

MAXPANEL TECHNICAL DATA

MAXPANEL

ALUMINUM COMPOSITE PANEL



PRODUCT DESCRIPTION

MAXPANEL Aluminum Composite Panel (ACP) is a high-performance product. Consisting of two sheets of 0.28mm aluminum permanently bonded to each side of an extruded POLYETHYLENE compound core material - a simple concept resulting in an extraordinarily flat and highly formable material with an excellent strength-to-weight ratio.

Two different core materials are available to suit a variety of applications: a polyethylene (PE) core, or a fire-resistant (FR) core material. A selection of different finishes are available to color MAXPANEL material. We can provide expert advice on the best finish system for your application.

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

MAXPANEL is well suited for both exterior and interior architectural applications, as well as for industrial and specialty product designs. Consider MAXPANEL for exterior cladding, clean rooms, signage, corporate identity, column covers, interior partitions, canopies, equipment enclosures, kiosks, exhibits and displays. The creative possibilities of this material have only begun to be explored.

TOLERANCES

MAXPANEL is manufactured to exacting tolerances with state-of-the-art equipment in a continuous process. MAXPANEL (POLYETHYLENE) and FR (FIRE RATED) panels are manufactured to the following tolerances.

Product tolerance:

Characteristics	Size	Tolerance
Length:	within 5m (Standard length 2.44m, 3.2m, 3.5m,4m)	-1 ~ +1mm
Width:	within 1.55m (Standard width 1.22m, 1.25m, 1.50m)	-1 ~ +1mm
Thickness:	2mm, 3mm, 4mm	-0.2 ~ +0.2mm
Squareness:		Diagonals equal within -3 ~ +3mm
Flatness:		Maximum variation allowed is -0.2 ~ +0.2mm
Characteristics	Standard Index	Tolerance
Alloy/Temp	AA1100, H18	
Surface Pencil Hardness	2H	
Paint	1 side or 2 sides Polyester painting system	
Flexibility	T	
Pollute Resistance	<4.3%	
Adhesive	Class 1	
Aluminum Thickness	0.10mm, 0.20mm, 0.28mm, 0.30mm, 0.40mm	-0.02 ~ +0.02mm

MAXPANEL PHYSICAL CAPACITIES

Project		Technology requirements	
		Outside	Inner wall
Coating thickness, μm		≥ 25	≥ 16
		Gloss ≥ 70 . Max permissible deviation ≤ 10	
		Gloss < 70 . Max permissible deviation ≤ 70	
Pencil hardness		$\geq \text{HB}$	
Coating Flexibility		≤ 2	≤ 3
Adhesion. Grade		$\geq \text{Grade}$	
Impact resistance		50 kg-cm No peel-off, no crack	
Abrasion Resistance, L/ μm		≤ 5	-
Hot water resistance		No change	
Chemical Stability And Resistance	Stain resistance	≤ 5	-
	Acid resistance	No change	
	Alkali resistance	No change	
	Oil resistance	No change	
	Solvent resistance	No change	
	Brush resistance	$\geq 10\ 000$ times of no change	
Aging and weather resistance	Color deviation	≤ 3.0	-
	Gloss retention grad	$\geq \text{Grade 2}$	-
	Other aging performance	$\geq \text{Grade 0}$	-
Salt frog resistance		$\geq \text{Grade 2}$	-
Area density, Kg/m ²		Required value ± 0.5	

Bending strength, Mpa		≥100	≥60
Bending elastic module, Mpa		≥2.0x10 ⁴	≥1.5x10 ⁴
Through resistance		≥9.0	≥5.0
Shear strength		≥28.0	≥20.0
180 peeling strength, N/mm		≥7.0	≥5.0
Temperature resistance		≤4.00x10 ⁻⁵	
Coefficient of thermal expansion		No change	
Heat deflection temperature		≥105	≥95
Project, mm		Permissible deviation ranges	
Length, mm		±3	
Width, mm		±2	
Thickness, mm		±0.2	
Deviation of diagonal, mm		≤1	
Out of straight at sides, mm/m		≤5	
Adhesive	Not less than Grade 1	Squaring of Grade 0, Grade 1 marking method of rolling line	Qualified
Impact strength	50kg-cm Without paint off and crack	Pass	Qualified
Boiling water resistance	Boiling for 2h without change	Unchanged	Qualified
Acid resistance	Immerse surface with 5% HCL 1(mm)	Unchanged	Qualified

	for 48h without change		
Alkali resistance	Immerse surface with 5% NaOH 1(mm) for 48h without change	Unchanged	Qualified
Oil resistance	Immerse surface with 20mm of engine oil for 48h without change	Unchanged	Qualified
Solvent resistance	Clean 100 times with Butanone without change	Bottom unrevealed	Qualified
Cleaning resistance	Clean ≥ 10000 times without change	Unchanged	Qualified
Abrasion resistance	$\geq 5L/\mu m$	5.33L/ μm	Qualified
Contamination resistance	$\leq 15\%$	7.88%	Qualified
Bend strength	$\geq 100MPa$	121MPa	Qualified
Flexuous modulus of elasticity	$\geq 2.0 \times 10^3 MPa$	$3.12 \times 10^3 MPa$	Qualified
Through resistance	9.0kN	9.94kN	Qualified
Cutting strength	$\geq 28.0MPa$	32.0MPa	Qualified
180° Peel strength	$\geq 7.0N/mm$	11.2M/mm	Qualified
Resistance to change of temperature	+40°C-80°C,20 cycles without changes	Unchanged	Qualified

Heat deformation temperature	≥95°C	120°C	Qualified
Coefficient of heat expansion	≤4.00mmx100 °C	2.47mmx100°C	Qualified
Salt haze resistance aberration	Not less than Grade 2	Grade 1	Qualified
Aging resistance out of light	Not less than Grade 2	Grade 1	Qualified

PACKAGING SHIPPING & HANDLING

MAXPANEL sheets are produced from pellet resin and pre-finished coils, cut to length and packed on cushioned, wooden skids. The sheets are wrapped with industrial weight water-resistant paper for protection and the skid is then enclosed with (13mm) thick OSB board. MAXPANEL skids are constructed so well that many fabricating shops reuse them to ship fabricated product to the jobsite.

MAXPANEL, 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 polyethylene (PE) core panel weighs approximately 5.9 kg/m². Heavy duty masking, nominally 3.0 mils (75microns) with ultra violet barrier, is available to help protect the panel finish during fabrication and installation.

Care should be taken to keep work table surfaces clear of metal chips and shavings, etc., that could penetrate the masking and scratch or mar the panel surface. 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.

Normal precautions should be taken to protect the panel edges. Eye protection during fabrication is recommended.

MAXPANEL (fire resistant) core material may produce fine airborne particles when cut or routed, and we recommend breathing protection be worn during these operations.

COLORWELD FINISHES

MAXPANEL is offered in both standard Color weld 300 opaque finishes and Color weld 300XL metallic finishes. Custom color formulations in opaque, metallic and mica finishes are also available to meet virtually any architectural color requirement. Color weld finishes are full

strength PVDF coatings. They are the finest architectural metal finishes available today.

Prior to composite panel production, the aluminum skins are coil-coated, i.e. coils of aluminum sheet are unwound like spools of ribbon and painted in a reverse coil-coating process. This system continuously applies layers of paint to the metal strip by coating rolls which rotate opposite to the travel direction of the strip. Line speeds vary from 150 to 300 feet per minute (46 to 91 meters per minute). Coil coating produces exceptional application quality, efficiency, uniformity and economy compared to electrostatic spraying operations, which are characterized by non-uniform film thickness, over-spray losses and uneven application.

The metallic and mica coatings offered on MAXPANEL material are a three-coat system consisting of primer, color coat and a top, or sealer, clear coat. Some mica coatings are available as a standard two-coat system, these coatings are reflective or pearlescent in appearance because of millions of micron-sized aluminum or mica flakes suspended in the paint mixture, and are subsequently oriented in one longitudinal direction during the coating application process. The flakes are secured in position as the color coat is cured. The longitudinal orientation of the flakes is inherent in all metallic and mica coatings, and this orientation may cause a lighter or darker reflective appearance of the finish if the panels are turned 90° or 180° from the longitudinal run direction of adjacent panels. Panels or trim pieces turned in different directions may appear to be of 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. A specific effort must be made to anticipate the final position of the wall panels during the engineering layout and before panels are cut or fabricated from flat sheet stock. Additionally, forming MAXPANEL panels at or below ambient temperatures of 50 ° F (10 ° C) may adversely affect the appearance and performance of the Colorweld finish. MAXPANEL prints two lines of directional arrows on the back surface of every pane during production. The number of the production lot or unit is inked along with the directional arrows to identify the production run. Each panel is also sequentially numbered, but it is not necessary to place consecutively numbered panels adjacent to one another on the wall. Additionally, the protective strippable film is also printed with directional arrows to aid in the proper orientation of the panels.

It is the responsibility of the fabricator to be aware of the panel's directionality and to insure that additional arrows are marked on the panels as necessary if the panels are cut during fabrication. All panes 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.

In addition to directionality, all metallic and mica coatings are subject to appearance variations between coil coating runs. MAXPANEL strongly advises not mixing panels from different coil coating runs on the same wall elevation to avoid shading differences.

SAWING & ROUTING

Sawing and routing MAXPANEL 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.

LINE CUTS

MAXPANEL recommends (203mm) diameter, extra fine, carbide-tipped, 60 tooth, combination rip and cross cut blades. These blades can be used in both table and circular hand saws to successfully cut MAXPANEL ACP. Longevity of the cutting edge is dependent on the number and length of cuts performed.

EDGE KERF CUTS

These cuts are typically used to attach an extrusion lip. To rout the edge of the panel, MAXPANEL recommends (102mm) diameter circular saw blades mounted to a good quality (110mm) circular saw rated at 11,000 rpm. The 0.9mm×20mm) blade has a custom-made guide attachment, and the panels are edge cut, usually in a horizontal or flat position. The width of the saw cut will be dependent on the thickness of the extrusion lip to be inserted. It is not recommended to remove all of the core material at the panel edges down to the bare metal.

ROUTED CUTS

Circular Saws: MAXPANEL recommends custom circular saw blades machined from A2 tool steel for making groove cuts. These blades are (83mm) diameter, and have six evenly spaced dado type teeth at 105° and operate at about 11,000 rpm, which translates to a saw tip speed of 9360 feet per minute (47.6m/sec.). The groove allows the panel edge to be folded for a “rout and return”(R&R) panel unit or cassette.

Router Bits: MAXPANEL recommends standard bits that are machined to a 105°. The point is ground flat to create a 1/32” wide flat at the bottom of the cut. It is very important not to remove all of the core material from the back of the uncut aluminum skin, as this material provides a smooth radius bend line to be formed in the rout and return operation. The recommended thickness of core material to remain after routing is 0.020” (0.50mm) equal to the aluminum skin thickness.

Panel Saws: Automated vertical and horizontal pane 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. MAXPANEL 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.

ROLLFORMING

MAXPANEL ACP can be roll-formed to curved configurations for column covers, architectural bull-noses, radius building corners, and other applications requiring radius forming. This process can be accomplished with a “pyramid” roll-forming machine which consists of three motor-driven adjustable rollers. MAXPANEL has successfully roll-formed MAXPANEL using machines with minimum 2-1/2” (64mm) diameter rolls. The operator normally makes multiple

passes of the panel through the rollers to gradually obtain the desired radius.

MAXPANEL polyethylene (PE) core material can be rolled to a minimum radius equal to 15 times the thickness of the panel, i.e. for RB 160 (4mm) the minimum recommended inside radius is about 2-3/8" (60.3mm); for RB240 (6mm), about 3-1/2" (89mm).

Fire resistant (FR) core panels are offered in a standard thickness of 4mm. The FR core material has a minimum recommended curving radius of 12" to 15" (305 to 381mm). Note that the first 1" to 2" (25 to 50mm) of the panel edge may not be curved as it travels through the rollers. MAXPANEL does not recommend stretch forming MAXPANEL or heating the panel in any fashion to enhance formability.

BENDING

MAXPANEL ACP can be brake formed from 0° (flat) up to 90° to form a right angle. MAXPANEL has determined that RB 120 3mm panels can be bent 90° at a minimum inside radius of 5/8" (16mm) and RB160 4mm panels can be bent 90° at a 3/4" (19mm) inside radius. The tests were done in a hydraulic brake press using an open air bend bottom die with an inside opening of 2" (51mm) and an edge radius of 3/4" (19mm). To avoid damaging the aluminum skin, it is recommended that the center part of the die be filled with 60durometer rubber up to the top edges of the die. As with any fabrication technique, it may be advisable to try some experimental bends with scrap material, especially if a large number of typical units are scheduled for production.

FASTENING

A variety of different fasteners is used to fabricate and install MAXPANEL panels. Structural adequacy and selection of these fasteners is the responsibility of qualified engineers and in most instances where architectural panels are used, certified calculations will be required by the Building Official. MAXPANEL has successfully used specific fasteners for panel load testing purposes in obtaining Building Code recognition. MAXPANEL can provide this information upon request.

Pop rivets are often utilized to attach aluminum clip angles and other structural or ornamental elements to MAXPANEL 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. MAXPANEL has successfully used two 3/16" (5mm) diameter rivets to attach aluminum clip angles to the return leg of a rout and return panel system. 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 screws are industry standard and are appropriate to avoid corrosion and dissimilar metals contact. Because screws are customarily installed through pre-dried holes and because the MAXPANEL aluminum skins are nominally 0.28mm 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, MAXPANEL ACM 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 MAXPANEL panels to other MAXPANEL 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 torquing the nut onto the bolt. Because the plastic core material is compressible, over-torquing can deform the metal skins. Use lock nuts or double nuts with washers to prevent the nut from loosening over time.

INSTALLATION METHODS

MAXPANEL panels can be easily installed for both exterior and interior applications by a number of different methods. Several of these are shown in the following illustrations. A variety of both wet sea and dry seal systems are available from MAXPANEL of Qualified Architectural Dealers.

Rout & Return(R&R) and Continuous Edge Grip (CEG) are two of the most common attachment methods for aluminum composite material. Most architectural cladding systems are derivations of one or both methods. For interior applications, MAXPANEL may be installed with lightweight extrusions or in partition systems. MAXPANEL is also well suited for glazing into storefront and curtain wall applications.

Rout & Return begins with a flat sheet of MAXPANEL. Typically, a continuous vee-shaped routed groove is made around the entire panel perimeter at a minimum constant distance of one inch (25mm) from the panel edge. The face skin and a minimum thickness of 0.28mm of core material is all that remains after routing. The corners are removed and the edges are folded to create a one inch deep "pan" or cassette. The corners are reinforced with riveted aluminum angles to stiffen the panel unit.

Pre-punched aluminum clip angles are attached at approximately 12" (305mm) 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 accommodate a nestable, sequential installation plan. R&R joints should be minimum 5/8" (16mm) 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. R&R joints are then caulk sealed to prevent air and moisture infiltration...

Continuous Edge Grip (CEG) panels are perimeter-framed on the non-exposed side of the panel with extruded aluminum shapes, which provide registration and mechanically grab the panel edge. CEG lends itself to dry set (no exposed sealant) reveal joints. The CEG extrusions typically have a small lip which seats into a rectangular groove in the panel's edge. CEG extrusions are mitered and mechanically fastened at the corners and set in a continuous bead of silicone sealant, which provides positive structural attachment of the frame to the panel. MAXPANEL panels may need to be squared to form proper corner joints. CEG joints should be minimum 5/8" (16mm) wide to allow for thermal movement. Slotted holes at fastener connection points on the CEG extrusions may be needed to accommodate thermal movement. Consideration should be given to accepted curtainwall design practices.

SILICONE SEALANTS

Silicone sealants are often used in rout and return panel applications to caulk horizontal and vertical MAXPANEL panel joints. This creates a primary weatherseal between the exterior panel system and the interior of the building. Silicone sealants demonstrate excellent compatibility and adhesion to the Color weld finishes of MAXPANEL panels.

MAXPANEL does not recommend the placement of silicone sealants directly against the polyethylene (PE) or fire resistant (FR) core materials of MAXPANEL ACM if the intended purpose of the sealant is for weatherproofing the joint or structurally bonding the core to another material. 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.

HOT AIR WILDING

Hot air welding of the MAXPANEL 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 which is generating a stream of hot air approximately 500 ° (260 °C). The hot air liquifies the surfaces of the two adjoining pieces, as well as melting 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 training the hot air stream on one spot for too long. Some shrinkage may occur in the weld during cool down. Please consult the equipment manufacturer for installation. Hot air welds should not be relied upon to transfer static or dynamic loads to the panels, nor for weatherproofing of joints. Hot air welding is typically done on polyethylene core material only.

POST PAINTING & PANEL REPAIR

MAXPANEL panels are available from stock with a wash coat that is suitable for post-paint applications by qualified painters. Proper surface preparation and pre-treatment may be required to successfully apply the various air dry paint systems (ADS) that are available. Touch-up 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. MAXPANEL recommends 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. It is recommended that panels be purchased with available heavy duty (3mil) strippable film to help protect against this type of incidental damage. Small scratches can be easily repaired with

matching air-dry touch-up 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

MAXPANEL panels will thermally expand and contract the same as solid aluminum sheet or plate. RB160 (4mm) has a coefficient of expansion of 1.31×10^{-5} in/in/°F (2.36×10^{-5} mm/mm/°C). We suggest that architectural wall panel joints be a minimum 5/8(16mm) wide to account for thermal movement of the panes, unless design calculations prove otherwise. The expected increase in length of a 10 foot(3050mm) long panel will be about 3/16(4.8mm) 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"(11mm). Thermal growth or contraction can occur in any direction on the panel and is always greatest along the longest panel dimension. For examples of both expansion and contraction, and their effect on the panels,

PANEL REINFORCEMENT

MAXPANEL panels can be stiffened by various means to resist wind loads and reduce panel deflection. Stiffeners are usually 1"to 1/2" (25-38mm) deep aluminum extrusions and are adhered to the non-exposed back side of the panel at 24" (610mm) on center. Stiffeners act like miniature beams and are most effective if used across the shortest panel dimension. 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.

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 the table below. Because the maximum panel deflection is at the geometric center of the panel, a stiffener should be placed there with the remaining stiffeners extending laterally at equal spacing from that point.

CLEANING

MAXPANEL panels have factory coil coated skins with a Colorweld finish. Depending on the geographic location of the building and the atmospheric conditions, routine maintenance may be required to clean the Colorweld surface to 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 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 to larger exposed areas.

Mineral spirits may be used sparingly to remove caulking compounds or tar from the finish. Greasy or oily deposits can be removed with a PPG Grease and Wax Remover scaled DX330. Rinse with clear water. MAXPANEL recommends AAMA's "Voluntary Guide Specification for Cleaning and Maintenance of Painted Aluminum Extrusions and Curtain wall Panels." Publication No.610.1-1979 as suitable reference for required cleaning and maintenance of the painted finish of MAXPANEL panels.