

PVC FOAM BOARD FABRICATION GUIDES

Thank for Choosing the Skyline Composites PVC foam board products .This Fabrication Guide was launched to incorporate the most common fabrication methods that are used with Skyline composites' line of PVC foam board products. Not all fabrication methods are compatible with each product, but this format was kept for consistency purposes.

Introduction to Skyline Composites PVC foam board Collection

- Celuka PVC Foam board-Low Density
- Celuka PVC Foam board-Intermediate Density
- Celuka PVC Foam board-High Density
- White Co-extrusion PVC foam board
- Coloured Co-extrusion PVC foam board

Skyline Composites foamed PVC sheet is versatile, flexible, lightweight, and durable and is ideal for use digital or screen printing, fabrication, and construction. It has been successfully tested and approved by digital flatbed printer manufacturers worldwide. Printers and display builders will benefit from its consistent, smooth, and bright surface for producing high quality displays. Skyline Composite foamed PVC sheet is easily handled, cut and fabricated using conventional tools and equipment, and can be printed, painted or laminated.

Main Benefits:

Ease of fabrication

- Lightweight
- Excellent chemical resistance
- Superior Insulating Characteristics
- Moisture Resistant
- Recyclable and non-toxic

Cutting

Circular Saws

Skyline Composites foamed PVC sheet material up to 3 mm thick can be cut with a knife or blade. For sheets 3 mm and thicker, carbide-tipped, High speed steel blades normally recommended for wood or plastic (hook type) can be used.

The following settings are recommended:

- Rake angle: 0 - 8
- Clearance angle: 10 - 15
- Cutting speed: 4,000 - 8,000 feet per minute
- Feed rate: 6 - 30 meter per minute
- Tooth pitch: 5 - 12 mm

Band Saws

High speed steel blades normally recommended for wood or plastic can be used for Skyline Composite foamed PVC material utilizing the following guidelines.

Teeth: 6 to 8 per inch

Cutting speed: 3,000 to 5,000 feet per minute

Feed rate: 6 - 30 meter per minute.

Saber Saws

Rough cut type blades ground for plastics can be used on Skyline Composites foamed PVC sheets. Smooth metal-cutting blades are not recommended.

Drilling

Skyline Composites foamed PVC can be drilled with carbide-tipped bits using twist drills recommended for metals.

The following settings are recommended:

- Point angle: between 90 - 110
- Spiral angle: 30
- Cutting speed: 1000 - 3000 rpm
- Feed rate: 0.2 - 0.5 mm / revolution

The minimum distance from the edge should be 2 times the hole diameter. In an effort to reduce heat build up during drilling of thicker Skyline Composite foamed PVC sheets, it may be necessary to periodically remove the drill bit from the material.

Milling

Skyline Composites foamed PVC can be milled by using standard milling machines of various types utilizing the following guidelines:

- Relief angle: 5 to 10
- Rake angle: -10 to 0
- Cutting speed: up to 18000 rpm
- Cutting feed: 0.3-0.5 mm / revolution

Routing

Skyline Composites foamed PVC material can be easily routed using multi-fluted carbide tools on standard woodworking

routers. Standard tools and machines can be utilized with no need to alter equipment. Adjust feed and speed rates as needed to achieve the best edge finish on the parts.

Adhesive Bonding

General Information

Skyline Composites foamed PVC material can readily be bonded to itself or other materials. Commercially available adhesives that are suitable for bonding rigid PVC materials can be used for this purpose.

There are several considerations when choosing an adhesive:

1. The material to be bonded with Skyline Composites foamed PVC
2. Strength required—structural vs. non-structural
3. Temperature range expected
4. Expansion/contraction
5. Ease of application methods, curing times
6. Cost effectiveness
7. Environmental and safety considerations—flammability, fumes, odors, etc.

Surface Preparation

In order to attain the optimum bond, the Skyline Composites Foamed PVC material surfaces to be bonded must be cleaned and degreased using a white cloth soaked in isopropyl alcohol.

Selection of Adhesives

The selection of the proper adhesive for a project depends on the materials to be joined, as well as the end use and other considerations mentioned previously. The following suggestions serve as general guidelines:

A. Bonding between the Skyline Composites Foamed PVC Material

1. For edge bonding and joining parts made of Skyline Composites Foamed PVC material, use a PVC solvent such as (THF, MEK, cyclohexanone solvent systems).
2. For bonding large areas: If using PVC solvent such as pipe cement, spread with notched trowel and work rapidly.

B. Bonding Skyline Composites Foamed PVC Material to Non-Porous Solid Material (such as PVC, other plastics or metal):

1. Contact adhesive with solvent:
 - a. Neoprene, nitrile, polyurethane or other synthetic rubber types.
 - b. Adhesive must be applied to both faces. Parallel beads of adhesive are often preferred because it allows evaporation of solvent providing faster cure.
 - c. Use a slow setting adhesive, when bonding large areas. This allows for more time to properly install the panels prior to the adhesive curing.
 - d. For bonding Skyline Composites Foamed PVC material to flexible PVC sheets, only plasticizer-resistant types of adhesives should be used.

C. Bonding Skyline Composites Foamed PVC Material to Porous Materials (such as paper, textiles, fabrics or wood).

1. Contact adhesive with solvent: Same systems as for non-porous materials.
 2. Construction mastic, structural silicone adhesives.
- Considerations such as expected temperature ranges (expansion/contraction), substrate and size of Skyline Composites Foamed PVC material panels should be taken into consideration when deciding on a method of attachment.

Painting

The painting of Skyline Composites Foamed PVC is easily accomplished with paints known to have compatibility with rigid PVC.

Selection of a paint system for each use should be guided by the following:

1. Cost effectiveness
2. Ease of application.
3. Safety and Environmental — odor, solvent systems, toxicity, etc.
4. Convenience and speed — one part vs. two part, one coat vs. multiple coats.
5. Solvent and/or chemical resistance.
6. Outdoor weatherability & reflectance value.

(When painting Skyline Composites Foamed PVC with darker colors, for use in exterior applications, it is imperative that the paint has a light reflectance value of 55 or higher in order to avoid excessive heat absorption, which will result in distortion of the Skyline Composites Foamed PVC.)

I. Types of paints known compatible with Skyline Composites Foamed PVC

A. Vinyls

B. Acrylic Lacquers

C. Two part polyurethanes

Water-based latex systems and oil-based enamels generally do not have the good adherence properties of solvent based systems. Although, the use of primers can improve the adherence of non-solvent based systems, the adherence is usually minimal.

II. Surface Preparation

A. The surface to be painted must remain dry, clean, and grease free.

B. Any surface scratches on Skyline Composites Foamed PVC will have a tendency to telegraph through the paint. In order to remove small scratches or dents, rapidly fan a heat gun over the affected area. Care must be taken not to leave the hot air in one place for too long, as the surface can be deformed.

C. It is highly recommended that the surface be cleaned with a rag moistened with isopropyl alcohol prior to painting.

III. Adhesion Test

A. The paint system chosen should always be tested for adequate adhesion. To test for adhesion, conduct the Cross Hatch Test after the paint has dried for at least 24 hours.

1. Make eleven parallel cuts 1/16" apart with a razor blade knife. Make eleven similar cuts at 90 degrees to cross the first set.
2. Across the scored area apply a strip of strong tape, such as #610 Scotch tape. Press firmly.
3. Immediately remove the tape by pulling it back upon itself at 180 degrees in one rapid motion.
4. There shall be no removal of the paint squares to obtain a good adhesion rating.

IV. Application

A. Paints can usually be applied with a brush or roller, although conventional air spray equipment will provide a more consistent appearance.

B. Consult paint manufacturer's literature for recommended application technique and thinning requirements.

V. Drying

Skyline Composites PVC foam board is a thermoplastic material. It should not be dried at temperatures in excess of 150° F. For drying and cure times, consult paint manufacturer's literature.

CAUTION: Due to the wide variety of paint products on the market, and the fact that some paints have been known to embrittle or bow PVC foam board, testing is recommended for the initial use of any coating system before commercialization.

Graphic Applications

Skyline Composites Foamed PVC performs superbly in a wide range of graphic applications including those involving paints, screen printing, digital flatbed printing and vinyl films. It can be used to create weather-resistant signs, displays or Point of Purchase (POP) materials. The smooth board surface is ideal for all types of graphics, and it requires little surface preparation or surface treatment.

General Considerations

To ensure best results for any graphic application, consider the following factors that may affect the finish installation:

- Environmental and safety concerns
- Weathering
- Chemical resistance
- Ease of application
- Cost-effectiveness
- Hardness
- Scratch resistance
- Priming or multi-coat paint applications

Tip: Because of the wide range of products available, select paints carefully for each application. Initial testing of the selected paint system is recommended before a production run.

Cleaning / Pretreating

Before screen printing or painting Skyline Composites PVC foam board, the surface area should be cleaned with isopropyl alcohol and a clean white cloth.

Depending on the specific application, certain pre-treatments may also be required, as described in the following sections.

Screen Printing

With Skyline Composites PVC foam board, the process of Screen Printing is easily accomplished. The surface has a closed cell matte finish that makes mistakes easily wipe off with the appropriate thinner. The use of Vinyl and Vinyl/acrylic, solvent based inks are very compatible with Skyline Composites PVC foam board.

The use of Water Based Screen Printing Inks has also had some success with our material. Ink manufacturer directions must be followed for good adhesion. Surface preparation of Skyline Composites PVC foam board for screen printing is similar to those of painting.

A. The surface to be screen printed area must remain dry, clean, and grease free.

B. Any surface scratches on the board will have a tendency to shadow through the ink.

In order to remove small scratches or dents, rapidly fan a heat gun over the affected area. Care must be taken not to leave the hot air in one place for too long, as the surface can become deformed. It is highly recommended that the surface be cleaned with a white cloth moistened with isopropyl alcohol prior to printing.

All screen printing inks should be tested in a manner which duplicates your printing process before initiating production. It is strongly recommended to consult the appropriate ink manufacturer regarding any required ink additives such as catalyst for proper adhesion and exterior usage. Screen Printing ink should air dry, rather than be heat dried. Temperatures in excess of 150° F may cause warping or bowing of material.

Most UV Screen Printing Inks that are compatible with rigid PVC will work on Skyline Composites PVC foam board. The most important factor to be considered when using UV systems is the curing oven. Low wattage bulbs should be used to keep the temperature below 150° F. The use of UV curing systems, which have variable speed conveyors, are considered the best type to use with Skyline Composites PVC foam board.

Direct Digital Printing

Wide format and flatbed printers use various ink and ink curing technologies to allow high quality printing at relatively high speeds.

High quality digital printing depends on various factors:

- Printer capabilities
- Ink technology and quality
- Type of printing substrate and quality
- Machine operator

Skyline Composites PVC foam board's bright whiteness enables printers to print directly on it and achieve accurate, consistent color values and brightness.

The Skyline Composites PVC foam board is Suitable for use with UV curing and solvent-based digital inks, and for IR drying when water-based inks are used.

Skyline Composites PVC foam board retains superb whiteness, even after intense UV curing.

Protective Film Masking

The protective polyethylene film mask helps prevent surface abrasion and stains. However, removing the protective film may cause an increase of static electric charge, which can affect ink coverage. Therefore, after peeling the film away from the sheet, the static electricity that has built up in the sheet should be discharged using an ionized gun or a suitable device provided by the printer manufacture.

Cleaning and Preparing for Printing

The surface should be clean before printing. Carefully inspect each panel to ensure there is no: dust, fingerprints, residue or other problematic substances that may affect ink coverage or adhesion. If needed, the Skyline Composites PVC foam board should be cleaned with a damp rag, or with isopropyl alcohol.

Ink

Skyline Composites PVC foam board is suitable for all types of inks: Aqueous, Solvent-Based, and UV-curable. In fact, It has been tested and approved by major printer OEM's around the world. Consult the printer manual or contact the printer manufacturer for recommendations and compatibility information.

Drying the ink

The two main drying technologies are:

IR (Infrared) – Long exposure to high temperature in the drying tunnel may cause distortions in the sheet.

UV (Ultraviolet) – UV levels must be adjusted according the printing speed and substrate. UV overexposure can cause discoloration of both the ink and substrate.

Print Head Adjustment

The distance between the print head and the substrate can have a significant affect on print quality. Manufacturer specifications, combined with and operator experience, should determine print head distance from the substrate.

The suggested starting distance should not be more than 2 mm from the print head to the substrate.

Laminating

Skyline Composites PVC foam board is an ideal material for applications that require lamination. This section provides preparation information processes as well as detailed instructions for the various types of lamination that can used with Skyline Composites PVC foam board. Because prints are one of the most frequently laminated materials, the sections that follow will generally refer the lamination of a print, although many other materials can be used.

Please Note! Since Skyline Composites PVC foam material may warp when heated above 150°F or when heated from one side only, it cannot be used in any lamination process requiring heat.

Adhesion

For best results, the material should be cleaned with isopropyl alcohol prior to adhesion and allowed to dry thoroughly.

When laminating with pressure-sensitive adhesives, a force of 25–40 psi is required. Proper spacers are also critical. Because force must be applied equally across the material, the top roll must move evenly from left to right while maintaining even contact between top and bottom laminating rolls. To achieve even contact, “zero the nip,” then use spacer shims to preset the nip opening for a particular laminate. Use sufficient pressure to completely eliminate any air bubbles between the Skyline Composites PVC foam material, the adhesive and the print or other material. The lamination will achieve maximum bonding in three hours. If the lamination has been performed properly, the finished mount can be flexed without the print becoming loose in the center. To prevent moisture from becoming trapped between layers of porous material (such as paper) and creating blisters, the level of moisture in both the material to be laminated and the atmosphere should be reduced before pressing. Some materials may require pre-drying. Skyline Composites PVC foam board is nonporous and does not need pre-drying.

Preventing Surface flaws

Surface blemishes, such as wrinkles, can be caused by misalignment of the adhesive roll or too much pressure or rollers that are not parallel. Trapped dirt or lumps of hardened adhesive common with glossy prints may create small bumps in the finished product.

In order to prevent these problems, equipment used for Skyline Composites PVC foam board lamination must be kept clean. Use a fresh roll or sheet of transfer adhesive if bumps are caused by hardened adhesive. Dirt problems can be minimized by using an ionizing static eliminator. Using prints or other materials made with a paper 0.007" or thicker can help prevent strike through. For best results, wipe down the back of the print and the face of the Skyline Composites PVC foam board mount with a clean, dry cloth before it passes through the roll nip. Whether the finished product is to be used indoors or outdoors, a clear, high gloss overlay will help protect against fading as well as enhance the color.

Laminating Techniques

Four techniques are recommended for laminating materials to our products, as described in the following sections. Depending upon the type of applications and the equipment available, one or more of these processes may be appropriate for a particular application.

None of these processes involves the use of heat. Because Skyline Composites PVC foam board may warp at temperatures above 140 F or when heated from one side only, it cannot be dry mounted or hot mounted.

The four recommended lamination techniques for Skyline Composites PVC foam board are:

- Cold laminating with a press using adhesive-backed paper
- Cold laminating using a vacuum press
- Hand laminating using transfer adhesive
- Hand laminating using spray adhesive

Cold Laminating with a Press using Adhesive-backed Paper

This process is most frequently used by commercial photo labs. Either of two types of liner films, a single release liner film or a double release liner film, can be used for this process. The basic process for laminating with a press using adhesive-backed paper is described in the following section.

1. Set the roller pressure properly for the thickness of the pre-coated mounting substrate.
2. Place the mounting substrate on a flat surface and expose approximately one inch of the adhesive by peeling back the release paper. Fold back the release paper, making an even crease across the paper.
3. Carefully position the print on top of the substrate, using the folded release paper to prevent contact with the exposed adhesive.

Once positioned correctly, carefully apply the print to the exposed adhesive, pressing from the center toward the edges to ensure a smooth tack.

4. Place the direction switch in the forward position and the speed control on medium.
5. Insert the materials to be processed into the laminator opening. Feed the substrate between the rollers until the pressure roller rests on the tacked portion of the material.
6. Hold the un-tacked portion of the print up and against the pressure roller. Feed the substrate through the rollers while peeling the release paper off the mounting substrate with one hand. To prevent wrinkles, the print must be held against the roller with the opposite hand while the substrate feeds through the press.
7. Remove the mounted print from the rear of the laminator and trim it to the required size.

Coating using Single Release Liner Films

1. Set the pressure properly for the thickness of the substrate(s) to be processed.
2. Load the supply roll of pressure-sensitive adhesive.
3. Pull approximately 12 inches of adhesive film forward off the roll. Rest the film, adhesive side up, on top of the pressure roller.
4. Create a leader board by cutting a piece of substrate slightly larger than the width of the adhesive film and approximately four to six inches long. Lay the leader board across the adhesive film and smoothly adhere the bottom of the leader to the adhesive.

5. Place the direction switch in the forward position and the speed control on medium.
6. Pull the leader down and push it between the rollers. Feed the leader between the rollers approximately three to four inches. Be sure that the adhesive stays firmly adhered to the leader.
7. Once this process has been completed (referred to as "stringing the web") and the adhesive is feeding without wrinkles, the laminator is ready for production.
8. To coat, feed a substrate behind the leader board and between the roller while depressing the foot switch. Feed until the substrate exits the rollers and automatically stops feeding. At this time, another substrate may be fed between the rollers for coating. This process is suitable for films with a paper release liner and leaves a 3/8" to 1/2" gap between the coated substrates to facilitate the trimming process.
9. After exiting the laminator, the coated substrates should be split apart and trimmed.

Coating using Double Release Liner Films

Coating with double release liner film, requires the use of a take-up mechanism to automatically remove and rewind one of the release liners during the coating procedure.

1. Set the pressure properly for the thickness of the substrates to be processed.
2. Load the supply roll of pressure-sensitive adhesive.
3. Adhere double-stick tape or a pressure-sensitive adhesive film, to the surface of the take-up shaft.
4. Pull approximately 18 inches of adhesive film forward off the roll and adhere one release liner side smoothly to the take-up shaft, taking care to ensure that the film is square with the supply roll and no diagonal wrinkles are apparent.
5. Separate the adhesive film from the release liner secured to the take-up shaft and pull the adhesive film and remaining release liner down so that it rests adhesive side up on top of the pressure roller.
6. Lay a leader board the same thickness as the substrates to be used across the exposed adhesive.

Cold Laminating with a Vacuum Press

This method is suggested for small and medium-sized photo shops for mounting prints utilizing a spray adhesive.

1. Spray the adhesive on the back of the piece to be mounted, keeping the spray six to eight inches from the surface. If using a double coat of adhesive, the second coat should be applied in a direction perpendicular to the first coat. For bonding most art materials, the adhesive is typically applied only to one surface, usually the back of the print.
2. Allow the spray to dry two to four minutes before mounting so that the adhesive becomes tacky. If blisters occur from trapped solvent, allow the adhesive to dry slightly longer than four minutes.
3. Position the print on the Skyline Composites PVC foam material and place inside the vacuum frame.
4. Apply vacuum for 10 minutes.

Hand Laminating using Transfer Adhesive

For small shops or display makers without access to presses, this method can be used for the lamination of flat, relatively small items utilizing a transfer adhesive.

1. Using a sheet of transfer adhesive having both sides covered by release paper, peel away and fold back the release paper 1/2" inch from one edge.
2. Place the edge of the print to be laminated on the exposed adhesive.
3. Remove the rest of the release paper while lifting the print slightly to avoid contact with the adhesive, then use a roller or a squeegee to smooth the print evenly onto the adhesive.
4. With the print facing down and the remaining release paper facing up, smooth out any excess air from between the print and the adhesive with a squeegee.

5. To laminate the print to the Skyline Composites PVC foam material, peel away and fold back the release paper 1/2" inch from one edge.
6. Placing the print evenly on the Skyline Composites PVC foam material, tack the exposed adhesive to the material.
7. Gradually remove the liner while pressing closely with a hand roller or a squeegee to eliminate any air bubbles until the entire print has been laminated.

Hand Laminating using Spray Adhesive

For small shops or display makers without access to equipment, this method is recommended for the lamination of flat, relatively small items utilizing a spray adhesive.

1. Spray the adhesive on the back of the piece to be mounted, keeping the spray six to eight inches from the surface. If using a double coat of adhesive, the second coat should be applied in a direction perpendicular to the first coat. For bonding most art materials, the adhesive is typically applied only to one surface, preferably the back of the print.
2. Allow the spray to dry between two to four minutes before mounting so that the adhesive becomes tacky.
3. Place the adhesive side of the print or other item on the board surface, pressing smoothly from the center of the piece to the edges in order to eliminate any wrinkles and trapped air immediately.
4. Place a clean sheet of Skyline composites PVC foam board over the laminated piece to weigh it down. Although the bond should be at maximum strength after fifteen minutes, allow 24 hours before exposing the piece to any sudden temperature or humidity changes.

Delamination

A print mount can be delaminated within five minutes if a pressure sensitive adhesive, has been used. Although the print is usually destroyed, the board material can be reused. If five minutes have already passed, a hot air gun or a hair dryer can be used to heat the material in order to peel off the lamination. Isopropyl alcohol or mineral spirits can be used to remove the remaining adhesive.

Note:

This Fabrication Guide provided by Skyline Composites is to assist fabricators to work with the substrate in the most efficient and effective manner. The tips and suggestions contained in this guide are the result of many years of combined experience by fabricators. These fabrication suggestions are based on information which is, in our opinion, reliable. However, since skill, judgment, and quality of equipment and tools are involved, and since conditions and methods of using the substrate are beyond our control, the suggestions contained in this Guide are provided without guarantee. We recommend that prospective users determine the suitability of both the material and suggestions before adopting them on a commercial scale.

Skyline Composites CO., Ltd.

Homepage: www.skylinecomposites.com

Email: export@skylinecomposites.com