Storage, Handling, Maintenance and Removal of Films and Sheetings

Instruction Bulletin

Overview

This bulletin gives you basic procedures for storing, handling, maintaining, and removing films sold by 3M Commercial Solutions Division. These procedures help maximize the life of the graphic.

Refer also to the Product Bulletins for each product in your graphic construction for specific details that may influence the information in this Bulletin.

Definitions

Substrate The material to which a graphic is applied, such as painted metal or wallboard.

Surface The typography or physical characteristics of the substrate, such as flat, textured or corrugated.

Film Refers to both film and sheeting.

Health and Safety

When handling any chemical products, follow the container labels and the Material Data Safety Sheets for health, safety and environmental information.

Storage

These values are typical. Refer to your film's Product Bulletin for specific information.

General

- Clean dry area.
- Away from direct sunlight, excessive atmospheric moisture or humidity.
- Ambient temperatures less than 40 °C and a relative humidity less than 80 %.
- Store cut sheets lying flat.
- Do not stack cut sheets face-to-face.
- Do not apply pressure to stacks of cut sheets.
- Wrap stacks of cut sheets with polyethylene film and seal with tape to prevent moisture absorption by the liner, which can cause the sheets to curl or ripple.

Unapplied Graphics

- Apply graphics to a substrate within the time period specified in the Product Bulletin of the product(s) you are using.

Rolls

- Store horizontally in the shipping carton, with the end caps in place, and covered with the original plastic
- Rolls that have been removed from the carton can be suspended horizontally from a rod or pipe placed through the core.

Fabricated Sheets: Most Screen Printed

- Store and ship sheets lying flat or rolled onto a core.
  - For rolling screen printed graphics, use a core with a diameter of 130 mm (5 inch).
  - Wrap the graphic onto the core, graphics-side out. This helps prevent graphics or premask tape from popping off the liner.
- The final color and/or overprint clear must be completely dry before packaging.

Scotchlite Films 680CR or IJ680CR (all variations)

When 3M™ Scotchlite™ Reflective Graphic Films 680CR or IJ680CR are used for cut graphics and 3M™ Prespacing Tape SCPS-55 is applied, store and ship graphics lying flat, only.

Applied Graphics: On Panels, Sheet Metal, Plastic Sheet, etc.

- Large graphics should also be padded to reduce the risk of damage.
- Store applied panels on edge.
- Avoid banding, crating or stacking, and corrugated cardboard dividers, all of which put severe pressure on applied graphics.
- Store indoors and keep dry until ready to use. If the packaged graphics become wet, remove the slip sheeting and padding immediately, lay the graphics flat, and allow to dry. Repackage using new, dry materials.

Handling

Applied graphics must be handled carefully during shipment and installation to prevent damage to the face of the graphic.

Remove Premask Tape Before Exposing Graphic to Sunlight

Always remove any premask or application tape from the graphic immediately after application. Premask tape left on the graphic after application can quickly and permanently adhere to the graphic when exposed to sunlight.

Temporarily Covering Installed Graphics

If it is necessary to temporarily cover installed graphics, which is sometimes called “bagging", use caution to avoid damaging the graphics.

- You may use:
  - Porous cloth covers that are folded over the graphic edges and secured to the back of the graphic work well for one-sided graphics.
  - If porous cloth covers are used for two-sided graphics, secure the cloths to one another, not to the graphic.
- Avoid using:
  - Any type of tape, which can quickly and permanently bond to the graphic.
  - Paper or plastic covers, due to possible plasticizer migration.
  - Ropes or wire fasteners, which may abrade the graphic.

Maintenance

Graphics with a Screen Print Clear or Overlaminate

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.)

Digitally-Printed Graphics with a Clear Coat

Use a wet, non-abrasive solution that contains NO solvents and NO alcohol and has a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline.)

Power Washing Graphics

Power washing, or pressure washing, may be used. However, aggressive washing can damage the graphic.

Excessive pressure during power washing can damage the graphic by forcing water underneath the graphic. Water lessens the adhesion of the graphic to the substrate allowing the graphic to lift or curl. These problems are magnified by wind. This is a critical problem for perforated window graphic film.

To avoid edge lifting or other damage to the graphics, follow these important steps:

- Use a spray nozzle with a 40 degree wide spray pattern.
- Be sure the spray nozzle includes a nozzle protector (tip guard).
- Use a maximum pressure of 140 bar.
- If the system is heated, limit the water temperature to 80 °C or less.
- Hold nozzle at least 300 mm away from and perpendicular (90 degrees +/- 10) to the graphic.
- Do not direct the water stream at a sharp angle to the edge of the graphic.

Note

Loose graphics could tear away from a moving vehicle or from a building and cause an obstruction to motorists and pedestrians. After washing, check all the graphics carefully for edge lifting and repair, remove or replace damaged graphics.

Automatic Brush Washing

Automatic brush washing may be used, but keep these two points in mind:

- Brushes can catch a loose edge of the graphic and cause further damage to the graphic.
- Brushes can dull the finish of the graphic.

Hand Washing Exterior Graphics

1. Flush the graphic with clean water to remove loose dirt particles. A trigger-type hose nozzle is convenient for this purpose.
2. Use a mild liquid detergent and water solution and wash the graphic with a soft brush, rag or sponge
   - Wash thoroughly from the top down.
   - Avoid abrading the graphic by unnecessary scrubbing.
   - After applying the cleaning solution, keep a steady stream of water flowing on the graphic to wash away dirt particles.
3. Rinse the entire graphic thoroughly with clean water. Allow to dry naturally.

Hand Washing Interior Graphics

1. Use a mild liquid detergent and water solution and wash the graphic with a soft brush, rag, or sponge.
   - Wash thoroughly from the top down.
   - Avoid abrading the graphic by unnecessary scrubbing.
2. Wipe the graphic with a water-soaked brush, rag or sponge to wash away the detergent and dirt.
3. Dry the graphic with clean toweling.
4. Refer to Removing Difficult Contaminants, above, if necessary.

Caring for Matte, Textured or Other Unique Film Finishes

Special care must be taken to avoid abrading or scratching the film. Scratching and abrasion marks may be visible and you may not be able to work them out of the unique finish of the film. To help avoid such damage, avoid using harsh chemicals, brushes or hard scrubbing when cleaning your vehicle, and avoid parking near shrubs and trees or any other items that could scratch the film.

Clean as directed above. Rinse thoroughly after cleaning and dry with a clean, soft cloth or soft rubber squeegee to avoid water spots.

Do not apply waxes, polishes, paint or clear coat over these films.

If there is wax and wax residue on the film, remove with an all-purpose cleaner. To help restore the finish of the film, clean it with isopropyl alcohol and water (2:1 ratio).

Removing Difficult Contaminants

Some contaminants may remain after following the normal cleaning procedures. Most contaminants can be removed using one of these methods. Other cleaning products and methods should be used only on a customer test-and-approve basis.

1. To remove tar, oil, diesel smut or bituminous material:
   - Wipe with 3M™ Citrus Base Cleaner. Do not use other solvents.
2. To remove pollen and fungus:
   - Wash the graphic with a liquid detergent and water, and clean it with isopropyl alcohol and water (2:1 ratio)
   - Rinse with clean water immediately.
3. To remove crayon, lipstick, or similar materials:
   - Select an appropriate solvent and test it in an inconspicuous area to ensure it removes the contaminant without damaging the graphic. This must be done on a customer test and approve basis.
   - Wash immediately with mild liquid detergent and water, then rinse with clean water.

Graphic Repair

Sometimes graphic damage can be repaired; however, repaired graphics are not warranted. These procedures are for information only.

Damage to Face of Graphic

1. Trim and clean loose areas of film before patching.
2. Use a film with pressure-sensitive adhesive, if possible. The color or gloss of the new film will vary slightly due to weathering of the original material.
3. Cut the patches so they overlap all sides of the damaged area by at least 6 mm.
4. Position the patch over the damaged area.
5. Hold the patch in place at the top with a strip of Scotch™ Masking Tape.
6. Remove the film's liner.
7. Squeegee the film firmly into place using a plastic applicator.
8. Use a heat gun to heat all edges of the patch, and then re-squeegee all edges.

Edge Damage

Trim loose edges back to the point where the adhesive is firmly adhered to the substrate.

Apply edge sealing, if desired. Edge sealant may help prevent further damage if the lifting is caused by aggressive washing conditions. Refer to the film Product Bulletin for the appropriate edge sealer.

Removal Factors

The terms removable and permanent simply indicate how easy or difficult it is to remove the film from smooth, flat surfaces, and how much adhesive might remain on the substrate.

For the best results, removable films should be removed within the time period specified in the film's Product Bulletin. Permanent films can be removed with varying degrees of difficulty and success at almost any time. Results will vary when removing any graphic from non-flat, non-smooth surfaces.

Warranted removal rates for fleet applications as part of the 3M™ MCS™ Warranty depend upon: (A) substrates that were in good condition at the time of the application, (B) use of 3M's recommended removal methods: and, (C) notification to 3M no later than five business days after the attempted removal so that 3M may assist in or verify the removal method.

The ease with which a graphic can be removed depends on nine primary factors, listed below. Any one of these factors can significantly affect the speed and ease of removal. Different combinations of factors cause different results. For example, if one of two identical graphics is exposed to more UV light than the other over the same period of time, the graphic exposed to the most UV light may be more difficult to remove.

It is important to understand and assess each of these factors before estimating the time, labor and related costs for removal.

Adhesive Types

There are two categories of adhesive: removable and permanent. The descriptions assume the film is applied to a recommended and properly prepared sound substrate with a smooth surface. Any other substrate may give other results. Whether a film is removable is largely, but not exclusively, a function of the adhesive.

- Permanent films are not designed to be removed. In some cases they can be removed, but with difficulty and may leave adhesive residue.

Type of Substrate and Surface

- The type of substrate and surface to which a particular film is applied can affect both the initial adhesion and ultimate adhesion.
- Graphics applied to a flat surface are the easiest to remove. Surfaces with rivets are more difficult, and corrugated surfaces are usually even more difficult.
- Some substrates are not designed to have graphics removed and removal may damage the substrate. These substrates include unpainted wallboard and some flexible materials.
- Removal is not warranted from substrates that have coatings such as anti-reflection and scratch resistance, which may be damaged by film removal.

Temperature

Film becomes brittle in cold weather, causing it to break into small pieces during removal. Do not remove film when the temperature (air and substrate) is less than 16 °C. Generally, the higher the temperature, the better the results. Applying heat will help with most removals, but use care not to damage the substrate with excessive heat.

Condition of the Substrate at Application

Removing graphics from substrates that were not in good condition at the time of application may result in substrate damage. We recommend discussing any concerns with your customer if you suspect that damage will result.

- Slightly oxidized (not chalked), painted substrates actually develop a much higher adhesion than newly painted substrates. Graphic removal may require more effort and is not covered by the fleet applications removal rate warranty.
- However, highly oxidized substrates, such as chalked paint, have poor adhesion and graphics may remove more easily.
- Painted substrates must be dried or cured for 7 days per the paint manufacturer's recommendations. Graphics that were applied to freshly painted substrates, before the paint had sufficient time to cure, make removal difficult. This is not covered by the application's removal rate warranty. Substrate damage may also occur.

Type and Amount of Ink

The type and amount of ink used affects the elongation and tear characteristics of printed film. UV-cured inks tend to be harder and more durable than solvent inks. Thicker and/or more durable inks stretch less so that graphics tear more easily during removal.

Type of Overlaminate or Clear

Adding an overlaminate or clear (an ink) further affects the elongation and tear characteristics of a graphic. An overlaminated film is thicker and may be easier to remove.

Age of the Graphic

Older graphics become brittle and their adhesion to the substrate increases with time. Both of these conditions make removal more difficult.

Outdoor Exposure

Exposure to higher temperatures and UV light (sunlight) affects removal. Prolonged exposure to these elements can make the film brittle, changing its tensile strength. This film may tear and break easily, making removal very slow and tedious.

Cut, Torn and Damaged Film

Film tears along any cuts or damage so it tends to pull off in small pieces rather than large ones. This makes removal very slow and tedious.

Removal Methods for Removable Films

Before starting to remove a graphic, read About Angle of Pull-off and Speed of Removal and About Using Heat Sources. These sections apply to all removal methods.

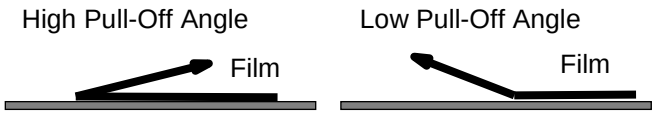
If you do not know the characteristics and history of the graphic, try the simplest removal techniques first. The techniques are listed in order from easiest (1) to most difficult (4), starting on page 6.

About Angle of Pull-off and Speed of Removal

The angle at which you pull off film is important. It depends on the film and may affect the amount of adhesive residue that remains on the substrate. Removable films usually require a high angle, such as pulling the film back onto itself. A low angle is recommend for 3M™ Scotchcal™ Perforated Window Graphic Films and removable 3M™ Scotchlite™ Reflective Films and Sheetings. Sometimes the pull-off angle affects the amount of adhesive residue. Experiment with the angle until you get the best removal results. See FIGURE 1.

The speed, or rate, at which you pull off the graphic can affect how much adhesive residue remains on the substrate. Some films can be pulled off quickly, or “snapped" off. Brittle films can sometimes be peeled off slowly.

FIGURE 1
Angle of Pull-Off



About Using Heat Sources

Always provide adequate ventilation to remove emissions that may result from the use of heat. Failure to provide adequate ventilation can result in operator exposure.

Heating a graphic eases removal of almost any film, even films that can typically be removed without aids. Heat softens the adhesive, reducing the pull-off force needed. However, film printed with some UV inks become brittle when using heat unless moisture is also used.

The applicator/remover must determine the appropriate tools, techniques and safety precautions for each situation. For most situations, use a heat source that can raise the applied graphic temperature from 50 °C to 70 °C can be used. Exposure to the sun may be sufficient. Other sources include heat lamps, hot water, industrial heat guns, steamers, hand torches and weed burners. Preferably use an IR-heater to warm longer areas.

Use care not to scorch, burn or otherwise damage the film or substrate when using heat.

Heat Sources on Window Graphics

For glass, heat is not required if the glass window panels are warmer than 16 °C.

Glass Breakage Important Note!

3M is not responsible for glass breakage due to the application or removal of film, or damage caused to a substrate due to incorrect removal techniques.

Unaided Film Removal

Removable films can be removed without any aids within the time period specified in the film's Product Bulletin.

- Use a razor, knife or air release tool to lift up a corner of the graphic.
- Pull the graphic from the substrate.
- If the removal is done in cooler temperatures, heating the graphic and/or cutting it into 300 to 400 mm wide strips makes removal even easier. Be careful not to damage the substrate.

Heat-aided Film Removal

Removable films usually come off with just the aid of heat within the time period specified in the film's Product Bulletin.

Note: Some substrates are heat sensitive. Composites bonded together with foam or adhesive may separate when heat is applied. Before using heat, check to make sure that heat will not damage the substrate.

- Review the section, About Using Heat Sources, page 8.
- Use a razor, knife or air release tool to lift up a corner of the graphic.
- Pull the graphic from the substrate. Removable films usually require a low pull-off angle. Some films can be “snapped" off in sections.
- Score the graphic into 300 to 400 mm wide strips to make removal easier. Be careful not to damage the substrate

Chemically-aided Film Removal

Chemical aids may be needed for removable films if the film cannot be removed with heat alone. This may occur when the graphic has been exposed to excessive environmental conditions or has remained on the substrate longer than intended.

There are several chemical methods available, many of which require special precautions to use in a safe, environmentally-responsible manner. The user must obtain, read, and follow the MSDS sheet for any chemical used.

Some chemicals may damage the substrate or its finish. Always test the chemical in a small, inconspicuous area, allowing the chemical to remain on the graphic for the recommended length of time. Remove the film and check for substrate damage.

3M™ Controltac™ Film Remover R-221 and Adhesive Remover R-231

This remover system is designed specifically for removing 3M™ Controltac™ Graphic Films with or without Comply™ Adhesive that is unprinted or printed with solvent ink. It is not effective on graphics printed with UV inks.

1. Follow the manufacturer's safe handling instructions, including wearing appropriate protective equipment such as rubber gloves and safety goggles.
2. Clean the graphic surface with mild detergent and water. Dry thoroughly.
3. Mask around the graphic. This helps protect the substrate from damage.
4. Make a drip tray using wide masking tape that has been doubled over and adhered directly below the graphic. This prevents residue from dripping around the graphic. See FIGURE 2.
5. Thoroughly coat the graphic with film remover R-221, using a paint brush or roller. The coverage rate should be 3.7 m²/l.
6. Allow to dry for at least 15 minutes at room temperature or warmer. Leave it on for a longer time in cooler temperatures.
7. Test removability by grasping a corner of the graphic and pulling it from the surface at a low angle--less than 90 degrees. The film should come off with low to moderate force. It should stretch and remove easily.
   - If the film is still too brittle, apply a second coat, let dry, and repeat the removal test.
   - If the film removes easily, continue with Step 7.
8. Remove the masking tape but leave the drip tray in place.
9. Spray adhesive remover R-231 onto areas where there is adhesive residue.
10. Allow the liquid to penetrate for 30 to 60 seconds.
11. Remove the adhesive by scraping with a plastic applicator or rivet brush. Wipe the loosened residue with a cloth saturated with adhesive remover. Repeat this procedure as needed.
12. Remove the drip tray.
13. Clean the entire surface with a solvent wipe and follow with a mild detergent and water wash.
14. Dry the surface.

Removing Adhesive Residue from the Substrate

Some adhesive residue may be left on the substrate after removing the film. Always read and follow the MSDS sheet for the products you use.

Products Used In Residue Removal

- 3M™ Adhesive Remover R-231 for Controltac™ Film
- 3M™ Scotch-Weld Citrus Cleaner

General Residue Removal Steps

These steps may vary depending on the product you are using.

1. Read the manufacturer's instructions for the adhesive remover product. Use the product only as directed and only in a well-ventilated area.
2. Follow the manufacturer's safe handling instructions, including wearing appropriate protective equipment such as rubber gloves and safety goggles.
3. Test the remover by applying in an inconspicuous area to make certain that it does not damage the substrate.
4. Apply the remover as directed and allow the prescribed time for the chemical to penetrate the adhesive.
5. Remove the softened adhesive by scraping with a plastic applicator or rivet brush.
6. Pick up the loosened adhesive with a cloth saturated with the adhesive remover.
7. Repeat steps 4 through 6 as needed.
8. After the residue is removed, clean the entire surface with a solvent wipe and then wipe dry with clean toweling before the solvent evaporates.
9. Wash the entire substrate with a solution of detergent and water.
10. If you are applying a new graphic, dry the substrate thoroughly with a clean, lint-free towel.

Disposing of Removed Graphic Material

Adhesive or film removers, and solvent wipes or film wetted with the removers, should be incinerated in a permitted hazardous waste incinerator. Since regulations vary, consult the applicable regulations or authorities before disposal.

Removing Adhesive Residue from the Substrate

Some adhesive residue may be left on the substrate after removing the film. Always read and follow the MSDS sheet for the products you use.

Remarks

This bulletin provides technical information only.

Important Notice

All questions of warranty and liability relating to this product are governed by the terms and conditions of the sale, subject, where applicable, to the prevailing law.

Before using, the user must determine the suitability of the product for its required or intended use, and the user assumes all risk and liability whatsoever in connection therewith.

Additional Information

Visit the web site http://www.3Mgraphics.com for getting more:

- details about 3M™ MCS™ Warranty and 3M™ Performance Guarantee
- additional instruction bulletins
- a complete product overview about materials 3M is offering.

3M

Commercial Solutions Division
Hermeslaan 7
1831 Diegem, Belgium

Responsible for this technical instruction bulletin

3M Deutschland GmbH | Safety & Graphics Laboratory
Carl-Schurz-Str. 1 | 41453 Neuss, Germany