



Making Backlit Signs With 3M Digitally-Printed Graphics

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How to Use This Bulletin

This bulletin describes how to construct backlit signs printed on 3M-approved electrostatic or piezo ink jet printers using the recommended 3M materials.

1. Review **Maximizing the Image Quality of Backlit Graphics** on page 5.
2. Select the appropriate **Construction Option** (pages 3 and 4). This section also helps you determine which compatible products are suitable for your graphic and printer platform. We encourage you to experiment with multiple options to determine the best one for your customer's needs.
3. Review the **Product Bulletins** for the films you are using to determine any special usage details or restrictions, and whether an overlamine is required.
4. Refer to the **Product and Instruction Bulletins for the ink/toner** you are using to determine processing conditions for backlit signs.

5. Use a **wet application method**.
 - a. See **General Assembly Methods**, page 7.
 - b. Follow the assembly method for your specific construction.
 - See **Assembly Methods for Single Panels with No Overlaps or Trapped Film**, page 9.
 - See **Assembly Method For Complex Constructions Using Trapped Film or Seams (Overlaps)**, page 11.

Compatible Products

Printer Platforms, Inks/Toners, Transfer Media

- Scotchprint® Printer 2000 and Printer 9512
 - Scotchprint® Toner Series 8700
 - 3M™ Trident Transfer Paper
- Océ Arizona 180 Printer
 - 3M™ Piezo Ink Jet Ink Series 3700
- Scitex PressJet-W™ Digital Press
 - 3M™ Piezo Ink Jet Ink Series 1600
- VUTEK UltraVu™ 2360/3360 Printers
 - 3M™ Piezo Ink Jet Ink Series 2300
- VUTEK UltraVu™ 3000/3300 and 5000/5300 Printers
 - 3M™ Piezo Ink Jet Ink Series 4000

Imaging Films

- 3M™ Scotchcal™ Graphic Film IJ3630-20
- 3M™ Scotchcal™ Graphic Film RG3630-20
- 3M™ Scotchcal™ Graphic Film 3650-114
- 3M™ Scotchcal™ Graphic Film RG3650-114
- 3M™ Scotchcal™ Clear Graphic Film 8626 ES
- 3M™ Scotchcal™ Translucent Graphic Film 8628 ES
- 3M™ Scotchcal™ Changeable Graphic Film 8650-20 ES and 8650-114 ES

Supporting Films

- 3M™ Scotchcal™ Translucent Graphic Film Series 3630
- 3M™ Scotchcal™ Translucent Graphic Film Series 7725
- 3M™ Diffuser Films 3635-30, 3635-70
- 3M™ Light Enhancement Film 3635-100

Overlaminates

- 3M™ Scotchcal™ Luster Overlamine 8908 ES
- 3M™ Scotchcal™ Matte Overlamine 8909 ES
- 3M™ Scotchcal™ Luster Overlamine 8910 ES
- 3M™ Scotchcal™ Matte Overlamine 8911 ES
- 3M™ Scotchcal™ Luster Overlamine 8519
- 3M™ Scotchcal™ Matte Overlamine 8520

Substrates for Film Constructions

- 3M™ Panaflex™ Awning and Sign Facing 945GPS
- 3M™ Panaflex™ *Enhanced Image* Sign Facing 645EI
- Clear or translucent substrates such as glass or plastic

Substrate for VUTEk UltraVu™ Direct Print

3M™ Panagraphics™ II Intermediate Flexible Substrate. This substrate may be printed directly with the UltraVu™ printers and 3M™ Piezo Ink Jet Inks. No further details are provided in this bulletin. Refer to Product Bulletin: Panagraphics for details.

Tools

- 3M™ Plastic Applicator PA-1 (blue or gold)*
- 3M™ Low Friction Sleeve SA-1*
(Use a low friction sleeve on the plastic applicator to minimize the possibility of surface scratching)
- Pin or 3M™ Air Release Tool 391X*
- Razor blades/cutting knives
- Straight edge
- Spray bottle or plastic garden sprayer
- Clean, soft, lint-free cloths or paper toweling
- Light table
- Adequate clean work area

*Available from 3M Commercial Graphics Division.

Health and Safety

Caution

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

To obtain MSDS sheets for 3M products:

- By fax, call 1-800-364-0768 in the US and Canada or 1-650-556-8417 for all other locations.
- Electronically, visit us at <http://www.3M.com/MSDS>.
- By mail, or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

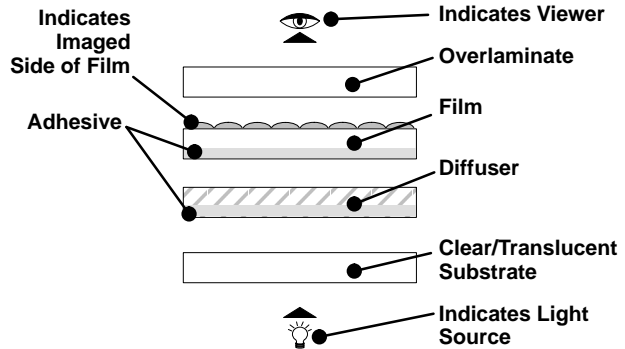
When using any equipment, always follow the manufacturers' instructions for safe operation.

Construction Options

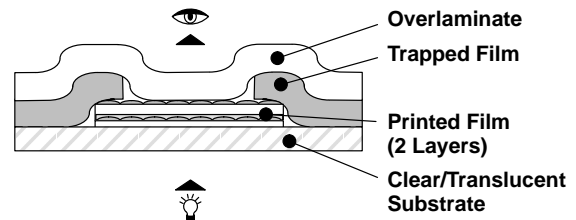
Key to Illustrations

The proportions of the construction option illustrations are intentionally exaggerated to provide more detail about the order of the materials used and the direction the printed side of the film faces.

Key for Typical Stacked Construction



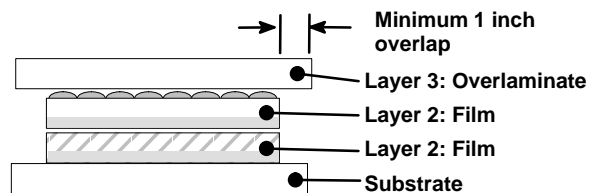
Key for Typical Trapped Film Construction



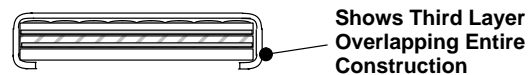
Note about Using Three Film Layers

Whenever three consecutive layers of film are used, the top layer of film must extend beyond the edges of the two underlying layers of film by at least one inch all around. The margin of film can wrap around the substrate, or the underlying two layers can be cut smaller than the substrate so that the top (third layer) is bonded to the substrate.

Option: Sandwiching Two Film Layers



Option: Overlapping Entire Construction



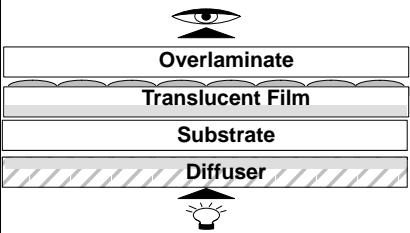
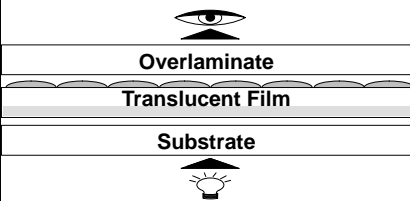
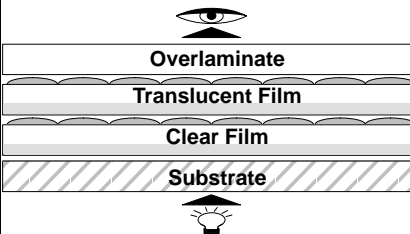
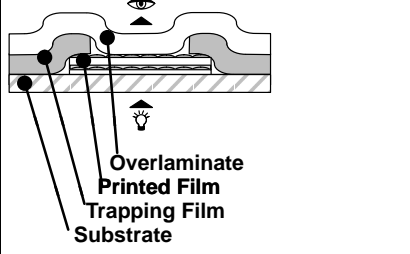
Note About Where to Put A Diffuser Film

If you are using a diffuser film and a rigid substrate, the diffuser film can be applied directly to the opposite side of the substrate as the film is applied. For many constructions, this is an excellent way to avoid three consecutive film layers, as described above. Read more about whether you should use a diffuser film on page 5.

Note: For the full product names of the 3M products listed on this page, please see page 1.

First Surface Options

First surface graphics are those in which the film is printed right facing and, technically, you see the ink before the film. This type of construction typically uses an overlaminate to provide protection from abrasion, especially if the light box does not have a built-in front cover, but an overlaminate may not be required on all piezo printed graphics.

Option	MATERIALS		FILMS / PLATFORM			
	Product	Printer 2000 Printer 9512	Piezo Ink Jet			
			Arizona 180	Pressjet-W	UltraVu 2360/3360	UltraVu Series 3000 and 5000
OPTION A1 First Surface, with One Printed Film Layer, an Overlaminate and a Diffuser Film applied second surface <i>See page 9 for construction technique.</i>						
	Overlaminat e	8910 <i>or</i> 8911	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹
	Film, Translucent	8650-20	RG3630-20	IJ3630-20	IJ3630-20	IJ3630-20
	Diffuser	3635-30 <i>or</i> 3635-70 ²	3635-30 <i>or</i> 3635-70 ²	3635-30 <i>or</i> 3635-70 ²	3635-30 <i>or</i> 3635-70 ²	3635-30 <i>or</i> 3635-70 ²
	Substrate	Clear, Rigid				
OPTION A2 First Surface, with One Printed Film Layer and an Overlaminate <i>See page 9 for construction technique.</i>						
	Overlaminat e	8910 <i>or</i> 8911	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹
	Film, Translucent	8628	RG3620-20	IJ3630-20	IJ3630-20	IJ3630-20
	Substrate	Translucent, Flexible or Rigid				
OPTION A3 First Surface, with Two Printed Film Layers and an Overlaminate <i>See page 9 for construction technique.</i>						
	Overlaminat e	8910 <i>or</i> 8911	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹
	Film, Translucent	8628 <i>or</i> 8650-20	RG3630-20	IJ3630-20	IJ3630-20	IJ3630-20
	Film, Clear	8626 <i>or</i> 8650-114	RG3650-114	3650-114	3650-114	3650-114
	Substrate	Translucent, Flexible or Rigid				
OPTION A4 First Surface, Two Printed Film Layers, Trapped Film and an Overlaminate <i>See page 11 for construction technique.</i>						
	Overlaminat e	8910 <i>or</i> 8911	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹	8519 <i>or</i> 8520 <i>or</i> None ¹
	Trapped Film	3M™ Scotchcal™ Translucent Film				
	Film	8628 <i>or</i> 8650-20	RG3630-20	IJ3630-20	IJ3630-20	IJ3630-20
	Film	8626 <i>or</i> 8650-114	RG3650-114	3650-114	3650-114	3650-114
Substrate	Translucent, Flexible or Rigid					

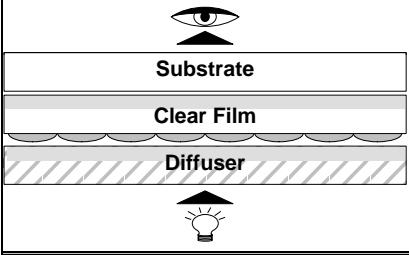
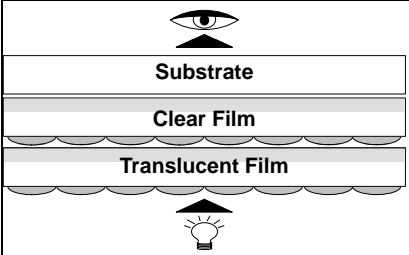
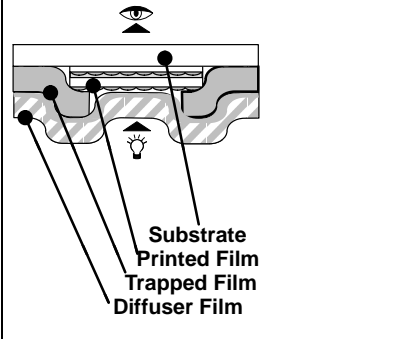
¹ The warranty for piezo printed graphics varies by whether or not an overlaminate is used, and by which overlaminate is used. Refer to the base film's product bulletin for details.

² In most graphics, diffuser film 3635-30 is the best choice with 30% light transmission. However, diffuser film 3635-70 with 60% light transmission may be sufficient for darker images.

Note: For the full product names of the 3M products listed on this page, please see page 1 and 2.

Second Surface Options

Second surface backlit graphics are well suited for light boxes that do not have a built-in front cover. In this construction, the graphic is printed as a mirror image and technically, the viewer sees the film before the printed image. The clear, rigid substrate provides protection for the graphic.

Option	MATERIALS	FILMS / PLATFORM				
	Product	Electrostatic	Piezo Ink Jet			
		Printer 2000 Printer 9512	Arizona 180	Pressjet-W	UltraVu 2360/3360	UltraVu Series 3000 and 5000
OPTION B1 Second Surface, One Printed Film Layer and a Diffuser Film <i>See page 10 for construction technique.</i>						
	Substrate	Clear, rigid				
	Film Print as mirror image	8626 <i>or</i> 8650-114	RG3650-114	3650-114	3650-114	3650-114
	Diffuser	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ¹
OPTION B2 Second Surface, Two Printed Film Layers <i>See page 10 for construction technique.</i>						
	Substrate	Clear, rigid				
	Film Print as mirror image	8626 <i>or</i> 8650-114	RG3650-114	3650-114	3650-114	3650-114
	Film Print as mirror image	8628 <i>or</i> 8650-20	RG3630-20	IJ3630-20	IJ3630-20	IJ3630-20
OPTION B3 Second Surface, Two Printed Film Layers, Trapped Film and Diffuser Film <i>See page 11 for construction technique.</i>						
	Substrate	Clear, rigid				
	Film Print as mirror image	8626 <i>or</i> 8650-114	RG3650-114	3650-114	3650-114	3650-114
	Film Print as mirror image	8628 <i>or</i> 8650-20	RG3630-20	IJ3630-20	IJ3630-20	IJ3630-20
	Trapped Film	Translucent Graphic Film 3630 or 7725				
	Diffuser Film	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ²	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ¹	3635-30 <i>or</i> 3635-70 ¹

¹ In most graphics, diffuser film 3635-30 is the best choice with 30% light transmission. However, diffuser film 3635-70 with 60% light transmission may be sufficient for darker images.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Maximizing the Image Quality of Backlit Graphics

It is more difficult to create a successful backlit graphic than an opaque graphic. Good image density is the most important factor. However, you must consider all of the following points and work to balance them until you achieve the desired results. We encourage you to experiment with multiple options to determine the best one for each of your customer's needs.

- Colors used in the graphic:
 - Pastel images *may* require only one printed film layer.
 - Bright, dark images need two printed film layers to achieve sufficient image density.
 - High contrast images may reveal inconsistencies in the light source more obviously.
- Design of the graphic:
 - Large areas of solid color, unless they are all pastel, need two printed film layers to achieve sufficient image density and consistency.
 - Busy images are usually most successful, but dark or bright images need two printed film layers.
- The purpose of a diffuser:

A diffuser helps create image density by decreasing light. Too little diffusion diminishes density. Depending on your construction, sufficient diffusion may be achieved by using a translucent substrate, a translucent imaged film, and/or a translucent film specifically designed as a diffuser.
- Type of substrate used:

Depending on the construction you use, first surface graphics can use translucent or clear, flexible or rigid substrates. Second surface graphics require a clear, rigid plastic substrate.
- Characteristics of the light box:

The design of some light boxes tends to produce hot spots or create a washed out graphic appearance. To minimize these problems:

 - Use a diffuser film between the light source and the film. Although there will be some loss in overall image brightness, you will have a more consistent image.
 - To maximize the use of light inside a light box, we recommend lining the box with light enhancement film 3635-100. This is a proprietary diffuse reflective film that creates a brighter, more uniform appearing sign face. See 3M Related Literature at the end of this document for how to get more information about this product.

Printing

Piezo

For piezo-printed graphics, refer to the ink's product bulletin for detailed printing recommendations. DO NOT exceed the total ink coverage recommendations in an attempt to increase image density. This will cause other performance problems.

Electrostatic

For electrostatic printing, the image is first printed on Trident transfer paper and then transferred through heat and pressure to the film. Refer to Product Bulletin Trident and Instruction Bulletin 4.7 for details.

Screening Patterns for Double Layer Backlit Signs that Minimize Moire

If Using Scotchprint® Graphic Maker Software 4.1 or higher

Use one of the following screening methods.

- 3M Stochastic
 - RIP both graphic layers using the Stochastic screening method.
- 3M Fast Dither
 - RIP the first graphic layer using Stochastic.dth or DotGrowth.dth
 - RIP the second layer graphic using 3M stochastic_180.dith or DotGrowth_180.dth
- 3M Halftone (not recommended for piezo ink jet)
 - Rip first dg4a
 - Rip second dg4a90

If Using PosterShop™ Software

Print the clear and translucent films using the same screen combination. Do not use 154 or 309 screen pattern to print two film layers for backlit signs.

Use one of the following screening methods.

- 309 Stochastic
- 309 FDRP Diffusion
- 154 FDRP Diffusion

When to Use an Overlamine

All electrostatically-printed, first surface graphics require an overlamine in order to be warranted.

Piezo-printed backlit graphics are warranted even without an overlamine. However, you can use an overlamine to change the gloss of the graphic, provide additional protection from contaminants and abrasion, and it may increase the warranty. Refer to the film's Product Bulletin for details.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Applying an Overlaminator with a Laminator

The overlaminator can be applied with a cold roll laminator if you allow the assembled backlit film/substrate construction to dry for at least 24 hours *and* your laminator can handle the thickness and rigidity of the construction.

When to Tension Panaflex Sign Facing 645EI

If you plan to heat tension the sign facing, always install it in the frame and heat tension **BEFORE** applying a digitally-imaged graphic.

If you need to apply the graphic first, mechanical tensioning must be used.

See Instruction Bulletin 5.21 for details.

Substrate Preparation

Preparing Plastic Substrate

Some plastic substrate (also called plastic sheet) has a protective covering. Be sure you peel it off and remove all traces of the adhesive. Then clean the substrate.

Dry rigid plastic substrate before applying the film. Use the method recommended by the plastic manufacturer. Failure to properly dry the plastic can result in outgassing, which may cause the film to bubble.

Note: PETG and some acrylic substrate need no pre-drying. Consult your plastic manufacturer.

Preparing Panaflex Sign Facing

Clean as instructed below before applying any film.

Substrate Cleaning Procedure

√ Important Note

All substrates must be considered contaminated; clean all substrate immediately prior to application.

Caution

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

1. Ensure the compatibility of any solvents you use with the plastic substrate before cleaning it. Refer to the plastic sheet manufacturer's recommendations. Solvents such as Dupont's Prep-Sol™ 3919S, VM&P Naphtha, or isopropyl alcohol are good cleaning solvents.
2. Saturate a clean paper towel with solvent that is compatible with the plastic substrate being used. Wipe the substrate clean.
3. Dry the substrate with a lint-free paper towel *before* the solvent evaporates.
4. Wash the substrate with a synthetic, free-rinsing detergent. Avoid washing the substrate with a soap containing creams or lotions. Wipe dry with a lint-free cloth.

Key Application Tips

Keep these key application tips in mind before and during application.

- **Clean work area.** Make sure the work surface and surrounding area are properly cleaned to avoid contaminating the graphics.
- **Temperature.** Make sure the film, air and surface temperatures are between 60° and 100°F (16° and 39°C).
- **Wet application method.** Use only the detergent and water application method. Other application techniques cause dark marks, which are visible in transmitted light.
- **Handling paper liners.** If the film you are using has a paper liner, DO NOT allow the liner to get wet before removing it from the film. A wet liner is difficult to remove.
- **Seams and overlaps.** Seams must be made using the overlap method. See page 11.
- **Applicator tools.** Use plastic applicator PA-1 that is smooth and not nicked. A large window squeegee may be used to remove the water solution. However, an applicator PA-1 with a low friction sleeve SA-1 must be used for the final squeegeeing.
- Review the **Squeegee Techniques and Squeegee Procedures** on page 8.
- Puncture air bubbles with an air release tool. See **Removing Air Bubbles** on page 12.
- **To remove an application tape,** if used, always remove it at an angle as close as possible to 180 degrees and immediately re-squeegee the film.
- **Cut and weed** within 1-1/2 hours after application, for the best results. See **Cutting and Weeding** on page 12.
- **Keep newly fabricated sign faces out of direct sunlight for at least 24 hours.** This allows any remaining moisture to dry evenly without wrinkling the film.

Caution

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

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

General Assembly Procedures

Review these general assembly procedures and then use them as instructed in the specific assembly procedures for your type of graphic construction (Option A1, etc.), which begin on page 9.

F. Make the Wetting Solution

- Use a mild liquid dish detergent (not soap) that contains no creams or fragrance. Other types of detergents may cause application problems and may interfere with the bond of the adhesive.
- Make a wetting solution using mild liquid dish detergent and cool water. If the detergent is concentrated, use of one-half teaspoon (3 cc); if it is not concentrated use one teaspoon (6 cc).
- For further details, see Instruction Bulletin 5.1.

G. How to Remove a Liner and Wet the Adhesive

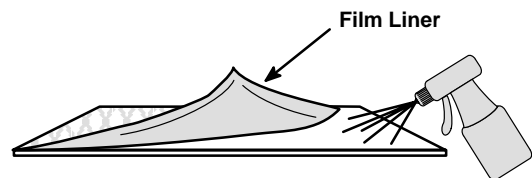


Figure 1. Remove the Liner; Wet the Film

1. Place the layer so it is liner side up on a clean light table.
2. Lift one corner of the liner while spraying the wetting solution onto the exposed adhesive.

Note: If the film has a paper liner, avoid wetting the liner, which makes it more difficult to remove.

3. Continue to remove the liner and spray the solution. By the time the liner is completely removed, the entire adhesive surface should be wet. Spray on more solution if necessary.

H. Squeegee Technique.

Note: Use this procedure in conjunction with **Squeegee Procedure**, below.

1. Always squeegee across the shortest distance (center to edge). Start in the center of the graphic and squeegee straight out to one edge. Do NOT use an arcing stroke, which traps the wetting solution and air.
2. Return to the center and squeegee to the opposite edge.
3. Return to the center and start the next stroke so it overlaps the previous one by about 50 percent.
4. Continue up the graphic, return to the center of the graphic, and continue down until the film is completely adhered.

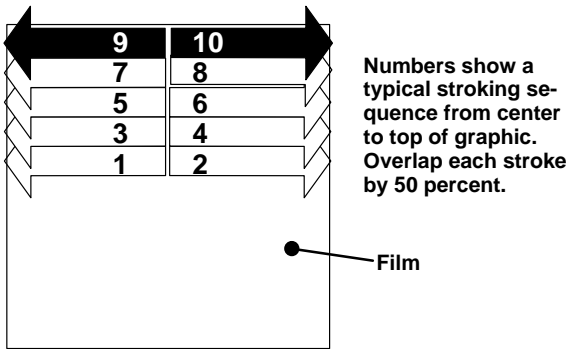


Figure 2. Typical Stroking Sequence for Squeegeeing

I. Squeegee Procedure

1. To avoid friction, spray additional wetting solution onto the surface that you will be squeegeeing.
2. The first time over the film, use light overlapping squeegee strokes while smoothing out the wrinkles. If a large amount of film builds up ahead of the squeegee, use your hand to push out the excess water and smooth the film. Then continue with light overlapping strokes across the entire graphic.
3. Go over the film again using firm squeegee strokes.

4. Dry the graphic with a lint-free clean cloth or soft paper toweling. Be sure to absorb the moisture along the edges, too.
5. Re-squeegee the entire graphic—several times, if necessary, to remove all water between the image and the spacer. If needed, use a little of the detergent and water solution to lubricate the squeegee.

Note: If the application has bubbles, refer to **Removing Bubbles Under the Film**, page 12.

6. Check for good adhesion by trying to lift a corner.

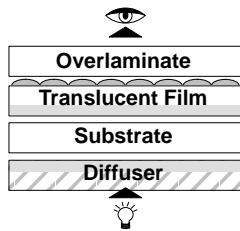
J. Re-squeegee After 24 Hours

After 24 hours at room conditions, re-squeegee all film edges. Use a low friction sleeve SA-1 on the applicator to prevent scratching.

Assembly Method For Single Panels with No Overlaps Or Trapped Film

Option A1

First surface, one printed film layer, an overlamine and a diffuser film applied second surface

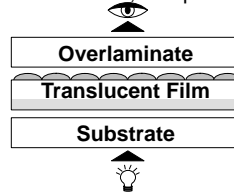


Note: To avoid three consecutive layers of film, Option A1 places the diffuser film on the second surface of this construction. See **Note about Using Three Film Layers** and **Note About Where to Put A Diffuser Film** on page 2 for other options.

1. Remove the liner as you wet the adhesive on the diffuser film. See **Remove a Liner and Wet the Film**, page 7.
2. Thoroughly flood the substrate with wetting solution.
3. Position the adhesive side of the diffuser film against the *second surface* of the substrate.
4. Wet the the top of the diffuser film.
5. Squeegee thoroughly. See **Squeegee Techniques and Squeegee Procedures** on page 8.
6. Turn the substrate over so the *first surface* is facing up.
7. Remove the liner as you wet the adhesive on the translucent film.
8. Thoroughly flood the *first surface* of the substrate with wetting solution.
9. Position the adhesive side of the translucent film against the substrate.
10. Wet the the top of translucent film. Squeegee thoroughly.
11. If you are using an overlamine:
 - a. Remove the liner as you wet the adhesive on the overlamine.
 - b. Thoroughly flood the translucent film with wetting solution.
 - c. Position the adhesive side of the overlamine against the translucent film.
 - d. Wet the top of the overlamine. Squeegee thoroughly.
12. **Re-squeegee all edges after 24 hours.**
13. Mount the construction in the light box.

Option A2

First surface, one printed film layer and an overlamine

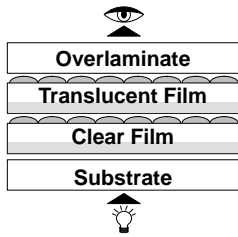


1. Remove the liner as you wet the adhesive on the translucent film. See **Remove a Liner and Wet the Film**, page 7.
2. Thoroughly flood the substrate with wetting solution.
3. Position the adhesive side of the translucent film against the substrate.
4. Wet the top of the translucent film.
5. Squeegee thoroughly. See **Squeegee Techniques and Squeegee Procedures** on page 8.
6. If you are using an overlamine:
 - a. Remove the liner as you wet the adhesive on the overlamine.
 - b. Thoroughly flood the translucent film with wetting solution.
 - c. Position the adhesive side of the overlamine against the translucent film.
 - d. Wet the top of the overlamine. Squeegee thoroughly.
7. **Re-squeegee all edges after 24 hours.**
8. Mount the construction in the light box.

Assembly Method For Single Panels with No Overlaps Or Trapped Film, continued

Option A3

First surface, two printed film layers and an overlaminate



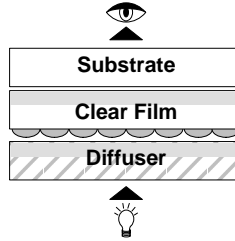
Note: Before beginning, see **Note about Using Three Film Layers** on page 2.

Note: For this option, be sure you are working on a light box and precisely align the two layers of imaged film.

1. Remove the liner as you wet the adhesive on the clear film. See **Remove a Liner and Wet the Film**, page 7.
2. Thoroughly flood the substrate with wetting solution.
3. Position the adhesive side of the clear film against the substrate.
4. Wet the top of the clear film.
5. Squeegee thoroughly. See **Squeegee Techniques and Squeegee Procedures** on page 8.
6. Remove the liner as you wet the adhesive on the translucent film.
7. Thoroughly flood the clear film with wetting solution.
8. Position the adhesive side of the translucent film against the clear film.
9. Wet the top of the translucent film. Make sure the images on both printed film layers are precisely aligned. Squeegee thoroughly.
10. If you are using an overlaminate:
 - a. Remove the liner as you wet the adhesive on the overlaminate.
 - b. Thoroughly flood the translucent film with wetting solution.
 - c. Position the adhesive side of the overlaminate against the translucent film.
 - d. Wet the top of the overlaminate. Squeegee thoroughly.
11. **Re-squeegee all edges after 24 hours.**
12. Mount the construction in the light box.

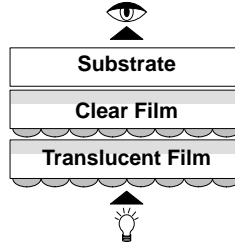
Option B1

Second surface, one printed film layer and diffuser film



Option B2

Second surface, two printed film layers



Note: For this option, be sure you are working on a light box and precisely align the two layers of imaged film.

1. Remove the liner as you wet the adhesive on the clear film. See **Remove a Liner and Wet the Film**, page 7.
2. Thoroughly flood the substrate with wetting solution.
3. Position the adhesive side of the clear film against the substrate.
4. Wet the top of the clear film.
5. Squeegee thoroughly. See **Squeegee Techniques and Squeegee Procedures** on page 8.
6. Remove the liner as you wet the adhesive on the diffuser film *or* translucent film.
7. Thoroughly flood the clear film with wetting solution.
8. Position the adhesive side of the diffuser film *or* translucent film against the clear film.
9. Wet the top of the diffuser film *or* translucent film. Make sure the images on both printed film layers are precisely aligned. Squeegee thoroughly.
10. **Re-squeegee all edges after 24 hours.**
11. Mount the construction in the light box.

Assembly Method For Complex Constructions Using Trapped Film or Seams (Overlaps)

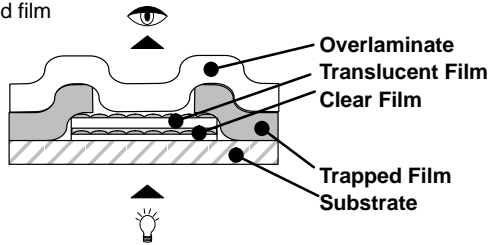
Complex Constructions with Trapped Film

To create a unique effect, you can trap a solid color translucent film between the printed film and an overlamine. This type of construction requires skill and patience. Construction Options A4 and B3 illustrate this technique, but keep the following points in mind.

- The films used may require electronic cutting and pre-mask tape; these elements of the construction are not discussed in this procedure, but you will need to consider them.
- There will be some gloss difference where the overlamine film ends, if it is not applied over the entire sign face.
- The various films used may also have different durability; the warranty, when offered, is equal to the lowest warranty for any product used in the 3M recommended construction.

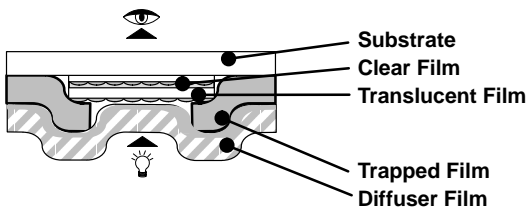
Option A4

First surface, two printed film layers, overlamine and trapped film



Option B3

First surface, two printed film layers, trapped film and diffuser film



1. Follow Steps 1 to 10 of Option B2, page 10.
2. Remove the liner as you wet the adhesive on the trapped film.
3. Position the trapped film over the printed film, ensuring the overlap specified in Figure 3.

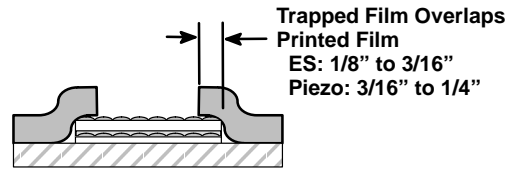


Figure 3. Overlaps Required for Trapped Film

4. Thoroughly flood the surface of the trapped film with wetting solution. Squeegee thoroughly.
5. Remove the liner as you wet the adhesive on the overlamine *OR* diffuser film.
6. Thoroughly flood the trapped film with wetting solution.
7. Position the wet adhesive side of the overlamine *OR* diffuser film against the wet trapped film.
8. Wet the surface of the overlamine *OR* diffuser film. Squeegee thoroughly.
9. **Re-squeegee all edges after 24 hours.**
10. Mount the construction in the light box.

Alternative Overlamine Application for Option A4

Covering the trapped film completely with the overlamine is the preferred method. However, you can apply the overlamine over just the printed film as long as it overlaps the trapped film by a minimum of 1/4 inch.

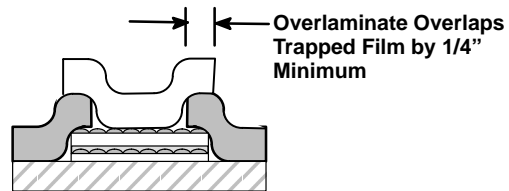


Figure 4. Alternative Overlamine Application

Complex Constructions with Seamed Film

For most digitally-imaged graphics, you can create multi-panel signs. However, take these points into consideration:

- Digitally-imaged film may shrink after installation.
- If the film shrinks, there will be a light leak that is usually unacceptable.
- The appearance of light leaks can be reduced or eliminated by creating an overlap at the panel seams. The seam does appear darker than the rest of the image, especially when backlit, but it is generally more acceptable than a light leak. This is the only method recommended by 3M. See Figure 5.
 - Overlap electrostatically-imaged graphic panels by 1/8 to 3/16 inch .
 - Overlap piezo-imaged graphic panels by 3/16 to 1/4 inch .

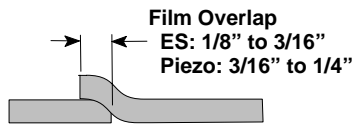


Figure 5. Recommended Film Overlaps

- Use only horizontal or only vertical seams in one sign; do not use a combination of seam directions. If you are making horizontal seams (rain lap), lap the top panel over the bottom panel.
- Seams for each layer of film, diffuser and/or overlaminate must each be offset by at least 1/4 inch. Figure 6 illustrates the preferred method of offsetting the overlaps. This method eliminates all gaps except the one in the bottom layer of film and creates a better sealing seam.

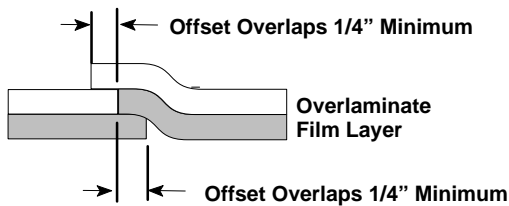


Figure 6. Offset Overlaps Required for Each Layer

Cutting and Weeding After Application

For the best results, cut and weed the film within 1-1/2 hours after application. The adhesive bond builds with time and weeding becomes more difficult.

1. Cutting may be done with conventional graphic knives, either fixed or swivel, or with a sharp razor blade in a safety holder.

2. Patterns may be placed on the surface of the applied film by pouncing with chalk or carbon dust. Some carbon papers and some graphic pens may permanently mark the film so check suitability before using.
3. Avoid or minimize over-cuts to eliminate light leaks.
4. To weed, carefully pick up a corner of the weed and pull with sharp, short jerks at a 180 degree angle. If adhesive transfers to the substrate during removal, warm the surface slightly during removal to reduce the amount of transfer.
5. Any adhesive left on the substrate may be removed by rubbing with the thumb or finger.

Removing Bubbles Under the Film

1. To remove entrapped bubbles, puncture the film at one end of the bubble with a pin or other sharp, round pointed tool, such as 3M™ Air Release Tool 391X. Press out the entrapped air or wetting solution with the thumb or squeegee, moving toward the puncture. See Figure 7.

Note: Do not use a knife or razor blade to puncture the film; those tools will create too large an opening.

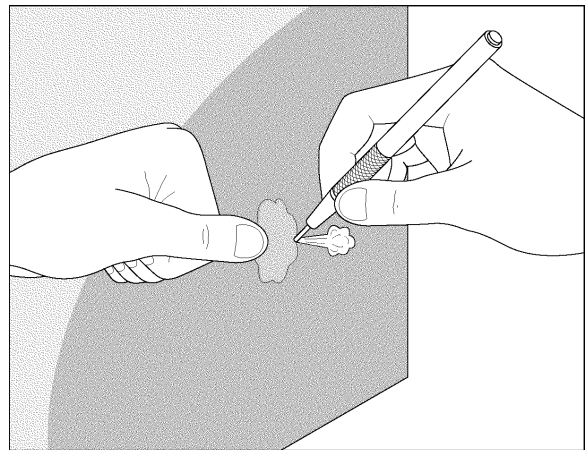


Figure 7. Using a Pin to Remove Bubbles

2. Some bubbles may be removed by spraying the top area with solution and squeezing it out with rapid stroke of the squeegee.

Installing in Sign Frames

There are two methods of preparing the edges of the graphic to reduce the chance of damage when installing it in a sign frame.

- Trim away the film at least 1/8 inch from the edges of the substrate all around the graphic. The trimmed area will be hidden by the retainer.
- Apply a clear protective tape to the edges of the graphic to reduce the risk of film damage due to constant rubbing.

Use care when inserting the sign face into the sign frame to ensure that sharp edges do not catch or tear the film.

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Using 3M application tapes; premasking and prespacing for films	4.3	6503
Application, substrate selection, preparation and substrate-specific application techniques	5.1	7001
Application and attachment of graphics for Panaflex awning and sign facing 645EI	5.21	7021
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