Instruction Bulletin 5.37
Release L, Effective March 2014 (*Replaces K, Nov 13)*
See Bulletin Change Summary at end of Bulletin

A Guide to Understanding and Applying Graphics to Common Smooth and Textured Wall Surfaces

Why you'll want to read this Bulletin *before* you wrap another wall!

It's all about a successful installation.

Low VOC paints are driving change in wall film applications. The chemistry of paints has been changing over the years to drive down the level of Volatile Organic Compounds, VOCs, due to both sustainability efforts and regulatory requirements. These new paint formulations have changed how the painted surface interacts with the adhesive on films, affecting the films' ability to adhere to the paint.

Simple steps can maximize film adhesion. Because the paint formulations are protected by trade secrets, it is difficult for any film manufacturer to understand how film adhesives interact with these paints. We have found through extensive testing that there is no single film or adhesive that works "best" on each paint tested. In fact, one film can perform well on one paint and poorly on another paint. However, by using the new 3M™ Enhanced Adhesion Cleaning Method and testing the film's adhesion to the walls, which are covered in this Bulletin, you can quickly, easily and successfully adhere almost any 3M wall film to nearly any paint.

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

Important Considerations

- Due to the wide variety of surface types and surface finishes, including low VOC paints, 3M provides only a Basic Product Warranty for unused material; no warranty is implied or offered for the adhesion, printed or applied appearance, durability or removability. See details on page 4.
- A change in gloss or wall staining after film removal is possible. It is usually the result of one or more of the following: the initial wall cleaning process, paint and pigment quality, exposure to heat and light, migrating particles in the paint, and/or adhesive residue. See details on page 8.

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Films Mentioned in This Bulletin

3M™ Envision™ Print Wrap Film 480Cv3
3M™ Envision™ Gloss Wrap Overlaminate 8548G
3M™ Controltac™ Graphic Film with Comply™ V3 Adhesive IJ180Cv3-10
3M™ Scotchcal™ Luster Overlaminate 8524
3M™ Scotchcal™ High Tack Graphic Film IJ39-20

1. Information for Designers, Specifiers, Graphics Manufacturers and Installers

1. Your Role in a Successful Installation

A successful installation is the result of a collaboration between designers, specifiers, graphics manufacturers (or convertors) and installers in order to meet the needs of the customer. Being aware of the details of the installation will help ensure success.

2. Understand the Customer's Expectations

- Length of time the film must remain on the wall.
- Whether removability is a requirement. See Step 10, page 4.
- Expectations of wall appearance upon removing film.

3. Know the characteristics of each application surface (wall) and the environment to which the film will be exposed.

- **Jobs that include multiple walls.** Consider the characteristics of each wall, which may have various textures, exposures or finishes. If there are multiple types of walls, the graphics manufacturer may need to select more than one 3M film to complete the job.
- **Wall soundness.** The soundness of any wall may vary from spot to spot and no test can ensure consistent results over the entire application area.
- **Paint.** "Paint" includes all wall finishes. Some finishes may have silicone, graffiti-resistance or texturizing additives that can make film adhesion even more difficult.
- **Physical contact.** Exposure to physical contact with people, animals or equipment.
- **Indoor smooth walls**
  - Constant or variable temperature and/or humidity.
  - Direct or indirect sunlight.
  - Wallboard that conceals heating or cooling ducts, pipes or water source, behind or in close proximity. Moisture that seeps into wallboard, even if it has been sealed on the face, will likely result in further wall damage if the film is removed from it.
  - Block walls in front of equipment such as a pool. If well sealed and cured, may not cause a problem.
- **Outdoor textured walls**
  - **Excessive texture.** More than 1/8 inch (3 mm) variation in high and low spots of substrate texture and grout lines, as well as square cut or undercut grout lines, may result in lifting.
  - **Insufficient adhesion.** If installed film can be easily removed from a textured wall using a force of <2 pound/lineal inch (0.36 kg/cm), it is unlikely to be durable in an outdoor application.
  - **Exposure to moisture.** Film exposed to water from rain or irrigation systems can be trapped behind film applied outdoors, leading to lifting as well as the creation of mold. Applying a bead of sealant along the top of the film helps reduce these issues.

⚠ Caution

Mold or mildew on top of or behind the film may be a health concern for some individuals, especially during film removal.

  - **Excessive temperatures.**
    - Substrates that reach temperatures higher than 115°F (46°C) may exhibit lifting, especially in grout lines.
  - **Freezing and thawing cycles.** For a textured masonry wall that has both an indoor facing side and an outdoor facing side and no effective moisture barrier, moisture vapor transmission occurs naturally when the indoor wall has a room environment that is warmer and moister than the outdoor wall. When film is applied to the outdoor wall and there are cycles of freezing and thawing, moisture can be trapped between the wall and result in film lifting, as well as in spalling both within the wall and on the outdoor facing wall. Such damage can be unsightly and costly to repair.

    Salts passing through masonry may be trapped behind the film. Salt collection on the masonry wall for extended periods may cause staining or discoloration.

    Always check and follow your local building codes. 3M is not responsible for damage caused by using this product for any wall application.

4. Graphics Manufacturing Considerations

- **Smooth Walls.** Film must retain some flexibility in order to achieve maximum adhesion. Do not use a stiff or thick overlaminate (over 3 mils) on the base film.
- **Textured Walls.** 3M film applied to a textured wall requires using the recommended overlaminate: Film IJ8624 with overlaminate 8524, or film 480Cv3 with overlaminate 8548G.
- **Imaging method.** Use only the inks recommended for the film you use and follow the ink's Product & Instruction Bulletin for proper use. Solvent inkjet printed film must have sufficient time for all solvent to evaporate before the graphics manufacturer applies the overlaminate (3M recommends 24 hours for best results). Failure to do so may result in outgassing when the film is applied, which can contribute to poor or inconsistent film adhesion.
- **Inform the installer.** The graphics manufacturer needs to convey details about the graphic construction to the installer.

5. Perform a 3M Wall Film Adhesion Test on the Walls and with the Films You Plan to Use

Important Note	**Smooth walls:** Testing the film adhesion on smooth walls takes less than 30 minutes. **Textured walls:** Testing film adhesion on textured walls takes about 30 minutes to perform, but must stay in place for one week (recommended) to get an accurate assessment of adhesion strength. Plan ahead so you can complete this important test!

- **Either the graphics manufacturer or the installer can do film adhesion tests.** It's important to test both the films you plan to use and the walls that will receive film before the full job is printed. In many cases, the graphics manufacturer may be in the best position to do the adhesion tests. If testing is done by the installer, they need to report the results to the graphics manufacturer.
- Test the film(s) on each wall to receive film. The paint used on different walls may look the same but have a different paint chemistry or cure time—factors that affect adhesion.
  - 3M Smooth Walls Film Adhesion Test: see page 9.
  - 3M Textured Walls Film Adhesion Test: see page 12.

6. Examining Job Site Walls

At some point before the installation, it is a good practice to contact the property or building maintenance manager for the installation site to determine the following.

- Will any wall repairs be made in time to dry properly?
- Will any new finishes have the proper time to cure? Cure time varies greatly and can be as long as 30 days.

Important Note	It is critical that the paint be allowed to cure for the entire time period stated by the paint manufacturer.

- Does the wall show poor paint-to-substrate bond?
  - Obvious: peeling, lifting or bubbling of the paint.
  - Less obvious: multiple layers of paint on the substrate. The bond of one or more layers to another layer may not be adequate. The weight of the film on such a wall may contribute to the separation of paint layers, resulting in paint and film falling off the wall.

7. Considerations in Bidding a Job

- Include time for doing the 3M Wall Film Adhesion Tests. The wall test must include travel time and testing time. The following are estimates only based on 3M experience performing tests.
  - Testing 3 different films on 1 smooth wall: 30 minutes
  - Testing 1 film on 1 textured wall: 45 minutes. Remember, the film must be left in place for 1 week, so consider the time needed to return to the job site.
  - Cleaning a wall prior to installing the job: 30 minutes for 125 square feet (11.6 square meters)

8. Proper Wall Cleaning is an Essential Step to Good Adhesion

Using the **3M™ Enhanced Adhesion Cleaning Method** on page 14 helps make sure the wall is ready to receive and hold film. Adopting this as a best practice for every installation can make the difference between success and failure.

9. Using the Proper Installation Techniques

Installers must use the proper tools and installation techniques, as described in this Bulletin and any others recommended by 3M.

10. Limitations and Warranty

- 3M provides only a Basic Product Warranty only for unused material; no warranty is implied or offered for the adhesion, printed or applied appearance, or durability.
- 3M does not warrant easy or clean removal of any film, even film described as removable or changeable, from indoor or outdoor walls. Removal may damage the substrate by removing small to large amounts of paint, changing the gloss of the paint, or pulling the paper off the wallboard. The bond of a paint to the wall is often less than the bond of the film to the paint. Proper removal techniques may help minimize damage.
- The **3M Wall Film Adhesion Tests** (smooth walls, page 9, or textured walls, page 12) may not detect problems with pre-existing variations in the substrate, poor paint-to-substrate bond, poor bond between multiple layers of paint on a substrate, or insufficiently cured paint.
- Film applied to contaminated walls, or walls that exhibit visible signs of peeling, lifting, bubbling, or dampness are likely to fail.
- The color and/or shape of any underlying film or image may be visible after application of a new film. Films with a gray adhesive increase have increased hiding power.
- Under-cured paint may continue to outgas and cause bubbles in film that appears to be well applied right after application.

2. Worksheet for Walls

Important Note	The results of the 3M Wall Film Adhesion Tests will help determine which film is most suitable for the job. In some cases, one job may require using more than one film, depending on the adhesion that can be achieved on each different wall.

Make Copies of This Page As Needed

Installation Site Information	Adhesion Test Results		Finished Graphics To Be Installed		
Business Name	Test Strip Film Number	Adhesion Value	Graphic Description	Graphic Size (Square feet)	Location of Wall
Address					
City/State/Zip					
Customer Information					
Contact Name					
Business Name					
Address					
City/State/Zip					
Area Code/Phone					
Graphics Manufacturer					
Business Name					
Area Code/Phone					

Installation Site Information	Adhesion Test Results		Finished Graphics To Be Installed		
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Address					
City/State/Zip					
Customer Information					
Contact Name					
Business Name					
Address					
City/State/Zip					
Area Code/Phone					
Graphics Manufacturer					
Business Name					
Area Code/Phone					

3. Wall Textures and Composition

A. Definitions

Application surface. The actual surface to which a film is applied. This may be the finish (paint, varnish, wallpaper), a high tack film applied to the substrate, a composite material or the bare substrate. The application surface is simply called a wall in this Bulletin.

Substrate. The supporting structure of a wall, such as wood framing members covered by wallboard, or hard surfaces such as brick, concrete block, stucco, etc.

Texture. This is the tactile feeling that every wall has. Texture can be as smooth as glass or as rough as heavily textured concrete—and everything in between. Whether it is smooth or rough, texture has a significant affect on film choice, ease of application, film adhesion and removal. These descriptions provide a way to generally categorize texture but are subject to interpretation. Use them in combination with the photos of textures on the next page to better understand the texture of your walls, and make the right film choices and use the proper installation techniques.

- **Smooth texture.** Little or no surface variation. Allows the easiest application since the adhesive can make contact with the entire surface.

  Painted wallboard has more texture than you might expect. See page FIGURE 19, page 17, for details.

  Film IJ8624/8524 is intended only for use on textured surfaces.

  Film 480Cv3/8548G may be used on smooth walls or textured walls.

- **Unsmooth texture**. Has moderate high spots and low spots, which range from just a little texture (like fine sandpaper) to heavy texture (like brick). Extra effort and more time-consuming application techniques are needed to conform the film to the texture. The amount of variation in texture changes throughout any given textured substrate, and your results using the same measuring tool could vary. These descriptions help differentiate textures using the terms related to 3M film recommendations.
  - **Medium unsmooth texture.** Relatively equal distribution of moderately high and low spots.
  - **Heavy unsmooth texture**. Irregular and severe high spots and/or low spots.

Important Note	Do not use 3M's films for textured walls on substrates with loose surfaces, such as loose sand-textured block. The textured should be more firmly anchored, like sandpaper.

B. Common Indoor Wall Composition

This describes the wall's substrate material.

Brick. A kiln-dried, hard clay surfacing material, thicker than tile, for indoor or outdoor walls. Inherently smooth, but may be patterned or textured before firing. Usually has grout lines.

Concrete. A building material made from a mixture of portland cement, water, fine and coarse particles. Texture can range from smooth to heavy.

Concrete masonry (CMU). A usually hollow building block made with concrete. May be painted or unpainted. Texture is usually medium. Usually has grout lines.

Grout lines (mortar joints). A concrete or composite product used to hold together building materials such as concrete blocks and brick. Such lines can range greatly in width, depth, profile and texture. 3M films for textured walls work best if the grout lines are not more than about 1/8 inch deep, and are flush, concave or V-shaped. Excessive rough texture, excessively steep elevation change—such as Raked, or an undercut profile—such as Weathered or Struck, generally provide challenging applications that may not have the results you desire. The **Mosaic Graphic Technique** on page 22 is the most effective way to manage film in excessively deep grout lines.

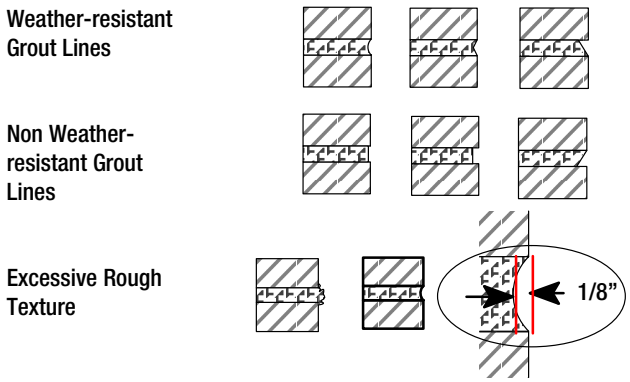


FIGURE 1 Grout Line Examples

Painted wallboard. Common indoor wall surface, primed, painted and thoroughly dried. Texture varies depending on paint technique.

Stucco. A cement or plaster mixture that is hand or machine applied to indoor or outdoor walls. The example is between smooth and medium texture, although texture can range from smooth to heavy.

Tile. A kiln-dried, thin, hard clay surfacing material for indoor or outdoor walls. May be glazed or unglazed. Texture is usually smooth or a smooth base with an irregular pattern of light texture. Usually has grout lines.

C. Common Wall Finishes

Vinyl or paper wallcovering. A thin to heavyweight material used to cover indoor walls. Texture can range from smooth to heavy and may have little to significant pattern. These materials may contain plasticizers that migrate to the surface and can cause premature film adhesion failure.

Note: Film intended for use on textured walls but applied to any vinyl or paper wall covering or wallboard, will typically also pull off the wall covering or wallboard paper during removal. Use at your own risk.

Paint. Refer to the Paint section, page 8.

Glaze, varnish or other surface sealant. A product applied to a wall to provide color, gloss, protection and/or cleanability.

Note: In this Bulletin, “paint” refers to any type of wall finish.

D. Photos of Textures

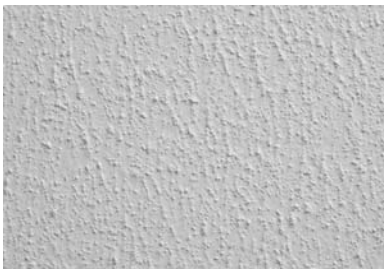
Use the descriptions on this page and the photos on page 7 to determine both the texture and wall composition of common wall surfaces. These characteristics are important in selecting and using the right film as well as determining if the wall is suitable for a successful film application.

Painted Wallboard -
Smooth Texture
❑ Use Smooth Wall Film

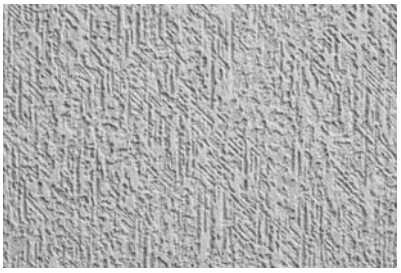
Vinyl Wallcovering -
Heavy Unsmooth Texture
❑ Use Textured Surface Film

Concrete -
Heavy Unsmooth Texture
❑ Use Textured Surface Film

Painted Wallboard -
Medium Unsmooth Texture
❑ Use Smooth Wall Film

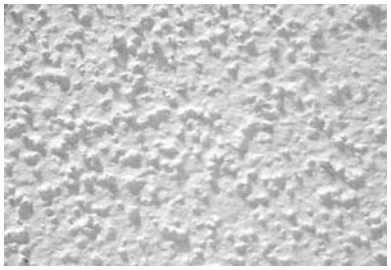


Vinyl Wallcovering -
Heavy Unsmooth Texture
❑ Use Textured Surface Film



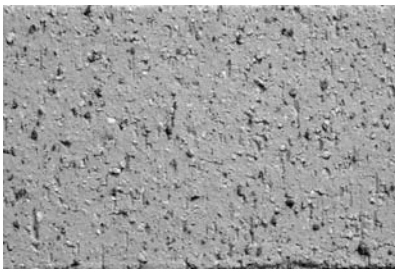
CMU/Concrete Block, Painted/Unpainted
Medium Unsmooth Texture
❑ Use Textured Surface Film

Painted Wallboard -
Heavy Unsmooth Texture
❑ Contact Technical Service



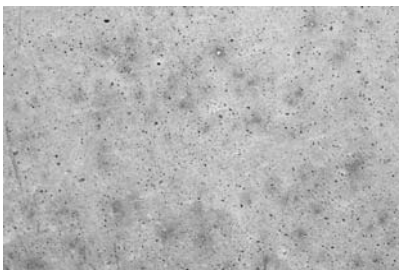
Glazed Tile -
Smooth Texture with Mortar Lines
❑ Contact Technical Service

Medium Unsmooth Texture Brick
❑ Use Textured Surface Film



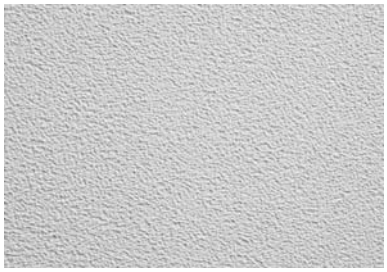
Vinyl Wallcovering -
Smooth Texture
❑ Use Smooth Wall Film

Poured Concrete -
Smooth Texture
❑ Use Smooth Wall Film

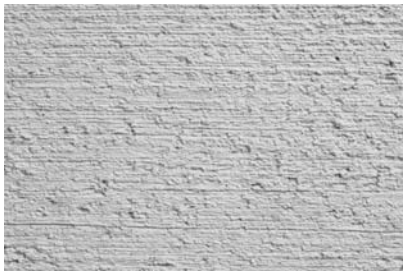


Industrial Stucco -
Medium Unsmooth Texture
❑ Use Textured Surface Film

Vinyl Wallcovering -
Medium Unsmooth Texture
❑ Use Textured Surface Film



Concrete -
Medium Unsmooth Texture
❑ Use Textured Surface Film



4. Understanding Paints and Wall Finishes

Important Note	**Low VOC paints are driving change in wall film applications.** The chemistry of paints and wall finishes has been changing over the years to drive down the level of Volatile Organic Compounds, VOCs, due to both sustainability efforts and regulatory requirements. These newer paint formulations have changed how the painted surface interacts with the adhesive on all films, affecting the films' ability to adhere to the paint. **Simple steps can maximize film adhesion.** Because the paint formulations are protected by trade secrets, it is difficult for any film manufacturer to understand how film adhesives interact with these paints. 3M has found through recent testing with many low VOC paints that there is no single film or adhesive that works "best" on each paint tested. One film can perform well on one paint and poorly on another paint. However, by using the cleaning and testing procedures described in this Bulletin, you can quickly and easily determine how well the films you want to use will adhere, and then successfully install the job.

1. **Outgassing resulting from uncured paint**

   As paint dries, it releases certain gases until it is fully dried and cured. Applying a film before the paint has fully cured can result in lifting, bubbles and a premature installation failure. Unfortunately, there is no way to test for this. Cure time varies greatly and can be as long as 30 days.

Important Note	It is critical that the paint be allowed to cure for the entire time period stated by the paint manufacturer.

2. **Paint particle migration**

   Particles in the paint can migrate to the surface over time. The first time you clean the wall with the Isopropyl Alcohol mixture (you'll do it twice), you may notice a powdery substance on the cleaning cloth, the same color as the paint. See FIGURE 7, page 14, for an example of particles that have migrated to the surface.

   Migrated particles not only affect initial adhesion if the wall is not properly cleaned, but can also affect film removal later on.

3. **Differences in paint finishes**

   While films have historically adhered best to semi-gloss finishes, proper testing and preparation of every type of painted wall is now required to ensure success.

4. **Textured paints or surfaces**

   3M offers films designed for use on smooth surfaces or textured walls. Performing the 3M Wall Film Adhesion Test helps ensure that the correct films are chosen for a job.

5. **Change in surface gloss or appearance after film is removed**

   The cleaning procedure, heat, environmental exposure, natural fading of uncovered areas, and other factors can contribute to a change in the appearance of the paint's original gloss or staining on the wall.

5. Film Adhesion Characteristics and Testing: Smooth and Textured

A. All Walls - Adhesion Characteristics

Adhesion is the ability of the film's adhesive to bond to the wall. The amount of both initial and final adhesion varies with the type of adhesive used on the film, the texture of the wall, the paint characteristics, the application temperature and the application techniques. The adhesive bond builds with time. The film may never achieve its full bond if it is poorly applied or you are using the wrong film/adhesive combination for the wall and its paint.

- **Adhesion, final.** The maximum amount of bond achieved by a film, usually in 24 to 48 hours after installation except in cool temperatures or textured walls.
- **Adhesion, initial.** The amount of bond needed to hold the film in place during application.
- **Size of film.** The larger the piece of film, the greater the initial and final adhesive bond to the wall must be to support the weight of the film.
- **Imaging method.** Use only the inks recommended for the film you use and follow the ink's Product & Instruction Bulletin for proper use. Solvent inkjet printed film must have sufficient time for all solvent to evaporate before the graphics manufacturer applies the overlaminate (3M recommends 24 hours for best results). Failure to do so may result in outgassing when the film is applied, which can contribute to poor or inconsistent film adhesion.
- **Stretching the film.** Film stretched during application may later shrink. This affects the film's adhesion to the wall and may result in premature failure.

B. Effect of Overlaminate on Adhesion

Film must retain some flexibility in order to achieve maximum adhesion. Do not use a stiff or thick overlaminate (over 3 mils).

Films that will be applied to textured walls using heat need the recommended overlaminate. The overlaminate is critical in helping conform the film to the texture.

Refer to the base film's Product Bulletin for the recommended graphic protection options. The most common constructions are:

- **Smooth walls**
  - One of the recommended films with overlaminate luster 8519 and matte 8520.
- **Textured walls**
  - Textured walls: Film IJ8624 with overlaminate 8524.
  - Textured walls: Film 480Cv3 with overlaminate 8548G.

6. 3M Wall Film Adhesion Test for SMOOTH Walls

A. Purpose of Wall Film Adhesion Test

This test is designed to show *initial adhesion capability measured in grams,* of the wall film you plan to use when the wall is cleaned according to 3M's recommendations and the film is applied to a fairly smooth indoor wall surface.

B. Limitations of Test and Cleaning Method

This test cannot detect problems with pre-existing variations in the wall or poor paint-to-wall bond. Such problems may result in poor film adhesion as well as wall damage upon attempted removal of the film. 3M is not responsible for the results of film installed on walls.

Important Note	Removal of any film from a painted wallboard wall always has a risk of pulling paint off the wall or even damaging the wall. Increasing the initial adhesion of film by using the processes described in this Bulletin may actually make attempted removal more challenging. If this is a concern for your customer, please see some **Options** on page 11.

C. Before Doing the Test

1. Review and use the **Walls Worksheet**, page 5.
2. Read and understand the types of wall surfaces and the variables that influence film adhesion. See **Wall Textures and Composition,** page 6.

D. Test Conditions

- Perform the adhesion tests in an inconspicuous area of the same wall on which you will be applying the actual job.
- If you will be applying film to more than one wall, perform the tests on each wall. While one wall may look the same as another in color and gloss, they may have been painted at different times and with different paint, which can affect the adhesion test results. Performing the test on a different wall/paint than will be used in the job will not give you the adhesion values and information you need to make a good evaluation.

Important Note	For each film being considered you will be testing THREE samples of the same film on the same wall and comparing the results.

E. Supplies Needed

- Spring scale
  - Scales are available from: Ohaus 29 Hanover Rd., Florham Park, N.J. 07932; 1-800-672-7722, www.ohaus.com.
  - 0-500 grams, part number 8002-MA
    0-1000 grams, part number 8003-MN
    0-2000 grams, part number 8004-MA
- 3M™ Rivet Brush RBA-1
- Copy or cut out the **Measured Reference Guide** from page 29. This will be used during the test to help you gage how fast to pull the film strip.
- Hole punch
- Strips of each film you plan to test

Note: See **3M™ Enhanced Adhesion Cleaning Method** on page 14 for other supplies that will be needed.

F. Prepare the Film Test Strips

1. Cut three, 1 inch by 10 inch (2.5 cm x 25 cm) strips of each film you plan to test on a given wall.
2. Note the film name or number on each test strip and on the **Walls Worksheet**, page 5.
3. Remove about 2 inches (5 cm) of liner and fold over the film, adhesive to adhesive, to make a tab.
4. Punch a hole in the tab.

FIGURE 2 Preparing Film Strips

G. Film Adhesion Test Procedure

1. Clean the area of the wall you will be testing using the **3M™ Enhanced Adhesion Cleaning Method** on page 14.
2. Use your thumb to initially adhere the film strip (punched hole at the top) to the cleaned wall.

Important Note	You will test three strips of the same film on the same wall. You may apply all of them at one time, leaving a few inches between each.

3. Working in the long direction of the test strip and using the RBA-1 rivet brush, use firm pressure and a circular motion to go over the strip three times to firmly adhere it to the wall. See FIGURE 3.

FIGURE 3 Adhering Film Strips

4. Tape the **Measured Reference Guide** next to the film strip you are testing. See FIGURE 5.
5. Wait a full 15 minutes before proceeding with the test to allow some adhesion to build.
6. Make sure the scale is zeroed out per the scale manufacturer's recommendations.

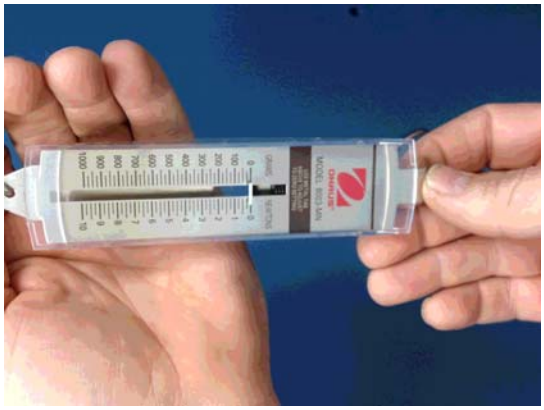


FIGURE 4 Zeroing Scale

7. After 15 minutes, slide the scale's S hook through the punched hole in the film strip.
8. Hold the scale in your palm, keeping it as straight as possible but without any portion of the scale or your hand contacting the wall during the test.
9. Pull the scale downward at a steady rate of about 1 inch (2.5 cm) in 5 seconds, using the **Measured Reference Guide** lines as a guide. **Once you have started pulling, DO NOT STOP until the film is fully released from the wall.**

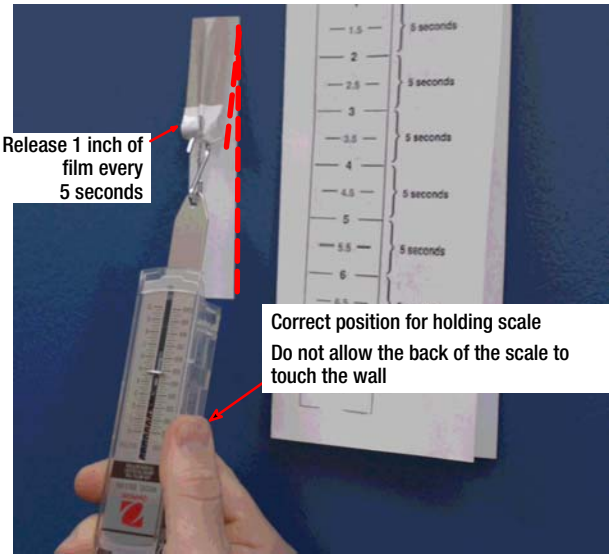


FIGURE 5 Release Test

10. As you pull down on the scale:
    a. Observe the release characteristics of the film and compare to the table, below.
    b. Note and record the grams/inch that register on the scale.
11. Repeat steps 2 to 10 for each of the same test strips. This is necessary so you can average the test results.

H. Test Evaluation - Smooth Walls Only

1. Averaging test results

   If two or three out of three strips of the same film perform the same way, use those characteristics to judge the suitability of that particular film for that wall.

2. Interpreting scale values

Note: 450 grams equal 1 pound.

Scale Value	Release Characteristics	Recommendation
Less than 300 grams/inch	Removes very easily; little or no resistance	Unacceptable adhesion; do not use this film
300-1000 grams/inch	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 1000 grams/inch	Smooth consistent release; no jerkiness, but substantial resistance to releasing	Excellent adhesion; removal will cause damage

Note: Please see the next page for more important information about Test Evaluation--Smooth Walls Only.

H. Test Evaluation—Smooth Walls Only *continued*

3. Factors in unsatisfactory test results.

   a. Test strip removes jerkily, unevenly.

      – Inconsistent or low adhesion value; due to high and low spots in the surface texture, the film's adhesive does not make full contact.

      – Cold wall and air temperature, which doesn't allow adhesive to flow or make full contact.

   b. Test strip pulls paint off wall.

      If any paint is pulled off with the test strip, the paint is not sufficiently bonded to the wall and film should not be applied until the problem is corrected, a new paint is fully cured, and the 3M Wall Film Adhesion Test is performed again with satisfactory results.

   c. Poor film choice for the job.

      All films being considered for a job should be tested before printing to ensure it is the right choice.

   d. Films with Comply™ Adhesive (air release channels)

      Films with Comply adhesive (e.g., film IJ180Cv3, 480Cv3), which have air release channels to ease installation, may be used for walls. However, if their tested adhesion values are too low, 3M recommends trying a film without Comply adhesive; such films typically have higher adhesion values.

4. Films that require greater adhesion level:

   - Films exposed to indoor environmental changes, such as direct sunlight or close proximity heat sources.
   - Overlaminated film (which adds weight).
   - Large pieces of film (which adds weight).

I. 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 wall film. However, the higher adhesion means the film will be more difficult to remove and is likely to pull paint off the wall or damage the surface of the wallboard. There is no ideal solution, but the following options can be considered.

1. Construct a false wall.

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

2. Apply a new surface to an existing wall.

   Some customers, such as at construction sites, may need to change film often. This option can be used on a false 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 wall 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. You can also apply one film over another if the new film has a gray pigmented adhesive, which offers good hiding power. Before installing the film that will be applied over film IJ39-20, follow the cleaning and testing procedures described in this Bulletin.

7. 3M Wall Film Adhesion Test for TEXTURED Walls

A. Purpose of Wall Film Adhesion Test

This test is designed to show whether a film for textured walls, 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.

B. Limitations of Test and Cleaning Method

This test cannot detect problems with pre-existing variations in the substrate or poor paint-to-substrate bond. Such problems may result in insufficient film adhesion as well as wall damage if removing the film. 3M cannot be responsible for the results of wall installations.

Important 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 potential damage to the substrate if removal is attempted.

C. Before Doing the Test

1. Review and use the **Walls Worksheet**, page 5.
2. Read and understand the types of wall surfaces and the variables that influence film adhesion. See **Wall Textures and Composition,** page 6.

D. Supplies Needed

- Industrial heat gun with electronic readout, capable of achieving and sustaining 1000°F (538°C). Models you may want to consider are:
  - Steinel® HL 2010 E LCD Display IntelliTemp™ Heat Gun*
  - Milwaukee® 8988-20 Variable Temperature Heat Gun*
  - Bosch BOS1944LCDK Programmable Heat Gun Kit*

  *Other heat guns may meet your requirements. 3M is not responsible for the performance or suitability of these products.
- 3M™ Two-Handled Textured Surface Applicator TSA-4
- Heat resistant gloves
- Film/overlaminate IJ8624/8524 and/or 480Cv3/8548G
  - Option 1, preferred for most accurate results: A 2 feet x 2 feet (61 cm x 61 cm) piece of film/overlaminate, printed with the ink that will be used for the job
  - Option 2: A 2 feet x 2 feet (61 cm x 61 cm) piece of film/overlaminate, unprinted
  - Option 3: A 8 inch x 11 inch (18 cm x 28 cm) piece of film/overlaminate, unprinted—at least large enough to cover most of two blocks and one grout line

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

⚠ CAUTION

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

E. Substrate Considerations

- **Pre-cast concrete material**. This material can have an oily surface and be speckled with dust because of the production process. These characteristics inhibit good film adhesion.
- **Greasy or sooty substrate.** Consider using TSP (tri-sodium 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 with a wet-dry vacuum, then allow 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. See Step 9, page 21, for a possible solution.

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

F. Film Adhesion Test Procedure

1. Follow the **3M™ Enhanced Adhesion Cleaning Method** on page 14 to prepare the area where you will apply the film.
2. Apply the film with the TSA-4 tool. See pages 18-21 for specific installation instructions.
   a. **For film IJ8624/8524**, move at a rate of 2 inches/second (50 mm/second).
   b. **For film 480Cv3/8548G**, move at a rate of 3 inches/second (75 mm/second.
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 (180 degree angle), holding it close to the wall. Compare your results to the following table.

G. Test Evaluation - Textured Walls Only

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; may result in premature graphic failure.
Removing the film pulls off substantial paint/finish/texture	No paint primer; insufficient paint curing.
Film popped out of grout lines	If the grout lines are deeper than 1/8 inch (3.2 mm) raked or under cut, but adhesion is otherwise good, trim the installed film using the **Mosaic Graphic Technique** on page 22, for the best results.

8. Health and Safety

⚠ CAUTION

Safety Data Sheets (SDS)

When handling any chemical products, read the manufacturers' container labels and the Safety Data Sheets (SDS) for important health, safety and environmental information. To obtain SDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

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

⚠ WARNING

Physical Comfort

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.

⚠ WARNING

Risks of Using Heat Sources

- Read, understand and follow the safety instructions contained in both this 3M Instruction Bulletin as well as the heat-gun manufacturer's manual.
- Wear a heat-resistant glove on the hand(s) holding the applicator.
- Do not use heat sources near solvent mixtures or residues, or in areas where solvent vapors may be present at hazardous levels.
- Never use an open-flame heat source in this process.

⚠ CAUTION

Ventilation

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

Important Note

High Heat May Degrade Foam Rollers and Damage Substrate

High heat directed at the foam may degrade the foam. Always direct the heat toward the film, not the foam roller.

High heat may also damage the substrate: use with caution.

Important Note

Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning solutions. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. You should check with your State environmental authorities to determine whether use of this solution is restricted or prohibited.

9. 3M™ Enhanced Adhesion Cleaning Method

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

Note: This cleaning procedure is also available in a one-page document. Look for **Instruction Bulletin Clean** at www.3Mgraphics.com.

A. Cleaning Procedure

1. Clean stubborn grease and grime with your preferred method.
2. Prepare a cleaning solution with 70% Isopropyl Alcohol (IPA) and 30% water in a spray bottle.
3. Soak a clean, lint-free cloth with the cleaning solution until it is dripping wet.

FIGURE 6 Soaking a Lint-free Cloth

4. Clean the test (or application) area with overlapping strokes. You may notice some migrated paint particles on the cloth.

FIGURE 7 Paint Particles After First Cleaning

Important 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 as much as 10 degrees F—a noticeable difference. When the alcohol has completely flashed off, which takes about 10 minutes, the wall will return to its normal temperature. You can use an IR gun to accurately measure the temperature before cleaning and immediately after cleaning, or simply touch the back of your hand to the cleaned area. When it no longer feels cool, it is dry and you can proceed with the film adhesion test, or if you are ready, with the film installation.

BEFORE CLEANING **IMMEDIATELY AFTER CLEANING**

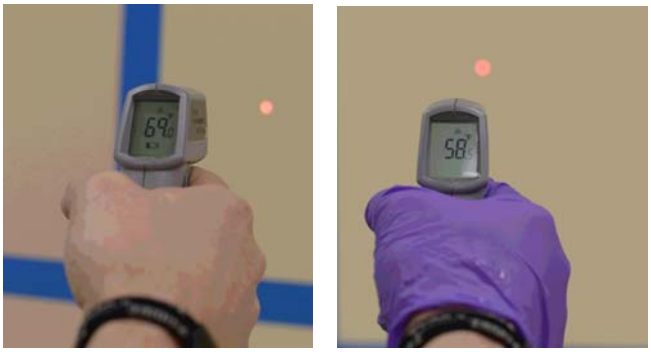


FIGURE 8 Testing Wall Temperature

Pro's Tip

1. Mark off sections of the installation area with masking tape and clean one area at a time to be sure you don't miss any areas..
2. Cleaning the installation area can reduce the gloss of the paint. Mark off the size of the graphic with masking tape and clean only within that area.

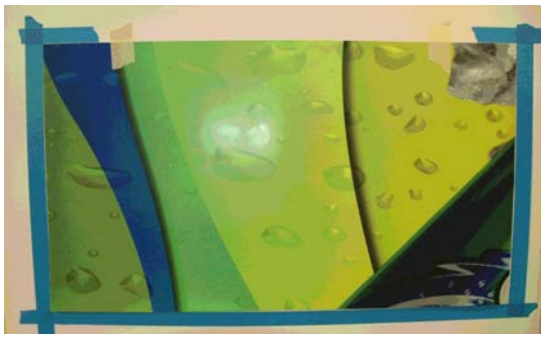


FIGURE 9 Clean Within Taped Area

B. 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.

C. Time Study for Job Estimating

In a time study, we determined that this cleaning method takes about 30 minutes for 125 square feet (11.6 square meters) which is approximately an 8 foot x 16 foot (2.4 m x 4.9 m) wall. Keep this in mind as you estimate your next job. It will be time well spent.

10. Installation to Smooth Indoor Walls - General Instructions

A. Tools and Supplies

- Scotch™ Masking Tape, 2 inch wide*
- 3M™ Power Grip Applicator CPA-1
- 3M™ Plastic Applicator PA-1 Gold Squeegee
  - Protect one edge with the loop side of 3M's Hook and Loop Tape
- 3M™ Rivet Brush RBA-1* and RBA-3*
- 3M™ Air Release Tool 391X*
- Cutting tools, such as a razor blade with a safety holder
- Liner cutter. This tool has a guide under the blade that slips between the film and liner so you cut through only the liner. This is sometimes called a wallpaper cutter. One option is “Seam Buster”, a product from Advance Equipment Manufacturing. It is available online and at many hardware and home improvement stores.
- Industrial heat gun; must be capable of attaining 500° to 750°F (260° to 399°C), or equivalent

*Available from 3M Commercial Solutions

B. About Application Tape

An application tape is not recommended. Application tape may have a greater adhesive bond to the film than the film has to the wall surface. Removing the application tape generally lifts the film from the wall surface and compromises the adhesive bond of the film. If application tape is used on smooth surfaces, you must thoroughly rework the entire graphic and all edges after removing it.

C. Plan the Layout

To minimize application problems, which waste time, test your layout by temporarily positioning the film on the wall using masking tape.

- Certain areas of your film installationss are more prone to damage than others from people or equipment rubbing against the edges. This includes areas around doors, openings such as vents, outside corners of walls and inside corners.
- Plan so the film edges are in the least vulnerable place possible.
- To reduce the risk of damage and lifting, trim the film 1/8 to 1/4 inch from the edge rather than wrapping the vulnerable edges.

  Note: Knifeless™ Tape may be applied to the wall before the film to aid in cutting and trimming. See www.KnifelessTechSystems.-com for details.

- Always plan time in your installation to rework all edges of the film to help ensure good edge adhesion.

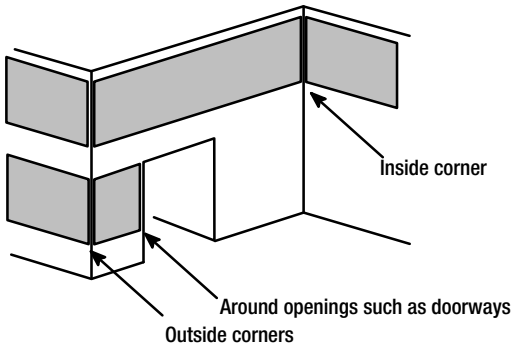


FIGURE 10 Planning the Layout

D. Hinge Methods

Important Note	Select the Hinge Method you prefer to use, review the procedure, but do not install the film until you review and follow the **General Installation Procedure**, page 16, which includes using the **3M™ Enhanced Adhesion Cleaning Method** on page 14

1. **Horizontal Hinge Method—Most Common**
   Ideal for film panels that are longer than they are wide
   a. Tape the film to the wall in the desired position.
   b. Apply a piece of tape horizontally across the film, 6 to 8 inches below the top edge.
   c. Remove the positioning tape strips.
   d. Follow the Section E, **General Installation Procedure**, page 16.

FIGURE 11 Horizontal Hinge

2. **Vertical Hinge Method**
   Ideal for film panels that are wider than they are tall
   a. Tape the film to the wall in the desired position.
   b. Apply a strip of tape vertically down the middle of the film.
   c. Follow the Section E, **General Installation Procedure**, page 16.

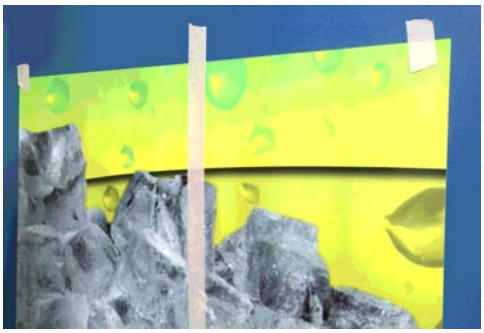


FIGURE 12 Vertical Hinge

3. **Self Hinge Method**

   Ideal for smaller film panels; self hinge can be made at the top of the film or in the center of it (as shown)

   a. Lay the film side down on a clean work table.

   b. Using a liner cutter, cut through just the liner going across the shortest width of the film.

   c. Make another liner cut about four inches from the first, and remove the strip of liner.

FIGURE 13 Cutting Out Section of Liner for Self Hinge

   d. Position the film on the wall and use your fingers to lightly adhere the film to the wall in the area of the exposed adhesive.

   e. Squeegee the film along the exposed adhesive working toward the nearest edge.

   f. Follow Section E, **General Installation Procedure**, page 16.

FIGURE 14 Squeegeeing Exposed Adhesive for Self Hinge

E. General Installation Procedure

1. Follow the **3M™ Enhanced Adhesion Cleaning Method** on page 14.

2. Separate the liner from the film.

FIGURE 15 Separate the Liner from the Film

3. Roll back the edge of the film and use a liner cutter to make a straight cut through just the liner, right next to the tape hinge. Remove the liner, or as much as needed.

Note: If you need to touch exposed adhesive, keep your fingers 2 or more inches (5 cm) from the edge to avoid contaminating the vulnerable film edges.

FIGURE 16 Cutting Liner

4. Keep some tension on the film while squeegeeing to help it stay flat and smooth. Sometimes this requires holding both film and liner during part of the installation.

FIGURE 17 Keep Tension on the Unapplied Film

5. Starting in the middle of the film, squeegee to one edge, return to the center, and squeegee to the other edge.
   a. Always push the air toward the nearest edge in either the 10:00 o'clock or 2:00 o'clock position.
   b. Always end the squeegee stroke past the edge of the film.
   c. Overlap every stroke by about half the width of the squeegee.

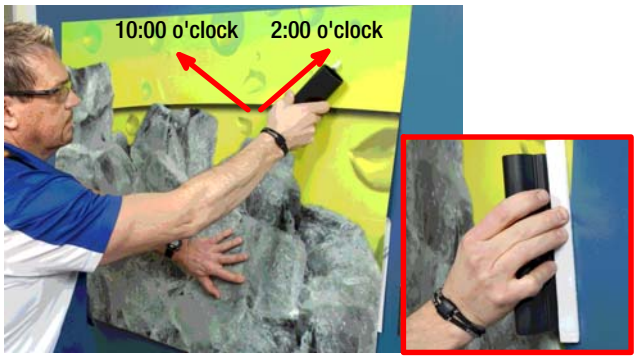


FIGURE 18 Squeegee with the 10:00 and 2:00 O'Clock Position; End Stroke Past Film Edge

6. As needed, lift the film, grasp both sides of the liner, and pull away a few inches of liner. Continue applying film as before.
7. Before the job is considered done:
   a. Visually inspect how well the film is conforming—even to an apparently smooth wall. See the Important Note.
   b. Take time to resqueegee all film edges, which are the most vulnerable and the first place film may begin to lift.

Important Note	Even an apparently smooth wall may have more texture than you realize. If you don't use firm, overlapping strokes, you may not get full adhesive contact with the wall. In FIGURE 19 notice the area circled in red. After rubbing a finger over this area, you can see that the film is now making more contact (a finer, tighter visual texture) with the wall than the adjacent areas that were poorly squeegeed.

FIGURE 19 Check for Full Adhesive Contact with Wall

11. Installation to Textured Walls - General Instructions

Note: Some tools and processes in this Bulletin are described and claimed in 3M Patents and pending Patent applications.

Important Note	Installation of film to textured walls requires the use of high heat, 3M's textured surface applicator tools and unique installation techniques. To help ensure a successful installation, you should view the 3M Wall and Textured Surface Videos, at 3Mgraphics.com, Tools & Support, or arrange for a training class, in addition to using this Instruction Bulletin. Please contact your local 3M sales representative to assist you with either of these options.

- Scotch™ Masking Tape*, 2 inch (50 mnm) wide
- Industrial heat gun with electronic readout, capable of achieving and sustaining 1000°F. The following are examples of heat guns that meet the needed criteria.
  - Steinel HL 2010E LCD Display IntelliTemp Heat Gun
  - Milwaukee 8988-20 Variable Temperature Heat Gun
  - Bosch BOS1944LCDK Programmable Heat Gun Kit
- 3M™ Textured Surface Applicator TSA-1* *Large Area Roller*
- 3M™ Textured Surface Applicator TSA-2* *Grout Line Roller*
- 3M™ Textured Surface Applicator TSA-3* *Edge Roller*
- 3M™ Two-Handled Textured Surface Applicator TSA-4* *Combination Heat Gun Holder and Roller*

Note: We recommend storing all foam tools neatly in a rigid plastic box when not in use. Storing them carelessly with heavy or sharp objects or exposing them to contaminants, can all damage the foam and reduce the effectiveness of the tools.

- 3M™ Air Release Tool 391X*
- Tweezers
- Cutting tools, such as a razor blade with break off tips in a safety holder

*Available from 3M Commercial Graphics

A. Tips for a Good Installation

Important Note	**High Heat May Degrade Foam Rollers and Damage Substrate** High heat directed at foam rollers may degrade the foam. Always direct the heat toward the film, not the foam roller. High heat may also damage the substrate: use with caution.

1. Understand how film conforms to a textured wall.
   - **Heat.** High heat warms the film and adhesive to make it more conformable. Insufficient heating of the film during installation may result in a film that looks good immediately following installation, but may lift days or weeks later.
   - **Speed.** The proper speed allows the film to be warmed sufficiently to relax lifting stresses within the film, and conform effectively to the texture while the film is still pliable.
   - **Pressure**. Firm, consistent pressure on the roller allows the foam to conform the film into the texture. Since the film and adhesive cool very quickly when the heat source is moved away, adhesion occurs quickly.
2. When applying multiple film panels, use a 1/2 inch (13 mm) overlap.
3. Assess the grout lines for the wall on which you will be working to determine the proper technique for handling them. Refer to **Wall Textures and Compositions** on page 6 for more information and examples.
   - Less than 1/8 inch (3.2 mm) deep and fairly smooth. Bridge the grout lines so that at least 1 inch (25 mm) of film extends beyond the line. The heat and pressure of the roller will conform the film into the grout lines.

Film conforms well to shallow grout lines

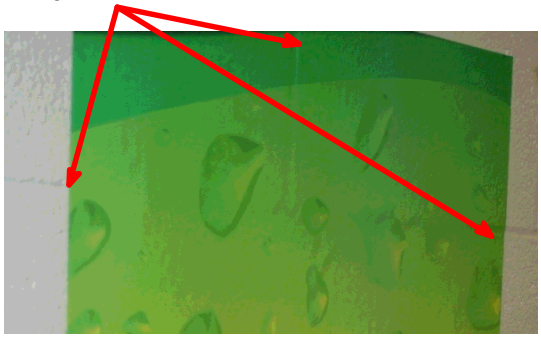


FIGURE 20 Shallow Grout Lines

   - Greater than 1/8 inch (3.2) deep and/or heavily textured. Align the first outside corner on the corner of the brick or tile next to the grout line. After installing the film, trim the film from the grout lines as described in **Mosaic Graphic Technique** on page 22

Film bridges deep grout lines

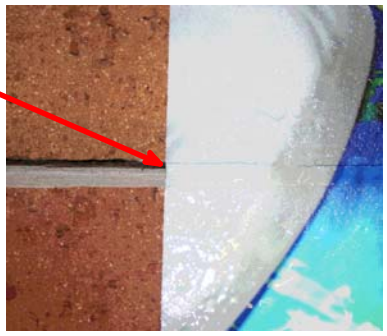


FIGURE 21 Deep Grout Lines

B. Using the 3M™ Two-Handled Textured Surface Applicator TSA-4

1. Consider this before mounting the gun:
   a. Use a heat gun with a barrel of 1.53 to 1.55 inch (38.9 to 39.3 mm) diameter.
   b. The gun must heat the film before the roller contacts the film.
   c. In the orientation shown in these photos, the installer would always be leading with the left hand and following with the right hand. To lead with the right hand, rotate the tool 180 degrees.

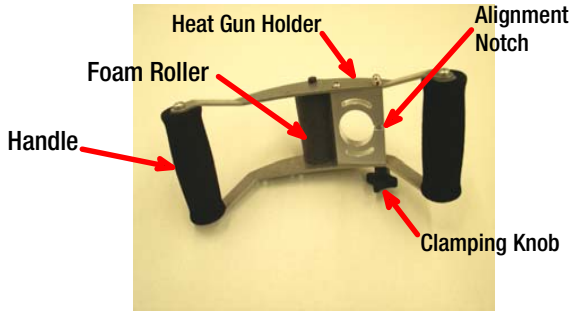


FIGURE 22 Applicator TSA-4

2. Position the heat gun in the Heat Gun Holder so only about 1/2 inch (1.2 cm) of the nozzle extends beyond the opening. Tighten the Clamping Knob snugly. The end of the nozzle should be about 1 inch (2.5 cm) above the film when the tool is in use.

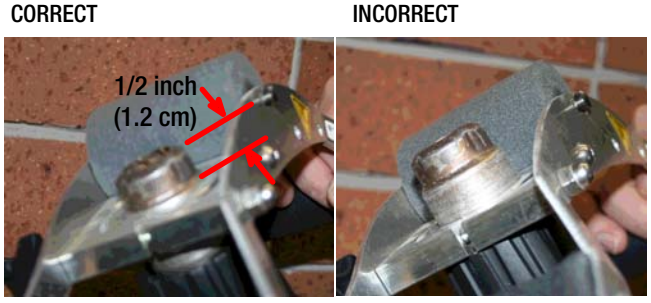


FIGURE 23 Positioning Heat Gun Nozzle in Heat Gun Holder

3. Always move so the heat gun heats the film before the foam roller conforms the film.
4. Start every stroke just off the film so that the edges are well sealed.
5. Overlap every stroke by half the width of the TSA-4 roller. You can use the notch in the heat gun holder as a visual guide to align the next stroke with the bottom of the previous stroke.
6. Maintain a consistent temperature of 1000°F (538°C).

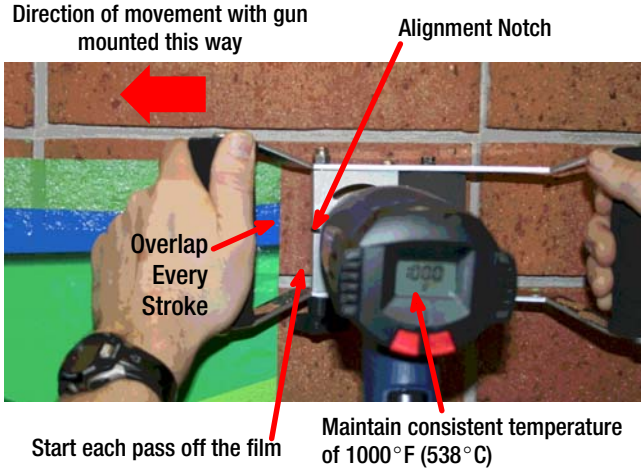


FIGURE 24 Good Installation Techniques

7. Use proper TSA-4 tool ergonomics.
   a. Keep both handles parallel to the installation wall so the gun nozzle maintains an even distance from the wall so there is uniform pressure at both the top and bottom of the roller. Keep the gun nozzle at an even distance from the film.
   b. Walk along with the tool, using your body staying centered in front of it for even pressure rather than extending your arms across a broad distance.
   c. Use enough pressure to conform the film to the substrate.

Lean into the wall to get good, consistent pressure on the TSA-4 tool

FIGURE 25

8. Apply film/overlaminate at the right speed for consistent results.
    a. For film IJ8624/8524, move at about 2 inches/second (50 mm/second).
    b. For film 480Cv3/8548G, move at about 3 inches/second (75 mm/second).

Pro's Tip

Use this trick to learn how fast to work across the wall.

Measure the width of the film in inches (mm).

- For film IJ8624/8524, divide the width by 2 (5). It should take about 36 seconds to work across a 72 inch (189 cm) wide panel: 72÷2=36 (183÷5=36).
- For film 480Cv3/8548G, divide the width by 3 (7.5). It should take about 24 seconds to work across a 72 inch (189 cm) panel: 72÷3=24 (183÷7.5=24).

    c. When following the speed of installation indicated above, these are the typical rates of installation:
        - film IJ8624/8524: less than 50 square feet/hour
        - film 480Cv3/8548G: less than 75 square feet/hour
9. While working, stop occasionally to look at the applied film to identify problems that indicate you need to adjust speed, heat, pressure or overlaps. Working too slowly overheats the film and can cause burns in the film. Working too quickly does not permit good adhesion and conformability, which may appear as gloss banding. Here are some issues you may observe and how to improve your technique.
    a. **Gloss banding.** Apply consistent pressure; overlap every pass by 50%.

Pro's Tip

Film for textured surfaces is protected by a gloss overlaminate. As you apply the film, the heat reduces the gloss. Observing variations in gloss of installed film helps you troubleshoot your installation technique.

    b. Blisters or burns. Do the next pass a little faster.
    c. Bubbles. Slow down a little and apply a little more pressure.

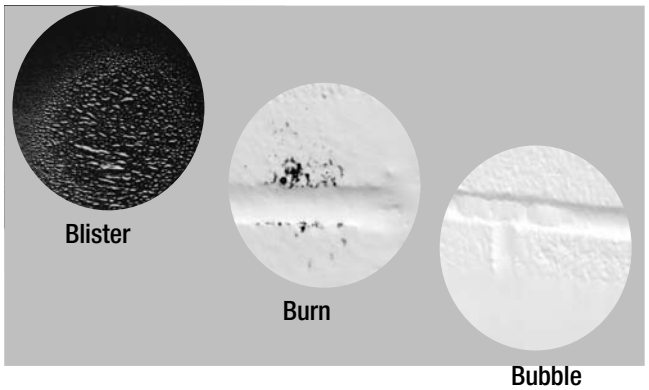


FIGURE 26 Examples of Installation Problems Related to Speed and/or Pressure

Pro's Tip

Practice on each type of substrate to which you will be applying film to learn the proper speed of installation.

The biggest problem inexperienced applicators have is moving too quickly.

C. Textured Wall Film Installation Procedure

1. Follow the **3M™ Enhanced Adhesion Cleaning Method** on page 14
2. Remove the liner using care not to allow the film's exposed adhesive to fold back on itself. Align the film to the wall, making sure no film edge is resting in the middle of a grout line. For larger pieces of film, use two people for this step.
3. Pass your hand lightly over the film to pre-adhere it to the wall. The texture of the wall will prevent the film from adhering too securely so you can easily straighten any wrinkles or adjust the alignment.

FIGURE 27 Use Your Hand to Pre-Adhere Film to the Wall

4. Set the heat gun to 1000°F (538°C) and allow it to come up to temperature.

5. Lightly set the film edges with the TSA-4 tool.

   a. In general, sealing three of the four edges is sufficient. Leaving one edge open maintains an air escape route, especially when using film IJ8624/8524.

   b. If the grout lines are shallow (1/8 inch/2.1 mm or less), the film will conform into these shallow lines.

Lightly set 3 film edges

FIGURE 28 Lightly Set 3 Film Edges

   c. If the wall has deep grout lines—greater than 1/8 inch (3.2 mm)—you can seal all four edges, if desired. Deep grout lines provide sufficient air escape as the film will not be conformed into the lines.

Lightly set 4 film edges when applying to deep grout lines, if desired

FIGURE 29 Lightly Set 4 Film Edges

6. Start the installation at an outside top corner, overlapping the wall and film, and leading with the heat gun. Work straight across the film without stopping until you have passed the other edge of the film. Remember to use these speeds:

   a. For film IJ8624/8524, move at about 2 inches/second (50 mm/second).

   b. For film 480Cv3/8548G, move at about 3 inches/second (75 mm/second).

FIGURE 30 Starting Position

7. Make the next pass by starting at a place that overlaps the previous pass about 50%. An easy way to judge the overlap is to align the notch in the TSA-4 tool with the bottom of the previous pass.

Align this notch with the bottom of the previous pass to ensure a 50% pass overlap

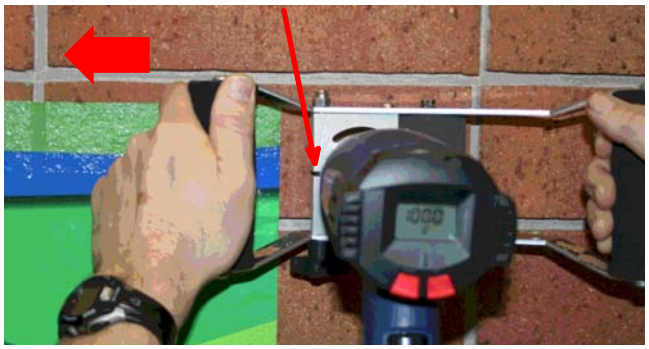


FIGURE 31 Use Notch in TSA-4 Tool to Ensure a 50% Pass Overlap

8. If you observe banding or evidence that the film is not well adhered in some areas, remove the heat gun from the TSA-4 tool. Use the gun to heat the film and conform it with the TSA-3 tool.

Note: Direct the heat at the film, not the foam roller of the tool.

FIGURE 32 Use the TSA-3 Tool and Heat Gun to Touch Up Poorly Adhered Areas

9. For outdoor installations, we recommend applying a bead of sealant along the top edge of the film. This can reduce trapping water from rain or irrigation systems behind the film and leading to lifting as well as the creation of mold.

D. Mosaic Graphic Technique

This technique removes the film that bridges grout lines. It is highly recommended when the grout lines are deeper than 1/8 inch (3.2 mm) and/or the mortar is highly textured. Failure to remove the bridged film may result in premature installation failure. Although time consuming, this technique creates the striking appearance of an image that is kiln fired onto the block or tile or even painted on.

1. Hold a clean, sharp razor against the edge of the block and cut the film as cleanly as possible around each block. Try to leave a very slim margin of film--about 1/16 inch (1.6 mm) around the blocks.

Note: The first cut on the side of a bridged grout line is always easiest since there is tension on the film. It may be helpful to hold the cut side with tweezers or an air release tool to maintain tension on the film as you make the parallel cut.

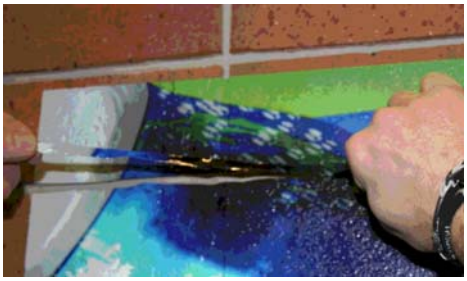


FIGURE 33 Cutting Film From Grout Lines

2. Heat and roll all edges of each block with the TSA-2 tool to ensure good adhesion. The flexibility of the foam will conform the film around the edges. Inspect the edges for good adherence

Note: Direct the heat at the film, not the foam roller of the tool.

FIGURE 34 Finishing Edges Around Blocks

Important Note	Attempting to force the film into deep grout lines will either tear the film or the film will pop back out of the grout lines.

E. Working Around an Obstruction

The best technique for working around an obstruction on the wall, such as an electrical outlet, is to cut the film out around the obstruction.

1. Cover the obstruction with masking tape. This prevents the film from adhering to the obstruction.

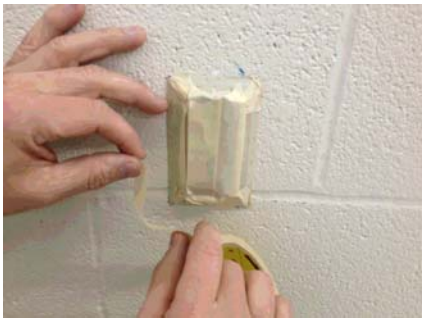


FIGURE 35 Cover the Obstruction with Masking Tape

2. Position the film on the wall and create a tape hinge on one edge.
3. Remove the liner.
4. Drape the film over the obstruction and pre-adhere the edges of the film using your hand.
5. Cut the film away from the obstruction a little at a time, leaving about 1/8 inch (3.2 mm) all around the obstruction that will be tucked behind it.
6. Use the TSA-4 tool to lightly set the edges of the film on three sides.

FIGURE 36 Cut Away Film a Little at a Time

7. Heat the film around the obstruction and use a PA-1 plastic squeegee to conform the film around its edges.

FIGURE 37 Tuck Film Around Obstruction

8. Heat the film again and use the TSA-3 tool to conform 1 to 2 inches (25-50 mm) around the obstruction.

Note: Direct the heat at the film, not the foam roller of the tool.

FIGURE 38

9. Apply as much film as possible making horizontal passes with the TSA-4 tool, above and below the obstruction.
10. Then finish applying the film to the left and right sides of the obstruction.

Conforming film from right edge to obstruction

Conforming film from obstruction to left edge

FIGURE 39 Conforming Film Around Obstruction

12. Graphic Maintenance, Repair, Removal: Smooth and Textured

A. Edge Lifting: Causes and Repair

Edge lifting is generally caused by inadequate adhesion. It may be due to insufficient wall cleaning, the wrong film being used, contaminants on the wall, poor edge finishing during initial installation, or abrasion by people or equipment, or environment. The following options for reattaching lifted edges can extend the life of the film and improve appearance, but are aggressive and will likely damage the wall.

- **Option 1:** Use this procedure if a large area of film has come loose, which is most likely to occur at the top edge. Pull down more film until it does not release easily. Protect the exposed adhesive with a piece of clean plastic sheeting. Follow the **3M™ Enhanced Adhesion Cleaning Method** on page 14. Reinstall the film using the normal procedure.
- **Option 2:** Apply a strip of two-sided 3M™ Transfer Adhesive 950 (5 mil thick, 1/2" x 60 yard roll) to the back side of the film, close to the edge. Use a rivet brush to work the film in a circular motion all around the outer edges.
- **Option 3:** Use mechanical fasteners such as staples.

B. Disposal of Film Liners and Used Film

3M products may be incinerated or may also be safely disposed of in a landfill per U.S. Environmental Protection Agency guidelines.

C. Cleaning

Refer to Instruction Bulletin 6.5 for detailed cleaning guidelines.

D. Removal Risks

Important Note	Due to the great variety of wall surfaces, there is no guarantee against damage-free film removal, even if you are using a film described as removable or changeable. Be sure your customer is aware of the potential for damage, and use the techniques provided here at your own risk.

- **Film that is exposed to extreme environmental conditions,** such as heat and sun, for long periods of time are the most difficult to remove. Typically, the greater the adhesion level of the film to the wall, the greater the risk for damaging the wall upon film removal.
- **Film removal from textured block walls.** 3M films IJ8624/8524 and 480Cv3/8548G may exhibit satisfactory removal characteristics from textured block walls depending on the amount of texture. The greatest risk in removal typically is:
  - loose mortar may be pulled off.
  - the finish on the wall may be damaged.
  - film exposed outdoors for a long time may be especially difficult to remove cleanly.
- **Hidden problems** such as cuts in the wall or moisture that has penetrated the wallboard will contribute to seriously damaging the paint and/or the wallboard when film is removed.
- **Difference surface gloss after film is removed.** The cleaning procedure, heat, environmental exposure and other factors can contribute to changing the original gloss of the paint or finish.

E. Basic Removal Techniques

Important Note	Removing film from walls is significantly different than removing film from semi-trailers and vehicles. Remove at your own risk. 3M is not responsible for damage to the paint or wall.

- Using two hands, start at the top of the film and pull it down slowly at a consistent 120 to 180 degree angle.
- If the film is difficult to remove, cutting it into strips may ease the removal process. Do not cut the wall.
- Do NOT use chemicals for indoor wall film removal.
- If the walls are not made of wallboard, heating the film as you remove it may help. The heat softens the adhesive, reducing the pull-off force and making the film more elastic, which reduces the tendency to tear.
- If the wall appears stained or the gloss has changed after graphic removal, it is usually the result of one of the following: the initial wall cleaning process, paint and pigment quality, exposure to heat and light, migrating particles in the paint, and/or adhesive residue.
- See Instruction Bulletin 6.5 for more details.

13. Troubleshooting

Pro's Tip

Every effort should be made to ensure that walls are in good condition before applying graphics. This generally reduces installation time while improving graphic appearance, and if applicable, removal characteristics.

- Review all troubleshooting options before deciding on a course of action.
- Every wall paint must be cured for the full amount of time recommended by the paint manufacturer. See page 8.
- Follow the 3M Wall Film Adhesion Test (page 9 for smooth walls and page 12 for textured walls) for every film you intend to use and on each different wall included in the installation.
- Every installation wall must be cleaned with the **3M™ Enhanced Adhesion Cleaning Method** on page 14 before doing the 3M Wall Film Adhesion Test and before doing the full installation.
- Report installation issues to the graphics manufacturer.

	Problem	What To Look For	Recommended Solutions
A.	**Pre-Installation Problems - All Walls**		
1	Unsound walls or substructures.	Evidence of a loose, inconsistent or damaged surface, loose paint, mixed surface finishes, abrasion, gouges, etc.	Repair wall as appropriate. Be sure new paint cures for the full amount of time recommended by the paint manufacturer before applying film. Reconsider whether to apply a film at that location.
2		Concrete substrate is below grade and not sealed.	Seal and cure the paint the full amount of time recommended by the paint manufacturer before applying film. Reconsider whether to apply film at that location.
3		Moisture behind a substrate.	Look for boarded up windows or walls that back up to cooling systems, water pipes, overhead windows or water pipes. Notify the graphics manufacturer or customer that applying film in these locations could create condensation or drip water onto the film, resulting in premature failure.
4	Unclean substrate.	Wall contamination such as dust, dirt, grease, food, vehicle exhaust or cleaning products.	Clean the substrate, using a degreaser if needed. Do not use cleaning solutions that contain lotions, waxes or oils. Then clean using the **3M™ Enhanced Adhesion Cleaning Method** on page 14.
B.	**Installation Problems - Smooth Walls**		
5	Film does not adhere well or falls off wall prematurely.	Film was not tested on the wall prior to installation.	Low VOC paint was used on the wall. Please read page 8. Always perform the 3**M Film Adhesion Test** (page 9 for smooth walls and page 12 for textured walls) for each film and on each substrate before committing to the complete installation.
6		Wall repairs were not properly sealed, primed, painted or cured.	Always perform the **3M Film Adhesion Test** (page 9 for smooth walls and page 12 for textured walls) for each film and on each substrate before committing to the complete installation.
7		Walls were not washed with 70% isopropyl alcohol and 30% water	Always follow the **3M™ Enhanced Adhesion Cleaning Method** on page 14 to increase film adhesion.
8		The texture of the substrate is not well suited to the film being used.	If the wall texture is greater than just smooth, try film IJ8624/8524 or 480Cv3/8548G. • Some textured paint additives create too much texture for film intended for smooth walls. • A wall with too little texture may prevent proper air bleed during the installation of film IJ8624, which is necessary for a successful installation.
9		Substrate temperature tool low	Check the film's Product Bulletin to determine the installation temperature range.
C.	**Tool Problems - TEXTURED Walls Only**		
10	Foam on the tool is falling apart.	Foam has been exposed to too much heat.	Do not direct the heat from the gun at the foam, which causes it to degrade. Do not rub the tool against the hot barrel of the heat gun.
11		Foam tools have been improperly stored.	Store foam tools neatly in a rigid plastic box to avoid exposing to heavy or sharp objects or contaminates, which can damage the foam and reduce the effectiveness of the tools.
12		Tool is worn out.	Replacement foam rollers are available for TSA-1 and TSA-4 tools. Contact 3M Customer Service.

	Problem	What to Look For	Recommended Solutions
D. Installation Problems - TEXTURED Walls Only			
13	Film does not conform to grout lines.	Mortar in grout lines is very rough or loose and/or flakey. Grout line has too much texture or too severe a profile for success.	Refer to page 6 for more information on grout lines. Clean with a brush and dust away debris. Follow by the **3M™ Enhanced Adhesion Cleaning Method** on page 14. Consider using 3M's film 480Cv3, which conforms better over rough mortar. Cut the film from grout lines for a **Mosaic Graphic Technique** on page 22.
14	Film is not conforming well to texture.	Film was not heated enough.	Be sure the heat gun is about 1 inch (25 mm) above the film. Increase the heat. Slow down a little. Use a little more pressure on the tool. **Note:** Most textured substrates do not hold heat well, and cause the film to cool more quickly than you might expect.
15		Wall is too cold.	Refer to the film's Product Bulletin for the installation temperature range.
16	Film seems too stretchy; adhesive is delaminating from the film.	Temperature of the wall is too high.	The surface temperature of the wall should be less than 100°F (38°C) during the installation. Heat from the wall and heat gun can cause the film to become stretchy and the adhesive could delaminate from the film layer.
17	Film melts or blisters.	Heat was concentrated too long in one area.	Move the gun and tool a little more quickly. Recommended speeds are: • Film IJ8624/8524: 2 inches/second (50 mm/second) • Film 480Cv3/8548G: 3 inches/second (76 mm/second)
18	Film pops up from grout lines.	The grout lines are too deep.	Wall tools typically apply only light pressure to grout lines that are deeper than 1/8". First, work out any air bubbles, then try re-rolling the grout lines by applying heat and conforming with the TSA-2 tool. A contour gauge can be useful for visualizing grout line depth. Finish the film with the **Mosaic Graphic Technique** on page 22.
19		The grout line is too sharp.	Film IJ8624 do not conform well to square-cut (raked) or undercut grout lines as the film requires more stretching and the tools do not reach the corners. Film 480CV3 may adhere more successfully to rough mortar texture.
20		The film was not heated properly and worked well into the grout lines.	Typical rate of installation with a heat gun set to 1000° to 1100°F : • Film IJ8624/8524: less than 50 square feet/hour (4.6 m/hour) • Film 480Cv3/8658G: less than 75 square feet/hour (7 m/hour)
21		Film does not conform to the texture.	Perform the **3M Wall Film Adhesion Test** (page 9 for smooth walls and page 12 for textured walls) before committing to the entire installation. Following the **3M™ Enhanced Adhesion Cleaning Method** on page 14. As a last resort, apply 3M™ Primer 94 to the entire installation area before applying the film.
22	Film pops up from grout lines; leaks adhesive.	Printed film was not adequately dried prior to applying an overlaminate.	3M always recommends allowing solvent inkjet printed film to dry 24 hours before applying an overlaminate.
23	Film lifts over caulked lines.	Film will not stick to silicone caulk.	Using an acrylic caulk (even over existing caulk) may improve adhesion. Finish the film with the **Mosaic Graphic Technique** on page 22.
24	Bubbling and poor adhesion.	Film was applied to a damp substrate.	Exposure to rain, high humidity, or irrigation systems may make the textured wall too damp for some installations. Do not apply to a damp substrate or a substrate that cannot be adequately dried. Heating the substrate to dry it may help.

	Problem	What to Look For	Recommended Solutions
D. Installation Problems - TEXTURED Walls Only *continued*			
25	Large bubbles appear behind the film.	Film was not fully adhered during first pass of the tool.	Use enough pressure to press and conform the film into the lowest areas of the texture on the first pass with heat and the TSA-4 tool. Bridged areas (mortar lines) tend to lift more than the other areas.
26		Grout line is excessively deep.	Wall tools typically apply only light pressure to grout lines that are deeper than 1/8". First, work out any air bubbles, then try re-rolling the grout lines by applying heat and conforming with the TSA-2 tool. A contour gauge can be useful for visualizing grout line depth. Finish the film with the **Mosaic Graphic Technique** on page 22.
27		Adhesive channels through which air escapes were sealed before film was fully applied.	If air becomes trapped because all air release channels are closed off, use standard air release techniques, then apply heat and re-roll using a TSA tool.
28		Film was applied to flat, glazed tile.	For the best results, use film/overlaminate 480Cv3/8548G. Use a flat squeegee and conventional vehicle installation techniques. Then re-roll the grout lines using the TSA-1 or TSA-3 tool. Do not overheat the substrate, which may crack the tiles. For very smooth tile with little surface texture or contour, consider using 3M film IJ180Cv-3 and finish grout lines with a TSA tool and light heat.
29	Difficulty wrapping textured columns.	Wrong product.	Use film/overlaminate 480Cv3/8548G for the best results. This is generally flexible enough to wrap on a textured column.
30		Film is not level/properly aligned.	Use a laser level to assure a level graphic.
31		Exposing too much adhesive at one time.	Wrap the columns by working around the circumference, and pulling away only a foot or two of the liner at a time.
E. Post-Installation Problems - Textured Walls Only			
32	Visual bands on applied graphic.	Installer did not overlap every pass of the tool.	Overlap each pass of the tool by at least 50%, using the proper heat, pressure and speed of installation. See FIGURE 31, page 21, for a tip on overlaps. Typical installation speed and rate of installation: • film IJ8624/8524: 2 inches/second; about 50 square feet/hour or 20-30 minutes for a 4' x 8' panel. • film 480Cv3/8548G: 3 inches/second; about 75 square feet/hour or about 15 minutes for a 4' x 8' panel. Properly applied, the finished appearance of the film/overlaminate will be more luster than gloss.
33	Film is popping off the substrate.	Film was not heated enough.	See Installation Problems - Textured Walls Only, in this table.
34		Reworked an area that didn't go down well at first.	Make every effort to apply the film well during the initial installation. Reheating and reapplying a day or two later is less effective.
35		Film was not heated evenly.	Move at a consistent speed with even pressure, overlapping every pass.
36		Not enough heat was used.	Use a digital heat gun with an internal temperature of about 1000° (538°C). Hold the gun 1 inch (25 mm) from the film being heated.
37		Too hot an environment.	High environmental heat, such as locating the graphic on a hot sunny wall, may increase lifting, as well as make the film too stretchy. When possible, install the film in the coolest part of the day. Check the substrate temperature with an IR gun.
F. Post-Installation Problems - All Walls			
38	Edges of film lift prematurely.	Poor installation technique, or wrong tools.	Review this Bulletin and make sure you are using the right film, right tools, and right techniques for your walls. Particularly for textured walls, lots of practice is critical for consistent success.
39	Large portion of film lifts or falls off prematurely.	Poor initial bond of paint to wall.	Wrong film used. Perform the **3M Wall Film Adhesion Test** (page 9 for smooth walls and page 12 for textured walls). Wall not properly cleaned. Follow the **3M™ Enhanced Adhesion Cleaning Method** on page 14.
40		Under-cured paint.	Be sure the paint is properly applied and fully cured before applying film.
41		Moisture behind wallboard causing wallboard paper to release.	Avoid installations on walls that back up to cooling systems, water pipes, overhead windows or water pipes that could create condensation or drip water onto the graphic as well as boarded up windows.

42	The wall, its paint or wallcovering is damaged during graphic removal.	Poor bond of paint or wallcovering to substrate.	Enhancing film adhesion due to low VOC paints is likely to result in substrate damage even when removing removable or changeable films. If such damage is a concern to your customer, be sure you set the expectations prior to installation.
43		Improper removal technique.	See page 24 for the 3M recommended technique.
44		Cuts made to the graphic during the installation penetrated both the film and substrate.	Use caution when cutting film that near surfaces such as wallboard and wallpaper.
45		Wall is poured concrete.	The outer 0.5 to 1.0 mm of a poured concrete surface is often loosely bonded together, even though it doesn't appear that way to the eye. Even if the paint covering the wall is well cured and bonded, the force used in pulling off an adhesive product may fracture the concrete layer, pulling it and the paint off. Always perform the 3M Wall Film Adhesion Test in an inconspicuous area to determine the possibility of damage, with the understanding that this is not a definite test.
46	Film is popping off the substrate.	Texture is too severe.	It is difficult to force film into cavities of deeply recessed texture or sharp bumps. Experiment with increasing the heat and adjusting the installation pressure, as well as trying a variety of tools such as TSA-1, TSA-2, TSA-3 and CMP-1. 3M textured wall films are most successful on moderately textured walls.

G.	**Removal Problems - All Walls**		
47	Outdoor graphic caused substrate damage.	Film subjected to freeze-thaw cycles.	Freezing and thawing cycles can cause moisture vapor transmission issues. See the details on page 3. Salts that pass through masonry may be trapped behind film and result in staining or discoloration upon removing the film. Always check and follow your local building codes. 3M is not responsible for damage caused by using this product outdoors.
48	Substrate is being damaged as film is removed.	Film is too cold.	Warm the film with the heat gun set at about 250°F (121°C) while slowly pulling the film from the substrate.
49	Removal is difficult and time consuming.	Film has degraded	Over time and exposure to environmental conditions, film can degrade so that the adhesive and film layer do not stay together during removal.

14. Disclaimer

The information contained and techniques described herein are believed to be reliable, but 3M makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose.

The 3M Graphics Warranty Brochure, along with the applicable film Product Bulletins, provide the details to any warranty offered for the 3M graphics products described in this Bulletin.

15. Limitation of Liability

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

16. Technical Service

For assistance in reviewing your film adhesion test results or other questions regarding wall installations, call 3M Technical Service at 1-800-328-3908.

17. 3M Related Literature

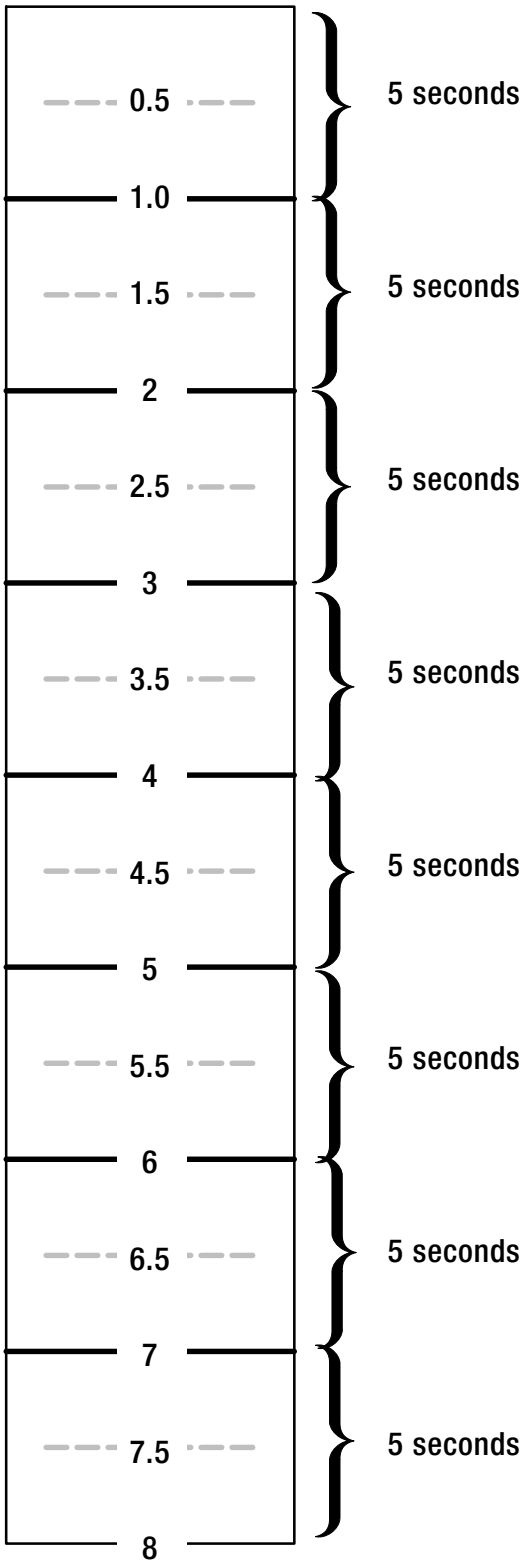
Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The techniques described in these Bulletins are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

18. Bulletin Change Summary

This bulletin has been substantially updated. Pay particular attention to the new information on low VOC paints, page 8, the 3M Wall Film Adhesion Test (page 9 for smooth walls and page 12 for textured walls) and **3M™ Enhanced Adhesion Cleaning Method** on page 14.

19. Measured Reference Guide



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