

Overview

This bulletin provides basic information on the proper preparation of 3M graphic materials and on application of overlaminates or application tapes using dedicated equipment.

All 3M Graphics printed films that are to be laminated must be printed and prepared according to 3M’s guidance. This bulletin provides only basic overviews regarding drying solvent, eco-solvent, and latex printed graphics, and on curing UV printed graphics. Graphic manufacturers should refer to the product bulletins for the ink used in constructing their graphic.

NOTE

The processes described in this bulletin are only general lamination procedures. Refer to manufacturer’s instructions for operating details specific to a given laminator.

NOTE

Always observe the laminator while it is running. Laminators are sensitive pieces of equipment and may develop issues unexpectedly. Keeping an eye on the laminator as it works helps prevent production of damaged graphics and the resulting waste of material. Pay special attention to the nip area to ensure it is flat and wrinkle free, as well as to the area where the laminate separates from its liner.

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Ink Considerations

For all ink types, ensure the total ink coverage limitations were followed during printing. For 3M films, refer to the Total Ink Coverage recommendations in the base film’s product bulletin. If no value is listed, assume a maximum ink density of 270%.

Solvent and Eco-Solvent Ink Printed Graphics

Ensure the inks are dried prior to lamination. Inadequate drying can result in graphic failures including curling, increased shrinkage, and adhesion failure, which are NOT covered under warranty.

Latex Ink Printed Graphics

Tests to confirm drying are mainly visual. To check if a sample dries properly, print a multi-colored test image using the correct media settings, then perform the visual, rubbing, and stacking tests.

UV Ink Printed Graphics

The lower laminating roll must be heated in order to eliminate trapped air, otherwise known as “silvering”. The heat from the lower roll allows the adhesive from the overlaminate to wet out over the slightly textured surface of uv cured inks. The maximum allowable temperature for the lower roll is 125°F (51.7°C).



Other Lamination Considerations

Polyester Overlaminates

- Cut printed graphics into sheets when a polyester overlaminate will be applied, as this reduces the risk of tunneling.
- Check the finished graphic for curling by cutting off a section of the graphic and looking for edge curling.

Thick and/or Stiff Finished Graphics

Thick and/or stiff finished graphics, such as those printed on reflective films, should be wound on a 6 in. (15 cm) core, with the finished graphic's printed side facing out to prevent tunneling.

Low Humidity Environments

Use static strings or other static control devices to prevent electrical shocks occurring during the lamination process.

Materials

1. Make sure the base film and overlaminate are compatible with each other.
2. Make sure there is enough laminate for the base film.

Clean the Laminator

1. Clean the laminator rolls with a mixture of 70% isopropyl alcohol and 30% water to prevent slipping of the rolls.
2. Wipe the laminating rolls with manufacturing approved cleaners to eliminate repeating surface impression defects.

Compatible Products

3M offers a variety of graphic protection and application tape options. See the product bulletins on the Technical Information Selector at 3Mgraphics.com/TechInfo for a list of all 3M graphic protection options and details thereon. See [3M Instruction Bulletin Production: 3M Application Tapes for Graphic Films](#) for details on all compatible 3M application tapes.

Tools

Hardware used for nip pressure lamination (roll to roll) should meet the following design specifications.

- 61 in. (155 cm) wide for 60 in. (152.4 cm) finished graphics
- 1.5 in. (3.8 cm) nip opening with adjustable controls
- Two pairs of unwind and take-up shafts/rolls
- One pair of 70 durometer main pressure rolls
- At least the lower main roll is capable of being heated to a minimum of 125°F (51.7°C)
- Pressure gauge: See the laminator's owner's manual for specifications
- Speed control ranging from 1 to 20 ft/min (0.3 to 6.1 m/min)
- Static strings or other static control devices as necessary

NOTE

Table systems exist in various configurations. The table as well as the main roll may not apply sufficient pressure to work with UV printed graphics and/or perforated window graphic film constructions (due to uneven surface contact).

Checking Laminator Rolls

Always check the laminating rolls for a consistent nip “footprint” across the entire roll before starting the lamination process. Failure to do so can result in various defects including wrinkles, trapped air, telescoping of finished roll, etc.

To check for consistent pressure across the nip rolls, start with a sheet of 3M™ Wrap Film 2080-G12 (gloss black) and a sheet of 3M™ Print Wrap Film IJ180mC-114 (clear). The sheet sizes should exceed the main roller width by 1 in. (2.5 cm) on each side and should be 1 yard (1 meter) long.

1. Lay the 2080-G12 on the bottom laminating roll.
2. Drape the IJ180mC-114 on the top laminating roll.
3. Close the nip.
4. Advance the sheet 1 to 2 in. (2.5 to 5.1 cm).
5. Analyze the area across the width of the laminated sheet.
 - a. Examine a minimum of five points on the sheet, starting in the center and working out to the edges.
 - b. Look for consistent pressure across the width of the laminate sample.
6. If there are inconsistencies, reference the Trouble Shooting guide at the end of this document for diagrams on how the laminating rolls may be configured.

Roll Lamination

Cold Roll to Roll Lamination Procedure for non-UV Inkjet and Colored Film Graphics

This cold roll to roll lamination procedure can be used for most graphics, including solvent, eco-solvent, and latex inkjet printed graphics and colored, pigmented graphics. The instructions reference overlaminates, but application tapes can work similarly.

1. Load and thread the medium to be laminated according to the laminator’s operating instructions. The medium should be on the bottom of the laminator with the image side facing up toward the upper laminating roll.
2. Thread the overlaminate, with the take up roll receiving the liner, according to the laminator’s operating instructions. (When using application tape, thread the application tape similarly, though without taking up any used liner.) Ensure the adhesive makes contact with the image side of the medium and line up the edges of the medium and overlaminate rolls.
3. Set the laminator speed to 2 ft/min (0.6 m/min) or the laminator’s slow setting.
4. Lower the roll to set the nip pressure between the medium and the overlaminate to 80%, or whatever is acceptable according to the laminator’s operating instructions.
5. As the finished graphic moves out of the nip rolls, ensure there are no wrinkles in it. If there are wrinkles, adjust the brakes or tension dials per the manufacturer’s instructions until the desired tension and wrinkle free graphics are achieved.
6. Increase the laminator speed to a desired output based on the project’s needs. 3M recommends a lamination speed in the range of 5 to 10 ft/min (1.5 to 3 m/min).
7. When lamination is complete:
 - a. Open the nip rolls.
 - b. Remove the finished graphic roll.
 - c. Convert it for shipping or application.
8. Remove the cores, used liner, and other items from the laminator and ensure the rollers are no longer in contact.

Cold Roll to Sheet Lamination Procedure for non-UV Inkjet and Colored Film Graphics

This cold roll to sheet lamination procedure can be used for most graphics, including solvent, eco-solvent, latex, and inkjet printed graphics and colored, pigmented graphics. The instructions refer to overlaminates, but application tapes can work similarly.

1. Load and thread an extra piece of film or liner on the bottom nip according to the laminator's operating instructions. This protects the nip rolls from the overlaminate adhesive when the two nip rolls are brought together.
2. Thread the overlaminate with the take up roll for the liner according to the laminator's operating instructions. (When using application tape, thread the application tape similarly, though without taking up any used liner.) Ensure the adhesive makes contact with the extra piece of film or liner and lines up with the film or liner's edges.
3. Set the laminator speed to 2 ft/min (0.6 m/min) or the laminator's slow setting.
4. Lower the roll to set the nip pressure between the medium and the overlaminate to 80% or whatever is acceptable according to the laminator's operating instructions.
5. As the film or liner comes out of the nip rolls, ensure there are no wrinkles in it. If there are wrinkles, adjust the brakes or tension dials on the laminator per the manufacturer's instructions until the desired tension and wrinkle free graphics are achieved.
6. Hand feed the finished graphic sheets into the nip rolls, ensuring the sheets line up with the overlaminate.
7. Increase the laminator speed to a desired output based on production needs. 3M recommends a lamination speed in the range of 5 to 10 ft/min (1.5 to 3 m/min).
8. When lamination is complete:
 - a. Open the nip rolls.
 - b. Remove the finished graphic roll.
 - c. Convert it for shipping or application.
9. Remove the cores, used liner, and other items from the laminator and ensure the rollers are no longer in contact.

Hot Roll to Roll Lamination Procedure for UV Inkjet Printed Graphics

3M recommends using hot roll lamination for UV inkjet printed graphics to help minimize silvering, a silvery appearance caused by air trapped between the overlaminate and the UV ink.

1. Load and thread the medium to be laminated according to the laminator's operating instructions.
2. Adjust the temperature of the lower roll against the printed graphic to a maximum of 125°F (51.7°C). The roll should heat the liner of the UV-printed graphic.

NOTE

Graphics manufacturers should NOT heat the upper roll past 86°F (30°C) and proper tension control is crucial whenever the upper roll is heated. This is to prevent the overlaminate from softening and stretching during lamination, which may cause curling in the finished graphic

3. Thread the overlaminate with the liner take up roll according to the laminator's operating instructions. Line up the medium with the overlaminate.
4. Set the laminator speed to 2 ft/min (0.6 m/min) or the laminator's slow setting.
5. Lower the roll to set the nip pressure between the medium and the overlaminate to 100% or whatever is acceptable according to the laminator's operating instructions.
6. As the finished graphic moves out of the nip rolls, ensure there are no wrinkles in it. If there are wrinkles, adjust the brakes or tension dials per the manufacturer's instructions until the desired tension and wrinkle free graphics are achieved.
7. Increase the laminator speed to a desired output based on production needs. 3M recommends a lamination speed in the range of 10 to 15 ft/min (3 to 4.6 m/min).
8. When lamination is complete, remove the finished graphic roll, and convert it for shipping or application.
9. Remove the cores, used liner, and other items from the laminator and ensure the rollers are no longer in contact.

Flatbed Applicator Lamination for Application Tapes

For graphics using application tapes, a flatbed applicator can work well. Overlaminates can be used with these machines, but additional steps must be taken with regards to used liner. A general procedure is outlined below.

1. Set the medium face up on the flatbed applicator table.
2. Load and thread the application tape per the manufacturer's recommendations. Ensure the application tape is wide enough to cover the medium on the table.
3. Lower the nip roll.
4. Pull the laminator roll across the medium, covering it with the application tape.
5. Raise the laminator roll.
6. Cut the application tape on the table.
7. Return the nip roll to its original position.
8. Cut the excess application tape from the table.
9. Remove the laminated graphic.
10. Repeat the process for additional sheets of media.

3M Related Literature

Read the most current 3M product and instruction bulletins before starting any job.

The information in 3M product and instruction bulletins is subject to change. Current bulletins are available at [3M.com/graphics](https://www.3m.com/graphics). 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 sections of the product bulletins of all 3M components used.

- [3M Instruction Bulletin Production: Graphic Design, Handling, and Storage](#)
- [3M Instruction Bulletin Production: 3M Application Tapes for Graphic Films](#)
- Refer to [3M Graphics Technical Information](#) to find relevant product bulletins for products used.

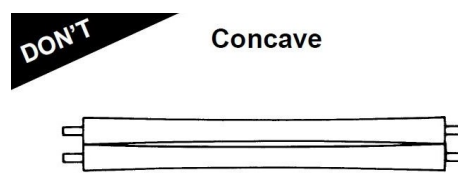
Trouble Shooting

The table below describes basic issues in the lamination process, as well as their potential causes, and provides recommended solutions for addressing those problems. This is not an all inclusive summary of potential issues that may occur during lamination.

Problem	What to Look For	Recommended Solution(s)
The finished graphic has wrinkles.	The overlamine is wrinkling in the nip roll.	<ol style="list-style-type: none"> 1. Ensure the overlamine and film are fully aligned. 2. Ensure the material rollers are secured in the laminator. 3. Check the laminator manufacturer's instructions to ensure the roller pressure is not set too high. 4. If wrinkling still occurs, contact the laminator manufacturer to ensure the machine is still in spec.
	The base film is wrinkling in the nip roll.	
The finished graphics are curling upwards.	Too much tension on the unwind.	Check the tension/break on the lamination shaft. The goal is to achieve the least tension/break pressure as is possible.
The finished graphics are curling downwards.	Too much tension on the take up roll.	Decrease the tension/brake on the film shaft and adjust. The goal is to achieve the least tension/break pressure as is possible.
There is a repeating defect in the finished graphic.	Defects in the overlamine	Check the overlamine for defects and determine if it is acceptable for use in producing finished graphics. Remember, small surface impressions should come out when heat is applied.
	Gouges or dents in the laminator's upper or lower roll.	Replace the damaged roll in the laminator immediately.
	Contamination on the upper roll.	Clean both the upper and lower rolls with a mixture of 70% isopropyl alcohol and 30% water. Users should consult the laminator's manual for specific cleaners and processes if they are concerned about using isopropyl alcohol.
The finished graphic has an uneven appearance.	Uneven nip roll pressure	Adjust the pressure on both sides to ensure they match each other. Refer to the laminator manual or contact the manufacturer's technical service.
The overlamine does not stay aligned to the base film.	Overhanging overlamine	Check the alignment of the overlamine and the film to ensure they are loaded straight. Both the laminate and film must be centered on the laminator's rolls from left to right. If film continues to drift, roller pressure on either side may be uneven. Refer to the laminator manual or contact the manufacturer's technical service for additional guidance.
	Idler rolls catching during lamination	
The finished graphic has tunneling off the liner edges.	Material is lifting from the edge and creating an air gap between the adhesive and liner.	Decrease the tension/brake on the take up roll.
		Cut the base film into sheets and use the sheet to roll lamination process instead.
		Use a larger diameter take up roll.

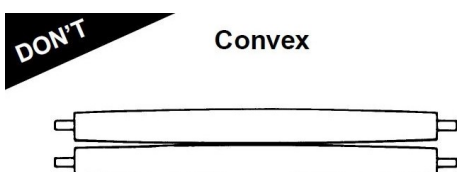


Figure 1. Proper Roller Alignment



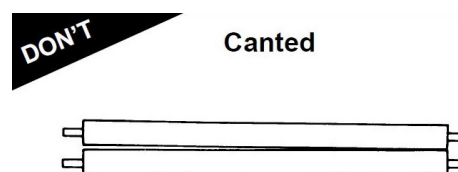
Problems:
Poor Bond, Adhesive Picking,
Trapped Air Bubbles

Figure 2. Concave Rollers



Problems:
Poor Bond, Edge Life, Bubbles

Figure 3. Convex Rollers



Problems:
Steering, Wrinkles, Bubbles

Figure 4. Canted Rollers

Health and Safety

Tools and Equipment Usage

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

Chemicals

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

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

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

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.

Air Quality Regulations

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

Warranty Information

Technical Information

Technical information, guidance, and other statements provided by 3M are based upon records, tests, or experience that 3M believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed. Such information is intended for people with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license to any intellectual property rights is granted or implied with respect to this technical information.

Product Selection and Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment, reviewing all applicable regulations and standards, and reviewing the product label and use instructions. Failure to properly evaluate, select, and use a 3M product in accordance with instructions or to meet all applicable safety regulations may result in injury, sickness, death, and/or harm to property.

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Commercial Branding and Transportation

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