3M

Envision™ Print Wrap Film 480Cv3

1. Product Description

A. Product Features

- High performance, 2-mil white, non-PVC film with a luster finish
- Pressure-activated adhesive for easy sliding, tacking, snap up and repositioning
- Non-visible air release channels for fast and easy, bubble-free installations
- For inkjet printing with select solvent, eco-solvent, UV and latex inks and for screen printing with select solvent and UV inks. Refer to the Compatible Products and Warranty Information sections for the recommended printing platforms.
- Versatile, ideal for many long-term graphic applications and for short-term wall graphics on smooth or moderately textured surfaces
- Flexible, highly conformable over compound curves, corrugations and rivets and requires less heat during application than vinyl films
    - Stretch graphic constructions using selected inks with the 3M™ Envision™ Gloss Wrap Overlaminate 8548G up to 150% (for example, a 10 inch piece of film can stretch to 15 inches) without primer or relief cuts while maintain lifting resistance; see details and exceptions in Section 9.
- Removable film, resists tearing in cooler temperatures for fast removal

This product offers several environmental benefits. For more information about these benefits, visit 3Mgraphics.com/Sustainability .

- Non-PVC, phthalate-free film
- Contains no added chlorine or halogens
- Made in part from bio-based materials
- Manufactured using 60% less solvent

Also visit 3Mgraphics.com/EnvisionWrap to see actual demonstrations using film 480Cv3.

B. Recommended Types of Graphics and End Uses

When constructed and used as described in this Bulletin, these types of graphics and end uses may be warranted. Please read the entire Bulletin for more details.

- Indoor and outdoor graphics and signs, including point-of-purchase and displays
- Fleet, vehicle, watercraft and transit
    - Commercial vehicles and fleet trucks and trailers; emblems or striping
    - Personal vehicle graphics and wraps
    - Watercraft graphics (above the static water line only)
    - Bus graphics
    - Rail cars and lead cars of trains, light rail and subways
    - Non-vertical and horizontal vehicle wraps, watercraft and transit when protected with overlaminate 8528 or 8548G
- Small format original equipment manufacturer's (OEM) decorative and identification graphics, cautionary and safety labeling
- Smooth and Textured Walls
    - Graphics applied to indoor smooth wall surfaces
    - Graphics applied to indoor or outdoor moderately textured surfaces when protected with overlaminate 8548G

C. Performance Overview

3M tests the performance of both individual products and finished graphic constructions. This table shows the best performance expected from this product without a Warranty Period and with a Warranty Period.

For detailed graphic construction and application options along with specific Warranty Periods, please see the Warranty Information, Section 5.

Expected Performance Life. This is the estimated period of time the product should perform satisfactorily.	
Unprinted film with no graphic protection, applied to a flat vertical outdoor surface.	11 years Unwarranted Period
3M™ MCS™ Warranty. This is the maximum period of time 3M will warrant the finished graphic performance.	
Printed film with the best 3M ink and graphic protection option, applied to a flat, vertical, vehicle surface.	7 years Warranty Period
3M Performance Guarantee. This is the maximum period of time 3M will warrant the performance of the 3M materials used.	
Printed film with the best ink and graphic protection option, applied to a flat, vertical, vehicle surface.	4 years Warranty Period

D. Limitations of End Uses

This 3M product is not designed or recommended for the following uses. Please contact us to discuss other options.

(1) Unsuitable End Uses for This Film

- Graphics applied to:
    - stainless steel (we recommend using 3M™ Controltac™ Graphic Film IJ181 instead)
    - non-3M films (see Removal Warranty)
    - watercraft when the graphic is below the static water line
    - watercraft graphics that are not edge sealed
    - painted substrates with poor paint to substrate, or paint-to-paint bond
    - substrate surfaces that are not clean properly
- Using prespacing tape in cut and weeded applications where the tape must adhere to the exposed liner
- Film without graphic protection when they are:
    - printed vehicle graphics
    - watercraft graphics
    - exposure to abrasive conditions, harsh cleaners or chemicals
    - outdoor, horizontal applications
- Graphic removal from:
    - applications with poor paint-to-substrate adhesion
    - existing graphics that must remain intact; damage may occur during removal of film
    - watercraft
    - outdoor, horizontal applications (except graphics using overlaminate 8528 or 8548G as described in this Bulletin)
- Graphics subjected to gasoline vapors or spills, including those at or on gas pumps, automobile fuel-tank ports, watercraft or top-feeding, petroleum tankers

E. Wall Graphics

This 2-mil film may be used for indoor smooth or textured surface wall graphics. However, the user is responsible for determining the product's suitability, including adhesion and, if required, removal characteristics. Due to the wide variability of wall surfaces, neither finished graphics nor removal is warranted, even for removable or changeable films. Instruction Bulletin 5.37 provides comprehensive information for the most successful wall graphics film selection and application.

F. Important Information About Bus Applications

Film used on buses must not be applied so as to restrict the safe use of emergency window exits. See the most current version of Instruction Bulletin 5.4 for details.

2. Compatible Products

This section provides a list of products that are approved by 3M for use with the base film covered in this Bulletin, and used for the creation of a graphic that is covered by the 3M™ MCS™ Warranty or 3M Performance Guarantee. Refer to the Product and Instruction Bulletins listed in 3M Related Literature at the end of this Bulletin for more information about the compatible products.

A. Inkjet Inks and Printers for 3M™ MCS™ Warranty

	Ink Series	Printer
(1) Solvent Inks and Printers	• SIIT GX 3M Ink Series	Seiko I Infotech ColorPainter™ H Series H-74s, H2-74s, H-104s, H2-104s, W-54s and W-64s Printers
(2) Latex Inkjet Inks and Printers	• HP 3M LX600 Specialty Latex Ink	HP Designjet L65500; Scitex LX600, LX800, LX820 & LX850; Latex 820 & 850 Printers
	• HP LX610 Latex Ink a 3M™ MCS™ Warranty Component	HP Designjet L65500, Scitex LX600, LX800, LX820 & LX850; Latex 820 & 850 Printers
	• HP 792 Latex Ink a 3M™ MCS™ Warranty Component	HP Designjet L26100, L26500 & L28500 Latex 210, 260 & 280 Printers
	• HP 881 Latex Ink a 3M™ MCS™ Warranty Component	HP Latex 3000 Printer
(3) UV Inkjet Inks and Printers	• 3M™ Piezo Inkjet Ink Series 2200UV	EFI™ VUTEk® PV200 Printer
	• 3M™ Piezo Inkjet Ink Series 2700UV	Durst Rho 160R and 351R Printers
	• 3M™ Piezo Inkjet Ink Series 2800UV	EFI™ VUTEk® QS2000, QS3200, QS3220 and QS220 Printers
	• EFI™ VUTEk® GS 3M™ Premium UV Inks	EFI™ VUTEk® GS2000, GS3200 & GS3250 Printers, including GS Pro Series
	• EFI™ VUTEk® GSr 3M™ Premium UV Inks	EFI™ VUTEk® GS3250r and GS5000r Printers
	• EFI™ R3225 3M™ UV Ink	EFI™ R3225 UV Roll-to-Roll Printer
	• Mimaki LF-200 Ink Series*	Mimaki UJV-160, JFX-1631 & 1615R Printers
	• Mimaki UV Ink LUS-200*	Mimaki UJV500-160 Printer
	* Manufactured by 3M	

B. Screen Printing Inks for 3M™ MCS™ Warranty
- 3M™ Screen Printing Ink Series 1900, *line color and four color*
- 3M™ Screen Printing UV Ink Series 9800, *line color and four color*

C. OEM Inkjet Inks and Printers for 3M Performance Guarantee
- For the most current information, please click here: [3M Performance Guarantee Matrix](#).

D. Graphic Protection
- 3M™ Scotchcal™ Gloss Overlaminate 8518
- 3M™ Scotchcal™ Luster Overlaminate 8519
- 3M™ Scotchcal™ Matte Overlaminate 8520
- 3M™ Scotchcal™ Gloss Overlaminate 8528
- 3M™ Envision™ Gloss Wrap Overlaminate 8548G *(required for textured wall applications)*
- 3M™ Scotchcal™ Ultra Matte Overlaminate 8915
- 3M™ Screen Print Dirt Resistant Gloss Clear 1920DR
- 3M™ Screen Print Low Gloss Clear 9730UV
- 3M™ Screen Print UV Gloss Clear 9740i

E.   **Other Products**

- 3M™ Premasking Tape SCPM-3
- 3M™ Premasking Tape SCPM-44X
- 3M™ Prespacing Tape SCPS-55
- 3M™ Edge Sealer 3950
- 3M™ Edge Sealer Tape 8914
- 3M™ Vehicle Channel Applicator Tool VCAT-2
- 3M™ Roller L (larger hard roller)
- 3M™ Roller S (small hard roller)

F.   **Tools for Textured Wall Surfaces**

- 3M™ Textured Surface Applicator TSA-1
- 3M™ Textured Surface Applicator TSA-2
- 3M™ Textured Surface Applicator TSA-3
- 3M™ Textured Surface Applicator TSA-4
- Industrial heat gun with an electronic readout, capable of achieving and sustaining 1000°F (537°C). See Instruction Bulletin 5.37 for examples of suitable heat guns.
- Heat and burn resistant gloves

Note: Do not attempt to apply this film to textured wall surfaces using a standard squeegee; you will not be successful.

3.   **Characteristics**

These are typical values for **unprocessed film**; processing may change the values. Contact your 3M representative for a custom specification.

A.   **Physical Characteristics**

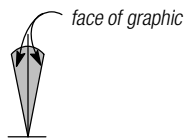| Characteristic	Value
Material	High performance non-PVC polymer
Film color	White, opaque
Thickness	**Without adhesive:** 2 mil (0.05 mm) **With adhesive:** 3-4 mil (0.08-0.10 mm)
Adhesive	Pressure-activated (slide, tack, snap up, reposition) with air release channels
Adhesive color	Gray
Film Liner	Polyethylene-coated paper
Adhesion, Typical *24 hours after application*	ABS 2-4 pounds/inch (0.36-0.72 kg/cm) Acrylic enamel 2-4 pounds/inch (0.36-0.72 kg/cm) Aluminum, anodized 5-7 pounds/inch (0.89-1.26 kg/cm) Aluminum, etched 4-6 pounds/inch (0.72-1.08 kg/cm) Fruehauf pre-painted panels 2-4 pounds/inch (0.36-0.72 kg/cm) Automotive clear coats 3-5 pounds/inch (0.54-0.89 kg/cm)
Tensile strength	11-13 pounds/inch at 73°F (1.98-2.34 kg/cm at 23°C)
Chemical resistance	• Resists mild alkalis, mild acids, and salt • Excellent resistance to water *(does not include immersion)* • Resists occasional fuel spills
Flammability	ASTM E84 report or go to the On-line Product Catalog at 3Mgraphics.com All other test reports: call 1-800-328-3908

B. Application Characteristics

Characteristic	Value
Finished graphic application recommendation	**Sign and vehicle applications:** • **Surface type:** Flat, with and without rivets, simple curves, compound curves, corrugations and deep channels • **Substrate type:** ABS resins, aluminum, chrome, glass, fiberglass reinforced plastics, paint (check adhesion to powder-coated or water-based paints), fiberglass with gel coat **Wall applications:** Indoor smooth surface walls, moderately-textured surfaces such as concrete block, brick, industrial stucco and tile, as found on flat walls and/or simple curved architectural elements such as columns. See Instruction Bulletin 5.37 for details. **Application temperature:** *(air and substrate)* • Flat without rivets: 40°-100°F (4°-38°C) • Curves or corrugations with rivets: 50°-100°F (10°-38°C) • Compound Curves and/or watercraft: 60°-90°F (16°-32°C) • Walls: 40°-100°F (4°-38°C)
Finished graphic application recommendation	**Application method:** Dry
Applied shrinkage	Less than 0.015 inches (0.4 mm)
Temperature range after application	-65°to 225°F (-60° to 107°C)
Graphic removal	**Most substrates:** Removable with heat and/or chemicals within the Warranty Period at 50°F (10°C) minimum (air and substrate) **Wall applications:** Varies with type of substrate; using heat enhances removal of film; may leave adhesive residue, may remove some surface paint or finish, may damage mortar.

4. Definitions

A. Exposure Types

U.S. Vertical Exposure

face of graphic

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

U.S. Non-vertical Exposure
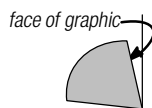
face of graphic

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. Horizontal Exposure

face of graphic

The face of the graphic is +/- 5° from horizontal.

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 Tools and Support, Warranties.

B. Graphic Construction

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

C. Graphic Protection

Overlaminate films or clear coats used to protect the graphic and/or change gloss.

D. Graphic Types

As identified in the warranty tables

Indoor Signs	Stationary graphics applied indoors and *not* exposed to the elements.
Outdoor Signs	Stationary graphics applied outdoors and exposed to the elements.
OEM	Labels and decorative graphics produced for and used by original equipment manufacturers. May also be called decals.
Vehicle	**Vehicle.** Buses, vans, passenger vehicles, delivery trucks, pickup trucks, enclosed trailers. Certain restrictions may apply as noted in the applicable Product Bulletin.

Straight Trucks. Semi-Tractors and Semi-Trailers. Straight trucks, semi-tractors and semi-trailers used for commercial business purposes. Excludes air shields.

Recreational Vehicle (RV). Vehicles used for personal pleasure, such as campers, motor homes and trailers, that are not used in connection with any commercial or business enterprise.

Watercraft. Boats intended for personal pleasure such as runabouts and speedboats having aluminum and/or smooth fiberglass/gel coat bodies, including boats used in fishing tournaments and off-shore racing boats, but not 1 to 3 person personal watercraft or other boats used in connection with commercial or business enterprise. 3M specifically excludes all other recreational vehicles from this definition.

Rail. Rail cars and lead cars of trains, light rail and subways, but not locomotives or engines.

5. Warranty Information

A. Warranty Coverage Overview

The warranty coverage for each graphic is based on the user(s) both reading and following all applicable and current 3M Product and Instruction Bulletins. 3M will honor the Warranty Period stated in the base film's Product Bulletin that is current when the film was purchased. The Warranty Period may be reduced and stipulations may apply for certain constructions and applications, as covered in this Bulletin.

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.

B. 3M Basic Product Warranty

This product is 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 and as further set forth in the 3M Commercial Graphics Warranty Brochure.

Note: When used to produce wall graphics, this film is only covered by the 3M Basic Product Warranty. See Section 7. for the Expected Performance Life (unwarranted time period) of a wall graphic and key factors that affect its performance.

C. Limited Remedy

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.

D. Limitation of Liability

Except where prohibited by law, 3M SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO PURCHASER OR USER FOR ANY DIRECT (EXCEPT FOR THE LIMITED REMEDY PROVIDED ABOVE), INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LABOR, NON-3M MATERIAL CHARGES, LOSS OF PROFITS, REVENUE, BUSINESS, OPPORTUNITY, OR GOODWILL) RESULTING FROM OR IN ANY WAY RELATED TO SELLER'S PRODUCTS, SERVICES or THIS BULLETIN. This limitation of liability applies regardless of the legal or equitable theory under which such losses or damages are sought including breach of contract, breach of warranty, negligence, strict liability, or any other legal or equitable theory.

E. Additional Limitations

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

F. 3M Performance Guarantee
Subject to Stipulations set forth in Section H., below

Graphics constructed with the 3M materials specified and in the exposure specified in the Warranty Period, Section F.(1), are eligible for the 3M Performance Guarantee. This warranty only covers the performance of the recommended 3M products used in the graphic construction when imaged with the printers and OEM inks listed in the most current version of the Performance Guarantee Matrix at 3Mgraphics.com. The Matrix may also list certain restrictions for using the film covered in this Bulletin. For warranties for other exposures, see Section H.(1).

(1) Warranty Period
for 3M Performance Guarantee in a Standard U.S. Vertical Exposure

Warranty Period for 3M Performance Guarantee, in Years

Film	Graphic Protection	Vehicle	Outdoor & Indoor Signs	Watercraft	Inks & Printers **
480Cv3	8518 8519 8520 8915	3	3	2	See the Performance Guarantee Matrix
	8528* 8548G*	4	3	2	
	1920DR 9740i	3	3	—	

* For overlaminate 8528 or 8548G horizontal warranties for vehicle graphics, see Section H.(2).

** Some of the graphic protection products and graphic types may not be approved for this film on certain printing platforms. Always refer to the Performance Guarantee Matrix.

G. 3M™ MCS™ Warranty
Subject to Stipulations set forth in Section H., below

Finished graphics constructed with the materials specified and the exposure specified in the Warranty Period, Sections G.(1), G.(2) and G.(3), are eligible for the 3M™ MCS™ Warranty. For warranties for other exposures, see Sections H.(1) and H.(2).

(1) INKJET Warranty Period
for Finished Graphics in a Standard U.S. Vertical Exposure

See Graphic Type Descriptions in Section 4.
VEH = Commercial Vehicle, Fleet Truck and Trailer, Bus, Personal Vehicles
OUT = Outdoor Signs
WATER = Watercraft Graphics
IN = Indoor Signs

INKJET Warranty Period for Finished Graphics, in Years

SOLVENT PRINTERS and INKS	SIIT ColorPainter™ H-74s, H-104s, H2-74s, H2-104s, W-54s, W-64s Printers			
	GX 3M Ink Series			
Graphic Protection	VEH	OUT	WATER	IN
8518, 8519, 8520, 8915●	7	4	2	8
8528■	7/3	4	2	8
8548G■	7/2	4	2	8
1920DR	3	3	2	5
9740i	5	4	2	8
none	—	2	—	2

■ = Overlaminate 8528 or 8548G: first number represents the vertical warranty and the second number the horizontal warranty on vehicle graphics. Please see Section H.(2).
● = Overlaminate 8915 is not approved or warranted for use with SIIT GX 3M Ink Series.

INKJET Warranty Period for Finished Graphics, in Years

LATEX PRINTERS and INKS	HP Designjet L65500; Scitex LX600, LX800, LX820, LX850; Latex 820, 850 Printers				HP Designjet L65500; Scitex LX600, LX800, LX820, LX850; Latex 820, 850 Printers				HP Designjet L26100, L26500, L28500; Latex 210, 260, 280 Printers			
	HP 3M LX600 Specialty Latex Ink				**HP LX610 Latex Ink** a 3M™ MCS™ Warranty Component				**HP 792 Latex Ink** a 3M™ MCS™ Warranty Component			
Graphic Protection	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN
8518, 8519, 8520, 8915	5	4	2	7	5	4	2	7	5	4	2	7
8528, 8548G■	5/2	4	2	7	5/2	4	2	7	5/2	4	2	7
1920DR	2	2	—	3	2	2	—	3	2	2	—	3

LATEX PRINTERS and INKS	HP Latex 3000 Printer			
	HP 881 Latex Ink a 3M™ MCS™ Warranty Component			
Graphic Protection	VEH	OUT	WATER	IN
8518, 8519, 8520, 8915	5	3	2	5
8528, 8548G■	5/2	3	2	5
1920DR	2	2	—	3

UV PRINTERS and INKS	Mimaki UJV-160, JFX-1631 & 1615R Printers				EFI™ VUTEk® PV200 Printer				Durst Rho 160R & 351R Printers			
	Ink Series LF-200 Manufactured by 3M				**3M Ink Series 2200UV**				**3M Ink Series 2700UV**			
Graphic Protection	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN
8518, 8519, 8520, 8915	7	4	2	8	7	4	2	8	7	4	2	8
8528■	7/3	4	2	8	7/3	4	2	8	7/3	4	2	8
8548G■	7/2	4	2	8	7/2	4	2	8	7/2	4	2	8
1920DR	—	—	—	—	—	—	—	—	—	—	—	—
9740i	—	—	—	—	5	4	2	8	5	4	2	8
none	—	—	—	—	—	3	—	3	—	3	—	3

UV PRINTERS and INKS	EFI™ VUTEk® QS2000, QS3200, QS3220, QS220 Printers				EFI™ VUTEk® GS5000r, GS3250r Printer				EFI™ VUTEK® GS2000, GS3200, GS3250 and GS Pro Series Printers			
	3M Ink Series 2800UV				**GSr 3M™ Premium UV Inks**				**GS 3M™ Premium UV Inks**			
Graphic Protection	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN
8518, 8519, 8520, 8915	7	4	2	8	5	4	2	8	5	4	2	8
8528■	7/3	4	2	8	5/3	4	2	8	5/3	4	2	8
8548G■	7/2	4	2	8	5/2	4	2	8	5/2	4	2	8
1920DR	—	—	—	—	3	2	—	5	3	2	—	5
9740i	5	4	2	8	5	3	2	8	5	3	2	8
none	—	3	—	3	—	2	—	3	—	2	—	3

■ = Overlaminate 8528 or 8548G: first number represents the vertical warranty and the second number the horizontal warranty on vehicle graphics. Please see Section H.(2).

INKJET Warranty Period for Finished Graphics, in Years

UV PRINTERS and INKS	EFI™ R3225 UV Roll-to-Roll Printer				Mimaki UJV500-160 Printer			
	R3225 3M™ UV Inks				Mimaki UV Ink LUS-200 Manufactured by 3M			
Graphic Protection	VEH	OUT	WATER	IN	VEH	OUT	WATER	IN
8518, 8519, 8520, 8915	5	4	2	8	5	4	2	8
8528■	5/3	4	2	8	5/3	4	2	8
8548G■	5/2	4	2	8	5/2	4	2	8
1920DR	3	2	—	5	3	2	—	5
9740i	5	3	2	8	5	3	2	8
none	—	2	—	3	—	—	—	—

■ = Overlaminate 8528 or 8548G: first number represents the vertical warranty and the second number the horizontal warranty on vehicle graphics. Please see Section H.(2).

(2) SCREEN PRINT Warranty Period for Finished Graphics in a Standard U.S. Vertical Exposure

See Graphic Type Descriptions in Section 4.
VEH = Commercial Vehicle, Fleet Truck and Trailer, Bus, Personal Vehicles
OUT = Outdoor Signs
IN = Indoor Signs
RAIL = Railcars and Lead Cars
OEM = OEM Graphics

SCREEN PRINT Warranty Period for Finished Graphics, in Years

Graphic Protection	SOLVENT Ink Series 1900				UV Ink Series 9800				UV Ink Series 9800 Metallic			
	VEH	RAIL	IN OUT	OEM	VEH	RAIL	IN OUT	OEM	VEH	RAIL	IN OUT	OEM
1920DR, air dry	5	5 ◆	5	5	—	—	—	—	—	—	—	—
1920DR, oven dry	6 ■	6 ◆■	5 ■	5 ■	—	—	—	—	—	—	—	—
1930	2	2 ◆	2	2	—	—	—	—	—	—	—	—
9730UV	3	3 ◆	3	3	3	3 ◆	3	3	—	—	—	—
9740i	6	6 ◆	5	5	7	7 ◆	5	5	5	—	5	5
9800CL	—	—	—	—	5	5 ◆	5	5	5	—	5	5
None	—	—	—	—	—	—	2	—	—	—	—	—

◆ = Warranty for vertical railroad applications when printed with line color inks only.
■ = Warranty requires oven drying the last color of ink series 1900 and screen print 1920DR for 2 hours at 150ºF (65ºC).

(3) Paint Refurbishing Reimbursement Remedy

a. For Commercial and Recreational Vehicles

This Policy applies to commercial vehicles (e.g., automobiles, vans, buses) and recreational vehicles only, and specifically does not include Personal Vehicles or Watercraft. Refer to Instruction Bulletin 5.36 for complete details.

- A *Pre-Installation and Inspection Report* (in Bulletin 5.36) must be completed *prior to graphic installation* and submitted with any claim for paint damage sustained during the removal of 3M removable or changeable graphic film from vehicles.
- A separate report for each vehicle involved in a claim is required.

b. For Watercraft

This applies to Watercraft only and specifically does not include any other type of vehicle. Refer to Instruction Bulletin 5.42 for complete details.

- A *Pre-Installation and Inspection Report* (in Instruction Bulletin 5.42) must be completed *prior to graphic installation* and submitted with any claim.
- A separate report for each watercraft involved in a claim is required.
- Graphics must be applied above the static water line.
- Graphics must be cut at seams and all edges and seams and edges must be sealed.

H. General Warranty Stipulations for 3M™ MCS™ Warranty and 3M Performance Guarantee

These stipulations apply to both the 3M™ MCS™ Warranty and 3M Performance Guarantee. General provisions for these stipulations are covered in the 3M Warranty Brochure at 3Mgraphics.com.

(1) Reduced Warranty Exposures for Other Graphic Exposures

For each graphic exposure shown below, multiply the Warranty Period (in years) in the applicable warranty, Sections F.(1), G.(1), G.(2) and G.(3) for your graphic construction by the percentage shown for the intended graphic exposure. This is the reduced warranty.

If the Graphic Exposure is:	Use this Percentage of U.S. Vertical Exposure Warranty Period:	Calculation Examples
U.S. Non-vertical	50% (0.5)	0.5 x 5 years = 2.5 years 0.5 x 3 years = 1.5 years
Desert Southwest Vertical	70% (0.7)	0.7 x 5 years = 3.5 years 0.7 x 3 years = 2.1 years
Desert Southwest Non-vertical	35% (0.35)	0.35 x 5 years = 1.75 years 0.35 x 3 years = 1.05 years
Horizontal	0%	0

(2) Overlaminate 8528 or 8548G ONLY Horizontal Warranty

Printed film as specified in this bulletin for vehicle graphics with following overlaminate:

3M™ MCS™ Warranty
Overlaminate 8528 using solvent or UV inks: U.S. = 3 years; Desert S.W. = 2.1 years
Overlaminate 8528 using latex inks or 8548G: U.S. = 2 years; Desert S.W. = 1.4 years

3M Performance Guarantee
Overlaminate 8528 or 8548G: U.S. = 2 years; Desert S.W. = 1.4 years

(3) Removal Warranty with Heat or Chemicals

a. For 3M™ MCS™ Warranty and 3M Performance Guarantee Only

Within the stated Warranty Period, if this film cannot be removed with heat and/or chemicals, or if more than 30% of the adhesive residue remains on the substrate, 3M will reimburse a reasonable portion of extra removal costs.

b. Removal Warranty Exceptions

The following exceptions are not covered by the Removal Warranty.

- Substrate damage due to:
    - removing film from a pre-existing graphic
    - removing film that was applied to painted wallboard or any unapproved substrate
    - removing film from paint that is not firmly bonded to the substrate

- No guarantee is made for:
    - ease or speed of removal of any graphic
    - removal from paint that is improperly cured
    - removal from aged paint or metals, surface oxidation or chalking; user must test, approve and accept liability for such applications
    - removal from horizontally-exposed outdoor applications (except graphics using overlaminate 8528 or 8548G as described in this Bulletin)

(4) Abrasion and Loss of Gloss

Abrasion damage and loss of gloss are not covered by any 3M warranty. This is considered normal wear and tear. However, to help maintain the appearance of your graphic, use the recommended graphic protection whenever:

- it is required for the construction and end use as shown in the Warranty Period tables.
- the graphic, **including printed vehicle or watercraft graphics**, is exposed to abrasive conditions, harsh cleaners or chemicals.

(5) Application to Rooftops

Graphics constructions using film 480Cv3 with overlaminate 8548G are not warranted for application to rooftops on straight trucks, semi-tractors and semi-trailers.

(6) Application Outside the U.S.

Contact the 3M organization for that country.

(7) Application to Glass

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

(8) Graphics Made with Components Not Sold or Recommended by 3M

The **3M™ MCS™ Warranty** does not, under any circumstances, cover graphics made with inks, film, graphic protection and/or application tapes that are not sold or recommended by 3M.

The **3M Performance Guarantee** does not, under any circumstances, cover OEM inks, even those approved by 3M for this program, or any type of 3M product failure that results from their use.

The user is solely responsible for the graphic appearance, performance and durability of graphic constructions that include any non recommended or qualified products.

6. Factors that Affect Graphic Performance Life

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

- Correct combination of 3M-recommended graphics products
- Adequate ink drying or curing
- Selection and preparation of the substrate
- Surface texture
- Application methods
- Angle and direction of sun exposure
- Environmental conditions
- Cleaning or maintenance methods

Note: See Section 7.B. for specific factors that affect the performance of wall graphics.

7. Wall Graphic Performance

To ensure that this film meets your specific needs for producing wall graphics, 3M recommends that graphic manufacturers test this film for satisfactory printing, cutting, adhesion and removal characteristics for the intended end uses. This information does not imply a Warranty Period.

A. Expected Performance Life

- **Indoor:** greater than 2 years in most applications
- **Outdoor:** 3-6 months when not used in the freezing and thawing cycles described below; graphics perform much longer in dry, temperate environments

B. Factors that Influence Performance Life

- **Installation techniques.** Improper installation techniques result in edge curling, lifting and/or poor adhesion.
- **Adhesion for outdoor graphics.** When testing film adhesion, the film is unlikely to be durable in outdoor applications if it can be easily removed from a textured surface (using a force of <2 pound/lineal inch (0.36 kg/cm)).
- **Outdoor graphics exposed to water from rain or irrigation systems.** Water can be trapped behind graphics applied outdoors, leading to lifting as well as the creation of mold.
- **Surface temperature.** Textured substrates that reach temperatures in excess of 135°F (57°C) may exhibit lifting, especially in mortar joints.
- **Texture variation.** More than 1/8 inch (3 mm) variation in high and low spots of substrate texture and mortar joints, as well as square cut or undercut mortar joints, may exhibit lifting.
- **Freezing and thawing cycles.** For a textured masonry wall that has both an indoor facing side and an outdoor facing side and no effective moisture barrier, moisture vapor transmission occurs naturally when the indoor surface has a room environment that is warmer and moister than the outdoor surface. When a graphic is applied to the outdoor wall and there are cycles of outdoor freezing and thawing, moisture can be trapped between the wall and result in graphic lifting, as well as in spalling both within the wall and on the outdoor facing wall. Such damage can be unsightly and costly to repair.
- **Removal.** Unsound substrates, paint, texture-finished wallboard and textured wallpaper may be damaged upon graphic removal.

8. Graphics Manufacturing

⚠ **CAUTION**

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

A. Inkjet Printing

(1) Ink

Always read and follow the ink manufacturer's written instructions on usage.

(2) Total Ink Coverage

The maximum recommended total ink coverage for this film is:

- **270%** when printed with all approved 3M and OEM inkjet inks

Do not exceed the recommended total ink coverage for the ink series used on this film. Too high of a total physical ink amount on the film results in media characteristic changes, incomplete drying, overlaminate lifting, and/or poor graphic performance. For additional details about total ink coverage, refer to the Product & Instruction Bulletins for 3M inks or the Performance Guarantee Matrix for OEM inks.

(3) Completely Dry Graphics

Important Note! Incomplete drying can result in graphic failure including curling, increased shrinkage and adhesion failure, which are not covered under warranty.

Always build enough time into your process to ensure complete drying of the graphic. Poorly dried film may become soft and stretchy, and the adhesive may become too aggressive. This can cause difficulty when applying an overlaminate, rolling or applying the graphic. See the ink's Instruction Bulletin for more details.

(4) Printing on Sheeted Film 3M does not recommend inkjet printing on sheeted film because material handling can contaminate the film's surface and affect print quality.

B. Cutting The following are common cutting methods for this film. See Instruction Bulletin 4.1 for details.

(1) Cutting Methods

- Bandsawing
- Hot kiss cutting
- Hot and cold steel-rule die cutting
- Drum-type electronic cutting
- Flat-bed electronic cutting
- Guillotine
- Hand cut

(2) Size of Cut Text These values are based on upper case Helvetica medium type. Weeding can be more difficult with smaller text.

- **Minimum stroke width:** 0.25 inch (6.35 mm)
- **Minimum height:** 3.0 inch (76.2 mm)
- **Minimum radius for end of stripe:** 0.125 inch (3.18 mm)

C. Graphic Protection Graphic protection may improve the appearance, performance and durability of the graphic.

- Overlaminates must be cold or hot roll applied. When overlaminating UV piezo inkjet printed graphics, 3M recommends using hot roll lamination to help minimize a silvered graphic appearance caused by bubbles being trapped within the valleys of a graphic. See Instruction Bulletin 4.22 for details.
- For textured wall applications, film 480Cv3 must be protected with overlaminate 8548G.

D. Application Tapes

(1) When to Use Premasking Tape

- Use as an application aid to increase stiffness, and prevent stretching and damage during application.
- Use when little or no liner is exposed.

(2) When to Use Prespacing Tape

- Use to hold cut and weeded letters or graphics in registration after removing the film liner.
- Use to protect cut graphic parts from scratching or damage during application.
- Use when large amounts of liner are exposed.

Note: Prespacing tape does not adhere to the exposed liner of film but it does adhere to the top of the film. Therefore, prespacing tape may still be useful when applying large graphics—even large cut graphics—with some smaller cut and weeded graphics to hold the elements in alignment. Use film IJ180 or IJ180C for more intricately cut and weeded graphics.

(3) How to Select an Application Tape

Determine whether you want to premask the graphic or prespace cut pieces of film such as letters. Then locate the graphic protection used on your graphic in the table below, and use the corresponding tape. See Instruction Bulletin 4.3 for complete details.

EXAMPLE: To premask a film includes overlaminate 8519, use premasking tape SCPM-3. To prespace a film that includes 1920DR, use prespacing tape SCPS-55.

Select the tape based on what is on top of the graphic

Tape	None	8519 8520 8915	1920DR	9730UV 9740i 9800CL	8518 8528 8548G
Premasking SCPM-3	■	■	■	—	—
Premasking SCPM-44X	—	—	—	■	—
Prespacing SCPS-55	■	■	■	■	—

— = Use of an application tape is not recommended in this construction.

9. Application and Installation

Install the film using the dry application method.

Refer to the **3M Related Literature** section, located at the end of this bulletin, for a list of the Instruction Bulletins that may be needed to apply or install this film.

A. Pressure-activated Adhesive

- The pressure-activated adhesive on this film offers:
    - smooth sliding into position on a substrate;
    - fast finger tacking to check position; and
    - easy snap up and repositioning when you need it.
- The **snap up and reposition feature is lost:**
    - when firm pressure with a squeegee or other application tool is applied.
    - at application temperatures above 100°F (38°C) even if only light finger pressure was used for tacking.
    - if any part of the film is removed from the original liner and reapplied to the same or another liner.
    - solvent from inkjet ink has not completely dried or cured, which affects both slide-ability and snap up.

B. Working with Air Release Channels

Air release channels are a characteristic of films with Comply adhesive. Films designated as Cv3 offer the ultimate in invisible air release channels.

- The channels will be damaged and effective air removal affected if you remove and attempt to change liners or reapply the same liner.
- For the best results, always work from the center out to the edges of the graphic to allow trapped air to exit through the air release channels. If the channels are closed off by firm pressure and air is trapped, use an air release tool to aid in removing air bubbles. See Instruction Bulletin 5.4 for details.

Video ▶ See how 3M's Comply adhesive technology works.

C. Stretching the Film

When this film is printed with solvent, eco-solvent or latex based inks and use overlaminates 8518, 8519, 8520, 8528 or 8915, graphics can be stretched up to 130% (for example, a 10 inch piece of film can stretch to 13 inches) without using primer or making relief cuts. When these films are printed with solvent, eco-solvent or latex based inks and use overlaminate 8548G, graphics can be stretched up to 150% (for example, a 10 inch piece of film can stretch to 15 inches) without using primer or making relief cuts.

When stretching at higher levels, primer and/or relief cuts are required. See Instruction Bulletin 5.36 for complete details.

D. Heating the Film

Because film 480Cv3 requires less heat to make the film conformable, 3M recommends using a heat gun instead of a torch to provide better control and distribution of heat on the film.

Note: This film may be heated with a torch provided the installer is highly skilled and understands the properties of this material.

(1) Graphics Printed with UV Inkjet Inks are Heat Sensitive

UV inkjet inks will crack if too much heat is used during graphic application, **especially when the film is stretched** into complex curves, deep contours, around rivets and textured walls. This will limit the amount of stretching you can do when applying this film. When using a heat gun or other heat source during application, make sure the film surface temperature does not exceed 212°F (100°C).

Using additional heat in the post-application process may also cause UV inkjet ink to crack.

For the best results, **always do a test application** of a UV printed graphic to determine how much heat can be used without damaging the image. Also see Instruction Bulletin 5.36.

E. 3M™ Tape Primer 94

Although this product does not require the use of Primer 94, it is good practice to use this primer to maximize adhesion on any area where the film will be stretched or stressed.

F. Application to Vehicles

Read and follow all instructions, and complete the *3M Automobiles, Vans and Buses Pre-installation Inspection Record* in Instruction Bulletin 5.36 **prior to** manufacturing or applying any graphic to a standard vehicle, van or bus.

G. Application to Walls

See Instruction Bulletin 5.37 for detailed instructions on how to apply graphic film to smooth and textured wall surfaces and to complete the Pre-installation Worksheet and Customer Checklist prior to apply wall graphics to ensure a successful application.

Video ▶

Watch a rough wall installation and also visit the 3M Graphics Video Library to see other videos about techniques for installing wall graphics.

(1) Tips for Successful Textured Wall Applications

On textured surfaces, the film and adhesive must conform to irregular high and low spots, which often includes mortar joints. This film is designed to be effective on many of the most common moderate textures found in public stadiums, arenas and similar environments. However, due to the wide variation in substrate texture, you should verify that the film and 3M techniques described in this Bulletin and Instruction Bulletin 5.37 are suitable for each of your applications.

- Use an installer trained in 3M's techniques and with access to the required 3M tools.
- Test each different textured surface you are considering at each location. See the instructions in the following section.
- Use a 3 inch (76 mm) per second rate of speed for application. (Typically, this is 1 inch (25 mm) per second faster than most wall films.)
- Film is more susceptible to lifting from deep or undercut mortar joints than shallow ones (about 1/8" (3 mm) deep). Instruction Bulletin 5.37 discusses the various types of mortar joints.
- In most cases, minor lifting does not detract from the impact of your customer's message, nor from the overall durability of the graphic. Edge lifting, which is usually most noticeable at mortar joints, may be susceptible to picking and tearing if the graphic is at pedestrian level and within reach.
- Avoid extremes in temperatures.
  - Freeze/thaw cycles that trap moisture behind graphics can cause lifting.
  - Water may accumulate behind graphics applied to unsealed substrates, resulting in water bubbles that cause lifting.
  - Intense direct sunlight may cause lifting.

H. Application to Other Substrates

3M offers several detailed Instruction Bulletins to help you achieve a successful graphic installation. Please see **3M Related Literature**.

10. Maintenance and Cleaning

Use a cleaner designed for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents, and have a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline.)

11. Removal

- **For most substrates:** removal requires heat and/or chemicals. The ease and rate of removal depends on a number of factors. See Instruction Bulletin 6.5 for details. Follow the procedures for using 3M™ Film Remover R-221 and 3M™ Adhesive Remover R-231 and for additional removal details.
- **For wall applications:** removal varies by the type of substrate. Using heat may ease the removal.

12. Shelf Life, Storage and Shipping

A. Shelf Life

Total shelf life: 3 years from the date of manufacture on the original box.
If you do process the film, do so within 2 years and apply within 1 year.
If you do not process the film, apply it within 3 years.

B. Storage Conditions

- 40° to 100°F (4° to 38°C)
- Out of sunlight
- Clean dry area
- Original container
- Bring the film to print room temperature before using

C. Shipping Finished Graphics

Flat, or rolled printed side out on 6 inch (15 cm) or larger core. This helps prevent the application tape, if used, from popping off.

13. 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.

⚠ **CAUTION**

Be aware that graphics installed outdoors can develop mold or mildew on top of or behind the graphic, which may be a health concern for some individuals, especially during graphic removal.

14. 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 following applicable Bulletins provide information and processes you need to properly make the graphics described in this Bulletin. 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.
3M™ Piezo Inkjet Ink Series 2200UV	PB-IB	2200UV
3M™ Piezo Inkjet Ink Series 2700UV	PB-IB	2700UV
3M™ Piezo Inkjet Ink Series 2800UV	PB-IB	2800UV
EFI™ VUTEk® GS 3M™ Premium UV Inks	PB-IB	GS
EFI™ VUTEk® GSr 3M™ Premium UV Inks	PB-IB	GSr
EFI™ R3225 3M™ UV Ink	PB-IB	R3225
SIIT GX 3M Ink Series	PB-IB	GX
Mimaki Ink Series LF-200, manufactured by 3M	PB-IB	LF-200
Mimaki UV Ink LUS-200, manufactured by 3M	PB-IB	LUS-200
HP 3M LX600 Specialty Latex Ink	PB-IB	LX600
HP LX610 Latex Ink, a 3M™ MCS™ Warranty Component	PB-IB	LX610
HP 792 Latex Ink, a 3M™ MCS™ Warranty Component	PB-IB	792
HP 881 Latex Ink, a 3M™ MCS™ Warranty Component	PB-IB	881
3M™ Screen Printing Ink Series 1900 and Clear 1920DR - Screen printing with ink series 1900- line color - Screen printing with ink series 1900- 4 color	PB IB IB	1900 3.12 3.11
3M™ Screen Printing UV Ink Series 9800 - Screen printing with UV ink series 9800 - line color - Screen printing with UV ink series 9800 - 4-color	PB IB IB	9800 3.20 3.21
3M™ Screen Print UV Gloss Clear 9740i, Low Gloss Clear 9730UV	PB-IB	UV Clears
3M Graphic Protection Products *overview of all graphic protection products and specific information on most overlaminates*	PB	GP-1
3M™ Edge Sealer 3950	PB	3950

3M Related Literature, continued…

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

Subject	Type	Bulletin No.
Application, substrate selection, preparation, substrate-specific techniques	IB	5.1
3M™ Vehicle Channel Applicator Tools	PB-IB	V-Tools
Scoring and cutting	IB	4.1
Hot and cold roll lamination	IB	4.22
Using 3M application tapes; premasking and prespacing for films	IB	4.3
Application, special considerations for automobiles, vans and buses and inspection forms	IB	5.36
A guide to understanding and applying graphics to common indoor and out-door wall surfaces	IB	5.37
Application, special applications and vehicles	IB	5.4
Application, special considerations for watercraft	IB	5.42
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Storage, handling, maintenance, removal	IB	6.5
3M Commercial Graphics Warranty Brochure	go to www.3Mgraphics.com	

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15. Bulletin Change Summary

Modified and new content is marked with a black bar in the margin. Added HP 881 Latex Ink and Mimaki UV Ink LUS-200 as compatible inks. Overlaminate 8528 now is a compatible overlaminate with a 3-year horizontal warranty for UV and solvent inks. Increased Warranty Periods for HP LX610 and 792 Inks and correct Warranty Periods for outdoor signs with overlaminate 8548G using GSr and GS UV Inks. Added the new HP Latex printer product names; HP renamed the Scitex LX820 and LX850 to HP Latex 820 and 850 Printers and HP Designjet L26100, L26500 and L28500 to Latex 210, 260 and 280 Printers.

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