Application

Substrate Selection, Preparation and Substrate-specific Application Techniques

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OVERVIEW

How To Use This Bulletin Effectively

This bulletin tells you:

- How to select and prepare a substrate so that the 3M film or sheeting will adhere well.
- How to apply film or sheeting to specific types of substrates.

For the best results:

- Use this bulletin in conjunction with Instruction Bulletin 5.5, *General Procedures for Interior and Exterior Dry Applications.*
- Read **Substrate Requirements**, which helps you determine the general types of substrates that can be used. Refer to the film or sheeting Product Bulletin for specific substrate recommendations.
- Review the cleaning methods on pages 3 and 4. All recommended substrates can be cleaned with one or more of these methods.
- Locate the type of substrate you plan to use and review the preparation and application techniques provided.

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.

⚠ Caution

Any activity performed for a long period of time in an awkward position or with a high amount of force is potentially a risk for causing musculoskeletal strain, pain or injury. When applying graphics, follow these practices to improve comfort and avoid injury:

- Alternative your tasks during the application.
- Schedule regular breaks.
- Perform stretches or do exercises to improve circulation.
- Avoid awkward reaching.

SUBSTRATE REQUIREMENTS

To obtain a high-quality, long-lasting graphic, use the proper preparation and application techniques for each type of substrate.

Films can be applied to most substrates that are:

- **Clean**. All substrates must be considered contaminated and must be cleaned prior to application of film or sheeting, with the last cleaning step being done *immediately* before application. A freshly cleaned or painted substrate can quickly collect dust.
  - *For wall applications:* Be sure to clean the edges under the ceiling and all corners. These areas are easily overlooked.
- **Dry**. Any moisture trapped beneath the graphic will cause the graphic to fail prematurely. Moisture prevents the adhesive from adhering correctly, can cause bubbles, and can freeze in cold environments.

  Moisture results from:
  - Inadequate drying after cleaning.
  - Failure to pre-dry some substrates such as polycarbonate sheeting.
  - Condensation at low temperatures.
  - High humidity environments.

  It is impossible to keep the substrate dry if there is condensation or high humidity.

  Because of the difficulty removing all of the moisture, wet application is not recommended on vehicles or non-flat surfaces. Moisture is also difficult to remove from beneath 3M™ Controltac™ *Plus* and Scotchlite™ *Plus* films or Films with Comply™ Performance.
- **Relatively non-porous**. Porous materials absorb moisture that affects the ability of the film or sheeting to adhere to the surface.
- **Smooth**. It is more difficult for the adhesive to make good contact with textured surfaces rougher than 150 grit sandpaper. Refer to Instruction Bulletin 5.5, *General Procedures for Interior and Exterior Dry Applications,* for application techniques to rough surfaces.

CLEANING METHODS

⚠ Caution

Before handling any chemical products, always read the container label and the MSDS.

⚠ Caution

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

Air Quality Regulations

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.

- There are four basic cleaning methods: General Cleaning, Solvent Cleaning, Isopropyl Alcohol Cleaning and Dust and Dry Particle Cleaning. The type of substrate determines which procedure to use.
- Using 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. Cleaners with low solvent content may not remove 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 trisodium phosphate (TSP) and lukewarm water. Prepare the solution according to the manufacturer's written instructions.
3. Dry thoroughly with clean, lint-free paper towels.

Note: Porous materials absorb moisture and must have time to dry.

Method 2: Solvent Cleaning

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

Cleaners with Low Solvent Content

- 3M™ Prep Solvent 70:*
- Several other products are available from your local building products store.

Cleaners with Petroleum Distillate

- 3M™ General Purpose Adhesive Cleaner:*
- DuPont Prep-Sol™ Solvent Cleaner 3919S**
- Sherwin Williams R7K156 or R7K158 Sher-Will-Clean™**
- Xylol, lacquer thinner, or VM&P Naphtha ***

** 3M Automotive Aftermarket Division.*

*** Auto parts suppliers handling DuPont or Sherwin Williams products.*

**** Look up "Solvents" in the Yellow Pages.*

Procedure

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. Saturate a clean lint-free paper towel with a solvent and thoroughly wipe the substrate.
3. Wipe with a second 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.
4. Make sure the substrate is completely dry. If necessary, use a heat gun to dry any retained liquid.
5. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

Method 3: Isopropyl Alcohol Cleaning

Important Notice:

Isopropyl Alcohol is not a recommended cleaning product for vehicle wrapping: because it evaporates too quickly, IPA (Isopropyl Alcohol) is not an appropriate cleaner. 3M Surface preparation system is the only 3M recommended cleaning product.

Note: For same reason , 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. 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. Saturate a clean lint-free paper towel with with isopropyl alcohol (IPA)* and thoroughly wipe the substrate.
3. Wipe with a second paper towel before the 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.
4. Make sure the substrate is completely dry. If necessary, use a heat gun to dry out any liquid retained in the seams.
5. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

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

IMPORTANT NOTE

Flatting down of paint.

Abrading painted surfaces with abrasive discs can result in anti-blocking agents from the disc remaining on the surface. This can result in reduced adhesion levels when applying graphics. Paint dust can also be held in the grooves of the abraded surface. Thorough solvent wiping is required to remove these 'contaminants' to ensure proper adhesion levels are achieved. (See cleaning Methods.)

The wiped surface should appear uniform in colour after wiping and drying.

Method 4: Dust and Dry Particle Cleaning

In cases where the surface has only dust or other loose particles or debris, you can use the Dust and Dry Particle Cleaning method. If no other method is needed, the Dust and Dry Particle Cleaning method is required to remove particles that could interfere with the adhesive.

Smooth Surfaces

- Wipe down the entire surface with a *clean* Scotch-Bright™ High Performance Cleaning Cloth. Follow the product directions for cleaning the cloth.

Rough or Textured Surfaces

- **Preferred Method**—Vacuum the entire surface with a soft-bristled vacuum head to dislodge and remove any loose particles or dust.
- **Alternate Method**—Sweep the entire surface with a soft-bristled broom to dislodge any loose particles or dust.

SUBSTRATE CLEANING AND APPLICATION GUIDELINES

Note: Methods for cleaning are on pages 3 and 4.

Note: In many cases, you are given multiple options for cleaning a particular type of substrate. Read the descriptions for each method and select the most appropriate for your circumstances.

A. 3M Graphics: Application over Existing Graphic

You can apply one 3M graphic (which could be a single layer of film or a fabricated multi-layer construction) on top of one existing new or old 3M graphic as long as the application meets the requirements below.

Requirements

Condition of Bottom Graphic

The bottom graphic must be in good condition and well adhered to the substrate.

Size and Edge Gap

One of the following two statements must be true:

- The top graphic is larger than the bottom graphic, and it extends beyond the edge of the bottom graphic by a minimum of 1/2 inch (1.3 cm) along the entire edge of the bottom graphic.
- The top graphic is smaller than the bottom graphic and all its edges are a minimum of 1/2 inch (1.3 cm) inside the edges of the bottom graphic.

Refer to Instruction Bulletin 6.5 before removing part or all of an existing graphic.

Compatibility with Substrate Material

- The bottom graphic must be recommended for application to the substrate.
- If the top graphic is larger than the bottom graphic, the top graphic must also be recommended for application to the primary substrate.

Compatibility with Substrate Shape

The top and bottom graphic must both be recommended for application to the shape of the application surface (e.g., corrugated surfaces).

Warranted Durability and Removal

Note: Specific warranty details and limitations for the films can be found in the individual Product Bulletins.

Durability

If the requirements above are not met, durability is not warranted for this type of application.

Removal

Removal of only the top film in this type of application is *not* warranted unless:

- The top film is changeable or is removable with heat only, and
- The bottom film is removable with heat and/or chemicals or is permanent.

Cleaning Procedure

Clean the surface. For fleet applications, use:

- **Method 1**: General Cleaning, *followed by*
- **Method 2**: Solvent Cleaning.

For signs, use:

- **Method 1**: General Cleaning, *followed by*
- **Method 3**: Isopropyl Alcohol Cleaning.

B. Building Materials

Exterior Brick

1. Prepare a muriatic acid solution according to the manufacturer's instructions. Muriatic acid can be found in most home improvement stores.
2. When using muriatic acid, follow the manufacturer's safe handling instructions, including wearing appropriate protective equipment such as rubber gloves and safety goggles.

Interior Brick

Clean the surface. Use:

- **Method 1**: General Cleaning, *or*
- **Method 4**: Dust and Dry Particle Cleaning.

Ceramic Tile, Countertop Laminate, Marble, Decorating Stone

Clean the surface. Use:

- **Method 3**: Isopropyl Alcohol Cleaning, *or*
- **Method 4**: Dust and Dry Particle Cleaning.

Concrete, Bare

Note: If you are applying Scotchprint® Graphics for Sidewalk Signs, refer to Instruction Bulletin 5.33.

1. Allow new concrete to cure 6 to 12 months. Curing is necessary to remove the strong alkali in fresh concrete.
2. Brush with a wire brush to remove loose debris.
3. Use the same steps recommended for **Brick** substrates.

Concrete, Sealed and Painted

Clean the surface. Use:

- **Method 1**: General Cleaning, *or*
- **Method 4**: Dust and Dry Particle Cleaning.

Flooring

See Instruction Bulletin 5.26.

Wallboard

Removing even changeable graphics may damage wallboard, especially if the wallboard is cut during application.

1. Paint or prime the substrate. Then follow the cleaning and preparation recommendations in **Painted or Primed Substrates**, page 8.
2. Test for substrate integrity with the **Tape Snap Test**, page 11.
3. Clean the surface. Use **Method 4**: Dust and Dry Particle Cleaning.

Wall Coverings

All seams and edges must have good adhesion to the wall. Clean the surface. Use:

- **Method 1**: General Cleaning, *or*
- **Method 4**: Dust and Dry Particle Cleaning.

C. Composites

Some composites require special consideration to ensure that the graphic performs as expected.

Body Fillers

Films adhere to most body fillers. Follow the manufacturer's instructions and test to make sure that the film you are using has good adhesion.

FRP (Fiberglass Reinforced Plywood)

Gelcoat that cracks will also crack the film or sheeting.

1. Perform the **Outgassing Test**, page 11.
2. Use a mild abrasive or buffing wheel to remove any residue, if the gelcoat has chalked.
3. Clean the surface. Use:
   - **Method 1**: General Cleaning, *followed by*
   - **Method 2**: Solvent Cleaning.

Urethane Foam-filled Trailer Sides and Doors

1. Perform the **Outgassing Test**, page 11.
2. Clean the surface. Use:
   - **Method 1**: General Cleaning, *followed by*
   - **Method 2**: Solvent Cleaning.

D. Flexible Substrates

Images printed on 3M™ Wear Coat and Transfer Media can be transferred to some substrates. These are unwarranted constructions. Check Instruction Bulletin 4.13 for specific substrates.

Banners

Clean the surface. Use **Method 3**: Isopropyl Alcohol Cleaning.

3M™ Panaflex™ Awning and Sign Facing

For additional application instructions, see Instruction Bulletin 5.7. Clean the surface. Use:

- **Method 1**: General Cleaning, *followed by*
- **Method 3**: Isopropyl Alcohol Cleaning.

E. Glass

Note: 3M accepts no liability for glass breakage due to temperature differences across the glass, which can be caused by sunlight on dark areas of the graphic. Glass size, thickness, quality of cut, edge treatment, tinting and frame design also greatly affect the likelihood of breakage.

Waxes and Other Coatings on Glass

Many glass surfaces have wax or other invisible coatings on them that interfere with adhesion. Perform the following procedure to identify and eliminate any coatings.

1. Place drops of water on several regions of the glass.
2. If the water forms into beads, there is a coating that must be removed:
   - Use a cleaner such as Bon Ami® Glass Cleaner or Soft Scrub® to remove the coating. Follow the manufacturer's instructions.
   - Return to step 1.
3. If the water does not form into beads, there is no coating that needs to be removed.
4. Clean the surface. Use **Method 3**: Solvent Cleaning.

Note: Methods for cleaning are on pages 3 and 4.

F. Metals

Any painted surface with bare metal or rust spots should be entirely resurfaced as recommended for the following metals.

Aluminium

For the best results, use etched and degreased Aluminium or anodized Aluminium. Clean the surface. Use **Method 3**: Isopropyl Alcohol Cleaning.

For other types of Aluminium, follow these additional procedures prior to cleaning.

Badly Pitted or Oxidized Substrate

Use a commercial acid-brightener.

Uncoated and Unetched

1. Remove white rust (oxidation).
2. Smooth with 150 grit or finer abrasive.
3. Degrease the metal.
4. Etch the surface or prepare it with an amorphous chromate or non-chrome conversion coating.

Conversion Coated

Coating should meet one of the following requirements:

- Chromate: ASTM B 449, Class 2
- Non-chromate: ASTM B 449, Class 1
- Air-dried, acrylic on non-chrome coated: ASTM D 3359 for tape snap adhesion or ASTM D 4541 for adhesion the same as a chromate coated Aluminium of the same alloy.

1. Remove white rust (oxidation).
2. Be sure that coating adheres tightly to the Aluminium and is free of any powdery residue.

Chrome

Clean the surface. Use:

- **Method 1**: General Cleaning, *followed by*
- **Method 2**: Solvent Cleaning.

Stainless Steel

Note: The film or sheeting used must be recommended for stainless steel. Refer to the appropriate product bulletin.

Clean the surface. Use:

- **Method 1**: General Cleaning, *followed by*
- **Method 2**: Solvent Cleaning, *followed by*
- **Method 3**: Isopropyl Alcohol Cleaning.

Vehicles

- Make sure that there is no moisture remaining on the substrate, underneath the rivets, or in body seams.
- Special consideration must be given to the lower panel on all panel seams. Use a 3M™ Plastic Applicator PA-1 wrapped with a clean paper towel to clean difficult to reach areas.

Steel

Do not apply film directly to unpainted steel. Any painted surface with bare metal or rust spots should be entirely refinished. After painting, follow preparation recommendations found in **Painted or Primed Substrates**, page 8.

Untreated or Electro-Galvanized

Includes bare metal, Zinc electroplated, cold rolled, hot rolled pickled and black iron.

1. Contact metal treatment suppliers for recommendations on treatment and finishing.
2. Prime and paint.

Phosphate-Coated Galvanized

1. Remove white rust (oxidation) with a 3M™ Scotch-Brite™ Cleaning Pad.
2. Rinse with water and dry. All moisture must be removed.
3. Check for moisture by applying a piece of film to the steel. Bake it in a 300°F (149°C) oven for 5 minutes. Check for blisters in the film.
4. Prime and paint.

Rusted

1. Abrade the substrate lightly with a right angle grinder or random orbital sander. Use a 3M™ Scotch-Brite™ Surface Conditioning Disc (super fine-gray) of appropriate size or 3M™ Scotch-Brite™ Cleaning Pad.
2. Clean the surface. Use **Method 3**: Isopropyl Alcohol Cleaning.
3. Test the cleaned substrate by wiping with a clean paper towel.
4. If there is any evidence of dust or solvent film on the paper towel, return to step 2.
5. Prime and paint. Apply a fast-dry paint to any bare-metal areas.

Unwarranted Metals

- Brass
- Copper
- Lead
- Magnesium
- Tin, Tin Plate or Alloys

Note: Methods for cleaning are on pages 3 and 4.

G. 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**, page 11.
- 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 high concentrations of ingredients such as silicones or chlorinated waxes. 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.

Baked Enamel Paint

1. Bake according to the manufacturer's recommendations
2. Cool to room temperature.
3. Clean the surface. Use:
   - **Method 1**: General Cleaning, *followed by*
   - **Method 2**: Solvent Cleaning (for weathered paint, *or*

Enamel or Oil-Based Paint

Clean the surface. Use:

- **Method 1**: General Cleaning

Latex Paint

For better results, use high quality gloss or semi-gloss paints. Low luster or matte paints contain matting agents that may contribute to poor film adhesion.

Some paints do not allow films to adhere well. Paint testing is available from 3M. Call Technical Service on 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**, page 11, in several locations.

Clean the surface. Use:

- **Method 1**: General Cleaning, or
- **Method 4**: Dust and Dry Particle 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 paint manufacturer's instructions.

Proper curing generally requires temperatures above 70° F (21° C) for 5 to 7 days, depending on paint thickness. This type of paint does not cure at temperatures below 50° F (9° C).

1. Perform the **Outgassing Test**, page 11.
2. Clean the surface. Use:
   - **Method 1**: General Cleaning, *followed by*
   - **Method 2**: Solvent Cleaning.

Powder-coated Paint

There are many types of powder coated paints. Some types do not allow films to adhere well. Paint testing is available from 3M. Call Technical Service on 01344 857850 for information.

Clean the surface. Use:

- **Method 1**: General Cleaning, *followed by*
- **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**, page 11.
3. If any dust comes off on the tape, clean the surface again.

Note: Methods for cleaning are on pages 3 and 4.

H. Plastics and Rubber

Images printed on 3M™ Wear Coat and Transfer Media can be transferred to some substrates. These are unwarranted constructions. Check Instruction Bulletin 4.13 for specific substrates.

Because of the wide variety of plastic and rubber materials, it is important that you clean an inconspicuous area before cleaning the entire substrate to be sure the method does not damage the material.

For rigid plastic sheets that will be thermoformed, dry the material according to the manufacturer's instructions. Use the method recommended by the plastic manufacturer. Failure to properly dry the plastic can cause bubbling within the plastic sheet or under the applied film during thermoforming.

PETG sheeting and some acrylic sheeting may not need predrying. Consult the plastic manufacturer.

Common types of plastic are listed below. Contact 3M Technical Service on 01344 857850 for unlisted plastics.

Acrylonitrile Butadiene Styrene (ABS)

Clean the surface. Use:

- **Method 1**: General Cleaning, *followed by*
- **Method 2**: Solvent Cleaning.

Acrylic (such as Lucite^{R} and Plexiglas^{R})

Clean the surface. Use:

- **Method 1**: General Cleaning, or
- **Method 3**: Isopropyl Alcohol Cleaning.

Fiberglass

1. Perform the **Outgassing Test**, page 11. Time factors for this test should duplicate the time involved between production of the fiberglass and the application of film.
2. If bubbles appear under the film, cure the fiberglass 1 week or bake for 2 hours at 150°F (65°C) and retest.
3. If no bubbles appear, clean the surface. Use:
   - **Method 1**: General Cleaning, *followed by*
   - **Method 2**: Solvent Cleaning.

Copolyester Sign Sheet

Clean the surface. Use **Method 1**: General Cleaning.

Polycarbonate (such as Lexan®)

The mechanical strength of molded safety products, such as sports helmets, may be reduced if certain films or sheetings are applied. Therefore, 3M does not warrant such applications.

1. Follow the fabrication and handling procedures recommended by the resin manufacturer. Molding and filling techniques, surface preparation and handling also affect the mechanical strength.
2. Perform the **Outgassing Test**, page 11.
3. If there is bubbling, do not use the substrate; outgassing can continue for extended periods and may take weeks to show up in the field.
4. Clean the surface. Use:
   - **Method 1**: General Cleaning, *or*
   - **Method 3**: Isopropyl Alcohol Cleaning.
5. See Instruction Bulletin 5.16 for specific instructions on thermoforming.

Polypropylene and Polyethylene

1. Clean the surface. Use:
   - **Method 1**: General Cleaning, *followed by*
   - **Method 3**: Isopropyl Alcohol Cleaning.
2. If the film is not specifically recommended for these substrates, **Flame Treat** the substrate, page 11.

Polystyrene, Styrene

Do not use for exterior applications. Clean the surface. Use **Method 1**: General Cleaning.

Rubber and Caulking Materials

Not warranted. Films and sheetings have poor adhesion to these materials.

I. Poster Board

Images printed on 3M™ Wear Coat and Image Transfer Media 8604 or 8605 can be transferred to some substrates. These are unwarranted constructions. Check Instruction Bulletin 4.13 for specific substrates.

Expanded PVC (such as Sintra® and Lustra®)

Clean the surface. Use:

- **Method 3**: Isopropyl Alcohol Cleaning, *or*
- **Method 4**: Dust and Dry Particle Cleaning.

Paper-based Poster Board (such as Fome-cor®)

- **Method 3**: Isopropyl Alcohol Cleaning, *or*
- **Method 4**: Dust and Dry Particle Cleaning.

Note: Methods for cleaning are on pages 3 and 4.

J. Wood Products

Because wood absorbs moisture, it must have a thick, smooth coating of high-quality paint on both sides and all edges.

All faces of exterior surfaces must be primed and painted with high-quality exterior wood paints.

All faces of interior surfaces require only a prime coat.

Some substrates listed below require edge sealing. Two examples of appropriate sealers are aluminized, urethane edge sealer or polysilicone paint.

Fiberboard or Oriented Strand Board

1. Test for paint coating integrity with the **Tape Snap Test**, page 11.
2. Clean the surface as outlined in **Painted or Primed Substrates**, page 8.

Hardboard

1. Use material that is fused or tempered and is smooth on both sides.
2. Fill voids with wood filler and sand with fine-grit sandpaper.
3. Prime and paint.
4. Clean the surface as outlined in **Painted or Primed Substrates**, page 8.

Plywood

Surface must be smooth, impermeable and weatherproof.

1. Fill voids with wood filler and sand with fine-grit sandpaper.
2. Coat the edges multiple times with an edge sealer.
3. Remove any loose debris.
4. Clean the surface as outlined in **Painted or Primed Substrates**, page 8.

High Density Overlaid U.S. Product Standard PS 1 General use or sign grade only

1. Seal the edges.
2. Scuff the face with 200 grit or finer sandpaper.
3. Lightly wipe with a tack cloth to remove any dust.
4. Clean the surface as outlined in **Painted or Primed Substrates**, page 8.

Medium Density Overlay Plywood Exterior Grade Plywood (fir only, not oil treated)

1. Seal the edges.
2. Prime and paint the substrate.
3. Clean the surface as outlined in **Painted or Primed Substrates**, page 8.

Simpson HighwayR HDO Panels or Equivalent, U.S. Product Standard PS 1

1. Seal the edges.
2. This has an overlay on both faces and does not require sanding or solvent wiping.
3. Lightly wipe with a tack cloth to remove any dust.
4. Clean the surface as outlined in **Painted or Primed Substrates**, page NO TAG.

Other Wood Products

Avoid heavy resin-coated woods. Follow the wood supplier's surface preparation recommendations.

1. Seal the edges.
2. Prime and paint the substrate.
3. Clean the surface as outlined in **Painted or Primed Substrates**, page 8.

SPECIAL TESTING OR SURFACE PREPARATION

Flame Treating

⚠ Caution

Heat or open flames may contribute to a flash fire or burns. Follow these precautions when using a heat source for flame treating.

- Read and follow the instructions supplied with the heat source.
- Avoid personal contact with the heat source. Wear heat-resistant gloves and safety glasses.
- Do not use heat sources near solvent mixtures or residues, or where solvent vapors may be present.

⚠ Caution

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

Flame treating changes the molecular structure of the substrate. It oxidizes a very thin layer of the substrate allowing the adhesive to wet the surface and make a good bond.

1. Clean the substrate so that it is free of dirt and oil.
2. Use a burner designed to produce a continuous, straight or curved ribbon of flame, or use a series of small burners, as appropriate for the shape of the substrate.
3. Obtain a volumetric air to natural gas ratio of 11 or 12 to 1, or an air to propane gas ratio of 24 to 1.
4. Touch the tip of the flame's outer blue envelope (*not* the inner, yellow or red cone) to the material for 1 second. Longer exposure can deform or soften the material—Flame treating is *not* heat treating.
5. Check for proper treatment by pouring water on the substrate. If the water forms into beads, the surface is not adequately treated. If the water does not form into beads, the surface is adequately treated.
6. Thoroughly dry the surface, but do not touch it with your bare hands.
7. Apply the film to the substrate soon after flame treating. The surface oxidation will disappear within minutes after treatment.

Outgassing Test

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

1. Apply a 5 by 5 inch (135 by 135 cm) 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 a polyester film for greatest assurance that the substrate will not outgas.
2. Wait for 24 hours or, if possible, oven bake for 2 hours at 150°F (65°C) or 5 minutes at 350°F (176°C).
3. If bubbles appear under the film, the substrate is outgassing: repeat the test daily until bubbles do not appear. If outgassing continues after repeated tests, contact the manufacturer for assistance.
4. If no bubbles appear, the material is not outgassing.

Tape Snap Test

This test can be used to help determine if a substrate appears to have sufficient integrity to remain intact during eventual graphic removal, but passing the test does not mean that non-damaging removal is warranted. If a substrate is damaged during removal of removable or changeable products because of failure of the substrate's integrity, substrate damage is not covered by the 3M warranty.

1. Using 3M™ Plastic Applicator PA-1, firmly apply a 1 inch strip of aggressive, pressure-sensitive tape (ScotchR 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.

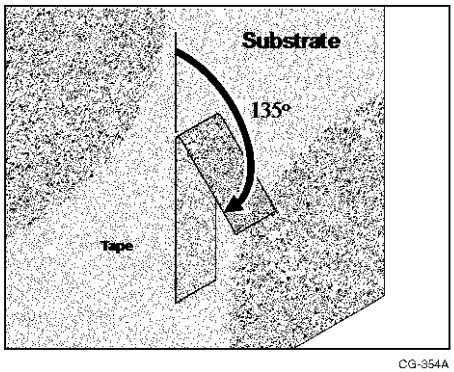

Figure 1. Pull Off Masking Tape at a 135° Angle

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.

ADDITIONAL INFORMATION

3M Related Literature

Listed below is related 3M technical literature that may be of interest.

Instruction Bulletins	
Image transfer using Wear Coat and Transfer Media 8604 ES and 8605 ES	4.13
Application, Special Applications and Vehicles	5.4
Instruction Bulletins (continued)	
Application, General Procedures for Interior and Exterior Dry Applications	5.5
Detergent and Water Application	5.7
Cutting and Applying Curtain Sided Vehicle Film	5.12
Applying Diamond Grade conspicuity film	5.13
Constructing Panaflex banners with Scotchprint® Graphics	5.18
Application and maintenance of ink jet graphics for floors	5.29
Application and maintenance of sidewalk signs	5.33
Applying 3M Graphic Films with Comply™ Performance	5.31
Thermoforming	5.16
Applicator's Quick Reference Guide for Vehicle Film	5.35
Application: Special Considerations for Complex Contours of Automobiles, Vans and Buses and Inspection Forms	5.36
Storage, Handling, Maintenance, Removal	6.5
Vehicle Graphics Warranty	

Technical Assistance

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

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