

Avery Dennison[®] Instructional Bulletin 1.5

Application Instructions for Perforated Window Films

Revision 5

Introduction

Avery Dennison Perforated Window Films are designed for use on flat or simple curved transparent surfaces such as glass windows or doors, and automotive windows with slight curves. This bulletin provides optimal recommendations for converting, application and removal. Testing of the product should be performed prior to commencing final application to ensure suitability of the product for the intended use. If there are any low surface energy coatings present (i.e. silicone), loss of adhesion may occur. Refer to Instructional Bulletin 1.01 Substrate Cleaning and Preparation before commencing application of the film.

1.0 Product Description

Avery Dennison Perforated Window Films are perforated calendared PVC films with a white print face and black back on the adhesive side, with a removable clear adhesive, on a one side PE coated non-perforated kraft paper liner. After printing and proper drying/curing of the Perforated Window Film, the graphic must be laminated to provide protection for the ink and to keep water and dirt from accumulating in the holes. Avery Dennison offers a range of perforated window films for various applications. These films should only be used in the appropriate applications where consideration of viewing requirements, minimum VLT % (Visual Light Transmission) and compliance with specific state or territories traffic and transport regulations.

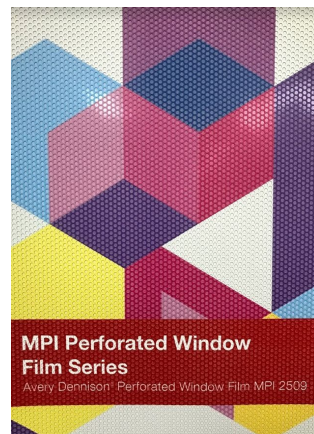
Important Note: Automotive windows with angles greater than 20° from vertical such as rear windows of hatch back or sedans will have reduced visibility due to the reduced aperture of the perforations in relation to the viewer. Consideration should be made not to install perforated window films on windows with angles greater than 20° from vertical.

- MPI 2509 Perforated Window 50/50, 50% open area (Larger 2mm hole size) 150 micron film
 - Passenger vehicle compliance (meeting minimum 35 VLT%* transport regulatory compliance)
- MPI 2529 Perforated Window 50/50, 50% open area (Larger 2mm hole size) 180 micron film
 - Transit vehicle advertising
- MPI 2709 Perforated Window 60/40, 40% open area (1.5mm hole size) 150 micron film
 - Transit vehicle advertising, NOT for passenger vehicle applications
- MPI 3709 Perforated Window 60/40, 40% open area (1.5mm hole size) 150 micron film
 - For Architectural window promotional advertising

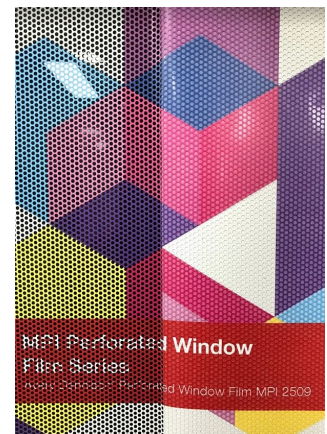
*Independent testing certification outlining minimum 35 VLT % transport regulatory compliance.

3.0 Digital Inkjet Printing

When printing on Avery Dennison Perforated Window Films, consideration should be given to the visual appearance of the final applied graphics. Due to the perforations, a percentage of the print area will be reduced and may affect colour density, appearance and the legibility of small fonts.



**Unapplied, printed MPI 2509
PWF with liner**



**Partially applied MPI 2509
PWF, revealing the percentage
of print missing in
perforations.**

When printing, limit the total amount of ink as much as possible, by using the correct ICC profile and RIP settings with a maximum total ink limit of 250% for acceptable print quality, ensuring correct printer and environment temperatures are controlled to ensure the ink is completely cured.

Note: Exceeding the maximum ink limit to provide higher ink saturation can result in the ink webbing or connecting in the circular perforations, resulting in the holes appearing blocked or partially blocked with a layer of ink.

3.1 Digital Solvent Inkjet Printing

Drying and Curing Procedure

Due to the perforations in the film, solvent ink is able to come directly in contact with the adhesive side allowing it to absorb into the adhesive, subsequently reducing the cohesive strength and adhesion. Therefore it is highly important to properly dry or cure the film prior to overlaminating with DOL 1060 Max and before installation. Allow the printed material to dry immediately after printing for a minimum of 5 days, or until fully cured before further processing. Ensure the correct drying method is used by hanging printed material vertically or loosely wound and standing off the ground allowing solvents to leave the film. Further external air flow, such as a fan placed vertically downwards over the prints, can further assist in removing solvents. See Instructional Bulletin 4.06 Processing tips for DOL films. The drying time of the printed film depends on the type of ink used, colour density of the printed image and ambient temperature and humidity.

Note: SL 6460 is not to be used with Avery Dennison perforated window films.

3.2 Digital Latex Inkjet Printing

- Reference Instructional Bulletin 4.14 for Printing and Finishing of Digitally Printed Graphics

3.3 Digital UV Inkjet Printing

- Reference Instructional Bulletin 4.14 for Printing and Finishing of Digitally Printed Graphics

Note: UV cured ink is prone to bridging and blocking the perforations in Avery Dennison perforated window films, thus testing the material with your printer and ink combination prior to use is recommended.

4.0 Finishing

- The printed film must be overlaminated with Avery Dennison DOL 1060 Max optically clear laminate films to maintain clear visibility, in addition to extending the durability and scuff resistance.
- Printed graphics must only be overlaminated after the ink has had sufficient time to dry or cure. See Instructional Bulletin 4.06 Processing tips for DOL films.
- Use the following recommended laminator settings: no heat, no laminate tension, with optimised pressure and speed, to obtain flat acceptable finished images.

Note: Without the DOL 1060 Max overlaminate, the removability of the film may be affected, and reduced visibility may also occur due to environmental conditions, dirt, contamination and water getting trapped in the perforations.

Note: SL 6460 is not to be used with Avery Dennison Window Films.

5.0 Preparation of the Application Surface - Architectural or Automotive Glass

A clean, dry substrate in good condition is absolutely necessary to ensure the adhesive reaches a suitable level of adhesion. Refer to Avery Dennison Instructional Bulletins: 1.01 Substrate Cleaning and Preparation, section 3.6 and 1.4 Application Methods for Pressure Sensitive Adhesive Films for specific technical recommendations.

- A detergent wash and water rinse is recommended, followed by wiping the substrate dry with a rubber window squeegee and microfibre cloth.
- A recommended detergent solution of 1-2ml of J&J baby shampoo in 1 Litre of clean water.
- Scratch proof glass scourers can also be used in conjunction with detergent wash to remove stubborn contaminants.
- The substrate should be cleaned with Avery Dennison Surface Cleaner.
- Spray Surface Cleaner onto the substrate and allow it to dwell, remove using a clean, soft, lint-free cloth or microfiber towel, remembering to rotate the cloth for each new area you clean. Alternatively clean the substrate using a lint free cloth or microfiber towel soaked with the IPA and water solution (70% IPA and 30% water) then wipe off with a clean dry lint free cloth or microfiber towel, before the solution has time to evaporate, remembering to rotate the cloth for each new area you clean.
- It may be necessary to clean some areas more than once until the desired result is achieved
- For the removal of stubborn contaminants like old decals or adhesive residue (paint or silicone edge sealers in the case of Architectural glass), glass window scrapers can be used.
- Ensure all edges, corners and areas where the glass meets the window frame and seals are washed to remove any residual dirt and contaminants, finishing by drying with a towel.

5.1 Application Temperature & Environment

- Application temperature is one of the most critical factors in film application
- Lower temperatures can affect adhesion properties, which increase the risk of film failure due to low levels of adhesion
- The substrate and ambient temperature must be above 10°C application temperature.
- For optimal application performance and ease-of-use characteristics, a minimum temperature of 16°C is recommended
- Higher heat and humidity conditions may also make a graphic more difficult to reposition once it has made contact with the application surface

Note: For all products be sure to read the appropriate product data sheet for details about minimum and maximum application temperatures, recommended substrates, and immediate service conditions before and after application.

6.0 Application Tools

- Toolbelt – to hold all application tools
- Microfiber Felt Edge Squeegee, like the following:
 - Squeegee Pro Flexible - Red
 - Squeegee Pro Rigid - White
- Knife with break-off blades
- Stainless steel replacement blades
- Snitty
- Heat Gun
- Avery Dennison Surface Cleaner
- Lint-free microfiber cleaning cloth
- Removable painting masking tape i.e. 36-48mm
- Scratch proof glass scourers

6.1 Application Method - Automotive Glass

Note: These films must only be dry applied using squeegees that are covered with a non-abrasive felt/microfibre edge to prevent scratching.

- Clean the glass thoroughly to remove dirt, grime, grease wax, coatings or other contaminants which could affect the adhesion of the pressure-sensitive films.
- Measure the decal to be applied and be sure the graphic fits into the window space with clearance around any moulding or silicone sealant.

Note: At no time should the graphic touch or overlay any window mouldings or silicone sealant. Loss of adhesion causing film failure can occur if material overlaps mouldings or silicone sealant.

- For windows with no window moulding or silicone sealant, where the glass finishes on an edge such as some automotive rear windows, material can be trimmed 3-5mm away from the edge using knifeless tape, that can be positioned on the outer edge of the window, or the graphic can be trimmed after application with a knife on the glass bevel edge.
- While the liner is still attached, use removable masking tape to make a vertical or horizontal hinge at the top centre or the middle of the graphic, enabling it to be positioned in place on the window.
- Fold the first or top half of the graphic at the hinge, back slit the liner and start removing the liner from the graphic back down close to the substrate and start applying squeegee pressure to the film from the center outwards towards the edges, creating adhesive contact to the window with.

Note: To minimise the appearance of adhesive lines, peel back sufficient media and apply the graphic with minimal to no tension on the film, stop short of the liner, again trying not to apply tension to the graphic. Then flip the remaining graphic, peel back the liner as you apply to the other edge. If needed, the graphic can be adjusted, carefully lifted shortly after application to realign the material or remove any wrinkles, always re-squeegee after repositioning.

Note: The use of water or slip solutions during the application are not recommended for perforated window films. Water will remain trapped in the holes causing a reduction in vision when looking through graphics.

- If the window is very large and the graphic joins within the window, a splice join may be required, allow the two panels to overlap and using a steel ruler trim half way between the overlap, remove the top strip and excess film from underneath the other panel to form a butt seam. Do not overlap joins or edges. Trimming should be done prior to application. Cutting film on windows may permanently scratch the window.
- All exposed edges and seams of exterior decals are recommended to be sealed with Avery Dennison DOL 1060 Max narrow strips of overlamine film. This will prevent water ingress and contaminants from penetrating underneath the film and reducing vision or compromising the adhesive. When using overlamine film strips, trimming the graphic 3-5mm from the window edge will allow more contact with glass thus obtaining a better seal. Avery Dennison overlamine film strips should be applied carefully to completely seal the edges.

6.3 Application Method - Architectural Flat Glass

Note: These films must only be dry applied to a window using Avery Dennison squeegees that are covered with a non-abrasive felt/microfibre edge to prevent scratching.

- Clean the glass thoroughly following section 5.0 to remove dirt, grime, grease wax, coatings or other contaminants which could affect the adhesion of the pressure-sensitive films.

Caution: Follow all warnings and safety instructions supplied by the manufacturer of the solvents. See Material Safety Data Sheet for health, safety, and handling information.

Note: DO NOT use Windex, ammonia-based cleaners, commercial detergents with additives (i.e. moisturiser, enzymes, perfumes, lanolin) that can contaminate the application surfaces and reduce adhesion.

- Measure the graphic to be applied and ensure it fits into the window with a clearance around any rubber seal. At no time should the graphic touch or overlay any window mouldings or silicone sealant. Loss of adhesion causing material failure can occur if material overlaps mouldings or silicone sealant.
- Dry application of Avery Dennison Perforated Window Films to architectural flat glass is similar to the application method used in typical wall graphics. Ref to Avery Dennison IB 1.6 Printing and Application of Interior Wall Graphics for illustration.
- Removable masking tape is used to make a horizontal hinge at the top centre, approximately 200mm from the top of the graphic, to position into place on the window while the liner is still attached. In some cases a vertical hinge will be used depending on the size of the graphic

For larger graphics that cover large or multiple windows, a horizontal hinge is used.

Note: For large graphics consisting of multiple adjacent drops that require accurate image alignment. Registration tabs/markers should be used during installation to ensure correct image alignment. Not using any image registration tabs/markers, can result in uneven stretching of the film and image misalignment.

- Flip the top horizontal hinge of the graphic using the low tack tape and start removing the liner from the graphic, remove the excess liner by cutting with a Snitty, flip the graphic back and up close to the surface of the glass and start applying squeegee pressure to the film from the center outwards to the edges upwards, creating good adhesive contact to the window glass.

Note: To minimise the appearance of adhesive lines, peel back sufficient media and apply the media with minimal to no tension on the film, and stop short of the removed liner, again trying not to apply tension to the graphic.

- After the application of the top hinge, peel back the liner and apply the film further, stopping short of the remaining removed liner, avoiding tension and inducing stretch to the film, maintaining image registration with multiple panels, and to minimise any visible adhesive lines. If needed, the graphic can be adjusted carefully when lifted shortly after application to realign the material or remove any wrinkles, followed by re-squeegeeing after repositioning.

Note: Ensure the length of the liner being removed is consistent down the length and from drop to drop to ensure consistent image stretch / registration ie. Suggested 400mm, otherwise there is a high risk of image registration misalignment between multiple panels.

Note: Ensure the length of the liner being removed is consistent down the length and from drop to drop to ensure consistent image stretch / registration ie. Suggested 400mm, otherwise there is a high risk of image registration misalignment between multiple panels.

- If panels meet edge to edge in the window (overlap), trim edges carefully to form a butt seam. Do not overlap seams or edges. Trimming should be done prior to application. Cutting film on windows may permanently scratch the window, otherwise use knifeless tape.
- All exposed edges and seams of exterior decals are recommended to be sealed with Avery Dennison DOL 1060 Max narrow strips of overlamine film. This will prevent water ingress and contaminants from penetrating underneath the film and reducing vision or compromising the adhesive. When using overlamine film strips, trimming the graphic 3-5mm from the window edge will allow more contact with glass thus obtaining a better seal. Avery Dennison overlamine film strips should be applied carefully to completely seal the edges.

7.0 Removal Instructions

The following methods are recommended in order to remove Perforated Window Film with minimum damage to the substrate. Surfaces treated with abrasion-resistant or anti-reflection coatings may experience some degradation, and as a result, could be affected during removal.

7.1 Removal

- Inserting a razor blade, or knife under the corner to loosen the graphic, be careful not to damage the substrate. Grasp the lifted edge and pull up and away from the substrate with a slow even rate at an angle less than 90°.
- Cold pull, commencing from one edge of the graphic, and peel back the graphic removing it from the glass surface.
- If adhesive residue is left on the substrate, follow the instructions below for additional removal tips.
- For vehicle/transit graphics, remove the graphic under warmer environmental conditions i.e. 16C or greater, or expose the graphic to outdoor sunlight to aid removal. Avoid removing graphics in cold conditions (below 10C) due to the potential breaking and removal in small pieces.

Note: The use of wallpaper steamers, heat lamps, and heat guns can assist in heating the adhesive to aid removal, but caution needs to be exercised to ensure glass substrate is not damaged with the use of heat.

Caution: Take care when using heat in cooler conditions as thermal shock of glass can occur. Glass heated in a localised area can expand more rapidly than the rest of the glass causing it to break. Always ensure that the whole window is heated gradually and allowed to warm uniformly..

Caution: Extreme caution should be used to avoid fracturing, shattering, or cracking of glass substrates.

7.2 Chemical Removal

- The use of chemical removal systems is possible to remove Perforated Window Films. Such systems can be used on overlaminated material, but the process may not be as effective. Read all instructions as supplied by any chemical removal system manufacturer and pre-test any product with the substrate and surrounding materials to ensure compatibility. Obey all safety, handling, and health precautions supplied by the chemical manufacturer.

Note: If adhesive remains after removal of the film, this may be removed by wiping with a rag soaked with Avery Dennison Adhesive Remover. Allow the Adhesive Remover soak into the adhesive. Use a plastic squeegee to scrape off the residue, repeating if necessary. Other non-flammable citrus based removers are available and can be used. Follow all instructions from the manufacturer.

Caution: Use caution with flammable products. Do not use a heat gun, heat lamp, open flame or other electric equipment in close proximity to solvent mixtures, vapors, or residues. Follow all manufacturers' instructions and review health and safety information.

For further information, contact your local Avery Dennison representative.

Warranty and Limited Remedy

This instructional bulletin describes a technique. The information contained herein is believed to be reliable, but Avery Dennison makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. To the extent allowed by law, Avery Dennison shall not be liable for any loss or damages, whether direct, indirect, special, incidental or consequential, in any way related to the technique of making a graphic regardless of the legal theory asserted.

The above information provides basic information on how to apply pressure-sensitive graphics. The instructions are designed to help ensure success across a broad range of applications. Depending on the size and complexity of applications, a certain amount of expertise is needed.

Professional applicators can be hired to ensure proper application of finished graphics. When mounting graphics in remote geographic areas, professional applicators can offer the added benefit of local service.

Avery Dennison has a vast network of Certified Installers who have been specially trained and certified in accordance with our recommended techniques.

You can review the Certified Installer list here: [Find a Graphics Installer](#)

Consider hiring a professional whenever the application requires:

- Multiple panels to be registered
- Complex surfaces, such as rivet and corrugated trucks
- Harsh environmental conditions (i.e. outdoor applications in high heat climates)
- Remote geographic locations

For further information, contact your local Avery Dennison representative.

