



DIBOND®

e-panel™

The Aluminum Composite Material (ACM) Family

Fabrication Manual

Thank you for choosing a 3A Composites product for your graphic display applications.

We have compiled this Fabrication Manual based on our Fabrication Guide, which is divided into the following sections:

Mounting

Repositioning Vinyl

Direct Digital Printing

Direct Screen Printing

Painting

Knife Cutting

Saw Cutting

Routing

Die Cutting / Punching

Embossing

Forming Curves

Appendix I: MSDS (Material Data Safety Sheet)

Appendix II: Specifications

Appendix III: Products For Use

This Fabrication Guide was created to incorporate the most common fabrication methods that are used with 3A Composites' line of graphics display products. Not all fabrication methods are compatible with each product, but this format was kept for consistency purposes. **The term "the substrate" is used throughout this guide and is meant to apply to all members of the substrate family unless noted otherwise.** Those fabrication methods that do not apply to a certain product are stated with a short explanation and a recommendation for an alternative product that fits that application method.

This manual also contains Appendix I which provides a Material Safety Data Sheet section. Appendix II includes an adhesives, fastening and storage guidelines section. Any unique product information will be contained in Appendix II. See Table of Contents. An Appendix III section lists products that can be used in conjunction with 3A Composites products. 3A Composites is not responsible for the performance of any of these products when used independently or with any 3A Composites product.

The date of the last revision is shown on the bottom right hand corner of each page. Please make sure you have the most current version by going to GraphicDisplayUSA.com and selecting the document library.

If you have any further questions about our product or about how to use this manual, please feel free to contact us at 1-800-626-3365.

PLEASE NOTE:

TRIALING IS RECOMMENDED TO ENSURE SUITABILITY FOR THE PROPOSED APPLICATION AND FABRICATION BEFORE FULL-SCALE COMMERCIALIZATION.

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CHOOSING YOUR GRAPHIC DISPLAY BOARD IS EASIER THAN EVER.

3A Composites offers a legendary array of brands for the graphic display market, including: fluted polypropylene sheets, paper-faced foam boards, expanded plastic boards, polystyrene foam boards with wood-fiber veneers, and aluminum composite panels. All of our brands offer unique competitive advantages and outstanding capabilities for designers and fabricators seeking to create signage, displays and graphic applications on an epic scale.

FLUTED POLYPROPYLENE

- **Omni-Flute™** is fluted polypropylene specifically for graphic display. It is comprised of extruded polypropylene flutes and facers to form a homogeneous corrugated sheet.

WHY CHOOSE OMNI-FLUTE™?

- Made with latest technology and equipment
- Extremely lightweight yet rigid
- Color consistent
- Specially treated surface on both sides to promote the adhesion of most forms of graphics



THE PAPER-FACED FOAM BOARD FAMILY

- **Fome-Cor® Board** is the industry's leading paper-faced foam board for more than 40 years. It is comprised of extruded polystyrene foam with clay-coated white or black paper facers.
- **Fome-Cor® ValuBoard™** is comprised of extruded polystyrene foam with natural kraft facers.
- **Fome-Cor® Acid-Free** is comprised of extruded polystyrene foam with acid-free paper facers that meet Library of Congress standards for conservation framing.
- **Fome-Cor® Self-Adhesive** is comprised of extruded polystyrene foam with clay-coated paper facers, one of which is covered with pressure sensitive adhesive. Simply peel back the release facer as you position the graphic on the sticky surface.
- **Fome-Cor® Heat-Activated** is comprised of extruded polystyrene foam with clay-coated paper facers, one of which is covered with heat-activated adhesive.
- **Fome-Cor® JetMount®** is comprised of denser extruded polystyrene foam with clay-coated paper facers.
- **Foam-X® Recovery** is comprised of "memory retaining" polystyrene foam with clay-coated paper facers.

WHY CHOOSE FOME-COR®?

- The original graphic arts foam board with a great reputation for performance
- Perfect for die cutting with a compressed edge that stays closed
- Quick service on cut-to-size orders including large sheets up to 8'x10'
- Uniquely embossable for 3-D effect displays
- Cuts easily and cleanly, even by hand
- Extremely lightweight
- Well-suited for screen printing or digital direct printing applications

WHY CHOOSE FOME-COR® VALUEBOARD™?

- A cost-effective alternative to corrugated cardboard
- Provides a smooth surface for mounting with no flute marks

WHY CHOOSE FOME-COR® ACID FREE?

- Perfect for the archival preservation of valuable art and photographs
- No additional backing is required, saving time and framing materials

WHY CHOOSE FOME-COR® SELF-ADHESIVE?

- Eliminates the use of pressure-sensitive adhesive stock
- Available in repositionable Low-Tack (LT) or immediate bonding High-Tack (HT)
- HT identified by red release facer and LT identified by blue release facer

WHY CHOOSE FOME-COR® HEAT-ACTIVATED?

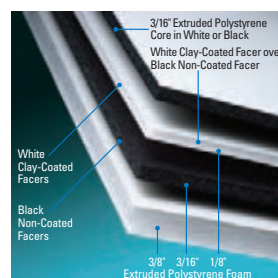
- Eliminates the use of hot melt tissue stock
- The adhesive is activated with low temperature settings for a quick, damage-free mount
- Can be used on a heated mechanical or vacuum dry mount press, or with a heated roller laminator

WHY CHOOSE FOME-COR® JETMOUNT®?

- The denser foam core provides increased rigidity and warp resistance
- Great for more demanding mounting jobs for display, signage and framing

WHY CHOOSE FOAM-X® RECOVERY?

- Memory core resists denting
- Edges remain open when die cut
- Economical alternative to competitive foam boards



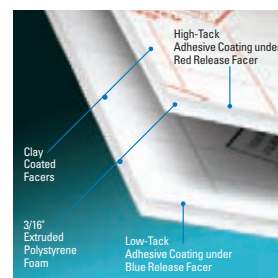
Fome-Cor® Board



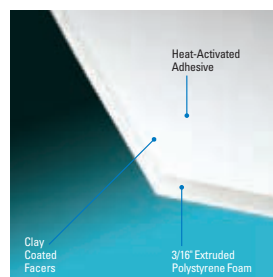
ValuBoard™



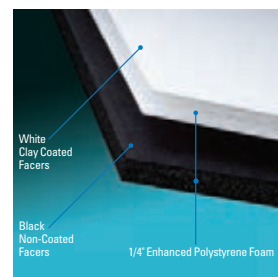
Acid-Free



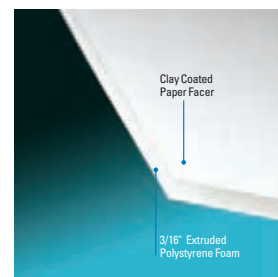
Self-Adhesive



Heat-Activated



JetMount®



Foam-X® Recovery

THE FOAMED PVC FAMILY

- **Sintra®** has been the industry's leading PVC for more than 20 years. It is comprised of moderately expanded closed-cell polyvinyl chloride (PVC) in a homogenous sheet with a low-gloss matte finish.
- **e-pvc™** is a low-density, lighter, and less rigid expanded PVC board.

WHY CHOOSE SINTRA®?

- Sintra Bright White is now the brightest and whitest PVC board on the market
- The trusted brand leader by which all others are measured
- Lightweight yet rigid and durable
- Easily formed into just about any shape imaginable using wood and foam board fabrication techniques
- Heat formable and chemical resistant
- Superior dent and scratch resistance

WHY CHOOSE e-pvc™?

- Economical PVC alternative for less-demanding applications



THE HEAVY-DUTY FOAM BOARD FAMILY

- **Gatorfoam®** is the industry's leading heavy-duty foam board for more than 30 years. It is comprised of extruded polystyrene foam bonded between two layers of wood-fiber veneer.
- **Gatorplast®** is comprised of extruded polystyrene foam bonded between two layers of high-impact polystyrene cap sheets.
- **Gatorblanks®** are thick panels of extruded polystyrene foam with no facers.

WHY CHOOSE GATORFOAM®?

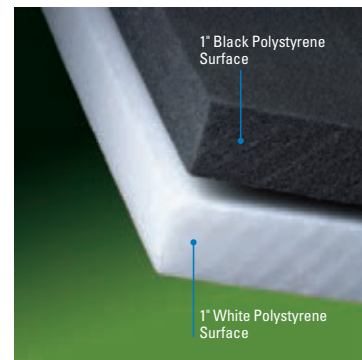
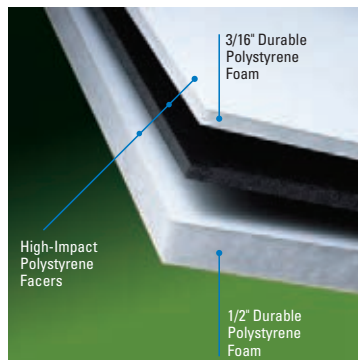
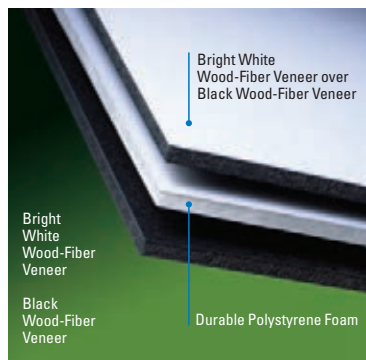
- The original, heavy-duty graphic arts board
- Excellent reputation for digital and screenprinting
- New, Bright White facer is the brightest board of its kind
- Dent and scratch resistant

WHY CHOOSE GATORPLAST®?

- Smooth, high-impact liners resist warping
- Lightweight and water-resistant
- Vinyl graphics are repositionable

WHY CHOOSE GATORBLANKS®?

- Perfect for signs, displays and dramatic in-store lettering
- Lightweight yet durable, and easy to cut and form



THE ALUMINUM COMPOSITE MATERIAL (ACM) FAMILY

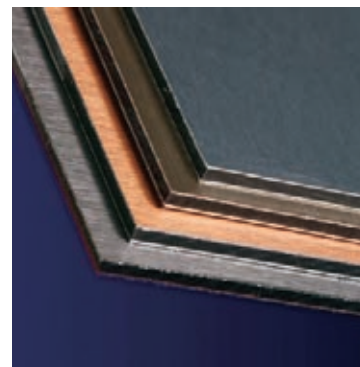
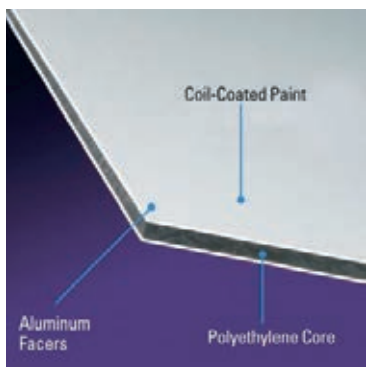
- **Dibond®** has been the industry's leading ACM for more than 15 years. It is comprised of two pre-painted sheets of .012" aluminum with a solid polyethylene core.
- **e-panel™** is comprised of two pre-painted sheets of .008" aluminum with a solid polyethylene core, and manufactured in China.

WHY CHOOSE DIBOND®?

- Flattest panel on the market
- Superior surface protects expensive digital and screen-printed graphics
- Provides excellent durability in outdoor applications
- Won't bow or oil can
- Approximately one half the weight of a solid aluminum sheet
- Can be routed and returned to add dimension or roll-formed to deliver sweeping curves

WHY CHOOSE e-panel™?

- Recommended for flat panel applications



Choosing Your Graphic Display Board

Application Guide

	POP Displays	Exhibits & Kiosks	Framing	Framing - Archival	Signage - Interior	Signage - Exterior	Signage - Structure
\$ Omni-Flute™	M	M			M	S	
\$ Fome-Cor® ValuBoard™	S	S	L		S		
\$ Fome-Cor® Board	S	S	L		S		
\$ Foam-X® Recovery	S	S	L		S		
\$ Fome-Cor® Acid-Free				L			
\$ Fome-Cor® Self-Adhesive HT	S	S	L		S		
\$ Fome-Cor® Self-Adhesive LT	S	S	L		S		
\$ Fome-Cor® Heat-Activated	S	S	L		S		
\$ Fome-Cor® JetMount®	S	S	L		S		
\$ e-pvc™	M	M	L	L	M	M	
\$ Sintra®	M	M	L	L	M	M	
\$ Gatorblanks®	M	M			M	M	
\$ Gatorplast®	M	M			M		
\$ Gatorfoam®	M	M	L		M	M1	
\$ e-panel™	L	L	L	L	L	L	
\$ Dibond®	L	L	L	L	L	L	L1

- S** Short-term application life
M Medium-term application life
M1 Black Gatorfoam is not recommended for outdoor usage
L Long-term application life
L1 Applications such as workzone signage, canopies, pylons and column covers



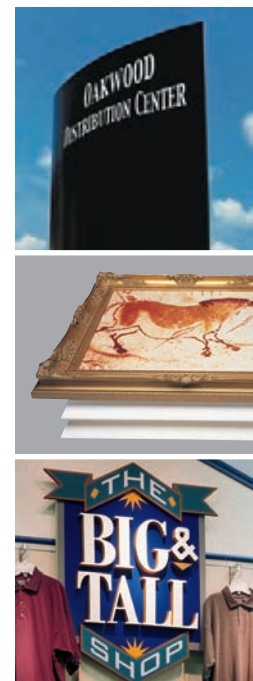
TOP TO BOTTOM / SAMPLE APPLICATIONS

- > Short-term interior signage using 3/16" White Foam-X Recovery photomounted.
- > Medium-term POP display using 3mm White Sintra screenprinted.
- > Long-term exterior signage using 3mm White Dibond with colored acrylic overlay.

Fabrication Guide

	Mounting	Repositioning Vinyl	Direct Digital Printing	Direct Screen Printing	Painting	Knife Cutting	Saw Cutting	Routing	Die Cutting/Punching	Embossing	Forming Curves
\$ Omni-Flute™	0	0	0	0	0	0	0	0	0	0	0
\$ Fome-Cor® ValuBoard™	0	0	0	0	0	0	0	0	0	0	0
\$ Fome-Cor® Board	0	0	0	0	3	0	0	0	0	0	0
\$ Foam-X® Recovery	0	0	0	0	3	0	0	0	0	0	0
\$ Fome-Cor® Acid-Free	0	0	0	0	0	0	0	0	0	0	0
\$ Fome-Cor® Self-Adhesive HT	0	0	0	0	0	0	0	0	0	0	0
\$ Fome-Cor® Self-Adhesive LT	0	0	0	0	0	0	0	0	0	0	0
\$ Fome-Cor® Heat-Activated	0	0	0	0	0	0	0	0	0	0	0
\$ Fome-Cor® JetMount®	0	0	0	0	3	0	0	0	0	0	0
\$ e-pvc™	0	0	0	0	0	0	0	0	0	0	0
\$ Sintra®	1	0	0	0	0	0	0	0	0	0	0
\$ Gatorblanks®	0	0	0	0	3	0	0	0	0	0	0
\$ Gatorplast®	0	0	0	0	3	0	0	0	0	0	0
\$ Gatorfoam®	0	0	0	2	3	0	0	0	0	0	0
\$ e-panel™	1	0	0	0	0	0	0	0	0	0	0
\$ Dibond®	1	0	0	0	0	0	0	0	0	0	0

- 0** Archival conservation mounting
1 Cold mounting techniques only
2 Face priming will provide better results
3 Do not expose polystyrene to solvent-based paints
4 May be knife cut in gauges up to 3mm
5 May be die cut in gauges up to 5mm or 3/16"
6 Punch press die set is required, not a steel rule die



TOP TO BOTTOM / SAMPLE APPLICATIONS

- > Exterior signage application using pyramid rolled 3mm Black Dibond.
- > Archival photo mounting using 3/16" Fome-Cor Acid-Free.
- > In-store signage application features multiple layers of 1/2", 3/4" and 1-1/2" White Gatorfoam spray painted, silk screened and routed.

Dibond® material is an affordable, aluminum composite material (ACM) made of two lightweight sheets of .012" aluminum with a solid thermoplastic core. The material is intended for such applications as point of purchase displays, exhibits and kiosks, framing, archival framing, interior signage and exterior signage as well as structural signage. Additionally, Dibond's unique properties lend itself to very unique OEM industrial applications, such as engine covers, housings, etc.

The sheets are pre-painted with a polyester paint finish applied to both sides of the sheet. Dibond material is available in 2mm, 3mm and 4mm thicknesses in 4' x 8', 4' x 10', and 5' x 10' sheets. The substrate is available in: White, Black, Dark Bronze, Fine Silver, Hunter Red, Caution Yellow, Dark Green, Ultra Marine Blue, Brushed Silver, Brushed Bronze, Brushed Copper and Brushed Stainless. Consult the Dibond website for the most current products at **DibondUSA.com**.

Dibond material is a UL (Underwriters Laboratories Inc.®) recognized component for electrical signage (UL 94V-0). All thicknesses of Dibond material meet the criteria for ASTM E-84, and are Class 1 or Class A materials.

Dibond material can substitute for:



- .032", .040", .050", .063", .080", .090" & .125" aluminum sheet
- MDO Board/Laminated Boards/Corrugated ACM Boards
- Thick Gauge Plastics
- Wood/Plywood Products
- Expanded PVC

Why Choose Dibond?

Applications

- Wall-mounted Signs
- Billboards
- Post & Panel Signage
- Scoreboards
- Column/Pole Covers
- Photomounting
- Fascia/Sign Bands
- Routed Sign Faces
- Point of Purchase Displays
- Cart/Kiosk Mfg.
- Transportation Applications
- Screen Printing
- Backing for Channel Letters
- Interior Signage
- Digital & Electrostatic Printing
- Awnings
- Custom Exhibit Booths
- Murals
- Custom Architectural Signage
- Workzone, Traffic, Highway Signage
- Illuminated & Non-illuminated Signage

Application	POP Displays	Exhibits & Kiosks	Framing	Framing - Archival	Signage - Interior	Signage - Exterior	Signage - Structural
Dibond®	L	L	L	L	L	L	L1
e-panel™	L	L	L	L	L	L	

 Long-term application life
 Applications such as work zone signage, canopies, pylons and column covers

Fabrication	Mounting	Repositioning Vinyl	Direct Digital Printing	Direct Screenprinting	Painting	Knife Cutting	Saw Cutting	Routing	Die Cutting / Punching	Embossing	Forming Curves
Dibond®	1								2		
e-panel™	1								2		

1 Cold mounting techniques only
2 Punch press die is required, not a steel rule die

Mounting – General Notes

Mounting, laminating and bonding are terms that are often times interchanged. For this document mounting is defined as the attachment of the graphic to the substrate. Lamination is the application of a covering (film or liquid) over the mounted item to either protect the graphic or provide a certain appearance i.e. matte or glossy finish. Bonding also conveys affixing one thing to another. This can involve a graphic to a substrate or one substrate to another. This document uses the term “mounting” to convey affixing as opposed to bonding. A paper, foil, plastic or fabric graphic can be mounted to the substrate.

With regard to adhesive, mounting consideration should follow the adhesive manufacturer’s instructions. In general, determine the minimum amount of adhesive lay down to attain the desired adhesion level. It is advisable to leave the boards for a period of time to setup. Consult the adhesive manufacturer’s instructions to see what specific times are recommended. Please refer to Appendix I for additional adhesive information.

1. A Note on Archival Mounting (Conservation Framing)

- a. The substrate is not suitable for Archival Mounting.
- b. Conservation or archival mounting requires the selection of materials that are pH neutral to use in conjunction with the substrate and the artwork. This includes matting material, hinges, and adhesives. Matboards, particularly those in contact with the art, should meet the Library of Congress specifications. Art must never be mounted in contact with the glass. If long-term preservation is the goal, only UV protection glass should be used. Finally, it is a good practice to seal the back of the frame with a dust cover or barrier paper.

2. Methods for Mounting

- a. There are a variety of methods (adhesive, pressure, etc.) for mounting a graphic to a substrate. For this document, mounting will be broken into two groupings; hot or cold mounting, with discussion on the various methods of applying pressure.
 - i. Hot mounting provides a heat source to activate the adhesive. Typically, this is accomplished with a heat source associated with either a vacuum press or a roller press.
 - ii. Cold mounting typically utilizes a spray or pressure-sensitive film or coating in combination with a roller press.
- b. Printed papers, foils, and fabrics can all be mounted to the substrate provided that the proper types of adhesives are selected. Mounting can be accomplished on most standard equipment capable of applying adhesive and laminating sheets or roll stock to rigid boards.

3. Surface Preparation

- a. Surface should be cleaned and free of any surface contaminants (i.e. oils, dust particles, etc.) prior to commencing.
- b. The substrate should be cleaned with isopropyl alcohol, using a non-colored cloth for best results. It is important not to use thinners or soaps as they may leave a film residue which can affect adhesion. Additionally, cleaners containing silicone can interfere with adhesion and are not recommended.

4. Other Considerations

- a. Care should be taken when using laminate films on only one side of the mounted graphic. Moisture pickup will be sealed on one side while the other side is not protected from moisture pickup. Bowing may occur because of moisture imbalance.
- b. Additionally, care should be taken when mounting only one side with spray adhesives. As the mount cures out, tensile forces within the adhesive may cause the substrate to bow. It may be necessary to apply a counter-mount of comparable strength on the backside.
- c. Finally, one must use the minimum amount of tension when mounting with film or pressure sensitive adhesives as too much tension will cause the substrate to bow; too little will cause the graphic to wrinkle.

Hot Mounting – General Notes

The substrate is not recommended for this fabrication method. Please see the fabrication guide on page 9 for choosing the best recommended product.

Cold Mounting – General Notes

1. Getting Good Adhesion

- a. To cold mount pressure-sensitive adhesives, you need sufficient pressure. You also must make sure that proper spacers are used. Because effective mounting depends on equal force exerted across the entire width of the substrate being mounted, the top roll must move down evenly left and right. Even contact between the top and the bottom mounting rolls is essential.
- b. Adequate pressure helps squeeze out air from between the adhesive, the substrate and the print.
- c. The mount obtained after 3 hours will generally allow for processing. Maximum mount is usually obtained within 24 hours after mounting.
- d. To test adhesion, flex the finished mount. It should not come loose in the center.
- e. Moisture can become trapped between layers of porous material (such as paper) and cause blisters. The level of moisture in the atmosphere should be reduced before press work. Prints may even have to be pre-dried.
- f. When tacking prints to the substrate, some shops will hang a number of tacked pieces in an upside-down position until they are ready to pass them through. As a precaution, it is advisable not to hold them any longer than 10 minutes or the prints may absorb moisture, change in dimension and cause bubbles and wrinkles.
- g. Please contact the film manufacturer for recommendations concerning the use of their respective laminating material in conjunction with the substrate as film choice is the most important consideration.
- h. It is advisable to use a film with a high “green tack” strength. When using pressure sensitive films, the substrate should be at room temperature to achieve optimal results.

2. Demounting Bad Mounts

- a. Pressure-sensitive adhesives may be demounted if done within 5 minutes after mounting. The print will probably be ruined, but the substrate may be reused.
- b. Beyond 5 minutes, the adhesive has set and other methods will have to be used, such as a hot air gun or a hair dryer to peel off the laminate. The remaining adhesive may be taken off with isopropyl alcohol or mineral spirits.

3. Avoiding Wrinkles and Surface Blemishes

- a. Wrinkles can be caused by misalignment of adhesive roll, too much pressure, or unparallel rolls.
- b. Small bumps, particularly visible with Cibachrome or glossy prints, are caused by trapped dirt or hardened adhesive. Good housekeeping and an ionizing static eliminator on the press are important to minimize dirt pick-up. During mounting, the back of the print should be checked and wiped down before it is processed. If bumps are caused by hardened adhesive (cut open to check), use a fresh roll or sheet of transfer adhesive. To prevent strikethrough, one might also consider using a print made with thicker paper (.007+).
- c. Pressure roller applicators can compress the leading edge of the mounting substrate. In order to keep the leading edge from rounding as it goes through the roller, use a plastic lead or guide of the same thickness of the mounted substrate.

4. Clear Overlays

- a. Clear high-gloss overlays enhance color and protect against fading indoors and outdoors. To avoid blistering, do not use overlays, clear coatings, or sprays which contain solvents.

Cold Mounting Procedures

There are several techniques for cold mounting to the substrate:

1. Cold Mounting by Hand Using Transfer Adhesive

- a. Take a sheet of transfer adhesive (both sides covered by release paper) and fold back release paper on one side approximately 1/2" from one edge.
- b. Tack on edge of print to exposed adhesive.
- c. Lift the print slightly, remove the rest of the release paper and use a roller or squeegee to smooth the print onto the adhesive. The back of the print is now coated with an adhesive which is protected by release paper.
- d. Before mounting to the substrate, remove excess air between print and adhesive. This is done by turning the print over so that the release paper is up and smoothing out from the center with a squeegee.
- e. Now peel off approximately 1/2"—1" of release paper from upper edge and fold back.
- f. Tack on to the substrate, lining up edges.
- g. Using a hand roller or squeegee, closely follow the removal of the liner to eliminate bubbles caused by air entrapment. Work with a small surface at a time (approximately 12"). Continue this step until the mounting is complete.

2. Cold Mounting by Hand or Press Using Spray Adhesive

- a. Spray adhesive on the back of the piece to be mounted. Spray 6"—8" away from the surface. A double coat is best, with the second coat applied in a cross direction to the first coat. For mounting most art materials, adhesive need only be applied to one surface, preferably the print. Avoid using excessive bonding adhesive.
- b. Before mounting, allow adhesive to dry to the touch; the adhesive must be aggressively tacky. If there are blisters due to trapped solvent, allow slightly longer than 4 minutes of drying time.
- c. Carefully position piece on the substrate and smooth out if possible to eliminate any wrinkles and trapped solvent.
- d. If using a press, simply turn on the press to complete the mount.
- e. If mounting is done by hand, place a clean sheet of the substrate over the laminated piece and weigh down for 15 minutes to obtain the maximum bond. Depending upon the type of adhesive, allow 24 hours for maximum cure out before exposing the laminate to sudden temperature or humidity changes.

3. Cold Mounting by Roller Laminator with an Adhesive-backed Graphic

- a. Adjust rollers to the thickness of the substrate to provide adequate pressure for mounting.
- b. Peel off a 1/2"—1" section of release paper from the upper edge of the preprinted adhesive backed paper.
- c. Tack on to the substrate, lining up edges.
- d. Feed tacked edge into nip of rollers keeping printed piece bent away from the substrate.
- e. As it passes through the rollers, strip away the release paper. (Make sure there are no wrinkles or trapped dirt.)

4. A Note on Cold Mounting Non-Porous Graphics

- a. For non-porous material such as PVC, other plastics or metal, the following types of contact adhesive with solvent may be used.
 - i. Neoprene, nitrile, polyurethane or other synthetic rubber types
 - ii. Adhesive must be applied to both faces. Parallel beads of adhesive are often preferred because it allows evaporation of solvent providing faster cure.
 - iii. For mounting the substrate to flexible PVC sheets, only plasticizer-resistant types of adhesives should be used.

5. A Note on Cold Mounting Porous Graphics

- a. For porous materials such as paper, textiles, fabrics or wood, the following adhesives may be used.
 - i. Contact adhesive with solvent: Same systems as for non-porous materials.
 - ii. Construction mastic, structural silicone adhesives.
- b. Considerations such as expected temperature ranges (expansion/contraction), porous material, and size of substrate should be taken into careful consideration when deciding on a method of attachment.

6. A Note on Cold Mounting with Pressure Sensitive Tapes

- a. Pressure sensitive tapes can be used for:
 - i. Less demanding applications that are stress-free.
 - ii. Adhering parts during installation work.
 - iii. Holding parts while the primary adhesive is curing.
- b. Trial pressure sensitive tapes prior to use.

TROUBLESHOOTING WHEN USING COLD MOUNTING PRESSES		
PROBLEM	CAUSED BY	ACTION
Poor adhesion or bubbles:	<ul style="list-style-type: none"> a. Insufficient pressure. b. Stripping back more than 1" of release paper while tacking on print traps air. c. Premature contact between print and adhesive traps air. d. The print contains moisture. 	<ul style="list-style-type: none"> a. Increase mounting roll pressure if running without spacer shims. If using spacer shims, use next smaller size. b. Never strip back more than 1" of release paper. c. As it is fed through rolls, the print should be tilted or bent away from adhesive until it enters the nip. d. Pre-dry print and/or keep humidity at a low level.
Curl (bowing):	<ul style="list-style-type: none"> a. Too much web tension. 	<ul style="list-style-type: none"> a. Reduce unwind brake pressure.
Wrinkles:	<ul style="list-style-type: none"> a. Misalignment of adhesive roll, causing web tension. b. Top and bottom mounting rolls are not parallel. c. Too much pressure. d. Substrate material thickness relative to shim thickness is too great (should be no more than $\frac{1}{32}$"). 	<ul style="list-style-type: none"> a. Shift the material roll on the bar to release tension. b. Make sure spacer shims are the same size, then zero the nip. c. Reduce roll pressure. d. If correctly sized spacer shims are not available, zero the nip.

Vinyl – General Notes

Major market brands of vinyl films work well with the substrate. These vinyl films are, for the most part, flexible PVC films and are produced in various thicknesses, color shades, and gloss levels. They can also be un-pigmented to act as a U.V. inhibitor. These films have a layer of adhesive and a siliconized sheet of cover paper. These films generally have excellent adhesion to the substrate. Final selection of a particular vinyl film should be made after consultation with the manufacturer to ensure conformity for its application.

For thinner gauge substrates (1mm-2mm), the technique of “counter-balancing” should be considered. A vinyl sheet may be required on the back side of a vinyl covered substrate to prevent the possibility of bowing.

As a rule, take caution to avoid too much tension when applying vinyl, as excessive tension may lead to bowing of the substrate.

1. Surface Preparation

- a. Surface should be cleaned and free of any surface contaminants (i.e. oils, dust particles, etc.) prior to commencing.
- b. The substrate should be cleaned with 70% isopropyl alcohol, using a non-colored cloth for best results. It is important not to use thinners or soaps as they may leave a film residue which can affect adhesion. Additionally, cleaners containing silicone can interfere with adhesion and are not recommended.

2. Repositioning the Vinyl

- a. Identify any misaligned or improperly adhered vinyl graphic.
- b. Using a sharp edge or razor blade held at a 45-degree angle to the substrate, begin to lift the vinyl, taking care to not scratch the substrate surface.
- c. After lifting enough of the vinyl surface in order to grab between the fingers, continue to peel back the graphic by hand, proceed with a proper speed so as to not tear or damage the vinyl graphic.
- d. Once completely removed, lay the vinyl graphic face-down smoothly on transfer paper.
- e. Reposition the vinyl graphic face-up in the proper location on the substrate and gently rub the transfer paper to re-adhere the vinyl graphic.
- f. Remove the transfer paper and gently press out any wrinkles or bubbles within the vinyl graphic by hand.

Direct Digital Printing – General Notes

Large format digital printing on flatbed printers has excellent application for the substrate. Although the substrate is available in a wide range of colors that all demonstrate excellent ink adhesion, the predominant substrate color is white when direct digital printing. However, colored variations of the substrate may provide vibrant color contrasts depending upon the availability of a white print head on the printer.

1. Surface Preparation

- a. Surface should be cleaned and free of any surface contaminants (i.e. oils, dust particles, etc.) prior to commencing.
- b. The substrate should be cleaned with isopropyl alcohol, using a non-colored cloth for best results. It is important not to use thinners or soaps as they may leave a film residue which can affect adhesion. Additionally, cleaners containing silicone can interfere with adhesion and are not recommended.

2. Suitable Inks

- a. Actual ink type depends upon the printer make and model. Consult the printer owner's manual for recommendations. Trialing for ink compatibility is always recommended.
- b. The substrate readily accepts all types of inks including:
 - i. Aqueous
 - ii. Solvent-Based
 - iii. UV-curable

Direct Screen Printing – General Notes

Large format screen printing has excellent application for the substrate. The substrate is available in a wide range of colors that all demonstrate excellent ink adhesion.

1. Surface Preparation

- a. Surface should be cleaned and free of any surface contaminants (i.e. oils, dust particles, etc.) prior to commencing.
- b. The substrate should be cleaned with 70% isopropyl alcohol, using a non-colored cloth for best results. It is important not to use thinners or soaps as they may leave a film residue which can affect adhesion. Additionally, cleaners containing silicone can interfere with adhesion and are not recommended.

2. Suitable Inks

- a. When screen printing with the substrate, the following inks may be suitable:
 - Solvent-based
 - Vinyl/Acrylic
 - UV-cured
- b. Screen Printing inks should be tested in a manner which duplicates your printing process before initiating production. It is advised that you contact the equipment and ink supplier to provide you with specific recommendations to achieve maximum results. It is strongly recommended to consult the appropriate ink manufacturer regarding any required ink additives such as catalyst for proper adhesion and exterior use.

3. Ink Curing

- a. The ink, once applied, must be given proper time and treatment to completely adhere and cure.
- b. The substrate can must be cured by air drying, jet drying under 40 seconds at a maximum temperature of 175°F or UV cured. Temperature dwell times in excess of these limits may cause warping or distortion of the panel.

Painting – General Notes

Painting is a suitable fabrication option for the substrate, whether for artistic expression or more commercial applications. On some projects that involve the substrate, a small quantity of “custom color” may be required that is often not practical to obtain from the factory and post painting is a viable option.

1. Surface Preparation

- a. Surface should be cleaned and free of any surface contaminants (i.e. oils, dust particles, etc.) prior to commencing.
- b. The substrate should be cleaned with 70% isopropyl alcohol, using a non-colored cloth for best results. It is important not to use thinners or soaps as they may leave a film residue which can affect adhesion. Additionally, cleaners containing silicone can interfere with adhesion and are not recommended.

2. Suitable Paints

- a. The substrate readily accepts the following paints if the surface is scuff-sanded:
 - Poster colors
 - Acrylic paints
 - Tempera
 - India ink
 - Latex-based pigments
 - Lacquers
 - Acrylic Lacquers
 - Two-part polyurethanes
 - Vinyls
 - Some water-based paints may also be suitable, depending upon the application.

3. 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:
 - i. Make 11 parallel cuts 1/16" apart with a razor blade knife. Make 11 similar cuts at 90 degrees to cross the first set.
 - ii. Across the scored area apply a strip of strong tape, such as #610 Scotch tape. Press firmly.
 - iii. Immediately remove the tape by pulling it back upon itself at 180 degrees in one rapid motion.
 - iv. There shall be no removal of the paint squares to obtain a good adhesion rating.

4. 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.

5. Drying

- a. For drying and cure times, consult paint manufacturer’s literature.
- b. Due to the wide variety of paint products on the market, testing is recommended for the initial use of any coating system before commercialization.

6. A Note on Post-Painting

- a. Several paint manufacturers have tested their products for use on the substrate. Painting should be done by qualified parties with experience in this type of application.
- b. A urethane-based paint is typically recommended for use with the substrate because it provides exceptional adhesion. Any coating material under consideration should be tested for performance over small pieces of the substrate prior to full scale production. Lacquers are not recommended.
- c. For off-line coating and repaint operations, proper substrate preparation is important, from sanding and scuffing to proper primer selection. Best adhesion will occur after lightly scuff-sanding the substrate's existing polyester finish followed by an IPA wipe and application of properly selected paints.
- d. Any painting operation must be of the type that is cured by chemical action or by air drying. Never use a paint system that must be backed in an oven for curing. The drying time may be speeded up with heat provided that heat does not exceed a maximum of 175°F. The coating adhesion between the post paint finish and the original coating must be carefully evaluated using common coating adhesion testing procedures. Also, color and gloss matching needs to be evaluated to provide an acceptable final appearance. If testing indicates poor adhesion, do not proceed. Contact the coating manufacturer for additional recommendations.
- e. Metallic colors are difficult to repair and special procedures must be followed. Spray applications will not reproduce identical metal flake alignment obtained in the factory-applied finish. This is due to the application differences between coil-coated and post-painted finishes. Where sanding is necessary, do not sand through coating to metal substrate.

Cutting – General Notes:

There are many different methods in which “cutting” can be accomplished. This guide focuses on five primary cutting methods:

- Knife Cutting
- Shearing
- Saw Cutting
- Routing
- Die Cutting/Punching

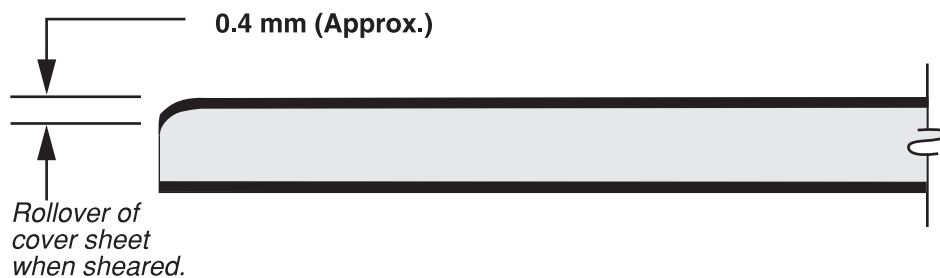
None of the aforementioned methods require cutting lubricants, oils or coolants. When necessary, laying out a pattern on the surface of the substrate is best achieved with a soft pencil.

1. Knife Cutting

The substrate is not recommended for this fabrication method. Please see the fabrication guide on page 9 for choosing the best recommended product.

2. Shearing

The substrate can be easily sheared. However, a slight roll-down of the aluminum cover sheet may occur on the impact side. This “roll-down” area is often referred to as the “edge zone.” In this area, the polyethylene core is compressed and can lead to increased stress between the core and the aluminum cover sheet. Due to this additional stress, shearing should be avoided when the edge of the panel is exposed to the environment. When shearing the substrate, light markings on the material may be caused by the hold down pads. In order to avoid these markings, the hold down on the shear should be fitted with a shock-absorbing rubber pad to prevent damage to the substrate.



3. Saw Cutting

The substrate is manufactured with a Polyester paint finish. Care should be taken to protect the finish during any sawing operation. In some cases it is best to move the saw blade rather than the substrate when sizing the panels.

1. Table Saws

Table saws are not recommended for cutting sheets larger than 4' x 4' in size.

- a. Blades should be Carbide tipped or High Speed Steel designed for cutting nonferrous materials, ground thinner from the rim towards the center to prevent pinching.
- b. The blades should have angled or circular teeth, alternate beveled, triple ground with the tooth gap wall rounded.
- c. The chip angle should be 5 to 15 degrees with a clearance angle of 10 to 30 degrees and a tooth spacing of 3/16" to 1".
- d. Cutting speeds of 5,500 RPM and feeds of 16"/second are possible.

2. Panel Saws

- a. Panel saws provide an effective method of cutting the substrate. These saws, whether standard equipment or custom made, perform well and have the added advantage of space savings.
- b. Blades should be the same type used for table saws.

3. Multiple Operation Rip/V-grooving Saws

- a. These saws are typically used for high volume production operations.
- b. Blades should be the same type used for Table Saws.

4. Portable (Circular) Saws

- a. Circular saws are also used effectively to cut the substrate. These saws should be production/industrial type equipment.
- b. Blades should be the same type used for table saws.

5. Reciprocating Saws

- a. Reciprocating saws work well for cutouts. Care should be taken with portable and reciprocating saws to prevent damage to the substrate surface.
- b. More than one sheet can be cut at a time by stacking panels.
- c. If center cutting (i.e. Letter cutouts) is required, a foam pad may be placed under the substrate with the reciprocating blade cutting into the foam.
- d. The sheets may be clamped or secured with double-faced tape for the cutting operation. When clamping between jaws, protect the panel surface against damage.
- e. Blades should be high speed steel, .03" to .047" thick, 3/16" to 9/16" wide, with hook or circular teeth with alternate angles, set or waved at a spacing of .010" to .250".
- f. Cutting feeds up to 4"/second are possible.

6. Band Saws

- a. Band saws may be used to cut irregular shapes or curves.
- b. Blades should be tempered spring strip steel, .03" to .047" thick, 9/16" to 1" wide, with skip teeth designed for non ferrous and ferrous materials spaced at a minimum of 10 teeth per inch.
- c. Cutting speeds of 10,000 FPM at a cutting feed of 10"/second are possible.

4. Routing – General Notes:

The substrate can be cut to size using either portable commercial or automated routing equipment. Bits should be carbide tipped and kept sharp. Single or multiple flutes may be used.

1. Routing: For Bending

- a. **e-panel is not recommended for this fabrication method as it is for flat sheet applications only. Please see the fabrication guide on page 9 for choosing the best recommended product.**
- b. The substrate can be accurately folded by hand after a simple routing operation is done on the back skin. This fabrication method is called Rout and Return. It is unique to metal composite panel fabrication. Do not use a press brake for tight folds of the substrate. The material may be routed by using one of the two following methods:
 - i. Hand operated routers equipped with modified 90-105 degree "V" bits (See figure 1) can be used effectively to remove material for folding.
 - ii. Table or circular saws can be equipped with a special blade (See figure 2); these blades referred to as "V" routing blades produce very close tolerances at a much faster rate than hand routers.

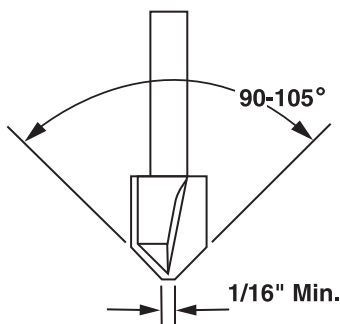


FIGURE 1

1/16" flat ground on bottom of commercially available wood working router bit.

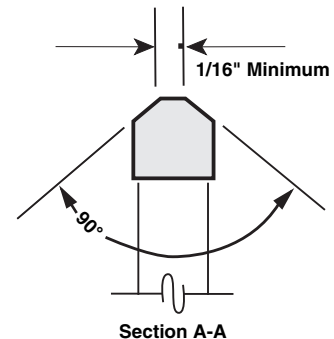
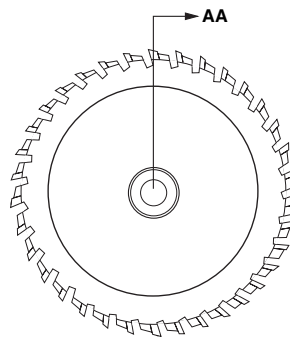


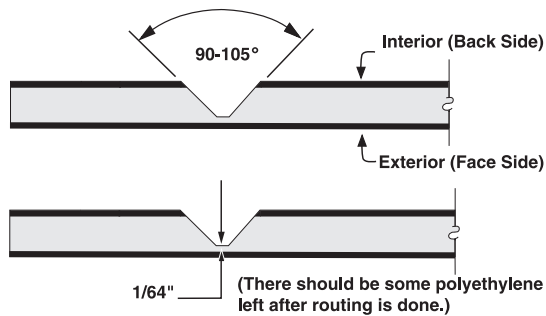
FIGURE 2

Routing Saw Blade ("V" Routing Blade)

2. Small Radius Bending (By Routing)

- A very small radius can be achieved by "V" routing and folding. The depth of the "V" rout is critical. As a general guide line, the exterior aluminum skin should be visible through the polyethylene core at the valley of the rout; this visual appearance should be consistent along the entire length of the rout (See figure 3). Constant depth of the rout ensures a good smooth line when the fold is made. Extreme care should be taken not to score the exterior aluminum skin with the cutter.
- By changing the shape of the cutter used, a larger radius can be achieved. A flatter, wider cut will result in a smoother bend (See figure 4).

FIGURE 3 - Routing



"V" Routing

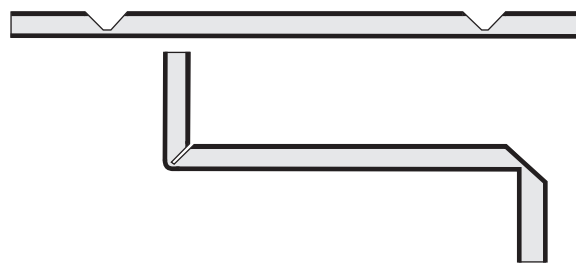
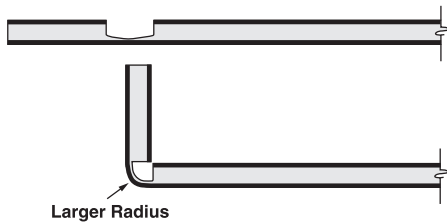
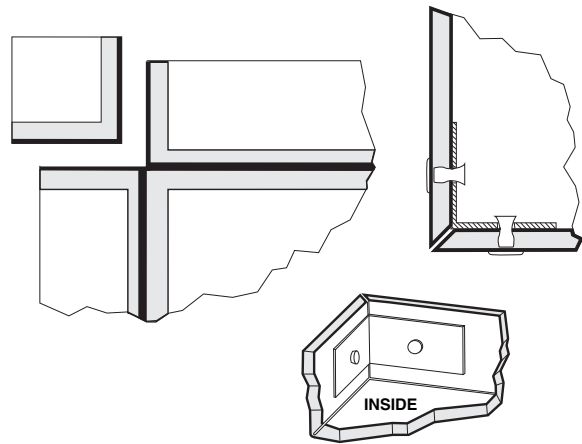


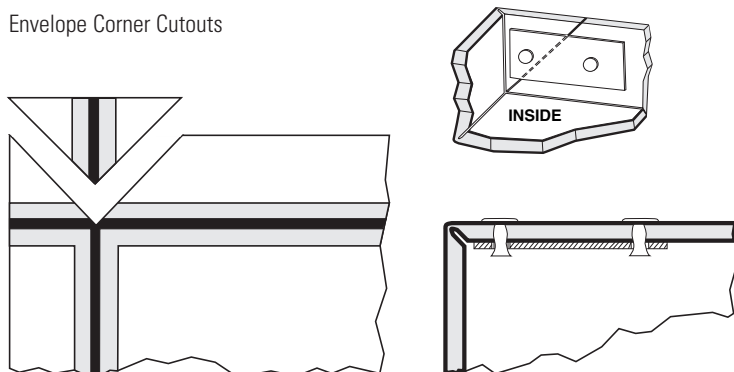
FIGURE 4 - Flat Routing



Square Corner Cutouts



Envelope Corner Cutouts

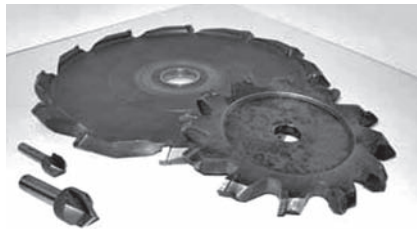


3. Making Corners

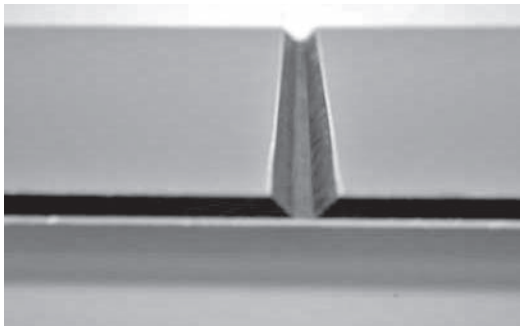
- a. An aluminum composite panel requires a “grooving” operation along any fold line prior to bending. This operation can be done with a custom saw blade or a customized router bit. Regardless of the tooling used the groove is commonly called a “rout.” The most common rout is a modified “90° V” with a flattened (1/8" wide minimum) bottom. The reason for this modification is so that the aluminum skin does not overstress during the bending process. Once correctly done, this V-Rout allows the composite panel to be folded along the rout from 0° to 90° easily. The term “Rout and Return” means that a panel has been routed and the edge returned or folded.
- b. A rout made with profiles other than 90° allows the substrate to be bent to various angles. These profiles eliminate fabrication problems and combine to create different joining techniques. Two additional common router profiles discussed in this document are the 135° and the Flat Rout.

4. Common 90° V-Routed Corner

- a. The most common corner is a 90° Rout and Return. This corner is made by folding a V-Routed panel to a 90° angle.
- b. It is critical that the modified V-Rout is made to the correct depth to create a good return angle. “Spring back” will occur if the rout is not deep enough, however, extreme care should be taken not to score the exterior aluminum skin with the router bit or blade during the routing operation so that the aluminum skin is not weakened. The depth is correct when the exterior skin is intact with approximately 1/64" of polyethylene in the bottom of the V-Rout and the return does not “spring back” when folded.



90° V-Router Bits & Blades



Modified V-Rout in Dibond®



Folded V-Routed Corner

5. Multiple 90° Corners

- a. The solid core of the substrate allows the panel to be routed at any location. Wherever a fold is required, a rout can be made. Rout, notch, fold and reinforce with a gusset (back-up plate), and a “dimensional” panel can be easily made.



Flat Panel Routed and Notched

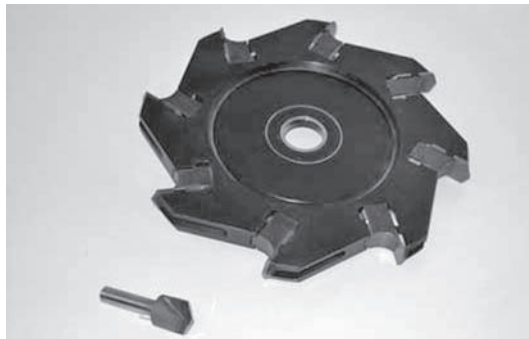


Panel Folded and Gusseted

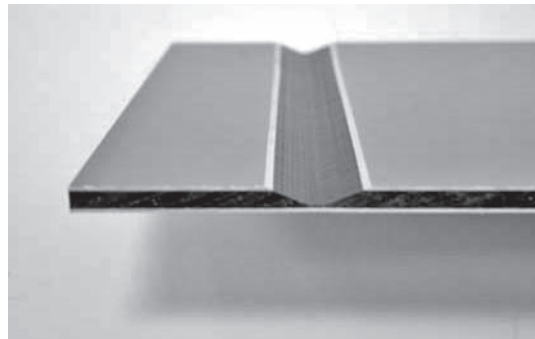
- b. Gussets can also be made from solid aluminum sheet stock. Regardless of the material used to make the gusset, the corner should be trimmed so it will not interfere with the folded corner.

6. 135° Profile

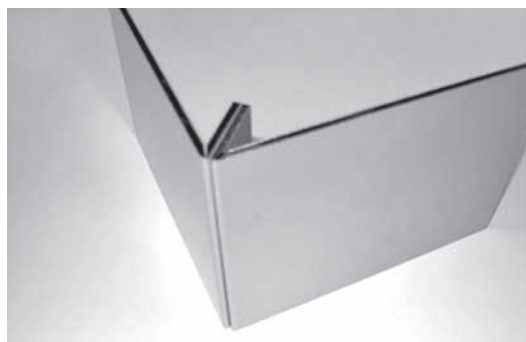
- a. This profile allows the panel to be folded to a 45° angle. This is useful when it is necessary to join two panels at a 90° corner.



135° Router Bit and Saw Blade



Modified 135° Rout



Two 45° Corners Riveted to Make a 90° Corner

7. 90° Corner with Sawed Relief Cuts

- a. A rout and return curved corner requires the curved portion of the return to be relieved to allow the substrate to curve. These “relief” cuts can be made with a router or a saw cut. They must be done carefully to prevent “bumps” being visible at the end of the relief cuts and showing on the exterior of the substrate. The pictures below show this type of corner reinforced with a gusset and the “bumps” visible along the curved edge.



Curved Panel with “Bumps”



Gusset Shown (Inside View)

8. 90° V-Routed and Trimmed

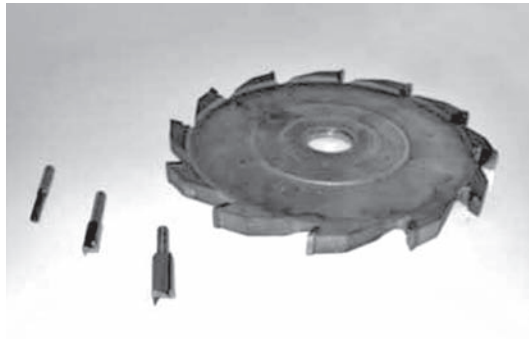
- a. There are instances when the “return” is trimmed or removed flush with the back of the substrate. One example is when a rout and return panel is fabricated into a curved panel. This method allows the outer skin of the substrate to be rolled without distortion. The substrate is first V-Routed and the return is removed at the correct location. The substrate is then curved and the return reinforced with a gusset. A filler plate has been added to form a Rout and Return Corner panel. This method eliminates “bumps.”



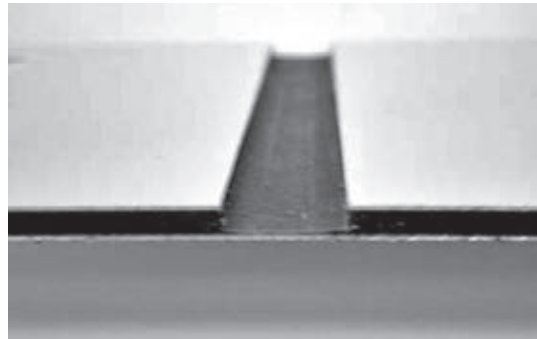
Corner Panel with Gusset and Filler Plate

9. Flat Routed Corner

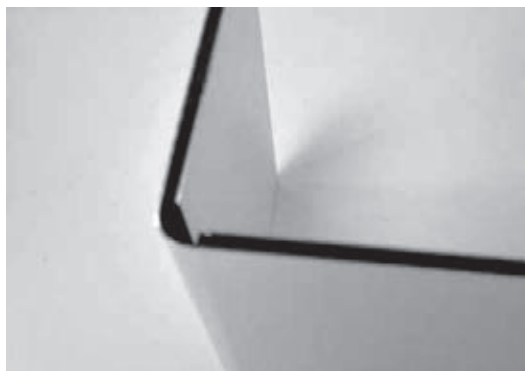
- a. This routed profile can be made with tooling of various widths. Once made, it allows the corner to curve gently and not be as sharp as the 90° V-Rout.



Flat Router Bit and Saw Blade



Flat Routed



Corner with Flat Rout

10. Flat Rout Distorted to Eliminate “Bumps” in Rout and Return Curved Corner

- a. The Flat Rout can also be folded anywhere within the “flat rout” to create a sharp 90° bend. This sharp 90° bend is sometimes used in the fabrication of a rout and return curved corner panel to eliminate the “bumps” at sawed relief cuts. The panel below has a gusset for reinforcement.



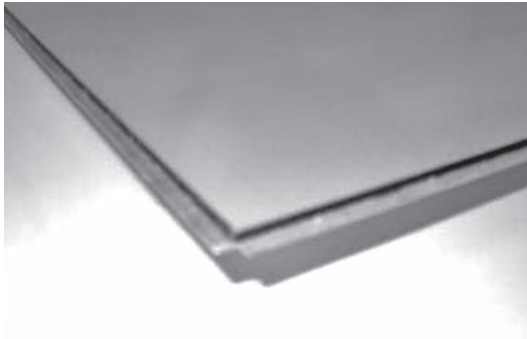
Distorted Flat Rout Folded 90°



Curved Corner

11. Flat Rout Used to Make a “Hem and Cope”

- a. The only time a rout is set to a depth to remove the entire core material is when a “Hem” or “Cope” is needed. Both are made using a flat rout. A cope makes a support (sometimes called a rabbet joint) at the edge of the substrate. It is generally routed to the same width as the substrate thickness. A hem is made by first cutting a cope and then bending the remaining skin over the core material. These two flat routed conditions can be used independently or together to solve many fabrication needs.



Cope at Edge of Panel



Folded Cope (A Hem)



Cope at Edge of Panel



Folded Cope (A Hem)

5. Die Cutting/Punching

Die cutting and/or Punching is a method for the rapid production of flat shapes or cutouts. Typical applications would include the die cutting of:

- Letters and shapes.
- Openings in a sheet used as part of an assembly
- Puzzle pieces

Die cutting and punching processes are similar in that they both can provide a curved shape by cutting through a substrate. Die cutting, however, uses one steel rule die that comes in contact with a flat platen, whereas, a punch has two designed shapes, a male and a female that cut the shape when pressed together.

Die cutting is typically used with lighter weight paper or foam type materials, where punches are used for heavier materials.

Prior to die cutting, the substrate can be painted or screen printed.

1. A Note on Punching

The punching of holes or flat-formed parts using the substrate is performed in the same way as for solid aluminum sheet. Evenly ground tools and the narrowest possible cutting gap will provide the best results. The substrate can be punched with a male-female die.

2. Steel Rule Die Cutting Process

The substrate is not recommended for this fabrication method. Please see the fabrication guide on page 9 for choosing the best recommended product.

Section VII: Embossing

Embossing

The substrate is not recommended for this fabrication method. Please see the fabrication guide on page 9 for choosing the best recommended product.

Forming Curves – General Notes

e-panel is not suitable for this fabrication method as it is for flat sheet applications only. Please see the fabrication guide on page 9 for choosing the best recommended product. The forming of curves can be accomplished with the substrate to provide a unique dimensional effect. Curves are typically formed by cold forming.

Curving Through Cold Forming

For forming curves requiring cutting techniques, see Section on Cutting.

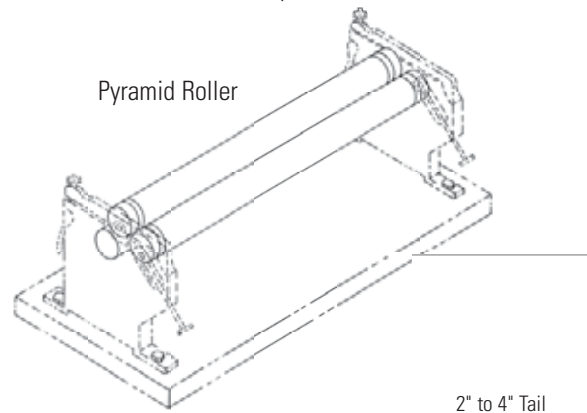
The minimum curving radius of the substrate without routing the back skin is 30 times the thickness of the material. For example, using a 2mm thick sheet: $2\text{mm} \times 30 = 60\text{mm}$ radius (2-3/8").

The substrate may be curved using one of the three methods common to the sheet metal industry:

1. Pyramid Roller

The use of a pyramid roller to curve the substrate is an acceptable method of obtaining a radius.

As a precaution, film should be used between the substrate and the rollers to protect the substrate surface.



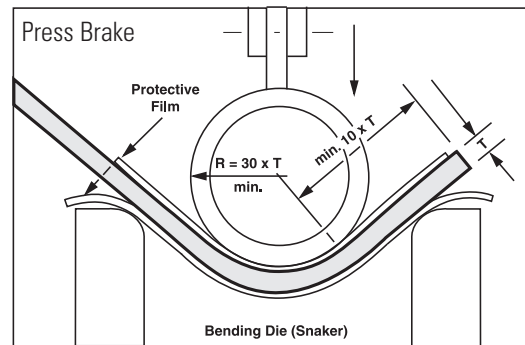
2. Press Brake

When forming with a brake press, use a top die with the desired radius.

The lower die should always have a protective film of less than 1/8".

The radius of the top die will be the approximate inside radius of the finished panel.

The end of the substrate should extend at least 10 times its thickness from the tangential contact point of the bending die.

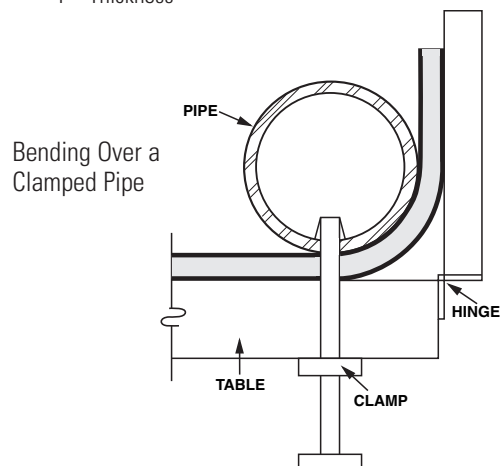


R = Radius
T = Thickness

3. Bending Over a Clamped Pipe

The substrate may be bent over a pipe of desired radius that is securely clamped to a table.

A hinged "leaf" attached to the end of the table will bend the substrate easily.



Material Safety Data Sheet (Page 1 of 3)

SECTION 1 - PRODUCT IDENTIFICATION

TRADE NAME:

Dibond®

SYNONYM:

Aluminum Laminated Construction

MANUFACTURER'S NAME AND ADDRESS:

Alcan Composites USA, Inc.
208 W. 5th Street, P.O. Box 507
Benton, KY 42025
(270) 527-4200

EMERGENCY TELEPHONE:

1-800-424-9300 Chemtrec

To be used only in the event of chemical emergencies involving a spill, leak, fire, and exposure accidents involving chemicals.

SECTION II - MATERIAL IDENTIFICATION AND INFORMATION

INGREDIENTS (Common Name)	PERCENT (%) (By wt.) ¹	Occupational Exp. Limits (OSHA) (mg/m3)
Polyethylene (CAS #9002-88-4)	39-72	10.0 Total ⁽²⁾ 5.0 Resp. ⁽²⁾
Aluminum ⁽³⁾	28-61	15.0 Total ⁽²⁾ 5.0 Resp. ⁽²⁾

SECTION III - PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Composite sheet material, odorless

MELTING POINT: 593° C / 890° F

SPECIFIC GRAVITY: 2.70-2.73 g/ccm range

SOLUBILITY: Insoluble in water

¹ Concentration of ingredients depends upon the thickness of the material.

² These products are not considered to be a health hazard in the form in which they are sold(sheet, panel). However, if these products are abraded, melted, welded, cut or processed in any manner that causes release of fumes or dusts, hazardous levels of fumes or dust may be generated from these materials or constituents of these materials. Dust from these materials is regulated as particulate, N.O.S.

³ This product is not considered to be a health hazard in the form in which it is sold(sheet, panel). However, if this product is abraded, melted, welded, cut or processed in any manner that causes release of fumes or dusts, hazardous levels of fumes or dust may be generated from these materials or constituents of these materials. Aluminum fumes or dust are subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Material Safety Data Sheet (Page 2 of 3)

SECTION IV - FIRE AND EXPLOSION DATA

AUTO IGNITION: Composite – (ASTM D-1929) 768 °F, 409 °C

EXTINGUISHING MEDIA: Water, foam, CO₂, dry chemical powder

SPECIAL FIRE FIGHTING PROCEDURE: Toxic gases may form upon combustion. Respiratory protection is recommended.

THERMAL DECOMPOSITION: May produce carbon monoxide, carbon dioxide, organic vapors.

SECTION V - REACTIVITY DATA

STABILITY: Stable.

INCOMPATIBILITY: None known.

DECOMPOSITION PRODUCTS: Reference: "Thermal Decomposition", Section IV.

CONDITIONS TO AVOID: None known.

SECTION VI - HEALTH HAZARD DATA

These products are not considered to be a health hazard in the form in which they are sold (sheet, panel). However, if these products are abraded, melted, welded, cut or processed in any manner that causes release of fumes or dusts, hazardous levels of fumes or dusts may be generated from these materials or constituents of these materials.

EFFECTS OF OVEREXPOSURE:

ACUTE: Physical irritation of the eyes may result from overexposure to high concentrations of dust or chips from certain fabricating operations. Overexposure to high concentrations of respirable dust may result in pulmonary fibrosis.

CHRONIC: Repeated long term inhalation of high concentrations of respirable dust may cause inflammation of the upper and lower respiratory tract.

SPECIAL PRECAUTIONS: Avoid prolonged inhalation of high dust concentrations and ingestion of material. Wash hands before eating, drinking or smoking. Wear proper eye and respiratory protection when working in areas of high dust concentrations.

EMERGENCY AND FIRST AID PROCEDURES: For dust contact with eyes, wash immediately under water for at least 15 minutes. For dust inhalation exposure, remove to fresh air. Contact a physician.

Material Safety Data Sheet (Page 3 of 3)

SECTION VII - STORAGE, HANDLING, AND DISPOSAL DATA

WASTE DISPOSAL: Care must be taken when using or disposing of material debris to prevent environmental contamination. Dispose of the debris in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act and all state or local laws / regulations regarding disposal.

STORAGE AND HANDLING PRECAUTIONS: Store in a flat dry area. Handle carefully to avoid scratching product finish. Caution should be taken to avoid sharp edges.

SECTION VIII - PERSONAL PROTECTION DATA

PRIMARY ROUTES OF ENTRY: Inhalation and ingestion of dust concentrations.

RESPIRATORY PROTECTION: An approved NIOSH/MSHA respirator must be used when engineering controls cannot be implemented to control dust concentrations. Reference OSHA 1910.134 for specific requirements.

VENTILATION: Local exhaust. Reference OSHA 1910.94 for specific requirements.

EYE: Eye protection must be worn when working in dust concentrations and during sawing or other operations which might cause flying debris. Reference OSHA 1910.133 for specific requirements.

PROTECTIVE GLOVE: Gloves should be used to prevent cuts or scrapes.

IMPORTANT: The information and data contained herein are believed to be accurate and have been compiled from sources believed to be accurate. All information contained herein is offered for your consideration, information, investigation, and verification. 3A COMPOSITES USA, INC. MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION AND DATA HEREIN. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE SPECIFICALLY EXCLUDED. 3A Composites USA, Inc. will not be responsible for claims relating to any parties' use of or reliance on information and data contained herein regardless of whether it is claimed that the information are inaccurate, incomplete, or otherwise misleading.

Adhesives

Adhesives Used with Dibond® Material

One of the display features in great demand is the ability to attach Dibond® Material to a substrate without having exposed fasteners. Although there are some techniques to accomplish this using conventional fasteners, the vast majority of this type connection is done using adhesives. To develop some general guidelines, 3A Composites USA Inc. has reviewed some well-known adhesives and can present the following information.

The following General Guidelines have been established based on the research done into the use of adhesives on Dibond® material.

1. **To achieve reliable bonding, it is imperative to follow the adhesive manufacturer's application instructions.**
2. Although many adhesive materials work well on the coil coated paint finishes on Dibond® Material, no product, either adhesive or tape, has been found that will adhere to the polyethylene core material. **All attachments should be made through contact with the painted aluminum facers of Dibond® material.**
3. Care must be taken in the selection of an adhesive regarding the thermal expansion of the materials to be joined. Where significant thermal expansion can occur (i.e. exterior applications) adhesives should be of medium or low modulus materials to allow for movement without shear or loss of bond. For interior applications where thermal expansion is not a consideration, high modulus adhesives can be used to join materials.
4. Cure time is generally a consideration in the choice of adhesives. Silicones take a good deal of time to cure before a load can be applied whereas the faster curing adhesives do not have the movement capabilities to meet the project needs. In these instances, a combination of double sided foam tape and adhesive is often used.

Example: Two pieces of Dibond® Material must be connected for a strong permanent bond in a short period of time. The adhesive area is 2" by 36".

Many times a strip of double sided foam tape (approx. 3/4" wide) will be applied next to a bead of silicone adhesive. For the near term, the tape holds the Dibond®. For the longer term, the silicone adhesive will cure and relieve the load applied to the tape.

Adhesive Research Results

The following adhesives have been shown to adhere to Dibond® Material. For specific questions about the adhesive, please refer to the adhesive manufacturer guidelines.

Isopropyl alcohol two-cloth cleaning method is a minimal surface preparation for all adhesive bonding.

1-Part Silicones, Adhesives and Sealants:

- Dow 995: 1-part silicone structural adhesive
- Pecora 864, 890, 895: 1-part silicone sealant
- Tremco Spectrem 1, Spectrem 2, Proglaze SG: 1-part silicone sealant
- Schnee Morehead SM5731, 1-part silicone sealant
- GE SCS2800, SCS9000, SCS2000, SCS2900, GE7000, 1-part silicone sealant

Isopropyl alcohol two-cloth cleaning method is a minimal surface preparation for all adhesive bonding.

1-Part Silicones or Urethane Adhesives/Sealants Requiring a Primer:

- Dow 790, Dow 795: 1-part silicone sealant
Surface preparation: solvent wipe and Dow Corning 1200 Prime Coat required.
- Tremco Dymonic: 1-part polyurethane sealant
Surface preparation: Isopropyl alcohol two-cloth cleaning method, primer #6

2-Part Methacrylate, Urethane, and Epoxy Adhesives:

- Lord 406/19 (methacrylate), 7542AB, 7545AB (urethane)
- Extreme Adhesives 300, 310, 350, 5315, 5375 methyl methacrylate
- IPS Weld-On 45, Weld-On SS515 (methacrylate)
- Scotch Weld 3M 2216 (epoxy with long working time): Scuffing required

Isopropyl alcohol two-cloth cleaning method is a minimal surface preparation for all adhesive bonding.

The adhesive manufacturers have reported that, Lord 406/19 and IPS Weld-On 45 may also be used on unprimed aluminum. Testing on this substrate was not included in this report.

Synthetic Rubber and 1-Part Urethane Adhesives:

- Lord 7610 (1-part urethane): Scuffing required
- Schnee-Morehead SM7108 (1-part urethane)
- Liquid Nails LN-901 (synthetic rubber)

Isopropyl alcohol two-cloth cleaning method is a minimal surface preparation for all adhesive bonding.

Acrylic Foam Tape:

- 3MTM 4845 Acrylic Foam
- YHB Tapes

Summary

Many different types of adhesives and tapes have been found to work well with Dibond® Material. It is important to follow the guidelines listed above and to experiment with any new adhesive or technique prior to generating the final product. For adhesive manufacturer contact information, please see Appendix II: Products For Use.

Fastening

Joining Dibond Material

Typical methods of joining Dibond material are the use of threaded fasteners, rivets, adhesives and double-faced high strength tapes.

Proper consideration should be given to the thermal expansion characteristics of Dibond material. See Thermal Expansion Section.

Use the general guidelines listed below when other elements come in direct contact with the surface of Dibond material. It is always recommended to trial application various joining techniques to ensure success.

1. Acceptable Joining Element Materials:

- Aluminum
- Plastic
- Stainless Steel

2. Unacceptable Joining Elements:

- Copper
- Brass
- Bronze
- Iron
- Raw Steel

Unacceptable materials may cause corrosion of joining surface due to electrolysis of dissimilar materials.

Threaded Fasteners

Threaded fasteners will allow the removal of the panel if needed. The use of a large flat washer will aid to minimize surface pressure and possible compression due to cold flow of the core material. Placement of the threaded fasteners should not be less than .75" from the edge of the sheet. It is not recommended to torque fasteners due to the cold flow of the core material, one turn past finger tight is common practice.

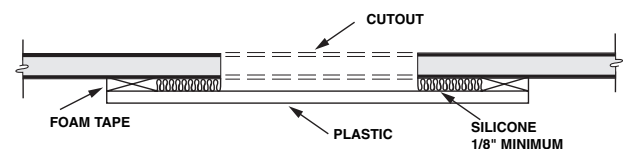
Rivets

Panels of Dibond material can be fastened together or joined to aluminum extrusion profiles with rivets common to aluminum construction. Rivet connections are well suited for parts that may be subjected to vibration. Colored plastic concealment caps can be used to conceal the exposed rivet head. Consult the rivet manufacturer for details.

Adhesives

For interior design purposes, high strength contact adhesives that do not require lengthy setting times can be used. Where moderate cure times are acceptable, construction adhesives and silicones can be used to obtain a stronger bond than with contact adhesives.

When using an adhesive to hold dissimilar materials, select one that will allow thermal differential movement without shearing. Use a low modulus sealant where greater amounts of movement are expected (i.e., plastics to Dibond material), and medium modulus sealants if minimum movement is expected (i.e., bonding aluminum to Dibond material).

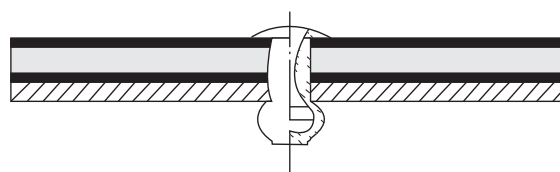
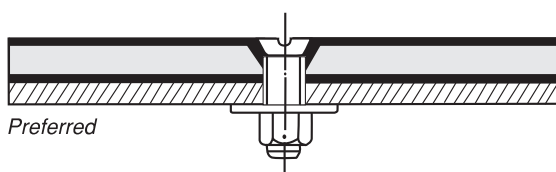
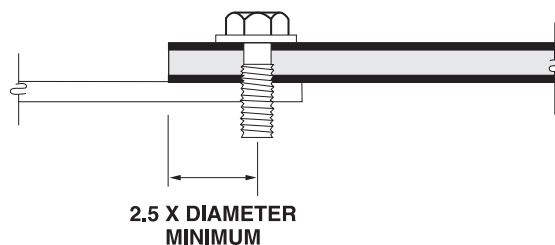
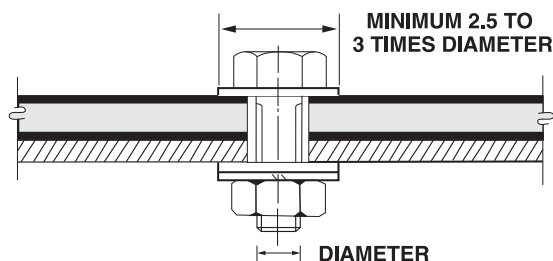
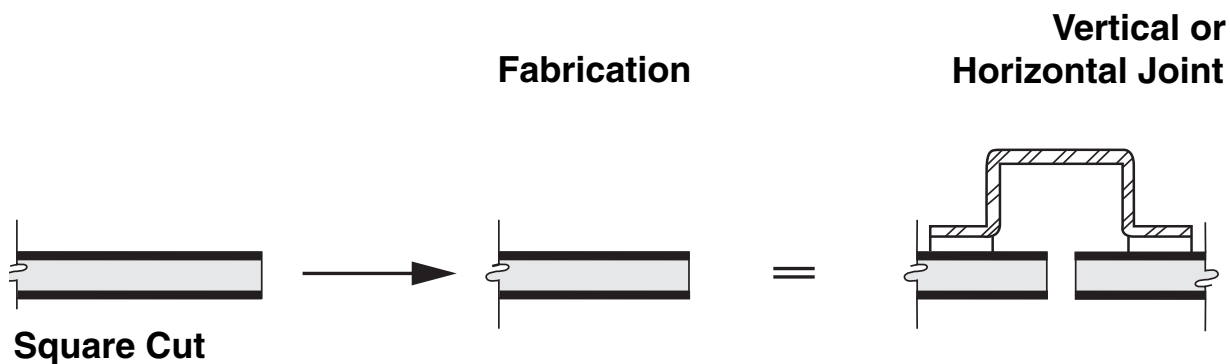


Tapes

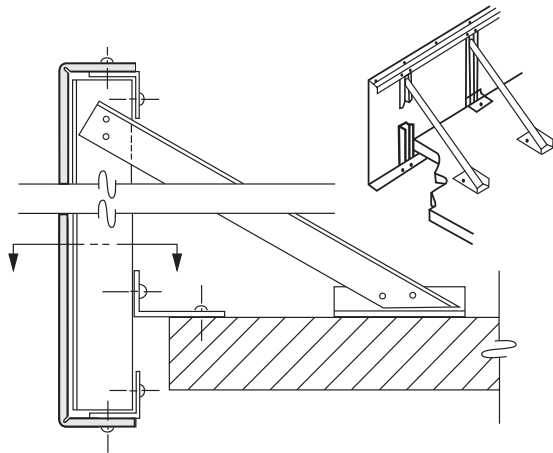
For stress-free applications and to hold parts while the primary adhesives cures, double-faced foam tapes are effective. Both surfaces to be bonded must be clean and dry. It is important that the tape manufacturer's directions are followed for best results.

Concepts

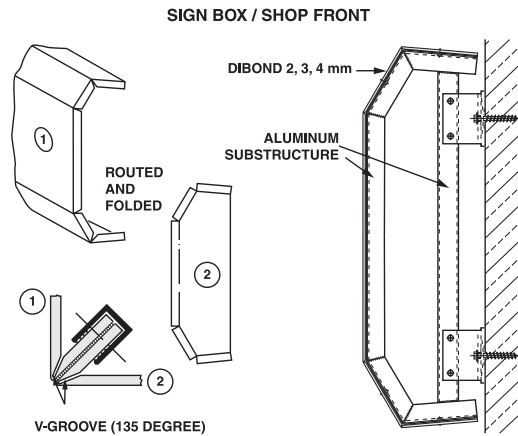
The following details are provided for conceptual purposes only. These are not the only methods that can be used to attach Dibond material, nor can they be used generically without consideration for each individual application. Good design for thermal expansion should influence the choice of details used.



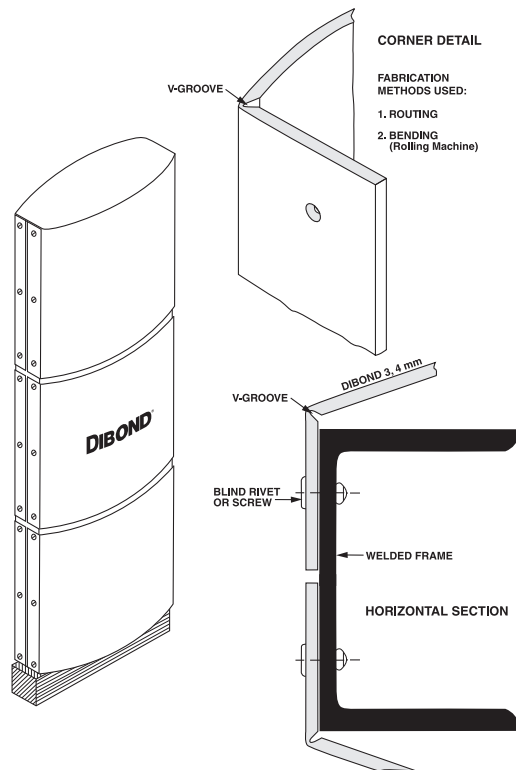
PAN FACES



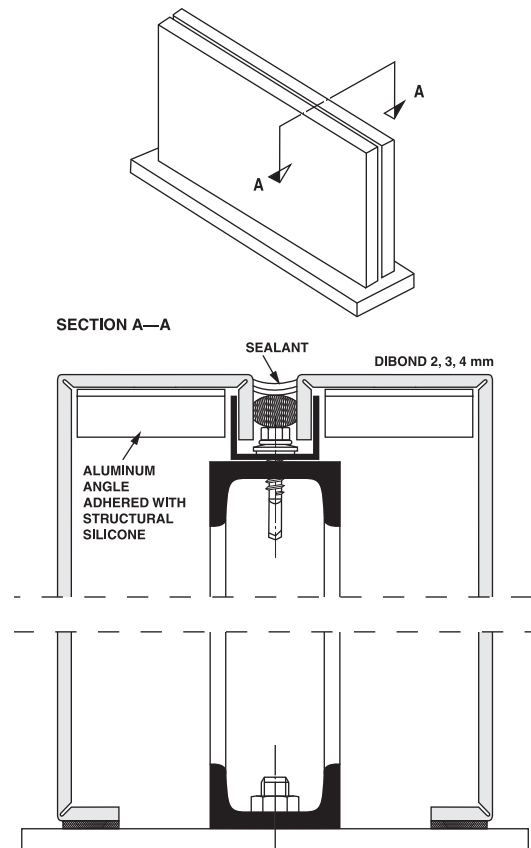
SIGN BAND / CANOPY / FASCIA



SIGN BOX/SHOP FRONT



SIGNS (TOTEEM)



SIGN BOX/MONUMENT SIGN

Drilling

Dibond material can be drilled with twist drills usually used for aluminum and plastics, and on drilling machines customarily used for metals.

WORKING SPECIFICATIONS:

Drill bit: Twist drill, high speed steel
Tip Angle: 100-140 degrees, or counter-bore grind with centering tip
Cutting speed: 164 RPM to 984 RPM

Quick removal of chips can be achieved by a high RPM, slow feed speed and occasional lifting of the bit.

Thermal Expansion

Thermal expansion should always be considered in designs using Dibond material. Dibond material has been tested and has a rate of expansion of .000156"/FT/°F. That translates into approximately an 1/8" movement in an 8' panel with a 100°F temperature change. Temperature differences must be considered between shop (fabrication) temperature and the highest and lowest panel temperature. Care should always be taken to avoid restricting thermal movement of the panel to eliminate unacceptable bowing or over stressing of the fasteners.

The coefficient of expansion for unlike materials should be considered in joint design.

Storage Guidelines

Dibond is to be stored inside in a dry and clean area. Material must be stored flat.

Dibond material should always be stored in a cool dry area where temperatures are relatively stable. Excessive temperature fluctuations may cause condensation to form on the stored sheets possibly resulting in permanent damage. Do not allow moisture to reach stored material.

The best way to store Dibond material is to lay it flat. If a rack storage system is decided upon, use the base of the crate as a bottom support for the material to rest on. If Dibond material is leaned on its side, it should be positioned to lean on the horizontal edge of the material only. Dibond material panels should be handled carefully when removing the panels from storage so that they do not slide against each other or so they don't slide over a rough surface to avoid panel damage. Vertical stacking of Dibond material is not recommended.

ENGINEERING SPECIFICATIONS

Panel-Thickness:			2mm	3mm	4mm
Thickness of Aluminum Cover Sheets Weight [lb/ft²]			0.012 in		
			0.60	0.79	0.98
Technical Properties:					
Tensile Yield	ASTM D638	PSI	8450	5580	4390
Ult. Yield	ASTM D638	PSI	8500	6220	5000
Elongation	ASTM D638	%	7.6	12	13
Tensile Modulus	ASTM D638	PSI x 10 ⁶	2.13	2.5	1.81
Ult. Flexural	ASTM D790	PSI	20120	15050	12180
Flexural Modulus	ASTM D790	KSI	1391	1430	1440
Flatwise Comp.	ASTM C365	PSI	1026	739	790
Shear Strength	ASTM C273	PSI	1637	1030	920
Thermal Cond. (K)	ASTM C177	BTU-in/hr.ft²-°F	0.953	1.221	1.532
Thermal Rest. (R)	ASTM C177	Hr.ft²-°F/BTU	0.084	0.097	0.103
Deflection Temp.	ASTM D648	°F	Above 350	303	188
Moment of Inertia		[in⁴/in]	.00003	.000075	.000141
Section Modulus		[in³/in]	.00079	.00126	.00172
Alloy of Cover Sheets				3000 Series	
Linear Thermal Expansion				0.000012 in/in/°F	

EVALUATED POST-PAINT FINISHES

SUPPLIER	SURFACE PREPARATION	PRIMER	TOP COAT
Akzo Nobel 800-233-3301 or 770-662-8464	Degrease with Grip-Gard® M-600 Wax & Grease Remover. Sand surface with 320-360 grit paper dry		Grip-Gard®
	Degrease with Grip-Gard® M-600 Wax & Grease Remover.		Grip-Gard® HS Grip-Gard® Plus Meta-Flex®
Carbit Paint Co. 312-280-2300	Clean surfaces with a 50/50 blend of isopropyl alcohol and water		Carbithane® 11 Series Carbithane® 12 Series
Dupont Industrial Coatings, 800-338-7668	Scuff sand with red Scotch-Brite pad, clean with H-69 isopropyl alcohol		Imron® 333 Line Polyurethane Enamel, Imron® 1.2 Waterborne Copolymer WG
	Scuff sand with red Scotch-Brite pad, clean with H-69 isopropyl alcohol	Imron® 1.5 Waterborne Copolymer Primer WF	Imron® 1.2 Waterborne Copolymer WG
	Scuff sand with red Scotch-Brite pad, pad, clean with H-69 isopropyl	Corlar® VHS 90P Epoxy Mastic Primer	Imron® 333 Line Polyurethane Enamel
Matthews Paint Co. 800-323-6593 or 262-947-0700	Wipe down with 45330SP Speed Prep Cleaner, abrade with 320/400 grit or red Scotch-Brite pad and wipe down with 45330SP Speed Prep Cleaner		MAP® VOC MAP® Satin VOC MAP®
One Shot, LLC 219-949-1684	Lightly scuff sand with gray Scotch-Brite pad and wipe down with isopropyl alcohol	5005 Acrylic Bonding Primer White	1 SHOT® Lettering Enamels, CHROMATIC Bulletin Colors
PPG Industries 800-441-9695	Lightly scuff sand and remove all forms of contamination; clean with solvent		PPG Duracryl® Acrylic Lacquer
T. J. Ronan Paint Corp. 800-247-6626 or 718-292-1100	Wipe with isopropyl alcohol (91%)		Bulletin Color, Lettering Enamel, Aquacote® (waterborne)
Sherwin-Williams 700-331-7979		DTM Bonding Primer	DTM Acrylic Coating METALATEX Semi-gloss Coating
	Cleaning per SSPC-SP1 (Solvent cleaning)		Bond-Plex® water based acrylic coating
Spraylat Corp. 800-336-1936 or 914-699-3035	Must be sanded or primed	Series 20/30 Wash Primer Polyurethane	Series 20 Acrylic Lacquer Series 30
	Scuff sand using Scotch-Brite Pad		Polycryl

SCREEN PRINTING INKS

INK SUPPLIER	SOLVENT INKS	UV INKS
Naz Dar (913) 422-1888	System 2 7200 9700	3200 w/5% NB 80 3600 w/5% NB 80
Sericol (800) 737-4265	Uvipak PE Fast Dry Enamel HGXE SP Enamel	Fascure Satin Gloss Poly MR Matte Polydyne Uvipak PE

Certificate of Compliance

Certificate Number **20100215 – E101623B**
Report Reference **E101623, 1992 September 08**
Issue Date **2010 February 15**

Page 1 of 1



Issued to: **ALCAN COMPOSITES USA INC**

**208 W 5TH ST
PO BOX 507
BENTON, KY 42025 USA**

*This is to certify that
representative samples of*

Sign Accessories - Component



Model Descriptions: Component Sign Accessory, Structural sign panel material, designated "DIBOND" made 2 mm, 3 mm, or 4 mm of polyethylene laminated on two sides with aluminum.

*Have been investigated by Underwriters Laboratories Inc.® in accordance
with the Standard(s) indicated on this Certificate.*

Standard(s) for Safety: **The basic standards used to investigate products in this category are ANSI/UL 879, "Electric Sign Components" and CAN/CSA-C22.2 No. 207, "Portable and Stationary Electric Signs and Displays."**

Additional Information: **See UL On-line Certification Directory at www.ul.com for additional information.**

Only those products bearing the UL Recognized Component Marks for the U.S. and Canada should be considered as being covered by UL's Recognition and Follow-Up Service and meeting the appropriate U.S. and Canadian requirements.

The UL Recognized Component Mark for the U.S. generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark: , may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions. The UL Recognized Component Mark for Canada consists of the UL Recognized Mark for Canada:  and the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory.

Look for the UL Recognized Component Mark on the product

William R. Carney
Director, North American Certification Programs

Underwriters Laboratories Inc.

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

For questions, please contact a local UL Customer Service Representative at <http://www.ul.com/global/eng/pages/corporate/contactus/>

DIBOND® PRODUCT SPECIFICATIONS			
Physical Product Specifications	2mm	3mm	4mm
Target Thickness	2mm	3mm	4mm
Gauge (+ or -)	+ / - 0.008" (0.2mm)	+ / - 0.008" (0.2mm)	+ / - 0.008" (0.2mm)
Sheet Size Tolerances			
Width	0" + 0.188" (3/16")	0" + 0.188" (3/16")	0" + 0.188" (3/16")
<66" Length 66" - 96" >96"	0" + 0.375" (3/8")	0" + 0.375" (3/8")	0" + 0.375" (3/8")
Diagonal	max 1/4"	max 1/4"	max 1/4"
Squareness (Cut Straightness)	N/A	N/A	N/A
Warpage / Bow	Length or width max .8%	Length or width max .8%	Length or width max .8%
Surface Energy (Dyne)	N/A	N/A	N/A
Color (ΔE)	N/A	N/A	N/A
Opacity	N/A	N/A	N/A

Definitions:

Target Thickness: The gauge that is to be focused on as optimum. The Gauge Range is then used to define the limits of the thickness that can be considered "in spec".

Gauge Range: The upper and lower limits in thickness that a product can be manufactured making it "in spec".
Example: Target of 250mils with a range of + or - 25 mils would be 225 mils to 275 mils.

Sheet Tolerances: We measure width, length and diagonal. Width is typically cross machine, length is typically machine direction and diagonal is the difference in the diagonals.

Squareness: The difference in the lengths of the machine direction sides.

Warpage / Bow: This is the measured by laying the sheet flat on a surface and measuring the amount of "smile" or "frown" in the center of the board in either the length or width. Should we have a problem described as "potato chip" this is a two direction warp, which is automatically "not in spec".

Surface Energy (Dyne): This is measured using standard dyne solution pens

Color (ΔE): This is measured using a standard color meter.

Opacity: This is measured using a standard opacity meter.

e-panel™ PRODUCT SPECIFICATIONS			
Physical Product Specifications	2mm	3mm	4mm
Target Thickness	2mm	3mm	4mm
Gauge (+ or -)	+ / - 0.008" (0.2mm)	+ / - 0.008" (0.2mm)	+ / - 0.008" (0.2mm)
Sheet Size Tolerances			
Width	+ / - 2 mm	+ / - 2 mm	+ / - 2 mm
Length <66" 66" - 96" >96"	+ / - 3 mm	+ / - 3 mm	+ / - 3 mm
Diagonal	max 5 mm	max 5 mm	max 5 mm
Squareness (Cut Straightness)	max 1 mm/m	max 1 mm/m	max 1 mm/m
Warp / Bow	max 5 mm/m	max 5 mm/m	max 5 mm/m
Surface Energy (Dyne)	N/A	N/A	N/A
Color (ΔE)	N/A	N/A	N/A
Opacity	N/A	N/A	N/A

Definitions:

Target Thickness: The gauge that is to be focused on as optimum. The Gauge Range is then used to define the limits of the thickness that can be considered "in spec".

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Surface Energy (Dyne): This is measured using standard dyne solution pens

Color (ΔE): This is measured using a standard color meter.

Opacity: This is measured using a standard opacity meter.

Mounting

Adhesive Engineering & Supply Inc.
15 Batchelder Road
Seabrook, NH 03874
Tel: (603) 474-3070
Fax: (603) 474-2750
www.extremeadhesives.com

GE Sealants & Adhesive
260 Hudson River Road
Waterford, NY 12188
Tel: 800-332-3390
Tel: 800-255-8886

Macco Adhesive Liquid Nails
925 Euclid Avenue
Cleveland OH 44115
Tel: 800-637-0015

3M Adhesive Division
3M Center, Building
220-8E-05 St.
Paul, MN 55144-1000
Tel: 800-362 3550

Dow Corning Corporation
Midland Michigan 48686-0994
Tel: 517-496-4000

IPS Corporation
455 W. Victoria Stree
Compton, CA 90220
Tel: 800-898-3300
Tel: 310-898-3300
Fax: 310-898-3392

Lord Corporation
2000 West Grandview Blvd.
Erie, PA 16509
Tel: 800-458-0434
Tel: 814-868-3611
Fax: 814-864-3452

Pecora Corporation
165 Wambold Road
Harleysville, PA 19438
Tel: 800-523-6688
Tel: 215-723-6051
Fax: 215-721-0286

Schnee Morehead, Inc.
111 North Nursery Road
Irving, TX 75060
Tel: 1-800-TRUST SM
Tel: 972-438-9111
Fax: 972-554-3939

Repositioning Vinyl

Direct Digital Printing

Direct Screen Printing

Painting

Cutting

Forming Curves

Framing

Fastening

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This Fabrication Manual has been developed to assist fabricators to work with the substrate in the most efficient and effective manner. The tips and suggestions contained in this manual are the result of many years of combined experience by fabricators in the U.S., Canada, South America, Asia and Europe.

These fabrication suggestions and product specifications 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 manual 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. 3A COMPOSITES USA, INC., DOES NOT MAKE ANY WARRANTIES, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR PURPOSE, WITH RESPECT TO ANY SAID SUGGESTIONS AND PRODUCT DATA. In no event shall 3A Composites USA, Inc., have any liability in any way related to or arising out of said suggestions and product data for direct, special, consequential or any other damages of any kind regardless of whether such liability is based on breach of contract, negligence or other tort, or breach of any warranty, express or implied.

Also, normal safety and health precautions practiced in any fabricating environment should be used when fabricating the substrate.



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