ALPOLIC™

ALPOLIC/NC-US Painted MCM

Fabrication Manual

Fabricating ALPOLIC®/NC-US

You discover why ALPOLIC aluminum composite material (ACM) is the building material of the future as soon as you fabricate it. Our NC-US MCM requires slightly different tooling and processing conditions compared to our standard ACM product offerings.

ALPOLIC's versatility makes it readily adaptable to many standard systems that are available from a variety of vendors, including rout & return systems, glazed-in systems, and creative custom systems. In addition, you can create complex assemblies with ALPOLIC and support systems attached with structural adhesives. ALPOLIC surfaces can be connected to one another or to other materials by such conventional methods of attachments as rivets, bolts or screws.

For interior installations, you can easily attach flat surfaces of ALPOLIC to such substrates as sheetrock and plasterboard with double-faced tape or a non-hardening adhesive. For further design, detailing and fabrication guidance, please refer to the materials in this section, or go to www.alpolic-americas.com. For samples or a list of authorized ALPOLIC fabricators, please call us toll-free at 1-800-422-7270, or e-mail us at info@alpolic.com.

Visual Consistency

Each of our product types has special characteristics that can affect 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 ALPOLIC panels.

Solid Colors: Solid colors present the best case for panel to panel and lot to lot consistency. The industry standard for allowable variation 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

Metallics: 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 (flop). 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 MCA ALPOLIC Division for confirmation that the lots are visually similar enough to be used together. The larger the flake size the greater the likelihood that the lots will not be able to be mixed.

Micas: The Mica finishes provide a metallic like appearance with a two pass paint system. Like the metallics the micas utilize flakes to give the flashy appearance, therefore, like the metallics, the mica finishes are directional, and lots should not be mixed on a building face without first contacting MCA ALPOLIC Division for confirmation that the lots are visually similar.

Note: All Color measurements are done using an R(0/45) geometry, D65, 10-degree observer in a Hunter color space.

PROPERTIES

Thermal Expansion/Contraction

Thermal expansion/contraction must be considered when designing with ALPOLIC®NC-US MCM.

To calculate thermal expansion/contraction, use the following equations:

Thermal Expansion/Contraction (inches) = 12 x Cth x ΔT(°F) x L(feet)

C-th = Coefficient of thermal expansion (11.67 x 10-6)
L = Length of ALPOLIC panel

ΔT= Ta – Ti where Ta is the actual temperature and Ti is the temperature when ALPOLIC was fabricated or installed. A positive ΔT indicates expansion and negative DT indicates contraction.

Thermal Expansion/Contraction Per Foot(inches)

ΔT	10	20	30	40	50	60
4mm	0.0014	0.0028	0.0042	0.0056	0.007	0.0084
ΔT	70	80	90	100	110	120
4mm	0.0098	0.0112	0.0126	0.014	0.0154	0.0168

Fire Resistance Properties

Surface Burning ASTM E84	
Smoke developed index	<25
Flame spread index	<450
Ignition temperature ASTM D1929	
Flash ignition:	946°F
Self-ignition:	955°F
Rate of burning ASTM D635	CC1
NFPA 285	Passed
Potential heat release NFPA 259	<1270 BTU//ft²

Mechanical Properties

Item	Unit	ASTM	4mm
Tensile strength	PSI	E-8	6,7440
Yield strength	PSI	E-8	6,991
Elongation	%	E-8	27
Flexural elasticity	PSI x 10^3	C393	5700
Maximum Lload	lb.	D-732	3,245
Shear resistance (1"-Ø)	PSI	D-732	6,465

Product Tolerance

Width	±0.08" (2mm)
Length	±0.012" per ft (1 mm/meter)
Thickness	±0.012" (.3mm)
Bow	Maximum 0.5% of the length and/or

Physical Properties

Item	Unit	ASTM	4mm
Specific gravity	—	—	2.015
Weight 1b/ft²	—	—	1.76
Thermal conductivity	BTU//hr	C1363	0.231
Deflection temperature	°F	DD-648	—

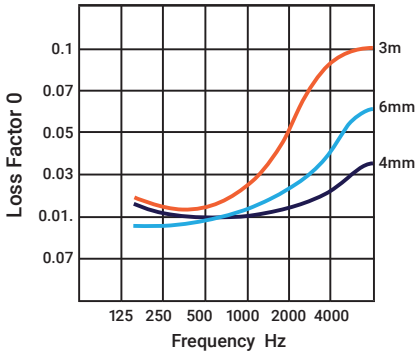
Body Integrity

Item	Unit	ASTM	4mm/.157"
Vertical pull	PSI	C-297	1,800
Climbing drum peel	In-lb./in	D-1781	30.1
	N·mm/mm	D-1781	133.8
Flatwise shear	PSI	C-273	1,220

Vibration Damping

As a laminated composite material, ALPOLIC® can dampen vibration by either absorbing vibration energy or converting it into thermal energy.

Vibration Damping (at 73.4°F)

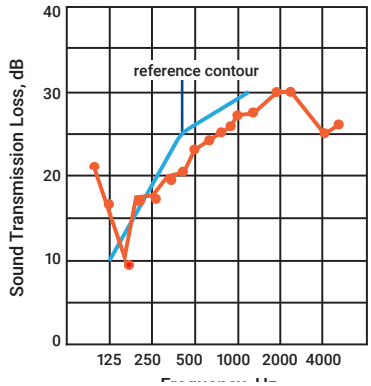


Sound Transmission

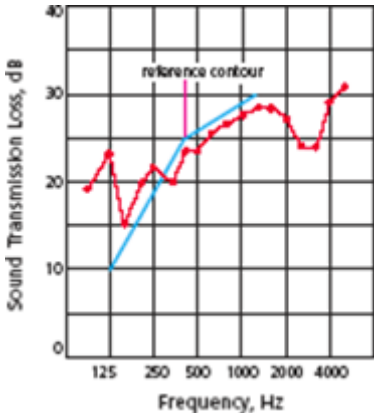
When tested in conformity with ASTM E-413, the following sound transmission classes (STC Nos.) were established:

4mm-STC 26
6mm-STC 26

Sound Transmission 4mm



Sound Transmission 6mm

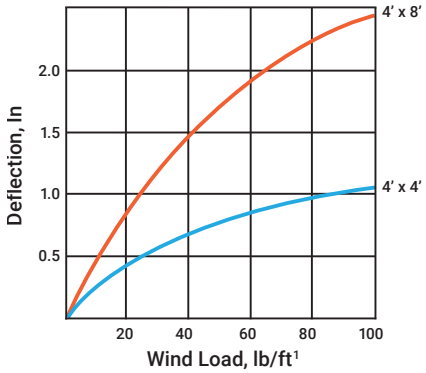


Wind Load Deflection

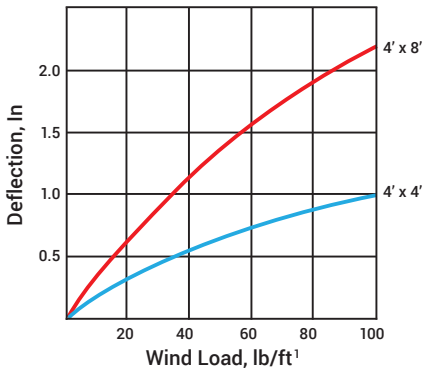
Wind load deflection depends on the thickness, aspect ratio, span, and boundary condition (whether ALPOLIC® is simply supported or fixed).

The aspect ratio is the ratio of the longer to the shorter dimension of a panel. Panels with the same area but different aspect ratios will have different wind load deflections. For example, a 2’ x 8’ panel with an aspect ratio of 4 will have a smaller wind load deflection than that of a 4’ x 4’ panel with an aspect ratio of 1.

Wind Load Deflection: 4mm



Wind Load Deflection: 6mm



For more information and calculations for wind load and deflection please refer to the download section of ALPOLIC-AMERICAS.com.

MECHANICAL PROCESSING

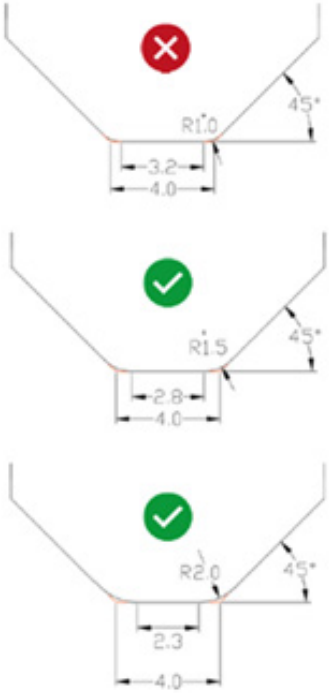
Cutting/Saw

ALPOLIC® can be easily cut using standard woodworking saws (i.e. circular hand saw or panel saw). A carbide tip blade made for aluminum and plastic is the most suitable for cutting ALPOLIC® . *(Refer to next page).*

Cutting/Shear

Square shear cutting is the easiest method for cutting large panels. Some shear droop may result at the cut part of the aluminum surface material.

For shear cutting ALPOLIC®: recommended rake angle for shear cutting as listed below.



Thickness of ALPOLIC®	Clearance	Rake angle
4 mm	0.0016”	1° 30’

Edge Finishing

When a smooth finished edge is required on ALPOLIC®, the following equipment can be used to provide specific requirements: woodworking planer or shaper, tenoning machine or milling machine.

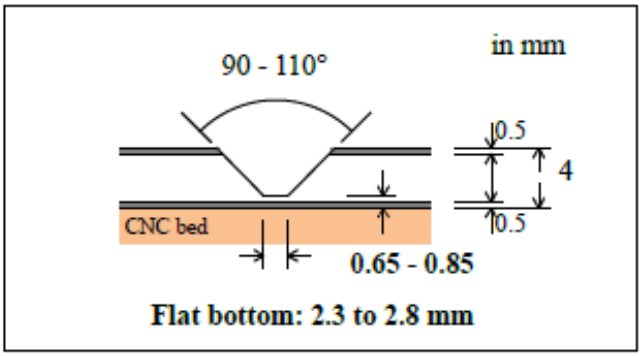
The edging process provides smooth, crisp, clean edges, to ensure clean joint intersections or to create a detailed frame effect when angled.

Processing

Because of ALPOLIC® NC-US’s composite makeup, the following process is required to fabricate sharp angle bends. This requires routing or cutting a ‘U’ groove in the ALPOLIC®, as shown, to provide the required bend.

Observe the following recommendations in ‘U‘ cut processing:

The ‘U’ cut bottom should not reach the back of the aluminum. The remaining thickness should be between 0.026” to 0.033” (0.65-0.85mm) which includes the core, aluminum, and protective film.



Typical U-groove shape

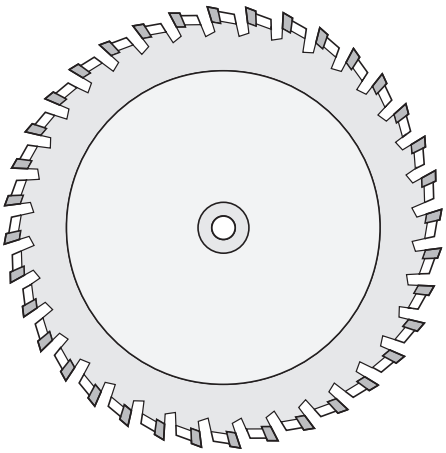
Number of teeth	2 - 4
Rotation speed	20,000 rpm
Feeding speed	10 - 16 ft/min.
Material	Carbide

Router and Trimmer Tools

Use the bit as shown in the drawings below, which corresponds to the cut diagrams above.

Saw Milling Cutters

Carbide Tip Saw Example	
Outside diameter	10”- 12”
Number of teeth	80-100 (saw)
Rotation speed	3,000 - 5,000 rpm (varible motor)
Feeding speed	32- ft/min.



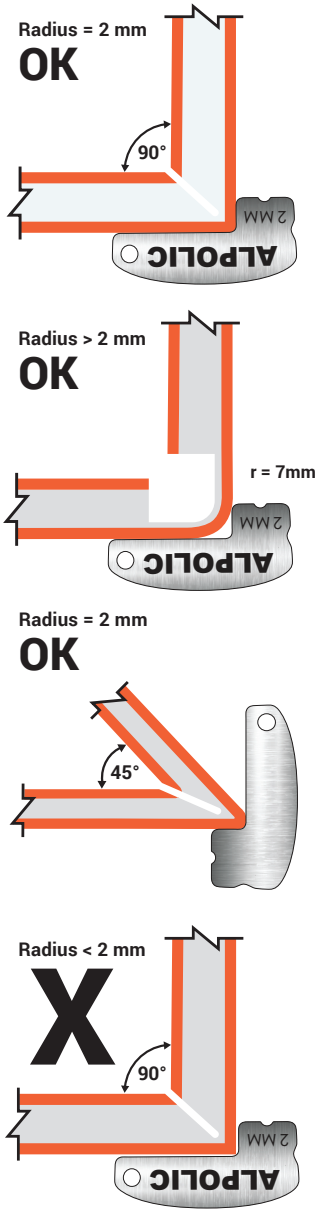
Bending

ALPOLIC® should be processed on a flat surface, void of irregularities, to ensure consistency in the depth of the ‘U’ grooving. This will ensure a smooth clean edge when bent.

If available, a folding jig should be used to bend processed ALPOLIC®/NC-US. When this is not possible a simple bending jig made of wood or metal is recommended.

When ALPOLIC® is processed with a ‘U’ groove and bent at 90°, the finished panel dimension will increase by 1/64-1/32”. This should be factored into the panel dimensions before final fabrication. It is advisable to do a preliminary test to ensure the proper adjustment.

A bend radius of less than 2mm may cause the finish to crack and void the finish warranty.

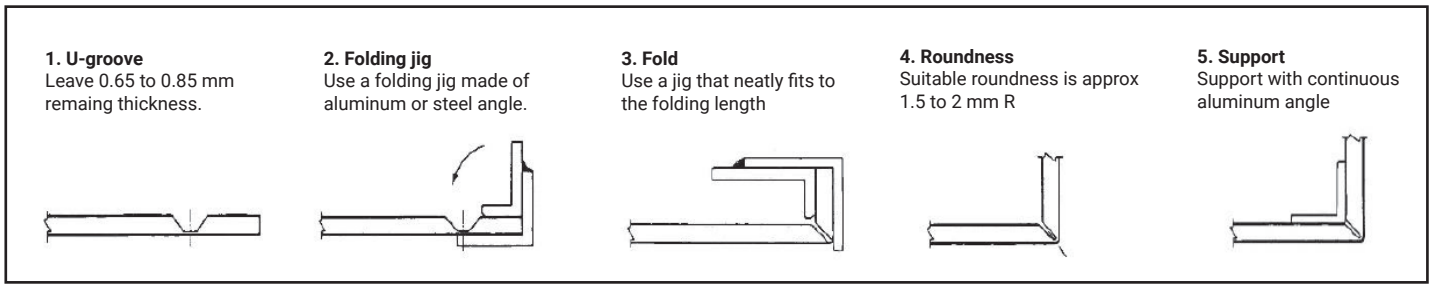


Folding Guide

After U-grooving, ALPOLIC®/NC-US can be folded using a folding jig.

A range of folding jigs should be used that are aligned with the length of the leg to be folded. Each length should be folded in one smooth continuous motion; incremental folding is not recommended. This will minimize any fracturing of the core that may occur.

Please see diagram and images below.



Folding Procedures

Curving

ALPOLIC® can be curved using a Roll Bender. The minimum bending radius is 59” (1500 mm R).

Note: Bending for small radius by means of a press break is not applicable due to less flexibility of the high mineral content core.

The following are guidelines and limitations for curving ALPOLIC® panels.

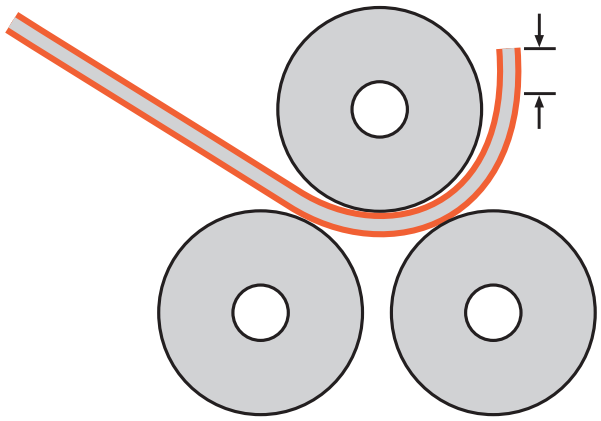
Guidelines in bending process:
The ALPOLIC® surface can be scratched, therefore it is recommended that the following precautions be taken:

a.) To prevent scratching, it is best to leave the factory applied protective film on the ALPOLIC® during processing. Be sure there are no air bubbles or wrinkles before processing.

b.) With ALPOLIC®, the volume of spring back can vary in relationship to the bending direction, thickness, material temperature, and the radius of the required bending angle.

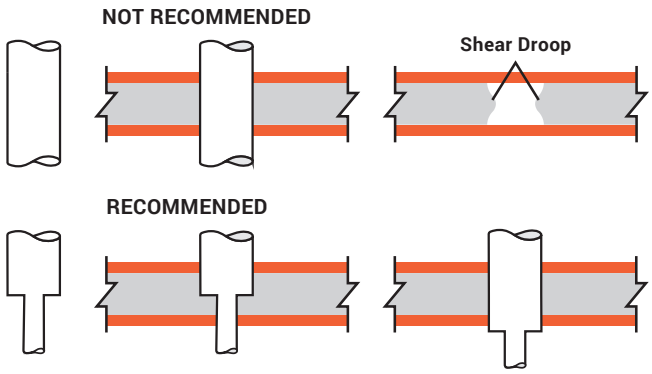
Bending with a Roller Bender:

A Roller Bender enables a larger bending radius. The bending angle is determined by the diameter of the roll and the distance between the rolls. However, a flat surface will appear at the beginning and the end of the panel. For instances in which this is not acceptable, it will be necessary to cut off and remove the flat surface in the finish fabrication process.



Punching

Punching with a press sometimes causes shear droop in the aluminum surface material similar to shear cutting. It is preferable that the clearance of punch and die be made as small as possible (thickness of panel times 5%). In the case of a small diameter hole (under 1/6”) the tool may need to be modified as shown below to ensure that the core is completely removed in the process.



Drilling

ALPOLIC® 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.

ATTACHMENT CONCEPTS

Joining Adhesion

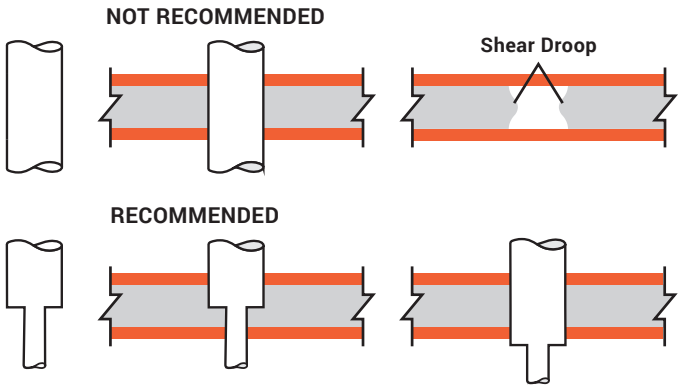
Typical methods of joining ALPOLIC® are the use of threaded fasteners, rivets, adhesives and double-faced high strength tapes. Proper consideration should be given to the thermal expansion characteristics of ALPOLIC®.

Please reference the joint details diagrams in the download section on ALPOLIC-AMERICAS.com.

Use the general guidelines listed below when other elements come in direct contact with the surface of ALPOLIC®. When attaching copper, iron, brass, raw steel and bronze consideration needs to be given to the possible corrosion of joining surface due to electrolysis of dissimilar materials. If these materials must be used, make sure that a protective coating or separation exists between the two surfaces.

Threaded Fasteners

When using threaded fasteners, caution should be taken not to overtighten the fastener. The examples below show different threaded fastening methods.



APPENDICES

Masking

ALPOLIC® comes with a factory applied protective masking film which should be removed after fabrication.

Storage

ALPOLIC® is packed in wooden crates and can usually be stacked up to four crates high.

When storing unpacked ALPOLIC® observe the following guidelines:

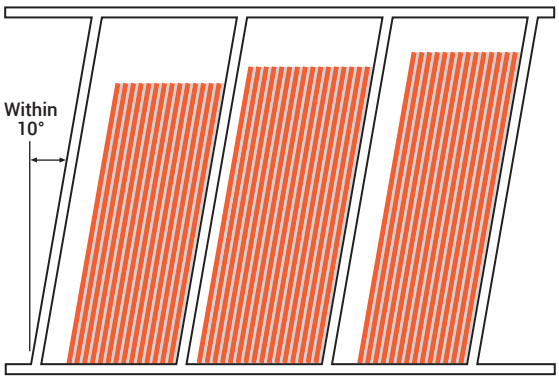
- To prevent warping or bending, place it horizontally on pallet or other stand.

- Avoid stacking ALPOLIC® 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.

- In storing them by leaning against the rack as shown below, lay a rubber mat underneath and lean the ALPOLIC® closely against the fixed back-up material.

RACKING SYSTEM



Cleaning

The following cleaning procedure can be used for all ALPOLIC® finishes.
ALPOLIC®'s Lumiflon® resin finish is self-cleaning and should shed airborne dust and dirt in rain showers. If cleaning is required, use the following procedure in order of increasing difficulty of removal.

1. Flush with water from hose.
2. Wipe lightly with soft cloth.
3. Use pressure washer.
4. Use mild detergent in power wash or with a soft cloth for hand wiping and flush with water.

For stubborn stains, graffiti, etc.:

1. Prepare a mixture of 1 part of Mirachem 500 Liquid, to 3 to 10 parts of water depending on desired strength. Solvents like alcohol are not recommended in view of environmental health and fire safety. Some solvents may also cause gloss change or paint damage.

2. Wash the ALPOLIC surface with the Mirachem 500 water solution by hand using a lamb's wool mitt or soft cloth. **Do not rub the surface hard.**

3. IMMEDIATELY use a garden hose to rinse the ALPOLIC® surface with water.

Note that a power washer (3,000 psi) only removes light dirt and does not remove streaks of grime.

MiraChem 500 liquid is available in 1, 5 and 55 gallons containers. 1 gallon of MiraChem 500 (4-11 gal. mixed) cleans approximately 1,500 - 4,000 ft2 of panel surface. For smaller areas, use MiraChem Foaming Aerosol.

Supplier:
The Mirachem Corporation
1045 South Edward Drive
Tempe, AZ 85181
Contact: 800.847.3527

Beautiful, durable, and safe architectural solutions.

alpolic-americas.com