

# Cleanability and Disinfection of Tedlar® PVF Films

DuPont™ Tedlar® is a versatile polyvinyl fluoride (PVF) film. For more than 60 years, Tedlar® PVF films have provided durable, long-lasting protection and timeless aesthetics to many types of surfaces that are subjected to harsh environments. Available as transparent film or in a variety of colors and gloss levels, it is typically applied to the surface of other materials to provide added durability, cleanability and chemical resistance. Its applications span a range of industries, including transportation, aerospace, building and construction, graphics and signage, electronics and photovoltaics.

Polyvinyl fluoride film is naturally transparent and flexible, enabling its use without addition of any co-resins or plasticizers. It is formulated to provide a desired color, gloss or special functionality using only inert additives that do not sustain the life of microorganisms like mold, mildew, fungus and bacteria. When sterilization is required to remove residual microbes, the films have extremely high resistance to degradation by chemicals and disinfectants for even the most rigorous disinfection protocols.

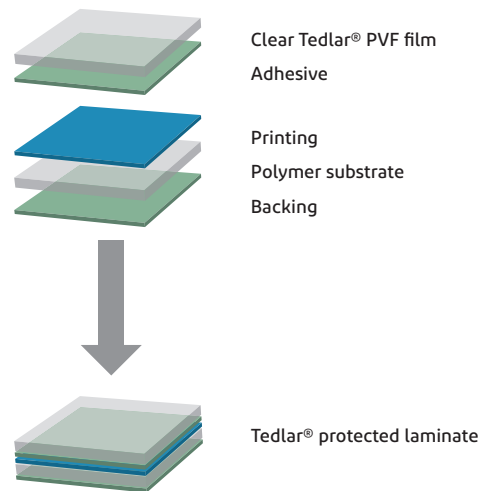


Figure 1: Picture of Tedlar® PVF film and a schematic of a laminated structure including Tedlar® as a protective surface glazing

## Cleanability of Tedlar® PVF Films

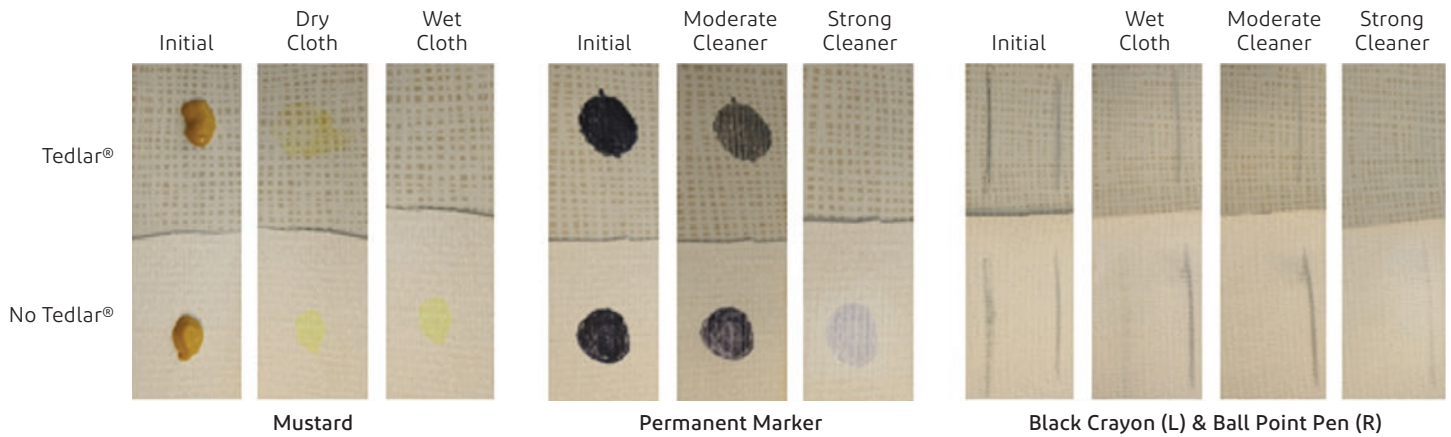
The cleanability of Tedlar® originates from its highly inert chemistry. The incorporation of fluorine into the monomer unit draws electron density away from the linear carbon backbone, effectively creating stronger bonds throughout the entire polymer chain. As a result, the PVF resin does not dissolve in any known solvent at room temperature, does not absorb water and is inert to attack by strong acids and alkalis, providing the highest level of resistance to chemicals, pollutants, corrosive agents, cleaners and disinfectants. The chemical resistance also prevents the ingress of staining agents and enables the removal of stains or graffiti from the surface without ghosting, using a wide range of cleaners and solvents.

Tedlar® is an excellent choice for use in high traffic areas that require frequent cleaning and disinfection, such as hospitals, healthcare centers, aircraft and other public transportation. The cleanability ensures that the intended aesthetics are maintained for many years despite high levels of use. The chemical resistance ensures that the widest variety of disinfectants can be used to kill bacteria, viruses, fungi and other pathogens without adversely affecting the material or the surface aesthetics.

Tedlar® PVF films have excellent resistance to stains and are easily cleanable. They are hydrophobic and impermeable to greases and oils, keeping most staining agents on the surface of the film where they can be easily removed. In fact, most dirt and debris can be easily removed with just soap and water. A cleanability test of Tedlar® PVF films is shown in Table 1. In this test, a variety of potential staining agents were placed on the surface of Tedlar® film and remained for 24 hours prior to cleaning. The residue was then wiped first with a dry cloth, followed by a wet cloth, then mild detergent, moderate household solvents like isopropyl alcohol and finally, if needed, stronger solvents such as acetone, toluene or MEK. Each item in the table is marked if the stain was fully removed (R) with no trace, partially removed with slight shadow (S) after cleaning, or not removed (NG).

Staining Agent	Dry Cloth	Wet Cloth	Soaps and Household Detergents	Moderate Household Solvents	Commercial Cleaning Solutions and Stronger Solvents
<b>Food and Drink</b>					
Butter	S	R			
Catsup	NG	S	R		
Chocolate Syrup	S	R			
Coffee	S	R			
Grape Juice	S	R			
Mustard	S	R			
Orange Juice	S	R			
Red Wine	S	R			
Tea	S	R			
Worcestershire Sauce	S	R			
<b>Household Items</b>					
Ball point pen	NG	NG	S	S	R
Black Crayon	S	R			
Brown Shoe Polish	NG	NG	R		
Calamine Lotion	S	R			
Lipstick	S	S	R		
Oily Pen	NG	S	R		
Permanent Marker	NG	NG	S	S	R
Spray Paint	NG	NG	NG	S	R
<b>Chemicals</b>					
Acetic Acid, Glacial	R				
Acetone	R				
Asphalt	NG	NG	S	R	
Betadine	S	R			
Bleach	R				
Brake Fluid	S	R			
Citric Acid, 10%	R				
Ethyl Alcohol	R				
Ethylene Glycol	R				
Gasoline	R				
Hydrochloric Acid, 20%	R				
Iodine	R				
Mercurchrome	NG	S	R		
Methyl Ethyl Ketone	R				
Nitric Acid, 10%	R				
Sodium Hydroxide	R				
Sulfuric Acid, 30%	R				
Stomach Acid	NA	R			
Human Sweat	NA	R			
Urine	NA	R			

**Table 1:** Typical stain resistance and cleaning of Tedlar® films.



**Figure 2:** Common, challenging stains are easily removed from surfaces protected with Tedlar® PVF film.

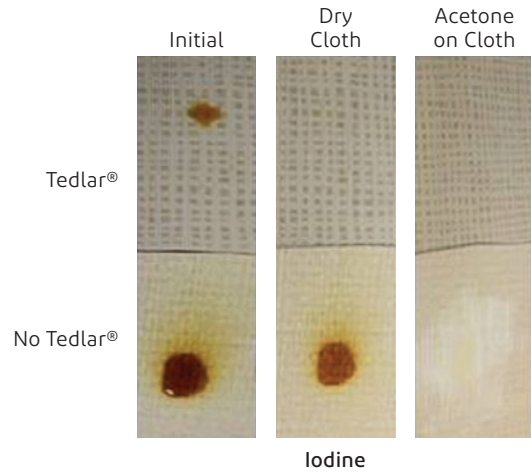
Stains come in all kinds of forms and can be generated by food and drinks, household items and even chemicals. Each stain removal may require a different cleaning agent and each cleaning agent has a different chemical makeup. Since Tedlar® PVF films have exceptional compatibility with many aggressive solvents, an entire range of cleaning products can be used without worry of permanent material damage. This includes even the harshest cleaners found in industrial applications for tough stain and graffiti removal. Figure 2 shows the progression of what is required to clean four common, yet very challenging stains that could occur, both with and without the presence of a Tedlar® protective film.

As an extreme example of a staining agent, the same volume of iodine solution was placed on the surface of commercial wallcovering, both with and without the protection of Tedlar® PVF film and left for an hour. The results are shown in Figure 3. The iodine was then wiped off with a wet cloth, and then wiped again with pure acetone. The hydrophobic Tedlar® PVF film prevents the waterborne iodine solution from soaking and staining the film, while the unprotected wallcovering is severely discolored. The Tedlar® film can be fully cleaned with acetone, while the unprotected wallcovering is permanently damaged.

Surfaces protected with Tedlar® should be cleaned first with a cloth, soap and water or household cleaning solutions before they are disinfected. If this procedure is not sufficient to remove a stain, then moderate to stronger solvents may be used (such as ethanol or acetone). The list of common stains in Table 1 and their behavior towards cleaning solutions may serve as a guide to select the right cleaning procedure.

### Disinfecting Tedlar® PVF Films

While cleaning removes dirt, debris and other matter from the surface of the film, it often does not kill bacteria, viruses, fungi, and other pathogens which can persist on the surface. For many public areas and especially healthcare settings, proper disinfection after cleaning is vital to ensuring public safety and controlling the spread of disease. Disinfection is most often performed by exposing surfaces to chemical disinfectants, but sometimes is also supplemented with exposure to ultraviolet (UV) light.



**Figure 3:** Enhanced chemical and stain resistance is imparted by covering a surface with Tedlar® PVF film. Here, a wallcovering film is made compatible with both iodine and acetone.

Disinfectant	Rating
Oxycide: Hydrogen Peroxide + Peroxyacetic Acid	E
Oxivir TB: Hydrogen Peroxide (0.5%)	E
Clorox Healthcare bleach solution (10%)	E
Virex II 256: Quaternary ammonium	E
Hand Sanitizer – 70% IPA	E
JF2 Glance: Non-ammoniated	E
JF3 Stride Citrus Neutral Cleaner	E

**Table 2:** Resistance of Tedlar® PVF film to common disinfectant solutions. The 'E' rating denotes that there was no perceptible change of appearance or mechanical properties when 2.5 mL were deposited on the surface each day for five days and cleaned off only at the end of the test.

When used on Tedlar® film, chemical disinfectants should be employed as described on their labeling. Due to the chemical resistance of Tedlar®, a wide range of disinfectants can be used without worrying about damaging the surface of the material. Table 2 demonstrates the outstanding resistance to common disinfectant solutions after five days of continuous contact. The surface exhibited no cracking, delamination or changes in color or gloss.

In addition to chemical disinfection, UV light is occasionally used as a supplement to chemical disinfection. Since pure polyvinyl fluoride film does not absorb ultraviolet light, it is exceptionally stable to these exposures. To demonstrate this, pigmented Tedlar® films were continuously exposed to 254 nm light using

an Air Science UV Box, which contains three 60 W bulbs emitting 52.5 W of UVC radiation and maintains a chamber temperature of around 52 °C, for a total of 24 days. As shown in Figure 4, the film had minimal color change and retained all its mechanical properties after this intense exposure.

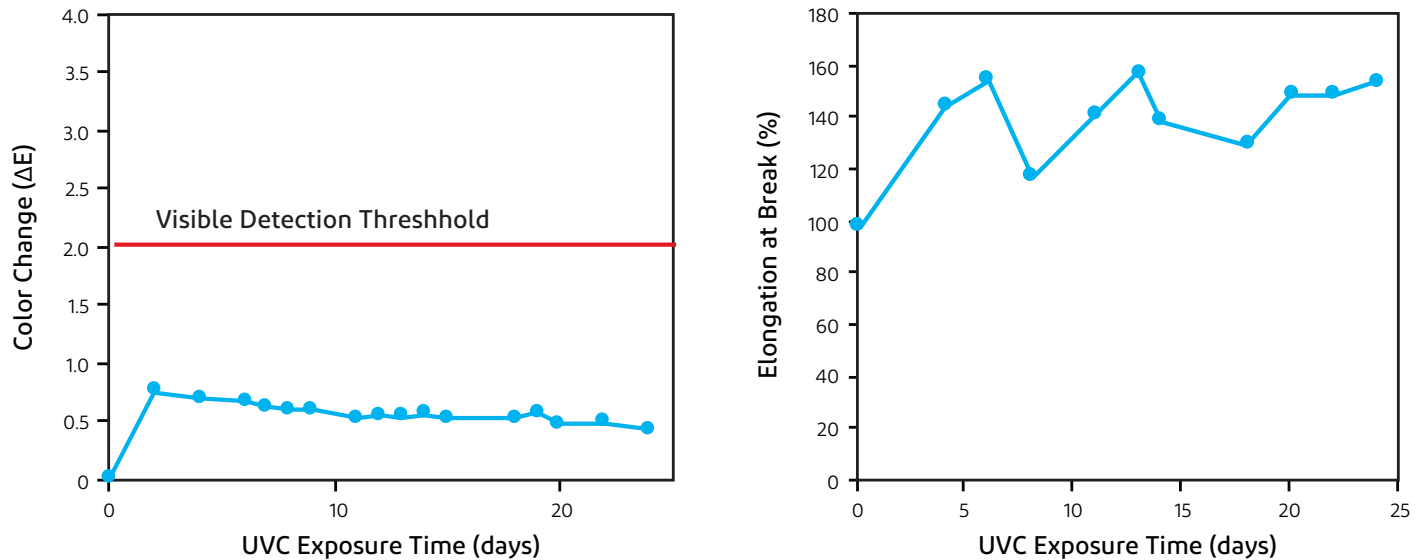


Figure 4: White Tedlar® film has minimal color change and maintains good mechanical properties even after 24 days of continuous exposure to intense 254 nm UVC light.

For any application demanding the highest performance for cleaning and disinfecting, Tedlar® will protect your surface for many years. The extremely high chemical stability and durability, combined with the versatile aesthetics, will provide a timeless appearance with unparalleled function.

For more information visit: [tedlar.com](https://www.tedlar.com)



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