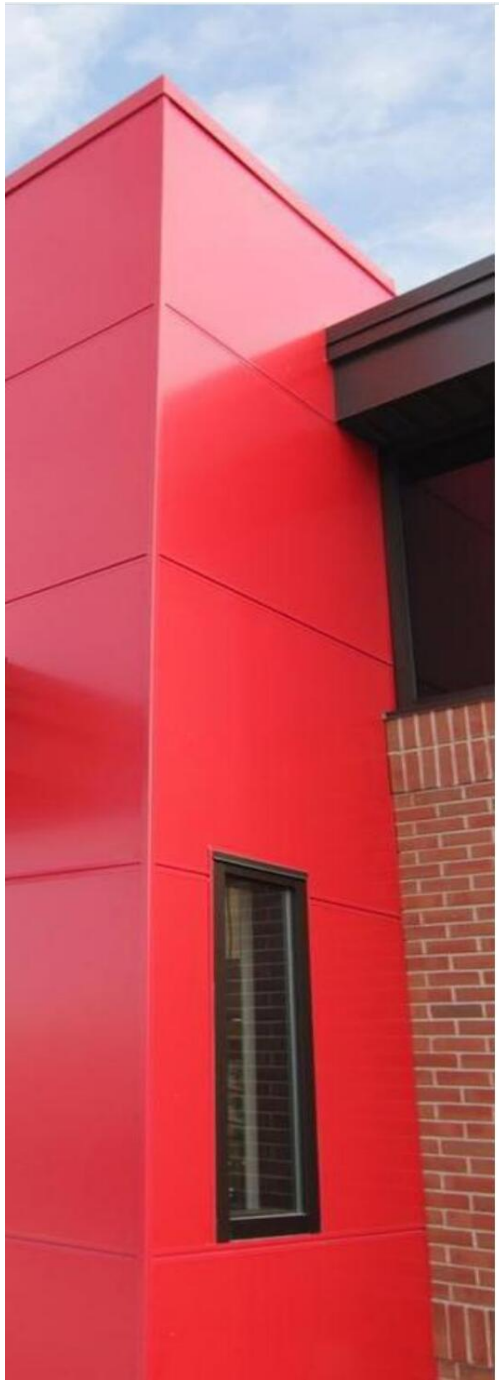
ALUSIGNPANEL

General Information
Fabrication Guidelines



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Product Description

Alusignpanel® Aluminum Composite Material (ACM) is a high-performance wall cladding product from Alusignpanel, consisting of two sheets of nominal 0.020" (0.50 mm) aluminum, each Sheet is permanently bonded to an extruded thermoplastic core. Resulting in an extraordinarily flat and highly formable material with an Exceptional strength-to-weight ratio (see figure 1).
Alusignpanel is a fully tested product, with building-code approvals throughout the world. It is available with either a Polyethylene (PE) core or a Fire Resistant (FR) core. Alusignpanel ACM is available in a near-infinite variety of colors. The properties for each skin thickness, core, color, and length vary from order to order. Speak with an Alusignpanel Representative for proper product use and design.

The versatility of Alusignpanel 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

Alusignpanel is well suited for exterior, interior, industrial and specialty architectural applications. Alusignpanel applications include: exterior cladding, clean rooms, signage, corporate identity, column covers, interior partitions, canopies, equipment enclosures, kiosks, exhibits and displays.

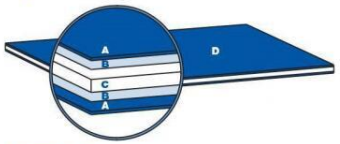
Tolerances

Alusignpanel is manufactured to exacting tolerances with state-of-the-art equipment in a continual process. Alusignpanel has a reputation for manufacturing products of the highest quality, and Alusignpanel is no exception. Alusignpanel PE and FR panels are manufactured to the tolerances shown (see figure 2).

Packaging, Shipping & Handling

Alusignpanel sheets are cut to length and packed on cushioned, wooden skids.(see figure 3).

Figure 1



A. Aluminum skin
B. Tie layer between aluminum skins and core material
C. Polyethylene or solid thermoplastic compound core (fire resistant) **D.** Alusignpanel Aluminum Composite Material

Figure 2

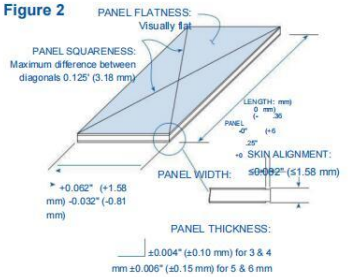
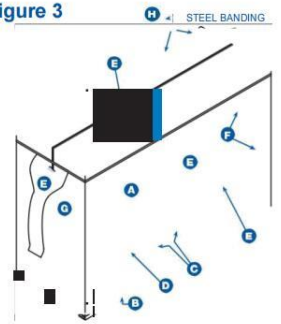


Figure 3



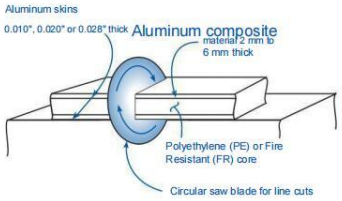
TYPICAL Alusignpanel ACM SKID

A. Alusignpanel sheets
B. 2x4 planks – doubled if skid is longer than 12' (3658 mm)
C. Double 2x4 and 4x4 at 24" on center
D. 1x4 plank
E. 1/2" (13 mm) OSB sheet
F. 1/2" foamed plastic sheet for cushioning material
G. Water-resistant waxed paper wrap
H. 2x4 cross member stiffness

Figure 4

Alusignpanel panel with Protective film masking

Figure 5



Alusignpanel®, 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 6-mm-thick PE core panel weighs approximately 1.5 pounds per square foot (7.4 kg/m^2). Protective masking, nominally 3.2 mils (80 microns) with ultraviolet barrier helps protect the panel finish during transportation, fabrication and installation (see figure 4). 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 panel surface. Although the protective masking is UV stabilized, it should be removed as soon as possible after installation.

Kynar 500

Alusignpanel is offered in Kynar 500 finishes, Kynar 500, metallic finishes and Kynar 500 mica finishes. Custom color formulations, using opaque, metallic and mica finishes are available in virtually any color. Kynar finishes are full-strength PVDF coatings and are the finest architectural metal finishes available.

Prior to composite panel 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 Alusignpanel 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 Alusignpanel 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 Alusignpanel 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. Metallic and mica 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. Panels or trim pieces turned in different directions may appear a slightly different shade. It is important that metallic- and mica-coated panels are fabricated and installed with this coating orientation in mind. Panel directionality must be

maintained to avoid shading differences between adjacent panels on the wall. Alusignpanel prints directional arrows on the back surface of every panel during production.

All panels are directionally oriented in the packing skids. Should any panel's direction be lost, it is possible to determine this by inspecting the panel ends. The shear that cuts the panels 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. Use panels manufactured from one coil of material to minimize variability of panel color. Forming Alusignpanel panels at or below ambient temperatures of 60° F (15.5° C) may adversely affect the appearance and performance of the Kynar finish.

Sawing & Routing

Sawing and Routing Alusignpanel panels 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 back of this guide.

Alusignpanel 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 Alusignpanel. Longevity of the cutting edge is dependent on the number and length of cuts performed

Figure 6

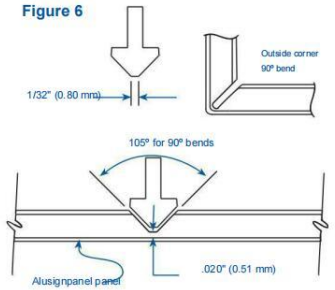


Figure 7

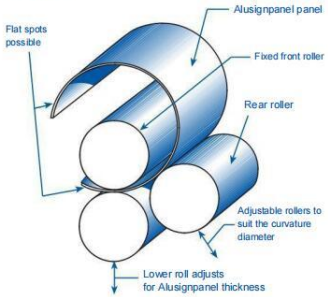
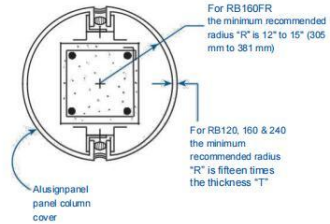


Figure 8



Routed cuts

Circular Saws: Alusignpanel 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 6. A tool steel saw is adequate for machining Alusignpanel®. Ideal grooves are 105°, with a 1/32" flat to allow the proper clearance when the panel 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 or decreased for other metals such as stainless steel. A chip thickness of 0.002" or less should be targeted. Too aggressive a feed may cause delaminating of the skin. A sample cutter could be 8" in diameter with 18 insert-type teeth. The cutter would be operated at 250 rpm (revolutions per minute) and 10 IPM (inches per minute) to attain 524 sfpm (surface feet per minute) with a chip thickness of 0.0022". This cutter would be used to machine stainless all Alusignpanel panels.

Note: The groove must be cut to remove the back metal skin and part of the core material. At least 0.020" 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 Alusignpanel and for any type of cutter used (see figure 6 for a detail of the groove).

Router Bits: Router bits may be used to machine the 105º V-groove in Alusignpanel. 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 6). This type of cutter does not have a very good tool life when machining other types of Alusignpanel. A saw-type cutter has better capacity to machine the product while dissipating the heat generated at a more rapid rate. If the cutter gets too hot, the core chips will stick and overload the bit.

Reverse Bends: Figures 11 and 12 show a reverse bend at the edge of the sheet. We recommend that a saw blade be used to cut a groove along the back side of Alusignpanel prior to bending. Leave the face skin with about 0.020" of core material attached. Bend Aluignpanel using hand tools. The blade kerf should not be more than 3/16". This technique is mandatory for FR core Alusignpanel and highly recommended for PE 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. Alusignpanel panels are usually mounted vertically in the fixture, and the cutting operation performed in this manner requires less shop floor area than if the panels are placed flat on a table. Panel saws can streamline the fabrication process. Alusignpanel FR core material may produce fine airborne particles when cut and we recommend breathing protection be worn.

Roll forming

Alusignpanel can be rollformed 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 rollform Alusignpanel using machines with minimum 2 1/2" (64 mm) diameter rolls. The operator normally makes multiple passes of the panel through the rollers to gradually obtain the desired radius (see figure 7).

Alusignpanel PE core material can be rolled to a minimum radius equal to 15 times the thickness of the panel; i.e., for (4 mm) the minimum recommended inside radius is about 2 3/8" (60.3 mm); and for (6 mm), about 3 1/2" (89 mm) (see figure 8).

FR core panels are 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). Note that the first 1" to 2" (25 to 50 mm) of the panel edge may not be curved as it travels through the rollers. Alusignpanel does not recommend stretch forming Alusignpanel or heating the panel in any fashion to enhance formability.

Figure 9
BRAKE FORMING ALUSIGNPANEL PANELS

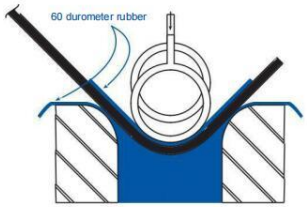


Figure 10
ROUT & RETURN PANEL SYSTEM

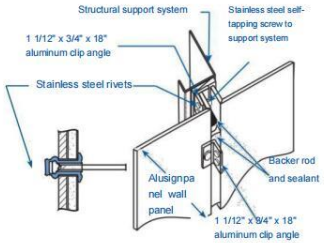
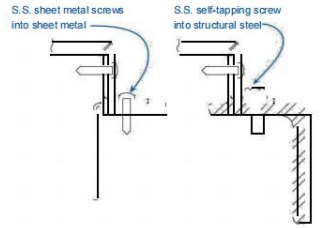


Figure 11



Bending

Alusignpanel® can be brake formed from 0° (flat) to 90° (right angle).

Alusignpanel recommends that (3 mm) panels, be bent with a minimum inside radius of 5/8" (16 mm), and (4 mm) panels, 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 9). NOTE: if the metal temperature is too low, damage can occur while bending.

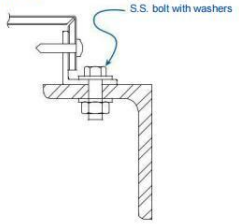
A variety of fasteners are used to fabricate and install Alusignpanel panels. Fastener selection is the construction project engineer's responsibility. You may successfully use specific fasteners for panel load-testing purposes in obtaining building-code recognition.

Pop rivets are often utilized to attach aluminum clip angles and other structural or ornamental elements to Alusignpanel panels. Because the rivet body will be in contact with the aluminum skins of the panel, it is recommended that either aluminum or stainless steel rivets be used, to avoid dissimilar metals contact. We have successfully used two 3/16" (5 mm)-diameter rivets to attach aluminum clip angles to the return leg of a Rout & Return panel system (see figure 10). 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 Alusignpanel. 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 11). Occasionally, Alusignpanel is face fastened directly to supports or sub-girts. 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 Alusignpanel panels 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 nuts or double nuts with washers to prevent the nut from loosening over time (see figure 12).

Figure 12

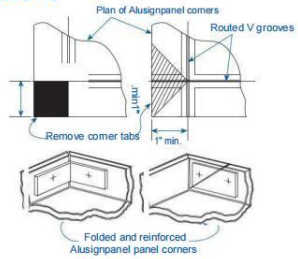


Installation Methods

Alusignpanel panels can be easily installed for both exterior and interior applications. Wet-seal and dry-seal systems are available from a global network of qualified architectural dealers. Most installations use the Rout & Return (R&R) method.

Rout & Return begins with a flat sheet ofAlusignpanel. Typically, a continuous V-shaped routed groove is made around the entire panel perimeter at a constant distance of 1" (25 mm) from the panel edge. 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 panel unit (see figure 13).

Figure 13



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 panel into the structural supports. Clips are staggered from one panel to the next to allow sequential installation. R&R joints should be at minimum 5/8" (16 mm) wide to allow for thermal movement.

Rout & Return System

Panel Type / Thickness	Design Load*
Panel size (nominal) 4' 0" x 12' 0" (1220 mm x 3658 mm)	
PE / 4 mm	58.6 (psf) / 2.8 (kPa)
FR / 4 mm	63.2 (psf) / 3.0 (kPa)
Panel size (nominal) 5' 0" x 15' 0" (1525 mm x 4572 mm)	
PE / 4 mm	51.0 (psf) / 2.4 (kPa)
FR / 4 mm	51.8 (psf) / 2.5 (kPa)

***Tested Values**

Figure 14

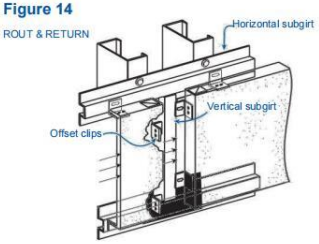
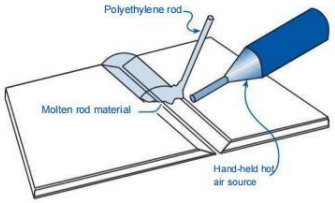


Figure 15



Slotted holes may be required in the aluminum clip angles at fastener connection points to accommodate this thermal movement (see figure 14). R&R joints are then caulk sealed to prevent air and moisture infiltration. For interior applications, Alusignpanel® may be installed with lightweight extrusions (see figure 14) or in partition systems. Alusignpanel is also well suited for glazing into storefront and curtain wall applications.

Silicone Sealants

Silicone sealants are often used in Rout & Return panel applications to caulk horizontal and vertical Alusignpanel panel 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 Kynar 500 finishes of Alusignpanel panels.

We do not recommend the placement of silicone sealants directly against the PE or FR core materials of Alusignpanel. Incidental contact of silicone sealant with the core material should not present any short- or long-term detrimental effects to the panel as a whole. Care must be taken to avoid staining of the painted panel 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.

Hot Air Welding

Hot air welding of the Alusignpanel polyethylene core is a special fabrication method and may be used to accommodate unusual assembly details such as joining multiple elements that cannot be mechanically fastened or when exposed fasteners cannot be used.

Welds are accomplished by melting small-diameter continuously fed polyethylene rods held beneath a hot air gun that is a stream of hot air at approximately 500° F (260° C) (see figure 15). The hot air liquefies the surfaces

of the two adjoining pieces, as well as melts the rod to form a homogeneous weld. Experienced welders and quality equipment should be used to make sure that panel paint surfaces are not damaged by the hot air stream. Some shrinkage may occur in the weld while cooling. Please consult the equipment manufacturer for installation instructions. Hot air welds should not be relied upon to transfer static or dynamic loads to the panels or for weatherproofing of joints. Hot air welding is typically done just on polyethylene (PE) core material.

Post-painting & Panel Repair

Alusignpanel panels are available from stock with a washcoat that is suitable for post-painting by qualified painters. Proper surface preparation and pretreatment may be required to successfully apply the various air-dry paint systems that are available. 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.

Panels may occasionally become scratched or nicked during fabrication and installation. Small scratches can be easily repaired with matching air-dry touchup paint. Small dents may be repaired with automotive-type body putty and then post-painted. As stated previously, proper surface preparations such +as sanding and priming may be required to achieve satisfactory results.

Thermal Movement

Alusignpanel panels will thermally expand and contract the same as solid aluminum sheet or plate. Alusignpanel (4 mm) has a coefficient of expansion of 1.31x105 in/in/°F (2.36x105 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 panel will be about 3/16" (4.8 mm) for a rise in temperature of 100° F (38° C). Assuming this panel is fixed at its center with connections that allow thermal growth in both directions, a 100° F temperature increase would reduce a 5/8" wide joint to 7/16" (11 mm). Thermal growth or contraction can occur in any

Figure 16
REAR VIEW OF STIFFENED ROUT & RETURN PANEL
See section thru stiffener below (figure 20)

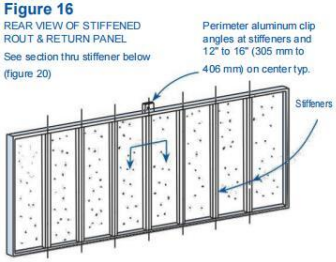


Figure 17
SECTION THRU STIFFENER

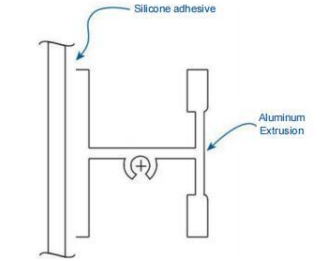
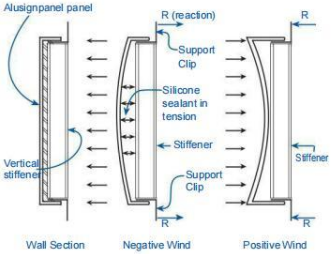


Figure 18
STIFFENER BEHAVIOR UNDER WIND LOAD



direction on the panel and is always greatest along the longest panel dimension. For examples of both expansion and contraction, and their effects on the panels, please refer to the illustrations on page 8.

Panel Reinforcement

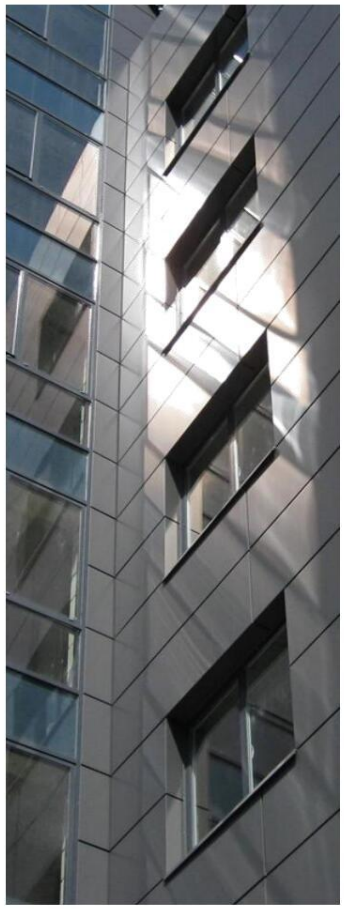
Alusignpanel® panels can be stiffened by various means to resist wind loads and reduce panel deflection. Stiffeners are usually 1" to 1 1/2" (25–38 mm)-deep aluminum extrusions and are adhered to the nonexposed back side of the panel at 24" (610 mm) on center. Stiffeners act like miniature beams and are most effective if used across the shortest panel dimension (see figures 16 & 17). Because stiffeners act as support beams, the applied wind load to the panel is transferred to the stiffener and the stiffener "reacts out" to the panel edge. Therefore, support clips should be located as close to the stiffener as possible (see figure 18).

The fasteners used to attach the panel to the structural supports should be placed at or close to the stiffener end locations so that loads are transferred from panel 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, panel thickness, fastener strength and support spacing. For related information on stiffener spacing and design loads please refer to figures 16-18 at the left. Because the maximum panel deflection is at the geometric center of the panel, 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 ACM should be lightly sanded and wiped with isopropyl alcohol to enhance the bond.

Cleaning

Alusignpanel panels have factory coil-coated skins with a Kynar 500 finish. Depending on the geographic location of the building and the atmospheric conditions, routine maintenance may be required to clean the surface and restore the panels to their original appearance.

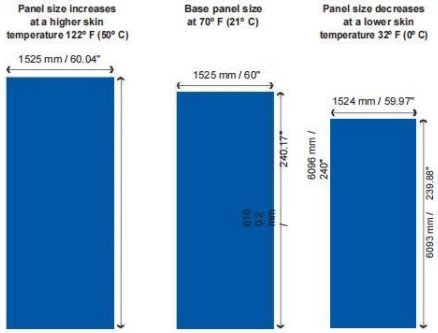
In industrial areas where thorough cleaning is necessary, or for stains resulting from tree sap, insecticides, chimney fumes, etc., the finish should be washed with a sponge or soft-bristled brush and a solution of mild detergent and water (1/3 cup mild detergent per gallon of water). Immediately rinse 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.



Thermal Movement Examples

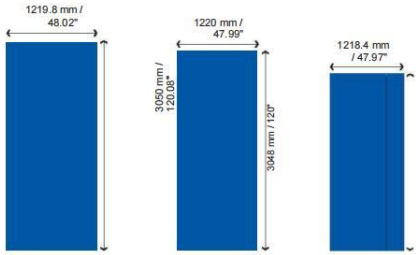
5' x 20' Panel (Example 1)

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



4' x 10' Panel (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 panel dimension.



4' x 4' Panel (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 panel direction.