

Substrate Cleaning and Preparation

Instructional Bulletin #1.10 (Revision 8)

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1.0 Scope

Proper cleaning and preparation of substrate prior to decal application is critical to the success of the decal. The following cleaning and surface preparation conditions must be followed immediately prior to application. Failure to adhere to these requirements can cause adhesion loss and therefore reduce the durability and performance level of the decal. The following conditions are relevant to properly prepared paint systems processed correctly per paint manufacturer specifications.

NOTE: It is the responsibility of the end-user/applicator to ensure all painted substrates have been processed and cured per the paint manufacturer's requirements. Failure to follow paint manufacturer requirements can lead to decal failures and/or removal problems.

This bulletin provides procedures for effectively cleaning and preparing identified substrates for maximized film or sheeting performance. Look for the specific substrate requiring graphics or decal application, and follow the instructions as set forth in this bulletin.

The use of any chemicals as recommended in this bulletin should be done with caution, and ALL manufacturer's safety guidelines and warnings should be followed. Read the instructions on the container, MSDS, or contact the manufacturer for complete guidelines.

Find the corresponding section to the substrate to be cleaned (for example Plywood, section 3.4.1) follow the specific directions outlined in that section. If you have questions, contact your Avery Dennison Technical or Sales Representative.

2.0 Cleaning and Preparation

All substrate surfaces should be considered contaminated, and must be cleaned prior to pressure sensitive material applications. Even freshly painted or recently cleaned surfaces will collect dust and dirt quickly, and should be cleaned prior to film application. Be sure all edges, corners, crevices, and hard to reach areas are cleaned as well; these are difficult and often overlooked areas.

All surfaces should be dry as well as clean. The trapping of any moisture under a graphics can cause premature failure by bubbling, incomplete adhesion, or creation of an ice layer in extreme cold situations. Moisture on a substrate can be created by the following; inadequate drying, failure

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to pre-cure some substrates like polycarbonates, condensation at low temperatures, or high humidity.

It may be necessary to combine two or more of the following cleaning methods to ensure the substrate is completely clean and contaminant free. It is the responsibility of the applicator to ensure the surface is clean and oil free, and properly tested and prepared for graphic and film application.

Graphics, films, or sheeting should be applied immediately after surface cleaning and preparation. Delay will allow dust and contaminants to gather preventing the adhesive from performing as required.

- **Do NOT use Windex, or ammonia based cleaners** (*ammonia affects the adhesive polymer stability*)

2.1 Standard Method – for lightly soiled surfaces

The surface to which Avery Dennison™ films are applied must be completely clean, smooth, and dry before final preparation.

- Remove all dirt and grime with a commercial synthetic detergent solution and warm water (1 ounce per gallon). Avoid detergents with lotions, waxes, creams, or oils. Be aware some window cleaners have waxes.
- Use of automated car wash facilities requires additional cleaning as some chemicals used in these systems will prevent complete adhesion of film.
- Interior walls with grease and/or oil present will require special attention to remove contaminants. Prepare a solution of trisodium phosphate and warm water as specified in the manufacturer's instructions, and clean the substrate.
- Thoroughly dry the substrate with a lint free cloth or paper towel. Allow porous materials to dry completely before application.

2.2 Solvent Based Method – for removal of heavy grease and oils

- Saturate a clean, lint free towel or cloth with solvent.
- Clean the substrate with the solvent cloth removing any grease, oils, or dirt.
- After thoroughly wiping with cleaner, dry wipe the surface completely using a clean, soft, lint-free cloth before solvent evaporates. NOTE: There must be no dirt, oil, grease or solvent residue remaining on the substrate prior to decal application.
- As the towels or cloths become dirty, discard and use fresh ones. Accumulated dirt or contaminants on the towel or cloth will prevent effective cleaning of substrate.
- Make sure the surface is completely dry. If necessary, use a heat gun to remove moisture.

The following is a partial list of widely available solvent based cleaners on the market. This list does not endorse or recommend one product over another. Other similar solvent based cleaners may be available through automotive, paint, marine, and other outlets.

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- DuPont Prep-Sol™ 3919S
- Sherwin Williams R7K156 or R7K158 Sher-Will-Clean™
- Xylol
- VM&P Naphtha

There are also non solvent based products available such as Rapid Tac's Rapid Prep. These products may also work to remove grease, oils, silicone, wax and other contaminants. Note that these cleaners may leave a residue and should be followed with an IPA cleaning as outlined in Section 2.3.

CAUTION: Prior to cleaning with solvents, test the cleaning solvent on an inconspicuous area of the application surface to check for potential damage from solvent usage.

CAUTION: Some solvents listed (and unlisted) may leave an oily residue behind, if an oily residue is present, follow this step with 2.3, IPA Cleaning Method to remove residue.

2.3 Isopropyl Alcohol (IPA) Method – for removal of light grease and oils

- Saturate a clean lint free cloth or towel with IPA
 - If using rubbing alcohol do not dilute.
 - If using industrial grade IPA, mix 2:1 water to IPA.
- Wipe the substrate thoroughly, dry wipe with a clean dry towel immediately before the IPA evaporates.
- Discard cloths as they become dirty. Dirty cloths do not clean effectively.
- Make sure the substrate is dry. Use a heat gun to complete process if necessary.

2.4 Light Particulate Method – for removal of dust or loose dirt

If only dust or loose dirt is present, and surface has been previously cleaned by one of the previous methods, it may acceptable to use the Light Particulate Method for cleaning.

- Wipe the substrate with a tack cloth, or clean lint free cloth.
- Vacuum surface if slightly textured with a soft-bristled vacuum head.
- Sweep the surface with a soft bristled broom.

3.0 Instructions for Specific Surfaces

3.1 Painted Surfaces

These are general recommendation for painted surfaces. It is essential to follow manufacturer's directions for complete surface preparation and adequate drying/curing time prior to graphic or film application.

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3.1.1 Non Recommended Paint Surfaces

CAUTION: Avoid the use of the following paint finishes, always test adhesion and paint/adhesive compatibility prior to production use.

- Avoid highly pigmented or flat metallic paints which tend to chalk and flake promoting poor film adhesion.
- Avoid flat latex paint.
- Avoid all latex paints on wooden substrates.
- Avoid Paints containing migratory agents, such as chlorinated waxes and silicones which may cause adhesion failure.
- Avoid oil alkyd primers and enamels, as they are slow to dry and will adversely affect adhesion of a film.

3.1.2 Paint and Painted Surface Precautions

- If applying film to a newly painted surface, follow all drying and curing instructions provided by the paint manufacturer prior to surface preparation and film application.
- All air drying paints should be allowed to dwell at near room temperature and humidity conditions for one week prior to film application.
- Baked enamel paints may be used directly upon cooling.
- Application of retroreflective film to zinc chromate primer or zinc rich primer is not recommended.
- Chalked and otherwise weathered paint surfaces must be refurbished with buffing, followed by substrate preparation and cleaning instructions as specified in Section 2.0 above.
- Some paint systems provide an extremely smooth surfaces, hence, initial adhesion will be low, extra dwell time is necessary before maximum adhesion is achieved.
- Any section of painted metal with bare or rust spots should be entirely resurfaced.
- Non film covered portion of painted metal should have a minimum of one finish coat.
- Primer and paint should be from the same manufacturer.
- Some pigmented paints may cause bleed through on some graphics or films, test prior to use.

3.1.3 Recommended Paint Surfaces - cleaning

NOTE: Always test adhesion and paint/adhesive compatibility prior to production use. The 2.3 Solvent Based Method may be skipped if there is no heavy presence of oils, grease, or other contaminants which can not be removed by Methods 2.1 Standard Method or 2.3 IPA Method.

- Baked Enamel
 - Use Method 2.1, Standard Method, followed by
 - 2.2 Solvent Based Method, followed by
 - 2.3 IPA Method (for weathered paint) or
 - 2.4 Light Particulate Method (for new paint)

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- Enamel or Oil-Based – test for solvent compatibility
 - Use Method 2.1, Standard Method, or
 - 2.2 Solvent Based Method, followed by
 - 2.3 IPA Method
- Latex – test adhesion of paint to substrate prior to film application
 - Use Method 2.1, Standard Method, or
 - 2.4 Light Particulate Method
- Two Part Urethane – ensure completely cured, or outgassing will cause graphics to bubble.
 - Use Method 2.1, Standard Method, followed by
 - 2.2 Solvent Based Method, followed by
 - 2.3 IPA Method
- Powder Coat Paint (may require special adhesives, call your Avery Dennison Technical or Sales Representative)
 - Use Method 2.1, Standard Method, followed by
 - 2.2 Solvent Based Method, followed by
 - 2.3 IPA Method

3.2 Tin or Alloys of Tin, Copper, Magnesium, Lead and Brass

- Not recommended or warranted for pressure sensitive film applications.

3.3 Stainless Steel

- The use of high quality exterior grade paints and OEM systems are recommended, followed by substrate cleaning and preparation instructions as specified in Section 2.0 above.
- Stainless steel substrates tend to maintain cold surface temperatures longer than most substrates. The use of a weed burner immediately before and after application accelerates bond, be sure to clean any carbon residue caused by the weed burner prior to film application.

NOTE: Application of Avery Dennison™ PX metalized films (PX 1070, 2070, 1071, 2071, 1076, 2072) and all retroreflective series films (unless specifically designed for stainless steel use) to bare stainless steel substrates is not recommended or warranted.

- Ensure no moisture remains on substrate in seams or around rivets.
- Cleaning
 - Use Method 2.1, Standard Method, followed by
 - 2.2 Solvent Based Method, followed by
 - 2.3 IPA Method

3.4 Wood Based Products

Because wood is a porous substrate and absorbs moisture, all surfaces must be coated with a high quality paint or sealant. This painting and/or sealing includes both sides and all edges.

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Matte, or flat finished paints and sealants are not recommended.

Some wood products will require the use of aluminized, urethane sealers, or polysicone paints on the edges.

Use of interior or exterior grade paints is dependent on the final placement of the completed construction. Follow all manufacturers' recommendations for preparing and applying paints.

Unpainted wood, fiberboard, or wood based products are generally not recommended for pressure-sensitive film.

3.4.1 Plywood – surface must be smooth and weatherproof

- Fill voids, dents, and nicks with wood filler.
- Sand with fine grit sandpaper
- Coat edges with edge sealers, several times.
- Prime and Paint per manufacturer's instructions.
- Cleaning per section 3.1.3 Recommended Paint Surfaces

3.4.2 Hardwood – use fused or tempered materials

- Fill voids, dents, and nicks with wood filler.
- Sand with fine grit sandpaper
- Prime and Paint per manufacturer's instructions.
- Cleaning per section 3.1.3 Recommended Paint Surfaces

3.4.3 High Density Overlaid (HDO) – general use, or sign grade only

- Seal edges
- Lightly sand with 200 or finer grit sandpaper
- Cleaning per 2.4 Light Particulate Method, followed by
- Cleaning per section 3.1.3 Recommended Paint Surfaces

3.4.4 Medium Density Overlaid (MDO) – do not use oil treated

- Seal edges
- Cleaning per 2.4 Light Particulate Method, followed by
- Cleaning per section 3.1.3 Recommended Paint Surfaces

3.4.5 Fiberboard or Strand Board

- Ensure paint coating is well bonded
- Cleaning per section 3.1.3 Recommended Paint Surfaces

3.4.6 Other Wood Based Products

- Fill voids, dents, and nicks with wood filler.
- Sand with fine grit sandpaper
- Seal edges

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- Prime and Paint per manufacturer's instructions.
- Cleaning per section 3.1.3 Recommended Paint Surfaces

3.5 Steel

Graphics or film should not be applied directly to untreated or unpainted steel. If there is any rust present, the entire surface should be refinished based on steel & paint manufacturer's recommendations. After final painting, clean as set forth in section 3.1.3 Recommended Paint Surfaces.

3.5.1 Confirming Proper Steel Galvanizing

- To ensure the substrate is properly galvanized, it is recommended to test all lots of galvanized steel. The following prepared solution is recommended:
 Caution: Follow all manufacturers' recommended procedures and safety recommendations. Refer to the container label and the Material Safety Data Sheet for health and safety information.
- Prepare 1 molar solution of Cupric Sulfate (25g of CuSO₄ mixed in 1 liter of deionized or purified water).
- Apply solution to the substrate using a clean dry rag. Surface is properly galvanized if solution turns 'black', continue with preparation procedures (Section 3.5.2).
- A resulting 'copper' color indicates lack of galvanizing, do not use steel sheet.

3.5.2 Preparation of Galvanized Steel Sheeting

- Remove any zinc oxide, zinc hydroxide, and the like from the surface by mechanically brushing the surface with a plastic abrasive pad.
- Degrease with a petroleum-distillate solvent such as Heptane, wipe surface with a clean dry cloth.
- Wipe surface with IPA, and dry with a clean dry cloth before the solvent evaporates.
- Prime and paint surface according to manufacturer's instructions.

3.5.3 Special Conditions for Retroreflective Film Applications to Galvanized Steel

- For retroreflective film application, the surface must be primed and painted.
- If metal is to be completely covered with film, a primer coating is generally sufficient on a smooth surface. Application of retroreflective film to zinc chromate primer or zinc rich primer is not recommended.
- Retroreflective film must be sealed around all edges.
- Reflective films with heat activated adhesives must be edge sealed and clear coated to prevent surface moisture penetration.
- Portion of painted metal not covered by film should have a minimum of one finish coat.

3.6 Aluminum

- Etched or anodized aluminum, degreased.

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- Use 2.3 IPA Method
- Uncoated and Unetched
- Badly pitted or oxidized surface
 - Remove oxidation, typically with a light acid wash, or with sandpaper, contact manufacturer
 - Smooth with sandpaper (150 grit or finer)
 - Degrease the metal
 - Etch the surface or prepare with the following treatments
 - Chromate: ASTM B 449, Class 2
 - Non-Chromate: ASTM B 449, Class 1
 - Ensure treatment adheres to substrate, and no residue can be removed easily.

3.7 Polycarbonate (i.e. Lexan®)

- Follow polycarbonate manufacturers drying and preparation instructions. Failure to properly prepare polycarbonate before film lamination may result in severe air bubbles trapped between the film and substrate sheeting.
- Test for outgassing by applying a small sample of film intended to be used to the polycarbonate, then oven bake the applied sample for 18 to 24 hours at 149°F to 158°F (65°C to 70°C). Resulting bubbles under the film indicates outgassing. If outgassing occurs, application of Avery film to the polycarbonate is not recommended or warranted.
- Clean as outlined in section 2.1 Standard Method, or
- 2.3 IPA Method

3.8 Acrylics, and other Acrylates (i.e. Plexiglas®)

- Clean as outlined in section 2.1 Standard Method, or
- 2.3 IPA Method

3.9 ABS (Acrylonitrile Butadiene Styrene)

- Clean as outlined in section 2.1 Standard Method, followed by
- 2.3 IPA Method, or
- 2.2 Solvent Based Method

3.10 Fiberglass

3.10.1 New Fiberglass

- Follow manufacturers curing and preparation instructions. Failure to properly prepare before film lamination may result in severe air bubbles trapped between the film and substrate sheeting.
- Test for outgassing by applying a small sample of film intended to be used to the fiberglass, allow to dwell at room temperature for 24 hours or oven bake for 3 hours at 149°F (65°C). If bubbles appear, outgassing is occurring. Cure the fiberglass for 5 days at 140°F (60°C). Repeat outgassing test.

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- Clean as outlined in section 2.1 Standard Method, followed by
- 2.3 IPA Method, or
- 2.2 Solvent Based Method

3.10.2 Weathered (Oxidized) Fiberglass

- Fiberglass that has been out in the elements can become oxidized and therefore may require additional cleaning.
- Begin by following procedure outlined in section 2.1 Standard Method (scrubbing the surface until water runs clear), followed by.
- 2.3 IPA Method, or
- 2.2 Solvent Based Method
- After cleaning test for proper adhesion by applying a small sample of the film intended to be used to the fiberglass. Allow to dwell for 60 seconds and then pull it off. Check the adhesive side of the sample to determine if it is still tacky or if it has removed additional residue from the fiberglass surface. If residue is on the sample additional cleaning is needed to remove oxidation.
- If further cleaning is required try using an abrasive pad such as the Mr. Clean Magic Eraser. Scrub the entire surface with this pad to remove additional oxidation. Once this is complete, follow the procedure outlined in 2.3 IPA Method again.

3.11 Glass Preparation

- Glass must be perfectly clean. Remove any tape, stickers, paint, or stain overspray, using a single edge razor blade scraper and/or a 4" razor blade scraper (available at most hardware stores).
NOTE: Wetting the glass with cleaning solution (DuPont Prepsol or Isopropyl Alcohol) will reduce the chance of scratching the surface during the scraping process. Use a fresh blade for each job. Check the blade for imperfections which may cause scratches.
- Once the glass has been scraped clean of contaminants, use the 4" razor to scrape the glass again, removing any remaining residue.
- Spray the glass with cleaning solution, squeegee it dry using a soft rubber window squeegee. Wipe the edges dry using lint-free paper towels.

NOTE: Avery Dennison accepts no liability for glass breakage due to temperature differences across the glass, or stresses caused by differential expansion or contraction of the glass compared to an applied graphic or film. Temperature changes can be attributable to heat absorption rates on dark areas of films or graphics being greater than areas of lighter colors or no coverage at all.

3.12 Chrome

- Clean per 2.1, Standard Method, followed by
- 2.2 Solvent Method, or
- 2.3 IPA Method

3.13 Sintra®, Lustra®, Fome-Cor® and specialty or synthetic boards

- Clean per 2.1, Standard Method, or

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- 2.3 IPA Method, or
- 2.4 Light Particulate Method

3.14 Banners

- Clean per 2.3 IPA Method

3.15 Flexible Awnings and Sign Facings

- Clean per 2.1, Standard Method, followed by
- 2.3 IPA Method

3.16 Drywall, Wallboard, Sheetrock (variations on nomenclature for standard walls)

- Wallboard may be damaged by removable product if cut during installation.
- Lightly sand down peaks of heavy textured drywall for a flatter, more smooth finish.
- Wallboard should be primed and painted as recommended by the manufacturer.
- Test for paint adhesion.
- Follow cleaning instructions based on Section 3.1.1 Recommended Paint Surfaces – cleaning

3.17 Wallpaper or Wall Coverings, vinyl or latex based

- Ensure all edges and seams are secure.
- Use Method 2.1, Standard Method, or
- 2.4 Light Particulate Method

CAUTION: Some wallpapers contain special coatings for easy cleaning, please check adhesive prior to application to ensure proper adhesion.

3.18 Fiberglass Reinforced Plywood (FRP)

If fiberglass layer cracks, film or graphic will crack as well.

- Test for outgassing, like in the Polycarbonate section 3.7
- If FRP surface is chalked, buff to remove residue.
- Clean per 2.1, Standard Method, followed by
- 2.2 Solvent Method, or
- 2.3 IPA Method

3.19 Concrete or Cinder Block

Concrete should be indoors or in a well protected area from the environment. All concrete surfaces should be sealed and/or painted with approved products as designated by their manufacturers to create a non-porous surface. Contact paint and sealant manufacturers for best recommendation.

- Clean as outlined in section 2.1 Standard Method, or
- 2.3 IPA Method

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