Reynobond®

Hoover™ Architectural Solutions

# GENERAL INFORMATION & FABRICATION GUIDELINES





BUILD BOLDER.

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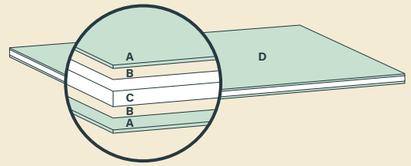

**Reynobond® aluminum composite material (ACM) is a high-performance wall cladding product from Hoover Architectural Solutions, LLC consisting of two sheets of nominal 0.020" (0.50 mm) aluminum, each permanently bonded to an extruded core. This is an elegant concept resulting in an extraordinarily flat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

**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 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 1

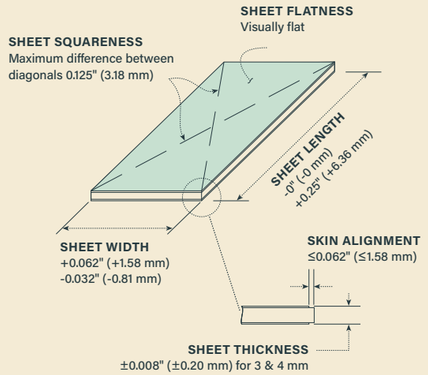



A. Aluminum skin
B. Tie layer between aluminum skins and core material
C. Fire Retardant (FR) core
D. Reynobond® Aluminum Composite Material

## TOLERANCES

Reynobond® products are manufactured to exacting tolerances with state-of-the-art equipment in a continous process. Hoover Architectural Solutions, LLC 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).

FIGURE 2

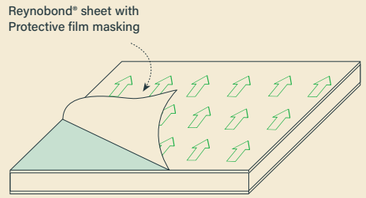



## PACKAGING, SHIPPING & HANDLING

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.

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.

FIGURE 3





## FINISHES TOLERANCES

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. Hoover Architectural Solutions, LLC prints directional arrows on the back surface of every sheet during production. The number of the production lot 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 mica or metallic flakes to provide a more pearlescent or reflective surface 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.

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, 80 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: Hoover Architectural Solutions, LLC 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. 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 90º 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).*

**FIGURE 4**

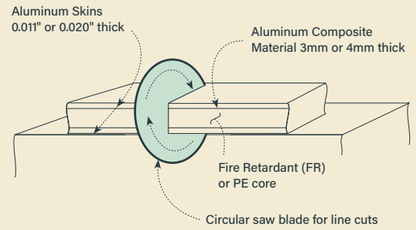



**FIGURE 5**

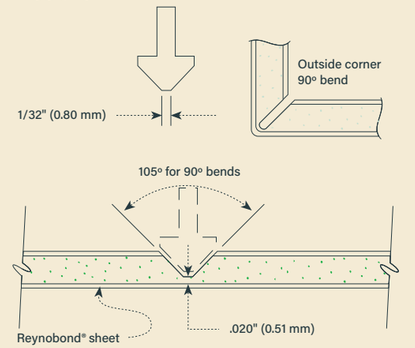


FIGURE 6

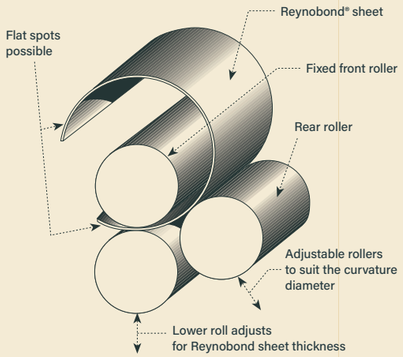
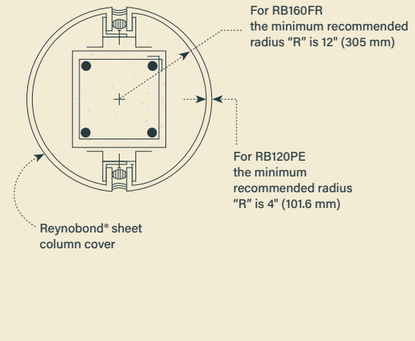



FIGURE 7




**Router Bits**

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

**Reverse Bends**

Hoover Architectural Solutions, LLC 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" (305 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. Hoover Architectural Solutions, LLC 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). Hoover Architectural Solutions, LLC 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.

## FASTENERS

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. Additionally, ensure that fasteners are torqued to the correct specifications.

Through bolt fasteners 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).

FIGURE 8
BRAKE FORMING REYNOBOND® COMPOSITE SHEETS

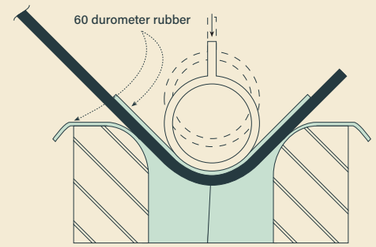



FIGURE 9
ROUT-AND-RETURN SYSTEM SHEETS

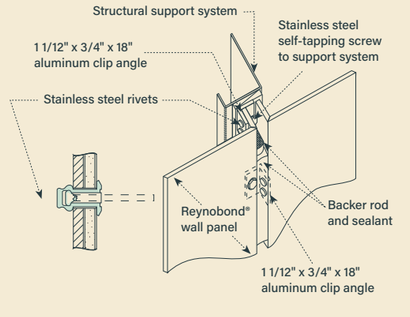



FIGURE 10

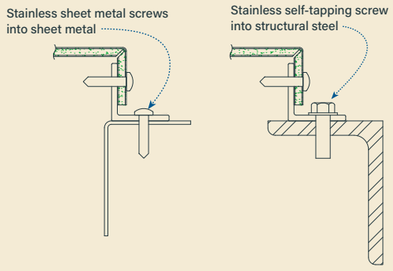



FIGURE 11

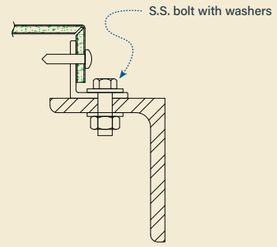


FIGURE 12

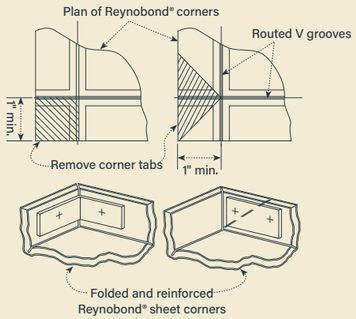
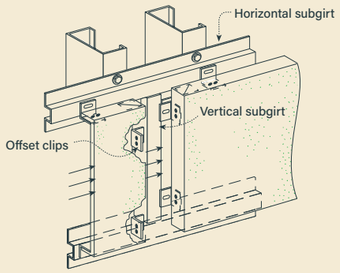



FIGURE 13
ROUT-AND-RETURN




## 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 system fabricators. Most installations use the rout-and-return method.

## 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 mechanically fastened 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 1/2" (12.7 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.

## 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 sheet 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 1/2" (12.7 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 approximately 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 1/2" (12.7 mm) wide joint to 5/16" (7.94 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" (610mm) on center. Stiffeners act like miniature beams and are most effective if used across the shortest dimension of the sheet (see figures 14 and 15). 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.

FIGURE 14
REAR VIEW OF STIFFENED ROUT & RETURN PANEL

See section thru stiffener below (figure 20)

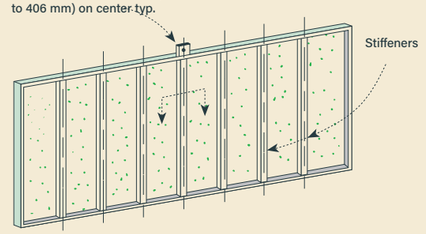
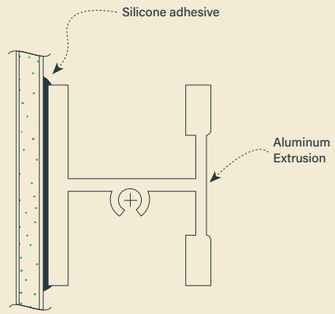



FIGURE 15
SECTION THRU STIFFENER





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 and 15). Because the maximum sheet deflection is at the geometric center of the sheet, a stiffener should be placed 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® should be lightly sanded and wiped with isopropyl alcohol to enhance the bond.

## PANEL CLEANING

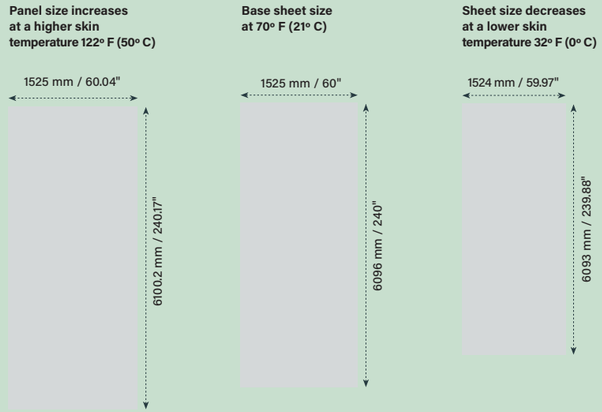
Reynobond® composite material has factory coil-coated skins with multiple finish options. Depending on the geographic location of the building and the atmospheric conditions, routine maintenance may be required to clean the surface of Reynobond® to restore the sheets to their original appearance.

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 Association'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.

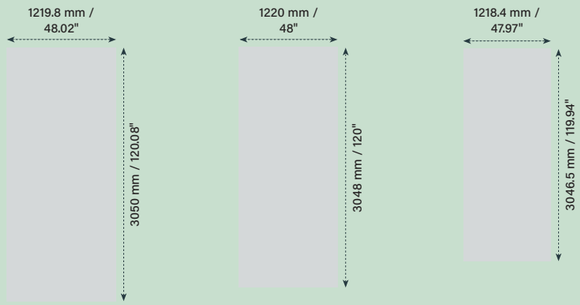
**See Reynobond® and Reynoplate® Cleaning Instructions for additional information and guidelines at hooveras.com/resources/technical-downloads.**

## THERMAL MOVEMENT EXAMPLES

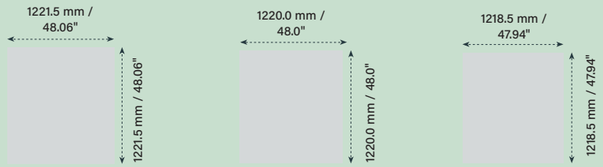
**5' x 20' Sheet (Example 1)**
*Summary:* For a 5' x 20' (1525 mm x 6096 mm) panel, a 90° F (32° C) change in skin temperature could result in expansion or contraction of 0.28" (7.2 mm) along the longest dimension of the sheet.



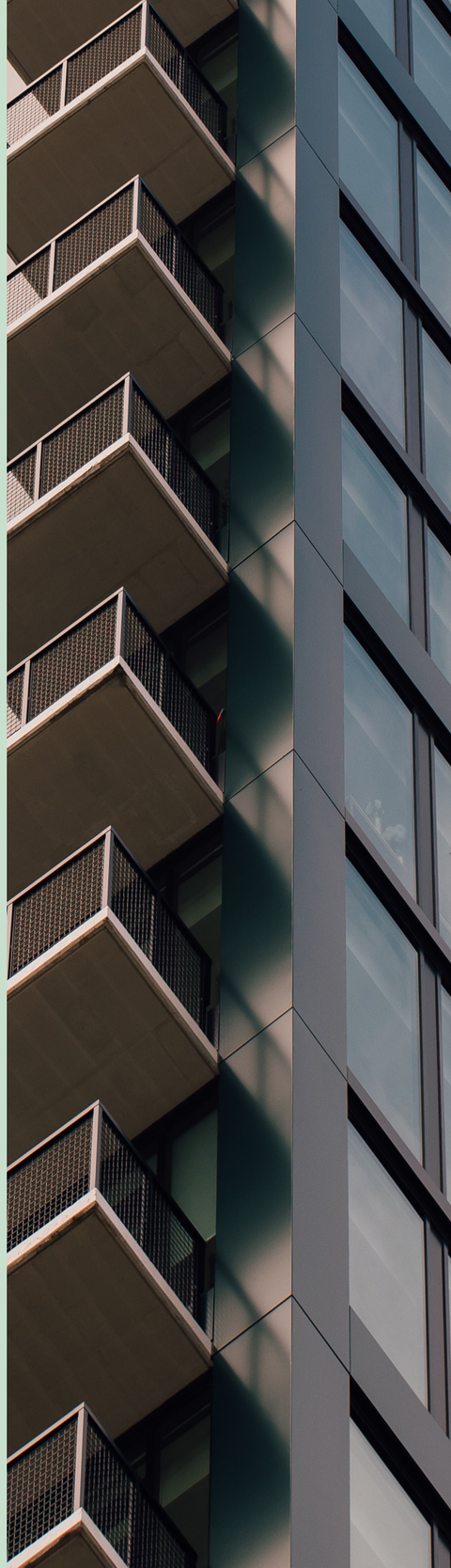

**4' x 10' Sheet (Example 2)**
*Summary:* For a 4' x 10' (1220 mm x 3048 mm) panel, a 90° F (32° C) change in skin temperature could result in expansion or contraction of 0.14" (3.5 mm) along the longest dimension of the sheet.




**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.





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Laws and building and safety codes governing the design and use of Hoover Architectural Solutions, LLC's products, and specifically aluminum composite materials, vary widely. It is the responsibility of the owner, the architect, the general contractor, the installer and the fabricator/transformer, consistent with their roles, to determine the appropriate materials for a project in strict conformity to all applicable national, regional and local building codes and regulations. REYNOBOND® FR AND REYNODUAL® HAVE SUCCESSFULLY PASSED US NFPA 285, E84 AND CANADA S134, S102 TESTS AS A PART OF AN ASSEMBLY. ENSURE THE PRODUCT IS USED IN A SYSTEM THAT COMPLIES WITH ALL APPLICABLE REGULATIONS. REYNOBOND® PE IS COMBUSTIBLE; IT COULD CATCH FIRE AND BURN. ANY LABORATORY TESTING INFORMATION PROVIDED BY HOOVER ARCHITECTURAL SOLUTIONS, LLC APPLIES ONLY TO THE PARTICULAR PRODUCT OR ASSEMBLY TESTED AND DOES NOT NECESSARILY REPRESENT HOW PRODUCTS WILL ACTUALLY PERFORM IN USE. REPORTS AND TEST DATA CORRESPONDING TO A PARTICULAR TESTED PRODUCT SAMPLE OR ASSEMBLY ARE NOT A GUARANTEE THAT THE SAME PRODUCT OR ASSEMBLY WOULD ALWAYS ACHIEVE THE SAME TEST RESULT

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