



Tedlar[®] PVF Film for Architectural Metal Panels

Agenda

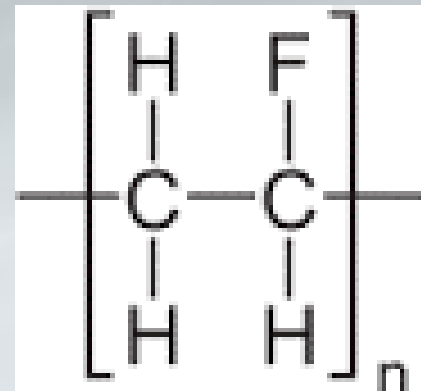
- **DuPont Tedlar® PVF Overview**
- Factors to consider with Building Exteriors
- DuPont Tedlar® PVF film for Building Exteriors
- Tedlar® PVF Global Installations



What is Tedlar®?

Tedlar® is a DuPont registered trademark for a **highly versatile polyvinyl fluoride (PVF) film** that provides a long-lasting finish to a wide variety of surfaces exposed to harsh environments.

- **DuPont invented polyvinyl fluoride (PVF) polymer** in the 1940s, and by the 1950s began developing products based on the material.
- In 1961, DuPont **registered the Tedlar® brand name** in the US and construction started on its **first production facility** in Buffalo, NY. Completed a **major capacity expansion** in 2012.
- More than fifty years later, Tedlar® film is recognized as **the high-performance standard for surface protection**, with proven durability in harsh operating environments.



Tedlar®

Why Do Customers Use Tedlar® PVF Film?

Core Attributes

Long-term Protection

- Excellent weatherability
- Corrosion, chemical, stain/graffiti resistant
- Can withstand the harshest chemicals without damage



DUPONT

Aesthetics

- UV resistant maintaining colors for years
- Available in several colors inspired by nature
- Long-term stability with low signs or fading, chalking or visible cracking



Easy to clean

- Chemically inert surface to protect against harsh solvents and pollution
- Easy to clean stains and graffiti for reduced maintenance cost



Tedlar®

Tedlar® PVF Applications

Proven applications, globally, for over 60 years



Aerospace & Transportation



Building & Construction



Signage



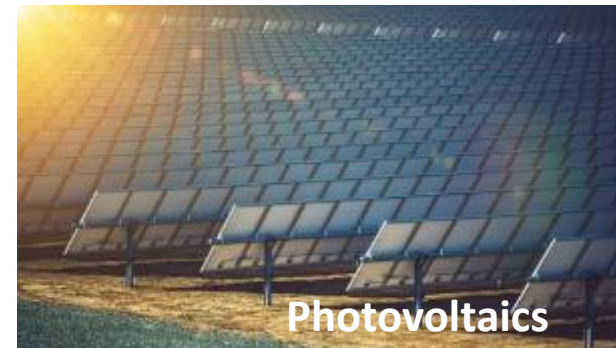
Wallcovering



Industrial



Composite Release



Photovoltaics



Agenda

- DuPont Tedlar® PVF Overview
- **Factors to Consider with Building Exteriors**
- DuPont Tedlar® PVF film for Building Exteriors
- Tedlar® PVF Global Installations



Weather – main factor along with the location environment

- Saltwater?
- Acid Rain?
- Graffiti?
- Particulates?



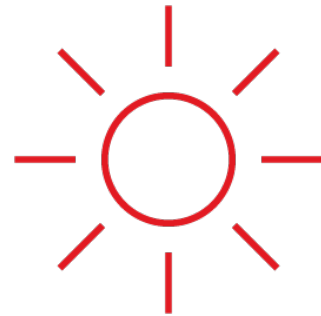


**These stresses on
exteriors can lead
to failures**

- Gloss loss
- Color change
- Cracking
- Corrosion / coating failure
- Mold and mildew

What is the Best Exterior Protection?

- Resilient to handle physical damage
- Chemically-inert
- UV light reflective
- Flexible to handle thermal changes
- Permanently adheres to the substrate



Agenda

- DuPont Tedlar® PVF Overview
- Factors to Consider with Building Exteriors
- **DuPont Tedlar® PVF film for Building Exteriors**
- Tedlar® PVF Global Installations



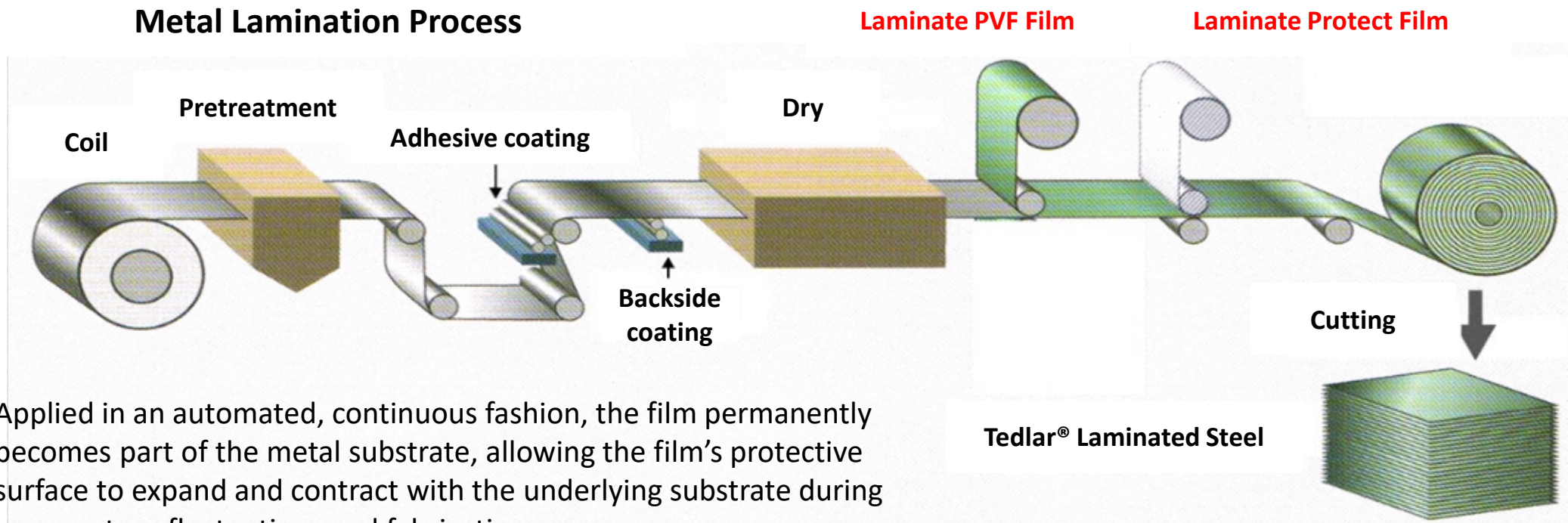
Tedlar® PVF Film for Building Architecture:

- Tedlar® PVF film has been used in numerous building product applications for over 50 years
- Tedlar® PVF film provides cost-effective long lasting aesthetic protection for architectural applications, even in extreme outdoor environments. **No coastal restrictions.**
- Tedlar® PVF films can preserve and extend a building's appearance and lifetime by preventing building facades from fading, cracking or corroding.
- Tedlar® PVF films are stain resistance and easy to clean that to reduce maintenance costs to provide lower total life cycle cost of buildings



Metal Lamination Process

Tedlar® PVF film is securely bonded to metal with flexible adhesives specially chosen to resist moisture and UV radiation using a hot lamination process.



Applied in an automated, continuous fashion, the film permanently becomes part of the metal substrate, allowing the film's protective surface to expand and contract with the underlying substrate during temperature fluctuations and fabrication.

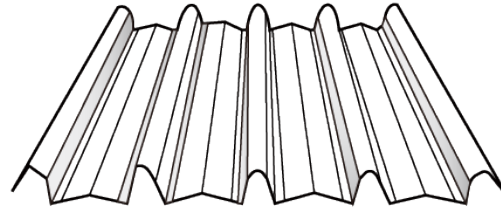
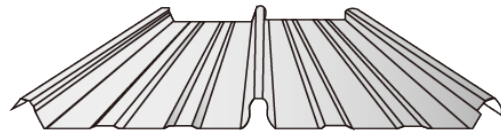
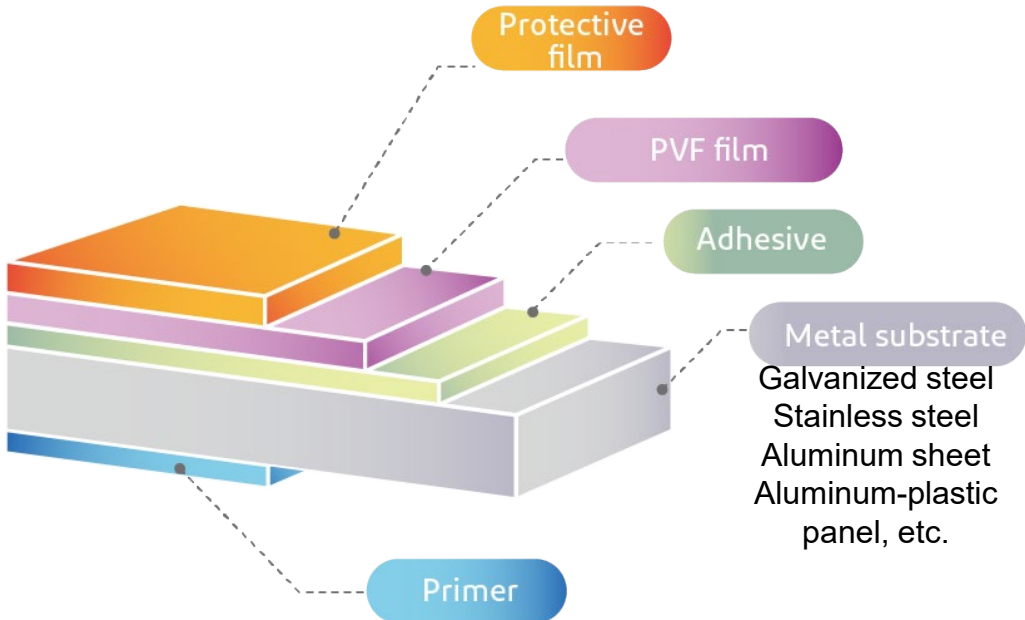
Even after extensive aging, Tedlar film cannot be removed, ensuring a low maintenance, durable structure with superior resistance to the wind, water, sunlight, hail, acid rain, chemical exposure and pollution.



Tedlar® Panel Product and Installation

Roof and wall panels made with Tedlar protected metal can be installed by an experienced professional in accordance with your supplier's installation guidelines, regulations, building codes and industry practices in your jurisdiction.

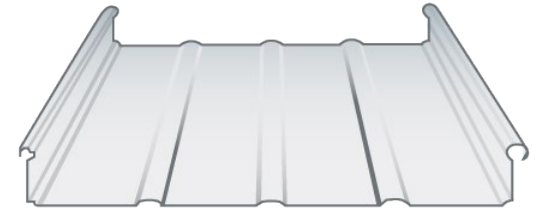
The installation process is the same process used for PVDF coated panels.



Congruent Metal Panels



Flat Panels



Roofing systems



Properties of Tedlar® PVF Film versus PVDF Coating

Properties of DuPont™ Tedlar® PVF film laminated on coil versus generic PVDF coated coil

Polyvinyl fluoride film vs. Polyvinylidene fluoride

Property	How to Test and Measure	Standard	Results	
			PVF	PVDF**
Adhesion	2 hour boiling water	ASTM D3359	100%	100%
Chemical resistance	5% HCl spot test		800 hours	168 hours
	10% NaOH spot test		Greater than 1000 hours	336 hours
	Nitric acid exposure		Delta E <3	Delta E <5
Coating flexibility	T bend	ASTM D4145	0T	2T
Hardness	Pencil hardness	ASTM D 3363	HB-F	H
Specular Gloss	60 degree	ASTM D523	~10	~40
Corrosion resistance	Salt spray	ASTM B117	Greater than 3000 hours on aluminum	1500 hours***
Humidity resistance		ASTM D2247	Greater than 4000 hours	4000 hours
Color change		ASTM D2244	No more than 4.5ΔE Hunter units at 15 years	

*Type of TWH15BL3 **Results may vary by manufacturer ***Field area

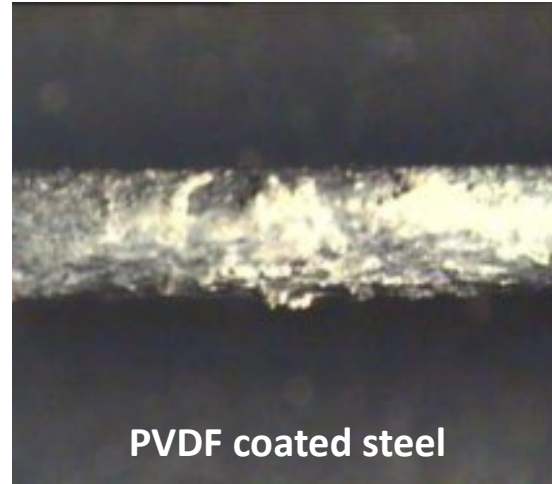
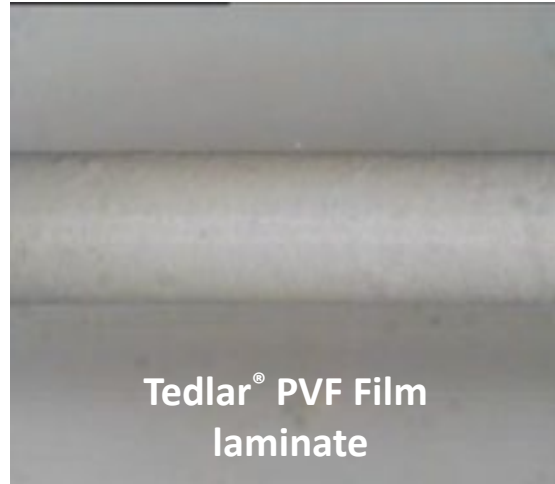


*Type of TWH15BL3 ** Gouge hardness *** Field area

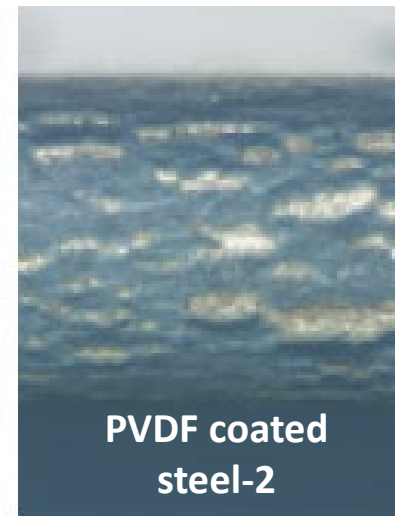
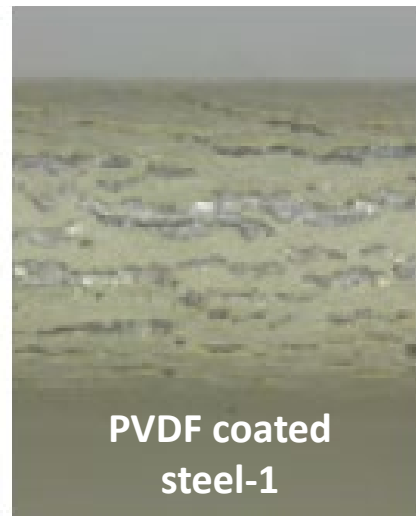


Chemical resistance and Bend - Tedlar® PVF Film versus PVDF Coating

Salt spray 2,000hrs



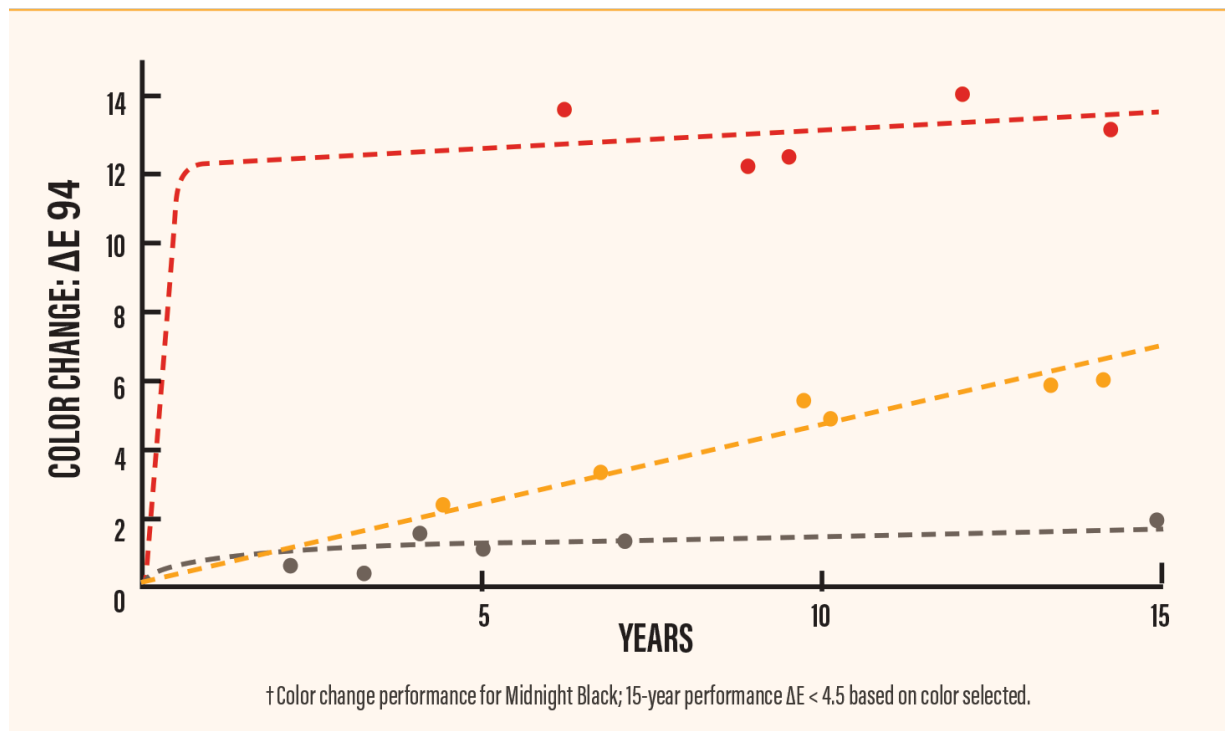
OT bending test
(magnification by 40 times)



Tedlar® PVF film has excellent formability, allowing for Zero T-Bend without microcracking even after applying a salt spray. Polyvinylidene fluoride (PVDF) coatings crack when trying to achieve extreme bends, but the elongation properties of Tedlar(R) film allow for unlimited designs.

Color Change - Tedlar[®] PVF Film versus PVDF Coating

In prolonged exposure to the sun, DuPont Tedlar[®] PVF film shows lower color change on metal surfaces compared to other finishes per the South Florida Exposure Testing.



- Polyester Paint Coating
- PVDF Paint Coating
- Tedlar[®] PVF Film[†]

DuPont Tedlar® PVF Film Warranty – No Coastal Waterway Restrictions

DuPont™ Tedlar® PVF film correctly applied to metal panels will meet the following performance criteria for the duration of the warranty period:

- Color fade maximum rating of delta E (CIE 94) 5 units – ASTM 2244
- Chalking maximum rating of 6 – ASTM D4214
- Film surface – no cracking or checking visible in the film surface from a minimum distance of 2 meters with un-aided eye

Product Only Warranty by application type:

Horizontal Roofing Application	Up to 30 years for chalk and color Up to 40 years for film surface
Vertical Wall Panel Application	Up to 40 years for chalk and color Up to 50 years for film surface

These critical qualities are warranted upon appropriate adhesion of Tedlar® PVF film independently of the substrate and the application process. This represents a distinct advantage compared to paint, which requires careful control of the substrate preparation, the application process and the paint formulation and storage conditions.



Tedlar® PVF Film is Eco-friendly:

- Tedlar PVF film's dense surface is non-reactive and inert.
- It is non-flammable and has low smoke toxicity.
- It does not support mold, mildew or bacteria growth and produces very low VOC emissions.
- Projects that specify Tedlar PVF film qualify for LEED credits based on color selected.
- Due to the color uniformity of Tedlar film from lot-to-lot and the resistance to fading once installed, replacement panels or new panels for an addition can be ordered in the same color as the original order. Building owner will not need to replace the entire roof.



Agenda

- DuPont Tedlar® PVF Overview
- Factors to Consider with Building Exteriors
- DuPont Tedlar® PVF film for Building Exteriors
- **Tedlar® PVF Global Installations**



Tedlar® PVF Film Installation – Yokohama of Japan

Facade of
building
remained
unchanged
in color for 34
years

Yokohama of Japan



Tedlar® Colored Film vs. Installed Tedlar®
after 34 years

Tedlar²⁰

Tedlar® PVF Film Installation – Steel Sheet Metal Plant, Japan



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.

Tedlar® PVF Film Installation – Yerkes Plant, Buffalo, NY



The pictures was taken in 2019 showing 27 years of lasting color performance of Tedlar® PVF film.

The corrugated metal on the sidewalls of the building are laminated with Tedlar® film TSB15BL3 Salem Blue color.

The Tedlar® film has resisted fading, chalking, and cracking keeping the outside of the building looking “blue” for years and years to come.

Tedlar® PVF Film Installation – Pullman Hotel Montparnasse, Paris



This skyscraper hotel in central Paris designed by Pierre Dufau et Associés and built in 1974 has had several different owners, from the Sheraton to the Méridien, before finally becoming the Pullman Hotel Montparnasse in 2011.

What hasn't changed is the striking 18,000 sqm façade featuring steel cladding, laminated with white Tedlar® film.

Almost half a century later, the hotel's interior has undergone major refurbishment, whilst the exterior with its vertical, angular lines remains untouched and in pristine condition, without yellowing, chalking or corrosion, helping to make this hotel a recognizable Parisian landmark from afar.

Tedlar® PVF Film Installation – Japan Okinawa Thermal Power Plant



Located less than 500 meters from the coastline, this installation is in a high salt spray environment along the coast. Additionally, the smoke from the power plant creates a very corrosive situation to buildings.

For 27 years the steel sheets protected by Tedlar® film look as good as new, even without rust at the edges and seams.

Moreover, the film has maintained an ultra high color stability with no obvious discoloration and chalking. There is almost no color difference compared with the sample left at the plant in 1986.

Tedlar® PVF Film Installation – Chemical Plant



This case is a steel roofing sheet project of a synthesis workshop in a chemical plant.

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.

Tedlar® PVF Film Installation – Buffalo, NY



29 Years of Rust
Protection

DuPont Plant in Buffalo, New York

Tedlar^{z6}

Tedlar® PVF Film Installation – 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 over three decades of use, the wall has almost no difference in color.



Tedlar® PVF Film Installation – South Korea



Incheon Asian
Games
Basketball Hall

(South Korea)

Tedlar® PVF Film Exposure

Corrosion damage seen at bends for PVC – Comparative installations in Utsunomiya Japan



PVC Coating
(Installed 1999)

**Tedlar® Film
Lamination**
(Installed 1983)



Copyright © 2021 DuPont and Dow. All rights reserved. The DuPont Oval Logo and DuPont™ are trademarks of E. I. du Pont de Nemours and Company or its affiliates. The Dow Diamond Logo, Dow™ are trademarks of the Dow Chemical Company or its affiliates.

Nothing contained herein shall be construed as a representation that any recommendations, use or resale of the product or process described herein is permitted and complies with the rules or regulations of any countries, regions, localities, etc., or does not infringe upon patents or other intellectual property rights of third parties.

The information provided herein is based on data DuPont believes to be reliable, to the best of its knowledge and is provided at the request of and without charge to our customers. Accordingly, DuPont does not guarantee or warrant such information and assumes no liability for its use. If this product literature is translated, the original English version will control and DuPont hereby disclaims responsibility for any errors caused by translation. This document is subject to change without further notice.