Description

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

ⓘ **IMPORTANT NOTE**

Follow the ink drying or curing recommendations in the applicable 3M™ ink's product and instruction bulletin. Apply the overlaminate or application tape as described in this bulletin.

Quick Links

3M Graphics Warranties
Technical Information Selector
Safety Data Sheets (SDS)
Videos

Some of these links lead to web-based resources that are not product-specific.

3M Graphic Protection Products

3M offers a variety of graphic protection and application tape options. See the Technical Information Selector at 3Mgraphics.com/TechInfo for a list of all 3M graphic protection options and details thereon. See the 3M™ Application Tapes bulletin for further details.

Graphic Preparation — All Lamination Methods

Before applying an overlaminate to a printed film, follow the process recommendations for drying or curing listed in this bulletin for the type of ink you are using.

Drying Solvent and Eco-Solvent Inks — Inkjet Printing

The liners on most base films are silicone coated. Once the film is rolled, the solvent from latex, solvent, and eco-solvent inks cannot evaporate and pass through the liner. Trapping these solvents contributes to inadequate graphic drying.

ⓘ **IMPORTANT NOTE**

Inadequate drying can result in graphic failures including curling, increased shrinkage, and adhesion failure, which are NOT covered under warranty.

Always build enough time into your process to ensure adequate graphic drying. Poorly dried film may become soft and stretchy, and the adhesive may become too aggressive. This can cause difficulties when applying an overlaminate, rolling the graphic, and applying the film. See your ink's instruction bulletin for more details.

1) Limit Ink Usage to Avoid Unnecessary Ink Saturation

Using too much ink inhibits complete drying.

For 3M™ films, refer to the ink limiting recommendations in your film's product bulletin. If no value is listed, assume a maximum ink density of 270%.

2) Drying Option 1: Spool the Printed Film

Printer dryers may not adequately dry latex and solvent inks in the brief time the printed film spends passing through the heater. Loosely spool printed film to allow air to circulate between the layers of rolled film. To further increase air circulation and reduce drying time, place the spooled film roll on a plastic egg crate with a fan running beneath the crate. Drying times may vary depending upon the conditions, so check the film periodically.

3) Drying Option 2: Sheet the Film and Place on Drying Racks

Cut the film into sheets and place one sheet on each rack. Do NOT stack printed sheets, as this inhibits drying. Place the racks in a drying oven at 150°F (65.6°C), if available, to reduce drying time.

4) Test the Dryness of the Ink

A common method for testing whether ink is dry is to press together, ink to ink, two dark areas of a printed sheet. Hold the sample near your ear and pull the two areas apart from each other. If there is a crackling sound, the ink is not yet dry.

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Drying Latex Inks — Inkjet Printing

Proper drying of latex inks on the printer is essential for achieving durable results and trouble-free post-processing, allowing samples to be safely post-processed immediately after printing.

Latex inks should emerge from the printer fully dried. Post-air drying of a wet print will not work, since latex ink drying requires the ink to be heated above the film formation temperature of the latex inside the printer.

Inadequate drying can inhibit overlaminate application, graphic rolling, and film application.

To ensure proper latex ink drying, follow these recommendations:

1) Media Presets

HP media presets contain all the needed settings to print on specific media. Download and use media presets from the following page: www.hp.com/go/mediasolutionslocator.

2) Environmental Conditions

HP media presets have been specially designed and tested for each printer-medium combination. Recommended environmental conditions are 68°F to 77°F (20°C to 25°C), and humidity at 40 - 60% relative humidity.

3) Proper Drying Performance Tests

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 following tests:

- **Visual Test:** Check the image immediately after printing. The sample should NOT be wet, sticky to the touch, or have an 'oily' feel when it emerges from the printer.
- **Rubbing Test:** After the visual inspection, wipe the printed sample with a wet paper towel. Fully-dried ink should resist wiping. If ink removes easily it is not dried.
- **Stacking Test:** In some cases, the top surface will appear dry after printing, but ink may migrate to the surface leaving an oily aspect a few minutes after printing. To test for proper drying, cut your test image into pieces, stack at least 12 graphic sheets—liner side to printed side—and let the stack sit for one hour. After 1 hour, remove the stack and check for "oily" stains, wet surfaces, and gloss changes on high ink laydown areas on each sheet. If any of these occur, the ink has not properly dried.

4) Drying Option 1: Spool the Printed Film

Loosely spooling the printed film open allows air to circulate between the layers of rolled film. To further increase air circulation and reduce drying time, place the spooled film roll on a plastic egg crate, with a fan running beneath the crate. Drying times may vary depending upon the conditions so check the film periodically. Spooling latex printed graphics and letting them sit doesn't cure the ink, but it does allow graphic manufacturers to see if any oily spots are generated which may interfere with proper overlaminate adhesion.

5) Improve Drying

If a sample is not properly dried on the printer, reprint the image under conditions that allow for complete drying. Printer settings to adjust to improve drying are:

- **Drying temperature.** Increase temperature in 5°F (2.8°C) increments until a sample dries properly.
- **Number of passes.** Increasing the number of passes slows down the printing process, increasing the amount of time a sample is under the drying module.**Ink amount.** Reducing the ink amount while keeping the remaining settings unchanged helps a printed surface dry faster.

Curing UV Inks - Inkjet Printing

> (i) **IMPORTANT NOTE**
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> Graphic manufacturers should wear proper personal protective equipment at all times when working with UV inks.

While complete curing of UV inks is essential, over-curing hardens the surface to the point that it becomes difficult to achieve a good bond between the graphic protection and the base film. UV ink continues to cure at a slow rate after removal from the printer. Keep the curing settings as low as possible. Use this procedure to determine the lowest workable cure setting for your UV inkjet printer:

1. Set the printer to its lowest cure setting.
2. Print a multicolored test sample and complete the cure.
3. Immediately wipe the printed surface with a clean white cloth, lint-free tissue, or cotton swab. Do NOT get uncured ink on yourself.
4. If any ink transfers to the cloth, increase the cure setting by one level.
5. Repeat Steps 2 through 4 until no ink wipes off onto the cloth.
6. Record this setting and use it every time going forward.
7. Apply an overlaminate (if using) to the graphic between 1 and 72 hours after UV printing for the best results.
- Combining different material types (e.g., a polyvinyl chloride base film with a polyester overlaminate) may cause curling of the finished graphic. Do NOT stretch the more flexible films during the lamination process.
- 3M recommends using hot roll lamination on UV inkjet printed graphics to help minimize silvering, a silvery appearance caused by air trapped between the overlaminate and the UV ink. Lamination details are available later in this bulletin.
- Bring all graphic materials to print room temperature. The ideal operating temperature is 60°F to 82°F (16°C to 28°C), at 40 - 60% relative humidity.
- The film surface must be free from debris and other contaminants. Contaminants can be trapped between the film surface and the overlaminate, especially for solid colored films. Wipe the colored film surface with 70% isopropyl alcohol and 30% water and a lint free towel to remove contaminants.
- Static can contaminate the graphic and may harm the operator. Hardware implements and additional devices for improving the printing process and dampening static are available.

Lamination Procedure

Equipment

Typical hardware for nip pressure lamination (roll to roll) meets the following design specifications.

- 61 in. (155 cm) wide for 60 in. (152.4 cm) finished graphics
- 1.5 in. (3.7 cm) nip opening with adjustable controls
- Two pairs of unwind and take-up shafts/rollers
- One pair of 70 durometer main pressure rollers
- All pressure rollers (or at least the lower main one) are capable of being heated to a minimum of 125°F (51.7°C)
- Pressure gauge: see laminator's owner's manual for specifications
- Speed control: ranging from 1 to 20 ft/min (0.3 to 6 m/min)

> (i) **IMPORTANT NOTE**
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> Table systems like "ROLLSROLLER" exist in various configurations. The table as well as the main roller may not apply sufficient pressure to work with UV printed graphics and/or perforated window graphic film constructions (due to uneven surface contact).

> (i) **IMPORTANT NOTE**
>
> This is a general lamination procedure. Refer to manufacturer's instruction for operating details.

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 except that graphic manufacturers using application tape will not need to take up any used liner.

1. Clean the laminator rolls.
2. Load and thread the media to be laminated according to your laminator's manufacturing operating instructions. The media should be on the bottom of the laminator and the image side should face up towards the upper laminating roll.
3. Thread the overlaminate with the take up roll for the liner according to your laminator's manufacturing 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 and line up the edges of the medium and overlaminate rolls.
4. Lower the roll to set the nip pressure between the medium and the overlaminate to 80% or whatever is acceptable for the laminator.
5. Set the laminator speed to 2 ft/min or your laminator's slow setting.
6. As the finished graphic moves out of the nip rollers, ensure there are no wrinkles in it. If there are wrinkles adjust the brakes on the laminator until the desired tension and wrinkle free graphics are achieved.
7. Increase the laminator speed to a desired output based on your needs. 3M recommends a lamination speed in the range of 5 - 10 ft/min (1.5 - 3 m/min).
8. When lamination is complete, remove the finished graphic roll and convert to a final format per 3M product bulletins.
9. Remove the cores, used liner, and other items from the laminator.

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, except that graphic manufacturers using application tape will not need to take up any used liner.

1. Clean the laminator rolls.
2. Load and thread an extra piece of film or liner on the bottom nip according to your laminator's manufacturing operating instructions. This serves to protect the nip rollers from the overlaminate adhesive when the two nip rolls are brought together.
3. Thread the overlaminate with the take up roll for the liner according to your laminator's manufacturing 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.
4. Lower the roll to set the nip pressure between the medium and the overlaminate to 80% or whatever is acceptable for the laminator.
5. Set the laminator speed to 2 ft/min or your laminator's slow setting. As the film or liner comes out of the nip rollers, ensure there are no wrinkles in the finished graphic. 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 sheets into the nip rollers ensuring the sheets line up with the overlaminate.
7. Increase the laminator speed to a desired output based on your 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, remove the finished graphic roll and convert to a final format per 3M product bulletins.
9. Remove the cores, used liner, and other items from the laminator.

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. Clean the laminator rolls.
2. Load and thread the media to be laminated according to your laminator's manufacturing operating instructions.
3. Adjust the temperature of the lower roller against the printed graphic to a maximum of 125°F (51.7°C). The roller should heat the liner of the UV-printed graphic. Do NOT heat the upper roll which touches the overlaminate. Doing so would cause the overlaminate to soften and stretch during lamination, potentially resulting in the finished graphic curling.
4. Thread the overlaminate with the liner take up roll according to your laminator's manufacturing operating instructions.Line up the medium with the overlaminate
5. Lower the roll to set the nip pressure between the medium and the overlaminate to100% or whatever is acceptable for the laminator.
6. Set the laminator speed to 2 ft/min (0.61 m/min) or your laminator's slow setting. As the film or liner comes out of the nip rollers, ensure there are no wrinkles in the graphic. 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.
7. Increase the laminator speed to a desired output based on your needs. 3M recommends a lamination speed in the range of 10 - 15 ft/min (3 - 4.6 m/min).
8. When lamination is complete, remove the finished graphic roll, and convert to a final format per 3M product bulletins.
9. Remove the cores, used liner, and other items from the laminator.

Flatbed Applicator Lamination Procedure for Application Tapes

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

1. Set the medium face up on the flatbed applicator table.
2. Load and thread up 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 roller.
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 roller to the original position.
8. Cut the excess application tape from the table and remove the laminated graphic.
9. Repeat the process for additional sheets of media.

Storage and Shipping

Review 3M Instruction Bulletin 6.5 for important details.

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Commercial Solutions
3M Center, Building 220-12E-04
St. Paul, MN 55144

1-800-328-3908
3M.com/Graphics

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