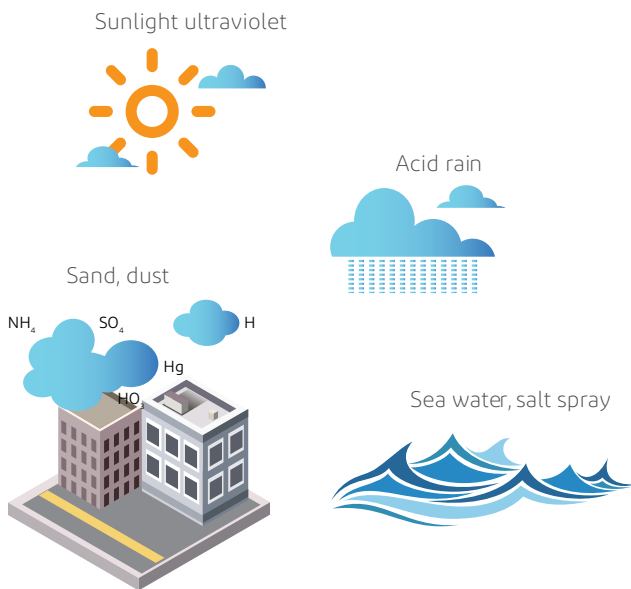
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Tedlar® for architectural sheet metals

In coastal and tropical/sub-tropical natural environments with high temperature, high humidity and especially high salt spray, pollution brought by industrial development is gradually evolving into a highly corrosive atmospheric environment. Metals exposed to these environments for many years are highly susceptible to corrosive damage caused by moisture, oxygen and corrosive substances (such as impurities, acids, salt ions, dust and surface deposits).

Tedlar® film consists of 100% fluorocarbon resin without the addition of plasticizers such as acrylic acid (also known as acrylic or polymethyl methacrylate [PMMA]). The chemical stability and aging resistance of fluorocarbon resins ensure the excellent weatherability of Tedlar®. In addition, Tedlar® film for buildings and construction has been subjected to biaxial stretching to improve mechanical, optical and barrier film properties. The surface of the film is resistant to pinholes, cracks and other abrasions, and provides long-term effective protection for the metal substrate.

The excellent weatherability and corrosion resistance of Tedlar® film laminated metal sheets have been proven in numerous practical application cases over the past 30 years.



Improve the corrosion resistance and service life of steel sheets with Tedlar®

The picture above shows the rooftop of an industrial plant. The rooftop of the plant consists of two parts. The lower left is Tedlar® film laminated steel sheet installed in 1983, and the upper right roof is steel sheet coated with other material installed in the late 20th century. Although the roof sheets are the same shape and used in the same environment, the appearance of the steel sheet roofs coated with different materials shows a huge difference.

The steel sheet roof not laminated with Tedlar® has been severely rusted, while the Tedlar® film laminated steel sheet roof appears as durable as new after more than 30 years of use.

Installation

Roof installation and construction



Bottom plate and insulation material laying, bracket installation



Metal sheet on-site molding



Simultaneous laying of roof panels



Roof panel occlusion



Installation completed

Copyright: Taiwan Lytec Steel

Features



Durable

Tedlar® film has delivered excellent weatherability and proven protection in a number of practical applications.



Stylish

With ultra-low color differences, a smooth and fine texture and excellent formability, Tedlar® film is stylish and aesthetically pleasing from installation until its removal. Its matte surface finish even prevents light pollution.



Easy to clean

Non-sticky and stain resistant, Tedlar® film can withstand all types of dirt and grime. Chemically inert, the film can be cleaned with various cleaning agents and requires little maintenance.



Safe & environmentally friendly

Tedlar® film is non-flammable and non-reactive, and it doesn't support bacterial growth. Additionally, it produces minimal volatile organic compound (VOC) emissions during processing.

Durable

Tedlar® film has delivered excellent weatherability and proven protection in a number of practical applications.

Japanese steel sheet plant

Founded in 1984, this steel sheet plant expanded its workshops in 2010 and installed Tedlar® film laminated steel sheets of the same color. As shown in the figure, the newly installed steel sheet has almost no difference in color and appearance compared with the steel sheet that has been used for 26 years.

In addition, although the plant is located in the coastal area, there is no obvious corrosion on the edges of the steel siding and at the screw holes, which indicates that the Tedlar® film provides effective protection for the steel sheet.



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Chaoyang Park Tennis Center, Beijing, China

Laminated with Tedlar® film, this tennis center's air bearing membrane roof has remained almost unchanged in color.



Okinawa Thermal Power Plant, Japan

Founded in 1986, this thermal power plant is located in the coastal area of Okinawa, less than 500 meters from the coastline. The high salt spray environment along the coast and the smoke in the power plant are very corrosive to buildings, especially metal sheets. After 27 years of erosion by wind and rain, the steel sheets protected by Tedlar® film revealed no signs of rusting at the edges and seams. Moreover, the film maintained an ultra-high color stability. After 27 years of use in the coastal environment, there is no obvious discoloration and chalking. There is almost no color difference compared with the sample left inside the plant in 1986.



Copyright: Nippon Steel Metal Products Co., Ltd

Easy to clean

Tedlar® is stain resistant and chemically inert, so it can be completely cleaned with a cleaning agent, even when exposed to stubborn stains such as spray paint or caulking compound. Other finishes, such as fluorocarbon paint, may be damaged in cleaning due to poor chemical inertness.

Non-sticky and stain resistant

Tedlar® film resists all types of dirt, including bird droppings, water marks, paint, cooking fumes, grease, dust, acid rain and more.

Chemically inert

Tedlar® film can stand up to a wide variety of detergents and strong solvents to remove stains such as asphalt, tar, grease, paint or caulking compound.

Self-cleaning

Contaminants can be easily washed away by rain water, keeping the building's appearance fresh and new, and reducing cleaning and maintenance costs.

Caulking compound and solvent cleaning test



Pedestrian bridge in Yokohama, Japan

Built in 1990, this pedestrian bridge in Yokohama, Japan still remains aesthetically pleasing after several decades of use. Tedlar® metal lamination was attached as a decorative panel to the side and bottom of the pedestrian bridge. Even today, the dust, moss and other stains on the Tedlar® surface are still very easy to clean, keeping the decorative surface clean and beautiful.



Stylish

Metal roofing panel

Tedlar® film's lot-to-lot color reproducibility is controlled to a delta of <math><0.5</math>.

Even & delicate surface finish

With an even surface finish, Tedlar® film prevents uneven thickness and pinholes caused by factors in processing.

Prevents light pollution

With a matte finish on the surface, Tedlar® film maintains an attractive aesthetic without allowing light pollution.

Ease of machining and shaping

Tedlar® film is pliable and ductile, allowing for excellent processability and application.

Building façade in Yokohama, Japan

In 1983, a building in Yokohama, Japan installed a façade using Tedlar® PVF film. The film is matte, with an even and delicate surface finish. Compared to the Tedlar® standard color chart, the exterior wall surface has almost no difference in color after three decades of use.



Building in Tokyo, Japan

In 1986, a building in Tokyo, Japan applied Tedlar® PVF to its exterior walls. Due to the complexity of the wall shape, Tedlar® film—with its easy-to-use machining and shaping properties—was the ideal choice. After more than three decades of use, the wall has almost no difference in color.



Safe

Excellent fire resistance

Tedlar® film is a component of structures that pass safety requirements for aircraft-grade fire resistance and low smoke toxicity. It is also recognized as a non-flammable material in Japan (NM0717, NM1553). Lamination onto metal sheet provides excellent fire resistance and low smoke toxicity.



Applied to the interior of aircraft cabins

Exceptional bacteria resistance

Tedlar® film does not support the growth of bacteria, mold and mildew. It is especially suitable for places that require a high level of cleanliness, such as hospitals, hotels, restaurants and shopping malls.



Applied to sterile operating rooms in hospital

Experiment verification

The excellent performance of Tedlar® film is verified by relevant experiments



**Chemical
resistance**



**Weather
resistance**

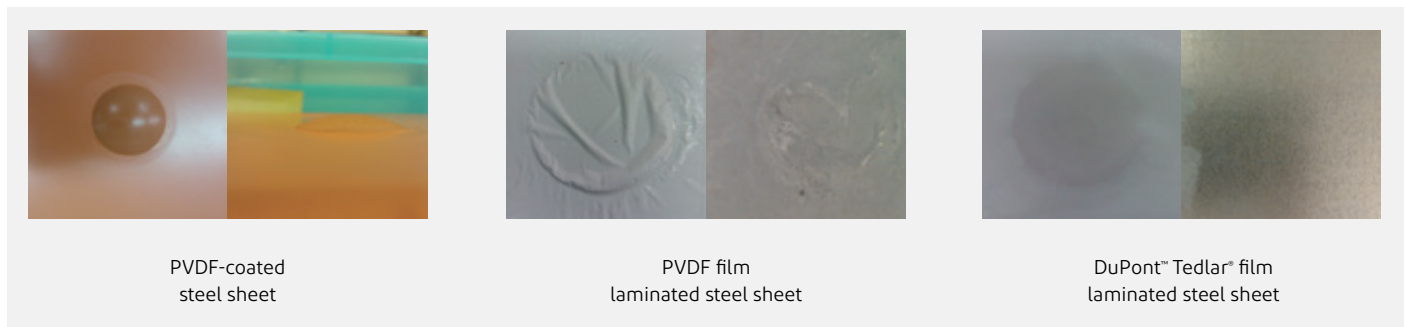


**Abrasion resistance
& processability**

Chemical resistance

Acid and alkali resistance – Test 1

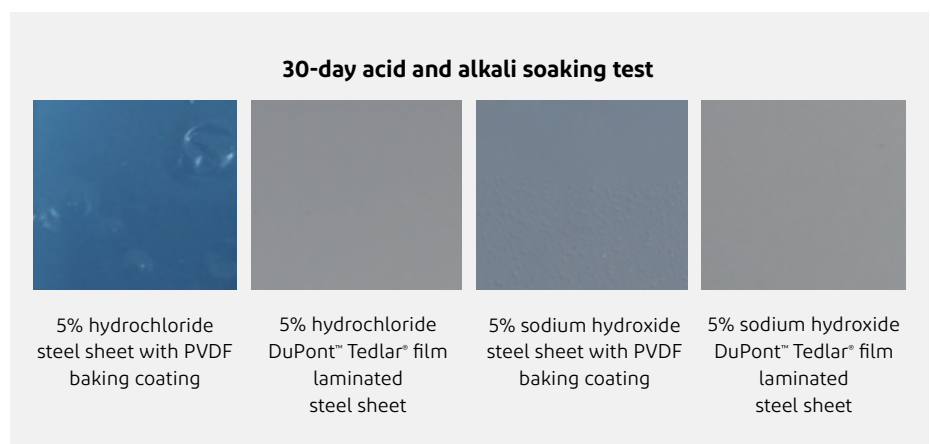
To test the acid and alkali resistance, experimenters placed drops of concentrated sulfuric acid (98%) on the surface of samples of Tedlar® and PVDF for 24 hours.



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Acid and alkali resistance – Test 2

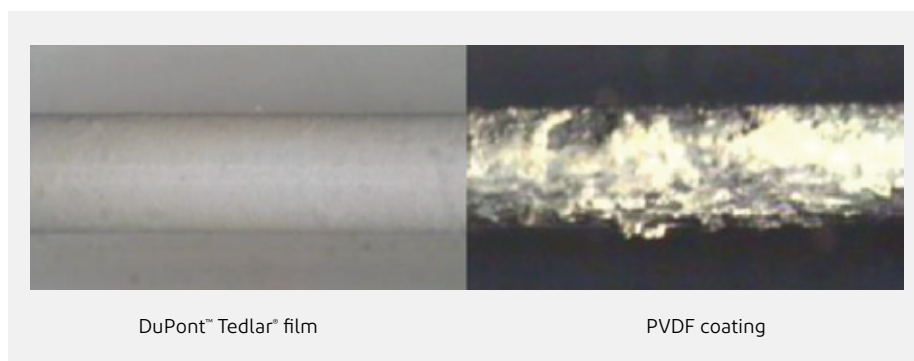
After Tedlar® film laminated steel sheet (gray) and PVDF fluorocarbon paint coated steel sheet (blue) have been soaked in 5% hydrochloric acid and 5% sodium hydroxide solution for 30 days at room temperature, obvious bubbling appears on the surface of the PVDF-coated steel sheet, which indicates that the substrate is severely corroded, while the Tedlar® film laminated steel sheet is free of bubbling, delamination, etc., indicating that the Tedlar® film-protected steel sheet has excellent resistance to acid and alkali.



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Salt spray resistance test

Tedlar® film and PVDF coating were exposed to salt spray for 2,000 hours.



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High-temperature acid gas resistance test

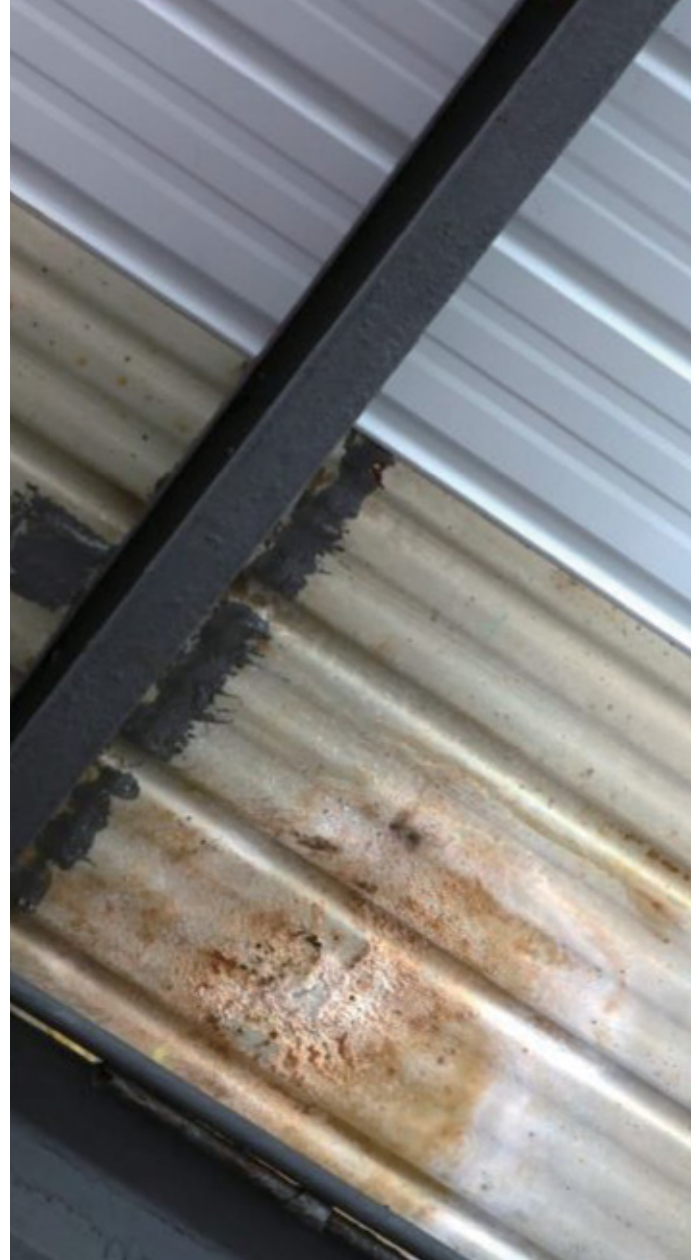
This case is a steel roofing sheet project of the synthesis workshop in a chemical plant. Because high-temperature acid gas produced in the synthesis workshop causes severe corrosion to the original steel roof panel, the building owner must replace the roof every two years, which not only affects normal operation of the plant, but also poses a large production safety hazard. The plant replaced some of its roofing with Tedlar® film laminated steel sheets in 2016. After two years, the normal roof was still corroded and had to be replaced regularly, but the new roof panel using the Tedlar® film laminated steel sheets had no corrosion and remained aesthetically pleasing.



Original steel sheet roofing



Tedlar® film laminated steel sheet roofing



Chemical resistance of Tedlar® film

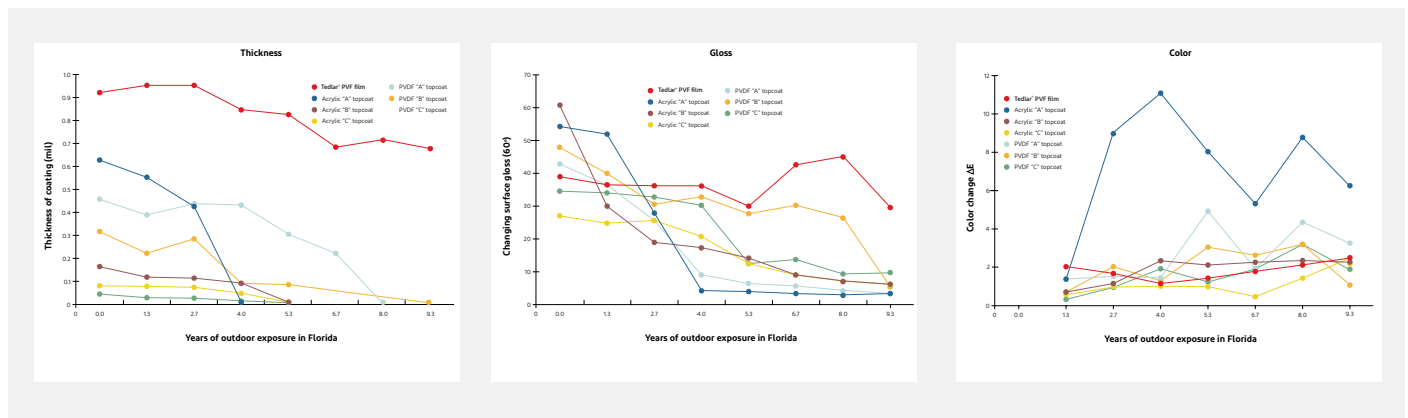
Experimenters immersed Tedlar® film in the following chemicals. The checkmarks indicate no significant change in tensile strength and ultimate elongation.

	1-year immersion at room temperature	2-hour immersion at boil	31-day immersion at 75°C (167°F)	
Acids	Acetic acid (glacial)	✓	✓	
	Hydrochloric acid (10% & 30%)		✓	
	Hydrochloric acid (10%)	✓	✓	
	Nitric acid (20%)	✓		
	Nitric acid (10% & 40%)			✓
	Phosphoric acid (20%)	✓		
	Sulfuric acid (20%)	✓		
	Sulfuric acid (30%)			✓
Bases	Ammonium hydroxide (12% & 39%)	✓		
	Ammonium hydroxide (10%)			✓
	Sodium hydroxide (10%)	✓	✓	
	Sodium hydroxide (10% & 54%)			✓
Solvents	Acetone	✓	✓	
	Benzene	✓	✓	
	Benzyl alcohol			✓
	Dioxane (14)			✓
	Ethyl acetate			✓
	Ethyl alcohol			✓
	n-Heptane	✓		
	Kerosene	✓		
	Methyl ethyl ketone (MEK)			✓
	Toluene			✓
	Trichloroethylene			✓
Miscellaneous	Phenol	✓		
	Phenol (5%)			✓
	Sodium chloride (10%)	✓		
	Sodium sulfide (9%)			✓
	Tricresyl phosphate			✓

Weather resistance

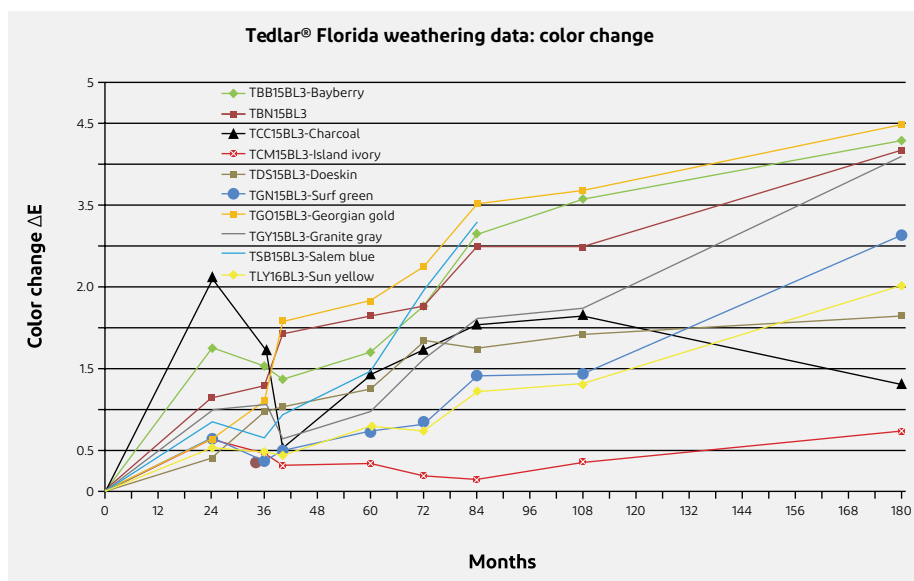
Accelerated aging and UV exposure test

As test results show, compared with the surface protection coatings such as acrylic and PVDF, Tedlar® film can better resist UV and acid rain, prevent dust buildup, and retain its thickness, color and gloss for a longer time, thus maintaining the building's original appearance for longer.



15-year Florida weather exposure test

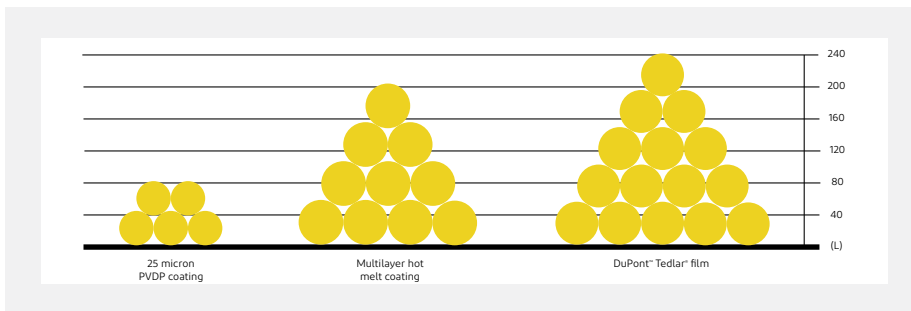
Florida's outdoor exposure field is recognized in the industry as a standard test site for assessing the weatherability of coatings. Ten-year Florida exposure is an important indicator of the American Architectural Manufacturers Association (AAMA) 2605, which is the highest weatherability rating for PVDF. Not only has Tedlar® film passed the 15-year Florida exposure test (color difference $E < 4.5$), but its color stability and weatherability rating is 50% higher than ordinary PVDF.



Abrasion resistance & processability

Abrasion resistance test

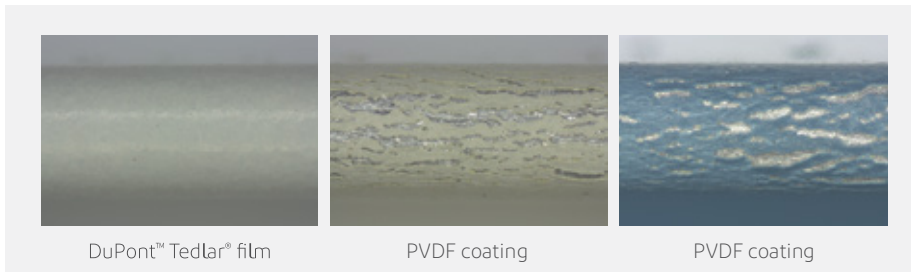
Falling sand abrasion tests (ASTM D968) were conducted for 25-micron PVDF coating, 100-micron multilayer hot melt coating and Tedlar® film. The results show that the abrasion resistance of 37.5-micron Tedlar® film surpasses that of PVDF, but is identical to that of 100-micron multilayer hot melt coating.



Data from Nippon Steel Metal Products Co., Ltd

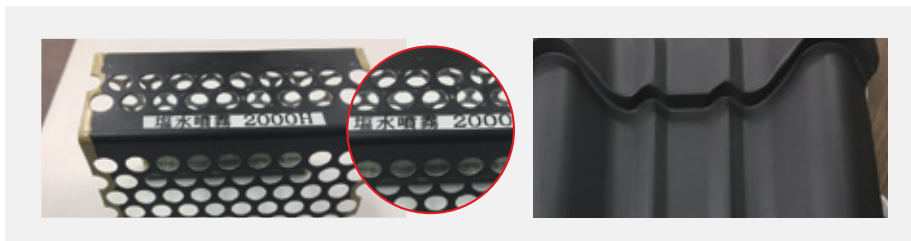
OT bending test

A 180° OT bending test (seen here at 40x magnification) shows that the PVDF-coated steel sheet has obvious cracks, while the Tedlar® film laminated steel plate shows no cracks. With film elongation up to 100%, Tedlar® has outstanding processability.



Processability test

Tedlar® has an elongation of more than 100% and doesn't crack after OT bending, thus protecting the sheet from corrosion. It allows for complex sheet shaping during processability, with no discoloration at the bend. Additionally, there is no rusting on the punched steel sheet after a 2000-hour salt spray test.



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Tedlar® PVF film passes SGS test

Test items	Test methods	Test contents	Test results	Remarks	
Weathering test (4000 hours)	Weathering test	CNS 15200-7-7 (2013)	Appearance	No cracking, blistering, etc.	<ol style="list-style-type: none"> Condition basis: refer to ASTM G154-12a Cycle 1 Illuminance: 0.89 W/m²/nm Light source type: UVA340 Cycle conditions: 8h UV at 6°C BPT; 4h condensation at 50°C BPT The sample is subject to OT bending and 9.5 mm cupping before test
	Gloss	CNS 10756-1	60° gloss retention (%)	100%	
	Fading (color difference)	ASTM D2244-11	4000 hours	ΔE: 0.33	
	Chalking test	ASTM D4214-07	Powdering degree	Level 10	
Damp heat resistance test (4000 hours)	Damp heat resistance test	CNS 11607	Appearance	No cracking, blistering, etc.	<ol style="list-style-type: none"> Moisture and heat resistance test conditions: temperature: 50 ± 2°C, humidity: 95 ± 5% RH The sample is subject to OT bending and 9.5 mm cupping before testing
	Gloss test	CNS 10756-1	60° gloss retention (%)	98%	
	Rusting grade rating	ASTM D1654-92	Rusting grade	Level 10	
Salt spray test (4000 hours)	Salt spray test	CNS 8886 (2002)	Appearance	No cracking, blistering, etc.	<p>Salt spray test conditions</p> <ol style="list-style-type: none"> Experimental salt: Analytical reagent Saline concentration: 5 w/v% NaCl Experimental water: pure water Spray exposure zone temperature (°C): 35.0 ± 1.0 Spray amount (ml/h/80 cm²): 1.7 (avg.) Supply air pressure (kgf/cm²): 1.0 (avg.) Cleaning method: before the test - rinse with 38°C warm water, then wipe and dry Solution pH: 6.8 (avg.) Sample placement: vertical placement with an inclination of 15 degrees Sample protection method: rubber seal on four sides The sample is subject to OT bending and 9.5 mm cupping before testing.
	Rusting grade rating	ASTM D1654-92	Rusting grade	Level 10	
Acid and alkali resistance test	Acid resistance test	CNS 10757 (1995)	20% H ₂ SO ₄ , room temperature, 360 hours	Immersion in acid solution without abnormality	<ol style="list-style-type: none"> The sample is subject to OT bending and 9.5 mm cupping before testing.
	Alkali resistance test	CNS 10757 (1995)	25% H ₂ SO ₄ , room temperature, 360 hours	Immersion in acid solution without abnormality	
	Chemical resistance	AAMA 2605-13	Nitric acid, after 30 minutes	No significant change in color	
Physical property test	Impact test	CNS 10757 (1995)	160in-lib	No cracking, peeling, etc.	
	Bending test	ASTM D4145-83 (2002)		OT (no cracking, peeling, etc.)	
	Cupping test	CNS 10757 (1995)		10.49 mm	
	Abrasion resistance (failing sand abrasion method)	ASTM D968-05 (2010)	Abrasion resistance (L/mil)(falling sand amount L)	127 191	

*This report is from Lytec Steel laminated with Tedlar® film.

Proven projects

North America



Ford's Theater (US)



Outdoor sports field (Canada)



Airport facility (US)



Casino (US)



Woodruff Arts Center (US)

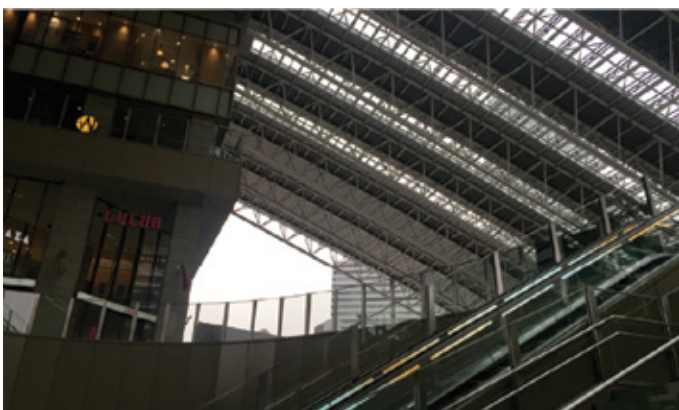
Asia



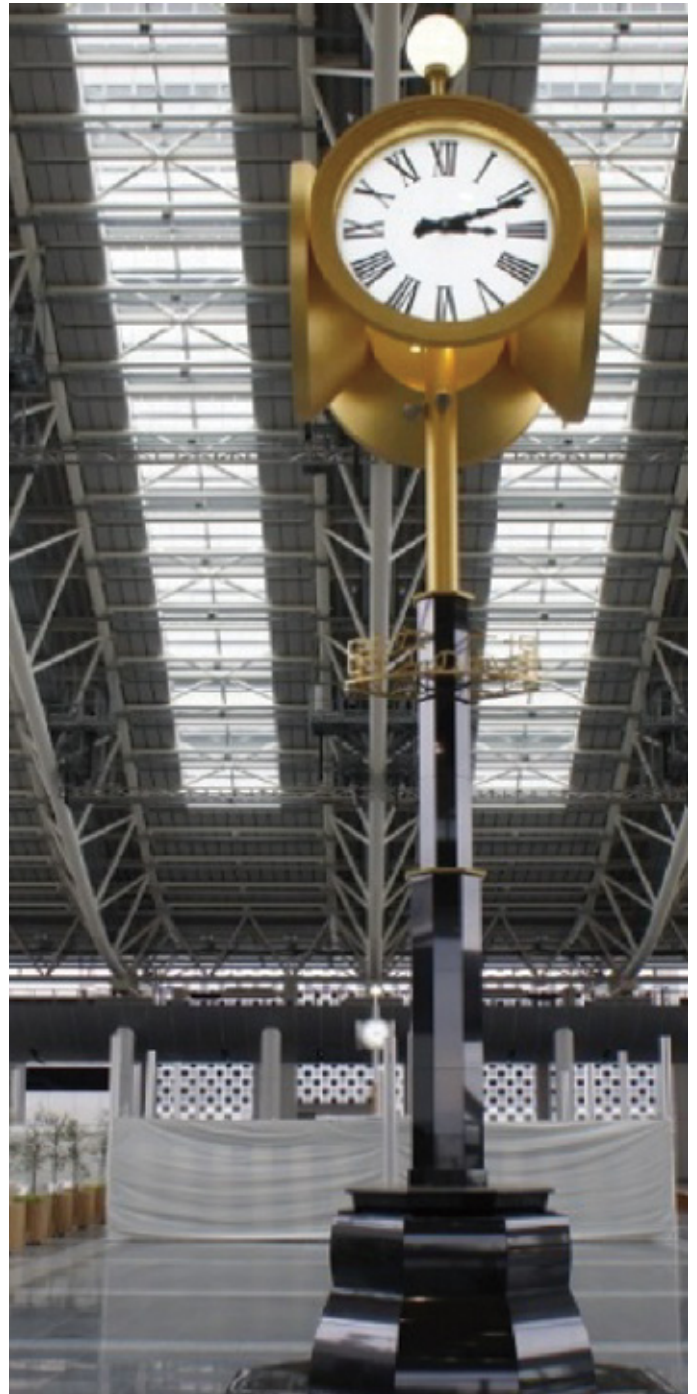
Hong Kong International Airport (Hong Kong)



Incheon Asian Games Basketball Hall (South Korea)



Osaka High Speed Rail Station (Japan)



Osaka High Speed Rail Station (Japan)

Asia



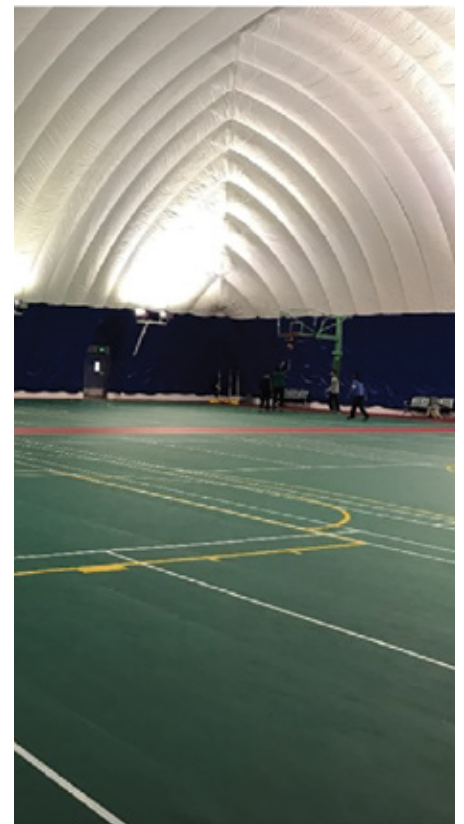
Beijing Urban Basketball Center (China)



**Wangjialing Staff Gymnasium in Shanxi
China Coal (China)**



**Air Film Gymnasium in Shanghai Jincai
Experimental Junior Middle School
(China)**



**Air Film Gymnasium in Shanghai Jincai
Experimental Junior Middle School
(China)**

Europe



Paris Pullman Hotel (France)



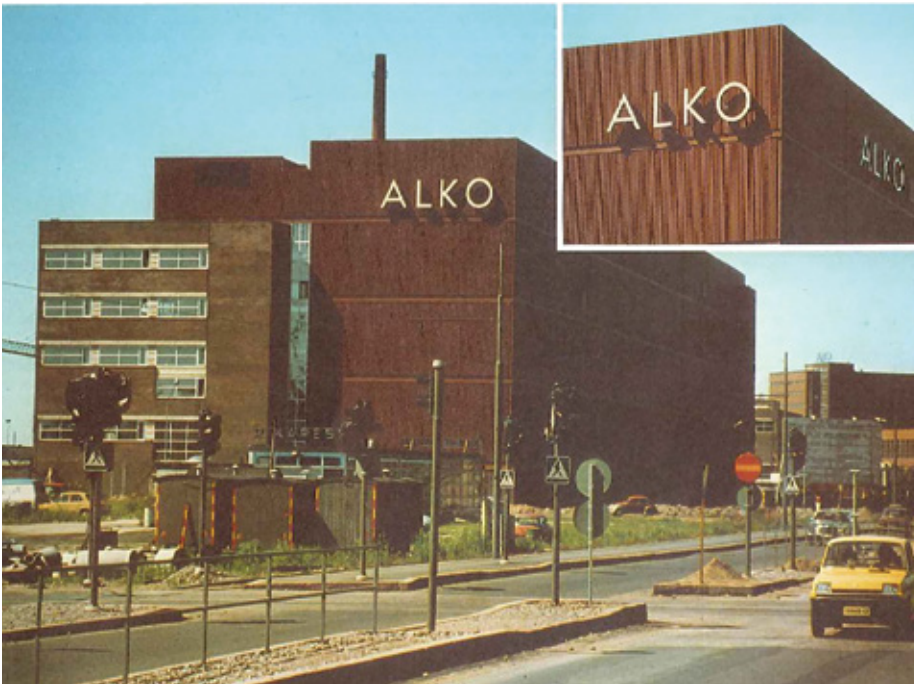
National Computing Centre (Denmark)



Shopping center (Netherlands)



Premium apartment building (France)



Logistics center (Finland)



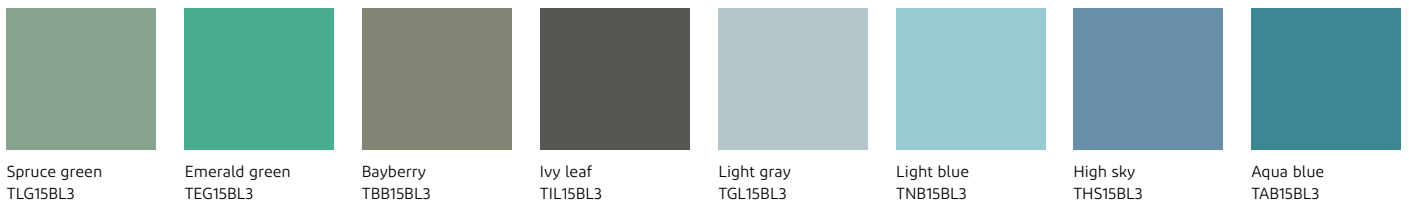
Tobacco company headquarters

Colorful. Enduring. Empowering.

Tedlar® PVF film provides a long-lasting finish to a wide variety of surfaces exposed to harsh environments. The color uniformity and fade resistance of Tedlar® allows it to hold its color and maintain its original appearance for decades.

Cool collection

Inspired by nature, the cool hues and understated bright tones in this collection bring to mind the sea, sky and lush foliage.



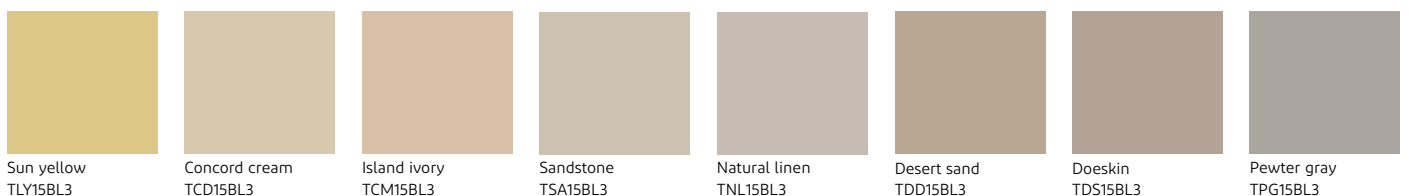
Neutral collection

Minimalistic and serene, this collection includes soothing tones and natural, soft hues.



Warm collection

Taking cues from the sun and sandy beaches, the creamy hues in this collection evoke feelings of comfort and warmth.





DuPont Advanced Materials
tedlar.com/enduringvalue

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