

Instruction Manual Of ACP

MENU

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Unloading, Transfer, Storage



| Unloading, Transfer, Storage

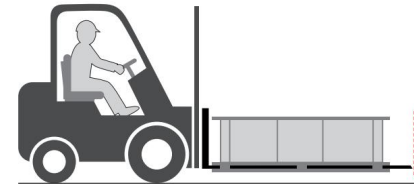
To protect ACP composite panels from mechanical damage during transport, storage and handling, the following rules must be respected. Complaints based on improper handling will not be accepted.

Forklift request

Sufficient lifting force must be guaranteed.

Length of the forklift truck

- Use of sufficiently long forklift forks. If necessary, fork extensions should be used.
- The forks should ideally protrude on the opposite side of the pallet or be at least 2/3 inserted in the pallet to ensure safe transport.
- Lift the pallet first and only then tilt it to prevent the fork tips from being pushed through.
- The load centre of gravity should be as close as possible to the lift mast and in the middle between the forks.
- Do not lift the pallet with the fork tips. It can cause damage to the packaging or the product.



Forklift forks ideally protrude on the opposite side of the pallet.

| Unloading, Transfer, Storage

Width adjustment of the forks

- Spread the forks to maximum width to prevent the pallet from bending, ACP panels from slipping and damage to the product or packaging. Lifting or transporting the pallet with forks together can cause the pallet to bend, which could damage the pallet and the product.

General handling

- Always lift or lower the pallets slowly to avoid bending. This prevents damage to the product or pallet.
- Stacked pallets must be secured against slipping when transported in closed trucks or containers.
- Appropriate edge protection should be used to prevent damage.

Storage

- If possible, the material should be stored inside the building to protect packaging and goods. If stored outdoors, protection against moisture should be provided.

Stacking

- It is recommended not to stack pallets in original packaging more than 5 units high. Long-term storage stacking requires each pallet to be stacked separately and can be stacked using tiered storage racks.

| Unloading, Transfer, Storage

Hoisting

- Ideally, the ACP should be lifted with a suitable tool, such as a vacuum lifter. If this is not possible, the following instructions for manual lifting should be considered.

Safety

- For the handling of ACP panels it is generally recommended to wear cut-resistant protective gloves to avoid cut injuries.

Cleaning of working area

- Before unpacking the ACP panels, the designated work area should be thoroughly cleaned of dirt, stones, aluminium chips or other objects. The same applies to further processing.

Stacking of individual panels

- To avoid imprints, nothing should lie between the ACP sheets when stacking.

| Unloading, Transfer, Storage

Electrostatic charge

- Mechanically stacked panels in particular are usually electrostatically charged. Before repackaging/further processing, the existing packaging must be opened and the ACP panel adhering underneath must be loosened.

Transport

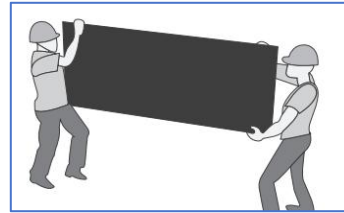
- For further transport, the ACP panels should always be lifted and carried vertically by two persons. To do this, grasp the panel at the four corners and lift it (do not pull it over each other) as shown " sketch1" .
- When flipping the aluminum composite panel from horizontal to vertical, it is necessary to manually control the force and proceed slowly. Some large 3mm thick panels can generate significant twisting forces during the flipping process, leading to deformation, which may cause warping when used in a digital printer later on.

Stock transfer

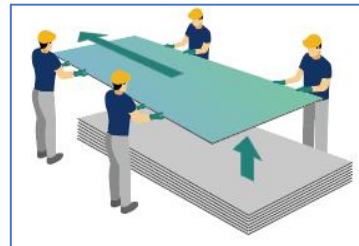
- Individual ACP panels must be completely lifted from the panels below, they must not be pushed over each other. We recommend the use of a vacuum lifter. The ACP panels should be lifted and transported along the long side as shown " sketch2" .

Number of persons required for repacking/transfer

- Panel length $\leq 4,500\text{mm}$: 4 persons required
- Panel length $\geq 4,500\text{mm}$: 6 persons required



Sketch1



Sketch2

Instructions for Using Protective Film

B

| Instructions for Using Protective Film

In order to keep the 3DPANEL surface protective film intact, the following requirements should be observed:

Do not tear the protective film during processing, and ensure that the protective film is not scratched as much as possible.

If the protective film is partially torn, the stain will accumulate on the surface of the board, when the protective film is completely torn, this part of the board needs special cleaning.

To avoid residuals of glue sticking to the surface of the panels due to UV radiation, it is recommended to remove the protective foil as soon as possible after the installation.

The protective foils and the panel surfaces must not be marked using ink (marker), adhesive tapes or stickers, as the lacquered surfaces could be damaged by solvents or plasticizers.

Make sure to remove the protective foil as soon as possible after installation as weathering for a longer period could make the foil difficult to remove.

CUTTING METHOD



| CUTTING

General Cutting Methods

Aluminum composite panels can be cut using circular saws, band saws, or jigsaws. If the edges are rough after cutting, it is usually due to the following reasons: the cutting tool has overly rounded edges, the machine base is not properly padded, excessive machine vibration, or too much debris on the saw blade causing heat buildup. If the feed speed during cutting is too fast, debris from the core material can accumulate and easily block the dust extraction system, affecting the cutting performance of the ACP. Therefore, it is crucial to choose the appropriate equipment and cutting parameters to control the debris generated and the heat produced.

Cutting for Complex Shapes

Complex shapes can be cut from ACP using CNC machines, water jet cutters, profile milling machines, contour saws, and jigsaws. When using a water jet cutter, it is advisable to employ abrasive cutting. Additionally, drill a hole in the middle of the panel before cutting; this provides a stable starting point, ensuring a smooth cutting process and preventing uneven edges and cutting issues.

Shearing and Punching

ACP can also be cut using a shear machine, but it is essential to place padding on the mold! Due to the viscoelastic properties of the core material, cutting on the panel's shearing surface may result in slight deformation of the aluminum surface on the front side. Generally, small marks on the edges of the panel do not affect its use. However, to prevent damage from impact, it is recommended to place a rubber pad on the front side of the panel.

Punching

ACP of any thickness can be processed using standard punching equipment. To ensure high-quality punching, it is essential to use a very flat bottom die and minimize the gap as much as possible. Additionally, the punching process may cause slight deformation of the surface panel.

GROOVE BEND

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D

| GROOVE BEND

The main feature of ACP panels is that they can be easily cold-formed using simple techniques. Processors can create panels of various sizes and shapes using straightforward grooving and bending techniques. When grooving, a circular saw or milling cutter is used to create V-shaped or rectangular grooves along the bending line on the back of the panel, leaving a portion of the polyethylene core layer intact. After grooving, bending can be done by hand without the need for any equipment. The corner radius of the bent panel depends on the shape and depth of the groove.

The compelling advantages of this technique include:

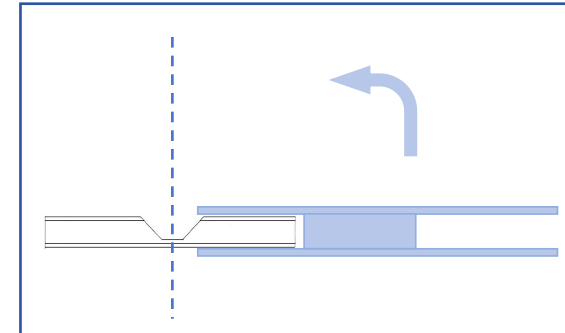
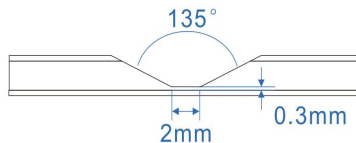
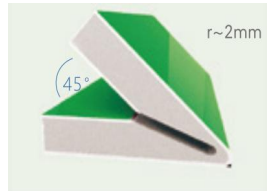
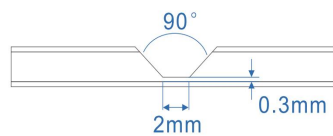
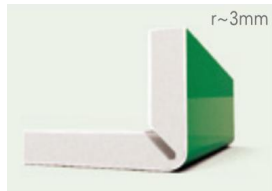
- Simple and easy processing technology;
- Bending can be done both in the workshop and on-site;
- Allows for different design shapes;
- The shape of the panel is not affected by the size of the processing equipment;



GROOVE BEND

After grooving and bending using the different methods listed below, the corner radius of the panel will be between 2~7mm:

- Use a milling cutter to create V-shaped or rectangular grooves along the bend line on the back of the panel. For V-shaped grooves, leave a 0.3mm thick layer of polyethylene on the front of the panel; for rectangular grooves, leave a 1.0mm thick polyethylene layer.
- For grooving, it is recommended to use a fixed grooving machine with a slotting cutter or a manual grooving machine with a guide rail or template. The corner radius of the bent panel will depend on the groove's shape and depth. Auxiliary methods, such as using H-shaped aluminum profiles with battens, can facilitate bending.
- Please strictly follow the grooving process above, especially for high-volume grooving, to ensure accurate groove depth.



OPEN HOLE



| OPEN HOLE

Drilling:

Aluminum composite panels can be drilled using drill bits specifically designed for aluminum or metal. During the drilling process, it is essential to quickly remove debris, especially the debris from the plastic core. This requires using high rotational speed and low feed rate, and occasionally lifting the drill bit to blow away the debris with compressed air.

Countersinking:

When processing countersunk holes, specialized drill bits for aluminum (such as flat-bottom drills) can be used. The countersunk holes should be positioned a certain distance from the edges of the panel, and flat-head taps can be used to drill holes in the aluminum composite panel. These specialized drill bits are designed for pre-drilling or drilling countersunk holes to ensure effective processing.

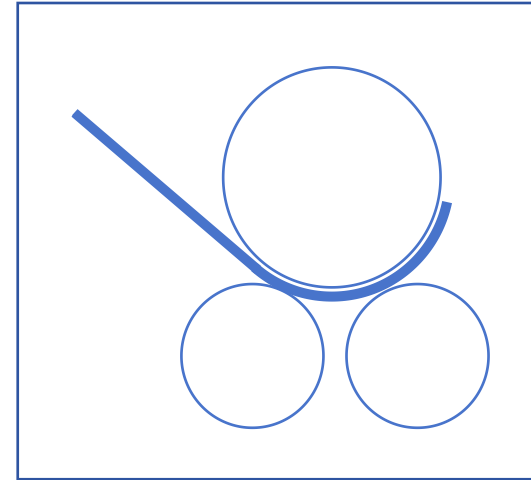
Curved ARC Processing Method



| Curved ARC Processing Method

ACP panels can be bent into curves using traditional methods for processing metal or plastic sheets. However, due to certain unique properties of composite panels, a few points need to be emphasized:

- Minimum bend radius $r=10 \times t$ (where "t" is the panel thickness)
- ACP panels have a higher spring-back rate compared to other isotropic sheets, so it's recommended to create a sample first when bending a large quantity of panels.
- During the bending process, protect the panel surface by placing a 1–2mm thick plastic sheet over the aluminum surface.



| Curved ARC Processing Method

Bending with a Press Brake

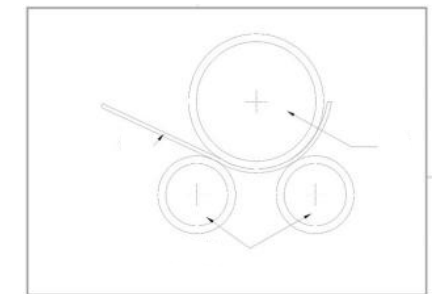
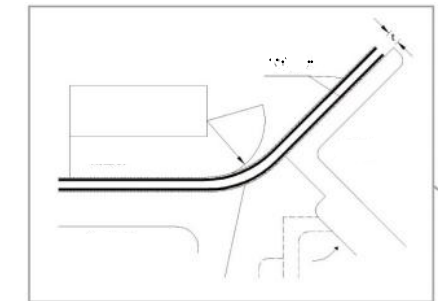
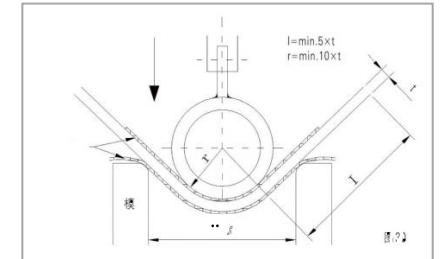
- Aluminum composite panels can be easily processed using a bending machine, just like metal sheets. During the processing, the panel is placed on a bottom die (grooved or rail), and the top die applies pressure downward using pneumatic force to bend the panel. The curvature of the bend is determined by the width of the bottom die and the stroke of the top die.
- Ideal bottom die width: $2 \times t + 2 \times \text{protective film thickness} + \text{top die diameter} + 15 \text{ mm}$. For the bent section, at least five times the panel thickness should remain along the edge to avoid bending issues.

Bending with a Folding Machine

- When using a folding machine, clamp the ACP panel and then rotate the panel around the upper mold with a movable lower mold to form the curved section.

Bending with a Roll Bending Machine

- ACP panels can also be curved with a standard metal roll bending machine, typically using a three-roller or four-roller setup. Avoid applying excessive pressure on the rollers. If the roll bending machine is also used for other metal sheets, make sure to thoroughly clean any metal debris from the roller surfaces before bending ACP panels to prevent damage to the panel surface.



Connection And Fixing Technique



| Connection And Fixing Technique

ACP panels can be connected following standard methods for metal or plastic sheets. When fixing ACP panels to other metal frames (non-aluminum) or using bolts or screws, please keep the following points in mind:

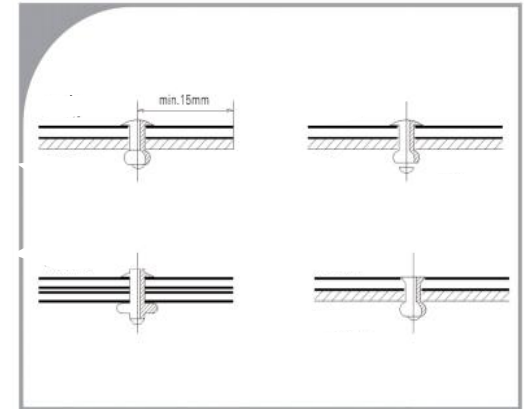
- Only fasteners and structural frames made of aluminum, plastic, or stainless steel should come into direct contact with the aluminum surface of ACP panels. If other materials are used, apply insulating spacers or protective coatings to prevent corrosion.
- For outdoor use, consider the thermal expansion of ACP panels to avoid deformation due to compression. The minimum gap required depends on the panel's expansion rate. The linear thermal expansion rate of ACP panels is determined by the aluminum surface layer. With a temperature difference of 100°C, the longitudinal expansion is 2.4mm per meter.
- When assembling or installing ACP panels on-site, ensure that all panels are oriented in the same direction, as indicated by the arrow on the protective film or on the back of the panel.



| Connection And Fixing Technique —— Riveting

When using rivets to connect ACP panels outdoors, consider the thermal expansion rate of the panels. The holes on the panels should be large enough to allow for expansion, avoiding deformation due to compression. Rivets suitable for aluminum structures can be used to join ACP panels or to connect ACP panels to other materials.

- In outdoor or high-humidity areas, use stainless steel blind rivets to prevent corrosion along the panel edges. When using stainless steel blind rivets, the core should be removed after riveting (detachable rivets).
- To prevent panel deformation, use rivet support clamps to embed the rivet into the hole. Manufacturers of blind rivets offer these auxiliary clamps, with top diameters ranging from 11mm to 14mm.
- Standard color caps can be placed over the rivet heads for decoration.
- **Countersunk rivets do not allow for panel expansion, making them unsuitable for outdoor use.**
- Note: Please remove the protective film from the aluminum panel before riveting.



| Connection And Fixing Technique — Screw fastening

Screws for Indoor Use

- Various metal and wood screws with different cap shapes are suitable for indoor applications. Typically, panel expansion is not considered.
- Countersunk screws can be pressed into the panel along with the surrounding aluminum surface using standard methods. When using this approach, the hole diameter in the panel must be larger than the screw diameter.

Screws for Outdoor Use

- When using screws outdoors, consider the thermal expansion and contraction of ACP panels. To prevent panel deformation, the hole size in the panel must account for future thermal expansion.
- Using specialized screws can help prevent panel deformation. Ensure that the screws are the correct size and properly fit.
- Standard color caps can be placed over the screw heads for decoration.

| Connection And Fixing Technique —— Bonding method :

Metal Adhesives / Universal Adhesives

Most metal adhesives or universal adhesives are suitable for constructing exhibition stands with aluminum composite panels and for bonding them to machinery.

Adhesive Tape / Velcro Tape

Double-sided adhesive tape (such as products from 3M or acrylic foam tape) is available for applications with low tensile strength and only lateral tensile requirements.

Velcro tape can be used for movable joints. 3M's SCOTCHMATE or Dual Lock can also be used.

Adhesive Sealant Components

When a high-strength elastic bond is required, we recommend the following single-component adhesives: Sika Bond T1 by Sika Chemie GmbH (polyurethane adhesive), Dow Corning 895 by Dow Corning GmbH (polymer adhesive). The above adhesives can be used for concealed connections outdoors.

Note: Please use correctly according to product instructions and manufacturer requirements. Adhesives and sealants cannot bond the core material of ACP panels (e.g., at the cross-section). Large-area bonding of ACP panels with other materials may lead to deformation between the composite layers (due to differing ductility/dissimilar metal effects).

Spray Painting
Screen Printing
Digital Printing



| Spray Painting, Screen Printing, Digital Printing

Painting on the Polyester Coating of Aluminum Composite Panels

In the factory, surface treatment and primer rolling are applied to the aluminum panels, ensuring stable quality and facilitating subsequent painting on the baked finish of the aluminum composite panels.

Steps for Painting Aluminum Composite Panels:

- Pre-clean the panel surface using methanol alcohol.
- Sand the exterior surface with wet sandpaper (grit size 360).
- Wipe off the sanding dust with a lint-free cloth moistened with alcohol.
- Follow the instructions provided by the exterior coating supplier for the outer coating.

Please Note:

- During rapid drying, the maximum allowable temperature for the panels (aluminum composite panels) is 70°C. Care must be taken to avoid deformation during high-temperature drying.
- The cut edges of the aluminum composite panels should not be in prolonged contact with organic solvents to prevent weakening of the material's adhesion.
- Finished aluminum composite panels after spraying cannot be bent or folded. Due to the low elasticity of the outer coating, the paint surface is prone to damage during bending or folding.
- Testing should be conducted before spraying, and the instructions from the paint supplier should be followed during application.

| Spray Painting, Screen Printing, Digital Printing

Screen Printing on the Polyester Coating of Aluminum Composite Panels

Aluminum composite panels that have undergone baking treatment are particularly suitable for screen printing. Before screen printing, the protective film must be removed, and the panel surface should be cleaned with a lint-free cloth moistened with ethanol or isopropanol. Do not apply alcohol directly to the panel surface. Using methanol may corrode the paint layer. After cleaning, allow the alcohol to evaporate for 10 to 15 minutes before proceeding with screen printing. Practice has shown that even if the panel's baked finish and the ink used meet technical specifications, various deviations can occur during screen printing. Therefore, it is necessary to test the adhesion of the ink for different applications.

Digital Printing on the Digital Coating of Aluminum Composite Panels

Extensive testing has confirmed that aluminum composite panels with a digital polyester coating are suitable for direct digital printing. All standard colors can be printed on aluminum composite panels.

Before printing, the protective film must be removed, and the panel surface should be cleaned with a lint-free cloth moistened with ethanol or isopropanol. Do not apply alcohol directly to the panel surface. Using methanol may corrode the paint layer. After cleaning, allow the alcohol to evaporate for 10 to 15 minutes before printing. Please follow the instructions provided by the ink supplier.

Laminating/Adhering Images

Using cast or calendered self-adhesive sheets, aluminum composite panels can be laminated (manually or by equipment). The clear coat will not peel off when changing sheets.

When adhering images, use adhesive films or discrete adhesives. Before applying the film layer or image, clean the panel surface to ensure it is free of dust.

Recycling of composite panels



| Recycling of composite panels

Aluminum composite panels, consisting of a low-density polyethylene (PE) core and double-sided aluminum face panels, are primarily used for building facades. The panels typically have a thickness of 4mm, containing about 50% aluminum, yet they exhibit excellent rigidity, lightweight characteristics, and ease of processing and installation.

Material Recycling Process

One of the challenges faced by manufacturers of aluminum composite panels is the recycling of waste panels, particularly the economic separation of aluminum panels from the PE core. An effective method for recycling large-sized panels involves using rolling techniques to separate the aluminum from the plastic. For smaller aluminum composite panels, cutting them into smaller pieces and grinding them can facilitate the separation of aluminum from plastic.

The aluminum panel portion can be recycled and remelted as a single material, while the PE portion, after simple processing, can be reused in the production of composite panels. Manufacturers can be responsible for the recycling of waste panels generated during the processing and installation of aluminum composite panels.



Weather resistance of
aluminum panel without paint



| Weather resistance of aluminum panel without paint

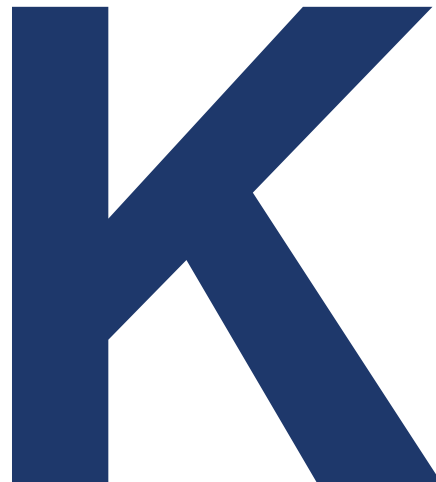
The aluminum alloy panel of the aluminum composite panel (ACP) uses aluminum alloys from series 3000 and above, commonly referred to as anti-rust aluminum in China. One of the main characteristics of this aluminum material is its excellent weather corrosion resistance. Therefore, the back aluminum panel of the ACP does not require a baked paint finish (though the actual product may use a protective baked paint).

Generally, aluminum alloys do not rust. This is because when untreated aluminum is exposed to air, a chemical change occurs on its surface, forming an oxide film that quickly develops to a thickness of about 0.1mm and then stops increasing. This oxide layer has excellent weather resistance and prevents further oxidation of the aluminum surface.

When aluminum is placed in a humid environment or comes into contact with water, white water stains may appear on its surface. However, once the water dries in a dry environment, the oxidation on the surface immediately stops and does not penetrate further into the aluminum panel, and the aluminum's performance remains unaffected. Occasionally, aluminum panels may accidentally get wet during transportation or storage, resulting in white water stains on the back of the panel. As long as the panel remains dry after installation, these stains will not affect its normal use.

However, when exposed to certain corrosive environments, there is a possibility of ongoing oxidation. For example, cement walls in humid environments are alkaline, and bare aluminum in such settings may continue to oxidize.

Surface maintenance and cleaning



| Surface maintenance and cleaning

The surface of aluminum composite panels requires regular professional cleaning and maintenance. This cleaning is not only to keep the building's walls looking clean and attractive but also to remove accumulated dirt on the paint surface that could damage the coating, ensuring the long-term quality of the paint.

The frequency of cleaning primarily depends on the environmental conditions of the project site and the actual level of contamination on the panel surface. We recommend that the exterior walls of the building be cleaned at least once a year, while interior walls should be cleaned based on the actual level of dirt.

Cleaning the building's walls should be done manually or with appropriate cleaning equipment, starting from the top and working down. Please do not use any abrasive items to scrub the painted surface.

The specific cleaning steps are as follows:

- First, rinse the panel surface with plenty of clean water.
- Use a soft cloth soaked in a diluted detergent solution to gently wipe the panel surface.
- Rinse the panel surface again with plenty of clean water to wash away dirt.
- Inspect the panel surface; for any areas that are not clean, apply detergent and scrub them thoroughly.
- Rinse the panel surface with clean water until all detergent is removed.

Note: Do not clean hot panels (temperature above 40°C), as rapid evaporation of moisture can harm the paint! It is especially important to choose an appropriate detergent; a basic principle is to use a neutral detergent! Do not use strong alkaline detergents such as potassium hydroxide, sodium hydroxide, or sodium carbonate, strong acidic detergents, abrasive detergents, or paint-dissolving detergents.

Additionally, before starting large-scale cleaning, it is best to test a small area of the panel first and only proceed with the official cleaning once safety is confirmed