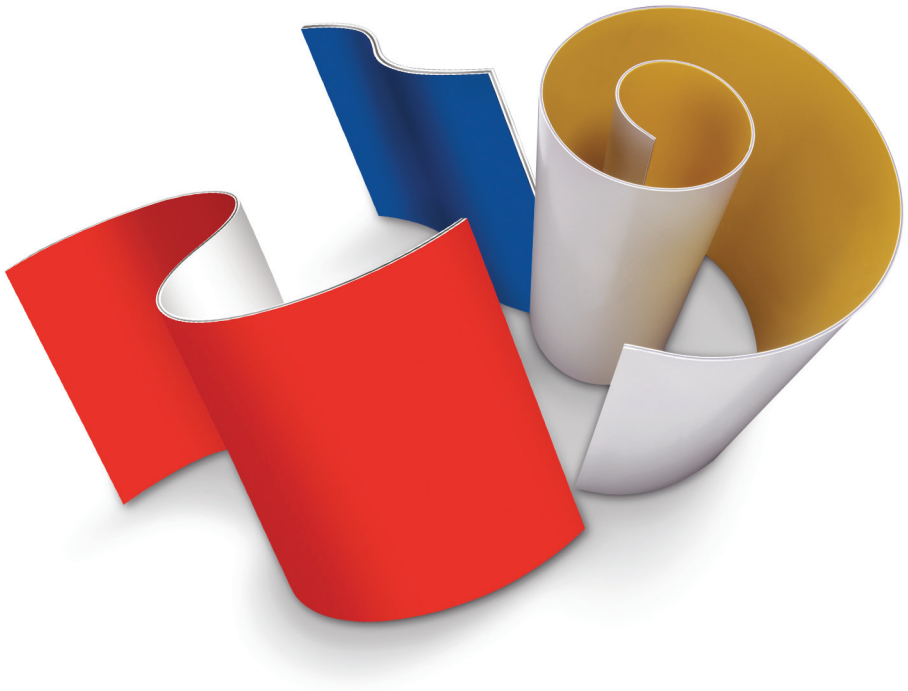
REYNOBOND®

General
Guidelines



General Information and Fabrication Guidelines

ARCONIC

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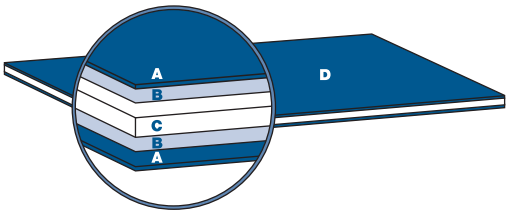
PRODUCT DESCRIPTION

Reynobond® aluminum composite material (ACM) is a high-performance wall cladding product from Arconic Architectural Products LLC (AAP), consisting of two sheets of nominal 0.020″ (0.50 mm) aluminum, each permanently bonded to an extruded core. This is an elegant concept resulting in an extraordinarily flat and highly formable material with an excellent strength-to-weight ratio (see figure 1).

Figure 1



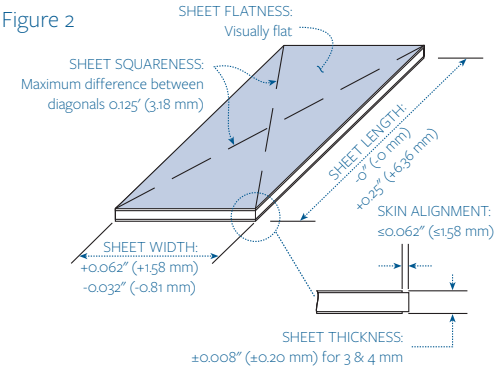
A. Aluminum skin
B. Tie layer between aluminum skins and core material
C. Fire Retardant (FR) core
D. Reynobond® Aluminum Composite Material

Reynobond® composite material is well suited for multiple applications. Reynobond® product applications include: exterior and interior cladding, corporate identity/retail programs, column covers, interior partitions, canopies, enclosures, kiosks, exhibits and displays.

Reynobond® ACM, for architectural applications, is only available with a Fire Retardant (FR) core. Reynobond® ACM is available in a near-infinite variety of colors.

The versatility of Reynobond® ACM offers many distinct advantages to the designer, fabricator and installer: unique flatness for creating smooth, monolithic surfaces; virtual elimination of oil canning; exceptional load-bearing capacity and flexural strength. Strong, smooth, flat, lightweight, durable and attractive—all inherent characteristics of a product that is easy to fabricate and install.

Figure 2



Tolerances

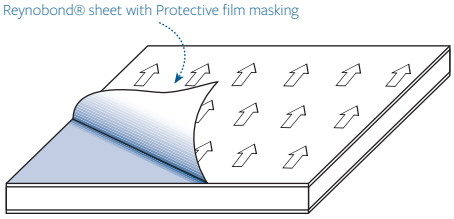
Reynobond® products are manufactured to exacting tolerances with state-of-the-art equipment in a continual process. AAP has a reputation for manufacturing products of the highest quality, and Reynobond® products are no exception. Reynobond® composite material is manufactured to the tolerances shown (see figure 2).

Packaging, Shipping & Handling

Reynobond® sheets are cut to length and packed on cushioned, wooden skids. Each skid is enclosed with thin board. Skids are then secured using poly cord strapping.

Figure 3

Reynobond® sheet with Protective film masking



Reynobond® ACM without stiffeners or edge forming, should be handled carefully. Longer sheets will sag at the center; therefore, when lifted at each end they should be supported at additional points within the length. A 4 mm thick Reynobond® FR composite sheet weighs approximately 1.55 lb/ft^2 (7.57 kg/m^2). Protective film masking, nominally 2.8 mils (70 microns) with ultraviolet (UV) barrier helps protect the sheet finish during transportation, fabrication and installation (see figure 3). Care should be taken to keep worktable surfaces clear of metal chips and shavings,

etc., which could penetrate the masking and scratch or mar the sheet surface. Although the protective film masking is UV stabilized, it should be removed as soon as possible after installation.

Finishes

Prior to composite sheet production, the aluminum skins are coil-coated. Coil-coating produces exceptional quality, efficiency, uniformity and economy compared to electrostatic spraying.

Standard opaque finishes offered on Reynobond® ACM are two-coat finishes typically consisting of a 0.2 mil primer and a 0.8 mil color coat, for a nominal dry film thickness of 1.0 mil. Standard mica finishes on Reynobond® ACM are two-coat finishes typically consisting of a 0.2 mil primer and a 0.8 mil color coat with mica flakes suspended in the finish for a nominal dry film thickness of 1.0 mil. Standard metallic finishes on Reynobond® ACM are three-coat finishes typically consisting of a 0.2 mil primer, a 0.8 mil color coat and a 0.5 mil clear top coat for a nominal dry film thickness of 1.5 mils. Mica and metallic coatings are reflective or pearlescent in appearance as a result of millions of micron-sized aluminum or mica flakes suspended in the paint mixture and subsequently oriented in one longitudinal direction during the coating process. The flakes are dried in position as the color coat is cured. The longitudinal orientation of the flakes may cause a lighter or darker reflective appearance of the finish in one viewing axis. Sheets or trim pieces turned in different directions may appear a slightly different shade. It is important that mica- and metallic-coated sheets are fabricated and installed with this coating orientation in mind. Sheet directionality must be maintained to avoid shading differences between adjacent sheets on the wall. AAP prints directional arrows on the back surface of every sheet during production. The number of the production lot or unit is inked along with the directional arrows to identify the production run and each sheet is also time stamped. Additionally, the protective film is also printed with directional arrows to aid in the proper orientation of the sheets.

All sheets are directionally oriented in the packing skids. Should any sheet's direction be lost, it is possible to determine this by inspecting the sheet ends. The shear that cuts the sheets to length at the end of the line will leave a slightly turned-down top skin along the leading edge. The trailing end top skin will be square cut by the shear.

Paint coating systems using either mica (mica flake) or metallic (aluminum flake) to provide a more pearlescent or reflective surface, respectively, have characteristics that may cause a variation in the perceived visual look of the panels when mounted on vertical surfaces. Forming Reynobond® composite material at or below ambient temperatures of 60° F (15.5° C) may adversely affect the appearance and performance of the finish.

Sawing & Routing

Sawing and routing Reynobond® composite material are relatively easy processes that can be done with ordinary commercial metal and woodworking equipment.

Saw blades and router bits are available through independent distributors who handle cutting tools. A list of potential manufacturers is located on the last page of this guide.

Reynobond® FR core material may produce fine airborne particles when cut or routed, so we recommend breathing protection be worn.

Line Cuts

We recommend 8″ (203 mm) diameter, extra fine, carbide-tipped, 60 tooth, combination rip and crosscut blades. These blades can be used in both table and circular hand saws to successfully cut Reynobond® composite material. Longevity of the cutting edge is dependent on the number and length of cuts performed (see figure 4).

Routed Cuts

Circular Saws: AAP recommends working with a custom tooling supplier. A special circular saw blade should be acquired that is wide enough to accommodate the special tooth design necessary to cut the correct groove, per figure 5. A tool steel saw is adequate for machining aluminum Reynobond® composite material. Ideal grooves are 105°, with a 1/32″ flat to allow the proper clearance when the sheet is bent to 90°.

The saw-type cutter should be at least 4″ in diameter. The cutter should operate at an rpm and feed rate to yield approximately 500 surface feet per minute as a beginning target. This can be increased for aluminum. A chip thickness of 0.002″ or less should be targeted. Too aggressive a feed may cause delamination of the skin. A sample cutter could be 8″ in diameter with 18 insert-type teeth.

Note:

The groove must be cut to remove the back metal skin and part of the core material. A recommended 0.020″, but no less than 0.010″, of core material must be left with the front metal skin to ensure a proper bend radius when the 90° bend is made. This is true for all types of Reynobond® products and for any type of cutter used (see figure 5 for a detail of the groove).

Router Bits:

Router bits may be used to machine the 105° V-groove in aluminum. The cutter should have an included angle of 105° and have the end ground to provide the 1/32″ flat cut necessary for the proper groove (see figure 5). This type of cutter

Figure 4

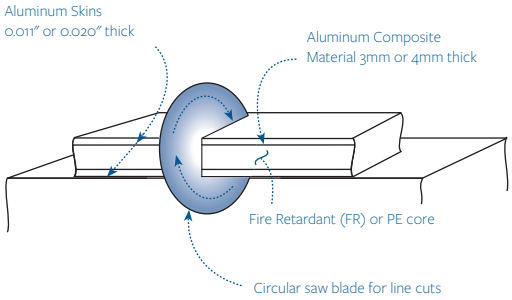


Figure 5

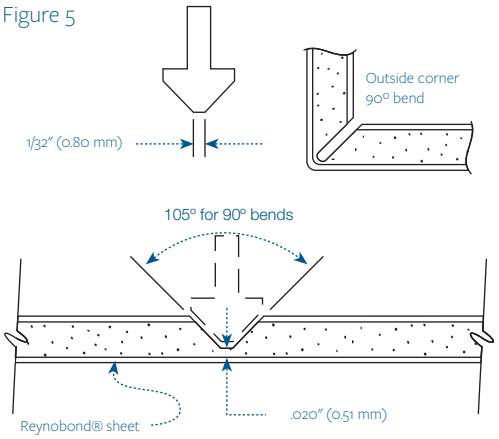


Figure 6

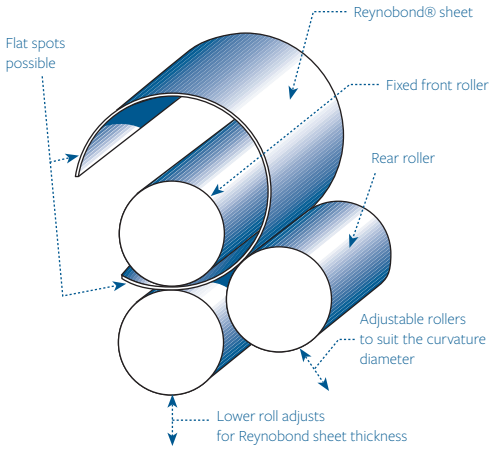
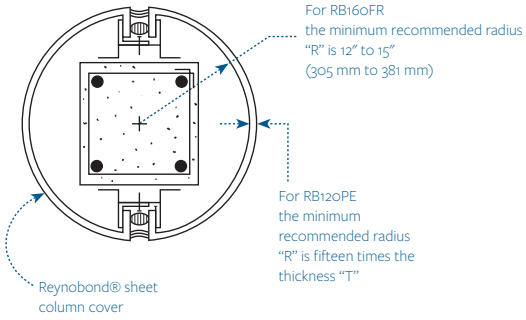


Figure 7



does not have a very good tool life when machining other types of Reynobond® products. A saw-type cutter has better capacity to machine the product while dissipating the heat generated at a more rapid rate. Should the cutter get too hot, the core chips will stick and overload the cutter.

Reverse Bends:

AAP does not recommend reverse bend for Reynobond® FR core products.

Panel Saws:

Automated vertical and horizontal panel saws are available through equipment manufacturers and distributors. These panel saws allow multiple vertical and horizontal routs and cuts to be made on one sheet at a time. Reynobond® composite material is usually mounted vertically in the fixture, and the cutting operation performed in this manner requires less shop floor area than if the sheets are placed flat on a table. Panel saws can streamline the fabrication process. Reynobond® FR core material may produce fine airborne particles when cut, so we recommend breathing protection be worn.

Radiusing or Curving

Reynobond® ACM can be radiused to curved configurations for column covers, architectural bullnoses, radius-building corners and other applications requiring radius forming. This process can be accomplished with a "pyramid" rollforming machine, which consists of three motor-driven adjustable rollers. You can successfully radius or curve Reynobond® composite material using machines with minimum 6" (152 mm) diameter rolls. The operator normally makes multiple passes of the sheet through the rollers to gradually obtain the desired radius (see figure 6).

Reynobond® FR composite material is offered in a standard thickness of 4 mm. The FR core material has a minimum recommended curving radius of 12" to 15" (305 to 381 mm) (see figure 7). Note that the first 1" to 2" (25 to 50 mm) of the sheet edge may not be curved as it travels through the rollers. AAP does not recommend stretch forming or heating the Reynobond® sheet in any fashion to enhance formability.

Bending

Reynobond® composite material can be brake formed from 0° (flat) to 90° (right angle). AAP recommends that RB120, 3 mm sheets, be bent with a minimum inside radius of 5/8" (16 mm) and RB160, 4 mm sheets, be bent with a 3/4" (19 mm) inside radius. The tests were done in a hydraulic brake press using an open-air, bend-bottom die with an inside opening of 2" (51 mm) and an edge radius of 3/4" (19 mm). To avoid damaging the aluminum skin, it is recommended that the center

part of the die be filled with 60 durometer rubber up to the top edges of the die. As with any fabrication technique, experiment with scrap material prior to production (see figure 8). Note: If the metal temperature is too low, damage can occur while bending.

A variety of fasteners are used to fabricate and install Reynobond® composite material. Fastener selection is the construction project engineer's responsibility. You may successfully use specific fasteners for sheet load-testing purposes in obtaining building code recognition. We can provide this information upon request.

Pop rivets are often utilized to attach aluminum clip angles and other structural or ornamental elements to Reynobond® sheets. Because the rivet body will be in contact with the aluminum skins of the sheet, it is recommended that either aluminum or stainless steel rivets be used, to avoid dissimilar metal contact. We have successfully used two 3/16″ (5 mm)-diameter rivets to attach aluminum clip angles to the return leg of a rout-and-return panel system (see figure 9). Ultimate shear and tensile strengths of various rivets are available from the rivet manufacturer. Please be advised that some building code jurisdictions do not endorse the use of pop rivets for structural connections.

Screws are also used to perform many of the same applications as rivets. Stainless steel sheet metal screws are recommended for attaching Reynobond® composite material. It is recommended that sheet metal screw-thread-type fasteners be used, especially when the screw is under tension load and this load is resisted by the aluminum skins (see figure 10). Occasionally, Reynobond® sheets are face fastened directly to supports or subgirts. The type and thickness of the support metal, as well as the applied load, will dictate the size and thread type of the correct fastener. Testing is advisable to determine the performance of any fastening system.

Through bolts may join adjacent Reynobond® sheets to each other or to other elements. Galvanized, stainless steel or aluminum bolts, nuts and washers should be used to avoid dissimilar metals contact. Caution is recommended in torquing the nut onto the bolt. Because the plastic core material is compressible, over-torquing can deform the metals skins. Use lock or double nuts with washers to prevent the nut from loosening over time (see figure 11).

Installation Methods

Reynobond® composite material can be easily installed for both exterior and interior applications. Wet-seal and dry-seal systems are available from a number of architectural dealers. Most installations use the rout-and-return method.

Figure 8
BRAKE FORMING REYNOBOND® COMPOSITE SHEETS

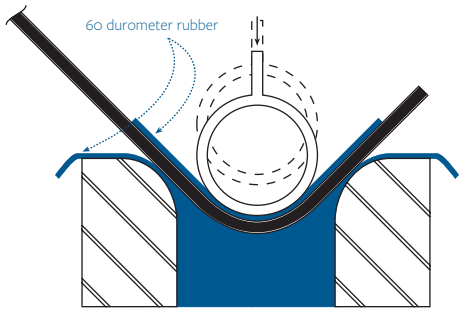


Figure 9
ROUT-AND-RETURN SYSTEM

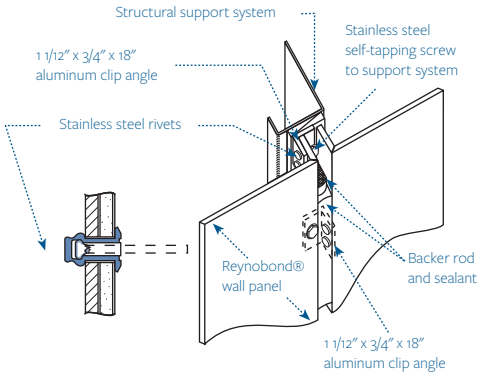


Figure 10

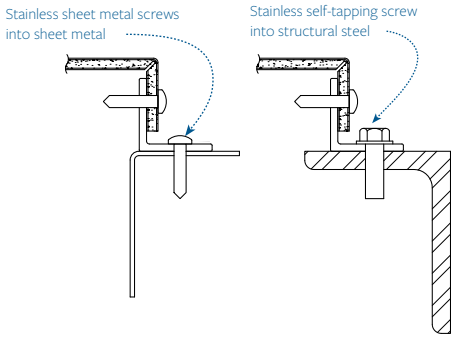


Figure 11

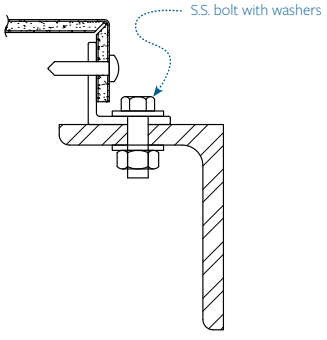
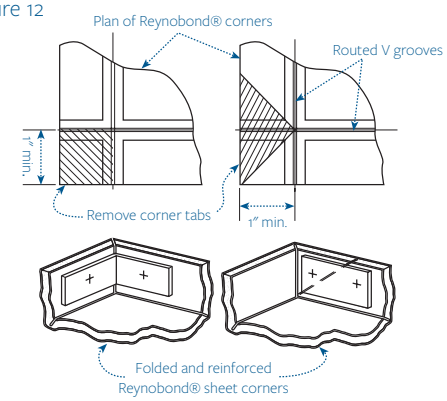


Figure 12

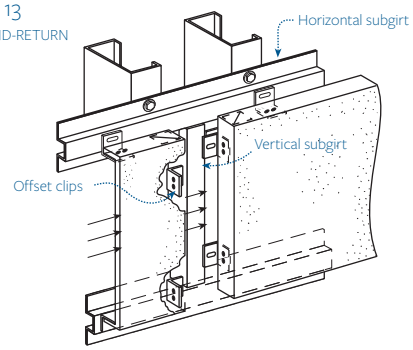


Rout-and-Return System

Rout-and-return begins with a flat sheet of Reynobond® ACM. Typically, a continuous V-shaped routed groove is made around the entire panel perimeter at a constant distance of 1″ (25 mm) from the edge of the Reynobond® composite material. The face skin and a minimum thickness of 0.020″ (0.51 mm) of core material are all that remain after routing. The corners are removed and the edges are folded to create a 1″ (25 mm)-deep "pan" or cassette. The corners are reinforced with riveted aluminum angles to stiffen the Reynobond® material. (see figure 12).

Prepunched aluminum clip angles are then attached at approximately 12″ (305 mm) on center to the returned pan edges. These clip angles transfer the wind load on the sheet into the structural supports. Clips are staggered from one sheet to the next to allow sequential installation. Rout-and-return joints should be at minimum 5/8″ (16 mm) wide to allow for thermal movement. Slotted holes may be required in the aluminum clip angles at fastener connection points to accommodate this thermal movement (see figure 13). Rout-and-return joints are then caulk sealed to prevent air and moisture infiltration. For interior applications, Reynobond® composite material may be installed with lightweight extrusions (see figure 13) or in partition systems. Reynobond® sheets are also well suited for glazing into storefront and curtainwall applications.

Figure 13
ROUT-AND-RETURN



Silicone Sealants

Silicone sealants are often used in rout-and-return panel applications to caulk horizontal and vertical Reynobond® joints. This creates a primary weather seal between the exterior panel system and the interior of the building. Silicone sealants demonstrate excellent compatibility and adhesion to the finishes of Reynobond® composite material.

We do not recommend the placement of silicone sealants directly against exposed material due to inadequate adhesion to core material. Incidental contact of silicone sealant with the core material should not present any short- or long-term detrimental effects to the sheet as a whole. Care must be taken to avoid staining of the painted sheetl face with these sealants during installation.

Silicone sealant is also used to structurally adhere perimeter extrusions and stiffeners to the back of the panel. Compatibility of any sealant to either painted surfaces or mill-finish aluminum should be confirmed by actual tests. Painted surfaces require a solvent cleaning prior to the application of any sealant. In some cases the painted surface may also require the application of a primer or adhesion promoter. Please contact your sealant provider for assistance with regard to your specific application.

Repair

Sheets may occasionally become scratched or nicked during fabrication and installation. Small scratches can easily be repaired with matching air-dry touchup paint. Proper surface preparations such as sanding and priming may be required to achieve satisfactory results.

Touchup paint should be applied with an artist's brush. Consult the paint manufacturer's application instructions for specific details. Paint systems that require oven heat for curing should not be used. It is recommended that a full-size sample be test painted before large-scale painting is undertaken.

Thermal Movement

Reynobond® sheets will thermally expand and contract the same as solid aluminum sheet or plate material. Reynobond® 4 mm sheets have an expansion coefficient of 1.31 x 10^5 in/in/°F (2.36 x 10^5 mm/mm/°C). We suggest that architectural wall panel joints be a minimum 5/8″ (16 mm) wide to account for thermal movement of the panels, unless design calculations prove otherwise. The expected increase in length of a 10′ (3050 mm)-long sheet will be about 3/16″ (4.8 mm) for a rise in temperature of 100° F (38° C). Assuming this sheet is fixed at its center with connections that allow thermal growth in both directions, a 100° F temperature increase would reduce a 5/8″ (16mm) wide joint to 7/16″ (11 mm). Thermal growth or contraction can occur in any direction on the sheet and is always greatest along the longest dimension of the sheet.

Reinforcement

Reynobond® composite material can be stiffened by various means to resist wind loads and reduce deflection. Stiffeners are usually 1″ to 1-1/2″ (25–38 mm)-deep aluminum extrusions and are adhered to the nonexposed back side of the sheet at 24″ (610 mm) on center. Stiffeners act like miniature beams and are most effective if used across the shortest dimension of the sheet (see figures 15 and 16). Because stiffeners act as support beams, the applied wind load to the sheet is transferred to the stiffener and the stiffener "reacts out" to the edge of the sheet. Therefore, support clips should be located as close to the stiffener as possible (see figure 16).

The fasteners used to attach the sheet to the structural supports should be placed at or close to the stiffener end locations so that loads are transferred from sheet to stiffener to support in the most direct manner. Stiffener spacing is a design decision that involves a number of variables such as stiffener strength, stiffener span, design wind load, allowable specified deflection, sheet thickness, fastener strength and support stiffener spacing and design should be determined by a qualified design engineer (see figures 14, 15 and 16). Because the maximum sheet deflection is at the geometric center of the sheet, a stiffener should be placed

Figure 14
REAR VIEW OF STIFFENED ROUT & RETURN PANEL
See section thru stiffener below (figure 20)

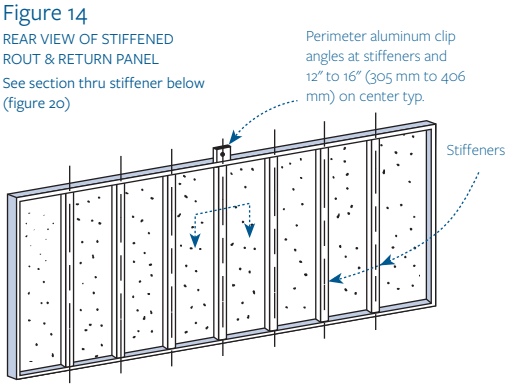


Figure 15
SECTION THRU STIFFENER

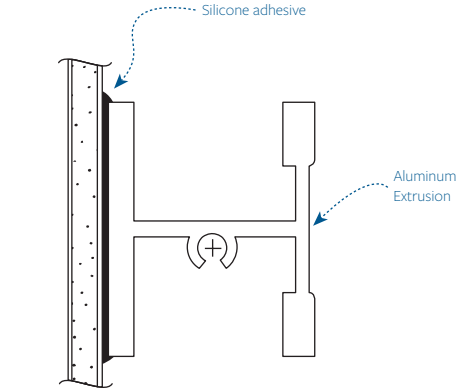
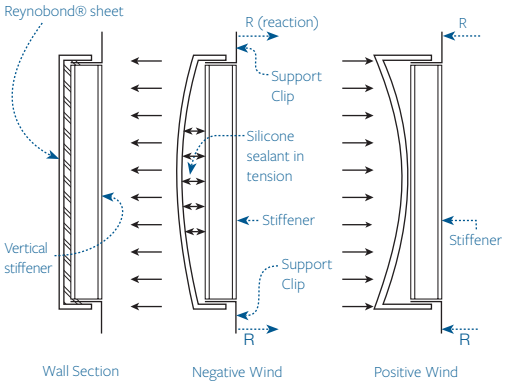


Figure 16
STIFFENER BEHAVIOR UNDER WIND LOAD



there. Any remaining stiffeners should be parallel and equally spaced before applying adhesive for stiffeners. It is recommended (or required) that the back side of the Reynobond® ACM should be lightly sanded and wiped with isopropyl alcohol to enhance the bond.

Panel Cleaning

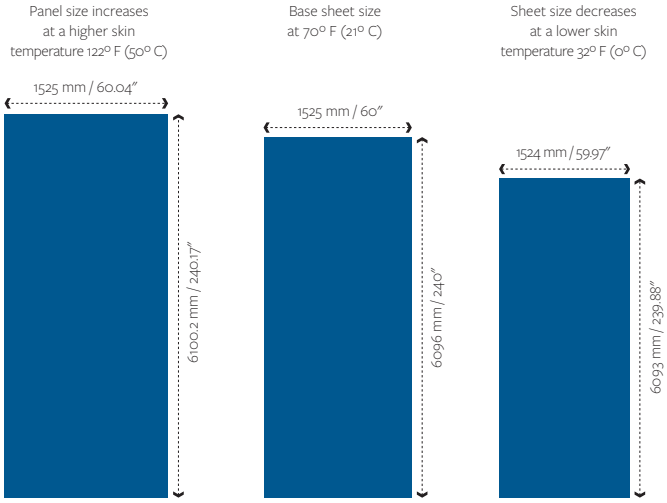
Reynobond® composite material has factory coil-coated skins with multiple finish options. Depending on the geographic location of the building and the atmospheric conditions, routine maintenance may be required to clean the surface of the Reynobond® composite material to restore the sheets to their original appearance.

In industrial areas where thorough cleaning is necessary, or for stains resulting from tree sap, insecticides, chimney fumes, etc., the finish should be washed with a sponge or soft-bristled brush and a solution of mild detergent and water (1/3 cup mild detergent per gallon of water). Immediately rinse surfaces thoroughly with a hose. To minimize streaking, wash from bottom to top. An adequate rinse should be assured to cleanse the finish and also further dilute the solution so as not to harm shrubbery. It is also advisable to test the solution or cleaner on a small, inconspicuous area before applying it to larger exposed areas. Mineral spirits may be used sparingly to remove caulking compounds or tar from the finish. Rinse with clear water. We recommend the American Architectural Manufacturers Assocation's (AAMA) "Voluntary Guide Specification for Cleaning and Maintenance of Painted Aluminum Extrusions and Curtainwall Panels," Publication No. 610-15, as a suitable cleaning reference.

Thermal Movement Examples

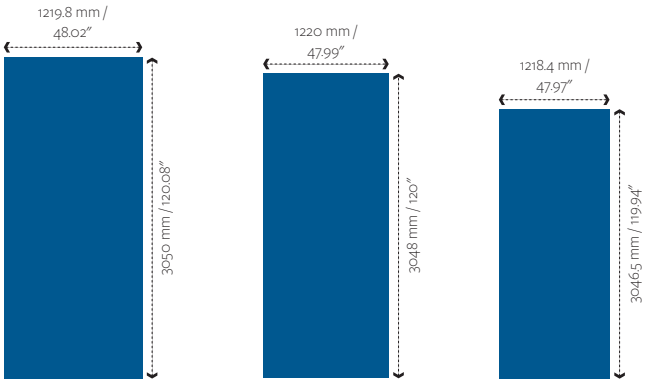
5′ x 20′ Sheet (Example 1)

Summary: For a 5′ x 20′ (1525 mm x 6096 mm) panel, a 90° F (32° C) change in skin temperature could result in expansion or contraction of 0.28″ (7.2 mm) along the longest dimension of the sheet.



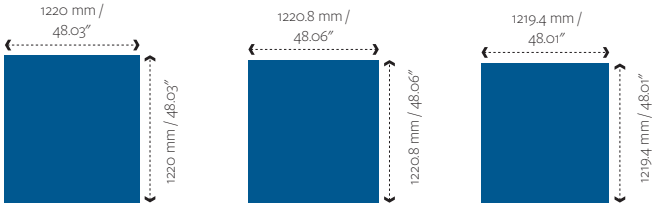
4′ x 10′ Sheet (Example 2)

Summary: For a 4′ x 10′ (1220 mm x 3048 mm) panel, a 90° F (32° C) change in skin temperature could result in expansion or contraction of 0.14″ (3.5 mm) along the longest dimension of the sheet..



4′ x 4′ Sheet (Example 3)

Summary: For a 4′ x 4′ (1220 mm x 1220 mm) panel, a 90° F (32° C) change in skin temperature could result in expansion or contraction of 0.06″ (1.5 mm) along either direction of the sheet.



Sources of Equipment & Accessories

The following is a list of material and equipment sources related to the fabrication of Reynobond®, Profile Products and sheets. This list can be used by customers and fabricators to locate materials, equipment or accessories. These sources are for reference only and do not represent a complete list of available suppliers. AAP does not endorse or guarantee the quality of their materials and/or services.

Cutting Tools

AXYZ International
5330 South Service Road
Burlington, ON L7L 5L1
Canada
Tel: 800 361 3408
Tel: 905 634 4940
Fax: 905 634 4966
www.axyz.com

G. C. Peterson Machinery
2300 Myrtle Avenue – 100
St. Paul, MN 55114
Tel: 651 789 5360
Fax: 651 789 5369
www.gcpeterson.com

MSC Industrial Supply Co.
20 Parkway View Dr.
Pittsburgh, PA 15205
Tel: 800 645 7270
www.mscdirect.com

Hypneumat, Inc.
5900 West Franklin Drive
Franklin, WI 53132
Tel: 800 228 9949
Tel: 800 323 7133
www.hypneumat.com

Extrusion Bending

Techniform Metal Curving
723 E. Mason St.
Mabank, TX 75147
Tel: 903 887 2363
Fax: 903 887 6050
www.techniform.com

Fasteners

Atlas Fasteners
1628 Troy Road
Ashland, OH 44805
Tel: 419 289 6171
www.atlasfasteners.com

SFS Intec, Inc.
Spring St. and Van Reed Road
P.O. Box 6326
Wyomissing, PA 19610
Tel: 800 234 4533
Tel: 610 376 5751
Fax: 610 376 8551
www.sfsintecusa.com

High Bond Tape

3M Specialty Tape Solutions
Tel: 800 362 3550
www.3M.com

Tesa®
tesa tape NA
5825 Carnegie Blvd.
Charlotte, NC 28209
Tel: 800 426 2181
Fax: 800 852 8831
www.tesa-acxplus.com

Panel Cleaning

Alumitech Limited
311 W. Washington St.
Chicago, IL 60606
Tel: 312 920 6300
www.alumitecltd.com

Panel Saws

Colonial Saw, Inc.
122 Pembroke Street
P.O. Box A
Kingston, MA 02364
Tel: 781 585 4364
www.csaw.com

HOLZ-HER
5120 Westinghouse Blvd.
Charlotte, NC 28273
Tel: 704 587 3400
www.holzher.com

Komo Machine, Inc.
1 Gusmer Drive
Lakewood, NJ 08701
Tel: 800 255 5670
www.komo.com

Forming Equipment

Watson Hegner Corp.
160 Gibson Court
Dallas, NC 28034
Tel: 704 922 9660
Fax: 704 922 9841
www.watsonhegner.com

Silicone Sealants

Dow Corning Corp.
2200 W. Salzburg Rd.
Midland, MI 48686
Tel: 989 496 4400
www.dowcorning.com

G E Silicones Headquarters
187 Danbury Road
Wilton, CT 06897
Tel: 800 255 8886
www.gesilicones.com

Tremco, Inc.
3735 Green Rd.
Beachwood, OH 44122
Tel: 216 292 5000
Tel: 800 321 7906
www.tremcosealants.com

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ARCONIC ARCHITECTURAL PRODUCTS LLC
50 Industrial Boulevard
Eastman, GA 31023-4129
Tel. 800 841 7774
www.reynobond.com
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