OCULUS
Panels

FABRICATING AND WORKING WITH ACM PANELS

You will discover why aluminum composite material (ACM) is the building material of the future as soon as you fabricate it. As easy to fabricate as working with wood, no special tools are required. It can be curved, bent, routed, drilled, sawed, sheared, punched, trimmed and molded into complex shapes with conventional woodworking or metalworking tools.

OCULUS Panels versatility makes it readily adaptable to other standard systems available from a variety of vendors, including rout & return systems, glazed-in systems as well as highly-creative custom systems. Additionally, you can create complex assemblies with our panels in combination with polyethylene welding and numerous support systems attached with structural adhesives. 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 the surface of the panel to such substrates as sheetrock and plasterboard with double-faced tape or a non-hardening adhesive. For design, detailing and fabrication guidance, please refer further within this document.

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 to install ACM 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. 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 the coating process, 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. The larger the flake size the greater the likelihood that the lots will not be able to be mixed.

Please call OCULUS Panels, 646.470.2722 or e-mail us at info@oc-ww.com to discus any questions you may have.

OCULUS
Panels

MECHANICAL PROCESSING

CUTTING/SAW

ACM 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 ACM (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 ACM: recommended rake angle for shear cutting as listed below.

Thickness of ACM Panel	Clearance	Rake angle
3 mm	0.002"	1°
4 mm	0.002"	1° 30'
6 mm	0.008"	2° 30'

EDGE FINISHING

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

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

PROCESSING

Because of ACM's composite makeup, the following process is required to fabricate sharp angle bends. This requires routing or cutting either a 'V' or 'U' groove in the ACM, as shown, to provide the required bend.

RECOMMENDATIONS

Observe the following recommendations

In 'U' or 'V' Cut Processing:

- The 'U' or 'V' cut bottom should not reach to the back of the aluminum. Leave about 0.008 - 0.016" of polyethylene core. Router and Trimmer Tools
- ACM should be processed on a flat surface, void of irregularities, to insure consistency in the depth of the 'V' or 'U' grooving. This will insure a smooth clean edge when bent.

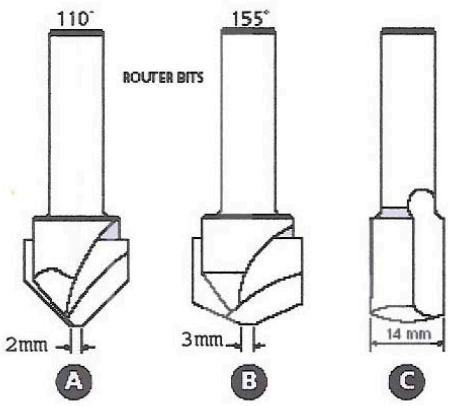
When Bending:

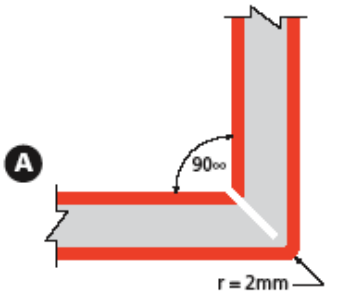
- If available, a plate or break press should be used to bend processed ACM. When this is not possible a simple bending jig made of wood or metal is recommended.
- When ACM is processed with a 'V' groove and bent at 90°, the finished panel dimension will increase by approximately 1/8". This should be factored into the panel dimensions before final fabrication. It is advisable to do a preliminary test to insure the proper adjustment

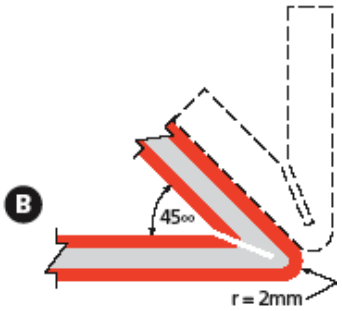
OCULUS
Panels

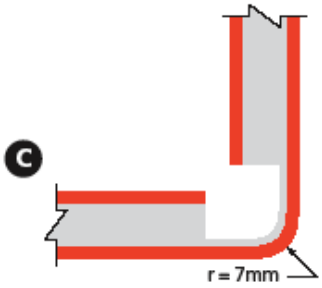
ROUTER, TRIMMER AND SAW/MILLING CUTTER TOOLS

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

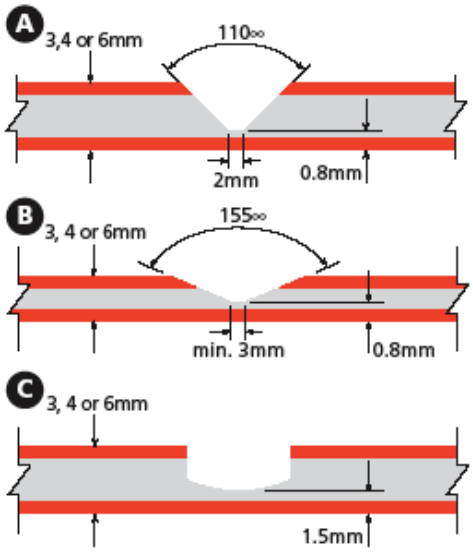


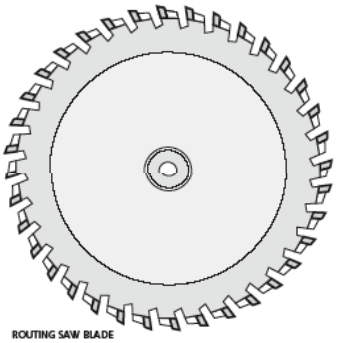






Number of teeth	2 - 4
Rotation speed	20,000 - 30,000 rpm
Feeding speed	10 - 16 ft/min.
Material	Carbide





Carbide Tip Saw Example	
Outside diameter	12" o
Number of teeth	36 (saw) 8 (grooving)
Rotation speed	3,000 - 5,000 rpm (variable motor)
Feeding speed	16 ft/min.

OCULUS
Panels

CURVING

ACM can be easily curved using any of the following processes: Press Break, Roll Bender, or Pipe Fixture.

The following are guidelines and limitations for curving ACM panels.

PRESS BRAKE

The minimum bending radius using a press brake is shown in the following table.

The Minimum Bending Radius with a Press Brake, 90º Bending and Internal Radius

ACP	Traverse (width)	Parallel (Length)
3 mm	1 1/2"	2"
4 mm	1 1/2"	2"
6 mm	2"	3"

GUIDELINES IN BENDING PROCESS

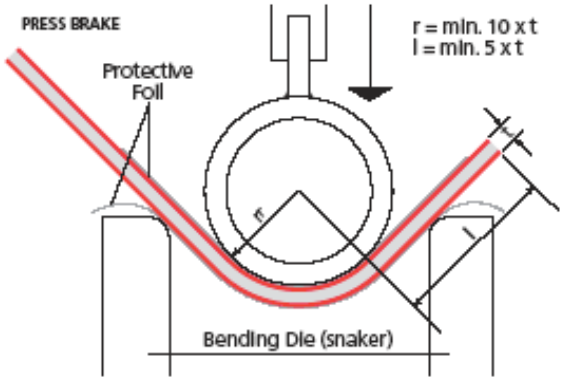
Because the ACM surface can be scratched, it is recommended that the following precautions be taken:

To prevent scratches, a protective pad should be used on the die of the press brake.

Pay attention to any scratches on the punch. It is recommended to use a fully polished punch.

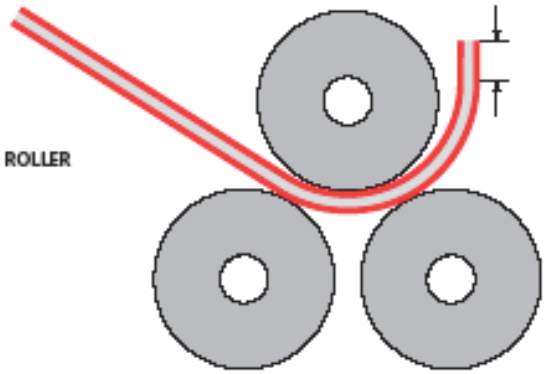
To prevent scratching, it is best to leave the factory applied protective film on the ACM during processing. Be sure there are no air bubbles or wrinkles before processing.

With ACM, the volume of spring back varies somewhat in relationship to the bending direction, thickness, material temperature and the radius of the required bending angle.



BENDING WITH A ROLLER BENDER

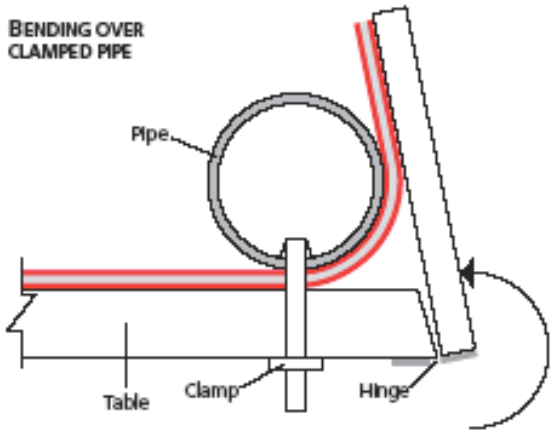
A Roller Bender enables a larger bending radius than a press brake. The bending angle is determined by the diameter of the roll and the distance between the rolls. However, a flat surface will appear at the beginning and the end of the panel. When this is not acceptable, it will be necessary to cut off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



OCULUS
Panels

BENDING WITH CLAMPED PIPE FIXTURE

ACM can be bent over a pipe of the proper inside diameter that is securely clamped to a table. A hinged leaf attached to the end of the table will make bending easier. Initial bending beyond 90 may be required to compensate for any memory spring back.

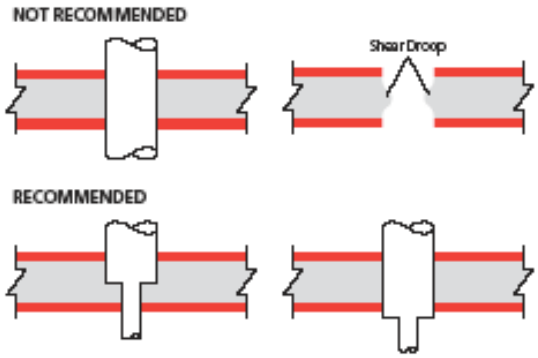


PUNCHING/DRILLING

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 polyethylene is completely removed in the process.



DRILLING

ACM 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.

OCULUS
Panels

ATTACHMENT CONCEPTS / JOINING ADHESION

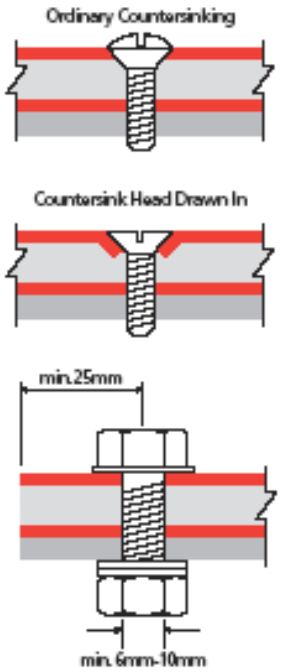
Typical methods of joining ACM are the use of threaded fasteners, rivets, adhesives and double-faced high strength tapes.

Proper consideration should be given to the thermal expansion characteristics of ACM.

Use the general guidelines listed below when other elements come in direct contact with the surface of ACM. 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 over tighten the fastener. The examples below show different threaded fastening methods.



RIVETS

Rivets can be used to fasten ACM panels together or to aluminum extrusion profiles. Rivets are especially suitable for fastening when vibration is likely. Colored plastic concealment caps can be used to conceal exposed rivet heads.

ADHESIVES & HIGH BOND TAPES

When the ACM attachment surface is flat (i.e. wall, ceiling, sign board, etc.) construction adhesive or double-faced high bond tapes can be used for installation.

ADHESIVES FOR ACM

Adhesives suitable for adhering ACM to various kinds of substrates are shown in the following table.

Kind of Adhesives	Substrate A-Metal B-Paper Honeycomb C- Plaster Board D-Styrene Foam E- Lumber				
	A	B	C	D	E
Epoxy-based	x	x	x	x	x
Acrylate-based	x	x	x		x
Chloroprene-based	x		x		x
Nitrile rubber-based a-cyano acrylate-based	x		x		x

OCULUS
Panels

WELDING/HOT MELT

EDGE PREPARATION

ACM parts should have edges beveled to the corresponding angle of the finished part and allowing an exposed surface on the welded side. A low-density polyethylene rod should be used in conjunction with a high-speed hot air welder equipped with a pressing apparatus.

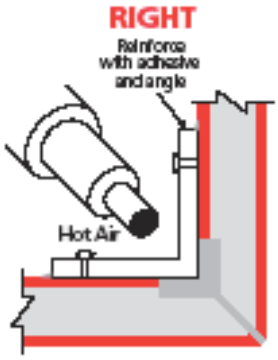
HOT AIR WELDING (PE CORE)

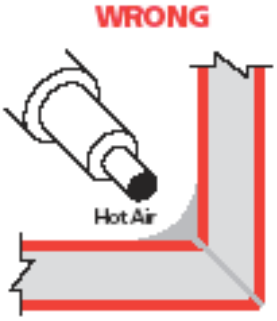
This process is used to join ACM panels through a process of welding the polyethylene core.

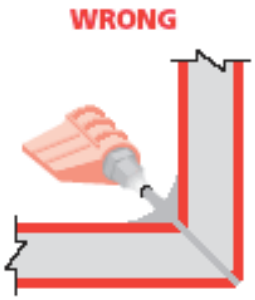
WELDING SPECIFICATIONS	
Welding Temperature:	446 - 464° F
Air Pressure:	0.10-0.14 lb/in
Pressing Pressure:	2.2-3.3lbs.
Welding speed:	40 in/min.

HOT MELT

When using Hot Melt systems to bond the the panel, be sure that the surfaces to be bonded have been abraded and cleaned. Hot Melt adhesives designed for bonding aluminum or metals are recommended. To insure the maximum bonding, please consult the adhesive manufacturer.







OCULUS
Panels

APPENDICES

OFF-LINE COATING

ACM can be off-line coated, if necessary. It is advisable to follow instructions as specified by the manufacturer of any paints to be used.

For off-line coating observe the following guidelines:

- Surface should be lightly abraded to provide a better coating surface. Surface should then be cleaned of all contaminates i.e. dust, dirt and oil etc. A soft cloth with a non-petroleum based solvent (e.g. rubbing alcohol) should be used to clean the surface area.
- Curing should be done at room temperature since temperatures above 175ºF can cause deformation of the ACM panel.

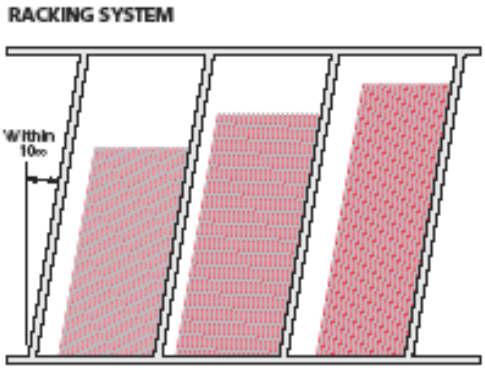
MASKING

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

STORAGE

ACM is packed in wooden crates and can usually be stacked up to four crates high. When storing unpacked ACM observe the following guidelines:

- To prevent warping or bending, place it horizontally on pallet or other stand.
- Avoid stacking ACM 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 ACM closely against the fixed back-up material.



CLEANING

The following cleaning procedure can be used for all ACM finishes. ACM finish is a self-cleaning product 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 a 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., please contact our office at 646.470.2722 for assistance.