

SECTION 08 87 00
GLAZING SURFACE FILMS

PART 1 - GENERAL

1.01 SECTION INCLUDE

- A. Anti-graffiti window film.
- B. Film attachment systems.

1.02 RELATED SECTIONS

- A. Section 08 80 00 – Glazing.

1.03 REFERENCES

- A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
- B. ASTM International (ASTM):
 - 1. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 2. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -- Tension.
 - 3. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
 - 4. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 - 5. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
 - 6. ASTM D 2240 - Standard Method for Rubber Property - Durometer Hardness.
 - 7. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
 - 8. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
 - 9. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
 - 10. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
 - 11. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
 - 12. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

13. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
 14. ASTM F1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings
 15. ASTM F2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings
- C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- D. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
- E. GSA-TS01-2003 -- Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.
- F. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.
- G. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.04 PERFORMANCE REQUIREMENTS

- A. Flammability: Surface burning characteristics when tested in accordance ASTM E 84:
1. Flame Spread Index: 25, maximum.
 2. Smoke Developed Index: 450, maximum.
- B. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.
- C. Provide glazing surface film to a minimum height of 7'-0" above any accessible walking surface. Any glazed window that receives the anti-graffiti window film shall be covered in its entirety

1.05 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- B. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

- C. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
- D. Performance Submittals: Provide laboratory data of emissivity.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer providing products with successful in service experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with demonstrated experience in installing products of the same type and scope as specified,
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
 - 2. Provide a reference list of 5 properties where the installer has applied window film. This list will include the following information:
 - a. Name of building.
 - b. The name and telephone number of a management contact.
 - c. Type of glass.
 - d. Type of film.
 - e. Amount of film installed.
 - f. Date of completion.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.09 WARRANTY

- A. At project closeout, provide to Owner's Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
- B. Anti-graffiti films are warranted for a period of 1 year when installed outdoors and for a period of (10) ten years when installed indoors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. 3M Window Film
 - 2. CPFilms
 - 3. Or approved Equal

2.02 ANTI-GRAFFITI WINDOW FILM

- A. 3M Anti-Graffiti 6 (AG-6): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
 - 1. Physical / Mechanical Performance Properties:
 - a. Film Color: Clear.
 - b. Thickness: Nominal 6.0 mils.
 - c. Tensile Strength (ASTM D 882): 32,200 psi.
 - d. Break Strength (ASTM D 882) (Per Inch Width): 190 lbs.
 - e. Elongation at Break (ASTM D 882): >100 percent.
 - f. Peel Strength: 1,000 g/inch.
 - g. Puncture Strength (ASTM D 4830): 132 lbs.
 - h. Abrasion Resistance (ASTM D 1044) : < 5 percent increase in haze.
 - 2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
 - 3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
 - 4. Identification: Labeled as to Manufacturer as listed in this Section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Film Examination:

1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
3. Commencement of installation constitutes acceptance of conditions.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Film Installation:
 1. Install in accordance with manufacturer's instructions.
 2. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.
 3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
 4. Apply film to glass and lightly spray film with slip solution.
 5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
 6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
 7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.04 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION



Scotchgard™ Graphic and Surface Protection Film 8991

Scotchgard™ Removable Graphic and Surface Protection Film 8991R

Description

Scotchgard™ Graphic and Surface Protection Film 8991 and the removable version, 8991R, are clear, tough, polyester overlaminates that provide resistance to many types of accidental and intentional stains, graffiti, and abrasion, gouging and UV light. They are also easier to clean than traditional overlaminates. Film 8991R is removable without heat from many surfaces.

Recommended Applications and End Uses

- Provide graphic or substrate protection on smooth, flat or simple curved surfaces.
- Interior or exterior graphics and signs
- Commercial vehicle or fleet graphics and emblems
- Substrate and surface protection

Limitations of End Uses

We do not normally warrant other applications, but please contact us to discuss your needs or let us suggest other 3M products.

Specifically, we do not recommend or warrant these surface protection films for the following:

- Cut film graphics, which may show entrapped air under the protection film
- Banners or other flexible substrates
- Painted or unpainted gypsum wall board
- Painted surfaces with poor paint-to-substrate adhesion, or uncured paint
- Graphics printed with solvent-based inks including solvent-based piezo inkjet inks
- Substrates that outgas such as polycarbonates, fiberglass and fresh paint. (See 3M Instruction Bulletin 5.1 for an outgassing test.)
- Porous or unsealed surfaces such as concrete
- Vandalism or excessive product abuse such as cutting or gouging or resulting damage to the substrate
- Application over rivets: rivets must be cut around
- Using film 8991 (permanent version) where removability may be needed
- Using film 8991R (removable) where removability is needed from printed or unprinted graphic film (it will not remove)
- Gasoline vapors or spills if allowed to penetrate the edges of the graphic
- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684 for alternatives.

Compatible Substrates

Please refer to the Product Bulletin for the base film to determine compatibility.

- Most smooth graphic films, solid color or imaged, and without a clear coat applied
- Smooth, untextured surfaces such as plastics, painted metals, countertop laminate or laminated wallboard

Characteristics

Characteristic	Description
Film	Transparent polyester
Gloss	High gloss
Thickness	Without adhesive: 4 mil (0.10 mm) With adhesive: 5.3 to 5.7 mils (0.13 mm to 0.14 mm)
Adhesive type and color	8991: Permanent, pressure sensitive, clear 8991R: Removable, pressure sensitive, clear
Liner	Polycoated paper
Recommended application surfaces	Flat, smooth, untextured; simple curves
Application temperature range	50° to 90°F (10° to 32°C)
Removal	8991: Permanent 8991R: Removable without heat (most substrates); removal not warranted
Applied shrinkage	5 mil (0.13 mm)
In use temperature range	-65° to +225°F (-54° to +107°C)
Chemical resistance	Resists most organic solvents and fluids; mild alkalis, mild acids and salt.

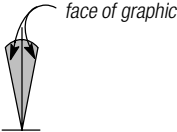
Flammability

Test Method	Film Tested	Results									
ASTM E84	8991	Flame Spread Index = 5 Class 1 Rating Smoke Developed Index = 65									
ASTM E-162	8991	Flame Spread Index = 0.0 Flame spread is non-existent Surface flammability of materials using a radiant heat source									
ASTM E662	8991	Specific optical density of smoke generated by solid materials. Specific Optical Density (Ts) <table> <tr> <td>Time</td><td>1.5 min.</td><td>4.0 min.</td></tr> <tr> <td>Flaming:</td><td>0.08</td><td>0.28</td></tr> <tr> <td>Non-flaming:</td><td>0.03</td><td>0.03</td></tr> </table>	Time	1.5 min.	4.0 min.	Flaming:	0.08	0.28	Non-flaming:	0.03	0.03
Time	1.5 min.	4.0 min.									
Flaming:	0.08	0.28									
Non-flaming:	0.03	0.03									
NFPA259	8991R	Heat release per unit mass. Potential heat in BTU/LB is 24615 No Required Level									
FMVSS302	8991R	Burn resistance of materials used in motor vehicles. Passed test on aluminum and glass; neither ignited.									
SMP800-C	8991R	Bombardier test method for toxic gas generation by materials on combustion. Passed detected levels of the gases tested are less than the required limit or less than detectable.									
BS476: Part 7	8991	Fire tests on building materials and structures; surface flame spread. Passed Category II Trains.									

Definitions

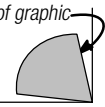
Exposure

U.S. Vertical Exposure



The face of the graphic is +/- 10° from vertical.

U.S. Non-vertical Exposure



The face of the graphic is greater than 10° from vertical and greater than 5° from horizontal. This includes non-vertical surfaces of vehicle wraps or fleet graphics.

U.S. Desert Southwest Exposure

Any outdoor graphic exposed to solar energy more than half of the daylight hours in Arizona, New Mexico and the desert areas of California, Nevada, Utah and Texas is subject to reduced warranties. A detailed map is available at 3Mgraphics.com under Warranties.

Graphic Construction

The products used to make a graphic, which may include film and/or flexible substrate, graphic protection, ink, printer and application tape.

Removable with Heat

Film is removable when heat is used within the specified time period and leaves no more than 10% adhesive residue on flat and simple curves without rivets, and no more than 30% adhesive residue on rivets and corrugations.

Warranty Information

Warranty and Limited Remedy

The following is made in lieu of all other express or implied warranties, including any implied warranty of **merchantability** or fitness for a particular purpose or implied warranty arising out of a course of dealing, custom or usage of trade: all 3M products are warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this Product Bulletin. 3M will replace or refund the price of any 3M materials that do not meet this warranty within the specified time periods. These remedies are exclusive. **In no case shall 3M be liable for any direct, indirect, or consequential damages, including any labor or non-3M materials charges.**

See the *3M Graphics Market Center Warranty Brochure* at 3Mgraphics.com, which gives the terms, additional limitations of the warranty, if any, and limitations of liability.

Warranty Coverage Overview

Both the warranty coverage and the durability for each graphic are based on the user(s) reading and following all applicable and current 3M Product and Instruction Bulletins. 3M will honor the Warranted Durability stated in the Warranted Durability Table in the base film or substrate Product Bulletin that is current when the film was purchased. Warranted durabilities may be reduced and stipulations may apply for certain constructions and applications, as covered in this Bulletin.

Usage	3M Graphic Constructions	Compatible Substrates (except films)	
		Most of U.S.	U.S. Desert Southwest
Indoor	up to 8 years ¹	8 years	n/a
Vertical Outdoor	up to 3 years ¹	3 years	2 years
Non-Vertical Outdoor	up to 2 years ¹	2 years	1 year
8991R only, removal	none	same as above	same as above

¹. The warranted durability is equal to, but shall not exceed, the best warranty stated in the film's 3M Product Bulletin based on the construction you choose (unprinted film or imaged film) and the exposure in which the product will be used (vertical, non-vertical, Desert Southwest).

General Warranty Stipulations

Abrasion and Loss of Gloss

These stipulations apply to graphics covered by the 3M™ MCS™ Warranty. Specific provisions of these stipulations are found in the *3M Graphics Market Center Warranty Brochure* at 3Mgraphics.com.

Abrasion damage and loss of gloss are not covered by any 3M warranty. This is considered normal wear and tear.

Application to Glass

3M accepts no liability for glass breakage when using this film for window graphics. See Instruction Bulletin 5.1 for details.

Application Outside the U.S.

Contact the 3M organization for that country.

Graphics Made with Components Not Sold or Recommended by 3M

The 3M™ MCS™ Warranty does not cover finished graphics made with inks, film, graphic protection and/or application tapes that are not sold or recommended by 3M. The user is solely responsible for the graphic appearance, performance and durability of graphic constructions that include any other products.

Factors that Affect Graphic Performance Life

The actual performance life of a graphic is affected by all of the following.

- The combination of graphics materials used
- Ink formulation
- Adequate ink drying or curing
- Selection, condition and preparation of the substrate
- Surface texture
- Application methods
- Angle and direction of sun exposure
- Environmental conditions
- Cleaning or maintenance methods

Fabrication

Application Using a Laminator

Films 8991 and 8991R are compatible with most squeeze roll laminators. No heat is required. Refer to Instruction Bulletin 4.22.

Application in the Field, or When Not Using a Laminator

For wet application (recommended), refer to Instruction Bulletin 5.7.

For dry application, refer to Instruction Bulletin 5.5.

Applying Multiple Panels of Pre-laminated Graphic Film

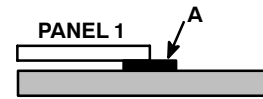
Edge-to-edge panel seaming is recommended (see the instructions below). For applications where overlaps are not subject to picking or environmental stresses, normal panel overlaps can be used.

- If the edges that meet are factory cut, align the edges of each panel and squeegee well. A wet or dry application can be used.
- If the edges are hand cut, it is unlikely that they are straight enough for good edge-to-edge fit. See *Making Perfect Fit Hand Cut Overlaps*. Only a dry application can be used.

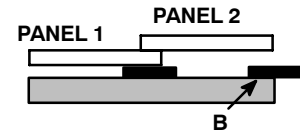
Making Perfect Fit Hand Cut Overlaps for Dry Application

The tape referenced in this procedure is one inch wide 3M brand filament or masking tape. The panels are graphic film to which either film 8991 or 8991R has already been laminated.

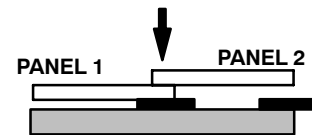
1. Apply panel 1.
 - a. Measure the width of panel 1.
 - b. Center and apply a strip of tape (A) to the substrate where the first panel overlap will occur. This protects the substrate when cut.
 - c. Apply the first panel as usual, except do not apply hard squeegee pressure on the edge where the substrate has been taped.



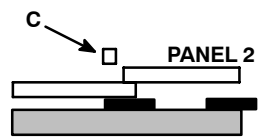
2. Apply panel 2.
 - a. Measure the width of panel 2.
 - b. Center and apply a strip of tape (B) to the substrate where the second panel overlap will occur.
 - c. Apply the second panel as usual, overlapping the previous panel where they meet, except do not apply hard squeegee pressure on the edges where the substrate has been taped.



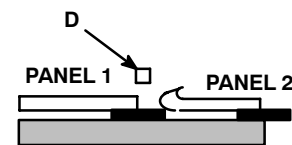
3. Continue with this process until all panels have been applied to the substrate.
4. With a sharp razor blade in a safety holder, cut down the center of the panel overlap, using just enough pressure to cut through both panels. Do not cut through the tape, which protects the substrate.



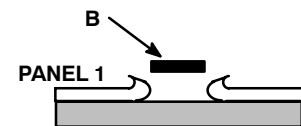
5. Remove the narrow piece (C) from the cut overlap from panel 2.



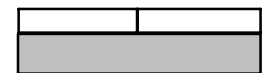
6. Lift the edge of panel 2 and remove the narrow piece (D) from panel 1.



7. Lift the edge of panel 1 and remove the remaining tape.



8. Inspect the substrate to make sure that it is clean and free from tape adhesive. Clean the area if necessary.
9. Press the cut edges together and re-squeegee the seams.



Maintenance and Cleaning

Use a cleaner such as the kind used for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents or alcohol, and have a pH value between 3.0 and 11.0 (neither strongly acidic nor strongly alkaline). A cloth or soft bristle brush can be used to apply or wipe the cleaner.

Note: Graphics damaged by improper cleaning are not covered by the 3M warranty.

This table shows the recommended cleaning method for various stains on graphics protected by films 8991 and 8991R. Always use the least aggressive cleaning method that provides satisfactory results.

Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

Stain and Cleaning Table

Stain	Cleaning Method			
	Dry Cloth	Detergent and Water	Isopropyl Alcohol or Household Cleaner	3M™ Citrus Based Cleaner
Ballpoint pen ink		●		●
Crayon			●	
Coffee/Tea	●			
Fruit Juice	●			
Grease			●	
Lipstick			●	
Ketchup			●	
Paint				●
Permanent marking pen			●	●
Shoe polish			●	

Note: Old and/or thicker stains may require longer soaking time or reapplication of the cleaner.

Removal

Film 8991 is a permanent product; its adhesive is not intended to be removable.

Shelf Life, Storage and Shipping

Shelf Life: One year from the date on the original shipping box when unused, plus one year after laminating. The total shelf life of a graphic before and after processing cannot exceed two years.

- Store the film in a clean, dry area, away from direct sunlight, and at an ambient temperature less than 86°F (30°C).
- Ship the finished graphic lying flat or in a roll. To roll the graphic, wrap it film-side out onto a core that is 6 inches (15 cm) or larger in diameter. These methods prevent the graphics and premask from wrinkling and popping off the liner.

Health and Safety



CAUTION

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The techniques described in these Bulletins are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
Base Films and Substrates Please visit our website to identify and select the additional Product and Instruction Bulletins you need for a successful application.		
Cold roll lamination	IB	4.22
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Application, wet method for translucent screen printed, thermal mass transfer and cut graphics	IB	5.7
Storage, handling, maintenance, removal	IB	6.5
3M Graphics Market Center Warranty Brochure	go to www.3Mgraphics.com , Warranties	

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Bulletin Change Summary

Added a limitation (page 1) regarding use on polycarbonate or any material that outgasses. Updated the warranty information, including a note of clarification regarding warranted durability.



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Protecting Your Brand

Shield Graphics, Surfaces and Windows with 3M™ Anti-Graffiti Film

- Surface protection against most scratches, acid etching, gouges and tagging
- Easy removal
- A fraction of the cost of new glass
- 99% UV rejection helps reduce fading of display merchandise

Product Performance and Technical Data

Film Properties (nominal)	AG-4	AG-6
Film Thickness	≥0.004"	≥0.006"
Tensile Strength	>25,000 psi	>25,000 psi
Break Strength	100 lbs/in	175 lbs/in
Elongation at Break	>100%	>100%
Peel Strength	1,000 g/in	1,000 g/in
Puncture Strength	93 lbs	132 lbs
Abrasion Resistance	< 5% increase in haze	< 5% increase in haze

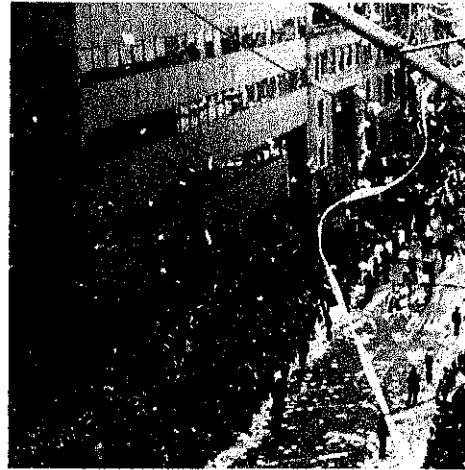
*Film properties not for specification purposes.

3M

Surface Protection

Events and Seasonal Tourism

Events or seasonal tourism give you a limited time opportunity to significantly increase sales for your business. Vandalism occurring during peak sales opportunities not only damages your image, but may deter limited time customers from giving your store a chance. Glass replacement would be costly and more disruptive, while 3M Anti-Graffiti Film can be removed and replaced quickly, and without the need to remove your windows.



Maintaining Your Image

When you see a building with graffiti or scratches on the window, what do you immediately think about that building or part of town? Your store is your livelihood. Do not let future customers have that opinion about your business. Protect your windows with 3M Anti-Graffiti Film so that signs of vandalism can be removed quickly which can help you maintain your valued reputation.



Civil Unrest

During times of civil unrest, large groups of passionate individuals can quickly generate damage. Use 3M Anti-Graffiti Film to help protect your windows and minimize damage. Damaged glass is very expensive to replace. Why replace the entire window when you can simply replace a cost-effective barrier? 3M Anti-Graffiti Film will reduce the risk of this expensive mistake.



**3M Renewable Energy Division
Window Films**
3M Center, Building 235-2S-27
St. Paul, MN 55144-1000
3M.com/windowfilm

Please recycle. Printed in U.S.A.
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98-0150-0333-2

Warranty and Limited Remedy: 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER EXPRESS OR IMPLIED WARRANTIES OR CONDITIONS, INCLUDING ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. If the 3M product does not conform to this warranty, the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price. **Limitation of Liability:** Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted.



Scotchgard™ Graphic and Surface Protection Film 8991

Scotchgard™ Removable Graphic and Surface Protection Film 8991R

Description

Scotchgard™ Graphic and Surface Protection Film 8991 and the removable version, 8991R, are clear, tough, polyester overlaminates that provide resistance to many types of accidental and intentional stains, graffiti, and abrasion, gouging and UV light. They are also easier to clean than traditional overlaminates. Film 8991R is removable without heat from many surfaces.

Recommended Applications and End Uses

- Provide graphic or substrate protection on smooth, flat or simple curved surfaces.
- Interior or exterior graphics and signs
- Commercial vehicle or fleet graphics and emblems
- Substrate and surface protection

Limitations of End Uses

We do not normally warrant other applications, but please contact us to discuss your needs or let us suggest other 3M products.

Specifically, we do not recommend or warrant these surface protection films for the following:

- Cut film graphics, which may show entrapped air under the protection film
- Banners or other flexible substrates
- Painted or unpainted gypsum wall board
- Painted surfaces with poor paint-to-substrate adhesion, or uncured paint
- Graphics printed with solvent-based inks including solvent-based piezo inkjet inks
- Substrates that outgas such as polycarbonates, fiberglass and fresh paint. (See 3M Instruction Bulletin 5.1 for an outgassing test.)
- Porous or unsealed surfaces such as concrete
- Vandalism or excessive product abuse such as cutting or gouging or resulting damage to the substrate
- Application over rivets: rivets must be cut around
- Using film 8991 (permanent version) where removability may be needed
- Using film 8991R (removable) where removability is needed from printed or unprinted graphic film (it will not remove)
- Gasoline vapors or spills if allowed to penetrate the edges of the graphic
- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684 for alternatives.

Compatible Substrates

Please refer to the Product Bulletin for the base film to determine compatibility.

- Most smooth graphic films, solid color or imaged, and without a clear coat applied
- Smooth, untextured surfaces such as plastics, painted metals, countertop laminate or laminated wallboard

Characteristics

Characteristic	Description
Film	Transparent polyester
Gloss	High gloss
Thickness	Without adhesive: 4 mil (0.10 mm) With adhesive: 5.3 to 5.7 mils (0.13 mm to 0.14 mm)
Adhesive type and color	8991: Permanent, pressure sensitive, clear 8991R: Removable, pressure sensitive, clear
Liner	Polycoated paper
Recommended application surfaces	Flat, smooth, untextured; simple curves
Application temperature range	50° to 90°F (10° to 32°C)
Removal	8991: Permanent 8991R: Removable without heat (most substrates); removal not warranted
Applied shrinkage	5 mil (0.13 mm)
In use temperature range	-65° to +225°F (-54° to +107°C)
Chemical resistance	Resists most organic solvents and fluids; mild alkalis, mild acids and salt.

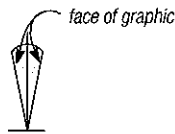
Flammability

Test Method	Film Tested	Results
ASTM E84	8991	Flame Spread Index = 5 Class 1 Rating Smoke Developed Index = 65
ASTM E-162	8991	Flame Spread Index = 0.0 Flame spread is non-existent Surface flammability of materials using a radiant heat source
ASTM E662	8991	Specific optical density of smoke generated by solid materials. Specific Optical Density (Ts) Time 1.5 min. 4.0 min. Flaming: 0.08 0.28 Non-flaming: 0.03 0.03
NFPA259	8991R	Heat release per unit mass. Potential heat in BTU/LB is 24615 No Required Level
FMVSS302	8991R	Burn resistance of materials used in motor vehicles. Passed test on aluminum and glass; neither ignited.
SMP800-C	8991R	Bombardier test method for toxic gas generation by materials on combustion. Passed detected levels of the gases tested are less than the required limit or less than detectable.
BS476: Part 7	8991	Fire tests on building materials and structures; surface flame spread. Passed Category II Trains.

Definitions

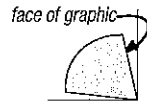
Exposure

U.S. Vertical Exposure



The face of the graphic is $\pm 10^\circ$ from vertical.

U.S. Non-vertical Exposure



The face of the graphic is greater than 10° from vertical and greater than 5° from horizontal. This includes non-vertical surfaces of vehicle wraps or fleet graphics.

U.S. Desert Southwest Exposure

Any outdoor graphic exposed to solar energy more than half of the daylight hours in Arizona, New Mexico and the desert areas of California, Nevada, Utah and Texas is subject to reduced warranties. A detailed map is available at 3Mgraphics.com under Warranties.

Graphic Construction

The products used to make a graphic, which may include film and/or flexible substrate, graphic protection, ink, printer and application tape.

Removable with Heat

Film is removable when heat is used within the specified time period and leaves no more than 10% adhesive residue on flat and simple curves without rivets, and no more than 30% adhesive residue on rivets and corrugations.

Warranty Information

Warranty and Limited Remedy

The following is made in lieu of all other express or implied warranties, including any implied warranty of **merchantability** or fitness for a particular purpose or implied warranty arising out of a course of dealing, custom or usage of trade: all 3M products are warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this Product Bulletin. 3M will replace or refund the price of any 3M materials that do not meet this warranty within the specified time periods. These remedies are exclusive. **In no case shall 3M be liable for any direct, indirect, or consequential damages, including any labor or non-3M materials charges.**

See the *3M Graphics Market Center Warranty Brochure* at 3Mgraphics.com, which gives the terms, additional limitations of the warranty, if any, and limitations of liability.

Warranty Coverage Overview

Both the warranty coverage and the durability for each graphic are based on the user(s) reading and following all applicable and current 3M Product and Instruction Bulletins. 3M will honor the Warranted Durability stated in the Warranted Durability Table in the base film or substrate Product Bulletin that is current when the film was purchased. Warranted durabilities may be reduced and stipulations may apply for certain constructions and applications, as covered in this Bulletin.

Usage	3M Graphic Constructions	Compatible Substrates (except films)	
		Most of U.S.	U.S. Desert Southwest
Indoor	up to 8 years ¹	8 years	n/a
Vertical Outdoor	up to 3 years ¹	3 years	2 years
Non-Vertical Outdoor	up to 2 years ¹	2 years	1 year
8991R only, removal	none	same as above	same as above

¹. The warranted durability is equal to, but shall not exceed, the best warranty stated in the film's 3M Product Bulletin based on the construction you choose (unprinted film or imaged film) and the exposure in which the product will be used (vertical, non-vertical, Desert Southwest).

General Warranty Stipulations

Abrasion and Loss of Gloss

These stipulations apply to graphics covered by the 3M™ MCS™ Warranty. Specific provisions of these stipulations are found in the *3M Graphics Market Center Warranty Brochure* at 3Mgraphics.com.

Abrasion damage and loss of gloss are not covered by any 3M warranty. This is considered normal wear and tear.

Application to Glass

3M accepts no liability for glass breakage when using this film for window graphics. See Instruction Bulletin 5.1 for details.

Application Outside the U.S.

Contact the 3M organization for that country.

Graphics Made with Components Not Sold or Recommended by 3M

The 3M™ MCS™ Warranty does not cover finished graphics made with inks, film, graphic protection and/or application tapes that are not sold or recommended by 3M. The user is solely responsible for the graphic appearance, performance and durability of graphic constructions that include any other products.

Factors that Affect Graphic Performance Life

The actual performance life of a graphic is affected by all of the following.

- The combination of graphics materials used
- Ink formulation
- Adequate ink drying or curing
- Selection, condition and preparation of the substrate
- Surface texture
- Application methods
- Angle and direction of sun exposure
- Environmental conditions
- Cleaning or maintenance methods

Fabrication

Application Using a Laminator

Films 8991 and 8991R are compatible with most squeeze roll laminators. No heat is required. Refer to Instruction Bulletin 4.22.

Application in the Field, or When Not Using a Laminator

For wet application (recommended), refer to Instruction Bulletin 5.7.

For dry application, refer to Instruction Bulletin 5.5.

Applying Multiple Panels of Pre-laminated Graphic Film

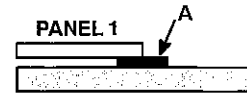
Edge-to-edge panel seaming is recommended (see the instructions below). For applications where overlaps are not subject to picking or environmental stresses, normal panel overlaps can be used.

- If the edges that meet are factory cut, align the edges of each panel and squeegee well. A wet or dry application can be used.
- If the edges are hand cut, it is unlikely that they are straight enough for good edge-to-edge fit. See *Making Perfect Fit Hand Cut Overlaps*. Only a dry application can be used.

Making Perfect Fit Hand Cut Overlaps for Dry Application

The tape referenced in this procedure is one inch wide 3M brand filament or masking tape. The panels are graphic film to which either film 8991 or 8991R has already been laminated.

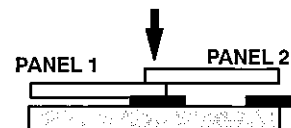
1. Apply panel 1.
 - a. Measure the width of panel 1.
 - b. Center and apply a strip of tape (A) to the substrate where the first panel overlap will occur. This protects the substrate when cut.
 - c. Apply the first panel as usual, except do not apply hard squeegee pressure on the edge where the substrate has been taped.



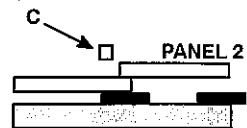
2. Apply panel 2.
 - a. Measure the width of panel 2.
 - b. Center and apply a strip of tape (B) to the substrate where the second panel overlap will occur.
 - c. Apply the second panel as usual, overlapping the previous panel where they meet, except do not apply hard squeegee pressure on the edges where the substrate has been taped.



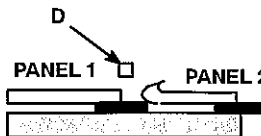
3. Continue with this process until all panels have been applied to the substrate.
4. With a sharp razor blade in a safety holder, cut down the center of the panel overlap, using just enough pressure to cut through both panels. Do not cut through the tape, which protects the substrate.



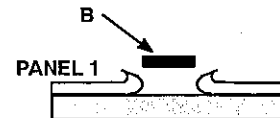
5. Remove the narrow piece (C) from the cut overlap from panel 2.



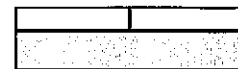
6. Lift the edge of panel 2 and remove the narrow piece (D) from panel 1.



7. Lift the edge of panel 1 and remove the remaining tape.



8. Inspect the substrate to make sure that it is clean and free from tape adhesive. Clean the area if necessary.
9. Press the cut edges together and re-squeegee the seams.



Maintenance and Cleaning

Use a cleaner such as the kind used for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents or alcohol, and have a pH value between 3.0 and 11.0 (neither strongly acidic nor strongly alkaline). A cloth or soft bristle brush can be used to apply or wipe the cleaner.

Note: Graphics damaged by improper cleaning are not covered by the 3M warranty.

This table shows the recommended cleaning method for various stains on graphics protected by films 8991 and 8991R. Always use the least aggressive cleaning method that provides satisfactory results.

Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

Stain and Cleaning Table

Stain	Cleaning Method			
	Dry Cloth	Detergent and Water	Isopropyl Alcohol or Household Cleaner	3M™ Citrus Based Cleaner
Ballpoint pen ink		●		●
Crayon			●	
Coffee/Tea	●			
Fruit Juice	●			
Grease			●	
Lipstick			●	
Ketchup			●	
Paint				●
Permanent marking pen			●	●
Shoe polish			●	

Note: Old and/or thicker stains may require longer soaking time or reapplication of the cleaner.

Removal

Film 8991 is a permanent product; its adhesive is not intended to be removable.

Shelf Life, Storage and Shipping

Shelf Life: One year from the date on the original shipping box when unused, plus one year after laminating. The total shelf life of a graphic before and after processing cannot exceed two years.

- Store the film in a clean, dry area, away from direct sunlight, and at an ambient temperature less than 86°F (30°C).
- Ship the finished graphic lying flat or in a roll. To roll the graphic, wrap it film-side out onto a core that is 6 inches (15 cm) or larger in diameter. These methods prevent the graphics and premask from wrinkling and popping off the liner.

Health and Safety



CAUTION

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The techniques described in these Bulletins are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
Base Films and Substrates Please visit our website to identify and select the additional Product and Instruction Bulletins you need for a successful application.		
Cold roll lamination	IB	4.22
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Application, wet method for translucent screen printed, thermal mass transfer and cut graphics	IB	5.7
Storage, handling, maintenance, removal	IB	6.5
3M Graphics Market Center Warranty Brochure	go to www.3Mgraphics.com , Warranties	

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Bulletin Change Summary

Added a limitation (page 1) regarding use on polycarbonate or any material that outgasses.
Updated the warranty information, including a note of clarification regarding warranted durability.



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