



Application Instructions

Guidelines for Graphic Repair on Vehicular Transport

Description

This bulletin gives 3M's recommended guidelines for graphic repair necessary following damage to the face and/or edge of graphics on vehicular transport.

Tools

- 3M™ Scotch™ Masking Tape, 2 inch wide
- 3M™ Applicator, PA1-G Gold
- 3M™ Low Friction Sleeve, SA-1
- 3M™ Rivet Brush Applicator, RBA-1
- Pin, or 3M™ Air Release Tool, 391x
- Cutting tools, such as a scalpel or razor blade
- Industrial heat gun
- 1 inch wide strip of 3M™ Scotchcal™ ElectroCut™ Film Series 100-114

Temperature & Environment

Apply graphics when the air, film and substrate temperatures are within the range specified in each film's Product Bulletin. The incorrect temperature may prevent the film from performing as expected.

Graphic Repair

Damaged graphics can be repaired. However patched repairs are **not warranted**.

Complete panels that have been replaced will carry the same warranty as the existing livery.

The colour or gloss of the new material may vary slightly when compared with original graphic, which may show some evidence of weathering over time.

Damage to Face of Graphic – Panel Replacement

1. The positioning of the replacement graphic panel should take account of the need to keep the number of joints in the panels to a minimum.
2. Prior to proceeding with repair, the area of the panel replacement should be cleaned using Method 1 in Appendix 1 Cleaning Methods.
3. Cut through the film using a scalpel against a straight edge running parallel with the panel edge and a minimum of 50mm from the damaged area or from where the film is not firmly adhered.

Note: When cutting onto the substrate take care to ensure that cut is through film layers only and there is no damage caused to the surface of substrate or paint finish.

4. Remove damaged panel using heat gun to soften the adhesive and if necessary clean off adhesive residue as per instructions in Appendix IV, taking care to avoid the edges of the adhered films.
5. After any repair of substrate that is necessary it should be ensured that filled areas are of a smooth finish and sealed with a suitable primer or paint. (Please refer to Appendix II for information on painted or primed substrates).
6. Clean the substrate, prior to application, using Method 1 followed by either Method 2 or Method 3 as detailed in Appendix I Cleaning Methods.
Areas where the new panel will overlap the old ones must also be cleaned and the edges of the films must overlap by at least 6.4mm (¼ inch).

- Using the top hinge method, position the graphic, using strips of Scotch™ Masking Tape to hold the graphic to the substrate. Then, apply a strip of masking tape 5.1 to 7.5 cm (2 to 3 inch) wide, horizontally across the top of the graphic. See Figure 1.

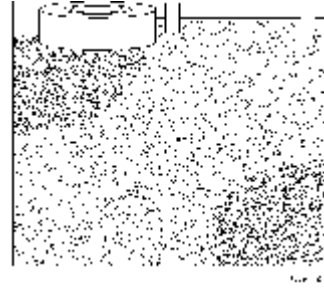


Figure 1. Make a Top Hinge

- Raise the graphic up over the top of the hinge and peel the liner back a few centimetres. See Figure 2.

Note: The entire liner may be removed at this time, if desired. However, for very large graphics, especially those with a pressure-sensitive adhesive, leaving the liner in place just prior to squeegeeing makes the graphic more controllable, keeps the adhesive clean, and reduces the possibility of stretching the film.

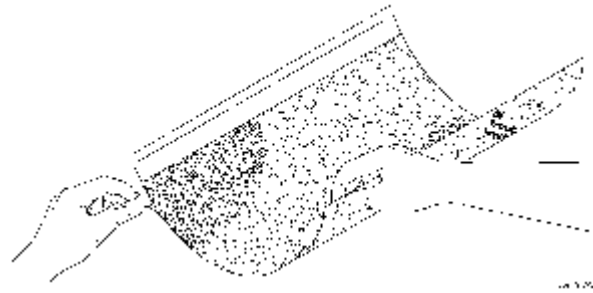


Figure 2. Lift the Graphic and Peel Back the Liner

- Begin squeegeeing at the top center. Squeegee the graphic beginning at the center of the tape hinge and working outward from the hinge to the closest edge. Use firm pressure on the plastic applicator and overlapping strokes. See Figure 3.
- Hold the graphic away from the surface and gradually remove the liner while squeegeeing down to the end.
- Remove the tape hinge. Squeegee the top edge.



Figure 3. Squeegee a Top Hinged Graphic

- Remove the application tape from the film by pulling it back upon itself at a 180 degree angle, see figure 4. It is acceptable to tear the premask into manageable sized pieces.
- ALWAYS re-squeegee all edges and overlaps and use a heat gun to improve adhesion, as loose edges may lift and can be damaged.
- Inspect the graphic for bubbles and puncture these at one end with a pin or 3M™ Air Release Tool, 391x. DO NOT use a razor blade or knife. Press out entrapped air by moving your thumb towards the puncture.
- Films that bridge over a seam or gasket will not adhere. Cut the film on both sides of the seam, remove the strip of film covering the seam or gasket and re-squeegee all seam edges.

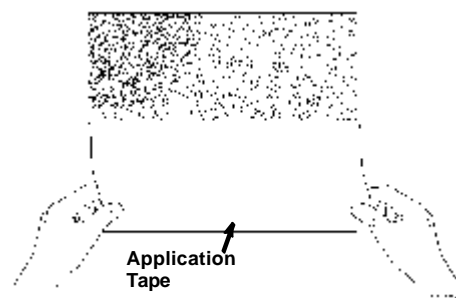


Figure 4. Removing Application Tape

Damage to Face of Graphic – Patch Repair

1. Prior to proceeding, the area of the patch repair should be cleaned using Method 1 in Appendix 1 Cleaning Methods.
2. The position and size of the patch should be determined to take account of the need to keep the number of joints in the panels to a minimum, also remove graphic a minimum of 50mm from the damaged area or from where the film is not firmly adhered.
3. Cut through the film around the area to be patched using a scalpel against a straight edge running parallel with the panel edges.

Note: When cutting onto the substrate take care to ensure that cut is through film layers only and there is no damage caused to the surface of substrate or paint finish.

4. Remove damaged area of graphic using heat gun to soften the adhesive and a razor, knife or air release tool to lift the graphic. If necessary clean off adhesive residue as per instructions in Appendix IV, taking care to avoid the edges of the adhered films.
5. After any repair of substrate that is necessary it should be ensured that filled areas are of a smooth finish and sealed with a suitable primer or paint. (Please refer to Appendix II for information on painted or primed substrates).
6. Clean the substrate, prior to application, using Method 1 followed by either Method 2 or Method 3 as detailed in Appendix I Cleaning Methods.
7. Cut the patch so it overlaps all sides of the damaged area by at least 6.4mm (¼ inch).
8. Using the top hinge method, position the graphic patch, using strips of Scotch™ Masking Tape to hold the graphic to the substrate. Then, apply a strip of masking tape 5.1 to 7.5 cm (2 to 3 inch) wide, horizontally across the top of the graphic patch. See Figure 1. on page 2.
8. Raise the graphic patch up over the top of the hinge and peel the liner back a few centimetres. See Figure 2. on page 2.

Note: The entire liner may be removed at this time, if desired. However for large patches leaving the liner in place just prior to squeegeeing makes the graphic more controllable, keeps the adhesive clean, and reduces the possibility of stretching the film.

10. Begin squeegeeing at the top centre. Squeegee the graphic patch beginning at the centre of the tape hinge and working outward from the hinge to the closest edge. Use firm pressure on the plastic applicator and overlapping strokes. See Figure 3 on page 2
11. Hold the patch away from the surface and gradually remove the liner while squeegeeing down to the end.
12. Remove the tape hinge. Squeegee the top edge.
13. Remove the application tape from the film by pulling it back on itself at 180 degree angle, see figure 4 on page 2.
14. ALWAYS re-squeegee all edges and overlaps and use a heat gun to improve adhesion, as loose edges may lift and can be damaged.
15. Inspect the patch for bubbles and puncture these at one end with a pin or 3M™ Air Release Tool, 391x. DO NOT use a razor blade or knife. Press out entrapped air by moving your thumb towards the puncture.
16. Films that bridge over a seam or gasket will not adhere. Cut the film on both sides of the seam, remove the strip of film covering the seam or gasket and re-squeegee all seam edges.

Edge Damage

1. Trim loose edges back to the point where the adhesive is firmly adhered to the substrate.
2. Clean areas to be applied with a solvent wipe.
3. Position the 1 inch wide strip of 3M™ Scotchcal™ ElectroCut™ Film Series 100-114, so that it covers equally both edges of film.
4. With the liner still attached, use masking tape at the top end to hold it in position.
5. Flip up the tape, using the masking tape as a hinge. Starting at the hinged end, remove the liner as the film is applied.
6. While pulling the liner off the tape, resqueegee the tape down, making sure the tape straddles both edges of the film.
7. Re-squeegee all edges, using gentle heat, making sure that all edges are completely sealed.

Health & Safety

Refer to the package label and the Material Safety Data Sheet for health, safety, and handling information on the products referenced in this bulletin. For 3M products, if necessary, you may contact our Toxicology/Product Responsibility Department on 01344 858000.

Important Notice to Purchaser

The 3M products described in this publication are covered by a 3M warranty and limitation of liability.

3M's warranty provides that if 3M finds that goods are defective in material or workmanship they will be replaced or the price refunded at 3M's option but note that 3M does not accept liability for other direct losses (except for personal injury or death) or consequential losses relating to defective products or from information supplied by 3M.

Purchasers and users of 3M products, and not 3M supplying companies, are always solely responsible for deciding on the suitability of the 3M product for their required or intended use.

Technical Assistance

For help on specific questions relating to 3M Commercial Graphics Division Products, contact your local Technical Service Representative.

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Appendix I

Cleaning Methods

⚠ Caution	⚠ Caution
Before handling any chemical products, always read the container label and the MSDS.	When using any equipment, always follow the manufacturers' instructions for safe operation.

There are three basic cleaning methods: General Cleaning, Solvent Cleaning and Isopropyl Alcohol Cleaning. The type of substrate determines which procedure to use.

The use of improper cleaning methods and techniques before applying the film voids the warranty.

Always test cleaners in an inconspicuous area before using. Some cleaners may dull your substrate or leave contaminants on it. Lower solvent content cleaners may not clean the type of contaminants you have.

METHOD 1: General Cleaning

1. Clean the substrate immediately before applying film. Dust and other contaminants can collect quickly on the substrate and prevent the film from adhering properly.
2. Use detergent and water to clean the substrate.
 - For most surfaces, interior or exterior: Wash the substrate with 1 ounce of synthetic detergent per gallon of lukewarm water. Avoid soaps or preparations that contain waxes, oils or lotions. Be aware that some window cleaners contain waxes.
 - Be aware that the chemicals used in some automated vehicle washing equipment may interfere with adhesion.
 - For interior walls where grease and/or oil is present on the substrate: Wash the substrate with a solution of TSP (trisodium phosphate) and lukewarm water. Prepare the solution according to the manufacturer's written instructions.
3. Dry thoroughly with clean, lint-free paper towels.

METHOD 2: Solvent Cleaning

The following list of cleaners is provided for your convenience; other acceptable cleaners may be available. 3M does not endorse any particular chemical manufacturer or supplier.

✓ Important Note

Local air quality regulations may regulate or prohibit the use of surface preparation and cleaning materials based on solvent (VOC) content. Consult your local air quality regulations.

Lower Solvent Content Cleaners

- 3M Prep Solvent-70, 8983*

Petroleum Distillate-based Cleaners

- 3M™ Adhesive Cleaner and Wax Remover 8984*
- 3M Surface Preparation System*
- DuPont Prep-Sol™ Solvent Cleaner 3919S**
- Sherwin Williams R7K156 Sher-Will-Clean™**
- Sherwin Williams R7K158 Sher-Will-Clean™**
- Xylol, lacquer thinner, or VM&P Naphtha***

* Available from 3M Commercial Graphics Division.

** Available from automobile supply houses handling DuPont or Sherwin Williams products.

*** Available from chemical companies listed under "Solvents" in the Yellow Pages. If these are not available locally in small quantities, they may be obtained from mail order chemical firms, such as E. H. Sargent and Co. and Fisher Scientific.

Procedure

1. Saturate a clean paper towel with a solvent.
2. Wipe with a lint-free paper towel before the solvent evaporates from the substrate. As the paper towel becomes dirty, discard it. A dirty towel just moves the dirt around, not remove it.
3. Make sure the substrate is completely dry. If necessary, use a heat gun to dry any retained liquid.
4. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

METHOD 3: Isopropyl Alcohol Cleaning

Note: Because it evaporates quickly, IPA (isopropyl alcohol) is not an appropriate cleaner if the substrate is warm or the conditions are windy. In such conditions, use the **General Cleaning Method**.

1. Saturate a clean paper towel with isopropyl alcohol (IPA)*.
2. Wipe with a lint-free paper towel before the IPA evaporates from the substrate. As the paper towel becomes dirty, discard it. A dirty towel just moves the dirt around, not remove it.
3. Make sure the substrate is completely dry. If necessary, use a heat gun to dry out any liquid retained in the seams.
4. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

*Available from 3M as 3M VHB™ Surface Cleaner

Appendix II

Printed or Primed Substrates

Painted or Primed Substrates

All surface treatments, primers and topcoats must adhere well to the base material. If the paint is not firmly attached to the base material, the graphic and the paint may pull away from the substrate. Any visible signs of peeling, lifting, or bubbling of the paint indicates poor paint-to-substrate adhesion. Original paint may not have adequate adhesion to some substrates. Even removing changeable films may pull off paint that is not firmly attached to the base material.

- Avoid finish paints that tend to chalk. Chalked paint on weathered surfaces must be removed by mechanical buffing. Chalked paint that is on the interior must be re-primed.
- Test for chalking with the **Tape Snap Test**, see Appendix III.
- Be aware that some tinted paints may bleed through some films or sheetings.
- Be aware that some graphic materials may bleed through onto the paint.
- Avoid paints that contain migratory agents or agents that are difficult to adhere to. Some paints, especially those sold as graffiti-resistant, may contain ingredients such as silicones, chlorinated waxes, or other ingredients in relatively high amounts. It may not be possible to obtain adequate adhesion to these types of paint.
- Follow the drying and curing times recommended by the paint manufacturer. Under-cured paint may outgas, prevent the adhesive from adhering adequately, or prevent a removable or changeable product from removing as expected.
- The primer and the paint should be produced by the same manufacturer and formulated as companion products to ensure good adhesion between the paint layers.

Note: METHODS for cleaning are in Appendix I.

Common Types of Paint

Baked Enamel Paint

These are the easiest paint systems to manage.

1. Bake according to the manufacturer's recommendations and cool to room temperature.
2. Clean the surface. Use:
 - **METHOD 1:** General Cleaning, then
 - **METHOD 2:** Solvent Cleaning.

Latex Paint

High quality gloss or semi-gloss paints provide the best application surface.

Low luster or matte paints contain matting agents that may contribute to poor film adhesion.

Some formulations do not allow films to adhere well. Paint testing is available from 3M. Call Technical Service at 01344 857850 for information.

Although most paints are usually dry to the touch within one hour, you cannot apply the graphic immediately after painting. Paint manufacturers typically recommend waiting one week. Even latex paint contains solvents that continue to evaporate for a period of time. If the paint is not thoroughly cured, the graphic may not adhere or its edges may curl. If you must apply the graphic sooner, perform the **Tape Snap Test** in several places to ensure adequate dryness. See Appendix III.

Clean the surface. Use:

- **METHOD 1:** General Cleaning.

Oil-based or Enamel Paint

Clean the surface. Use:

- **METHOD 1:** General Cleaning.

Two-part Urethane Paint

Two-part urethane paints must be cured before applying a graphic. If the paint has not thoroughly cured, bubbles will form under the applied graphic. Follow the recommendations of the paint manufacturer.

As a general guideline, proper curing requires temperatures above 21°C (70° F) for 5 to 7 days, depending on paint thickness and temperature. This type of paint does not cure at temperatures below 9°C (50° F).

1. Test for outgassing. See Appendix III.
2. Clean the surface. Use:
 - **METHOD 1:** General Cleaning, then
 - **METHOD 2:** Solvent Cleaning.

Powder-coated Paint

These paint systems are available in a wide variety of formulations. Some formulations do not allow films to adhere well. Paint testing is available from 3M. Call Technical Service at 01344 866328 for information.

Clean the surface. Use:

- **METHOD 1:** General Cleaning, then
- **METHOD 2:** Solvent Cleaning.

Textured Paints

1. Clean the surface. Use:
 - **METHOD 1:** General Cleaning.
2. Test for substrate integrity with the **Tape Snap Test**, See Appendix III..
3. If any dust comes off on the tape, clean the surface again.

Appendix III

Special Testing

Outgassing Test

3M assumes no liability for bubbling of films or sheetings due to outgassing

1. Apply a 135 by 135 cm (5 by 5 inch) piece of polyester film or the film or sheeting used to make the graphic. Films vary in their ability to allow the gas to escape. Use sheeting 690 or polyester for greatest assurance that the substrate will not outgas.
2. Wait for 24 hours or, if possible, oven bake for 2 hours at 65°C (150°F) or 5 minutes at 176°C (350°F).
3. If bubbles appear under the film, the substrate is outgassing.
4. If the paint or substrate outgasses, wait 24 hours and test again. Continue to apply test pieces until the substrate no longer outgasses. If the substrate continues to outgas, contact the substrate manufacturer for assistance.

Tape Snap Test

Because substrates vary, this test is only an indicator of general surface characteristics. It may not be indicative of the entire area.

1. Using 3M™ Plastic Applicator PA-1, firmly apply a 1 inch strip of aggressive, pressure-sensitive tape (Scotch® Tape #610) over the area.

Note: Plastic applicator PA-1 is available from 3M Commercial Graphics Division. Tape 610 is available through most film or tape distributors.

2. Remove the tape by pulling it back upon itself at a 135° angle using a rapid, firm pull. See Figure 1.

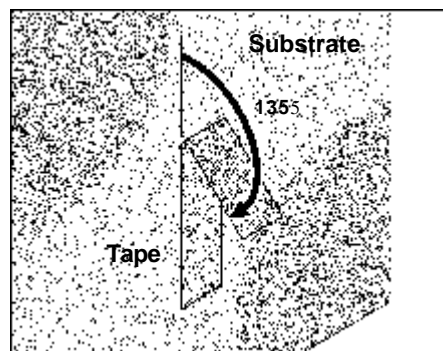


Figure 1. Pull Off Masking Tape at a 135° Angle

3. No separation should occur between the top coating and the layers underneath. No paint or chalking should be present on the tape.
4. If separation occurs, removal without damage is not warranted for removable or changeable products.

Appendix IV

Removing Adhesive Residue from the Substrate

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

Some of the adhesive removal products 3M sells are:

- 3M™ Citrus Based Industrial Cleaner
- 3M™ General Purpose Adhesive Cleaner 08984 (several sizes are available)
- 3M™ Controltac™ Plus Adhesive Remover R-231
- Xylol (xylene)
- 3M™ Graphic Remover System

✓ Important Note

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content. Consult your local air quality regulations.

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 paint and/or 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.

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