

## Overview

This bulletin describes mandatory substrate cleaning and preparation techniques to be used prior to applying 3M graphic films. Graphic manufacturers should read and understand this bulletin prior to installing graphics. By reading this bulletin, users will learn:

- Substrate type and condition requirements to ensure the 3M film or sheeting adheres well
- How to properly clean a wide variety of substrates to prepare them for installation of 3M film or sheeting. All substrates recommended by 3M for film application can be cleaned using one or more of the methods described in this bulletin.
- How to use this bulletin in conjunction with other applicable 3M product and instruction bulletins.
  - Several bulletins are linked within this bulletin, and users can find additional information at 3M's technical information library at [www.3Mgraphics.com](http://www.3Mgraphics.com).
- The requirements for applying 3M film over already applied graphics
- How to determine the general types of substrates that can be used.
  - Refer to the film or sheeting product bulletin for specific substrate recommendations.

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## Substrate Requirements

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

### NOTE

Read [3M Instruction Bulletin Application: Walls](#), which contains important considerations and techniques for film installations to wall surfaces.

Film 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 can cause premature graphic failure. 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
- **Relatively non-porous.** Porous materials absorb moisture, affecting the ability of the film or sheeting to adhere to the surface.
- **Smooth.** It is more difficult for adhesive to make good contact with textured surfaces rougher than 150 grit sandpaper. Refer to [3M Instruction Bulletin Application: Signage](#) for application techniques for smooth surfaces.

## Cleaning Methods

- Read the [“Health and Safety” section on page 17](#) before continuing.
- The type of substrate determines which of the four basic cleaning methods to use.
- Improperly prepared substrates void any 3M warranty.
- Users should test cleaners in an inconspicuous area before using them on the entire surface of their substrate. Some cleaners may dull the substrate or leave contaminants on it. Cleaners with a low solvent content may not remove all contaminants.

### NOTE

Clean the substrate immediately before applying film. Dust and other contaminants collect quickly on the substrate and can prevent the film from adhering properly.

### Method 1: General Cleaning

1. Use detergent and water to clean the substrate.
  - For most surfaces, interior or exterior: Wash the substrate with 1 oz (30 ml) of synthetic detergent per gallon of lukewarm water. Avoid soaps or preparations containing waxes, oils, or lotions. Some window cleaners also contain waxes.
  - Chemicals used in some automated vehicle washing equipment may interfere with film 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, prepared according to the manufacturer's written instructions.
2. Dry the substrate thoroughly with clean, lint-free paper towels.

### NOTE

Porous materials absorb moisture. Provide adequate time and conditions for the substrate to dry.

### Method 2: Degreaser/Solvent Cleaning

These cleaners remove oils, waxes, grease, and silicone from surfaces. This list of cleaners is provided for users' convenience. Other acceptable cleaners may be available. 3M does not endorse any particular chemical manufacturer or supplier.

- 3M™ Prep Solvent-70\*
  - 16 oz. (0.5 l) spray applicator, 08973
  - 1 gal. (3.8 l) container, 08983
- 3M™ General Purpose Adhesive Cleaner\*
  - 1 qt. (0.95 l) container, 08984
  - 15 oz. (0.6 l) aerosol can, 08987
- DuPont™ Prep-Sol™ Solvent Cleaner 3919S\*
- Sherwin Williams® R7K156 or R7K158 Sher-Will-Clean™\*
- Xylene, lacquer thinner, or VM&P Naphtha

\* Product availability varies by region. Contact a local sales representative or application engineer for details.

### Cleaning Procedure

Clean the substrate immediately before applying film. Grease and oils prevent the film from adhering properly.

1. Saturate a clean paper towel with a solvent and clean the substrate surface.
2. Wipe the substrate with lint-free paper towels before the solvent evaporates from the substrate. Discard and replace paper towels as they become dirty.
3. Ensure the substrate is completely dry. If necessary, use a heat gun to dry any remaining moisture.
4. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

## Method 3: Isopropyl Alcohol Cleaning

### NOTE

Isopropyl alcohol evaporates quickly. Installers must wipe the substrate before it evaporates. The evaporation rate increases in warm and/or windy environments.

1. Saturate a clean paper towel with a mixture of 70% isopropyl alcohol (IPA) and 30% water and clean the substrate surface.
2. Wipe the substrate with lint-free paper towels before the IPA evaporates from the surface. Discard and replace paper towels as they become dirty.
3. Ensure the substrate is completely dry. If necessary, use a heat gun to dry out any remaining moisture.
4. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

## Method 4: Dust and Dry Particle Cleaning

Use this method when the surface has no contamination other than dust and/or other loose particles or debris. Dust and loose particles may interfere with film adhesion.

### Smooth Surfaces

Wipe down the entire surface with a clean Scotch-Brite™ High Performance Cleaning Cloth or equivalent micro-fiber towel. Follow the product directions for cleaning the cloth.

### Rough or Textured Surfaces

Sweep the entire surface with a soft-bristled broom to dislodge any loose particles and dust.

## Method 5: Power Washing

1. Power wash the entire surface and allow the surface to dry.
2. Remove loose particles with stiff bristled brush.

### NOTE

Follow the power washing manufacturer's instructions for cleaning. 3M is NOT responsible for substrate damage resulting from improper use of a power washer.

## 3M Graphics: Application Over Existing Graphic

Installers 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.

### 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 all of its edges extend at least 1/2 in. (1.3 cm) beyond the perimeter of the bottom graphic.
- The top graphic is smaller than the bottom graphic and all its edges are at least 1/2 in. (1.3 cm) inside the perimeter of the bottom graphic.

### NOTE

Do NOT align overlaps from the top graphic with overlaps from the bottom graphic. Doing so can lead to premature graphic failure. Refer to [3M Instruction Bulletin: Maintenance](#) 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 substrate.

## Compatibility with Substrate Shape

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

## Removal

The top film in this type of application is only removable if:

- The top film has an ultra-removable adhesive, and
- The bottom film has an adhesive that is categorized as removable with heat and/or chemicals, or permanent.

## Cleaning Procedure

- Method 1: General Cleaning; followed by Method 3: Isopropyl Alcohol Cleaning

## Cleaning Method Selection by Substrate

### Building Materials

#### Exterior Brick

- Method 5: Power Washing, OR
- Method 4: Dust and Dry Particle Cleaning

If the wall is greasy, oily, or sooty, clean the wall with trisodium phosphate (TSP) or a muriatic acid solution prepared according to the manufacturer's instructions.

#### NOTE

Always check with the property or building maintenance manager before using any strong cleaning chemicals or harsh cleaning procedures.

#### Interior Brick

- Method 1: General Cleaning; OR
- Method 4: Dust and Dry Particle Cleaning

#### Ceramic Tile, Countertop Laminate, Marble, Decorating Stone

- Method 3: Isopropyl Alcohol Cleaning; OR
- Method 4: Dust and Dry Particle Cleaning

#### Bare Concrete

#### NOTE

3M only recommends applying [3M™ Scotchcal™ Graphic Film 3662-10](#) to unsealed concrete. Graphics applied to bare concrete may fail due to entrapped moisture or moisture transfer from an exterior wall. Refer to [3M Instruction Bulletin Application: Floor Graphics](#).

1. Allow new concrete to cure for six to 12 months, or have it sealed prior to applying graphics.
2. Use Method 4: Dust and Dry Particle Cleaning.

## Sealed and Painted Concrete

Follow the concrete manufacturer's instructions for concrete sealing.

- Method 1: General Cleaning; OR
- Method 4: Dust and Dry Particle Cleaning

## Indoor Flooring

See [3M Instruction Bulletin Application: Floor Graphics](#).

## Interior Wallboard (i.e. Gypsum Board, Sheetrock®, Plaster Board) and Wall Coverings

See [3M Instruction Bulletin Application: Walls](#) for important considerations and techniques for interior wall graphics.

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

1. Prime, seal or paint the substrate. Avoid using low/no VOC paint where possible due to the poor adhesion and longer cure times.
2. Follow the cleaning and preparation recommendations in [“Primed, Sealed or Painted Substrates” on page 7](#).
3. Test for substrate integrity with the [“3M Adhesion Test for Smooth Surfaces” section on page 10](#).
4. Clean the surface using Method 4: Dust and Dry Particle Cleaning.

## Wall Coverings

All seams and edges must adhere to the wall well. Clean the surface using:

- Method 1: General Cleaning; OR
- Method 4: Dust and Dry Cleaning

### NOTE

Perform a 3M™ Adhesion Test to determine if the wall covering is suitable for your film.

## EIFS

3M strongly advises against applying graphics to the Exterior Insulation Finishing System (EIFS), also known as Exterior Wall Insulation Systems (EWI) or External Thermal Insulation Composite Systems (ETICS). No warranty will be given for any application to these surfaces.

## Composites

Some composites require special consideration to ensure graphics perform as expected.

### Body Fillers

Because most plastic type body fillers are porous, they can absorb moisture. Apply an epoxy-based primer or 3M™ Tape Primer 94 (adhesion promoter) on the body filler to help seal the surface before installing film.

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

### FRP (Fiberglass Reinforced Panel)

Gelcoat that cracks will also crack the film or sheeting. Perform the [“Outgassing Test” on page 17](#).

If the gel coat has chalked, use a mild abrasive or buffing wheel to remove any residue.

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

### Urethane Foam-filled Trailer Sides and Doors

Perform the [“Outgassing Test” on page 17](#).

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

## Flexible Substrates

### Banners

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

### 3M Flexible Awnings and Sign Faces

Method 1: General Cleaning, followed by Method 3: Isopropyl Alcohol Cleaning. For additional application instructions, see [3M Instruction Bulletin: Maintenance](#).

## Glass

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 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.
3. Repeat steps one and two as necessary until the water does not form into beads, indicating there is no coating that needs to be removed.
4. Use Method 3: Isopropyl Alcohol Cleaning.

## Metals

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

### Aluminum

- For best results, use etched and degreased aluminum or anodized aluminum.
- Method 3: Isopropyl Alcohol Cleaning

### Chrome

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

### Stainless Steel

The film or sheeting used must be recommended for stainless steel. Refer to the film or sheeting's product bulletin.

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

### NOTE

Make sure no moisture remains on the substrate, underneath the rivets, or in body seams.

### Carbon Steel

Do NOT apply film directly to carbon steel. Remove any corrosion from the steel surface, and prime or paint the undamaged substrate prior to application. After painting or priming, follow the preparation recommendations in the ["Primed, Sealed or Painted Substrates" section on page 7](#) according to the type of paint or primer used.

## Unwarranted Metals

3M strongly advises against applying graphics to the following surfaces. No warranty will be given for any application to these surfaces.

- Brass
  - The film may damage the substrate during both installation and removal.
- Copper
- Lead
- Magnesium
- Tin, tin plate, and tin alloys

## Primed, Sealed or Painted Substrates

Low/no volatile organic compounds (VOC) paints are driving change in wall film applications. The chemistry of paints has been changed over the years to drive down VOC levels due to both sustainability efforts and regulatory requirements. As a result, newly painted surfaces interact differently with film adhesive, affecting graphic films' ability to adhere to the paint.

Simple steps can maximize film adhesion. Because paint formulations are protected trade secrets, it is difficult for any film manufacturer to understand how film adhesives interact with these paints. Extensive testing has determined there is no single film or adhesive that works "best" on each paint tested. Any given film can perform well on one paint and poorly on another. However, by using the [3M™ Enhanced Adhesion Cleaning Method on page 15](#) and testing the film's adhesion to the walls, both of which are covered in this bulletin, you can quickly, easily, and successfully select the correct 3M graphic film for any given wall application.

Reading and following the techniques in this bulletin can be the difference between a successful installation and a graphic that falls off the wall prematurely.

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. The original paint may not have adequate adhesion to some substrates. Even removing changeable films may remove paint that is not firmly attached to the base material.

Although most paints are usually dry to the touch within an hour, installers cannot apply the graphic immediately after painting. Follow the manufacturer's recommended **cure** times for the product being used. Paints contain 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 the graphic needs to be installed sooner, use a product with an appropriate cure time or perform the 3M Adhesion Test appropriate to the surface on several locations on the substrate prior to application.

- Test for paint chalking by performing the 3M Adhesion Test appropriate to the surface.
- Chalked paint must be removed prior to graphic installation. Removal may be accomplished by mechanical buffing or by a chemical process on a user test-and-approve basis. Test any chemical removal on an inconspicuous area prior to cleaning the full application area.
- Retest the substrate's adhesion after removing the chalked paint.
- Some tinted paints may bleed through some films.
- Some graphic materials may bleed through onto the paint.
- Follow the recoat and curing times recommended by the paint manufacturer. Under-cured paint may outgas, prevent adequate adhesion, or prevent film from removing as expected.
- If primers and paints are used together, they should be produced by the same manufacturer and formulated as companion products to ensure good adhesion between the paint layers.
- Low/no VOC paints negatively affect films' adhesion.
- Avoid paints containing migratory components or components that are difficult to adhere to. Some paints, especially those advertised 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 such paints.
- Test all painted surfaces using the 3M Adhesion Test appropriate to the surface prior to applying film.
- Cleaning painted surfaces may change the paint's gloss, and/or small amounts of paint may transfer from the painted surface to the cleaning implements. 3M is NOT liable for any damage to painted substrates from the cleaning process.



### Baked Enamel Paint

Bake according to the manufacturer's recommendations. Cool to room temperature.

- Method 1: General Cleaning, followed by:
  - **For weathered paint:** Method 2: Solvent Cleaning, followed by Method 3: Isopropyl Alcohol Cleaning
  - **For new paint:** Method 4: Dust and Dry Particle Cleaning, followed by Method 3: Isopropyl Alcohol Cleaning

### Enamel or Oil-Based Paint

- Method 1: General Cleaning; *OR*
- Method 4: Dust and Dry Particle Cleaning

### Latex Paint

Latex paints often have less VOCs than other paints. Film is less likely to adhere to paints with low VOC levels. Use the 3M Adhesion Test appropriate to the surface to determine substrate suitability for film application.

- Method 4: Dust and Dry Particle Cleaning; *OR*
- Method 3: Isopropyl Alcohol Cleaning

### Two-part Urethane Paint

Cure two-part urethane paints 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). This type of paint does NOT cure at temperatures below 50°F (10°C). Perform the [Outgassing Test on page 17](#).

- Method 1: General Cleaning, followed by Method 2: Solvent Cleaning, and then Method 3: Isopropyl Alcohol Cleaning

### Powder-coated Paints

Waxes used in powder coatings can negatively affect adhesion. Always perform the 3M Adhesion Test appropriate to the surface to test for acceptable paint adhesion prior to installation.

- Method 1: General Cleaning, followed by Method 2: Solvent Cleaning, and then Method 3: Isopropyl Alcohol Cleaning

### Textured Paints

- Method 1: General Cleaning, followed by Method 2: Solvent Cleaning, and then Method 3: Isopropyl Alcohol Cleaning

## Plastics

Because of the wide variety of plastic materials, it is important to clean an inconspicuous area before cleaning the entire substrate to ensure the method does not damage the material. 3M is NOT liable for any damage to plastic substrates resulting from the cleaning process.

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

PETG sheeting and some acrylic sheeting may not require pre-drying. Consult the plastic manufacturer. Common types of plastic are listed below.

### Acrylonitrile Butadiene Styrene (ABS)

- Method 3: Isopropyl Alcohol Cleaning

### Acrylic (such as Lucite and Plexiglas)

- Method 3: Isopropyl Alcohol Cleaning



### Fiberglass

1. Perform the [Outgassing Test on page 17](#).
2. If bubbles appear under the film, follow the fiberglass manufacturer's instructions for appropriate curing conditions.
3. Repeat Steps 1 and 2 until the fiberglass is fully cured.
4. When no bubbles appear, use Method 1: General Cleaning, followed by Method 2: Solvent Cleaning; and then Method 3: Isopropyl Alcohol Cleaning.

### Copolyester Sign Sheet

- Method 3: Isopropyl Alcohol Cleaning

### Polycarbonate (such as Lexan® Polycarbonate Resin)

1. Follow the fabrication and handling procedures recommended by the resin manufacturer.
2. Perform the [Outgassing Test on page 17](#). Do NOT use the substrate if there is bubbling. Outgassing can continue for extended periods of time and may take weeks to show up in the field.
3. If bubbles appear under the film, follow the polycarbonate manufacturer's instructions for appropriate curing conditions.
4. Repeat Steps 2 and 3 until the polycarbonate is fully cured.
5. When no bubbles appear, use Method 3: Isopropyl Alcohol Cleaning. See [3M Instruction Bulletin Production: Thermoforming Signage](#) for specific instructions on thermoforming.

### Polypropylene and Polyethylene

Polypropylene and polyethylene are low surface energy substrates. Use the ["3M Adhesion Test for Smooth Surfaces" on page 10](#) to determine the film best suited for these applications.

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

Films with low adhesion can work if the polypropylene or polyethylene substrates are flame treated (see the ["Flame Treating" section on page 16](#).)

### Polystyrene, Styrene

Do NOT use for exterior applications.

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

### Rubber and Caulking Materials

NOT warranted or recommended. Films have poor adhesion to these materials.

### Poster Board

Common types of poster board include expanded PVC (such as Sintra® and Lustra®), paper-based poster board (such as Fome-cor®), and corrugated plastic sheets (such as Coroplast®).

- Method 4: Dust and Dry Particle Cleaning, OR Method 3: Isopropyl Alcohol Cleaning

### Wood Products

"Wood Products" include, but are not limited to:

- Fiberboard or oriented strand board
- Hardboard
- Plywood
- Melamine board
- High density overlaid U.S. Product Standard PS 1, general use or sign grade only
- Medium density overlay plywood - exterior grade (fir only, not oil treated)
- Simpson Highway® HDO panels or equivalent
- Other wood products

## Wood Product Preparation Procedure

1. Perform a [“3M Adhesion Test for Smooth Surfaces” on page 10](#) to determine if the substrate is suitable for the film.
2. Clean the substrate with Method 3: Isopropyl Alcohol Cleaning.
3. Repair any loose or damaged areas.
  - a. Secure any loose sections with the proper adhesive for the substrate.
  - b. Fill any damaged areas with Bondo® Wood Filler or a similar product.
  - c. Allow it to fully cure.
  - d. Sand the filled areas with 180 to 220 grit sandpaper until it is perfectly smooth.
4. Re-clean all surfaces with Method 3: Isopropyl Alcohol Cleaning to remove any sanding residue left from the Bondo® Wood Filler or similar product used.
5. If the surface of the wood product is raw or the results from the [“3M Adhesion Test for Smooth Surfaces” on page 10](#) were not acceptable, add two coats of a 3M approved primer/sealer to the surface of the substrate.
  - a. Allow each coat of primer/sealer to fully cure.
  - b. Lightly sand between coats and after the final coat to smooth the finish. Follow the manufacturer’s recoat and cure time recommendations.

**Table A.** 3M Recommended Primers and Sealers

Primer/Sealer	Dry Time	Cure Time	Interior	Exterior
<b>ZINSSER® Bulls Eye 1-2-3® Water-Base Primer*</b>	<b>Touch:</b> 30 minutes <b>Recoat:</b> 1 hour	7 days	<b>X</b>	<b>X</b>
<b>ZINSSER® Gardz® Problem Surface Sealer*</b>	30 minutes	3 hours (3M recommends a 24 hour cure time)	<b>X</b>	
<b>ZINSSER® ALLPRIME™ Water-Base Primer Sealer*</b>	30 minutes	3 hours (3M recommends a 24 hour cure time)	<b>X</b>	
<b>INSL-X® Aqua Lock® Plus 100% Acrylic Primer Sealer*</b>	<b>Tack Free:</b> 30 minutes <b>Recoat:</b> 1 hour	3 to 4 days	<b>X</b>	<b>X</b>

\* Product availability varies by region. Contact a local sales representative or application engineer for details.

6. Perform a final cleaning with Method 3: Isopropyl Alcohol Cleaning, prior to installing the film.
7. Apply 3M™ Tape Primer 94 (adhesion promoter) as required to all substrate edges and corners.

## Special Testing or Surface Preparation

### 3M Adhesion Test for Smooth Surfaces

#### Purpose of Adhesion Test

This test is designed to show a film’s initial adhesion capability on a given surface, as measured in grams. This test is only applicable to smooth surfaces cleaned according to 3M’s recommendations in this bulletin. This test does NOT predict or guarantee removal of graphics using this test. The testing method described here is identical to the testing procedure in the 3M™ Graphic Film Adhesion Test Kit for Smooth Walls.

#### Limitations of Test and Cleaning Method

This test cannot detect problems with preexisting variations within a wall such as a poor paint to wall surface bond. Such problems may result in poor film adhesion as well as substrate damage upon removal of the film.

### Test Conditions

- Users should perform adhesion tests in inconspicuous areas on the same surfaces on which they plan to apply film.
- Users should perform the test on each surface where film will be applied.
- When applying film to more than one surface, test each surface individually. While one surface may look the same as another in color, texture, and gloss, they may have been painted at different times and/or with different paints, primers, and/or sealers, which may affect adhesion. Testing a different surface/paint/primer/sealer than will be used in the job will NOT provide the adhesion values and information needed to make a proper evaluation.

#### NOTE

For each film considered, users should test THREE samples of the same film on the same surface and average the results. Users can run all three samples at the same time.

### Supplies Needed

- Copy or cut out the [“Measured Reference Guide” on page 19](#). This is used during the test to help installers gauge how fast to pull the film strip.
- A 3M™ Adhesion Test Kit (Part Number 7100130285), or the following tools:
  - Spring scale
    - 0 to 1000 grams, part number 8003-MN
    - 0 to 2000 grams, part number 8004-MA
  - 3M™ Rivet Brush RBA-1
  - Hole punch
  - Strips of each film you plan to test

#### NOTE

See [“3M™ Enhanced Adhesion Cleaning Method” on page 15](#) for a list of other necessary supplies.

### Prepare the Film Test Strips

1. Cut three 1 in. by 10 in. (2.5 cm by 25 cm) strips of each film to be tested on a given surface.
2. Mark the specific film name or code on each test strip.
3. Remove about 2 in. (5 cm) of liner from each strip and fold the newly exposed adhesive back on itself to create a 1 in. (2.5 cm) tab.
4. Use the hole punch to make a hole in the center of the tab.



**Figure 1.** Preparing Film Strips

### Film Adhesion Test Procedure

1. Wipe the surface with a clean microfiber or lint free cloth to remove particulate contaminants. There is no need for additional cleaning yet as this test identifies a baseline adhesion value for the surface.
2. Remove the liner and, with the tab at the top, adhere the test strip to the surface. Apply all three strips concurrently.
3. In a circular motion with firm pressure, move the RBA-1 rivet brush up and down the applied strips. Go over each strip three times. See Figure 2.
4. Wait 15 minutes to allow adhesion to build.
5. Holding the “S” hook at the top of the scale, move the sliding scale until it reads “0”. See Figure 3.
6. Tape the Measured Reference Guide Rule on the wall next to the film strip to be tested, aligning the top of the film strip with “0.0” on the Guide Rule.
7. Slide the scale’s “S” hook through the hole in the tab and let the scale hang.
8. Holding the scale between your finger and thumb, pull the scale straight downward (180 degrees from the surface) at a steady rate of 1 in. (2.5 cm) per 5 seconds. Ensure neither your hand nor the scale touch the surface. Once started, keep pulling the film from the surface until the film is fully released.
9. While pulling, observe the maximum value on the scale (in grams). Once complete, note the release characteristics of the sample from the surface (i.e., smooth, consistent release vs. jerkiness).
10. Repeat Steps 4 through 8 for each test strip.

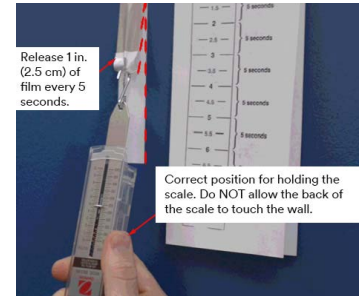
- Average the maximum values from the three test strips and record this number. Compare that number with the relevant value in the Minimum Acceptable Adhesion column of [Table B on page 12](#).



**Figure 2.** Adhering Film Strips



**Figure 3.** Zeroing Scale



**Figure 4.** Release Test

## Analyzing the Results

- If the average maximum value is greater than the Minimum Acceptable Adhesion value, the film should be acceptable for adhesion to the surface.
- If the average maximum value is lower than the Minimum Acceptable Adhesion value, wipe the surface with a mixture of 70% IPA and 30% water. Repeat the adhesion test. At this point, if the average maximum value is above the Minimum Acceptable Adhesion value, use the product with the 3M™ Enhanced Adhesion Cleaning Method for the project. If the average maximum value is still below the Minimum Acceptable Adhesion value, switch to a film with a higher minimum acceptable adhesion number. For example, if 3M™ Controltac™ Graphic Film w/Comply™ Adhesive v3 IJ180Cv3-10 tested below 600 grams on the surface, move to 3M™ Print Wrap Film IJ180mC-10LSE, which has 800 grams as a Minimum Acceptable Adhesion value.
- Repeat the adhesion test procedure with the new set of samples. Follow Steps 1 through 2.

**Table B.** 3M Adhesion Reference Table

Color	Reference Color Core	Adhesive Type	Suggested 3M Film(s) *	Minimum Acceptable Adhesion (Grams)
Yellow	Yellow	Ultra Removable/ Changeable	3M™ Scotchcal™ Changeable Graphic Film IJ3555 3M™ Controltac™ Ultra Removable Graphic Film IJ180mC-10UR 3M™ Promotional Film IJ56C	400
Black	Black	Removable with Heat	3M™ Controltac™ Print Film 40C-10R 3M™ Controltac™ Print Film 40C-20R 3M™ Envision™ Print Film 48C-20R	500
Red	Red	Removable with Heat	3M™ Print Wrap Film IJ280	600
Orange	Orange	Removable with Heat	3M™ Controltac™ Graphic Film w/Comply™ v3 Adhesive IJ180Cv3-10 3M™ Print Wrap Film IJ180mC-10 3M™ Envision™ Print Wrap Film LX480mC/SV480mC 3M™ Controltac™ Graphic Film 180mC Series with Comply™ Adhesive 3M™ Wrap Film Series 2080	600
Blue	Blue	Not Removable/ Permanent	3M™ Scotchcal™ Graphic Film Series IJ35C 3M™ Scotchcal™ Graphic Film Series IJ35 3M™ Scotchcal™ ElectroCut™ Graphic Film Series 7125/7725 3M™ Scotchcal™ Graphic Film Series IJ3650	800
Green	Green	Not Removable/ Permanent	3M™ Controltac™ Graphic Film IJ180mC-10LSE 3M™ Scotchcal™ Graphic Film Series 3690LF-10	800
	White	Not Removable/ Permanent	3M™ Scotchcal™ Graphic Film 3662-10	1000
N/A	NONE	Not Removable/ Permanent	3M™ DI-NOC™ Architectural Finishes	800

\* Product availability varies by region. Contact a local sales representative or application engineer for details.

**Table C.** Adhesion Test Result Recommendations

Scale Value	Release Characteristics	Recommendation
Less than Minimal Acceptable Adhesion	Removes very easily; little or no resistance	Unacceptable adhesion; do NOT use this film.
Equal to Minimal Acceptable Adhesion	Smooth, consistent release; no jerkiness, but more difficult to release	Acceptable adhesion; may be removable with heat/chemicals; removal may cause wall damage.
Greater than Minimal Acceptable Adhesion	Smooth, consistent release; no jerkiness, but substantial resistance to releasing	Excellent adhesion; removal will cause damage.

4. Factors which may cause unsatisfactory test results:
  - a. Test strip exhibited a jerky or uneven removal:
    - Inconsistent or low adhesion values may be due to high and low spots in the surface texture preventing the film's adhesive from making full contact.
    - Cold wall and air temperatures may prevent the adhesive flowing or making full contact.
  - b. Test strip removes paint from the substrate:
    - If any paint/primer/sealer is pulled off with the test strip, the paint/primer/sealer is NOT sufficiently bonded to the wall and film should NOT be applied until the problem is corrected, a new paint/primer/sealer is fully cured, and the ["3M Adhesion Test for Smooth Surfaces"](#) is performed again with satisfactory results.
5. Poor film choice for the job:
  - Any film considered for a job should be tested before printing to ensure it is the right choice.
6. Films with Comply™ Adhesive (air release channels):
  - Films with Comply™ adhesive (e.g., film 3M™ Controltac™ Graphic Film w/Comply™ Adhesive v3 IJ180Cv3-10, 3M™ Envision™ Print Wrap Film LX480mC/SV480mC) which have air release channels to ease installation, may be used for smooth surfaces. However, if their tested adhesion values are too low, 3M recommends trying a film without Comply™ adhesive, as such films typically have higher adhesion values.
7. Films that require a greater adhesion level include:
  - Films exposed to indoor environmental changes, such as direct sunlight or close proximity to heat sources;
  - Overlaminated films (which are heavier); and
  - Large pieces of film (which are heavier).

## Options for Film That Must Be Removed or Changed

3M testing shows that using the 3M™ Enhanced Adhesion Cleaning Method substantially improves film adhesion for almost every film. However, the higher adhesion means the film may be more difficult to remove and could pull paint/primer/sealer off the substrate or damage the surface of wallboard. In the case of this type of failure the following options can be considered.

### 1. Construct a temporary wall.

Consider constructing a temporary wall and securing it to the original wall. Be sure to properly paint, prime, and seal the temporary wall when necessary and allow the paint/primer/sealer to cure for the length of time specified by the manufacturer. Then, follow the cleaning and testing procedures described in this bulletin before installing the film. When the film is no longer needed, remove the temporary wall and repair any mounting holes.

### 2. Apply a new surface to an existing wall.

Some customers, such construction sites, may need to change film often. This option can be used on a temporary wall or on a wall that does not need to be reused at a later time.

Apply an aggressive film such as [3M™ Scotchcal™ High Tack Graphic Film IJ39-20](#) to the wall. Most removable or changeable 3M films will adhere very well to film IJ39-20 and remove reasonably well. Permanent adhesive films will NOT remove easily and may damage film IJ39-20. Installers can also apply one film over another if the new film has a gray pigmented adhesive, which offers good hiding power. Before installing film over IJ39-20, follow the cleaning and testing procedures described in this bulletin.

## 3M Adhesion Test for Textured Surfaces

### Purpose of Adhesion Test

This test is designed to show whether a film for textured surfaces, when applied with heat and pressure, will continue to build adhesion during a one week (3M recommended) test period, or if it will peel off easily, indicating insufficient adhesive bond.

### Limitations of Test and Cleaning Method

This test cannot detect problems with pre-existing variations in the substrate or poor paint-to-wall bonds. Such problems may result in insufficient film adhesion as well as wall damage when film is removed. 3M is NOT responsible for the results of textured wall installations.

#### NOTE

Removal of any film from a painted and/or textured wall has a risk of pulling paint, finish, or texture off the wall. Increasing the film's initial adhesion by using the processes described in this bulletin may increase damage to a substrate if removal is attempted.

### Supplies Needed

- Industrial heat gun with electronic readout, capable of achieving and sustaining 1000°F (538°C), with a nozzle that fits the 3M™ Two-Handled Textured Surface Applicator TSA-4.
- 3M™ Two-Handled Textured Surface Applicator TSA-4
- Heat resistant gloves
- Samples of Film IJ8624 with Overlamine 8524 and/or Film LX480mC/SV480mC with Overlamine 8550M:
  - **Option 1, preferred for most accurate results:** A 2 ft by 2 ft (61 cm by 61 cm) piece of film/overlamine, printed with the ink that will be used for the job.
  - **Option 2:** A 2 ft by 2 ft (61 cm by 61 cm) piece of film/overlamine, unprinted.
  - **Option 3:** An 8 in. by 11 in. (20 cm by 28 cm) piece of film/overlamine, unprinted—at least large enough to cover most of two blocks and one grout line.

#### NOTE

Use the 3M recommended tools and procedures for this test. Any other methods will NOT result in accurate test results.

### Substrate Considerations

- **Pre-cast concrete material.** This material can have an oily surface and may be speckled with dust because of the production process. These characteristics inhibit good film adhesion.
- **Greasy or sooty substrates.** Consider using trisodium phosphate and water according to the manufacturer's instructions, or use 3M™ All Purpose Cleaner and Degreaser, diluted as recommended. Scrub the wall with a brush. Vacuum the substrate with a wet-dry vacuum, then allow it to dry until it both looks and feels dry to the touch. Drying can take at least 24 hours, and more in humid environments.
- **Outdoor unsealed surfaces** such as concrete can trap moisture, which may lead to film lifting or the growth of mold under the film. 3M recommends applying sealant along the top edge of the film. This can prevent water from being trapped behind the film, which can lead to lifting as well as mold creation.

#### NOTE

Always check with the property or building maintenance manager before using any strong cleaning chemicals or harsh cleaning procedures.



## Film Adhesion Test Procedure

1. Follow the [“3M™ Enhanced Adhesion Cleaning Method” on page 15](#) to prepare the area where you will apply the film.
2. Apply the film with the TSA-4 tool. See “Installation to Textured Walls - General Instructions” in [3M Instruction Bulletin Application: Walls](#) for specific installation instructions.
  - a. For Film IJ8624 with Overlaminates 8524, move at a rate of 2 in./sec (50 mm/sec).
  - b. For Film LX480mC/SV480mC with Overlaminates 8548G, Overlaminates 8549L, or Overlaminates 8550M, move at a rate of 3 in./sec (75 mm/sec).
3. 3M recommends leaving the film in place for one week to achieve full adhesion and to accurately assess adhesion.
4. After one week, inspect the film for obvious signs of lifting, and then try to remove the film. Loosen a corner and pull the film diagonally across itself at an 180° angle, holding it close to the wall. Compare your results to the following table.

## Test Evaluation - Textured Walls Only

**Table D.** Textured Surface Adhesion Test Evaluation

Release Characteristics	Conclusions
Film removes with some resistance; pulls off little or no paint	The film should perform satisfactory on this wall.
Film removes easily	No increase in adhesive bond; use of the film on this substrate may result in premature graphic failure. The film should NOT be used on the tested substrate.
Removing the film pulls off substantial paint, finish, or texture	No paint primer; insufficient paint curing.
Film popped out of grout lines	If the grout lines are either raked or under cut and deeper than 1/8 in. (3.2 mm) raked, or under cut, but adhesion is otherwise good, trim the installed film using the “Mosaic Graphic Technique” described in <a href="#">3M Instruction Bulletin Application: Walls</a> , for the best results.

## 3M™ Enhanced Adhesion Cleaning Method

### NOTE

For your safety, always wear protective eye wear and disposable gloves when cleaning walls.

### Cleaning Procedure

1. Clean stubborn grease and grime with your preferred method.
2. Prepare a cleaning solution consisting of 70% isopropyl alcohol and 30% water in a spray bottle.
3. Soak a clean, lint-free cloth with the cleaning solution until it is dripping wet.
4. Clean the test or application area with overlapping strokes. Some paint particles may migrate to the cloth.



**Figure 5.** Soaking a Lint-free Cloth



**Figure 6.** Paint Particles After First Cleaning

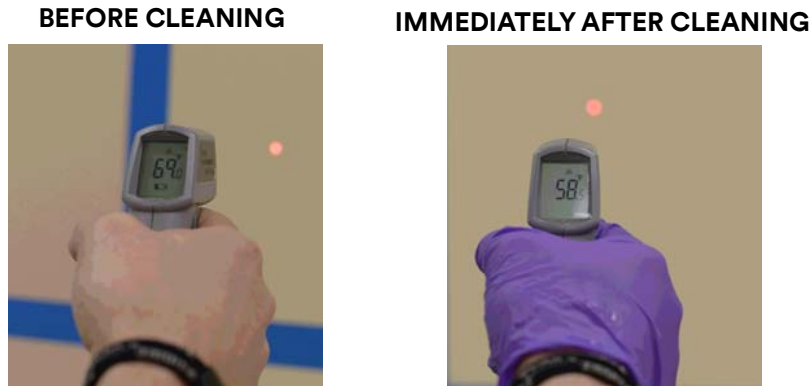
### NOTE

Change cleaning cloths often to avoid redepositing contaminants on another part of the wall. Soak each new cloth with the cleaning solution.

5. Thoroughly soak another clean, lint-free cloth with the cleaning solution and wash the wall again.
6. The alcohol in the cleaning solution will lower the surface temperature of the wall by as much as 10°F (5.6°C)—a noticeable difference. When the alcohol has completely flashed off—after about 10 minutes—the wall will return to its normal temperature.



Use an infrared thermometer to accurately measure the temperature before cleaning the surface and immediately after cleaning, or simply touch the back of a hand to the cleaned area. When it no longer feels cool, it is dry and the installer can proceed with the film adhesion test or film installation.



**Figure 7.** Testing Wall Temperature

#### NOTE

To help ensure all areas of the substrate are cleaned and to prevent changing the substrate's gloss in areas the graphic does not cover:

- Mark off sections of the installation area with masking tape and clean one area at a time to avoid missing any areas.
- Mark off the size of the graphic with masking tape and clean only within that area, as cleaning can reduce paint gloss.

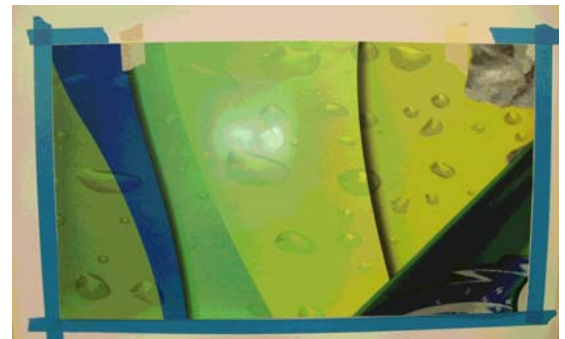
#### Establish This Best Practice

3M recommends establishing this cleaning method as a best practice for every film adhesion test as well as every actual film installation.

#### Flame Treating

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. Touch the tip of the flame's outer blue envelope (not the inner yellow or red cone) to the material for one second. Longer exposure can deform or soften the material. Flame treating is NOT heat treating.
4. Pour 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.
5. Thoroughly dry the surface, but do NOT touch it with your bare hands.
6. Apply the film to the substrate shortly after flame treating. The surface oxidation will disappear within minutes after treatment.



**Figure 8.** Clean Within Taped Area

## Outgassing Test

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

1. Create a test panel by applying at least a 12 in. by 12 in. (30.5 cm by 30.5 cm) piece of the film or sheeting used to make the graphic to the substrate. Films vary in their ability to allow gas to escape. Use [3M™ Scotchlite™ Reflective Graphic Film 680-10](#) or [3M™ Scotchgard™ Graphic and Surface Protection Film 8993](#) for the greatest likelihood that the substrate will not outgas.
2. Leave the test panel outside for 24 hours at 70°F (21.1°C) or higher. Alternately, if possible, oven bake for a minimum of two hours at 150°F (66°C) or five minutes at 350°F (177°C).

### NOTE

Outgassing is substrate and temperature dependent. Outgassing testing times may vary.

3. If bubbles appear under the film, the substrate is outgassing. Repeat the test daily until bubbles no longer appear. If outgassing continues after repeated tests, contact the manufacturer for assistance.
4. If no bubbles appear, the substrate is likely suitable for graphic application.

## Health and Safety

### Chemicals

When handling any chemical products, read the manufacturers' container labels and the Safety Data Sheets (SDS) for important health, safety, and environmental information.

[Follow this link to obtain SDS sheets for 3M products.](#)

[Follow this link to obtain information about substances of very high concern \(SVHC\) for EU products.](#)

### Tools and Equipment Usage

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

### Air Quality Regulations

Country, state, or regional volatile organic compound (VOC) regulations may prohibit the use of certain chemicals with VOCs in graphic arts coatings and printing operations. Check with local environmental authorities to determine whether use of this product may be restricted or prohibited.



### Ergonomics

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 or removing graphics, follow these practices to improve comfort and avoid injury:

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

### Ventilation

Always provide adequate ventilation to remove emissions resulting from the flame treating process. Failure to provide adequate ventilation can result in operator exposure.

## Warranty Information

### Technical Information

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