Tedlar® protective film for Interiors in Healthcare Environment

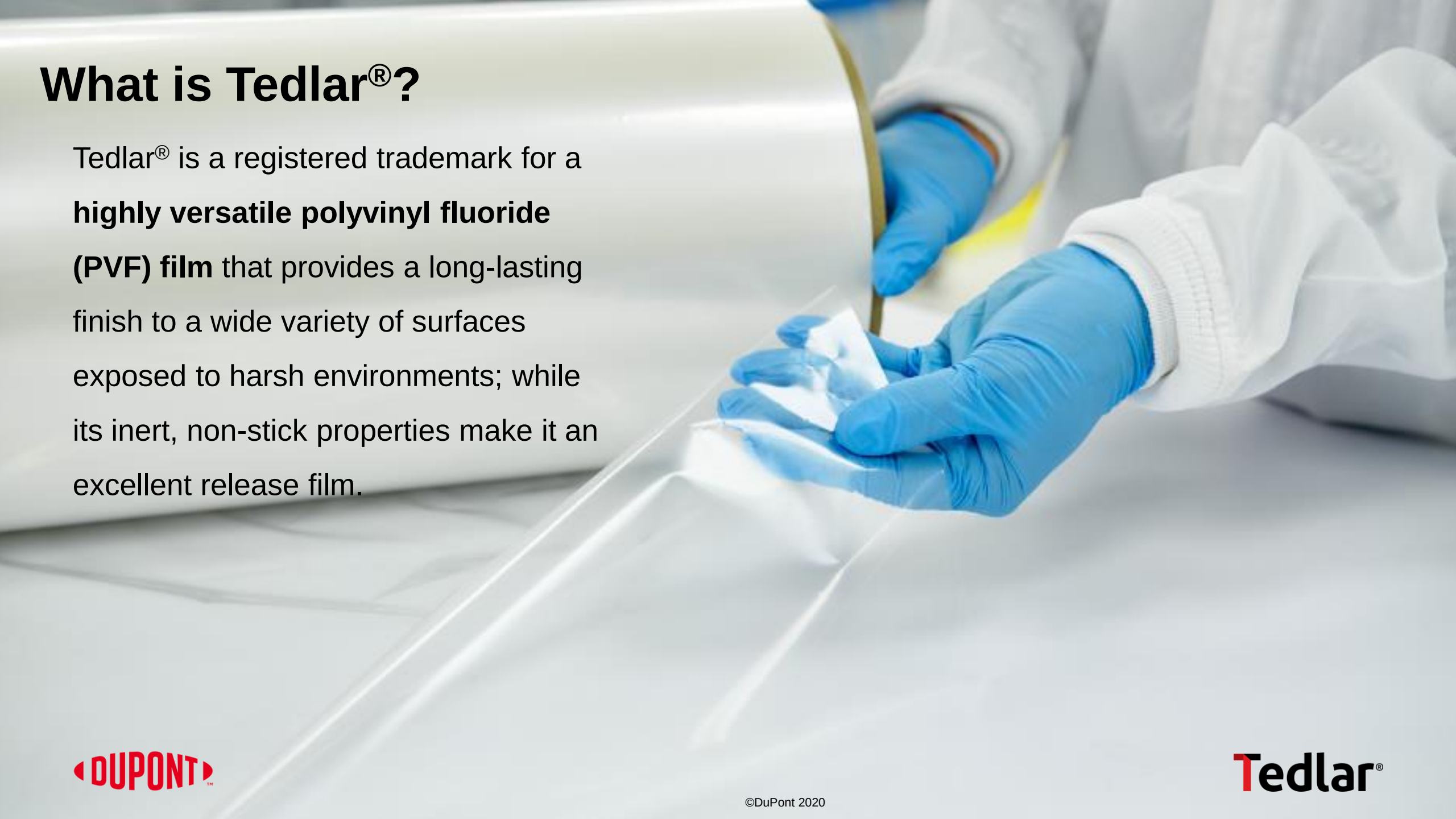
October 2020

Agenda

- Tedlar® Overview
- Unique Values in Healthcare
- Various Applications for Interiors
- Performance and Testing
- Case Studies

What is Tedlar®?

Tedlar® is a 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; while its inert, non-stick properties make it an excellent release film.



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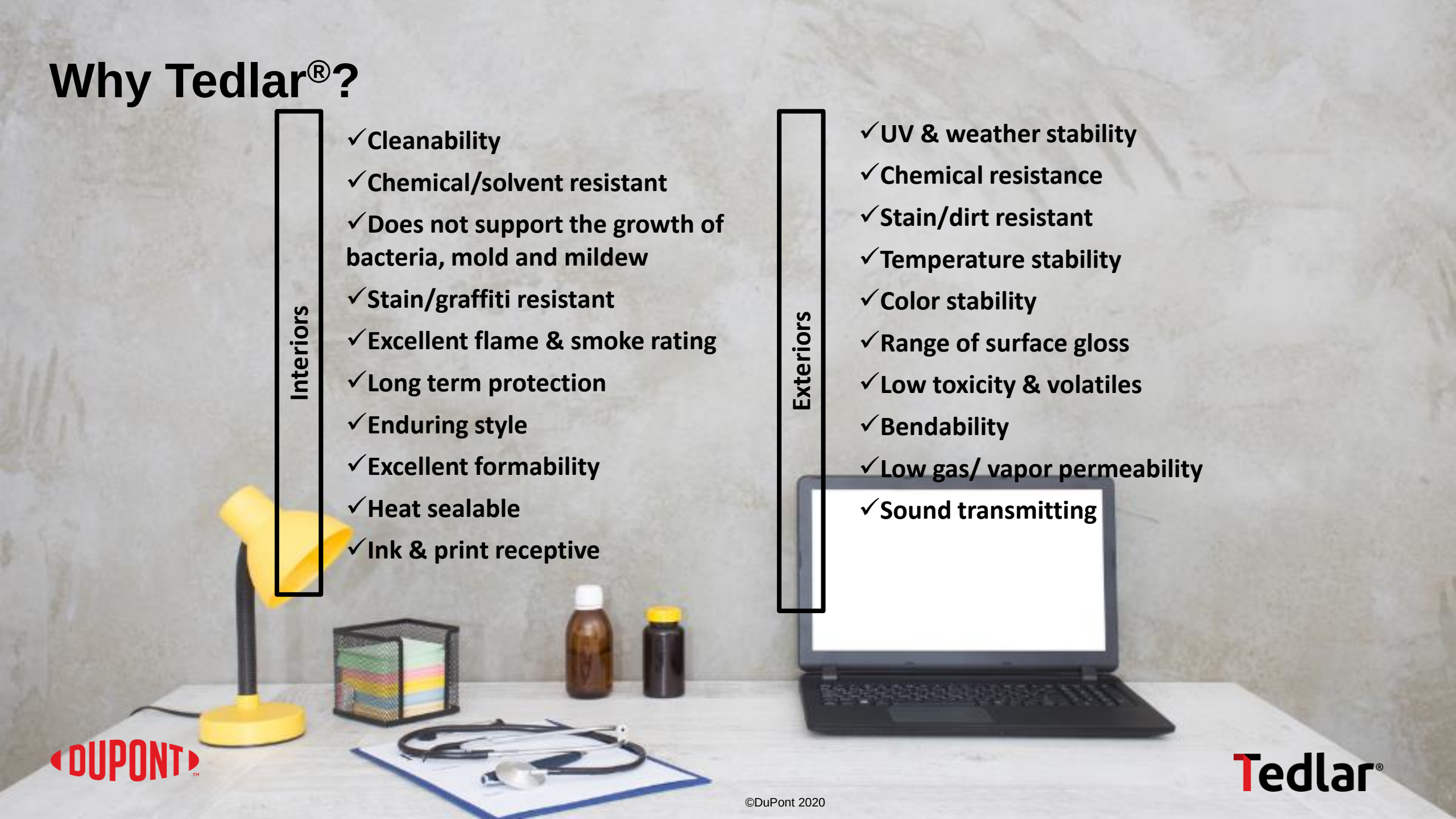
Why Tedlar®?

Interiors

- ✓Cleanability
- ✓Chemical/solvent resistant
- ✓Does not support the growth of bacteria, mold and mildew
- ✓Stain/graffiti resistant
- ✓Excellent flame & smoke rating
- ✓Long term protection
- ✓Enduring style
- ✓Excellent formability
- ✓Heat sealable
- ✓Ink & print receptive

Exteriors

- ✓UV & weather stability
- ✓Chemical resistance
- ✓Stain/dirt resistant
- ✓Temperature stability
- ✓Color stability
- ✓Range of surface gloss
- ✓Low toxicity & volatiles
- ✓Bendability
- ✓Low gas/ vapor permeability
- ✓Sound transmitting



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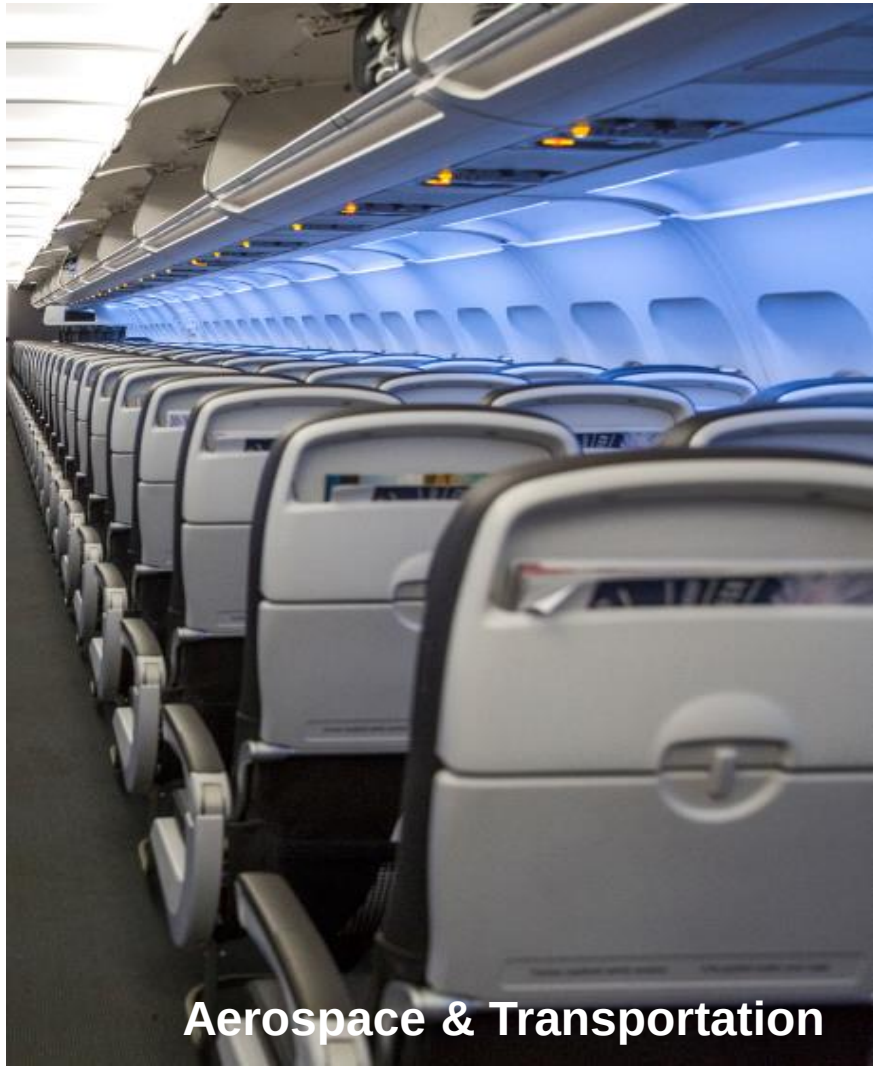
Tedlar® PVF Applications

Proven applications, globally, for over 50 years



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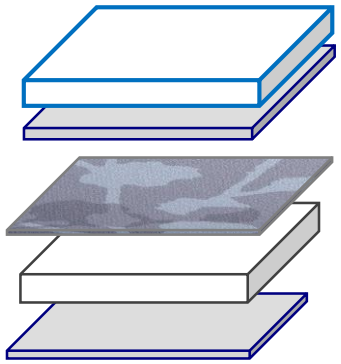
Example - Product Formation with Tedlar® PVF Film



Clear Tedlar® PVF Film

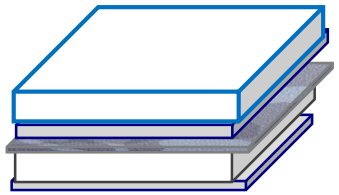
Adhesive

Printing

Substrate Film

Backing (optional)

Lamination



Embossing

Finished part protected with Tedlar® PVF Film

Lamination to substrate, thermoforming or vacuum forming

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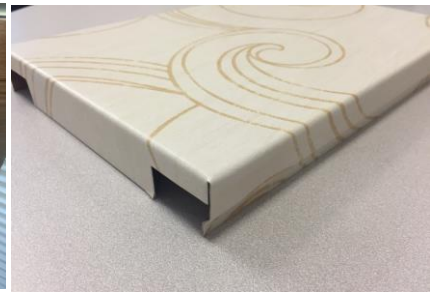
Surface Protection from all angles

Tedlar® film can be laminated on various substrates to create different applications for interiors

- Wallcoverings (wallpaper or laminated panel)
- Door and window
- Ceiling panel
- Floor materials
- Furniture surface
- Acoustical panel

Examples: PVF film laminated onto:

PVC



Metal

Wood or plasterboard

Tedlar® in Healthcare

Still going strong: Tedlar® protected wallcoverings are delivering durability and style for 30+ years

Omega Medical Center in Delaware region, built in1985.

“ The Tedlar® based wallcoverings have lasted a long time – better, in fact, than any other wallcovering used elsewhere in the building. It’s a heavy-duty product that is aesthetically pleasing.”

---- Siobhan Hawkins, Director of Operations, Omega Medical Center

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Unique Values for Healthcare Interiors

✓ Mold and Bacteria resistance

- Tedlar® is naturally flexible and does not need processing aids or additives (plasticizers) that provide nutrients for mold or bacteria growth.
- Tedlar® surface has been tested and certified using ASTM G21, JIS Z 2801, and ISO 846:2019(E). Results indicate that the films do not contain nutritive components for the bacteria or fungi tested to grow.

✓ Flame resistance

- Non-flammable and low smoke toxicity
- Used in aircrafts; Exceed the ASTM E84 Class A rating.

✓ Long-term Protection

- Provide a protective barrier against most staining agents and cleaning solvents, including: bleach, alcohols, ketones (acetone, MEK) and even strong acids and alkalis.

✓ Easy Cleaning

- Stain resistant to various species in healthcare environment, easy to clean completely after 24h dwell time

✓ Indoor Air Quality

- UL Greenguard GOLD for Low VOC and Mold Resistant certificate for Wallcoverings
- Designers & Architects can earn **LEED** points and customers get environmentally certified materials & stylish, healthier indoor spaces.

✓ UV Light Resistant

- PVF does not absorb UV radiation and maintains low color change when exposed to UVA, UVB, or UVC light for sterilization.

✓ Versatile Design and Enduring style

- PVF is naturally transparent with low color.
- Color is stable during use in harsh environments.
- Scrub resistant surfaces are ideal for high traffic areas

Bacteria, Mold & Mildew Testing

ISO 846 Part C: resistance to bacteria:

Several Tedlar® films paced on agar inoculated with bacteria *pseudomonas asruginosa,* after 28 days, showing the film does not support growth (MicroStar Lab)

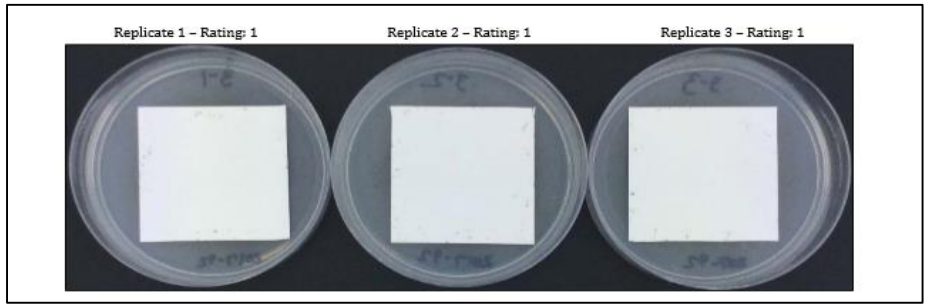
ASTM G21: mold and mildew*

White Tedlar® film paced on agar inoculated with a mixture of five fungal strains after four weeks of testing, showing no significant growth (MicroStar Lab)

The table below shows the results of the ISO 846 Part C on Tedlar® film samples.

Sample	Results
Dupont™ Tedlar™ Wallcovering Type II	No growth on or around for all 5 replicates The specimen does not contain nutritive components
TTR10BM3	No growth on or around for all 5 replicates The specimen does not contain nutritive components
TWH15BL3	No growth on or around for all 5 replicates The specimen does not contain nutritive components
TWH10BS1	No growth on or around for all 5 replicates The specimen does not contain nutritive components
TCP10BG3	No growth on or around for all 5 replicates The specimen does not contain nutritive components
TWH10SS1	No growth on or around for all 5 replicates The specimen does not contain nutritive components
TWH10SS3	No growth on or around for all 5 replicates The specimen does not contain nutritive components

The picture below shows the results of the ASTM G21 on White Tedlar® Film



*Certain types of Tedlar® film are resistant to fungi growth: contact your technical service rep. for more information.

Cleaning and Stain Resistance

- All products were applied to Tedlar® PVF Film and allowed to set for 24 hours. Utilizing the following methods, all products were successfully removed from the Tedlar® PVF Film with no damage to the Tedlar® film.

Dry Cloth Cleaning	Wet Cloth Cleaning	Mild Detergent	Solvent
Baby Oil	Human Sweat	Oily Pen	Ball Point Pen
Acid Solutions*	Urine	Mercurochrome	Surgical Fine Tip Marker
Acetone	Stomach Acid [11]	White Board Marker	Permanent Marker
Butanone	Skin Moisturizer	Lipstick	Spray Paint
Ethylalcohol	Sunscreen Lotion	Ketchup	
Glycol	Iodine	Shoe Polish	
Toluene	Coffee or Tea		
	Red Wine or Grape Juice		
	Black Crayon		
	Mustard		
	Brake Fluid		

*Acid solutions include: acetic acid, 10% nitric acid, 20% hydrochloric acid, and 30% sulfuric acid

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Tedlar® Cleanability vs. Competitive Products

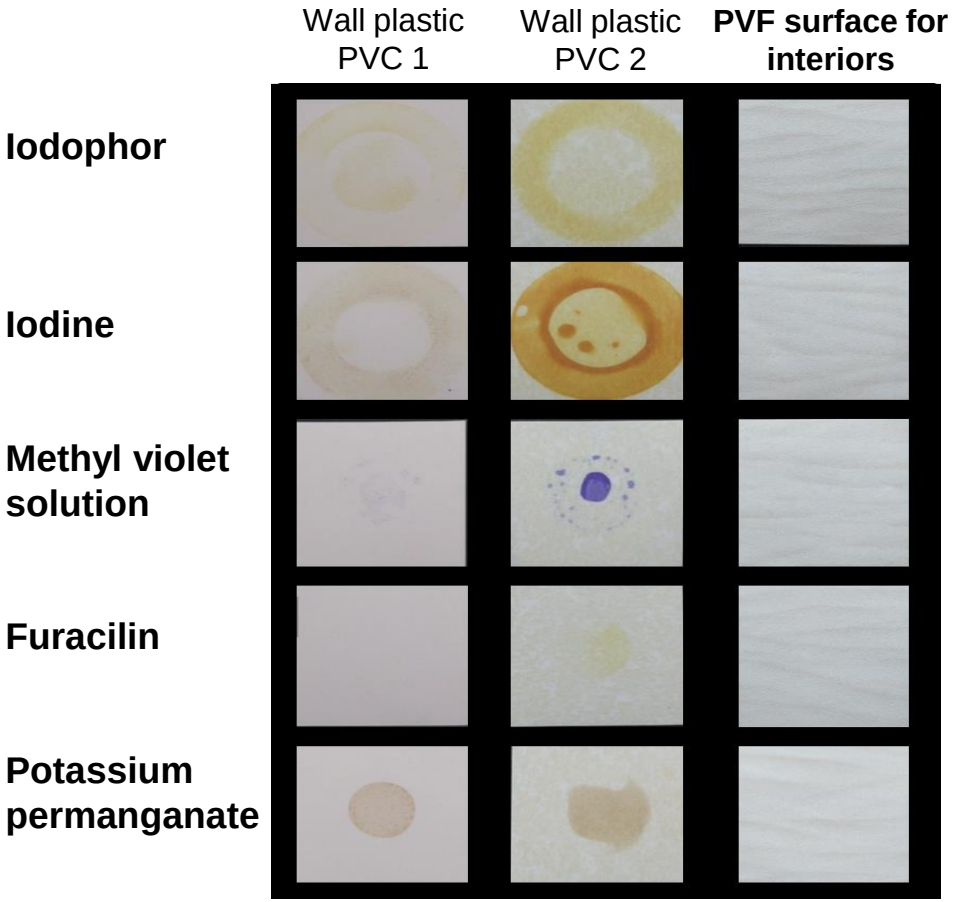
For critical areas: Clinic/Patient room/Emergency point etc.

Before aging

Stains	PVF	Wall plastic PVC 1	Wall plastic PVC 2	EVOH	PP	Melamine panel
	Alcohol	Alcohol	Alcohol	Alcohol	Alcohol	Alcohol
iodophor	5	1	1	4	2	5
iodine	3	1	1	2	2	5
Methyl violet solution	5	1	1	4	4	4
Furacilin	5	5	1	-	-	-
potassium permanganate	5	1	1	2	5	3

After aging

Stains	PVF	Wall plastic PVC 1	Wall plastic PVC 2	EVOH	PP
	Alcohol	Alcohol	Alcohol	Alcohol	Alcohol
Iodophor	5	1	1	2	2
iodine	3	1	1	2	2
methyl violet solution	4	1	1	2	4
Furacilin	5	3	1	-	-
potassium permanganate	5	1	1	2	3



Note：leaving stains 24hours before cleaning 5 = completely clean up；4 = slight stains left 3 = trace left；2 = obvious stains left；1 = can not be cleaned up at all

Aging test：15days aging test in 85℃ temperature and 85% humidity

Chemical Resistance

Chemical resistance is the ability of the material to maintain its chemical and physical properties after being exposed to a chemical substance (e.g., acids, bases, solvents).

Depending on the surface material composition of furniture walls, flooring, or any surface of concern and interest, a change to the surface can occur almost instantaneously, permanently damaging the surface exposed if the surface is not adequately protected.[13]

Tedlar® film has exceptional chemical resistance.

Cleaners and Solvents	Result
Glance: Non-ammoniated cleaner	
Stride Citrus Cleaner	
Ammonium Hydroxide (10%)	
Acetone	
Ethanol	
Isopropanol	
Methyl Ethyl Ketone	

- Testing was completed using acids, bases, solvents and miscellaneous chemicals after immersion for 1 year at 25 °C and for 2 hours at boiling conditions. All samples were given an 'E' that denotes that there was no perceptible change of either appearance or mechanical properties after the exposure.

Disinfectant Resistance

Tedlar® film is compatible with many acidic, basic, and solvent based substances that can be found in cleaning agents and disinfectants.

Surfaces protected with Tedlar® will not break down over time from continuous disinfecting.

Disinfectants	Result
Clorox™ Healthcare Bleach (10%)	☺
Oxivir TB: Hydrogen Peroxide (0.5%)	☺
Virex II 256: Quaternary	☺
Hand Sanitizer: Isopropanol (70%)	☺
Oxycide (Hydrogen Peroxide and Peroxyacetic Acid)	☺

- Test was completed depositing 2.5ml of solution each day for 5 days on surface then cleaned afterwards to check for damage

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More Chemical Resistance Results

(After exposure to the environments, marked with an X below, Tedlar® showed no significant change in tensile strength, elongation to break, or pneumatic impact strength.)

	1-Year Immersion at Room Temperature	2-Hour Immersion at Boil	31-Day Immersion at 75°C (167°F)
Acids			
Acetic Acid (glacial)	X		X
Hydrochloric Acid (10% & 30%)			X
Hydrochloric Acid (10%)	X	X	
Nitric Acid (20%)	X		
Nitric Acid (10% & 40%)			X
Phosphoric Acid (20%)	X		
Sulfuric Acid (20%)	X		
Sulfuric Acid (30%)			X
Bases			
Ammonium Hydroxide (12% & 39%)	X		
Ammonium Hydroxide (10%)			X
Sodium Hydroxide (10%)	X	X	
Sodium Hydroxide (10% & 54%)			X
Solvents			
Acetone	X	X	
Benzene	X	X	
Benzyl Alcohol			X
Dioxane (14)			X
Ethyl Acetate			X
Ethyl Alcohol			X
n-Heptane	X		
Kerosene	X		
Methyl Ethyl Ketone			X
Toluene			X
Trichloroethylene			X
Miscellaneous			
Phenol	X		
Phenol (5%)			X
Sodium Chloride (10%)	X		
Sodium Sulfide (9%)			X
Tricresyl Phosphate			X

*Blank areas have not been tested.

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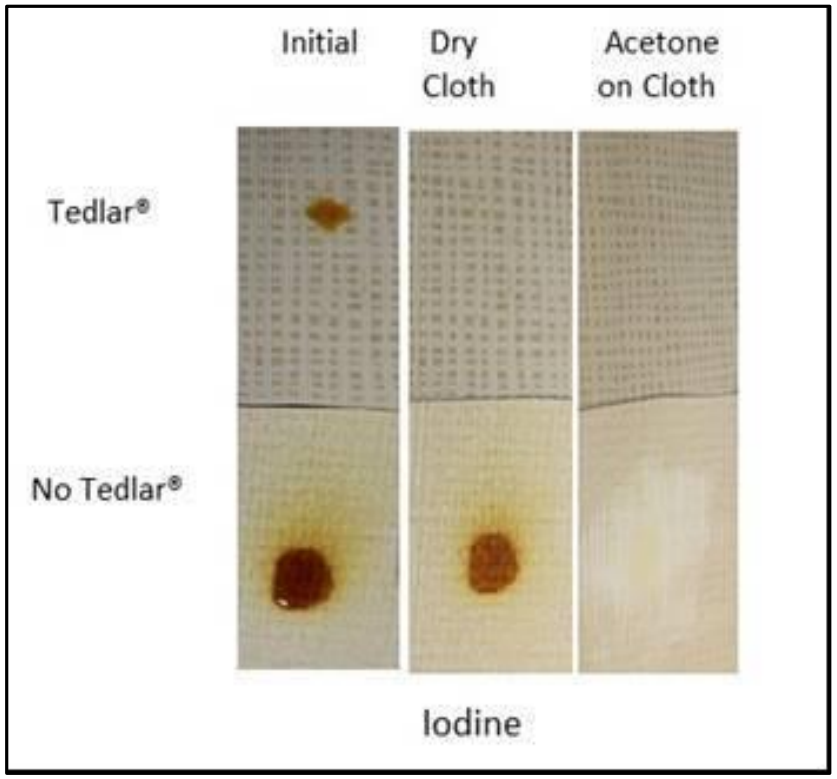
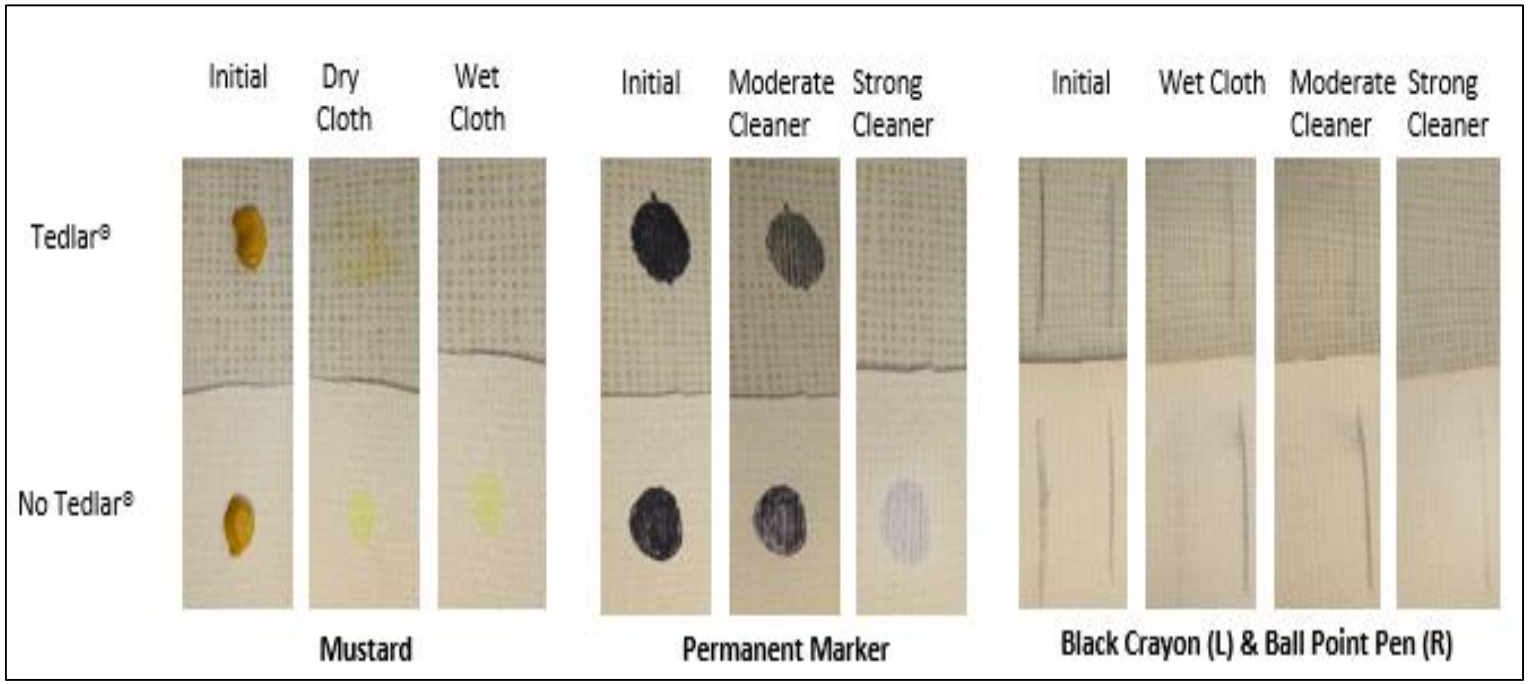
Tedlar® Chemical Resistance and Cleanability

The following examples show how materials can be protected from stains and chemicals by applying Tedlar® protective film as the outer layer. Below Tedlar® was applied to PVC wallcovering then tested with various stains and cleaning methods.

The PVC wallcovering that is protected with Tedlar® looks brand new even after cleaning with Acetone.





Overall Tedlar® Value for Healthcare Surfaces

- Cleanability
- Chemical/solvent resistant
- Does not support the growth of Bacteria, Mold and Mildew
- Stain/graffiti resistant
- Low VOC (potential to meet UL Greenguard rating)
- Excellent flame & smoke rating
- Long term protection
- Enduring style

Case studies

Healthcare Environment

Tedlar® PVF Interior Surface perfectly combine **Tedlar® wallcoverings' superior functionalities and durable metal board** that enables enduring style and extreme cleanliness. The **modular parts** with installation steps to meet all the requirements for the healthcare environment construction.

Application area: patient room, public area, waiting area.

Hospital in Changsha Guangxiu, Hunan China

VIP guests area: metal panel laminated with Tedlar® wallcovering

Waiting area

Corridor

Modern healthcare environment creation for a private maternity hospital. Over 30,000 sqm Tedlar® wallcoverings laminated on fiber cement board pre-installed, covering doctor's office, corridor, VIP patient room and labor room.
Stain resistant, easy-cleaning and durable protection are key elements for owners of the hospital to choose Tedlar®. Panel system installation keeps onsite installation clean and efficient.

Application area: diagnostic office, patient room, labor room, ultrasound diagnosis area

Hospital in Chengdu Xinan, Sichuan China

Diagnostic office: fiber-cement plasterboard laminated with Tedlar® wallcovering

Patient room

Labor room

Tedlar® is often used in applications that see high human traffic, such as the art installations in patient areas at Buffalo Children's Hospital in New York. In 2018, many of the common areas of the hospital were redesigned to include inspiring graphics for children and their families.

VSP Graphic group collaborated with The Martin Group and Kaleida Health to complete the installation. "After careful consideration, it was the anti-graffiti, resistance to mold and mildew, satin finish and second-to-none durability of Tedlar® that made it the best option for a medical environment like this," Josh Szary, Director of Sales and Marketing for VSP said, "Children, families, the client and the designers are thrilled with the outcome."

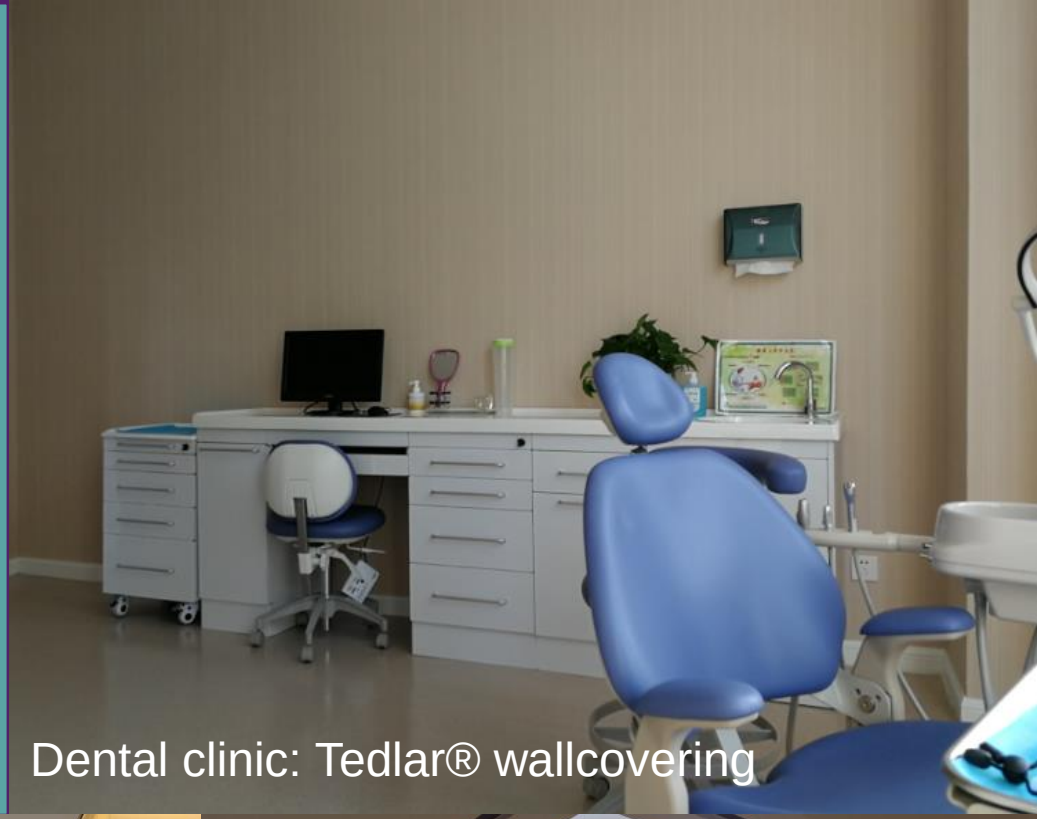
John R. Oishei Children's Hospital, Buffalo, New York

Hospital Main Entrance: drywall with graphic signage overlay protect by Tedlar®

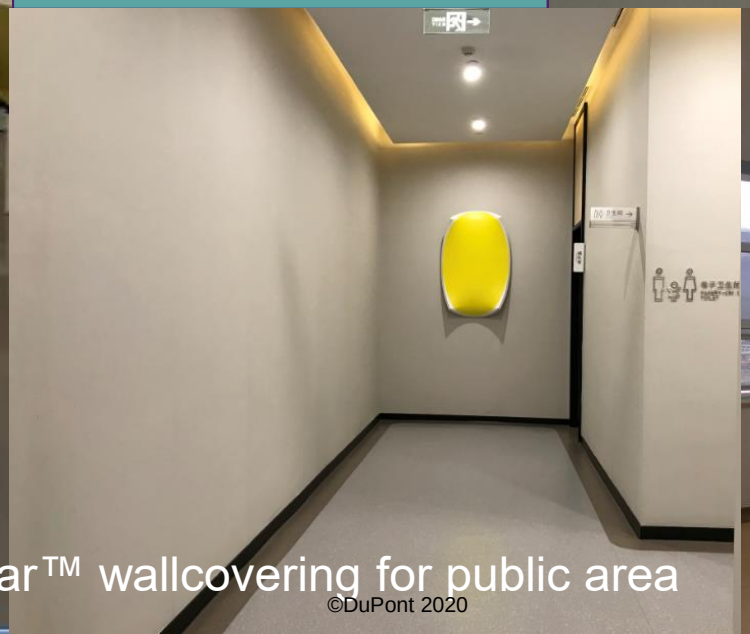
Nurse's Station

More cases in Healthcare are coming!

Children Health Management Center: Tedlar™ wallcovering for public area



Dental clinic: Tedlar® wallcovering



Traditional Chinese Medicine Hospital

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