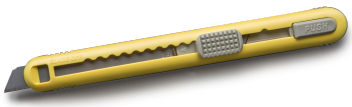
AVERY DENNISON CAR WRAP CERTIFICATION STUDY GUIDE 2018

Everything you need to know to pass the Avery Dennison Car Wrap Certification Exam

Avery Certification Written Test Information

Contents:



1 - Tools:

Knife - The knife best suitable for car wrapping is a retractable standard light-duty knife. The knife should hold the blade securely to ensure that cuts are made precisely and to minimize the possibility of cutting the body of the vehicle. Avery does not recommend the use of an X-ACTO knife or a box cutter for vehicle graphic installations.

Blades - The approved blades are standard AB blades with either a 45 or 30-degree angled tip. Recommended manufacturers are NT Cutter and Olfa.

Squeegee - The properties of the squeegee used for applications should be a combination of firm and flexible. The best Avery squeegees for vehicle graphic installations are the Avery Pro – blue and red. The blue squeegee is firm and is best used for flat surfaces and full print digital wraps. The red squeegee is soft and best suited for curved surfaces and color change films, particularly sensitive finishes like matte or textured. For best application, the squeegee must have a smooth nick free edge.

Squeegee buffer - All squeegees must have a buffer to keep the film from being damaged during the application process. There are a wide variety of buffers available. The keys are to find a buffer that minimizes scratching and aids the application process. Avoid buffers that are too wide and uneven such as female Velcro. These buffers apply film improperly because the buffer absorbs the force applied to the squeegee. Avoid buffers made from paper, as they tend to overly scratch. The most important factor with any buffer is to make sure that it is in good condition before the application begins. A dirty or worn out buffer can result in scratches and improperly applied film.

Propane Torch/Heat Gun/IR Heater/Steamer - The film can be heated up during the installation process with either a self-igniting propane torch, electric heat gun, IR heater or steamer.

- A propane torch is beneficial in that there is no extension cord, which makes it highly maneuverable. Another added benefit is that the tip of specialty propane torches generally does not get hot enough to cause burns. The downside to propane torches is that they heat the film quickly, which can lead to accidental burn marks on the film and they cannot be used to post heat. Also, propane cannot be used for matte or stain finishes as it will gloss the face.

- Heat guns produce temperatures that warm the film thoroughly and evenly which are key for wrapping difficult areas like bumpers and deep recessed areas. There are many types of heat guns available today so be sure to choose one that is durable and has 2-3 levels of heat output. One important aspect to note concerning heat guns is that if the installer is using one with built-in digital temperature readout this is not an accurate reading for post-heating. The heat gun may say that the temperature being produced is 180 degrees F but the film/surface temperature is 100 degrees F. For post heating, an infrared thermometer is required for an accurate reading.

- IR Heaters are useful when working with multi-layered films like chrome or for installers working by themselves on a bumper. IR heaters can be very effective as they can thoroughly heat the film which will allow it to stretch uniformly. IR heaters can be used to post heat though keep in mind that they can whiten the plastic on headlights if placed over these areas too long.

- Steamers can also be effective for warming multi-layered films like chrome. Most steamers reach a maximum temperature of 200F so can be a good way to avoid overheating the film. Be careful to keep the moisture from getting under the adhesive of the wrap films as this can compromise the adhesive layer. Steamers can be useful for aftercare as well as they can remove dirt as well as scratches from chrome.

Snitty: A Snitty is a cutting tool that enables an installer to safely cut the film and backing paper without damaging the vehicle. The blade is protected by a hard plastic sleeve, protecting the hands of the user, and allowing the slitting of liner and film. Be sure that the blade is sharp so that the backing paper and film is cut cleanly. A dull blade in a Snitty can cause the film to tear or the backing paper to break into tiny piece that get stuck to the adhesive.

Safety Box: A key for safety for both the installer and fellow workers is a knife or blade collection box. Instead of clicking the used blade tips onto the floor, click them into the safety box. This keeps the used blades from getting mixed in with the trash, which can lead to, fingers getting cut or embedded in shoes. Once the safety box is full dump it into a hard plastic container, seal, and then dispose of properly.

Magnets: Magnets are an excellent, time saving tool that can be used to hold the panels on the vehicle in lieu of masking tape. There are a wide variety of magnets available. Be sure to use magnets that are strong enough to hold a panel and that the side that comes into contact with the film/application surface is soft rubber. Note that magnets can leave marks on the film when they are removed. These marks, in most cases, fade as the adhesive layer settles.

Masking Tape: Masking tape is used primarily to reduce surface energy on the vehicle so the film doesn't stick on tricky areas during the installation process. An installer should have a variety of different widths on hand from ½ an inch to 2-inches to get the best results. Masking tape can be used on: windows, molding, lights, antennas, door handles and windshield wipers.

Tape Measure: To make the panel straight and precise use a tape measure. When done measuring, place the tape measure in a pocket or tool bag. Avoid securing the tape measure on the front side of the body as it can scratch the vehicle during the installation process.

Application Glove: Application gloves are a safe and effective way of working the film into hard to access areas like recessed areas or door handles. In addition, the glove protects the hand from heat, and reduces friction allowing smooth application of graphics. Do not apply the film with a dry application glove, as it will grab the film causing it to wrinkle. The application glove should be moistened with a soapy solution. Make sure that the application glove is form fitting and thin enough to allow the finger to form the film into place.

Baby Shampoo: The best soap to use for a soapy solution used to moisten a glove is baby shampoo. Baby shampoo doesn't have acid in it, which means it won't compromise the adhesive. Some dishwashing soap has acid in it, which can compromise the adhesive on some films. One large squirt of shampoo in a one-quart spray bottle is adequate to create an effective soap solution. It is better to error with more baby shampoo then less because the shampoo acts as a lubricant.

Basic Tool Set: A basic tool set is key for removing hardware on vehicles. A proper tool kit should include screwdrivers (flathead and Phillips), pliers, a ratchet set, and a Torx wrenches. These tools will assist in prepping a vehicle to remove obstacles prior to application of vinyl graphics.

Edge Seal-It pen: Edge sealer is used on windows and underneath the vehicle to form a seal which keeps moisture from getting under the film. Sealing these edges with edge sealer helps ensure durability.

ScrapeRite blade: This is a plastic razor blade that is very effective for removing adhesive residue. Be sure to test a small corner on the paint to make sure it doesn't scratch.

Infrared thermometer: After applying the film to critical areas like recessed areas and compound curves the film needs to be post heated. To gauge the proper temperature the best measurement device is an infrared thermometer.

Flextreme: The Avery Dennison Flextreme is a dual function tool. The handle side can be used to pull soft rubber away from the body to tuck the film behind. The wide side of the Flextreme is a micro squeegee that is very effective for corners and tight edges commonly found on molding and between the bumper/fender. Like the Avery Dennison squeegees, the blue Flextreme is firm, the red is soft.

2 - Properties of the Film:

Wrap Film Types:

There are two classifications of film - calendered and cast.

Calendered film is for flat or simple curved surfaces. The reason for this is that calender film has limited ability to stretch due mainly to the manufacturing process. Calender film starts off as a solid, is heated, and is rolled into a flat film. Due to the manufacturing process and typical components in the formulation of the calendered film the material is relatively stiff, and less flexible than cast products. calendered films are effective for partial wraps on simple curves and flat surfaces. At times these films can be used for short-term compound curve applications where premature lifting is not a consideration.

Cast film is considered the most effective film for vehicle wrap applications. The manufacturing process for cast film starts off as a liquid (also known as organisol) where plasticizers, pigments other components are dissolved in a solvent. The organisol is metered onto a carrier, or casting sheet, and then run through series of ovens to cure the film. The end result is a highly flexible film that can be applied to complex curves and recessed areas.

There are two classifications for vehicle wraps: Digital Full Print and Color change

Standard Digital Full Print Wrap Materials from Avery Dennison:

Print Media: MPI1105 Easy Apply RS - Cast

Protective Laminates: DOL1000 series (2 mil for general applications) - cast
DOL1300 series (1.3 mil for compound curves) - cast
DOL1400 series (1.3-mil super conformable) - cast

Definitions of Print Media:

MPI - Multi Purpose Inkjet
1105 – Cast, High Opacity, Gloss White, Long Term Removable
Easy Apply – Patented Air Egress Feature
RS – Repositionable & Slideable

Adhesive Color of MPI 1105:

The adhesive layer is gray. Gray is typically used to keep the color of the paint from changing the hue of the print. If the adhesive layer was clear or white, there is a high potential that the color of the underlying paint would change the hue of the film, creating issues in achieving approved color targets as selected by end users.

Protective Overlaminates:

Avery Dennison recommends the use of a solid overlaminate for most vehicle wrap installations with MPI 1105 Easy Apply RS. Avery Dennison calls their solid overlamination Digital Overlaminate or DOL for short. The DOL layer adds several benefits to the film that help both in terms of the installation process and durability. Adding DOL makes the wrapping film thicker. This makes the film easier to handle and less prone to overstretching or tearing. DOL comes in several different finishes - matte, satin, and gloss which gives the client more options in terms of effect. The DOL layer provides extra durability in UV protection and minimizing wear and tear. Another benefit of DOL is the added structure for improved removal. Keep in mind that these DOL's do not have any horizontal warranties, only vertical.

The standard DOL is a PVC cast construction and comes in the following range:

Number	Finish	Caliper	Uses
1060	Gloss	2.1 mil	Compound curves
1080	Matte	2.1 mil	Compound curves
1360	Gloss	1.3 mil	Compound curves and corrugations
1370	Luster	1.3 mil	Compound curves and corrugations
1380	Matte	1.3 mil	Compound curves and corrugations
1460	Gloss	1.3 mil	Ultra-conformable, deep recesses

- Thin gauge 1.3 mil laminates such as the 1300 and 1400 DOLs provides durability up to 4-years vertical/0-years horizontal.
- The use of the 2.1-mil laminates of the 1000 series provides durability up to 5- years vertical/0-years horizontal.

Avery Dennison also offers two additional cast DOLs:

- 6460 is a DOL that is polyurethane based which has a 3-year horizontal warranty. This is particularly beneficial for areas that are in Zone 2 and 3. 64600 is 1.5 mil thick and highly flexible which makes it warranted to be formed into deep recessed areas and extreme compound curves. Since it is not a PVC cast overlaminate, it should only be cleaned with approved aftercare products. Cleaning with alcohol can whiten the DOL. Also, for post heating, 6460 DOL should only be heated up to 170F maximum.

- 6040 is a PVC-based DOL that has metallic flakes which can add an enhanced effect for the wrap. This DOL has a 2-year vertical/ 0-year horizontal warranty. Keep in mind that this DOL is 3.0 mil, making it the thickest combination with MPI 1105. This makes using 6040 DOL slightly trickier to apply to compound curves and it is not warranted for deep recessed areas.

In addition to solid overlaminates, Avery Dennison does approve the use of liquid clear coats. These clear coats provide protection and added durability, but require the added layer of an application tape during the installation process. This is due to the fact that liquid clear coats are very thin which can make installing without application tape very difficult as it will be prone to overstretching and fold on itself.

Width of Media Rolls: MPI 1105 film and DOL laminates come in 30-inch, 48-inch, 54-inch and 60-inch wide rolls.

Color Change Wrap Films

Avery Dennison SW900 Supreme Wrapping Film

Along with offering car wrap film for digital prints, Avery Dennison produces color change film. These are single color films that are primarily used to change the entire color of a vehicle. Avery Dennison SW900 comes in a variety of colors and finishes with most them coming in 60-inch wide rolls. Conform Chrome is the only Supreme Wrapping Film that is not available in 60-inch width.

The thickness of Avery Dennison Supreme Wrapping Film varies per finish but it is generally between 3.0 and 3.6mil thick. Avery Dennison SW900 is a highly conformable film and can handle almost all compound curves and deep recessed areas.

It is very important to note that Avery Dennison Supreme Wrapping Film should not be printed on directly. Furthermore, most Avery Dennison SW 900 films come with a lamination layer that has been fused onto the liner during the manufacturing process. This lamination layer is a PVC cast layer similar to the DOL1300 series. If a client would like extra horizontal protection or a sparkle metallic effect, DOL6460 or DOL6040 can be laminated on top of the Avery Dennison SW900. Keep in mind that this will make the wrapping film thicker, making it harder to conform to compound curves and increase the possibility of lifting in deep recessed areas.

The adhesive layer will be either gray, white, or black, and will vary depending on the color of the fae film. This is done to achieve the right color match on the face and to keep the color of the vehicle from changing the hue of the material when applied.

There are several important factors to consider when installing SW 900 films: surface energy, directionality, lamination, and thickness. These factors play an important role in which tools to use during install, preparation, direction of overlaps, warranties, and other factors. A short guide for SW900 films is as follows:

Directionality:

Non-Directional: gloss, matte, conform chrome
Directional: gloss metallic, matte metallic, pearlescent, satin, brushed metallic, carbon, colorflow

Surface Energy:

Low Surface Energy: matte, carbon, brushed metallic
Medium Surface Energy: satin
High Surface Energy: gloss, pearlescent, conform chrome

Warranty:

10-year vertical/2-year horizontal: gloss and matte
5-year vertical/2-year horizontal: gloss metallic, matte metallic, pearlescent, satin
4-year vertical/1-year horizontal: carbon and brushed metallic
3-year vertical/1-year horizontal: conform chrome

No Lamination Layer:

Carbon Fiber, Brushed Metallic, and Conform Chrome do not have a lamination layer fused on during manufacturing. The surface of Carbon Fiber and brushed film is multi-dimensional, which doesn't allow for a lamination layer to be applied. For conform chrome, adding a lamination layer during the manufacturing process would further increase the cost of the film. Therefore, it is important to avoid scratching the surface of these films during the installation process, as these scratches cannot be self-healed.

To minimize scratches during the installation process of Conform Chrome and during the life of the wrap, it is highly recommended that DOL1460 is added before the installation. This combination will make the wrapping film 8.1 mil thick but, because DOL1460 is the most flexible solid overlaminate, it will not significantly affect the flexibility of the conform chrome.

Overlaps:

When making inlays for color change wraps, surface energy is very important to keep in mind to get the best durability. In almost all cases, apply the film that has the highest surface energy first then the weaker one on top. This can mean the edge of the overlap faces out and/or in the direction of where the vehicle is going.

Film Characteristics to Consider for Install:

Easy Apply: Easy Apply is the name for Avery Dennison's air-egress technology. Air-egress technology allows for the pushing out of air through mechanical design. These tiny channels spread air out underneath the film as it is applied. This makes the installation process significantly easier and results in less bubbles which helps ensure higher quality.

RS: RS is the term Avery Dennison uses for their adhesives that have repositionable and slideable technology. Repositionable technology is a process of creating a temporary buffer or offset between the adhesive layer and the application surface. This buffer, which are ink dots sprayed in a random pattern on the adhesive during the manufacturing process, allows the installer to easily reposition and slide the film during the application process. When the film is squeegeed onto the application surface the ink dots are pushed into the adhesive. This allows the adhesive to come into contact with the application surface and form the necessary bond for long-term durability. This is why it is called pressure activated adhesive.

* As with any technology that makes the film easier to apply it comes with certain rules. For films with Easy Apply and RS properties, the installer must be sure to squeegee with enough force to adhere the film to the application surface properly. Film that isn't applied with enough force will "float" above the application surface resulting in poor adhesion that can lead to failures particularly on compound curves and recessed areas.

* Note that MPI 1105 Easy Apply RS and SW900 have the same adhesive layer

Memory: Memory is a term that refers to the tendency of PVC (poly vinyl chloride) films to return to their original state. PVC is added to the films to give them strength and flexibility. These are necessary qualities for films that will be applied to complex surfaces, such as vehicles. The chemical and physical properties of PVC also give the film memory. This means film that has been stretched around curves or into recessed areas is constantly pulling back to their original shape. This memory effect puts a great deal of tension on the adhesive layer to hold the position on the vehicle. The memory effect will cause failures for film if the film is overstretched. Film that has been applied with sound techniques and not overstretched will conform better and have better durability. Cast films have less memory than calendered films due to the differing manufacturing processes. Proper post heating alleviates the memory in cast films.



Post Heating: Post heating refers to the process of eliminating the memory effect of the film, which decreases the tension on the adhesive. Once the film has been applied to the vehicle, an installer, using a heat gun, IR heater or steamer along with infrared thermometer, can heat the film up to a specified temperature.

Proper Adhesion: It generally takes 24 hours for the adhesive layer to reach maximum bonding strength with the application surface. For this to happen the vehicle and film must be above a specified temperature. In the case of MPI 1105 Easy Apply RS and SW900, the temperature of the vehicle/film must be above 55 degrees F. If the temperature of the vehicle/film is below 55 degrees F it will take incrementally longer for the film to reach maximum adhesion. If the film fails to bond quickly enough to the application surface it can lead to both short and long term failures. An installer has two options for vehicles that are completed with outside temperatures below 55 degrees F:

- Leave the completed vehicle inside the heated workspace for 24-hours
- Go over the entire surface area of the completed vehicle with a heat gun or IR heater. Warming the film speeds up the adhesion process.

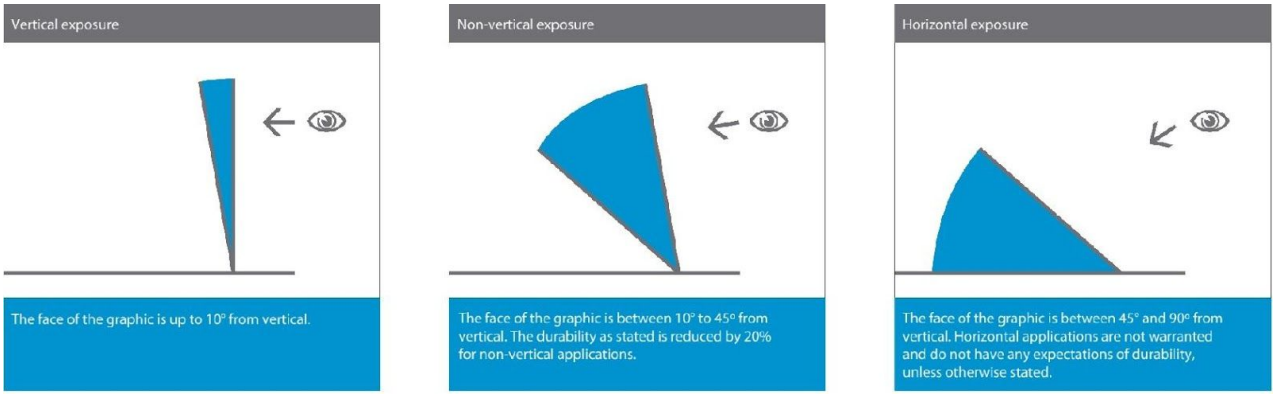
Liner (Backing Paper): Currently, the backing paper is not recyclable in most regions. We recommend stacking the backing paper up during the install so it can be rolled up as tightly as possible to minimize the space it takes up in the trash and landfill.

However, several regions are starting to make recycling silicon-based paper possible, so be sure to check with your local waste management organization to get the proper information. If the backing paper is recyclable in your region, Avery Dennison strongly recommends recycling the backing paper to lower waste and encourage the reuse of resources.

Vertical and Horizontal Warranties:

It is important to understand what is considered horizontal and vertical in terms of warranties along with how Avery Dennison breaks the warranty guidelines into regions.
Below is a graphic that shows what is considered vertical, non-vertical and horizontal.

Instructional Bulletin #1.30 (Revision 7)



Anything up to a 10-degree angle is considered vertical. The angles between 10 and 45 degrees are considered non-vertical which means the graphics have a 20% reduction in warranty coverage and for angles between 45 and 90 degrees are considered horizontal.

The graphic below shows how the regions are broken up in the United States. Avery Dennison makes three distinctions with their warranty system: Zone 1, Zone 2 and Zone 3. For all listed warranties for MPI 1105, DOLs and SW900, Zone 1 is used as the reference point. For example, for SW900 gloss carries a 10-year vertical and 2-year horizontal warranty. This is for Zone 1. If the install is taking place in Texas, this means that in most cases, it will be considered Zone 2. This reduced the warranty of the film by 20%, making the warranty for SW900 gloss 8-years vertical and 1.6 years horizontal.

Understanding the structure of the classifications of the zones and what they mean in terms of durability is critical to get full support from Avery Dennison's technical team if there are any issues with weathering or durability.

5.1 United States Coverage Map by Zone

5.1 Zone Reductions

- Zone 1 areas are indicated in green and include the United States and Canada unless otherwise noted on the map above.
- Zone 2 areas are indicated in yellow and will have a 20% warranty reduction.
- Zone 3 areas are indicated in red and will have a 60% warranty reduction.
- Areas indicated in white are referenced in individual maps below below

3 - Workspace:

A - Temperature
B - Light
C - Cleanliness
D - Space Requirements

A - Temperature: Temperature of the workspace plays a very important role during the application process. The film adapts very quickly to the temperature of the workspace and vehicle. Therefore, it's important that the workspace is between a specific temperature and that it stays consistent throughout the install.

The Avery Dennison recommended install temperature is between 60 and 75 degrees Fahrenheit (15-25 Celsius)

Too Cold: If the workspace is too cold, the film will become stiff and difficult to work with. In extreme cold weather, pay particular attention to two possible scenarios: One, a cold vehicle, or two, the floor radiates cold. If the vehicle that is to be wrapped will be cold when brought into the workspace, allow at least one hour for the body of the vehicle to warm up before applying the graphics. If the floor of a workspace radiates cold, the temperature of the film will get colder the lower it gets to the floor. This will change the dynamic of the film and can affect how well the adhesive bonds to the application surface. If this is the case, be sure go over the lower portion of the vehicle with a heat gun once the film has been applied to allow the adhesive to properly bond with the application surface.

Too hot: If the workspace is too warm, the film can easily overstretch, particularly on edges and critical cuts. Pay particular attention to avoid picking the film back up off the application surface as this can overstretch the film. When stretching the film onto compound curves and recessed areas, be sure to do this as incrementally as possible in order to avoid overstretching. If the temperature of the workspace will be too hot due to summer temperatures try to schedule the installations for early morning/evening to help ensure cooler temperatures.

B - Light: The best set-up for light in a workspace is from above and on all four sides. The light should illuminate the vehicle evenly from top to bottom and left to right. Skylights are ideal as natural light is best for seeing the film. If there is not enough light in the workspace use a portable light. This light can be moved throughout the installation process in order to maintain the proper level of light.

C - Cleanliness: - A clean workspace is essential for applying professional level graphics. Be sure to sweep the floor thoroughly before the vehicle is moved into the workspace.

Avoid:
- High traffic areas as they can kick up a lot of dust
- Construction work near or in the workspace
- Open doors and/or windows as they allow dust to enter the workspace

D - Space Requirements: - The installer should have a least 6 feet (2 meters) clearance on all sides of the vehicle. This space allows the installer to handle the panels properly and work without distraction. More importantly, it gives the installer the ability to stand back to assess how the graphics lay out on the vehicle. A workspace that is too cramped can keep an installer from seeing a panel that doesn't fit properly or is crooked. If the space is too small for sufficient clearance on all sides, maximize the space on the side that is being worked on. When the side is finished, reposition the vehicle accordingly.

Outside Installations:
Avoid applying graphics outside. There are too many variables that cannot be controlled – wind, changes in temperature, dust/dirt and humidity. If a client insists that the installation take place outdoors educate them on the variables that cannot be controlled. Be sure to note that there is no guarantee that dirt or other factors will not compromise the overall quality and durability.

4 - Hardware Removals:

Removing the hardware on a vehicle makes the installation process easier, the quality higher and helps ensure durability. The two main keys to removals are using the right tools and techniques so the vehicle/hardware doesn't get damaged and storing the emblems/hardware in a safe place for easy re-install.

Emblems: Most emblems are fastened to the vehicle with double-sided tape. To remove the emblems, use a wide plastic removal tool or a plastic wire to slowly pry them off. Work methodically in order to remove the emblems in one piece.

* Tip - Be sure to take measurements or pictures to remember the precise position of the emblems. Emblems can easily be reinstalled over the film or back on the body of the vehicle after the graphics are removed. Use outdoor double-sided tape to refasten the emblems.

Adhesive Removal: Adhesive residue is often left behind after the emblems or vinyl lettering is removed. It is very important to find an effective adhesive remover.

Avery Dennison recommends using a ScraperRite blade or similar plastic scraper as an effective way to remove adhesive when used in conjunction with an adhesive remover. Always be sure to wear heavy-duty rubber gloves and wipe off the adhesive residue with a paper towel. After all the adhesive is removed be sure to clean the area thoroughly with a degreaser.

License Plate – Most license plates are easily removed simply by removing the screws. To avoid losing the screws, secure them to the license plate with masking tape.

Windshield Wiper - Windshield wipers can be easily removed with the proper tools. Most windshield wipers have a factory seal so they will be difficult to remove the first time. Be sure to push as closely towards the center as possible to avoid breaking the wiper.

Windshield Wiper Nozzle – Windshield wiper nozzles should be removed. This makes the installation of the hood dramatically easier and the quality higher.

Side Lights – Lights on the fenders and above license plates can generally be removed. Be sure to attach masking tape to the wire and fasten it to the inside of the body. This will keep the wire from falling into the vehicle, which can be time consuming to retrieve.

Rubber Molding – The soft rubber molding around the upper portion of most windows can also be removed. First, roll the window completely down. Pull the molding away from the window and push it inside the vehicle. To re-install, simply form it back to the edge, starting from one side and working in increments to the other. The molding on the bottom of the window often as metal in it. Be careful to slide the molding out during the removal process to avoid bending it.

Door Handles – In some cases, door handles can easily be removed. Using the proper tool, generally a Torx wrench, loosen the bolt on the inside of the door. Pull the handle in one direction and pop it out. Make sure to leave the window open so the door can easily be opened during the installation.

Antennae – Antennas can easily be removed by simply unscrewing them. However, accessing this bolt can mean removing the ceiling panel which can be difficult. With the right technique, wrapping around the antenna is straightforward so in most cases its best to leave on

Back Lights - In most cases, back lights are straightforward to be removed

Front Lights – In most cases, front lights are difficult to remove and are best left on the vehicle.

* Be sure to place all hardware and screws/bolts in a low traffic area so nothing gets misplaced. A good spot is on the floor of the driver or passenger side of the vehicle.

Re-Installing Hardware: When the installation of the wrap film is completed all the hardware needs to be re-installed. In most cases, it's as simple as reversing the steps taken to remove the hardware. Cut out any areas where the film is bridging the gap where the hardware needs to go. Even though the hardware will cover this area, be sure to make the cuts as clean as possible.

Document Hardware: A good tip is to make a detailed list of what can or cannot be removed from a vehicle. This list can be an invaluable resource when calculating the time and difficulty of an installation as well as how to give a quote on a job.

5 - Cleaning:

Cleaning is the most important part of wrapping a vehicle. It doesn't matter how good the quality of the installation is if an edge or recessed area was improperly cleaned. The goal should be to clean the vehicle as thoroughly as possible in order for the film to bond properly to the application surface. Anything short of this will lead to failures, costing you more money and time.

The best way to begin the cleaning process is to have the client take the vehicle to the carwash the day before the install. The wash cycle should be basic – no wax or other treatments. Do not brush silicon onto the wheels. Because the silicon will spray off the wheels while the vehicle is in motion, resulting in the silicon ending up on the inside of wheel wells and even on the main body area. This can easily be overlooked by the installer and can compromise the adhesive.

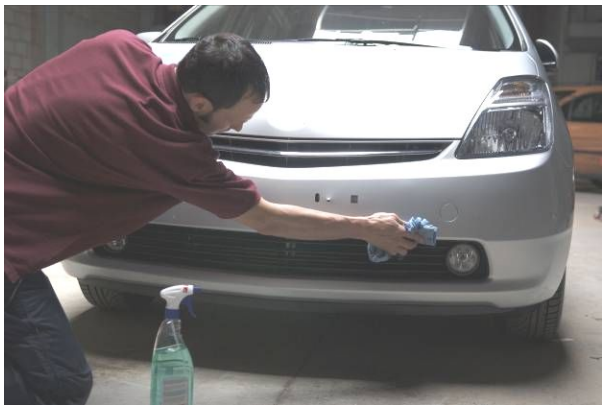
It's very important to not take the vehicle to a car wash on the day of the install. Taking it prior to the install will give the water that gets under the door handles and lights time to dry properly.

Cleaning: The following 2-step process is the most effective method for cleaning a vehicle for a digital full print wrap.

* Avery Dennison recommends using heavy-duty paper towels or microfiber towels for the cleaning process. Heavy-duty paper towels absorb more dirt and oil then standard paper towels and are more durable. For microfiber towels, be sure that if they are used, there are no particles stuck in the fibers as these can scratch the paint.

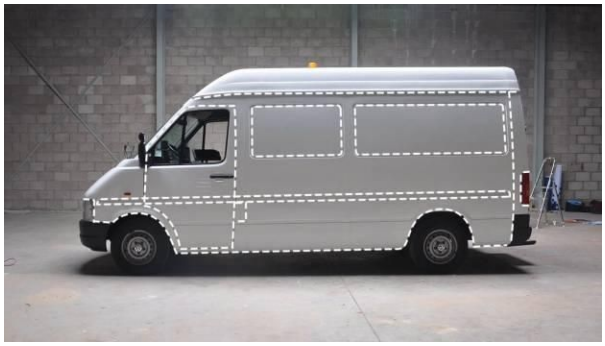
General Cleaning:

Step 1 – Clean the application surface with a general-purpose cleaner. Avoid using any cleaner that will leave a soapy residue or contains an oil-based product. Dirt can build up on the paper towel quickly, so be sure to rotate or replace the paper towel often. Baby shampoo and water is a good combination to use for cleaning.



Step 2 – The second step of the cleaning process involves addressing any oil residue on the application surface. The best way to remove oil residue is to use a degreaser. Avoid using a degreaser that will leave a haze or compromise the paint. When using a degreaser, be sure to wear heavy-duty rubber gloves and work in a well-ventilated area. Be extra careful and avoid inhaling the mist after spraying. Avery Dennison recommends 70% isopropyl alcohol as a degreaser.

Where to Focus the Cleaning:



The goal is to clean the entire vehicle and focus especially on the edges, recessed areas, and underneath the body. Edges and recessed areas are the weakest and most vulnerable points for the film and adhesive.

Be sure to open each door and clean the inside edges of the doors, especially on the lower section. Clean the recessed areas with lots of elbow grease and be thorough. A lot of oil and grime builds up under the body, so feel the area after cleaning. If the tips of the fingers feel oily or slick, this area will need a second cleaning.

For difficult to reach sections, wrap a squeegee in a paper towel, spray it with the degreaser then run the edge along these areas. This technique is especially useful around lights, door handles, free-floating windows and molding.

It's important to clean not only on the application surface, but the entire vehicle. Wheels, bumpers, and the front windshield area can be particularly dirty. Dirt from these areas can easily end up on the adhesive if not addressed.

To double-check if the application surface is clean enough, simply run a finger over the area. If the finger slides easily then it needs to be cleaned again. If it sticks or squeaks, then the surface has been properly cleaned and the graphics are ready to be installed.

Cleaning Color Change Wraps: It is recommended that after general cleaning is complete, a clay bar or clay bar glove/towel is used. This requires more prep time but results in an extra smooth surface that is critical in order to get a paint like finish. After this, wipe off the soapy residue then degrease with 70% isopropyl alcohol.

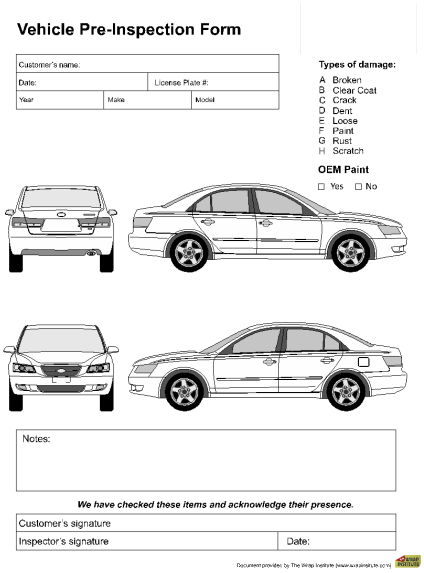
Wet Vehicle: There are times when the vehicle shows up at a job having come right out of the rain or snow. This means that moisture will be deep in crevices around lights and molding. It's important to dry these areas properly to avoid water getting under the adhesive as this will lead to failures. It is best to use an air compressor to blow out these hard to reach areas. A heat gun can also be used, as the heat will expand the water in these areas causing them to release onto the body of the vehicle.

6 - Liability/Guarantees

Paint: If the paint of the vehicle is OEM (the original paint), is in good condition with no cracks or damage to the clear coat layer and it is no older than 5-years, Avery Dennison will provide a guarantee that there will be no paint or clear coat failure when the wrap is removed within the warranty period. MPI 1105 Easy Apply RS and SW 900 will not leave more than 10% adhesive residue behind. In many cases, the graphics protect the paint of the vehicle from scratches and UV damage.

Damaged Application Surface: If the application surface is not OEM, has cracks, rust, or is missing the clear coat, there is no guarantee. Sections with rust can still be wrapped but they require extra preparation. Clean thoroughly and apply an adhesive primer to help secure the film. For sections that are missing clear coat be sure to not pick the film up during the installation process. Picking the film up can cause the surrounding areas of clear coat or paint sticking to the adhesive. This makes the adhesive layer unable to stick on the application surface and causes more damage to the vehicle.

Pre-Inspection Form:
Regardless of damage, be sure to make a pre-inspection sheet, sign and date it along with the client. Make a copy for the client and file the original away for safekeeping. Take care to note if the paint is OEM. In order to get support from Avery Dennison's technical team, it is necessary to fill out a pre-inspection form. Failing to do so will, in most cases, void any warranty claims if there is clear coat or paint damage when the wrap is removed.


Vehicle Pre-Inspection Form

Customer's name:
Date: License Plate #:
Year Make Model

Types of damage:
A Broken
B Clear Coat
C Crack
D Dent
E Loose
F Paint
G Rust
H Scratch

OEM Paint
☐ Yes ☐ No

Notes:

We have checked these items and acknowledge their presence.

Customer's signature
Inspector's signature Date:

7 - Safety:

Safety should always be a priority. The keys to proper safety are knowing what be aware of and instilling good habits until they become second nature.

Retract Blade After Every Cut – One of the most important habits to cultivate is retracting the blade after making a cut. Continuing to work with the blade out after cutting significantly increases the chances of causing bodily harm or damaging the vehicle.

Burns From Heat Guns – The tip of a heat gun gets very hot. It's important to make a good habit of keeping the tip away from the body and clothes. When sitting the heat gun down on the floor, be sure to sit it securely on the ground to prevent it from falling over.

Backing Paper – One side of the backing paper has a wax-like surface. This protects the adhesive side of the film but it can act like a sheet of ice when stepped on. Either place all backing paper immediately in the trash or stack it up in a low-traffic area, like underneath the vehicle.

Cleaning Agents – Always wear rubber gloves when using industrial grade cleaners and make sure that the workspace is well ventilated.

Gas Tanks – It is necessary to use heat to conform the film to the gas tank area. Before applying any heat to this area, open up the lid to make sure that the gas tank is securely in place. Make sure the area is dry. Without question, using a heat gun instead of a propane torch is the safest and most effective mean of heating this area. If a propane torch is the only option, use indirect heat to soften the film.

Put Used Blades in a Safety Box – Used blade tips on the ground can easily cut fingers when picking up the trash or end up in the soles of shoes. Instead of clicking the used blade tips onto the floor, place them in a safety box. When the safety box is full, place the used tips in a secure container for safe disposal.

Installation Overview and Protocol

The Top Four Factors for Installing Graphics:
1 – Properly Cleaned Vehicle – A dirty edge or recessed area will cause the film to not bond properly to the application surface. This means that over time these areas will fail.
2 – Choosing the Right Film – One type of SW 900 film or a specific DOL that is good for wrapping a standard sedan may not be able to handle deep recessed areas on a Transit.
3 – Overstretching the Film – All film needs to be stretched while wrapping vehicles. The key is to learn how to stretch but not overstretch.
4 – Post Heating – Taking the time to post heat the film after an install is key for ensuring durability.

8 - Basic Installation Techniques:

Setting up a Panel for Install – Hinges and "Going Cowboy":

Digital Full Print Wraps:

Hinges: Simply removing the entire backing paper and installing a digital full print that need to be aligned precisely is prone to mistakes, low quality and misalignment. Therefore, to safely and effectively install a digital full print a panel a hinge must be created. A hinge can either be vertical or horizontal. There are two types of hinges used in conjunction with each other – temporary and permanent.

Temporary hinge: Temporary hinges are readjustable methods of securing a panel to the application surface. There are three effective and easy to use ways of making temporary hinges.

1 – Magnets – Magnets are quick and effective tools for securing the panels to the vehicle. Be sure to use magnets that have a handle, as they are more efficient to work with.

2 – Masking Tape – Placing masking tape on either side of the panel works well. Be sure to use masking tape that is wider than 1 1/2 inches (4 cm).

3 – Half Circles – A quick, secure method that doesn't require any tools is tearing small half circles of the backing paper off on either side of the panel. The half circles should be 4 inches (12cm) in width.

Permanent Hinge: Once the temporary hinge has been set, the next step is to make a permanent hinge. Remove the backing paper to just above the temporary hinge and cut it evenly away. Pull the film away from the hinge with no wrinkles then make one squeegee stroke above the temporary hinge from one side of the panel to the other. This squeegee stroke is the permanent hinge since it activates the adhesive which holds the panel to the application surface. Once the permanent hinge is set then the alignment should be precise and the rest of the panel can be applied.

Color Change Wraps:

For color change wraps, there is no need to center any panels so the best option is to avoid starting with a temporary/permanent hinge and, instead, release the entire liner under the SW 900 while its on the section of the vehicle that is to be wrapped.. This is called "going cowboy". The RS feature will keep the SW 900 from tacking on the surface so, once the backing paper is removed, the installer can simply apply tension and the triangle technique to make the panel flat then squeegee the film onto the surface. The benefits of using this technique are that it eliminates workspace dirt from getting under the SW 900 when flipping the panel over from a temporary hinge and helps avoid adhesive lines.

Squeegeeing:

The Palm Technique: Avoiding Adhesive Lines:

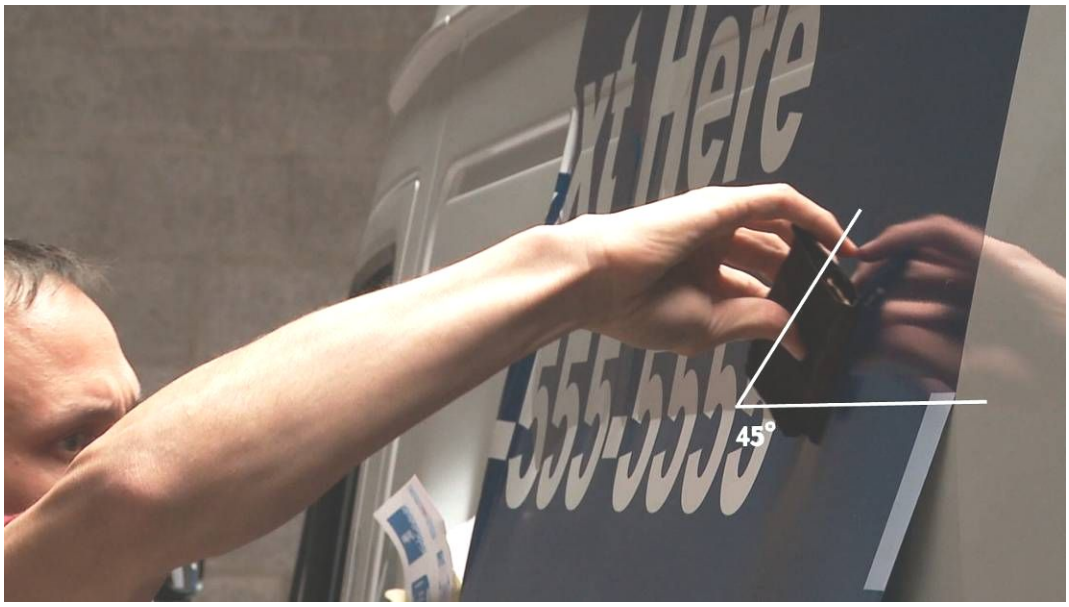
It is recommended that moderate recessed areas be applied first with an application glove then with a flat squeegee. This can, in most cases, be done without the use of heat which means the film will not be overstretched. By applying the recessed areas first with an application glove, the film is applied to the entire section in one stroke which avoids having to work into these areas in multiple squeegee strokes. Using squeegee strokes to apply the film into recessed areas can create adhesive lines.

Once the recessed area has been applied with the application glove, the flat section can be applied in overlapping squeegee strokes. The RS feature will keep the film away from the surface so there should be no bubbles.

Squeegee Technique:

How to hold: The squeegee should be held with the thumb on one side and the remaining fingers on the other side. The position of the fingers will shift depending on the size and surface type of the area being applied. The squeegee should be held firmly so the proper force can be applied onto the film. The adhesive is pressure activated, so the harder the force placed on the film, the better.

Angle: The optimum angle for applying the film is 45 degrees. This angle allows the air to properly escape while maximizing the amount of film that can be applied with each squeegee stroke. Too wide an angle and the air can't escape properly which can lead to bubbles and wrinkles. Too narrow of an angle and the squeegee strokes become inefficient and irregular.



Efficient Strokes: For large areas, the film should be worked down in even, side to side strokes; overlapping each stroke in one inch (3cm) sections. This process should be very methodical so the adhesive is uniformly bonded to the application surface. The film needs to be wrinkle free in order for the film to lay on the application surface.

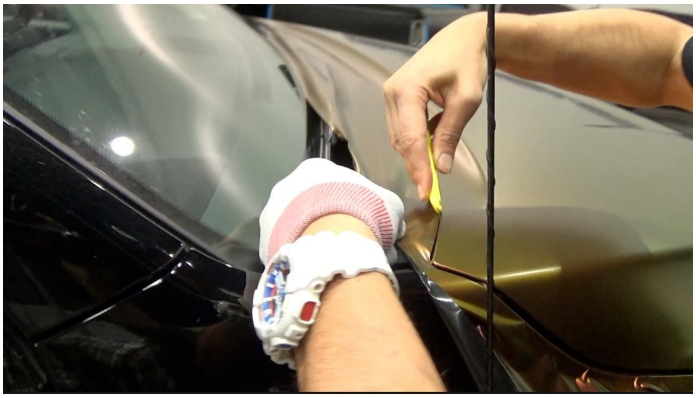
For smaller areas, the squeegee strokes are shorter but the same principles apply. Overlap each stroke and angle the squeegee so the air can properly escape. A good tip is to use the free hand to hold the film away from the application surface. The free hand sets up the film before each squeegee stroke so that it can be properly applied.

What to Avoid: It is very important to squeegee firmly. Not using enough pressure will keep the adhesive from bonding properly with the application surface, which will lead to failures. Do not pick the squeegee up off the film when applying. Picking the squeegee up can lead to missed areas and bubbles. Also, do not push the squeegee in random patterns. This is an inefficient and haphazard approach that produces poor results.

Cutting:

The Blade: Always use a short, sharp blade when making a cut. A blade that is extended only one or two clicks is held firmly by the knife. This ensures a steady, even blade that produces clean, mistake-free cuts. A long blade is wobbly and difficult to control. The long blade can also be prone to snapping which is very dangerous. The key is to always use a sharp blade. Clicking the tip of the blade off into the safety box each time before making a cut is a good habit to cultivate. A dull blade makes jagged cuts and can possibly damage the film or vehicle.

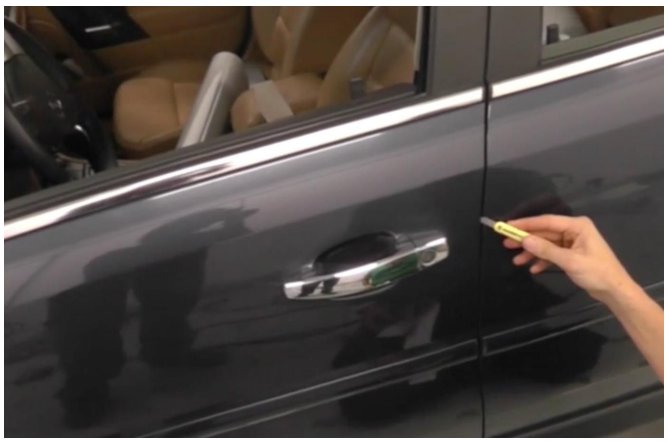
The Position: For cuts on edges, it's good to use the blade and knife in conjunction with each other. This is why Avery Dennison recommends using a plastic knife for wrapping vehicles. The side of the blade is pressed against the edge while the top of the knife pushes gently on the body of the vehicle. This set up snuggly holds the blade in place during the cut much like a train's wheels on tracks. It produces even cuts and reduces the chance of the blade jumping out of the edge and cutting the paint. For cuts on edges and molding, place a finger on the surface next to the knife. The finger balances and guides the knife during the cut.



4-Types of Cutting on Vehicles:

- Empty
- Solid
- Tuck and Cut
- Cutting Tape

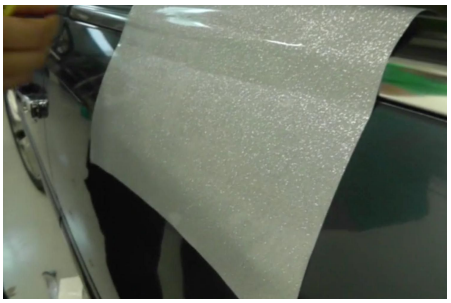
1 – Empty: – Empty is a term that means behind the edge the body of the vehicle doesn't continue. To test whether an edge is empty simply place a blade against it then angle it away. If the blade slips behind the edge, this means it's an empty cut. Most empty edges can be found on doors, trunks, hoods, lights and windows.

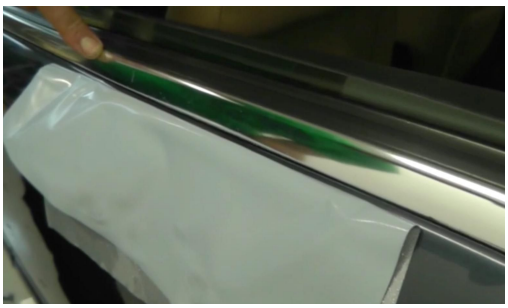


2 – Solid – If the blade is angled away from an edge but doesn't slip behind, it is considered a solid cut. This is because the body of the vehicle continues towards the inside of the vehicle.

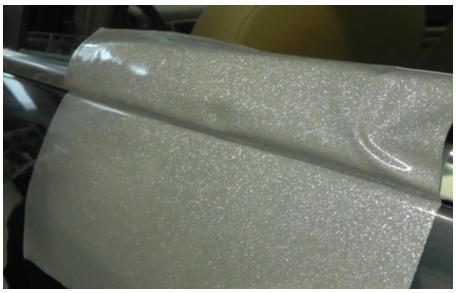
3 – Tuck and Cut – The film generally bridges the gap when the film has been applied around any raised object. It is very important to avoid heating the film up and forcing the bridged film into the gap. Stretching the film into the gap will put too much stress on the adhesive, and will cause the film to pull away from the edge. Instead, pick the film back up and tuck it firmly into the corner. When cutting the film away, be sure to angle the blade at a 10-degree angle along the edge being cut. This will keep the blade from cutting the body of the vehicle and the raised object. A properly tucked corner makes for a clean, precise cut and avoids overstretching.

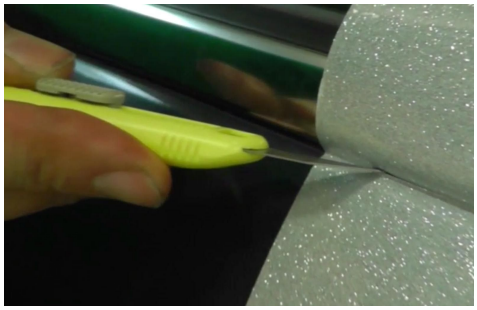
* Common areas to use the tuck and cut technique can be found on molding, door handles and antennae.

Bridge: 

Pull Back: 

Tuck: 

Setup: 

Cut: 

Seal: 

4 – Cutting Tape: When cutting directly on the body which is often the case for color change installs, it is recommended that the installer uses cutting tape like 3M Knifeless Tape or Wrap Cut. It is possible to learn how to cut directly on the film with a knife and not cut the surface of the vehicle. However, over the course of an entire wrap, even the best installers can cut too deep. Using cutting tape on solid cut avoids cutting the paint and helps make long symmetrical cuts.

Solid and Empty Cuts for Digital Full Print Wraps and Color Change:

Digital Full Print Wraps:

For this type of wrap, the cardinal rule is the installer will always cut on the empty side and seal the excess wrap film onto the solid side. The two reasons for this are:

1) There is no need to wrap deep inside the body of the vehicle since digital full print wraps are moving billboards. Only the outside portion of the vehicle body needs coverage.

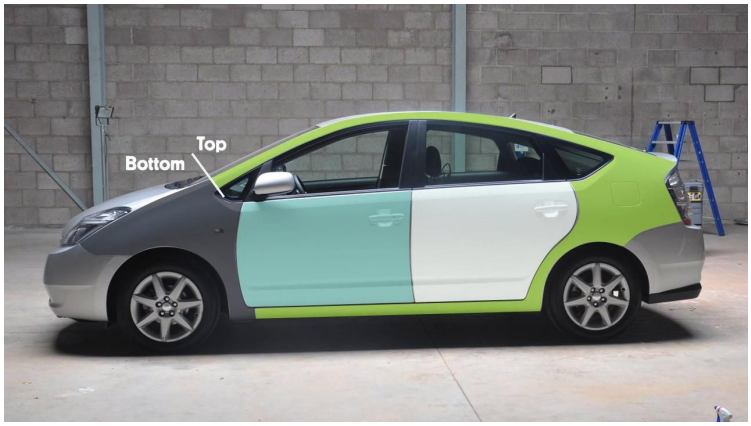
2) One panel will usually bridge an entire section so the installer only has two sides to choose where to cut – solid or empty. Cutting on the empty side allows the excess film to wrap inside the solid section which looks better visually and, in most cases, avoids the edge facing towards the front of the vehicle.

This formula makes cutting on digital full print wraps very straightforward which is why they are easier to install than color change wraps.

Color Change Wraps:

For this type of vehicle wrap, where and how to cut will be determined by the color of the car, the type of film being used, and how far the film was stretched. For black vehicles, in most cases, installers can cut on the empty side and fold to the solid just like on digital full print wraps. Also, installers can wrap the entire section like the driver side in one sheet instead of breaking the panel up into specific sections.

For vehicles that are not black, there are a wide variety of options to choose from as each section will be wrapped individually instead of in one large panel. In the photo below, because the vehicle is gray, the large panel is cut up into front door, back door, front fender and back fender with 3-inches of extra bleed per panel on all sides.

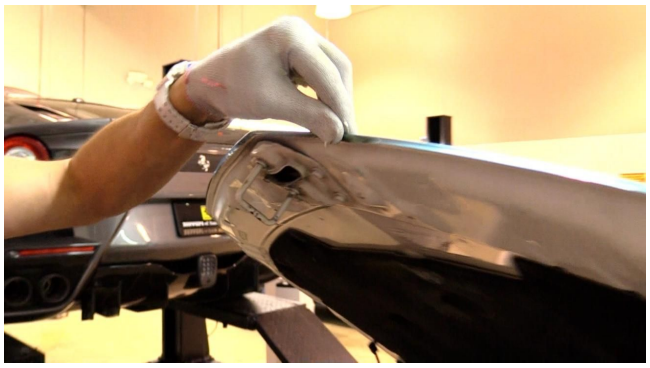


Empty Edges:

For empty edges that are not high grab points, the installer can cut on the empty side and angle the blade as far away as possible. This will create about 1/16 inch of material that will wrap around the edge for full coverage. This is called an Empty Cut #1 and is commonly found on the top off the hood, between the front door/front fender and sides of the trunk.

For empty edges that have thicker than normal edges, like on composite body parts or where the film got stretched more than normal, the installer can cut on the empty edge but angle the blade at 180 degrees. To do this, the section being wrapped should be opened. This is called Empty Cut #2. These are commonly found on hoods, doors and trunks.

For empty edges that are high grab points or white/yellow/red painted vehicles, its best for the installer to cut on the solid side of the gap. This will create around ¼ inch of material that will wrap around the empty edge. This is called Solid Cut #1. Be sure to heat and soften the angles found on body lines first to avoid any wrinkles when sealing the film onto inside portion of the body.



Solid Cuts:

For color change wraps on vehicles that are not painted black, installers will have to work the film deeper into the body of the vehicle. This means they will often be cutting directly on the paint. To remove the excess film, using cutting tape is required in order to avoid cutting the clear coat or paint. Its key to run the cutting tape along body lines in order to get professional finishes.

9 - Layout

Placement and alignment of the digital full print graphics is extremely important. Poorly placed or crooked graphics will make the install look bad no matter how meticulous the installation. Learning how to lay out the panels and align them precisely is key for professional level installations.

Printed Layout: A printed layout should come with the digital full print graphics. This printed layout is a guideline for the installer to use when laying out the panels. It is very important to remember that this printed layout is not an exact reference but a rough estimation. What will end up on the vehicle will not necessarily match the printed layout. This is due to several reasons:

- The design/printed layout is a 2-dimensional design made for a 3-dimensional object
- The vehicle may be a different year or model
- An error in the sizing of the graphics occurred during the printing process

On all printed layouts, the designer or production department should clearly label the panels. This helps an installer account for all the panels on location and helps reduce mistakes, particularly on vehicles like tour buses or semi-trailers that have 11-12 panels per side.

* If a printed layout did not come with the graphics, call the client or printer and ask them to e-mail or fax a layout to the install location. Guessing where the panels go without getting client approval can lead to unhappy clients or re-installs.

The Panels:

Packing the film up for shipment or delivery: The panels should be rolled together with the backing paper facing in. Be sure to place the panels in sequential order as this helps the installer account for all the panels when unpacking the film. Use quality masking tape to hold the roll of film together

Unpacking the Film: Make sure that the area where the panels are placed is clean and dust-free to avoid dirt and moisture from getting between the film and backing paper. Avoid unrolling the panels on the floor as dust and dirt can build up on the backing paper or scratch the print. If any of the panels are damaged from shipping, call the printer or client right away.

Once all the panels are accounted for place them next to their corresponding side on the vehicle. This makes it easier for the installer to go from panel to panel during the install and it keeps the good panels from getting mixed in with the trash.

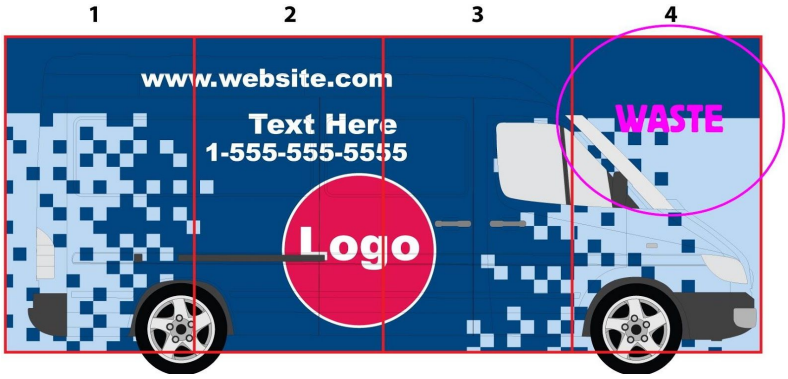
Sedans: For most sedans, the following sections of the vehicle should be printed on one panel:

- Hood
- Roof
- Rear
- Bumpers
- Passenger/Driver Sides

This means that for production, the digital full print film simply needs to be laminated and boxed up for delivery. No trimming of panels necessary.

For install, this means no registration and overlaps which significantly lowers install times and increases quality. In this case, 60-inch wide material should be used as this will cover the passenger/driver sides from top to bottom.

Vans: For most vans, tiling in vertical panels based on the width of the digital full print film being used is **not** the best option in terms of production, install speed and long term durability.



For production, this means each panel for the passenger/driver side need to be trimmed down which costs time and can lead to mistakes. Also, it means more film will be used for the printing/laminating along with extra waste at the end of the job (excess above fenders).

For install, it requires the installers to register each panel which can be challenging and they need to post heat each overlap at the end of the install which takes time.

For overall quality, the overlaps lay in the middle of the body sections which can look unsightly and the overlaps can be weak in terms of dirt build up and lifting.

Smart Tiling for Vans:

In order to get the best combination of production, material costs, and install time/quality as well as durability, it's best to use a mix of horizontal and vertical panels on vans. This means the width of the material used for the van can vary from 48-inch, 54-inch to 60-inch. This will be determined by the size of the vehicle and panels used.

Below, on the side of the van, three horizontal panels were used on the back section. One wide panel for the main section in the middle then two smaller horizontal panels for the top and bottom. During the printing process, the small panels were married on one panel which saves material costs. The door was printed vertically and the fender horizontally. During the printing process, the fender was married as well on one panel (driver/passenger). This saves material costs during printing and avoids waste above the fender during the install. Also, for production, the only panels that have to be trimmed are the bottom of the large horizontal panel and the top of the bottom horizontal panel.

For install, the only panels that have to be precisely registered are the bottom of the middle and top of the bottom horizontal panels. This is also the only section where there is an overlap and it's in a body line and horizontal. This means there is no stress on the overlap which means it does not have to be posted heated. Keep in mind that the bottom horizontal piece will need to be applied first as the edge of the overlap should face down. This will keep moisture from building up on the edge over the duration of the wrap.

For the other panels, the excess film will be cut off on the body breaks which means no overlaps. Higher quality and better durability.

10 – Alignment/Key Panel/Overlap

Alignment: Alignment is critical in order to get professional results. Always double-check where the image and text lay on the vehicle before committing the panel with a permanent hinge. Also, make sure that if window perforation is being used, check that it fits before installing the sides and back.

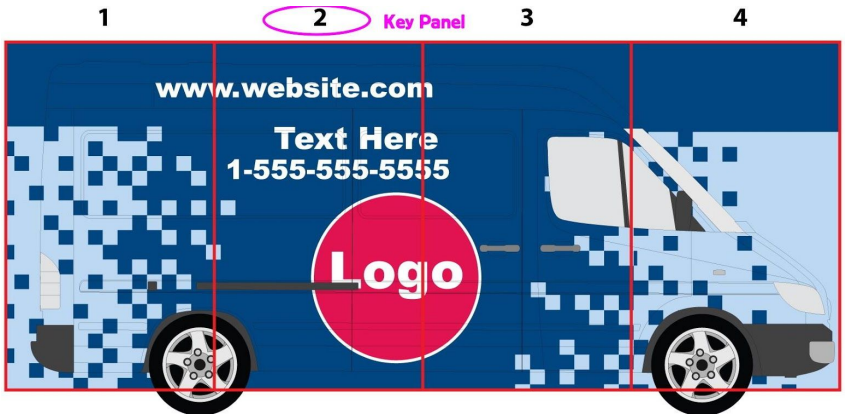
For alignment on the hood, trunk and roof areas, measure from symmetrical sections on the vehicle to straight lines or center points on the text/images.

For the passenger/driver sides of the vehicle, never use the ground or a water/laser level to judge a panel straight. The ground can be uneven or the front and back suspension can be at different heights.

It's best to use natural, straight breaks on the vehicle. These straight lines can vary from vehicle to vehicle. For most vehicles, the bottom of the doors will be straight. On some vans, vertical lines can be found on the sides of doors. Avoid using body lines to make the graphics straight as these can curve slightly up or down from one side of the vehicle to the other. If the bottom of the doors are not straight, running a strip of masking tape in between the middle of the hubcaps along the length of the car will create a straight line to measure from.

Key Panel: For sedans with long horizontal panels on the passenger/driver sides, there is no need to register or think about overlaps since there will not be any.

For vans that have been set up in vertical panels or a combination of horizontal/vertical, the first panel that will be applied to the side of the vehicle is called the key panel. For vertical panels, traditionally, the idea is the panels must be applied from back to front of the vehicle. The idea is that the edge of the overlapping panels will face away from where the vehicle is traveling thus reducing the possibility of water/dirt from getting under the film. However, the last panel on the vehicle is difficult to install as most vehicles curve on the backside and there are no straight lines to measure from. In order to reduce mistakes and create a more efficient install, the recommended key panel is the second panel from the back.



Overlap: Once the key panel is applied, the adjoining panel(s) are overlapped to ensure that the paint of the body remains covered for the duration of the install. If the panels were butted against each other they would separate over time. This is due to the fact that the film expands and contracts with temperature changes. The width of the overlap should be ¾ inch to 1-inch. An overlap smaller than ¾ inch runs the risk of coming up short, especially on vehicles that have compound curves and raised objects. An overlap bigger than 1-inch is overkill and unsightly.

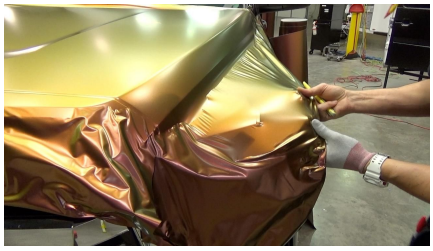
11 - Recessed Areas:

The below Avery Dennison films are recommended for deep recessed areas:

- MPI 1105 Easy Apply RS with 1460 DOL
- MPI 1105 Easy Apply RS with 1360/70/80 DOL with adhesive promoter
- MPI 1105 Easy Apply with 6460 DOL
- MPI 1405 Easy Apply with 6460 DOL
- SW900 Films

There are two types of recessed areas: open sided and enclosed. Each type has a different approach in terms of installation.

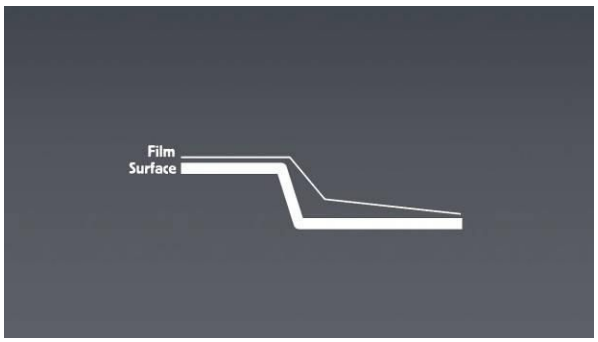
Open Sided: This type of recessed area means that there is a natural opening on both sides and it runs uniformly either vertically or horizontally from side to side. For open sided recessed areas, the cardinal rule is that the material should be fed into this area using a squeegee and/or application glove. By feeding the film into this area it keeps it from being overstretched during the install and eliminates the need to post heat the area. Keeping the backing paper on during this process helps keep the tension even side to side as the film is fed in.

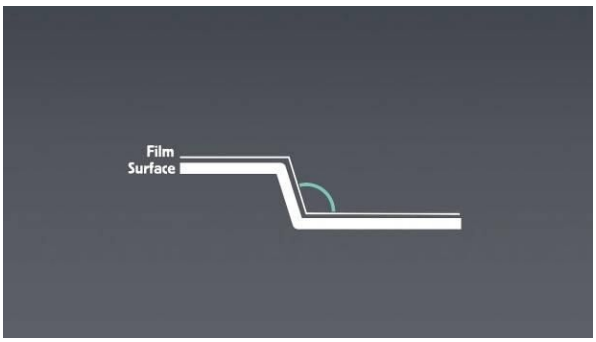




Enclosed Area: This type of deep recessed area is unique due to the fact that the air underneath the film has no immediate place to escape and the outside edge is curved. Before applying the film into this area, an outlet for the trapped air needs to be created. This can be a natural hole in the body of a vehicle like on a door handle or license plate area. If this is the case, work towards

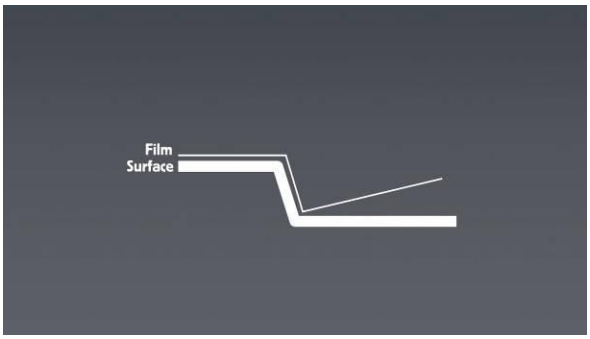
the opening so the air can escape. If there is no natural hole, using a raised object like a pen with masking tape, magnet or thick rubber band work well. The method of applying the film into an enclosed deep recessed area is critical to avoid overstretching the film.

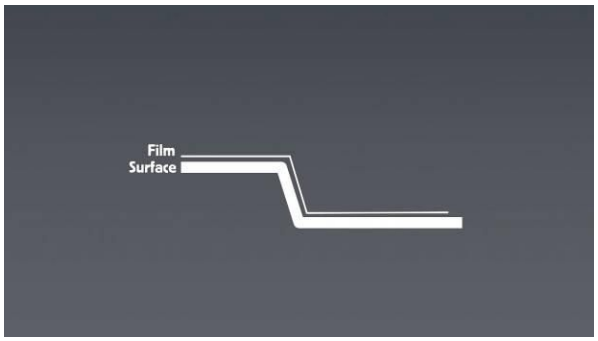
Incorrect Method: The incorrect method of applying the film into deep recessed areas is to bridge the film over the area, squeegee the flat section in the middle of the area then work the film into the deepest corner of the recess. Applying the film in this method can whiten/distort the film, create adhesive lines and can overstretche the film which will cause it to lift, even if post heated.





The Correct Method: The best method for applying the film into an enclosed deep recessed area is to apply the film into the deepest corner of the recessed area then apply the flat last.





First, run a finger along the edge of the recessed area. This creates uniform tension on the film around the area. Next, warm the film around 4 inches below the recessed area. This allows the film to stretch from the center out. Plus, it keeps the temperature of the film going into the recessed area around room temperature which maintains the thickness and integrity of the adhesive layer. Using a wet application glove, form the film into the deepest corner, working towards the opening. Once the deepest corners are applied, squeegee the film onto the flat

section. The RS feature will hold the film away from the surface and keep it from getting bubbles. Before moving on, go over the recessed area with a heat gun in order to ensure that the adhesive is flowing into the surface.

By applying the film this method, the tension shifts more to the flat area of the enclosed recessed area which helps with long term durability, it keeps the film from whitening/distorting and it avoids adhesive lines.

Step 1: 

Step 2: 

Step 3: 

Step 4: 

Keep in mind that Avery Dennison MPI 1105 and SW900 should not be post-heated immediately. The installer should wait 30 minutes but no longer than 12 hours after application. This will allow the adhesive layer to settle onto the surface so any air trapped under the film doesn't expand and burst though the film during the post heating process.

12 - Compound Curves:

Compound curves on vehicles can generally be found on fenders, bumpers, mirrors and door handles. It is critical that these areas are properly applied in order to achieve professional level quality and durability.

Improper Method: The method for compound curves that leads to the highest failure rates is heating the film up and pulling it forcefully over the compound curve or bridging the film over the area and forcing it in. This approach can overstretch the film, which puts too much pressure on the adhesive layer to hold the position on the vehicle.

Proper Method: The best method for compound curves is to a combination of techniques: triangle method, cold pre-stretch, and pre-stretch.

The key for compound curves is to spread the film out in a triangle shape and anchor the corners first. This will lay the film flat on the curve then it can be squeegeed to the surface, avoiding adhesive lines and whitening/distortion. Before cutting, installers should always add light heat to the edges. This will cause the film, which has been stretched around 3-5% to shrink back. This significantly helps relax any tension on the edges which will help ensure long term durability.

13 – Inlays/Overlays

Inlays are separate placements of the film on key areas that work in conjunction with larger sections of film. Inlays help to minimize overstretching and increase the durability of an install. They can be used to help reduce overstretching on deep recessed like on the bumper pictured above or for raised objects that cannot be removed like this door handle.

Overlays are pieces that go on top of the main panel being installed. These are often found at the top of back bumpers and at the edges of mirrors. These panels help reduce fingering and can easily be replaced if damaged from natural wear and tear on the wrap.

Consider These Factors for Inlays and Overlays:

Cutting: When cutting, the installer will be trimming off the excess film on the body of the vehicle. The installer must always be sure to use extra caution when cutting the film directly on the vehicle. If the installer does not feel confident about cutting on the vehicle, then cutting tape should be used. The overlap should be around 1/8 inch wide.

Overlap Direction: When possible, make overlaps on inlays/overlays face in towards the body of the vehicle. This will help hide the overlap visually and helps to keep moisture/dirt from building up on the edge and fingernails or other objects from catching the edge. Since most digital full print installs will use gloss DOL, this can be a standard rule of thumb.

Surface Energy: What trumps direction of the overlap is the surface energy of the film that will be on the bottom layer. The film that has the highest surface energy should always be applied first and the weaker one second. For example, if the top of a back bumper is getting a carbon fiber overlay and the main body is gloss, gloss goes on first. If a deep light area on a front bumper is getting matte black and the main body is gloss, gloss goes first.

If both pieces have low surface energy, like matte/matte, then before applying the overlay piece, clean the surface of the film with 70% isopropyl alcohol. This will increase the surface energy of the film enough for the top layer to properly bond with the bottom layer.

If the bottom layer is a textured film like brushed metallic or carbon it is highly recommended that no overlays are used as the uneven surface cannot achieve a full seal.

14- Vinyl or SW 900 Cutouts:

The Avery Dennison recommended cut vinyl is SC900 Supercast

Vinyl cutouts are made out of pre-colored vinyl. The vinyl can be cut into letters, numbers, and shapes and applied over or in conjunction with a printed install. In most cases, it's best to apply pre-mask on top since 900 SC is 2.0 mil thick and has no Easy Apply or RS features.

Vinyl cutouts replace straight text/numbers in a full print which can make installs easier. This takes the pressure off the installer during the installation, especially if they are a beginner or intermediate. In the case of this sedan, all letters and numbers on the door and fender were taken out of the full print and instead installed a vinyl cutouts.

For color change wraps, SC900 or SW900 cutouts can be used to make stripes or designs. In most cases, there will be no need to apply pre-mask since these films are thicker and have the Easy Apply and RS features.

Installation:
Use masking tape or magnets when making a temporary hinge for vinyl cutouts. The key is to place it where it holds the letter firmly to the vehicle to ensure that it remains properly aligned. Be sure to use the hard side of the squeegee when applying vinyl letters with pre-mask. Press very hard with the squeegee and be extra thorough.

When removing the pre-masking tape, the removal angle should be as close to a 180-degree angle as possible. This helps ensure that the vinyl stays on the application surface. Once the pre-masking tape has been removed go over the area with the soft side of the squeegee to ensure that all the edges of the vinyl are sealed.

15 - Window Perforation:

Avery Dennison 50/50 Window Perf: MPI 2528
Avery Dennison recommended DOL window lamination: DOL1360z (optically clear)

Window perforation is a calendered film that has tiny holes and black adhesive. This combination creates an optical effect that allows the people inside the vehicle to see out and those outside the vehicle to only see the printed graphic. This feature of window perforation allows the windows on vehicles to be covered, which adds more options in terms of design. Avery Dennison window perforation comes in two different percentages: 65/35 and 50/50. For vehicles, 50/50 should always be used.

Properties: Window perforation has similar properties of the film that goes on the body of the vehicle. The holes in the window perforation make it prone to overstretching and tearing so use more caution during the installation process.

On a full wrap, the window perforation is the last section of the install to complete. Since dust and dirt can build up on the vehicle during the course of the install, it's important to wipe down the windows before installing the window perforation. The cleaner the windows are the lower chance of failures.

Window perforation should be applied to the window with the same system as used on the body of the vehicle. Using a hinge, sound squeegee technique and relief cuts when necessary to work around windshield wipers or other protruding objects.

Windows: There are two types of windows on vehicles – free-floating and framed by molding

Free-Floating windows: Free-floating windows generally have beveled edges. This means that the edge of the window angles slightly in. When removing the excess film, be sure to angle the blade towards the inside area of the window. This cuts the window perforation precisely to the top of the beveled edge. This ensures window perforation lays uniformly on the flat surface. Once the excess film has been removed apply a thin coat of edge sealer around the window. The edge sealer forms an extra layer of protection to help ensure durability.

Molding/Roll-up Windows: For windows framed by rubber molding, install the film to the flat surface areas first. This will leave the window perforation bridging the area where the molding is. To safely apply the window perforation, pick it back up and tuck it into the molding that surrounds the window. Be careful when picking the window perforation back up. It is fragile, so pulling too quickly can cause it to tear.

For roll-up windows, cut the excess film at the top of the window flush to the molding. For the sides and bottom, Avery Dennison recommends that the window perforation gets tucked behind the molding by ¼ of an inch. To do so:

1 - Cut away the excess material roughly ¼ inch (1cm) below the top edge of the molding.
2 - Pick this overlapping section up so it is no longer in contact with the rubber.
3 - Starting on one side, work the film under the rubber using a combination of the Avery Dennison Flextreme and a squeegee.

By tucking the window perforation behind the rubber, it keeps the edge of the window perforation from getting damaged by the wear and tear of the window going up and down. This dramatically increases the durability of this type of window.

* Note that the edges of windows surrounded by molding are protected from moisture so there is no need to apply a coat of the edge sealer.

Lamination/No Lamination: Like the film on the body of the vehicle, window perforation should be laminated. The lamination performs three important functions.

1- it makes the window perforation thick enough to handle easily and prevents it from overstretching.
2- Lamination protects the window perforation from scratches and adds an extra layer of UV protection.
3 - It stops moisture from building up in the holes. Moisture in the holes of unlamented window perforation completely blocks the view from inside the vehicle, which can be very dangerous for the driver.

16 - Problem Solving:

Installing graphics is a dynamic process that brings with it a myriad of potential problems. Here are some of the most common problems and how to solve them.

Dirt/Oil on Adhesive – If dirt or oil ends up on the adhesive during the install, it's important to take the time and remove it before continuing. Pick large particles of dirt off with a finger or the tip of the knife. To remove any smaller particles, thoroughly wet the area with water and gently wipe the dirt off the adhesive with a wet paper towel. If oil is on the adhesive, use a light solution of isopropyl alcohol and water. Allow the adhesive to dry completely before installing. To expedite the drying process light heat can be applied.

Unsticking a Panel From Itself – A panel may fold upon itself during the installation process. It's very important to address this immediately. The longer the panel sticks together the harder it will be to separate. Separate the film in small increments. Avoid pulling or stretching the film as much as possible. Once the film has been separated go over the film with light heat. This will trigger the memory effect which makes any wrinkles or overstretching caused by this process disappear.

Picking A Panel off the Application Surface – A panel may need to be picked back up the application surface during the install in order to readjust or fix a problem area. If the backing paper is still on the panel, gently rock the film back and forth while holding either side. If backing paper has been removed or the film is in a difficult to reach area, it's best to insert a hand under the adhesive side and pull upwards. Make sure that the hand is clean and that the fingers are spread wide and flat. Avoid gripping the fingers for they can overstretch the film making it difficult to re-apply.

Popping Air Bubbles – Air bubbles are the result of the adhesive bonding to the application surface before all of the air can escape during the squeegeeing process. The air in the bubbles needs to be released in order to keep the film from failing and to help ensure professional looking install. Using a sharp blade or air release tool, poke a tiny hole at the edge of the air bubble. If done properly, the surface of the air bubble will visibly relax. This is a good indication that the air can now properly escape. Starting at the opposite end of the hole, gently push the air out of the bubble. Pushing too quickly can wrinkle the film so be sure to work methodically.

Smoothing out Wrinkles – Wrinkles refer to a state when the film is tightly bunched together or has folded upon itself. Once the film wrinkles, it's important to pick the panel back up, add light heat to trigger the memory effect then reapply the film once it's cooled. Waiting until the end of the install to deal with wrinkles is too late and will result in a low-quality install.

Dull Scratches – During the squeegee process, dull or light scratches may occur on the surface of the film. If the film has a lamination layer, then these scratches can be self-healed by adding heat. For gloss and pearlescent films a propane torch can be used. If the film is matte or satin, then a heat gun should be used as the propane torch will cause these types of lamination to gloss.

Saving Extra Film – Get in the habit of cutting away the excess film with the backing paper still on before installing the film. For digital full print wraps, these extra pieces are good to have in case the vehicle gets in a minor accident and a small section of the film needs to be repaired. It is important to note that it is very difficult for a second printing of the graphics to get the exact match in terms of color with the original. Having these extra pieces can save the client from

having to pay for a reprint, which they will appreciate. Roll the extra film up and place it in the vehicle for the client to keep.
For color change wraps, these extra pieces can be used for door handles, mirrors, inlays or custom stripes/shapes. Even with SW 900, there can be slight color variation from lot to lot so keeping these scraps can come in handy for repairs.

17 - Finishing an Install:

The install is not complete with the last squeegee stroke or last cut. There are several post-wrap steps to ensure for a long lasting, zero-failure installation.

Post Heating - Once the film has been applied to the vehicle the critical areas need to be post heated. These areas are generally on compound curves, recessed areas and overlaps. Specific examples of where these are on the vehicle are: fenders, door handles, license plate area, overlaps and bumpers. When post heating, be sure to point the infrared thermometer at an angle that ensures that the ambient heat doesn't affect the readout. Post heating can take anywhere from 5 to 30 minutes. This may seem like a long time, especially at the end of an install, but post heating is just as important as cleaning and installing the film precisely. Post heating ensures a durable install and saves money over time by avoiding the need to fix or reprint failed film.

The best post heating temperature is between 185-195F. For overlaps it should be 220F. This is to ensure that the bottom layer reaches 180F.

360-Degree Check-Over – With the post heating complete, take time to go around the vehicle to touch up any missed areas. Make sure all edges and recessed areas are properly applied and no air is left under the film. Look at the vehicle from all angles to make sure that nothing is missed.

Edge Sealing – It is highly recommended that all wheel well edges get a layer of liquid edge seal and the entire underside (bumpers and rocker panels) get an application of edge seal tape. The edge seal tape will go half on the wrap film and half on the paint. This will hold and seal the edge. Salt and other chemicals used to melt ice on roads can compromise the adhesive causing it to fail. Putting a coat of edge seal on these areas gives the film an extra layer of protection.

Pictures – Take time to get good pictures of the vehicle. In most cases, it's best to take the vehicle outside to get good light and proper angles. Be sure to get a straight on shot of each side and one portfolio pic. This portfolio pic is usually one that captures the hood and driver side from a low angle. Be sure to send the pictures to the client right after the install. This gives them satisfaction of knowing the install is completed properly and it also serves as a point of reference if there are any problems in the future.

18 – Aftercare:

In order to maintain the wrap for the duration, it's critical to avoid using the following to clean or protect the wrap:

Alcohol - removes protective solvents from the film and dries it out. This combination can cause the wrap film to look dull and weather prematurely.
Solvent-based Waxes - can actually burn the top layer of the film which can leave marks or cause the wrap film to break down prematurely

To clean and maintain the wrap, Avery Dennison recommends using their aftercare protection kit. Using this on a regular basis will keep dirt from building up on the lamination layer or in the grooves of textured film.

Using ceramic coatings on top of the wrap is still being tested by Avery Dennison and is not warranted at this time. The carrier for ceramic coatings is solvent based and, from certain manufacturers, these can be overly aggressive causing damage to the wrap film. That said, some ceramic coating manufacturers have changed their formulas to be better suited for wrap film. Keep in mind that no ceramic coatings tested by Avery Dennison have increased UV protection and they offer only added benefits in regards to cleaning.

19 - Removals:

When it comes time to remove the graphics, be sure that the vehicle and workspace are above 60 degrees. This will help ensure that the removal process is less time consuming and difficult.

Removal Process: To begin the removal process, begin at the corner of a section. Heat the film to soften the adhesive and then pull evenly, using both hands. Pull methodically and avoid quick movements. Pulling too quickly can cause the film to break or put undue pressure on the clear coat or paint, which may cause it to fail.

If the wrap film is removed within the warranty period, it should come off in large sections, if not the entire panel. Also, there should be minimal to no adhesive residue left behind. Removing the wrap film outside of the warranty period can result in it coming off in smaller pieces, longer removal times and more adhesive residue left behind.

Paint Damage: In most cases, if the paint was in good condition before an install, the film will not leave any adhesive residue behind or damage the paint. However, there are times when the paint does come off with the film. Paint generally fails if it's old, not the original paint or there was damage such as cracks and scratches before the application. As soon as paint starts to come off with the film, slow down the removal process. This can help minimize the damage. Save the

film with the paint on it and take photographs to document the damage. Compare the damaged area to the pre-inspection sheet to help determine whether the affected area was previously damaged. This will help explain why the paint failed. If no immediate cause for paint failure can be determined, call your local Avery Dennison Technical Specialist and explain the situation.