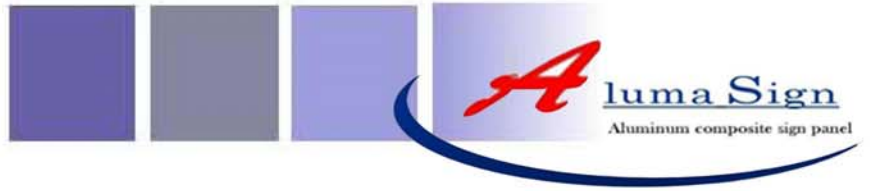
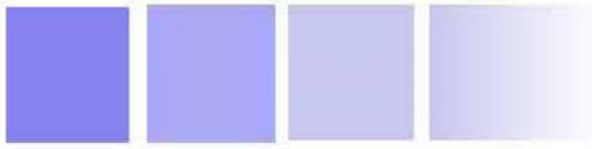


Aluminium Composite Panel



FABRICATION GUIDELINES





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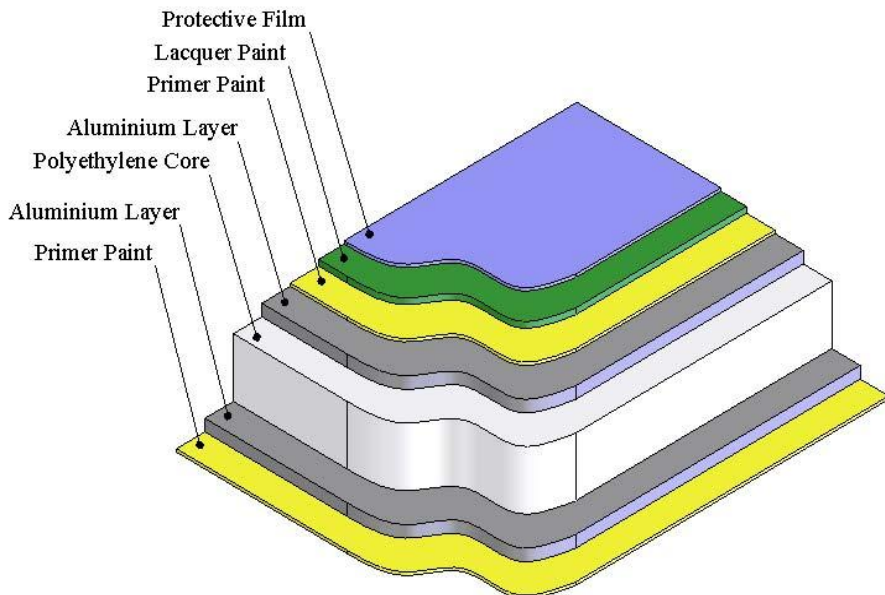
Product Description:

Alumasign is a high-performance product consisting of two aluminum sheets permanently bonded to each side of an extruded thermoplastic compound core material. As a result of this technology we have ideal flat and very formable material with an excellent strength-to-weight ratio.

Alumasign is available with 2 types of core materials: a polyethylene (PE) core, or a fire-resistant (FR) core material based on aluminum hydroxide mineral component. Alumasign panels are supplied with PDVF paint or PE paint on front side available in standard and special colors; the rear side of the panels is covered by a protective paint layer. Also both side painted panels are available. Unique characteristics make Alumasign composite panel ideal material for Designers, sign makers, architects, fabricators and installers.

Some of these advantages are: exceptional rigidity; outstanding strength to weight ratio; simple fabricating technique due to which routing and folding can even be performed on a construction site; easy and quick installation; high resistance to atmospheric factors; easy maintenance and a perfect appearance which keeps for many years.

We have developed this manual to assist fabricators and installers to work with Alumasign in the most efficient manner possible. These recommended suggestions and product data 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 Alumasign 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. In no event shall Foamacell USA., 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.



Safety:

Normal health and safety precautions practiced in any fabricating environment should be used when fabricating Alumasign Material. Goggles or other face protection, as well as hearing protection and gloves should always be worn. Alumasign FR (fire resistant) core material may produce fine airborne particles when cut or routed, and we recommend breathing protection be worn during these operations.

MSDS for Alumasign is available from our sales offices and dealers on request.

Packaging:

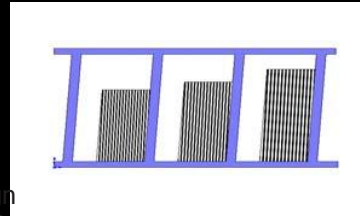
Heavy duty masking, nominally 80 microns with ultra violet barrier, is available to help protect the panel finish during fabrication and installation. Although the strippable masking is UV stabilized, it should be removed as soon as possible after installation, especially in the case of architectural panels exposed to sunlight and weather.

Storage:

When storing unpacked Alumasign observe the following guidelines:

- To prevent warping or bending, place it horizontally on pallet or other stand.
- Avoid stacking Alumasign of different sizes together, as the surface or panel can be scratched by the edges of the smaller pieces.
- Preferably, store them by size in racks.
- If storing panels by leaning them against a rack as shown below, lay a rubber mat underneath and lean the Alumasign closely against the fixed back-up material.
- Alumasign is packed in wooden crates and can usually be stacked up to four crates high.

Racking system.
Angle within 10 °



It is advisable to store Alumasign in a clean dry area with a minimum temperature of 15 C for a duration of 24 hours before use. After 24 hours of storage you will be able to start the processing requirements for each panel. After Alumasign has been removed from the stack it must be protected from any penetrating moisture.

Handling:

You should handle any Alumasign with a degree of care and where there are long lengths involved it is advisable that a team of you carry out the handling. When removing panels from a pallet / stack never drag the panel, always lift clear above the remaining panels on the stack. This will require two or more operatives.

**Visual consistency:**

Each of our product types has special characteristics that can affect the visual consistency from lot to lot and even from panel to panel. It is important that these characteristics be considered when planning how to use and install the Alumasign panels.

Solid colors: The industry standard for allowable variation for panel to panel and lot to lot is Delta E 1.0 or less in a hunter color space. Brighter colors, such as reds, yellows, blues, etc, which tend to be less opaque and which depend somewhat on film build (paint thickness) to achieve their appearance, will be more likely to exhibit more variation than subdued colors.

Metallic colors: The industry standard for color variation with metallic is Delta E 2.5 or less, much larger than the standard for solid colors. In coating the flakes will tend to align in one direction.

This greatly increases the directionality of the panel's appearance. For these reasons the panels must be installed with the directional arrows all aligned in the same direction and lots should not be mixed on a building face without first contacting Foamcell USA for a confirmation that the lots are visually similar enough to be used together.

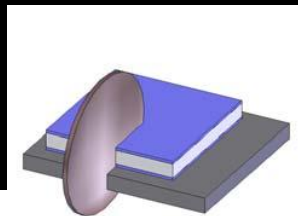
Before fabrication, remember to use a felt tip pen to draw arrows to indicate the coating direction on any small pieces that might be cut out from areas without the directional arrows.

Sawing:

Sawing Alumasign panels is a relatively easy process 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.

Prior to processing large quantities trial saw cuttings should be done to evaluate both the tool working conditions and the recommended cutting speeds. For marking the panels the use of a soft pencil is adequate. Hard marking tools should be avoided as they can fracture the Aluminum surface. The chips formed during saw cutting should be taken away with compressed air. Due to the nature of the Alumasign material it is best to move the saw blade rather than the material as no scratch will remain on the panel. If good saw cutting practices are applied and recommendations followed the result should be clean cuts with little bur. If despite following the recommendations, ragged cuts are produced check the following causes; poor tool support, tool vibration, blunt cutting edges, high frictional heat at the cutting edge.

As Alumasign has low thermal conductivity it cannot be cooled easily with compressed air or any other means. Thus it is recommended to select the tool geometry and cutting conditions in such a manner so as to minimize the frictional forces developed at the cutting point and keep the resulting heat at a low level.





Saw cutting can be accomplished with the following cutting equipment:

Panel Saws: Panel saws provide an effective method of cutting. These saws, whether standard equipment or custom made, perform well and have the added advantage of space savings. If a panel saw is to be used as production equipment, an industrial model should be purchased in order to obtain adequate cutting tolerances and increase the longevity of the equipment.

Multiple Operation Rip/V-Grooving Saws: In high production operations, equipment that is capable of performing more than one operation with a single pass through the machinery may be used. This equipment can make multiple saw cuts (Sizing the panel) and V-Grooves (rout) at the same time.

Table Saws: Table saws are not recommended for big sheets.

Portable Circular Saws: Cutting Alumasign with portable circular saws are another effective method. As mentioned, this equipment should also be production/industrial type equipment.

Jig Saws: Jig saws work well for cutouts. Care should be taken with portable jig saws to prevent damage to the Alumasign material surface. More than one sheet can be cut at a time by stacking panels.



If center cutting (i.e., letter cutouts) is required, a foam pad may be placed under the material with the blade cutting into the foam. 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.

Blade Recommendations: Consult the table below for recommended blades and cutting speeds for various types of saws.

Working method	Cutting Material	Blade or Band Geometry	Tooth Geometry	Max. Cutting Speed	Max. Cutting Feed
Circular saws					
Band saws					
Reciprocating saws	High speed steel.	Thickness: 0.8 mm to 1.2 mm. Width: 5 mm to 15 mm).	Hook or circular tooth with alternate angles, set or waved. Tooth spacing: 2 mm to 6 mm		10 mm/sec



Routing & Folding :

Alumasign can be routed by using conventional equipment (horizontal and vertical routing machines). For accurate and precise manual folding of the Alumasign composite panels, resulting in a good finish, we recommend to route the rear side of the panels and extract the aluminum sheet and a part of polyethylene core (2,5 mm thick for V groove). Normally the panel is grooved and folded 25-70mm from the edge.

In order to route Alumasign panels the following mechanical equipment is necessary.
Vertical panel saw: equipped with specially shaped routing saw blades.



The equipment needed is the same vertical saw as the one used for the cutting, but with a different saw blade and relevant equipment for adjusting the routing thickness.

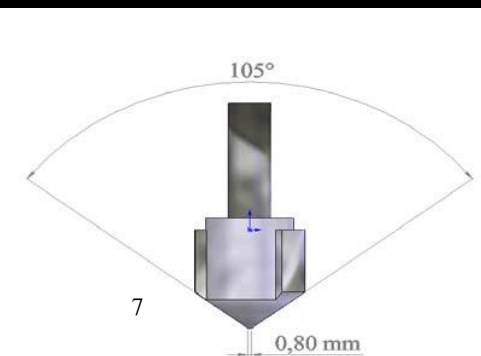
Exactly as with the cutting process with the vertical saw, vertical, horizontal or even angular on the axes of the panel routing can be made provided that Alumasign panels are placed. The use of a chip collector is essential.

Portable circular saw: A portable circular saw equipped with a suitable routing disk can be used only for a limited number of processing's. Note that special care should be given to the stability of the portable circular saw during the processing of the material, as well as the precision of the routings with the help of the chosen guided system.

Hand operated router with routing bits: These tools consist of routers that are available in the market and are used for wood processing. If they are equipped with special routing bits -carbide tipped cutter- the hand operated router can be used for a limited number of processes. In this case the stability of the tool and the guide-system considerably affect the quality of the routing.

Work directions:

For shaped elements with radius between 2 to 7 mm proceed as follows. First a V-shaped or rectangular groove is routed by a milling cutter on the inside of the fold, ensuring 0.3 to 1.00 mm of core material is left on the lower cladding sheet. The shape of the groove and its respective depth determines the folding radius. Note that smooth bending (shape forming of elements) cannot be obtained without uniform thickness of polyethylene remaining.





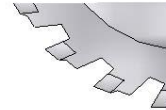
Grooving equipment:

For processing small quantities of panels a router and trimmer can be used. For processing large volumes of U-grooving as standard industrial production then a circular saw and a grooving cutter are needed along with a lifter.

Technical characteristics of carbide saw-tip:

- Outside diameter: 305
- No of the teeth: 24
- RPM: 3 000 to 5 000

Carbide Saw



...mm and the element mm lengths by 10 to 20mm as seen and should be cut shorter by that proportion.

**Corner cutting, notching:**

Two methods are normally used for cutting out corners to allow the forming of a cassette.

Punching:

This technique is the most productive, with the corners being cut out and the corner fastening holes being put in a single operation.

Wood chisel. A sharp hammer blow to a wood chisel allows you to cut out the small thickness at the bottom of a routing groove with no difficulty. The wood chisel must be wider than the part to be cut out. With a little experience, good clean joints can quickly be made.

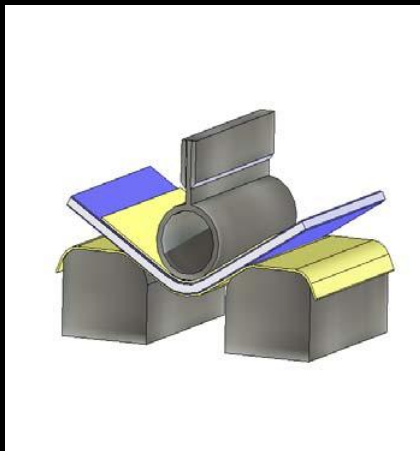
Curving:

The minimum bending radius for Alumasign without routing the back skin is fifteen times the thickness of the panel being curved i.e., 4 mm = 60 mm minimum radius. Alumasign can be cold formed in a pyramid roller, a press brake or over a clamped pipe. The process is similar to the forming of aluminum; however, due to the sensitive surface, care should be taken to ensure rollers are clean, smooth and free of defects to avoid damage to the surface finish.

Pyramid Roller:

As an extra precaution, a film should be used between the panel and the rollers to further protect the panel surface. Do not pinch the Alumasign between the rollers. Roll the panel 3° to 5° tighter to allow for a small amount of

Spring back that will occur. Once the sheet is curved; however, it will remain curved.

**Press Brake:**

When forming with a press brake, use a top die (tubular) with the radius desired and open the bottom die (jaws) approximately two times the thickness of the material plus film wider than the top die. The lower die should always have a protective pad of not less than 3mm film. Some adjustment of the lower jaws may be necessary to allow for varying bending properties between anodized and painted finish and for varying thicknesses. The radius of the top die will be the approximate inside radius of the finished panel (Reference Figure 13).

Bending Over a Clamped Pipe:

Alumasign may be formed over a pipe of the proper diameter that is securely clamped to a work table. A hinged "leaf" attached to the end of the table will bend the material easily.

**Drilling:**

Alumasign can be drilled with standard twist drills used for aluminum and plastics.

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.

Joining:

A variety of different fasteners are used to fabricate and install Alumasign panels. Structural adequacy and selection of these fasteners are the responsibility of qualified

engineers and in most instances where architectural panels are used, certified calculations will be required by the Building Official. You may successfully use specific fasteners for panel load testing purposes in obtaining building code recognition.

Please find below some important general information about joining techniques. Use the following guidelines when other elements come in direct contact with the surface of Alumasign Material:

1. Acceptable joining element materials: aluminum, plastic, stainless steel, plated or coated steel with cadmium, zinc or aluminum.
2. Unacceptable joining element materials: copper, brass, bronze, iron, raw steel. Unacceptable materials cause corrosion of joining surfaces due to electrolysis of dissimilar materials.

Therefore, use "heavy" or "red" metals only with an electrically insulating intermediate layer. When joining elements are to be anodized, assemble the materials after the anodizing process. Proper consideration should be given to the thermal expansion characteristics of Alumasign Material when using any of the joining techniques.

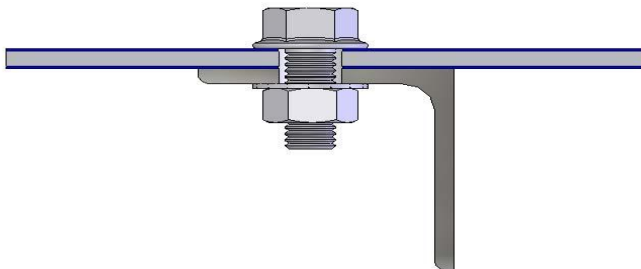
Pop rivets are often utilized to attach aluminum clip angles and other structural or ornamental elements to Alumasign. Because the rivet body will be in contact with the aluminum skins of the panel, it is recommended that either aluminum or stainless steel rivets be used to avoid dissimilar metals contacting. 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:

Screws are also used to perform many of the same applications as rivets. Stainless steel screws are industry standard and are appropriate to avoid corrosion and dissimilar metal contact. Because screws are customarily installed through pre-drilled holes and because the Alumasign aluminum skins are nominally 0.5 mm thick, 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. Occasionally, Alumasign is face fastened directly to supports or sub-grids. 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: provide an excellent way to join Alumasign panels to other Alumasign panels, or to other elements. Galvanized, stainless steel or aluminum bolts, nuts and washers should be used to avoid dissimilar metal contact.

Caution is recommended in tightening the nut onto the bolt. Because the plastic core material is compressible, over tightening can deform the metal skins. Use lock nuts or double nuts with washers to prevent the nut from loosening over time.



**Welding:**

This method is frequently used to assemble Alumasign panels. The filler rod and the polyethylene core are welded together after heating by a jet of hot air projected by an electrically heated welding gun.

For good quality welding, you need:

- Good preparation of the edges to be welded together
- Adequate filler rod quality
- A good welding speed
- Pressure evenly applied
- Clean hot air
- An appropriate temperature.

Welding by the to-and-fro method:

Hold the filler rod at a right angle whilst exerting regular pressure on the rod, make to-and-fro B-B (non-circular) movements. The filler rod and the edges to be welded must be heated in a similar way.

Welding using a high-speed nozzle:

Normal hot air guns fitted with a removable high-speed welding nozzle allow the edges to be welded and the filler rod to be heated at the same time. This makes for better quality welding. The filler rod is pushed by the constant pressure of the high-speed nozzle, and is therefore pressed between the edges to be welded.

Preparation of the edges to be welded:

- Butt welding: the edges must be beveled,
- Corner assembly: only one of the panels is beveled.
- T-assembly: remove the narrow strip of metal skin to free the areas to be welded.
- Welding of a fold: bevel the edges to be welded first of all using a shaped milling cutter.

The polyethylene core oxidizes relatively quickly once exposed to the air. It must be welded at the most 24 hours after it is beveled. After it has cooled, it is possible to remove the welding flash using a knife or scraper. We recommend that this operation be carried out in a clean, oil and water-free area.

The specific welding qualities of the filler rod are:

Polyethylene low density

Color: unpigmented

Density: 0.9 g/cm³

Diameter of rod: 3, 4 and 5mm

Immediately before welding, remove the outer layer of oxide from the filler rod.

Adhesive Bonding:

In addition to structural adhesives, double face tape can be used for fastening Alumasign on flat surfaces such as wall, ceiling, furniture, coverings etc.

The use of double face tape is for temporary adhesion.

Extreme care should be given when

selecting the adhesive so as to ensure it is chosen according to the application and the environmental conditions. It is important that the manufacturer is consulted prior to the usage of the adhesive for further instructions.

The substrate surface should be clean before the application of the structural adhesive.



Off-line Coating:

Alumasign

- should be used to clean the surface area.
- Curing should be done at room temperature since temperatures above 175.F can cause deformation of the Alumasign panel.

Screen Printing:

Printing can be done on Alumasign with an epoxy base or urethane base two-part type ink/paint. When selecting an ink, confirm its weather ability and adhesion with the ink manufacturer. It is recommended to test the ink's adhesion on the surface of the Alumasign before production.

For printing on Alumasign, observe the following guidelines

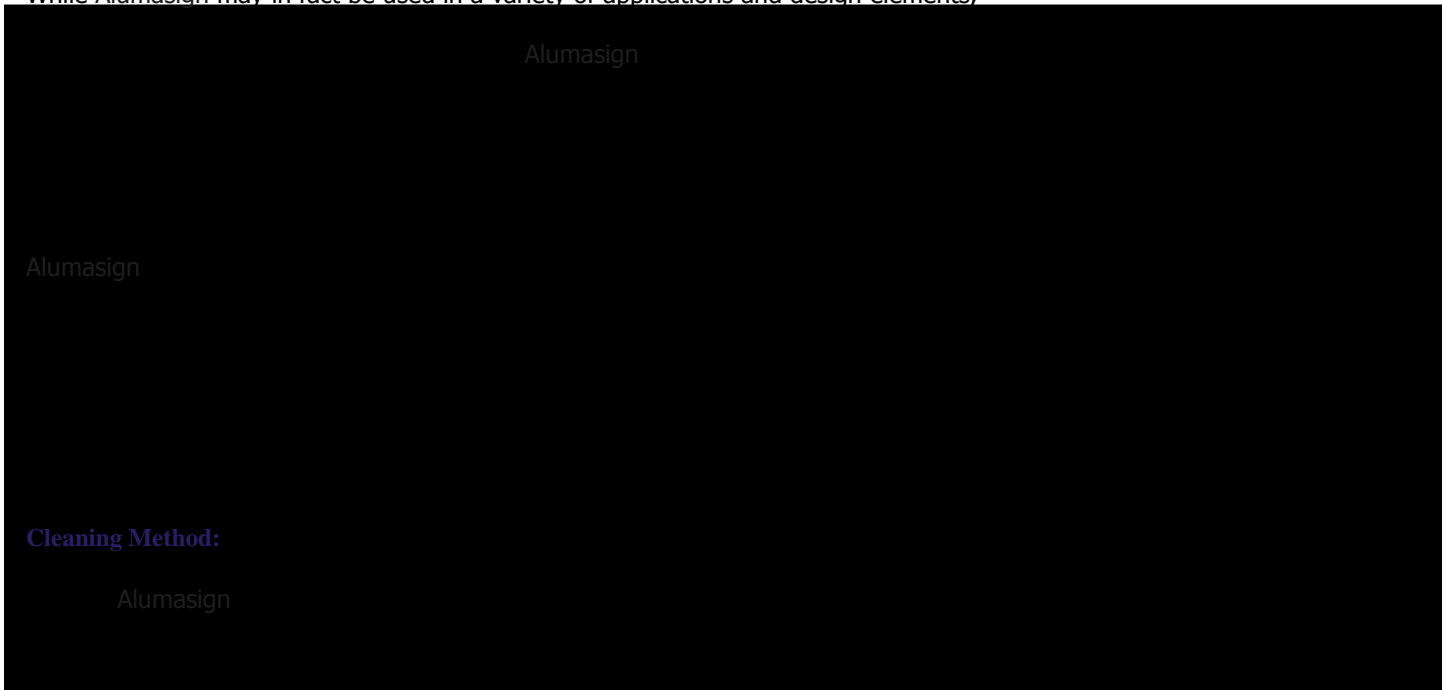
Remove all dust and dirt on the surface of Alumasign. Oily dirt causes splintering, splitting, or other defects of the paint. It must be completely removed with a soft cloth dipped in alcohol, N-hexane, etc.

If storing or drying is not proper, the adhesion or other performance may be adversely affected. Therefore, observe the storing condition of each paint as specified by the manufacturer.

Since storing in high temperature may cause deformation, keeping the storing temperature under 175°F and hold Alumasign horizontally.

Cleaning:

The cleaning of Alumasign surfaces can be generally described as wall cleaning. While Alumasign may in fact be used in a variety of applications and design elements,



4. Use detergent in a power wash or with a soft cloth for hand wiping and flush with water.



Alumasign strength calculations:

Composite technology makes Alumasign very light and rigid material. That is why it can be successfully used for architectural projects of different height with essential wind load and wind suction conditions.

We offer the following guide to enable you making easy calculations for your Alumasign projects.

Actually, Alumasign presents a kind of truss where characteristics of the panel are determined by characteristics of its upper and bottom aluminum layers. Aluminum layers are made of aluminum alloy AA1100H18 with tensile yield strength of 22000psi. It is the maximum tension material can bear before deformations turn to be irreversible.

Alumasign is available in different thicknesses so, please refer to below formula and table to calculate apparent thickness of your exact Alumasign type.

T – Apparent thickness of Alumasign

T_{panel} – total thickness of Alumasign

T_{core} – thickness of core material

For example, if we use Alumasign 4mm with thickness of aluminum layers 0,5mm, we can calculate apparent thickness as follows:

Apparent thicknesses for Alumasign types:

Product	Panel thickness, mm	Aluminum layers thickness, mm	Apparent thickness,
Alumasign 2	2	0,3	0,0638
Alumasign 3	3	0,3	0,0827
Alumasign 4	4	0,3	0,0976
Alumasign 4	4	0,5	0,1197
Alumasign 6	6	0,5	0,1531

Please choose your support conditions from the table below and use appropriate formula from the next column to calculate exact figure of the stress.

- 1 1 side fixed, 3 sides free;
evenly distributed load

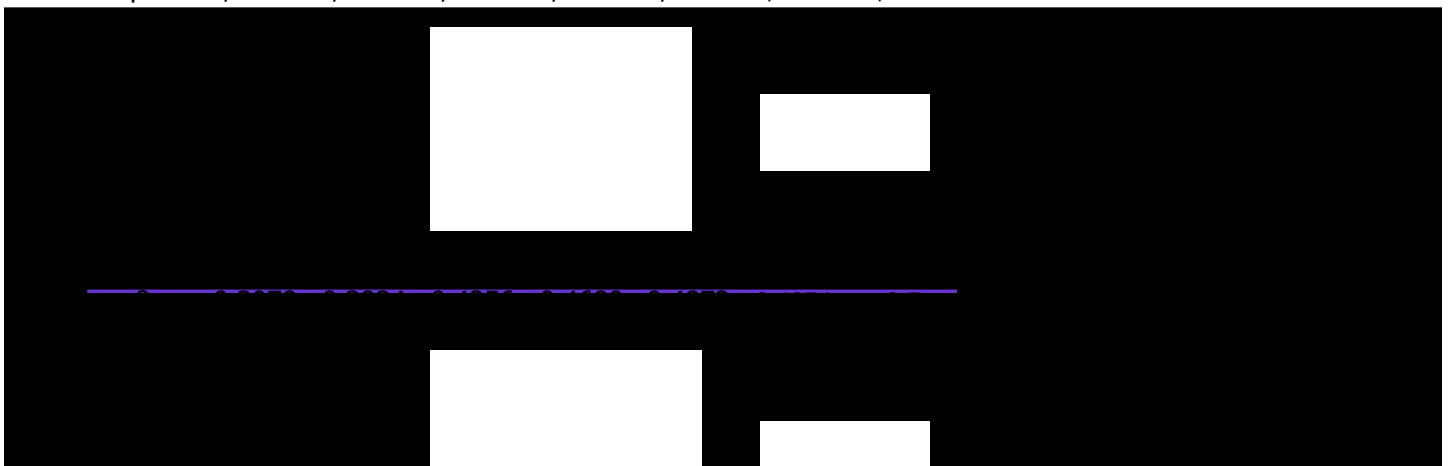
- 2 2 sides simply supported, 2
sides free; evenly
distributed load

- 3 1 side fixed opposite side
simply supported, 2 sides
free; evenly distributed load

- 4 2 sides fixed, 2 sides free;
evenly distributed load

- 5 4 sides simply supported;
evenly distributed load

l/h	1	1,2	1,4	1,6	1,8	2,0	3,0
β	0,2874	0,3762	0,4530	0,5172	0,5688	0,6102	0,7134



evenly distributed load

l/h	1	1,2	1,4	1,6	1,8	2,0	∞
β	0,4182	0,4086	0,4860	0,4968	0,4971	0,4973	0,5



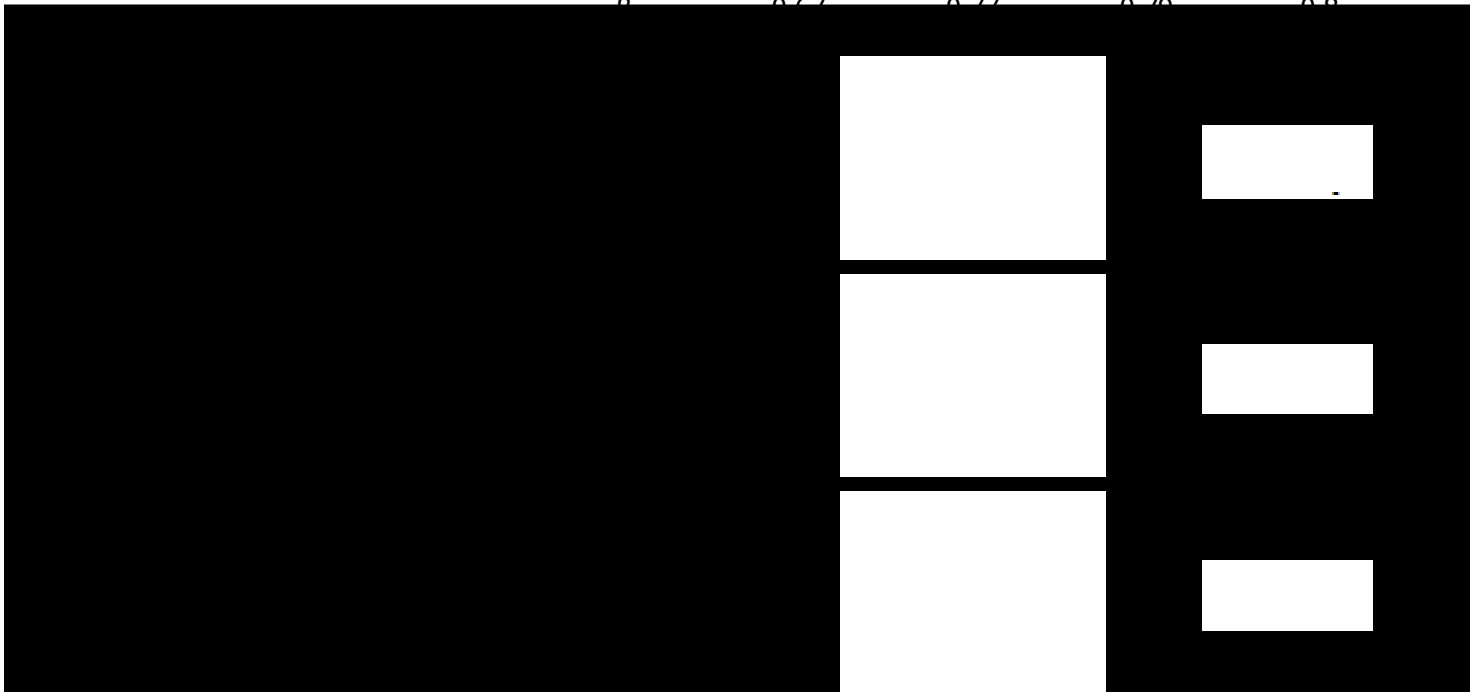
l/h	1	1,2	1,4	1,6	1,8	2,0	∞
β	0,4182	0,5208	0,5988	0,6540	0,6912	0,7146	0,75

9 1 longer side fixed, another longer side free, shorter sides simply supported; evenly distributed load

l/h	1	1,5	2	3	∞
β	0,714	1,362	1,914	2,568	3

10 1 shorter side free, other sides simply supported; evenly distributed load

l/h	1	1,5	2	4
β	0,67	0,77	0,79	0,8



l/h	1	1,2	1,4	1,6	1,8	2,0
β	0,565	0,350	0,211	0,125	0,073	0,0072

- 15 4 sides fixed,
concentrated
center load

l/h	1	1,2	1,4	1,6	1,8	2,0
β	0,7542	0,8940	0,9624	0,9906	1	1,004

Example :

Calculation of possibility to apply Alumasign 4mm with aluminum layers 0,5mm on a project with wind load pressure (w) equal to 40 psf with all 4 sides fixed.

$L=3'm$

$H=3'm$

$W= 40$ psf

Solution:



Sources of equipment and accessories :

Sources of Equipment

Panel Saws:

Striebig AG
www.striebig.com

Hand circular saws and routers:

Festool
www.festool.com

Hand routers with routing bits:

Festool
www.festool.com

Jig saws:

Festool
www.festool.com

Blades, Router Bits and Drill Bits:

KWO Tools (UK) Ltd
www.kwo.co.uk

Fabricating tables:

Festool
www.festool.com

Adhesive sealing components:

Sika AG
www.sika.com

Paints:

Akzo Nobel
www.akzonobel.com

PPG Industries
www.ppg.com

Fasteners:

(Available through commercial sources)

Hot air welding guns:

Leister Process Technologies
www.leister.com

Welding rods:

Ketterer + Liebherr GmbH & Co KG
www.ketterer-liebherr.de



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Alumasign products are available from the following stock list:

Aluminum Composite Panel



ALUMASIGN

ALUMASIGN

ALUMASIGN

