Avery Dennison Instructional Bulletin 1.17

Key Considerations for Vehicle Wrapping and Conforming Applications

Introduction

Vehicle wrapping and conforming applications are the most demanding applications for graphic films. It is most important the correct procedures are followed, taking short cuts and avoiding the following recommendations, will drastically increase the chance of problems occurring. Below is a summary of the most important points when performing these types of applications. Please refer to Instructional Bulletins 1.01, 1.16, 1.19, 1.4, 1.8, 2.09, 2.01 and 4.14 for further information relating to topics outlined below.

This Instructional Bulletin outlines the parameters to be used when printing, laminating, during application, and for care and maintenance after application.

Film Selection

For vehicle wrapping and conforming applications we ideally recommend the use of cast films because they;

- easily conform to convex, concave and compound curves found on vehicles.
- do not exhibit shrinkage (when processed correctly), thus reducing the chance of “popping” or lifting from recesses, compound curves and edges.
- have longer durability, as well as greater heat and chemical resistance, resulting in increased performance

Digital film combinations and suitable uses:

Print film	MPI 1105 Easy Apply RS™ 53 mic gloss white cast vinyl				MPI 1105 Easy Apply™ 53 mic gloss white cast vinyl
Overlaminate	**DOL 6460 High Gloss** 38 mic high gloss polyurethane	**DOL 1460Z Gloss Conformable** 30 mic high gloss PVC film	**DOL 1480Z Matte Conformable** 30 mic matte PVC film	**DOL 1060Z Gloss** 50 mic high gloss PVC film	**DOL 1060Z Gloss** 50 mic high gloss PVC film
Printer and ink compatibility					
Latex	Y	Y	Y	Y	Y
Eco-solvent	Y	Y	Y	Y	Y
Solvent	Y	Y	Y	Y	Y
UV curable	Y	Y	Y	Y	Y
Conformability					
Vans - Channels/Deep Recesses	Y	Y	Y	–	–
Cars - Compound and convex curves	Y	Y	Y	–	–
Trucks - Flat and simple curves	Y	Y	Y	Y	Y
Scratch resistance	Excellent	Very Good	Very Good	Very Good	Very Good
Removability	Excellent	Very Good	Very Good	Very Good	Very Good
Vertical warranty^	5 years	5 years	5 years	5 years	5 years
Horizontal warranty^	2 years	–	–	–	–

Converting Methods

Digital Inkjet Printed Graphics:

- Avery Dennison recommends printing with Solvent, Latex based inks, or flexible UV Curable inks. Graphics printed with rigid UV Curable inks cannot be stretched without cracking which is a known limitation for this ink technology.
- Limit the total amount of ink as much as possible when printing by using the correct ICC colour profile and RIP settings, to avoid excessive solvent build up and retention in the film. We recommend a maximum ink limit of 270%.
- You can download ICC Profiles from avery-ap.color-base.com, providing your printer and RIP combination have been profiled and added. You can further enhance the colour reproduction by linearising the provided profile using a spectrophotometer.
- For conversion using solvent and eco-solvent inks, a minimum curing time of 24-48 hours for flat applications and 72 hours for conforming and fleet applications is required before overlaminating.
- Dry immediately after printing by hanging prints vertically to allow solvents to “fall” out of film.
- Drying/curing time will vary depending on location and environmental conditions. If a strong solvent scent is present, or the film is softer than usual the drying process is not complete.
- For conversion using Latex inks, ensure the correct curing settings are used, by checking the printed image for signs of ink rewetting. If there are signs of ink rewetting shortly after printing, try increasing the drying/curing and or fan settings, until no longer present. Once the correct drying/curing and or fan setting are used, no further curing after printing is required before laminating.
- Overlaminate prints to be conformed and stretched with DOL 1400 Z Series or DOL 6460 High Gloss overlaminate. This must be completed after adequate drying of prints. Alternatively, use a qualified screen print clear overprint or clear coat/liquid laminate after application to vehicle. See relevant Avery ICS Performance Guarantee Bulletins for further information.

Screen Printed Graphics:

- Use Avery 900 Screen, 6900 or MPI 1105 series films.
- Must be printed with conventional Solvent inks, not UV Curable inks. Graphics printed with UV Curable inks cannot be stretched without cracking which is a known limitation for this ink technology.
- Must be coated with a qualified over print clear for longer-term applications. See relevant Avery ICS Performance Guarantee Bulletins for further information

Computer Cut Graphics:

- Use Avery 900 Series Super Cast Vinyl for plotter cut graphics and lettering.
- Do not use application tape on convex, concave and compound curves.

Wrapping and Colour Change Films:

- Avery Dennison® Supreme Wrapping Film is ideal for full or partial car wraps, colour change applications and large format cut graphics. Due to nature of the adhesive and the special backing paper not all intricate graphic designs and small lettering may be achievable. It is recommended to test the film for cutting of detailed graphics prior to production. See Avery Instructional Bulletin 1.19, 2.01 for more information.

Application Temperature & Environment

- Application temperature is one of the most critical factors in film application.
- Lower temperatures restrict good adhesion properties, which increase the risk of a graphic failure due to low levels of adhesion.
- For Easy Apply RS™ films, the substrate and ambient temperature must be above 10°C minimum application temperature. For optimal application performance and ease-of-use characteristics, a minimum temperature of 16°C is recommended.

- Easy Apply RS™ films have a broad application temperature range (refer to the appropriate product data bulletin). While the film can be applied at the lower end of the temperature range, more pressure will be needed and it will take longer for a functional bond to be achieved during application. Until a functional bond is achieved, it is risky to remove premask or allow a vehicle to be transported.
- Higher heat and humidity conditions may also make a graphic more difficult to reposition once it has made contact with the application surface. As the ambient or the application surface temperature exceeds our recommended maximum 25°C, Avery Dennison® Easy Apply RS™ installation performance may be limited, especially at temperatures above 30°C.

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.

Traditional Application Tools

Avery Dennison® Easy Apply RS™ Films can be applied using traditional tools and techniques; no special tools are required (refer to Instructional Bulletin 1.4).

Note: Due to the increased thickness, durability and higher scratch resistance of DOL 6460 High Gloss, you will need to ensure a fresh blade is used when trimming the combined films, frequently snapping your blade will result in optimum trimming and quality finishing (refer to Instructional Bulletin 1.4).

- Squeegee Pro (Blue), Squeegee Pro Flexible (Red) or Squeegee Pro Rigid (White)
- Flextreme Squeegee's
- Application Glove
- Heat gun
- Knife – With 30° or 45° blades, for optimum cutting, ultra sharp blades are recommended
- Snitty
- Rivet Brush
- Air Release Tool
- Masking Tape
- Avery Dennison Magnets
- Lasertemp
- Measuring Tape
- Wax/Chinagraph water based Pencil (chalk like marking pencil is strongly not recommended)

Cleaning and Preparation

Note: For detailed information on cleaning and preparation please refer to Avery Dennison Instructional Bulletin 1.01

Note: some new vans and commercial vehicles may have co-polymer paint protection coatings. These coatings make it difficult for pressure-sensitive adhesive products to adhere sufficiently. You should check with the manufacturer first, but it has been recommended to pre-clean with Autoglym Power Max 3. Ensure you follow the instructions as directed by the manufacturer: For removal of Copolymer paint protection coatings, a solution of 1 part Autoglym Power Max 3, to 4 parts clean water solution is to be made up for hand low pressure spray application. Spray apply evenly to all areas of van (especially deep recess and 3D sections) rub with a sponge, allow 5 min reaction time, do not allow to dry. If it dries, re-apply; re-work with sponge, then rinse systematically with high-pressure water, preferably hot, removing all of the solution.

Surface Preparation

- Surface of vehicle (must be OEM painted surface) must be cleaned thoroughly from all dirt, grime, oil, wax and other contaminates.
- Remove all dirt and grime with water and detergent solution.
- Remove any paint protection coatings (i.e. Co-polymer) with the use of Autoglym Power Max 3, as per manufacturer instructions.
- Remove grease, oil and wax by scrubbing with a rag soaked in solvent. We recommend Isopropyl Alcohol (IPA), or Avery Surface Cleaner

Final preparation

- The substrate should be cleaned with Avery Surface Cleaner. Spray the surface allowing to dwell, then wipe off with a clean dry lint free cloth or microfiber towel, ensuring you rotate to a clean side with each wipe. – or;
- The substrate should be wiped with an IPA soaked cloth, and cleaned off with a clean dry lint free cloth or microfiber towel, ensuring you rotate to a clean side with each wipe before the IPA has time to evaporate. Take special care with recesses, returns of panels, behind rubbers (e.g. inside edge of door) and any hard to reach areas.
- It may be necessary to clean some areas more than once until the desired result is achieved.
- Check all critical areas that have been cleaned by using the 'nail test'. Feel the surface with the back of you finger nail. If the surface feels slippery and your nail slides easily, then it should be cleaned again. If it is difficult to slide you nail across the surface and it grips heavily, then the surface is clean.

Application and Installation

The following important points should be adhered to when applying MPI 1105 Easy Apply RS™ and DOL 6460 High Gloss:

- When using heat gun to soften the film, an ideal temperature of 35-45°C is required for best results.
- Do not exceed temperatures of 70°C with free unapplied film due to the possibility of the face film making contact and bonding
- A soap and water solution should be used in conjunction with an application glove for application into deep recesses in order to reduce friction and unwanted wrinkles or creases.

Important Note: Avery Dennison vehicle wrapping films, including but not limited to: MPI 1105 Easy Apply RS™ and Supreme Wrapping Film, do not require the use of adhesive promoter or primer in order to achieve suitable adhesion levels in areas such as compound curves, corrugations or deep recesses. When properly processed and applied in accordance with Avery Dennison's recommendations in this Instructional Bulletin, these products will remain adhered and free from lifting or popping for the intended life of the film.

Important Note: The use of adhesive promoters or primer will invalidate any warranty statements made in accordance with the ICS Warranty Program.

Important Note: As with all graphics films, it is important to avoid using any hard solvents (i.e. IPA (Isopropyl Alcohol) or Avery Dennison Surface Cleaner) directly on the DOL 6460 High Gloss when cleaning or during the application process. Use of these products directly on the surface may cause matting and loss of gloss. If necessary during application, use a soap and water solution in conjunction with the application glove to further reduce friction. For solvent and chemical compatibility, please review **Table 1.1**

Note: Follow the recommended application technique and procedures. See Avery Dennison Vehicle Wrapping Instructional DVD for professional tips and tricks plus relevant how to videos on Avery Dennison Academy web site: http://www.academy.averygraphics.com/

- Ensure that the application surface is clean and dry before application of any graphic film. Refer to Instructional Bulletin 1.01 before application of any graphic.
- Be sure the environment, film and substrate are within the temperature range recommended for the film (16-25°C).
- Ensure application is done in a clean, dry and enclosed location free from dust and possible causes for contamination.
- Must be applied dry. Do not use water when applying.
- Experiment to find the correct tools and techniques that work best before applying large graphics. Easy Apply RS™ Series films are designed to work with a variety of tools and techniques. Regardless of the tools or technique, it is important to use enough pressure to make sure the graphic firmly adheres to the substrate, approx 5-7kg.
  Note: Pre-masked graphic requires additional pressure.
- Whenever handling the adhesive make sure your hands are clean, and the adhesive does not touch anything else besides the clean substrate.
- Try and keep stretching to an absolute minimum. Only stretch when necessary and distribute stretch over a greater amount of film to limit the stress and tension in any particular area.
- When applying multiple overlapping panels, start from the back and work forward or the bottom and work up.
  Note: Where two or more panels overlap, then each panel must be individually post heated to 90°C for MPI 1105 Easy Apply RS™ with DOL Z Series or 70°C for DOL 6460 High Gloss films, and cleaned where overlapping, prior to application of subsequent panels.
- Use firm, uniform strokes, and overlap all strokes by about 50%.
- Hold the squeegee at a 50-70 degree angle to the surface. A flatter angle will reduce distortion of the film during application.
- Locate where to position graphics and mark the spot using small pieces of masking tape, water based pencil or magnets.
- If the graphic is large, tape or magnet it into position securely and use the hinge method illustrated in Instruction Bulletin 1.4.
  Note: To avoid marks in the film, be careful not to place the magnet within area to be applied.
- If the graphic is less than $1m^2$, remove the entire liner. Position the graphic on the marked points using light tacking pressure similar to other Avery Dennison materials.
- Squeegee the film using moderately firm, overlapping strokes, making sure the applicator is flat with the substrate along the entire length of the stroke.
- Remove all bubbles using an Air Release Tool or a straight pin. Do not use a knife or blade. This must be done before post heating to avoid entrapped air expanding and damaging the graphic.
- Using a 30° blade, ensuring your knife's blade is constantly sharp, trim excess film. Wherever there is a join between two vehicle panels the film must be cut.
- Do not put film over rubber and plastic moldings.
- Ensure all edges where the graphic finishes are applied firmly.

Final Squeegee Pass

Note: This is a key final step and will help prevent premature graphic failure due to edge lifting.

- Wait at least 15–20 minutes after the application to allow the adhesion to build to the functional bond level.
- Re-squeegee all graphic edges, overlaps and seams using firm pressure. Use a squeegee with a new felt buffer to prevent scratching or damage to the decal.
- Re-squeegee is a must on ALL edges of the decal.

Finishing and Post Heating

Important Note: MPI 1105 Easy Apply RS™ and DOL 6460 High Gloss requires less heat when post heating. A **post heating temperature of 70°C is recommended**. Please note an absolute maximum temperature of 90°C should not be exceeded.

- Once application has been completed, all areas where the film has been stretched require post-heating.
- Post heating should be done no sooner than 30-45 minutes after application.
- With the use of a heat gun on a high setting and a digital thermometer (Lasertemp), apply heat until the conformed area of the graphic reaches a measured 70°C for DOL 6460 High Gloss and 90°C for DOL Z series laminates.
- Post heating must be done the same day as the application.
- Re-squeegee when cool to ensure maximum adhesion.
- Ensure you take the time to complete the job professionally. Failures occur when shortcuts are taken, and involve more work down the track. If you think you have finished, go over the job one last time to make sure you haven't missed anything. Heat from a heat gun will also show up any missed areas that can be firmly re-squeegeed, if air entrapment occurs use the Avery air release tool to pierce the film and release the air.
- When complete, provide you customer with Instructional Bulletin 1.8 Vehicle Wrap and Graphic Maintenance, this will ensure follow Avery Dennison's correct maintenance and care recommendations for your hard work and their investment.

Cleaning and Maintenance

For detailed information on cleaning and maintenance please refer to Avery Dennison Instructional Bulletin 1.8 Vehicle Wrap and Graphics Maintenance.

Important Note: As with all graphic films, it is important to avoid using any hard solvents (i.e. IPA (Isopropyl Alcohol) or Avery Dennison Surface Cleaner) directly on the DOL Z series and DOL 6460 High Gloss laminates when cleaning or during the application process. Use of these products directly on the surface may cause matting and loss of gloss. If necessary when cleaning use a damp microfiber towel, or Avery Dennison Supreme Wrap Care Cleaner to remove any light marks or contaminants.

Avery Dennison has tested a broad range of commercially available truck and car wash products for compatibility with the DOL 6460 High Gloss. All tests were conducted at 100% concentration and immersed for up to 24 hours, as opposed to the recommended rage of 0.005 - 20% concentration, using recommended washing techniques and times.

For truck and car wash compatibility, please review **Table 1.2**

For the removal of adhesive residue from the surface of DOL Z series and DOL 6460 High Gloss laminates, we recommend using the following solvents for the best result: Wax and Grease Remover (Diggers / Septone), White Spirits or Shellite. To remove adhesive residue, simply apply a small amount of the recommended solvent to a microfiber towel and wipe until the adhesive become loose and can easily be removed, avoid using high pressure and abrading the film.

For solvent and chemical compatibility, please review **Table 1.1**

Table 1.1 – Solvent and Chemical Compatibility for DOL Z Series and DOL 6460 High Gloss

Overlaminate	DOL 6460 High Gloss 38 mic high gloss polyurethane	DOL 1460Z Gloss Conformable 30 mic high gloss PVC film	DOL 1480Z Matte Conformable 30 mic matte PVC film	DOL 1060Z Gloss 50 mic high gloss PVC film
Cleaning Product				
De-Solv-it - RCR	✓	✓	✓	✓
IPA - 25% Dilution with water	✓	✓	✓	✓
Mineral Turpentine	✓	✓	✓	✓
Shellite	✓	✓	✓	✓
Supreme Wrap Care Cleaner - Avery Dennnison	✓	✓	✓	✓
Supreme Wrap Care Power Cleaner - Avery Dennnison	✓	✓	✓	✓
Supreme Wrap Care Sealant - Avery Dennnison	✓	✓	✓	✓
Wax & Grease Remover - Diggers / Septone	✓	✓	✓	✓
White Spirits	✓	✓	✓	✓
The below products are not compatible for use on the surface of Avery Dennison films				
Acetone	✗	✗	✗	✗
Adhesive Remover - Avery Dennison	✗	✗	✗	✗
IPA - 100%	✗	✗	✗	✗
IPA - 50% Dilution with water	✗	✗	✗	✗
Methylated Spirits	✗	✗	✗	✗
Oomph - Pasco's	✗	✗	✗	✗
Prep-Vinyl - Viponds	✗	✗	✗	✗
Prep-sol	✗	✗	✗	✗
Surface Cleaner - Avery Dennison	✗	✗	✗	✗

Table 1.2 – Truck and Car Wash Compatibility for DOL 6460 High Gloss

Overlaminate	DOL 6460 High Gloss 38 mic high gloss polyurethane
Truck and Car Wash	
Aquawax - Hot Wax Rinse Aid - Autosmart	✓
Brushwash - Concentrated Foam Shampoo - Autosmart	✓
CT18 - Superwash - Chemtech	✓
CT20 - Wash 'N' Wax - Chemtech	✓
G101 - Multi Purpose Non Caustic Cleaner - Autosmart	✓
Heavy Duty Super Wash - SCA / Koala Auto Kare	✓
Heavy Duty Truck Wash - SCA / Koala Auto Kare	✓
JET MPC - Multi Purpose Non Caustic Cleaner - Autosmart	✓
Reaction - Truck, Bus & Car Wash - Batch	✓
Tiger Plus - Heavy Duty Vehicle Wash - Autosmart	✓
Tigerwash - Truck Wash Concentrate - Autosmart	✓
Truck wash - Firefly	✓
Wash 'N' Glow - Concentreated Car Wash & Wax - Batch	✓

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 Specialist Installers who have been specially trained and certified in accordance with our recommended techniques.

You can review the Specialist Installer list here: http://carwrapsanz.com/specialist-installers/

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.