

Tedlar® Clear Protection Graphics (TCP)

February 2021



◀ DUPONT ▶TM

Tedlar® Clear Protection Film (TCP)

Clear and flexible overlaminate 1.0 mil film that protects vibrant outdoor images.

Official product name: TCP10BG3 (replaces previous UV film – TUT10BG3)

- Excellent outdoor durability and UV protection
- Graffiti-resistant with outstanding cleanability to remove common graffiti and stickers
- Excellent chemical resistance against acids, bases or solvents
- Low smoke ratings and does not support combustions - enables sign placement in hazardous and controlled areas
- Available in gloss finish



Features and Benefits

Features	Benefits
Clear and flexible overlamine	Protects vibrant graphic design in flat or contoured surfaces
Outdoor durability & UV protection	Keeps signs from fading, protecting the message and brand image
Graffiti resistance	Outstanding cleanability to remove common graffiti and stickers
Excellent chemical resistance against acids, bases or solvents	Heavy-duty protection film enables sign use in harsh chemical environments
Low smoke ratings and does not support combustion	Enables sign placement in hazardous and controlled areas

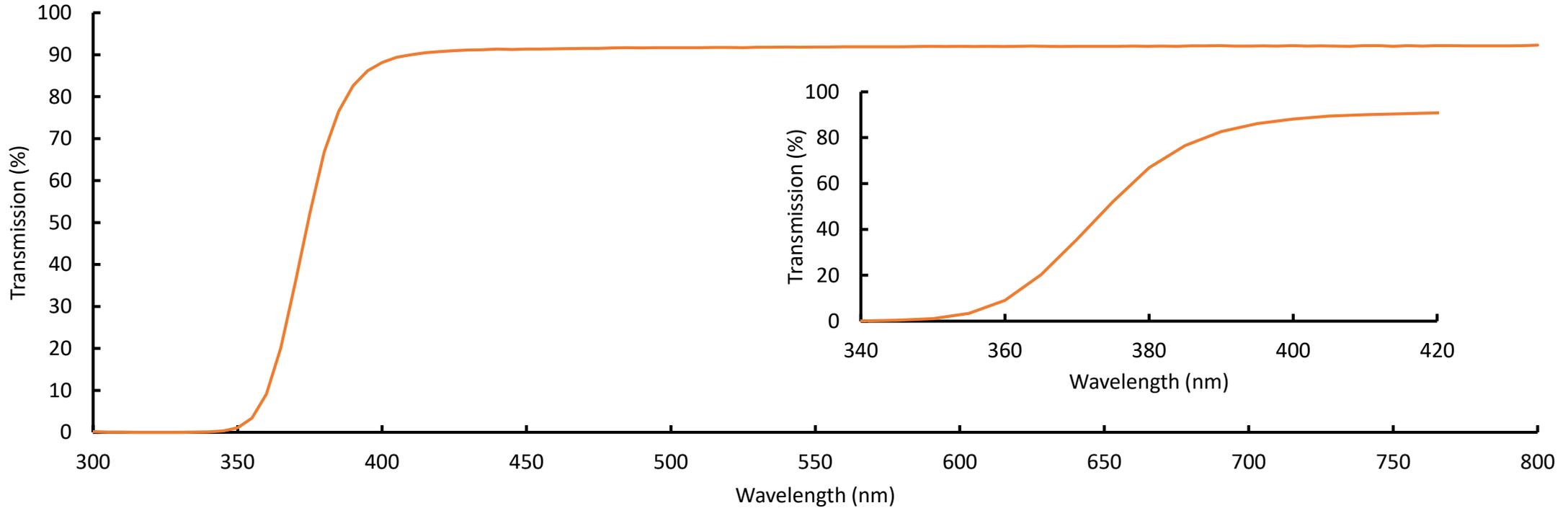


Physical Properties

Measured properties	Test method	Unit	Value
Unit weight	DuPont method	$\text{g}\cdot\text{m}^{-2}$	33-37
Gauge variation	DuPont method	%	≤ 20
Tensile strength MD/TD	ASTM D882	MPa (ksi)	≥ 62 (9.0)
Shrinkage TD @ 150°C	ASTM D1204	%	-1.0–4.5
Elongation at break MD/TD	ASTM D882	%	≥ 110
Haze	ASTM D1003	%	≤ 14



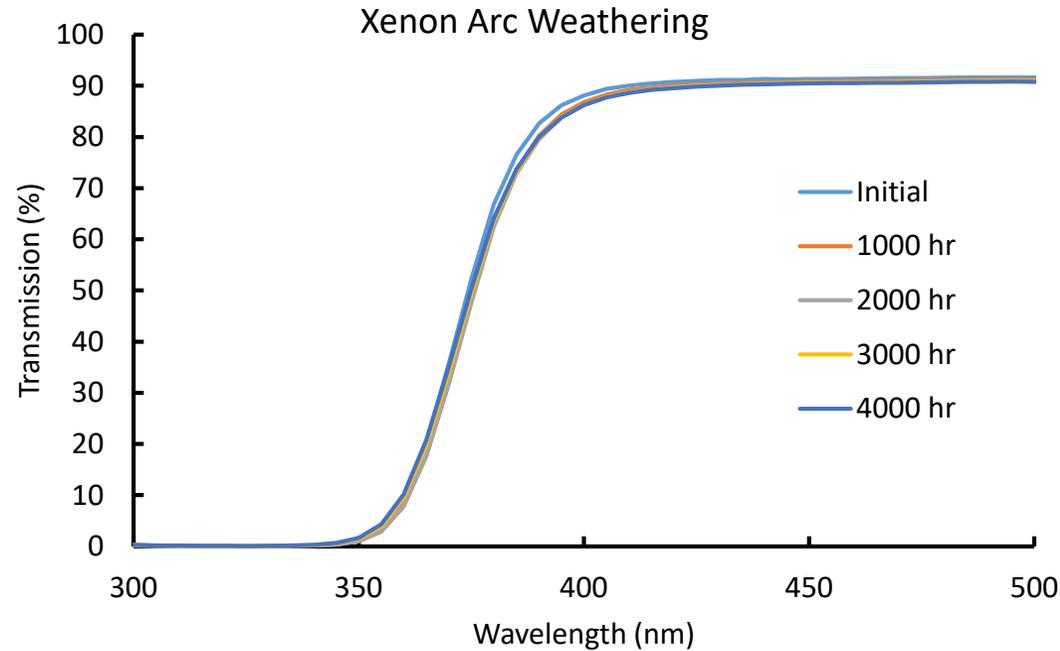
Optical Properties



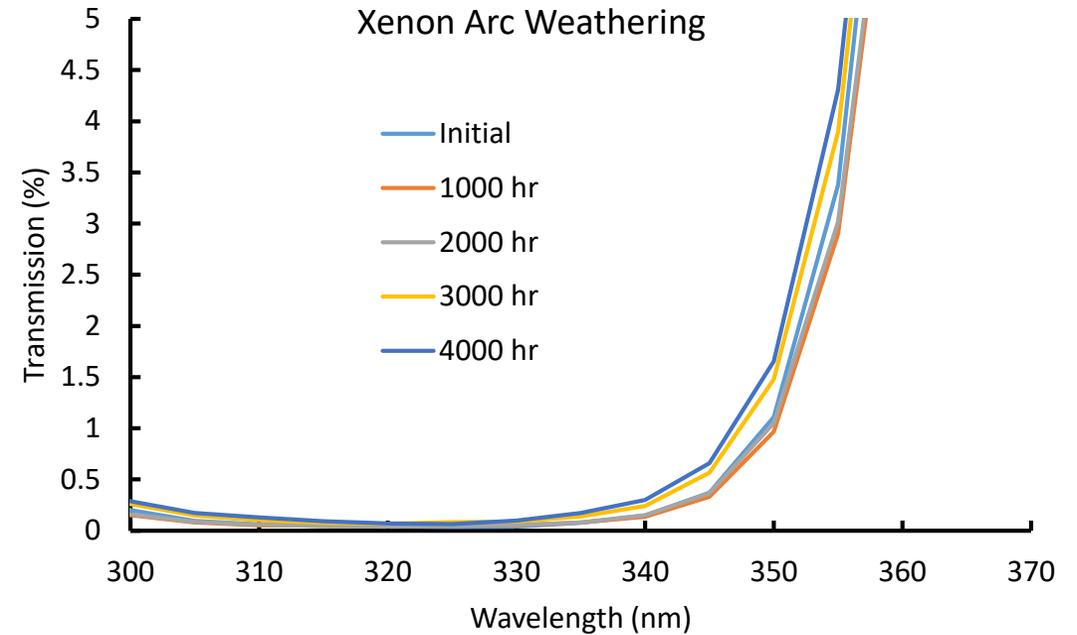
Property	Value*	Method
Thickness	25 μm	Micrometer
Optical Transmission	93 %	ASTM D1003
Cutoff Wavelength	361 nm	UV-VIS
Haze	12 %	ASTM D1003
Color (b*)	0.31	Colorimeter
60° Gloss	64	ASTM D523

* Values are typical and do not represent product specifications.

Accelerated Weathering - Xenon Arc 'A3'



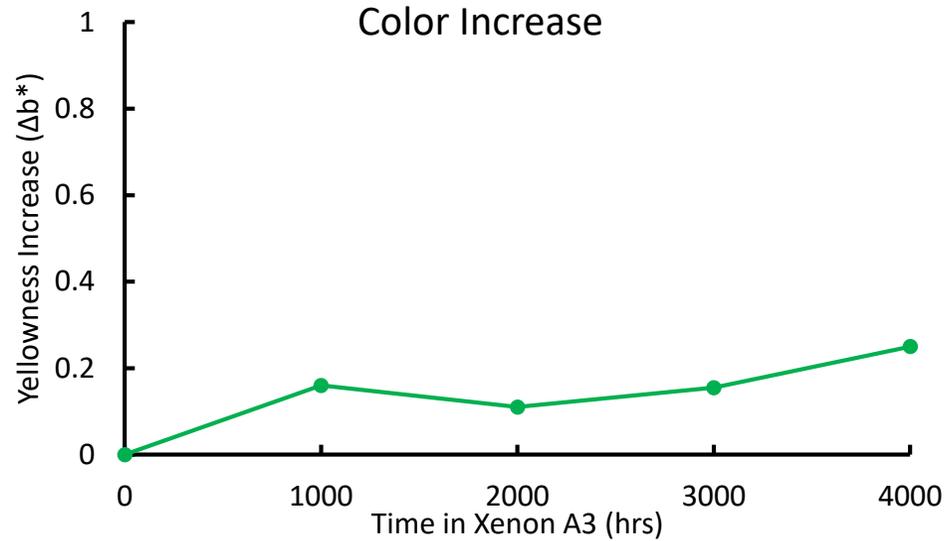
Transmission of a free-standing PVF film
4000 hrs = 324 kWh/m² of UV light (290-400 nm)



Close-up of UV blocking region from the graph at left

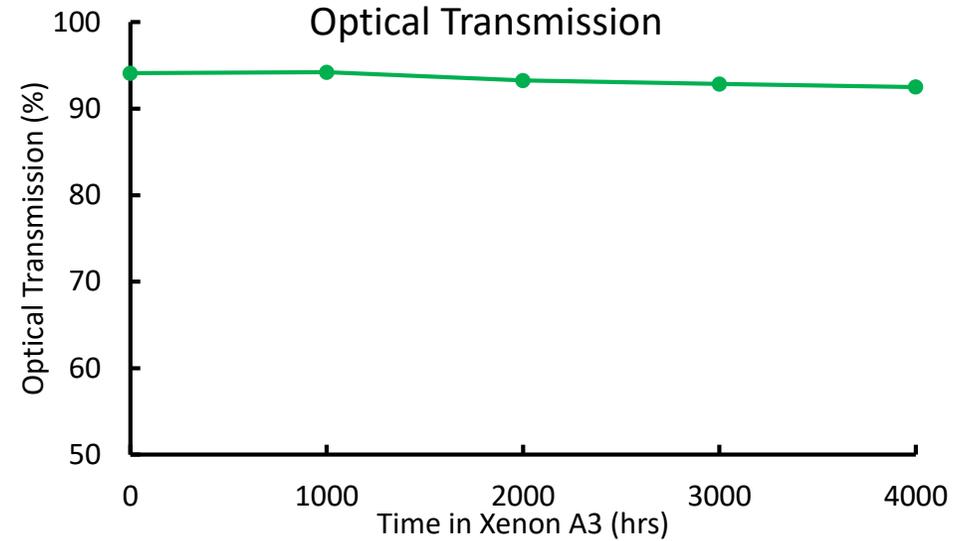
Xenon Arc Lamp, Right Light Filter, 0.8 W/m²-nm @ 340 nm
90 °C Uninsulated Black Panel Temperature

Accelerated Weathering – Xenon Arc ‘A3’



Yellowness increase in a free-standing PVF film

4000 hrs = 324 kWh/m² of UV light (290-400 nm)



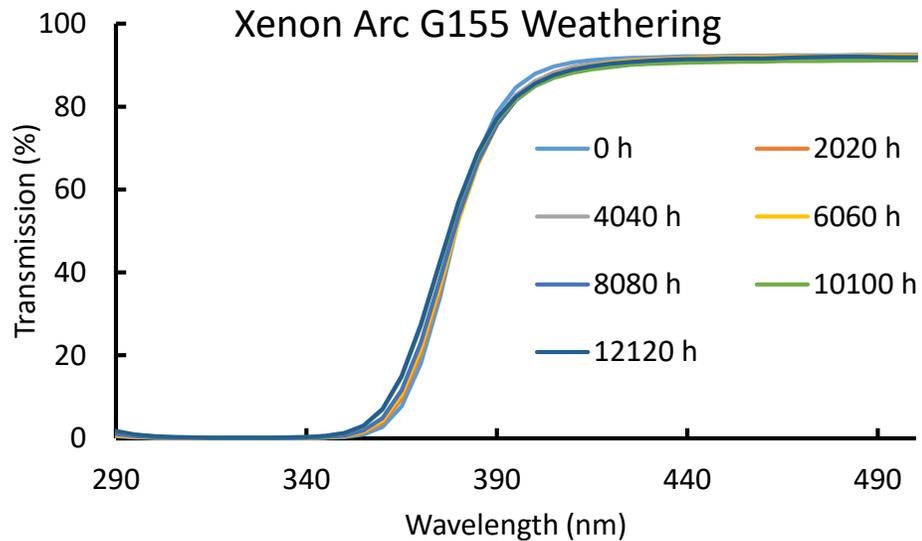
Optical transmission in a free-standing PVF film

4000 hrs = 324 kWh/m² of UV light (290-400 nm)

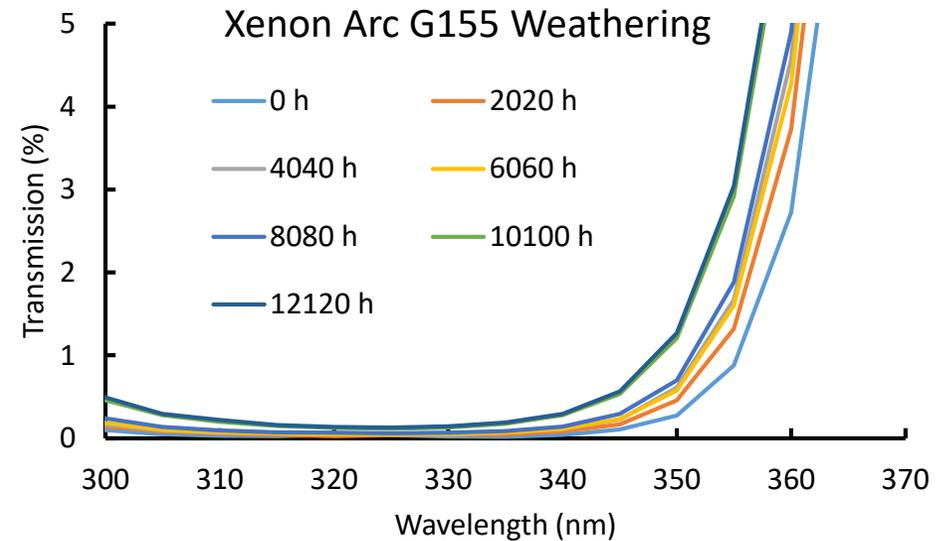
Xenon Arc Lamp, Right Light Filter, 0.8 W/m²-nm @ 340 nm

90 °C Uninsulated Black Panel Temperature

Accelerated Weathering – Xenon Arc ‘G155’



Transmission of a free-standing PVF film
12120 hrs = 733 kWh/m² of UV light (290-400 nm)



Close-up of UV blocking region from the graph at left

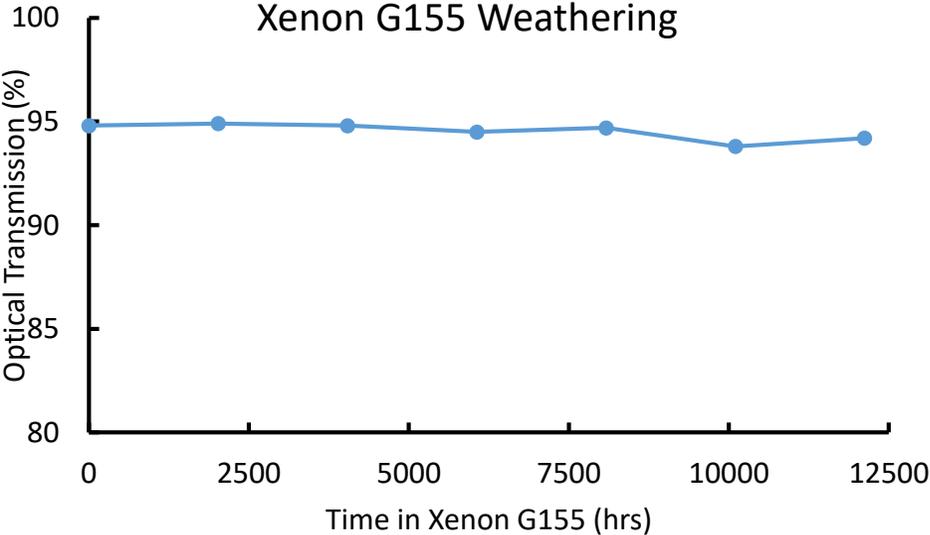
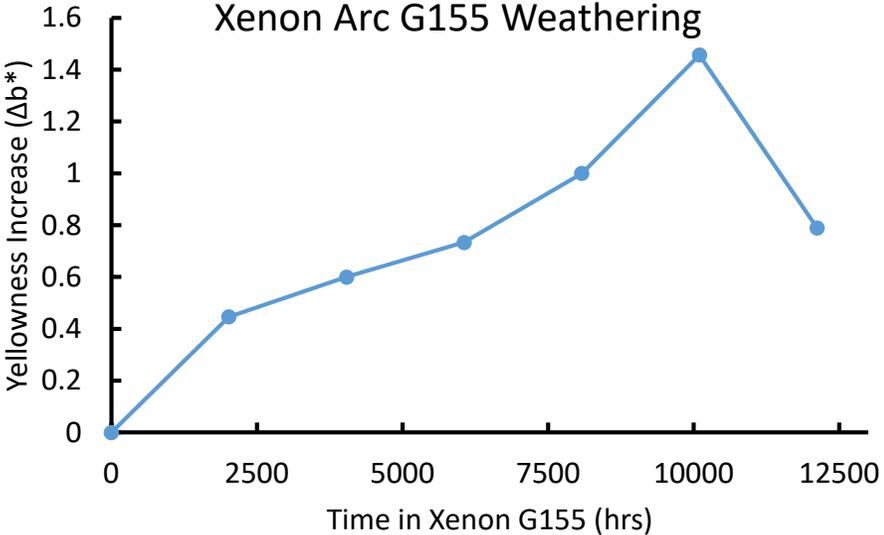
Xenon Arc Lamp, boro/boro Filter, 0.55 W/m²-nm @ 340 nm
70 °C Uninsulated Black Panel Temperature



Test results are from the prototype version of TCP10BG3. We expect that commercial TCP10BG3 will perform equally.



Accelerated Weathering– Xenon Arc ‘G155’



Yellowness increase in a free-standing PVF film
 12120 hrs = 733 kWh/m² of UV light (290-400 nm)

Optical transmission in a free-standing PVF film
 12120 hrs = 733 kWh/m² of UV light (290-400 nm)

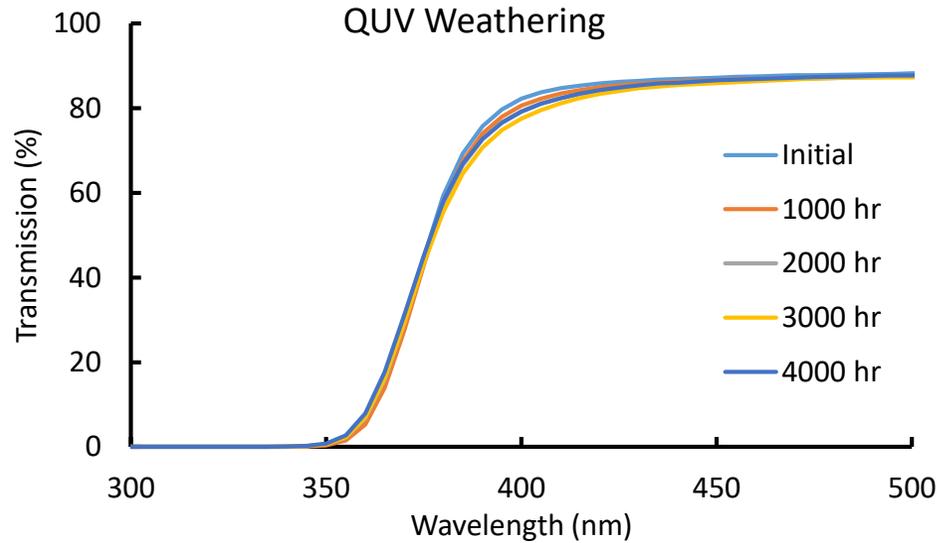
Xenon Arc Lamp, boro/boro Filter, 0.55 W/m²-nm @ 340 nm
 70 °C Uninsulated Black Panel Temperature



Test results are from the prototype version of TCP10BG3. We expect that commercial TCP10BG3 will perform equally.

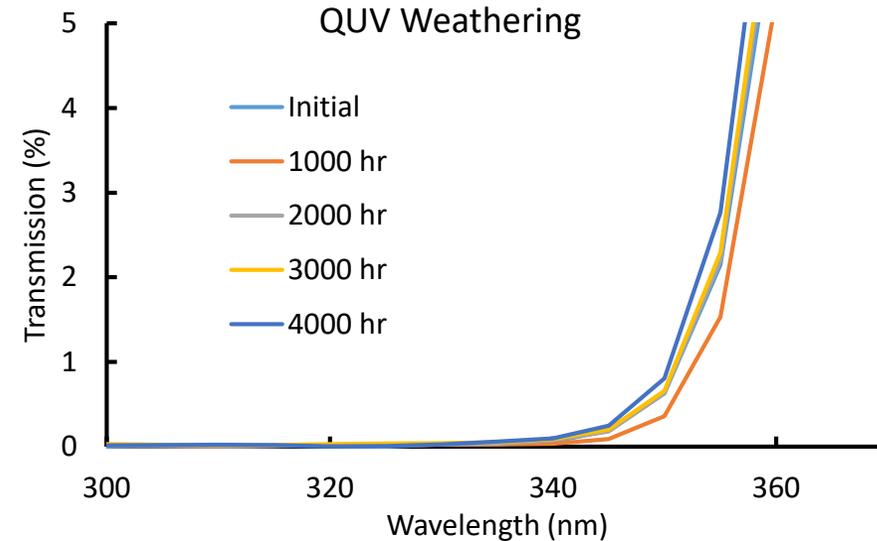


Accelerated Weathering – QUV



Transmission of PVF film laminated to PET using DuPont 68070 laminating adhesive

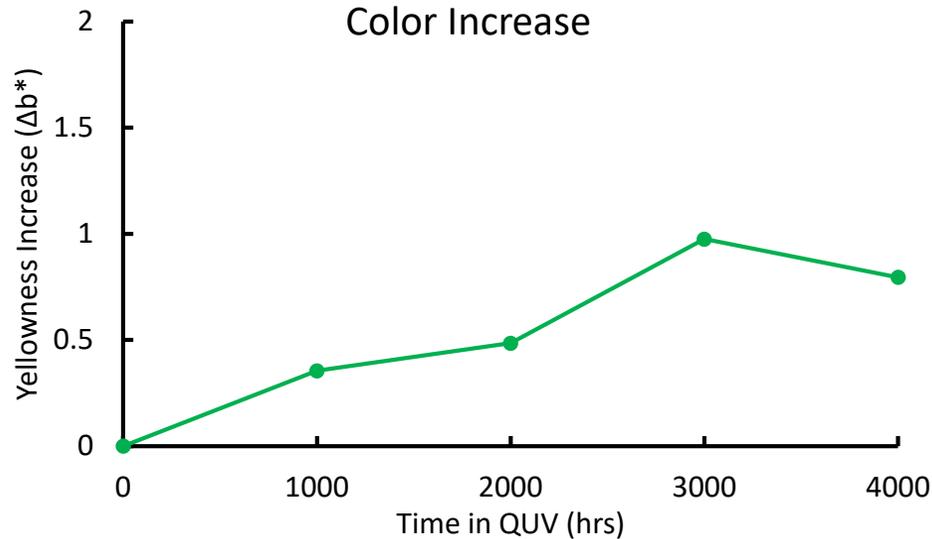
4000 hrs = 260 kWh/m² of UV light (290-400 nm)



Close-up of UV blocking region from the graph at left

QUV Weathering, UVA-340 bulb, no filter, 1.2 W/m²-nm @ 340 nm
70 °C Uninsulated Black Panel Temperature

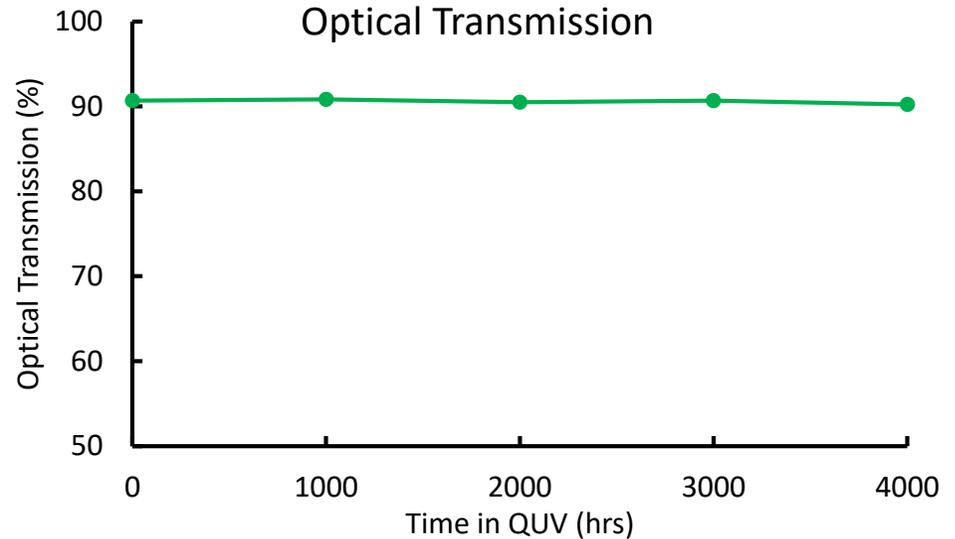
Accelerated Weathering – QUV



Yellowness increase in a PVF film laminated to PET using DuPont™ 68070 Laminating Adhesive

4000 hrs = 324 kWh/m² of UV light (290-400 nm)

Higher color increase than Xenon Arc may be due to lack of photo-bleaching effect by visible light.



Optical transmission in a PVF film laminated to PET using DuPont™ 68070 Laminating Adhesive

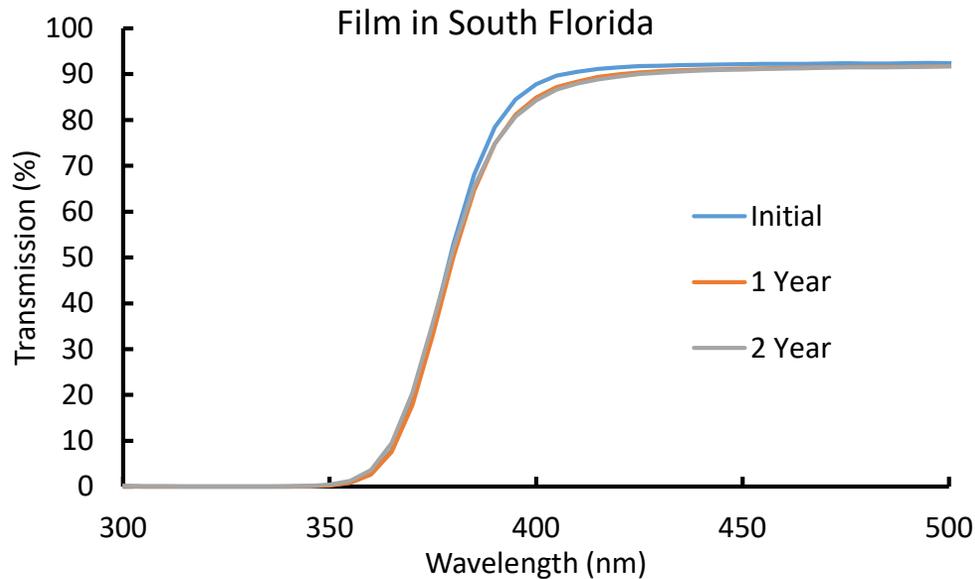
4000 hrs = 324 kWh/m² of UV light (290-400 nm)

QUV Weathering, UVA-340 bulb, no filter, 1.2 W/m²-nm @ 340 nm

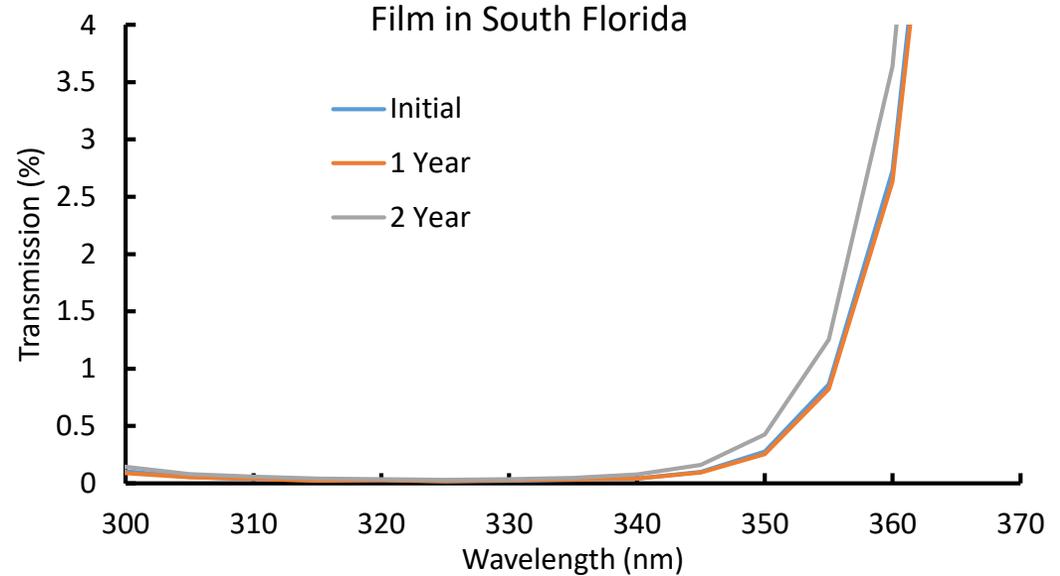
70 °C Uninsulated Black Panel Temperature



South Florida Weathering



Transmission of a free-standing PVF film



Close-up of UV blocking region from the graph at left

Exposed in Homestead FL (Q-Lab Test Services)
 45 ° South Facing
 No cleaning before measurement
Exposure still in progress

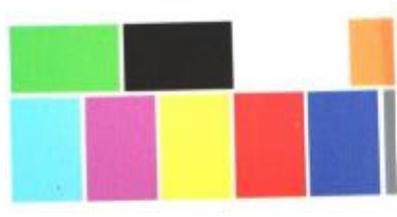
Property	Initial	1 Year S. Florida	2 Years S. Florida
Yellowness (b*)	0.36	0.66	0.74
Optical Transmission (%)	94.5	93.7	93.7
Haze (%)	8.0	10.6	12.7



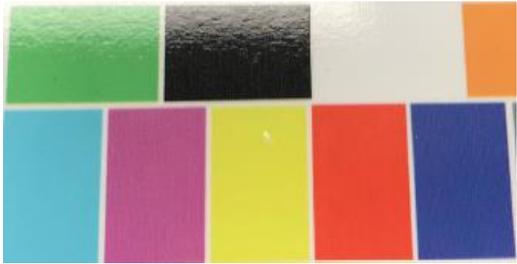
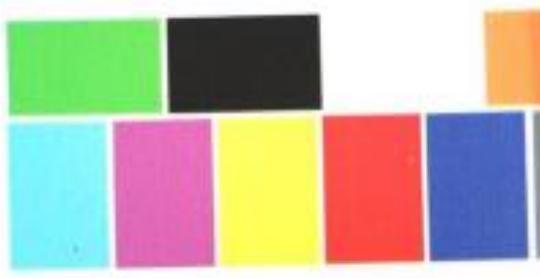
Test results are from the prototype version of TCP10BG3. We expect that commercial TCP10BG3 will perform equally.



Accelerated Weathering of TCP10BG3 on Colored Prints

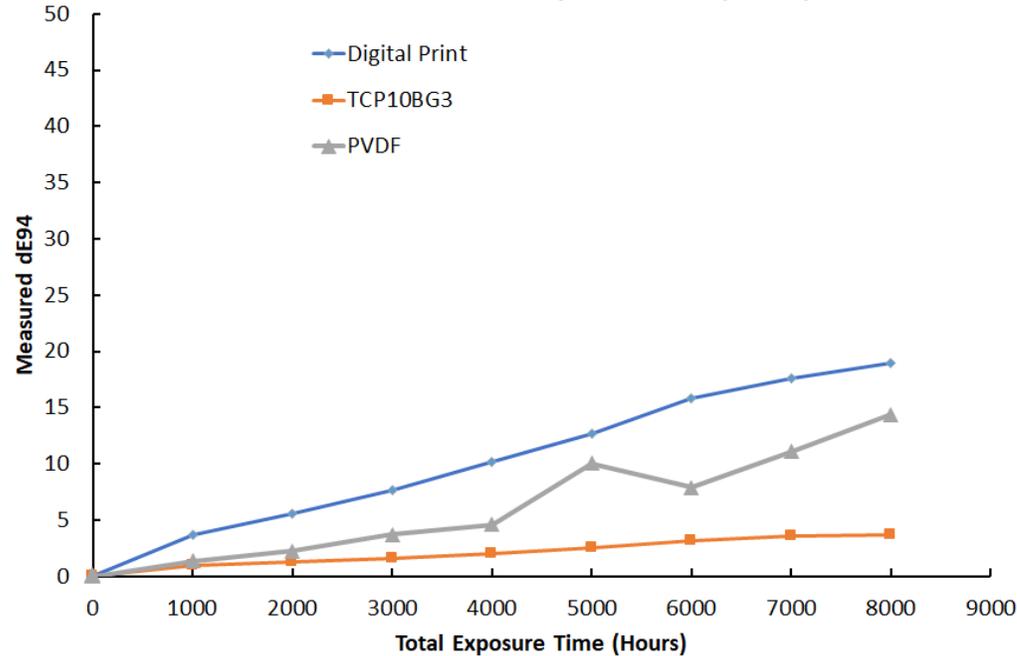
Time in QUV-UVA	Bare Digital Print	TCP10BG3	PVDF Clear Film
Initial			
3000 hrs			
6000 hrs			

Accelerated Weathering of TCP10BG3 on Colored Prints

Time in QUV-UVA	Bare Print	TCP10BG3	PVDF Clear Film
Initial			
6000 hrs			

Accelerated Weathering of TCP10BG3 on Colored Prints

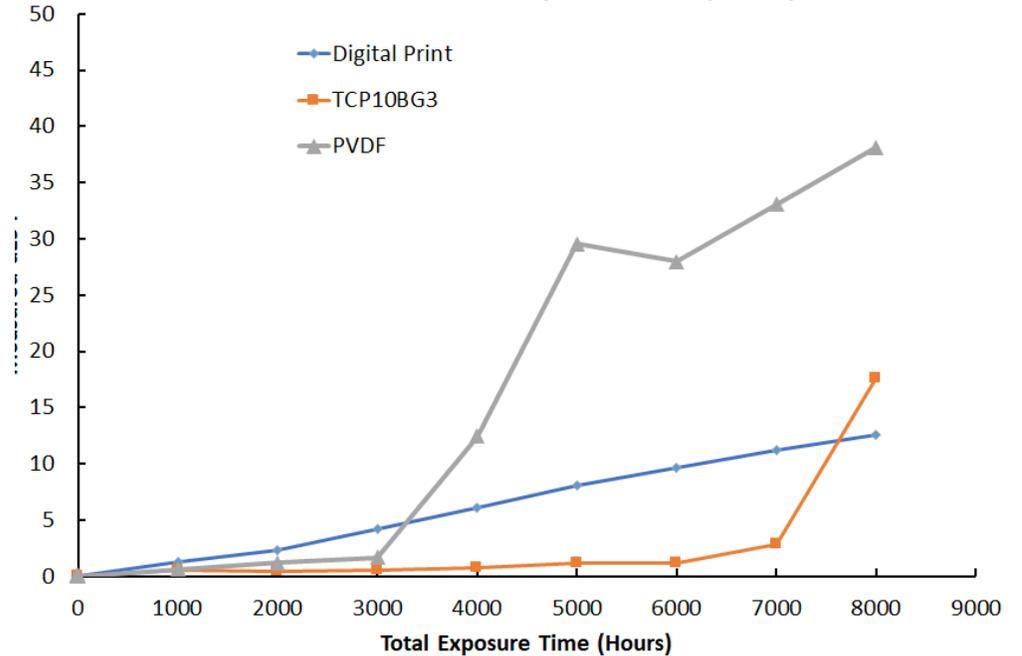
QUV UVA-340 Magenta Color Change Analysis
Measured dE94 vs. Total Exposure Time (Hours)



Color Change in Magenta Ink with Various Protective Films

8000 hrs = 520 kWh/m² of UV light (290-400 nm)

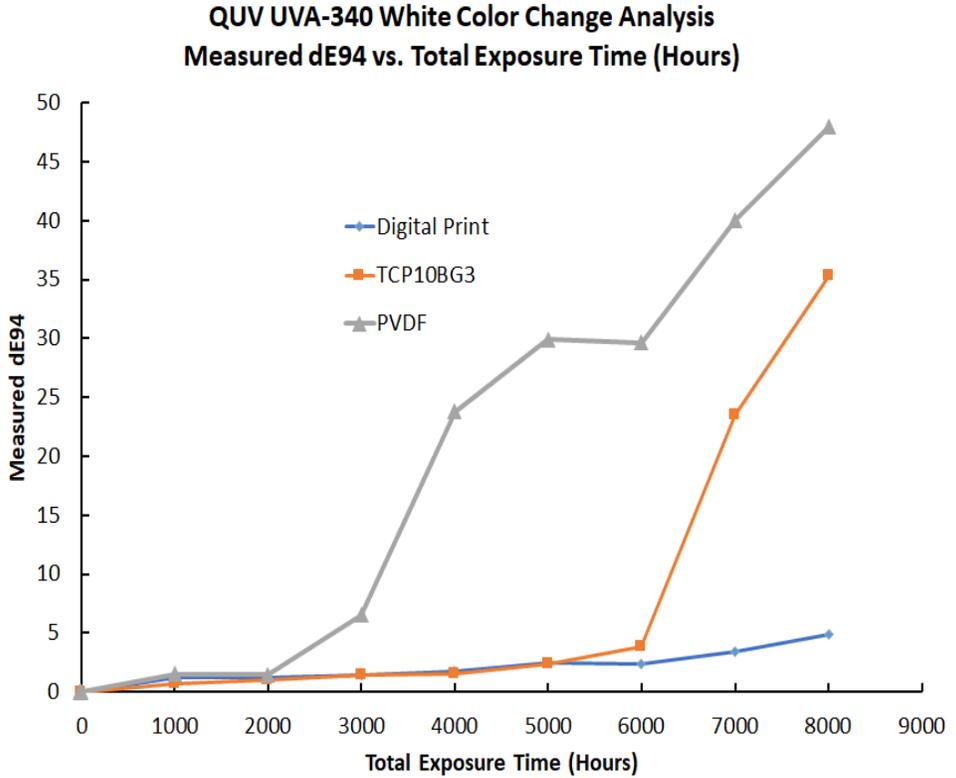
QUV UVA-340 Yellow Color Change Analysis
Measured dE94 vs. Total Exposure Time (Hours)



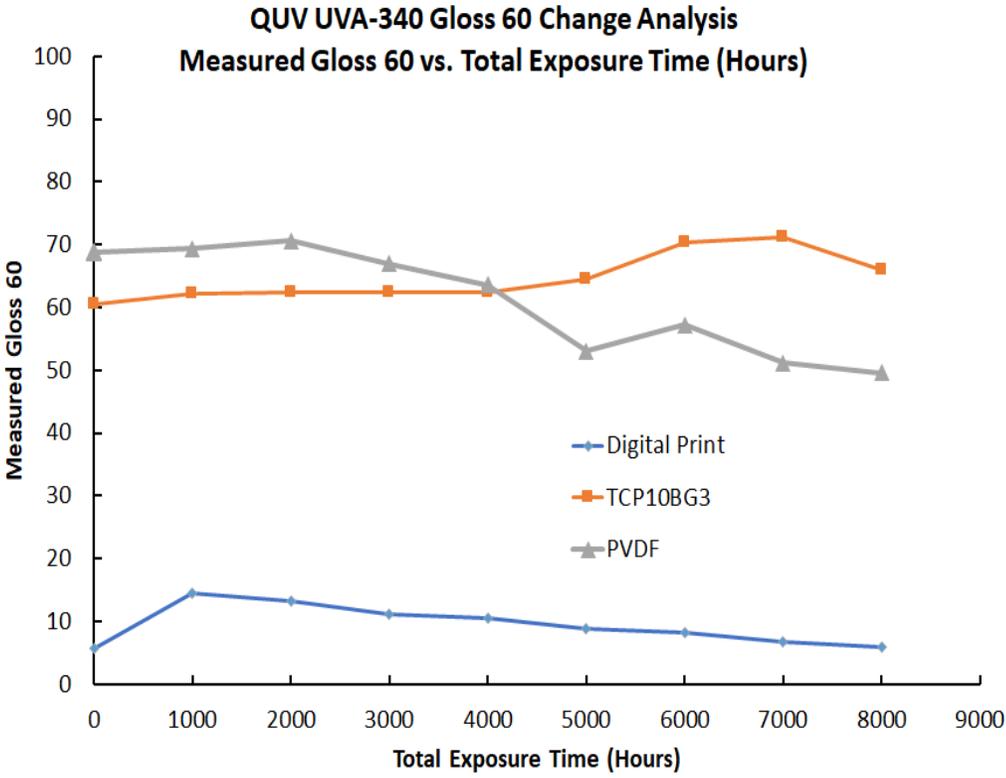
Color Change in Yellow Ink with Various Protective Films

8000 hrs = 520 kWh/m² of UV light (290-400 nm)

Accelerated Weathering of TCP10BG3 on Colored Prints



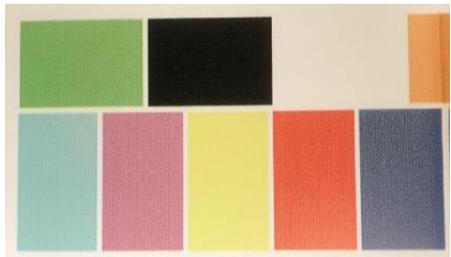
Color Change in White Blank with Various Protective Films
 8000 hrs = 520 kWh/m² of UV light (290-400 nm)



Gloss 60 Change with Various Protective Films
 8000 hrs = 520 kWh/m² of UV light (290-400 nm)



Accelerated Weathering of TCP10BG3 on Colored Prints

Time in QUV-UVA	Bare Print	TCP10BG3	TUT10BG3
Initial			
3000 hrs			
4000 hrs			

Graffiti and Stain Testing Results

Chemical Resistance Testing Results (15 min. exposure)

	Goo Gone Graffiti Remover	Goo Gone Spray Gel	Goof Off Heavy Duty Remover	Soy-based Remover	Chemical Agents				
Film Type	Esters, DEGMBE, Citrus, Ethyl lactate, Alcohols (<45%)	Petroleum Distillates (60-100%), d-Limonene & Citrus (<10%)	Benzyl Alcohol, Di butane, Sulfonic Acid, DEGMBE (<35%)	100% Soy-based	MEK	Acetone	Xylene	Gasoline	Comments
Tedlar® TCP10BG3									No change
ETFE 1									No change
ETFE 2									No change
PVDF with Acrylate									Solvents destroyed film
PMMA									Solvents destroyed film
Acrylic Polyurethane									Solvents destroyed film
Cast PVC 1									Solvents destroyed film
Cast PVC 2									Solvents destroyed film



Chemical Resistance Testing – Pictorial Example

Tedlar® TCP10BG3 Cleaned with Goo Gone Graffiti Remover



No residue.
Completely
cleaned

Premium Cast PVC Cleaned with Goo Gone Graffiti Remover



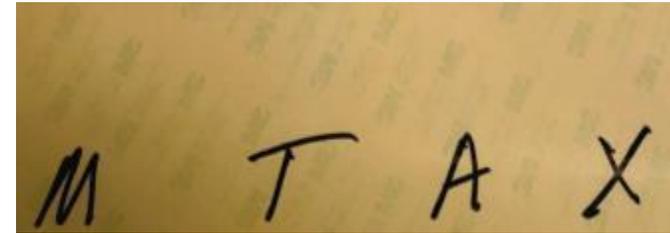
Cannot
completely
clean

Graffiti Removal Testing Results

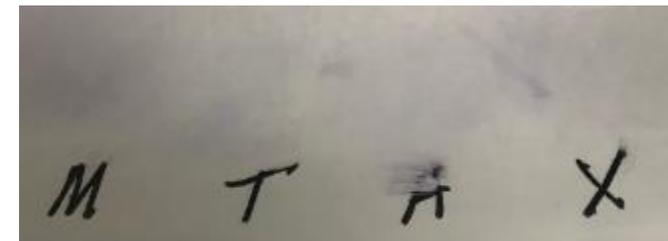
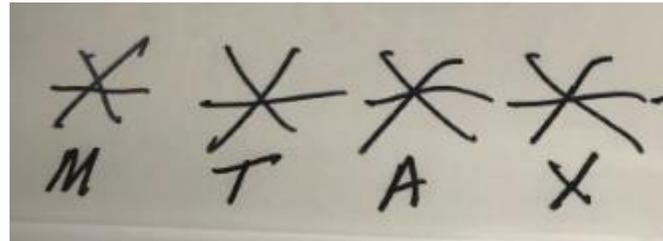
Graffiti Removal Lacquer Paint (solvents in paint included) (MEK, Xylene, 2- Propanol, Butane, Propane)									
	Goo Gone Graffiti Remover	Goo Gone Spray Gel	Goof Off Heavy Duty Remover	Soy-based Remover	Chemical Agents				
Film Type	Esters, DEGMBE, Citrus, Ethyl lactate, Alcohols (<45%)	Petroleum Distillates (60-100%), d-Limonene & Citrus (<10%)	Benzyl Alcohol, Di butane, Sulfonic Acid, DEGMBE (<35%)	100% Soy-based	MEK	Acetone	Xylene	Gasoline	Comments
Tedlar® TCP10BG3									No change
ETFE 1									No change
ETFE 2									No change
PVDF with Acrylate									Solvents swelled film
PMMA									Solvents swelled film
Acrylic Polyurethane									Solvents swelled film
Cast PVC 1									Solvents swelled film
Cast PVC 2									Solvents swelled film

Permanent Marker Test – Standard Solvents

TCP10BG3 PVF

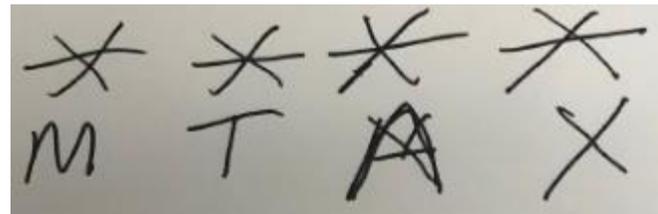


Competitor PVDF



Ghosting

Premium Cast PVC

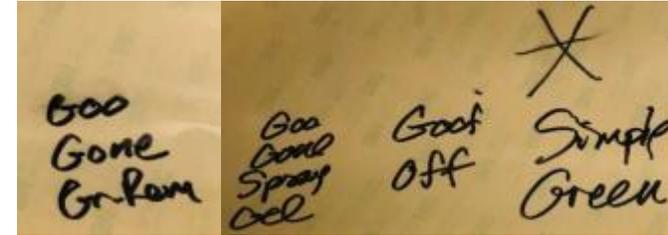
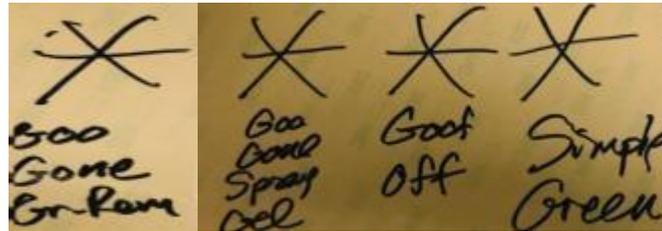


Ghosting and film damage

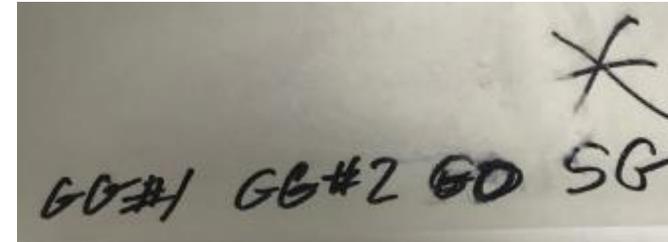
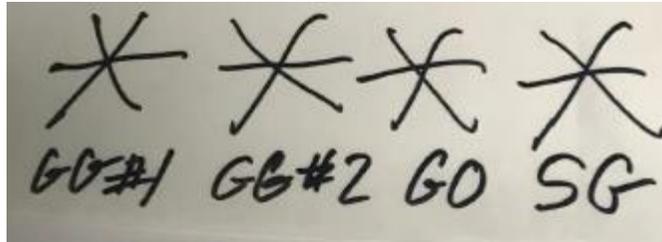
M = MEK T = Toluene A = Acetone X = Xylene

Permanent Marker Test – Commercial Cleaners

TCP10BG3 PVF

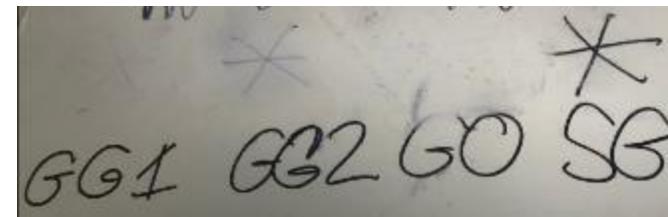
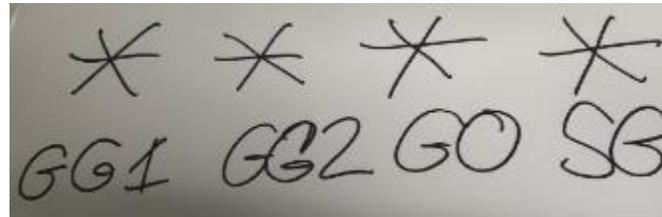


Competitor PVDF



Ghosting

Premium Cast PVC



Ghosting and film damage

GG1 = Goo Gone Graffiti Remover GO = Goof Off Household Remover
 GG2 = Goo Gone Spray Gel SG = Simple Green

Summary

Tedlar® Clear Protection Film (TCP) has outstanding physical and tensile properties that clearly outperform competitive PVDF/premium cast PVC films.

- High photo-stability leading to long-lasting protection from UV exposure
- Excellent color protection of printed laminates
- Higher chemical resistance

See the difference Tedlar® Clear Protect film can bring to your next project in Exhibit A:

Metal was laminated with printed PVC then capped with Tedlar® Clear Protection Film on one side and the leading premium film on the other. The metal was then taken to a tradeshow where attendees were allowed to use permanent marker on both sides, then clean off the marker with acetone.

The difference is clear!



Exhibit A: Live demo sample





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