PALBOARD™

Multilayered PVC Sheet

Fabrication Guide

Build On.

Contents

Some Foam PVC products manufactured by others may contain lead. PALBOARD™ is manufactured without lead or any other heavy metal.

RoHS Compliant · Heavy Metal Free

Introduction to PALBOARD™

In the world of multi-layer substrates, new PALBOARD is an innovative sheet that's like no other. Palboard combines the extra tough surface quality of solid PVC with the lightweight, easy-to-work-with characteristics of foam PVC. Its core is made with high quality recycled foam PVC, and the panel itself is recyclable, too.

PALBOARD has an ultra-smooth surface that offers excellent ink-adhesion for digital or traditional printing applications. It's easy to fabricate, can be cold-bent with a v-groove cut, and offers good mechanical strength & excellent chemical resistance, making it ideal for a wide variety of interior sign, display, or other applications.

Main Benefits

- Hard, smooth surface
- Recycled, lightweight foamed PVC core
- High structural strength with a relatively low weight
- Excellent chemical and fire resistance
- Easy to fabricate and thermoform
- Excellent adhesion capabilities
- Good electrical and thermal insulation

All fabrication processes can vary slightly, therefore, it is recommended that prior to fabricating for production, users should perform their own experimental testing to ensure their process produces the finest quality finish.
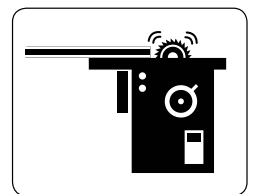
Cutting

Bridge Saw
For best results use a 17.72" blade, 100 teeth. Recommended cutting speed is up to 35 ft./min.

Circular Saws
PALBOARD material up to 3mm thick can be cut with a knife or blade. For PALBOARD sheets 3mm and thicker, carbide-tipped, high-speed steel blades normally recommended for wood or plastic, 10" x 72 tooth 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 - 12mm

Band Saws
High-speed steel blades normally recommended.
- **Teeth:** 180 tooth blade
- **Cutting speed:** 3,000 to 5,000 feet per minute
- **Feed rate:** 6 - 30 meter per minute.

Jigsaw
Rough cut type blades ground for plastics can be used on PALBOARD sheets. Smooth metal-cutting blades are not recommended.

Table Top Cutters/Vertical Cutters
It is recommended to use vertical cutters with Twin Wheel Head blade which are used for cutting ACP (Aluminum Composite Panel).
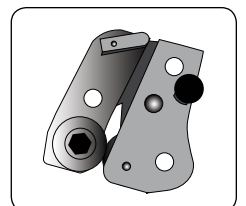
Drilling

PALBOARD can be drilled with carbide-tipped bits using twist drills recommended for metals.

The following settings are recommended:

- **Point angle:** between 90 to 110
- **Spiral angle:** 30
- **Relief angle:** 10
- **Cutting speed:** 150 to 1,300 feet per minute
- **Feed rate:** 0.01 to 0.02 inches per revolution

The minimum hole placement distance from the edge of the sheet should never be less than 1 inch. In an effort to reduce heat buildup during drilling of thicker PALBOARD sheets, it may be necessary to periodically remove the drill bit from the PALBOARD material.

Milling

PALBOARD 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: 3,000 to 3,500 feet per minute
- Cutting feed: 0.12 inches per revolution
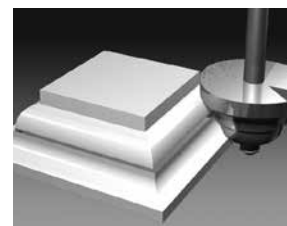
Routing

PALBOARD 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 PALBOARD parts.

Thermal Expansion / Contraction

As with most plastics, PALBOARD Multi-layered PVC Sheet will expand and contract with an increase or reduction in temperature. This material property is known as linear thermal expansion and contraction. Since PALBOARD can be used in a wide variety of indoor applications, linear thermal expansion and contraction may need to be considered during the fabrication and installation of the material. It is important to take in to account the temperature at which the PALBOARD material was fabricated as well as the temperature of the installation. PALBOARD should not be used in applications or climatic conditions that exceed 60°C(150°F) (ambient or surface temperature), at which temperature the PALBOARD will soften and permanently deform.

PALBOARD Linear Expansion / Contraction Quick Reference			
Total Temp. Change (Δ)	Expansion / Contraction of Material at Standard Lengths / Widths (in inches)		
	48 in.	60 in.	96 in.	120 in.
20°F	0.036	0.044	0.071	0.089
40°F	0.071	0.089	0.142	0.178
60°F	0.107	0.133	0.213	0.266
80°F	0.142	0.178	0.284	0.355
100°F	0.178	0.222	0.355	0.444
120°F	0.213	0.266	0.426	0.533
140°F	0.249	0.311	0.497	0.622

Screwing and Nailing

Any type of screw or nail can be used to fasten PALBOARD material. Power nailers and screw driving equipment are suggested. Inserting the screw or nail in an elongated slot or an oversized hole is recommended so that the material can expand or contract if fluctuations in temperature occur. For best results, use oversized washers or grommets in combination with screws.

Tips on Sign Installations with Posts

The following tips have been compiled to be used as a general guide for installing PALBOARD. Unusual designs falling outside the examples given may require certain modifications when considering PALBOARD. Contact your Palram representative for guidance.

Significant Items to be Considered

1. Bolt holes should always be larger than the bolt shaft to allow for thermal expansion and contraction, thus eliminating the possible stress at bolt fixing points. The use of washers spread the compressive load when bolts/nuts are tightened. Be sure not to over tighten as this will weaken the connection.

2. Split timber posts are the best to use because the PALBOARD is supported evenly on both sides. If steel or aluminum poles are used, nylon bolts and washers give the best results. Be certain to use an adequate number of fasteners for these types of installation. They should be evenly spaced and away from the top and bottom edges.

Hanging Signs

PALBOARD may be successfully used as interior hanging signs. As PALBOARD is a co-extruded sheet product, thin gauges or large hanging signs may require additional support. The addition of an aluminum or thick walled plastic "C" channel across the top, bottom, or around the perimeter may be needed to alleviate any tendencies to warp. When the additions of supporting channels are not an option, the method illustrated below may also be used to help prevent bending. The minimum hole placement distance from the edge of the sheet should never be less than 1 inch.

1 in.
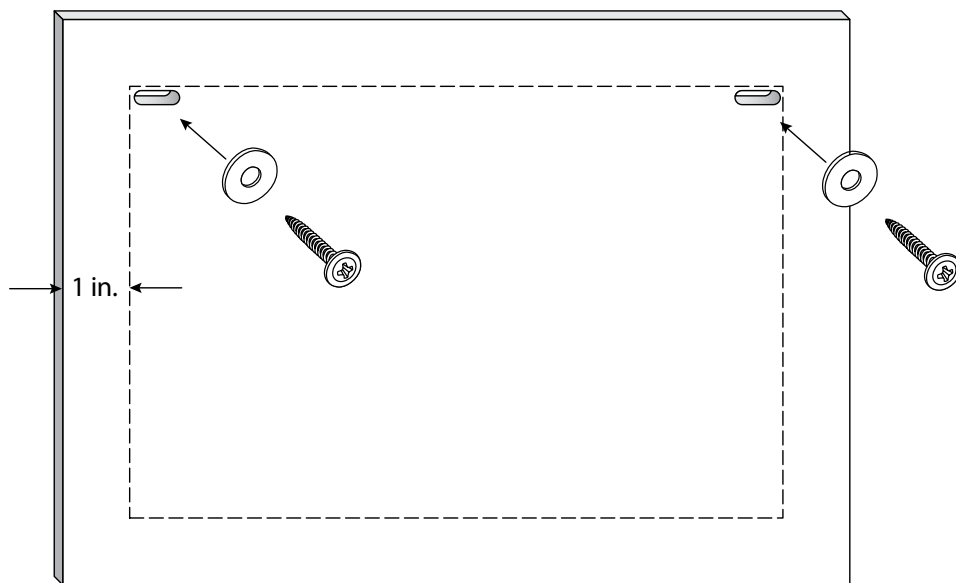
Adhesive Bonding of PALBOARD™

General Information
PALBOARD 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 PALBOARD
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 PALBOARD material surfaces to be bonded must be cleaned and de-greased 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 PALBOARD to PALBOARD Material

1. For edge bonding and joining parts made of PALBOARD material, use a PVC solvent such as THF, MEK, and 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 PALBOARD 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 PALBOARD material to flexible PVC sheets, only plasticizer-resistant types of adhesives should be used.

C. Bonding PALBOARD 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.

Expected temperature ranges (expansion/contraction), substrate and size of PALBOARD material panels should be taken into consideration when deciding on a method of attachment. For more in-depth guidelines, contact the adhesive manufacturer.

Heat Bending

PALBOARD sheet material can be bent by using Calrod or other radiant heaters, strip heaters or air-circulated ovens. Heat guns can also be used on small areas. To ensure best results, a rheostat should be used to control heating of the PALBOARD so that the surface temperature does not exceed 200°F (93°C). Heating PALBOARD material over 200°F (93°C) can cause the surface to become rough and possibly discolor.

When using a metal contact strip heater, cover the heater strip with Teflon spray to prevent marking the PALBOARD. Different sizes of rectangular heating bars can be used to produce bends of different radii. The larger the heated area of the PALBOARD, the larger the radius that can be created. PALBOARD should be heated from both sides when the sheet is thicker than 4mm. Heat times are dependent on heat source output and distance from the sheet.

To form tighter bends with smaller radii, use a small heated area on the upper surface (inside the bend) of the PALBOARD sheet and a larger heated area on the bottom surface (on the outside of the bend) of the sheet. A minimum radius of twice the sheet thickness is necessary to avoid breakage. When bending PALBOARD into an angle, typically the extension of the PALBOARD on either side of the angle should be at least 20 times the thickness of the PALBOARD material.

For example, 6mm PALBOARD would require the extension on each side to be 120mm in order to avoid warping of the material. For sides less than 20 times the material's thickness, the entire sheet must be heated. Once the PALBOARD is bent, place it in a fixture, such as a jig or clamp, to cool. Fans and/or compressed air will speed the cooling process.

Painting

The painting of PALBOARD is easily accomplished with paints known to have compatibility with rigid PVC.
Selection of a paint type for each use should be guided by the following:

I. Types of paints compatible with PALBOARD™ sheet

A.   Vinyls

B.   Acrylic Lacquers

C.   Two part polyurethanes

With PALBOARD, water-based latex paint and oil-based enamels generally do not have equal adhesion properties to that of solvent based systems. Although the use of primers can improve the adhesion of non-solvent based systems, the improvement is usually minimal.

II. Surface Preparation

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

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

III. Cross-Cut Adhesion Test

A.   The paint type chosen should always be tested for adequate adhesion. To test for adhesion, conduct the Cross-Cut Adhesion Test per ASTM D3359, the "Standard Test Method for Rating Adhesion Tape Test". Test after the paint has dried per the paint manufacturer's recommendations.

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

PALBOARD should not be exposed to temperatures in excess of 150F during the paint drying process. For drying and cure times, consult the paint manufacturer.

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, PALBOARD testing is recommended for the initial use of any coating type before commercialization.

Graphic Applications

PALBOARD performs superbly in a wide range of graphic applications including those involving paints, screen printing, digital flatbed printing and vinyl films. PALBOARD can be used to create weather-resistant signs, displays or Point of Purchase (POP) materials. The smooth PALBOARD surface is ideal for all types of graphics, and it does not require surface preparation or surface treatment.

Screen Printing

With PALBOARD, the process of Screen Printing is easily accomplished. The surface of PALBOARD has a semi-gloss finish that can easily be cleaned with the appropriate thinner. Vinyl, acrylic and solvent based inks are compatible with PALBOARD.

Water Based Screen Printing Inks can also be used with PALBOARD material. Follow ink manufacturer directions for best adhesion

Surface preparation of PALBOARD for screen printing is similar to those of painting.

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

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

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 a 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 PALBOARD material.

Most UV Screen Printing Inks that are compatible with rigid PVC will work on PALBOARD. 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 PALBOARD.

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

PALBOARD'S bright whiteness enables printers to print directly on it and achieve accurate, consistent color values and brightness. PALBOARD is suitable for use with UV/UV-Led curing and solvent-based digital inks, and for IR drying when water-based inks are used. PALBOARD 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 manufacturer.

Ink

PALBOARD is suitable for all types of inks: Aqueous, Solvent-Based, and UV/UV-Led curable. In fact, PALBOARD has been tested and approved by major printer OEM's around the world, including AGFA, EFI, HP, Mutoh, Canon, and more. 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/UV-Led levels must be adjusted according to 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 operator experience, should determine print head distance from the substrate. The suggested starting distance should not be more than 1.5mm from the print head to the substrate.

Laminating

PALBOARD 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 PALBOARD. Because prints are one of the most frequently laminated materials, the sections that follow will generally refer to the lamination of a print, although many other materials can be used.

NOTE! Since PALBOARD 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 PALBOARD 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 PALBOARD material, the adhesive and the print or other material.
The lamination will achieve maximum bonding in a few 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. PALBOARD 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 PALBOARD 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 PALBOARD mount with a clean, dry cloth before it passes through the nip roll. A clear, high gloss overlay will help protect against fading as well as enhance the color.

Laminating Techniques

Depending upon the type of applications and the equipment available, one or more of the following processes may be appropriate for a particular application. None of these processes involve the use of heat. Because PALBOARD may warp at temperatures above 150°F or when heated from one side only, it cannot be dry mounted or hot mounted.

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 substrates 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.

Chemical Resistance

Note: Information on chemical resistance can be found at www.PalramAmericas.com/tech. The information on the website serves as a basis for recommendation. PALRAM Industries does not guarantee chemical resistance unless specific separate documentation is supplied.

Physical Properties

A detailed overview of Palboard physical properties can be downloaded at:
https://www.palramamericas.com/Products/Flat-Sheets/palboard/
Additional information on this product may be obtained by calling your Palram representative.

Flammability

Standard	Thickness	Classification
UL 94	3-10mm	V-0
EN13501	3mm	B, s2, d0
	3-10mm	B, s3, d0

For additional information, please contact your Palram representative.

PSDS Sheet

Download a detailed copy of the PSDS (Product Safety Data Sheet, used in place of MSDS Sheet) for PALBOARD Here.

Further Information

Additional information on this product may be obtained by calling your Palram representative.

Inasmuch as Palram Americas has no control over the use to which others may put the product, it does not guarantee that the same results as those described herein will be obtained. Each user of the product should make his own tests to determine the product's suitability for his own particular use including the suitability of environmental conditions for the product. Statements concerning possible or suggested uses of the products described herein are not to be construed as constituting a license under any Palram Americas patent covering such use or as recommendations for use of such products in the infringement of any patent. Palram Americas or its distributors cannot be held responsible for any losses incurred through incorrect installation of the product. In accordance with our company policy of continual product development you are advised to check with your local Palram Americas supplier to ensure that you have obtained the most up to date information.

Palram Americas reserves the right to change product specifications and/or information contained in this brochure without notice.

MADE IN USA

R HS COMPLIANT
FREE OF LEAD AND OTHER HEAVY METALS

member **iapd**
international association of plastics distribution

Member
SGIA
Specialty Graphic Imaging Association

ISA ™
INTERNATIONAL SIGN ASSOCIATION

PALRAM AMERICAS
9735 Commerce Circle, Kutztown, PA 19530
Phone: 610-285-9918 (Toll Free: 800-999-9459)
Fax: 610-285-9928
E-mail: PalramAmericas@palram.com
Web Site: www.PalramAmericas.com

Form 1510 Rev. 09.28.2017 PBW 85 161