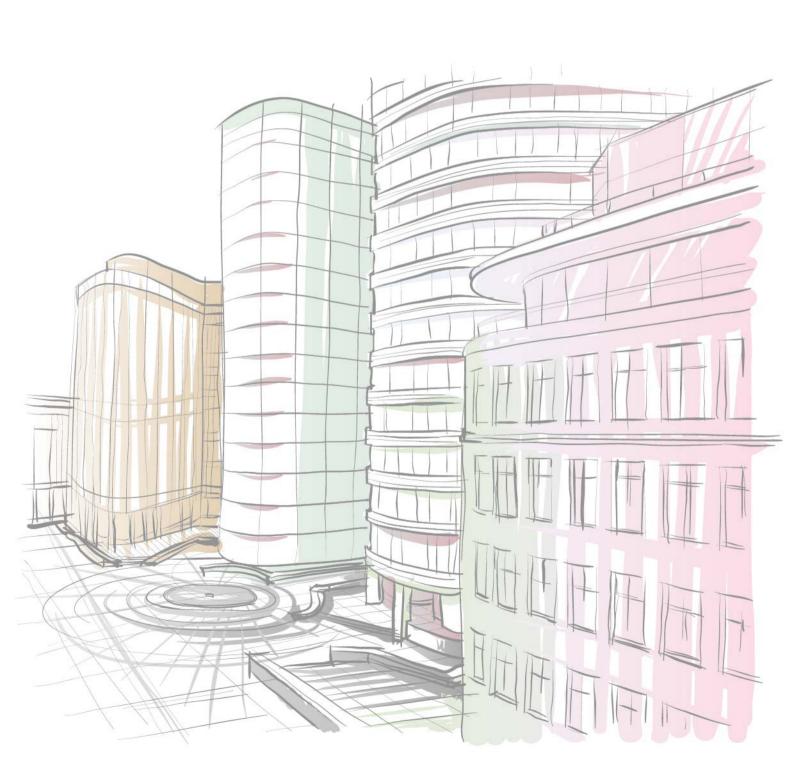




Technical Manual



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Transport, Storage, Handing, Fabrication and Intallation

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About This Manual



This manual is to assist fabricators to work with FEITENG Aluminum Composite Panel in efficient and effective manner. There may arise situation not covered in this manual in which case please kindly consult our technical service team at FEITENG. The method, suggestion and production data are based on reliable information, but the suggestions in this manual are provided without guarantee because the condition, skill and quality of equipment and tools are beyond our control. FEITENG Aluminum Composite Panel Co,LTD. Does not make any warranties, express or implied, including merchant-ability and fitness for purpose with respect to any suggestion and product data,

Technical Data Sheet

FEITENG Signage Grade

Panel thickness	Standard	Units	2mm	3mm	4mm
Thickness of Aluminum layers Weight		(mm)		0.2/0.3	
Weight		(kg/m²)	3.1/3.4	4.0/4.3	4.9/5.2
Fabrication Width		mm	1220, 1250	1220, 1250	1220, 1250
			1500	1500, 2000	1500, 2000
Technical Properties					
Section Modulus W	DIN 53293	(cm³/m)	0.51	0.81	1.11
Rigidity (E.I)	DIN 53293	(KNcm³/m)	345	865	1620
Alloy of Aluminum Layers	EN 573-3		1100	3003	5005
Modulus of Elasticity E	EN 1999 1-1	(N/mm²)		70000	
Tensile Strength of Aluminum	EN 485-2	(N/mm²)		Rm:145-185	
0.2% Proof Stress	EN 485-2	(N/mm²)		Rp0.2: 110-175	
Elongation	EN 485-2	(%)		A50>3%	
Linear Thermal Expansion	EN 1999 I-I		2.0mm/m(1	00.C temperature	e difference)
Surface					
Lacquering			Coil Coat	ting. Fluorocarbor	n (e.g. PE)
Gloss (initial value)	EN 13523-2	(%)		30-90	
Pencil hardness	EN 13523-4			2H	
Thermal Properties					
Temperature resistance		(°C)		-50~+80	

FEITENG Building Grade

Thickness	Standard	Unit	4 mm	6 mm
Thickness of Aluminum layers Weight		(mm)	0.5	60
Weight		(kg /m²)	7.5	10.5
Fabrication width		(mm)	1250, 1500	1250, 1500
			1575,2000	1575
Technological values				
Section modulus (W)	DIN 53293	(cm³ /m)	1.75	2.0
Rigidity (E.I)	DIN 53293	(kNcm²/m)	2 400	3100
Alloy	EN 573-3		3003	5005
Temper of cover sheets	EN 515		H18/	H22
Modulus of elasticity	EN 1999 I-I	(N/mm^2)	70 0	000
Tensile strength of cover sheets	EN 485-2	(N/mm²)	R _m ≥	130
Proof stress (0.2 %)	EN 485-2	(N/mm^2)	R _{p0.2} 2	≥90
Elongation	EN 485-2	(%)	A ₅₀ ;	≥5
Linear thermal expansion	EN 1999 I-I		2.4 mm/ m bei 100 °C t	emperature difference
Surface				
Lacquering			Coil Coating. Fluoro	carbon (e.g. PVDF)
Gloss (initial value)	EN 13523-2	(%)	30 –	45
Pencil hardness	EN 13523-4		21-	1
Thermal properties				
Temperature resistance		(°C)	-50	+80

Panel Dimensioning

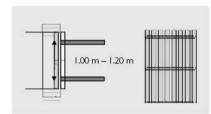
When dimensioning the panels, the following should be noted.

Dimensional tolerances Thickness: ±0.2mm Width: ±2mm

Length: 1000~3000mm (±2mm) Length: 3001~6000mm (±3mm)

When cutting and routing, the thermal expansion in length of FEITENGmust be taken into account to ensure the dimensional accuracy of the components during assembly. We recommend that prior to processing the panels should be stored at room temperature for at least one day.

Information of Care and Handing



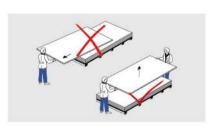
Set maximum fork width



Pick up the pallet, slightly raise the fork



Pick up the complete pallet, do not draw nor push



FEITENG panel is a prefabricated panel. The Surface of FEITENG panel is lacquered, anodized or laminated with a transform film. The surface are protected by a film during transport storage and processing. The following information must be noted.

(1)Unpack and pack

- · Unpack and pack wooden crates in a clean place .
- Remove dusts and chips from FEITENG panel and packing paper. The hard particles, Such as sand and cutting chips, caught between panels will cause a dent on the panel.
- · Do not handle FEITENG panel on a floor. Handle it on a worktable.
- · Handle FEITENG PANEL carefully by two persons facing the effective surface upward, to avoid possible rubbing of FEITENG PANEL surface during picking up and piling down panels.
- · Individual panels must be lifted off the pallet by two people holding all four corners and not drawn over each other. Carry the panels vertically. Wear gloves to avoid staining.

(2)Transportation

- · Lay the packed FEITENG PANEL horizontally and do not place heavy goods on it.
- · Make clearly "Handle with Care", "keep Dry", "No Hooks" and "This Side Up" on the packing.
- Treat pallets carefully during transport and moisture damages must be reported immediately and confirmed by the forwarder.









(3)Protective film

- · It is possible that the protective film of FEITENG PANEL will be invalid with direct sunlight and moisture. Store the panels in dry atmosphere, also not exceeding 6 months. Remove the film immediately after the installation is completed.
- Especially in Reversible Series in which protective film are applied on both sides of the panel, make sure that each film is peeled off from front and back, although the film is translucent (half-transparent) and it may be slightly hard to notice it.
- · Dirt deposits may build up in the course of the time where the protective film partly delaminated from the surface during handling.
- Storage exceeding 6 months should be avoided. Severe temperature fluctuations and exposure to direct sunlight reduce the long-term durability. In this case the protective film may become very difficult to remove.
- Do not mark the protective film with inks (markers), tapes or labels.
 Solvent or plasticizer may penetrate the film and affect the lacquered surface.
- · Should the protective film partially come off during processing or after assembly, dirtied edges can occur in the course of time, which may be difficult to remove.
- Remove the protective film as soon as possible after assembly.
 Protective film that remains on the panels for an extended period of exterior exposure may be very difficult to remove.

(4)Storing

- · Store panel in a dry, clean, frost-free room.
- · Place pallet and panels on a level surface which provides full support.
- · Keep panels in the original, closed packaging where possible.
- · Remove steel straps of the panels are to be stored for a long time.
- · Prevent a film of moisture from forming between the panels.
- · Do not place any moisture-sensitive(paper) payers between the panel.

(5) Fabrication

Rior to fabrication, clean out the worktable, temporary stand and both sides of FEITENG PANEL. specially, take notice of the cutting chips generated from saws, routers and drills, as well as those hips and particles caught between FEITENG PANEL and tools. It will damage.

Processing Method

FEITENG panel is very easy to process. All cutting, milling, punching, slotting, side-folding and curving can be easily fulfilled by simple tools used for processing timber and metal. It can be shaped into various shapes, such as curved, reserved curves, corner and sharp curves, according to requirements of building design. It is incomparable to other decorating materials.

Tools

Cutting















Bending







Routing and Folding









Cutting

1.Saw cutting

FEITENG Panels can be cut and processed with various types of saws including vertical panel saw, circular saw or jig saw. Suitable saw blade is carbide-tipped blades for aluminum or plastic use.



Example of suitable saw blade

Blade diameter	225m
Number of teeth	80 to 100
Cut width	2.0 to 2.6mm
Rake angle	10°
Tip	Carbide

Operating Conditions

Rotation of saw blade	2000-4000 rpm
Feed speed	10-30 m/min

Notes on saw cutting

- · Do the cutting operation with facing the effective side upward to prevent the panel from scratch and the protective film peeling off.
- · Remove cutting chips from FEITENG PANEL Aluminum Composite Panel carefully after cut, to avoid dent during storing or assembling.
- · Sharpen or replace the saw blade, when it becomes dull. Dull blade will result in large burr or distortion at cut edge.

2 Shear cutting

Feiteng Panel can be sheared with a conventional guillotine. A shearing angle of ≤ 1,5° and minimum clearance (paper test) are the prerequisites for the best possible quality of the cut.

To prevent damage to the cover sheet, it is appropriate to provide the down-holders of the guillotine with protective rubber pads.



▲ Important:

Cutting or shearing FEITENG panels for applications where cut edges are visible (e.g. riveted facades) is not suitable for decorative requirements.

3 Trimming

In saw cutting, burr appears on both sides of edges. In shear cutting, either droop or burr appears on each edge. If we install the panel with exposed cut edge, we have to take notice of the edge conditions.

Namely, in saw cutting we should keep the saw blade sharp to have a sharp cut. In shear cutting we should adjust the clearance of die properly.

Generally, the condition of edge is more important in interior than in exterior. Sometimes we have to trim the edge after cutting. For trimming, we use trimmer, plane or sandpaper:

In Solid and Metallic Colors, deep trimming like chamfering has a visual effect use a trimmer with a ball bearing chamfering bit or a plane for woodworks. In working with plane, a guide ruler will help to ensure a uniform edge.

In Stone and Timber Finishes, on the other hand, deep trimming is not suitable, because deep trimming harms the appearance of stone and timber. If it is possible to hurt a finger with cut edges in stone and timber finishes, make the edge dull with fine sandpaper. Normally, droop edge by shear cutting is mild enough to ensure the safety of edges.

4 Curving cut

Hand router and trimmer can cut FEITENG PANEL in curving lines. Guide template will help you to stabilize this work. Jigsaw is also useful for cutting complex shapes.







▲ Notes on the use of guide plate

- a. Put an appropriate guide plate (template) on the effective side of FEITENG PANEL to do the routing working through the guide plate.
- b. Particles caught between the template and the effective surface of FEITENG PANEL may cause dent or scratch.

5 Punching

FEITENG Panels of any thickness can be punched using conventional sheet metal punching machines. For clean cuts use sharp tools and dies with minimal cutting clearance (0.1 mm). This cutting process will cause a slight deflection of the cover sheet.



6 Perforating (for interior applications only)

FEITENG panels can be perforated using CNC punching machines. This is often used for interior and ceiling design. Holes of a minimum diameter of 4 mm can be punched. The minimum width of web between hole edges is also 4 mm. The best results will be obtained using a punch die for single punching. Multi-station machines are more economical. After punching, the flatness will possibly require further processing.

Turret puncher

Turret puncher, also computer-controlled, can be used for perforation of FEITENG PANEL. The suitable clearance between punch and die is 0.1 mm or smaller(material thickness × approx.2%). Small droop will appear at punched edge.



7 Water jet cutting

Water-jet cutting: Plunge cut (piercing at the starting point) in water-jet cutting may cause a certain extent of de-lamination between aluminum skin and core material. Therefore, we have to plunge at a disposable area or start at panel edge. After penetrating through the panel, water jet can cut FEITENG PANEL.



According to our test, we so far conclude that FEITENG PANEL is not suitable for laser cutting, because the fume generated from FEITENG PANEL might harm the sophisticated optical instrument of laser system.

Bending

I.Bending with press brake

FEITENG Panel, like sheet metal, is easily formed with a brake press. The air-bending process is used when forming with a brake press.



The minimum bendable radius with press brake is as follows:

Bending Direction	Minimum bendable radius	
Traverse	50mm	
Parallel	80mm	

A Notes on press brake bending

- a. "Traverse" and "Parallel" show the bending direction toward the rolling (coating) direction, printed on the protective film.
- b. The minimum bendable radius means the limit with which visible wrinkles appear on the aluminum surface of FEITENG PANEL.
- c. Use the top die (punch) with the similar radius to the desired radius. If the radius of the top die is too small, it is possible the bending radius becomes partially smaller than the above limit.
- d. Use a urethane pad for the bottom die, or place a rubber mat between FEITENG PANEL and the bottom die.
- e. Use a scratch-free top die. Polish and wipe the top die. Do the bending work without peeling off the protective film.

2. Bending with 3-roll bender

We can use manual or electric-drive 3-roll bender for bending FEITENG PANEL. The minimum bendable limit is normally 250mm in radius, but it depends on the length of the bender and the type of the machine. The following is an example of relationship between the length of bender and the minimum bendable limit.

Roll length (mm)	Minimum radius (mm R)
500	120
1000	150
2000	180
2500	200



▲ Notes on 3-roll bending

- a. Prior to bending operation, wipe the roll surface carefully.
- b. Remove the burr at FEITENG PANEL edge that may cause dent with rolling.
- c. Remove the cut particles suck on FEITENG PANEL and rectify the wrinkles of protective film, which may cause dent.
- d. Do not tighten FEITENG PANEL with rolls. If the roll clearance if rigid in the machine, adjust the dearance to panel thickness plus approx. 0.5mm.
- e. If notch is required in a curving panel, make the notch before (top) and after edge bending after bending. Making the notch before bending will result in a distorted curving.
- f. When bending to small radius, gradual bending is necessary by adjusting the elevation of bending roll.
- g. We can reduce the straight portion near edge by means of a subsidiary sheet material, but it remains to some extent. If a consistent curving line is needed near the edge, we have to do additional edge bending after the regular bending.

3. Bending with a folding machine

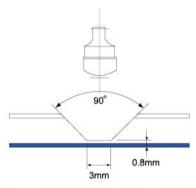
When working with folding machines, the panel to be bent is clamped between two cheeks. The projecting edge is bent around the upper clamping cheek or former using the movable swivel bar. The bending radius is determined by interchangeable formers attached to the upper clamping cheek.



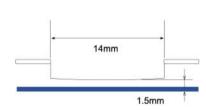
Routing and Folding

FEITENG Panels can be routed and folded using a flat bed CNC routing machine, a Vertical Panel Sawing Machine or a handheld router "V-Grooving" tool. The Panels can be bent and formed into cassette trays and be integrated onto exterior façade or curtain wall systems.

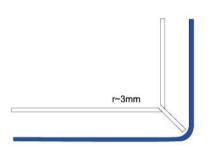
A "V" shaped or "Rectangular" shaped groove should be routed on the reverse side of the panel along the proposed folding edge. When routing, the groove should not be made all the way to bottom, a thin layer of core (0.8mm) must be retained at the base allowing enough room for easy folding. This is to prevent the paint on coated surface and the aluminum from cracking or crazing during the folding process.

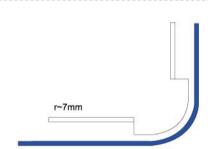


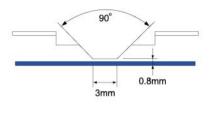
Groove 90° (V-shape) for foldings up to 90°

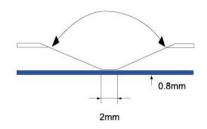


Not suitable for FEITENG rectangular groove for fol dings up to 150° depends on the panel thickness

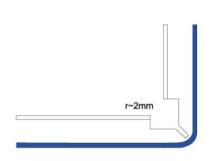


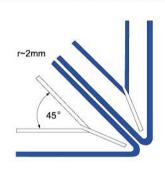






Groove 135° (V-shape) for foldings up to 135°





▲ Important

General information regarding the routing and folding technique.

Processing temperature: During folding, the ambient and material temperature should not be below 16 $^\circ\!\text{C}$ o

CNC router

CNC router can cut and groove FEITENG PANEL. As a series of processing is controlled by a computer program, CNC router is suitable for repetition of the same processing. The suitable bit and operating conditions are the same as hand routers.



Handy grooving machine

Hand grooving machine can groove FEITENG PANEL. An example of the suitable cutter blades and operating conditions are as follows

Cutter balde

Outside diameter	110-120mm
Number of teeth	4~8
Material	Carbide tip

Operating Conditions

Rotation	5,000-9,000 rpm
Feeding speed	5-20 m/min



Handy router

Hand router can groove straight lines and curving lines. Use a custom router bit having the groove shape shown in the above drawing. The suitable bit and operating conditions are as follows:

Router bit

Number of teeth	2-4	
Material	Carbide tip	

Operating Conditions

Rotation	20,000-30,000 rpm
Feeding speed	3-5 m/min



Panel saw

Efficient grooving work is possible with panel saw. Typical conditions are as follows:

Cutter balde

Outside diameter	220 mm
Material	Carbide tip

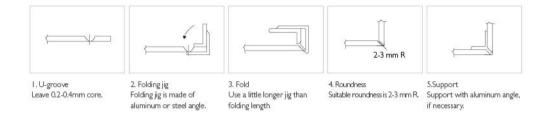
Operating Condition

Rotation	2	
Feeding speed	30 m/min	



Folding

After V-groove, we can fold FEITENG PANEL with folding jig. The typical folding procedures are as follows.





A Notes on folding

- a. Folding FEITENG PANEL on a flat and steady worktable. If we fold the fold the panel with warping, the folded line will not be straight.
- b. The folded comer should have a suitable roundness of 2-3mm in radius. If the roundness is too small, the coating may have a crack on the folded corner. This tendency becomes apparent when we carry out the folding work at low temperature. Have a folding work at 10°C or higher.
- c. Folding after U-grooving entails slight elongation. The elongation is 0.5-1.0mm depending on the roundness of the folding corner. Therefore, the position of grooving lines must be pre-adjusted when the fabrication drawings are prepared.

Joining Method

(I) Rivets

We often use rivets, bolt/nut and tapping screws for junction between FEITENG PANEL and Aluminum extrusions. Use aluminum blind rivet. We can do riveting work from one direction. Use bolt/nut and tapping screw made of aluminum or stainless steel.

(2) Adhesive

We can use commercial adhesives for joining and assembling of FEITENG PANEL. We can use wide variety of adhesives for FEITENG PANEL, except for some types of adhesives that may corrode aluminum metal. For example, vinyl acetate type, widely used for timber and styrene foam, corrodes aluminum metal. Main adhesives applicable to an adhesion between FEITENG PANEL and other materials are as follows.

Adhesives applicable to FEITENG PANEL

Adhesive typ	oe .	Ероху	Chloroprene	Silicone RTV	Cyano-acrylate
Suitable material to be adhered	Meta	OK	OK	OK	OK
	Timber	OK	OK	OK	OK
	Gypsum board	OK	OK	OK	OK
	Styrene foam	OK	OK	OK	OK

▲ Notes on adhesives

- a. Prior to adhesion work, remove all the foreign matters such as dust, particle, grease, water, etc. from the area to be adhered.
- b. Select the most appropriate adhesive that ensures the necessary adhesion power in the atmospheric conditions. The adhesion power depends on the surface conditions of the substrate, Follow the adhesive manufacturer's instructions.
- c. When FEITENG PANEL is adhered to different material, it is possible that FEITENG PANEL shows a deflection due to the thermal expansion different or dimension change of the material. Pre-test the adhesive before fabrication and intallation.
- d. Some adhesives may cause a distortion after hardening due to shrinkage of the adhesive, as shown in the diagram. Therefore, pre-testing is necessary for some types of adhesives. Generally, some of epoxy adhesives, polyurethane adhesives and silicone adhesives may show this kind of distortion. This distortion is usually very slight and sometimes it is not visible in low gloss and matte finished.

(3) Welding of core

One end of FEITENG PANEL can be adhered to another end of FEITENG PANEL by welding the core with hot melt adhesive(glue). Prior to heating a glue stick, we have to pre-heat the core surface for good adhesion. Normally, mechanical reinforcement is necessary after welding.

(4) Double-sided tape

Double-sided tape like 3M's VHB tape is effective in joining FEITENG PANEL to other materials. VHB tape simplifies the joining work and the sticker ones allow a movement of the adhered two materials to some extent.

(5) Hook/loop fastener

Hook/loop fasteners like Velcro tape is useful for guide signs and displays. This type of fastener is removable and restorable.

(6) Sealant

In order to ensure waterproofing of joints between panels, normally a sealing material is used. The sealing material shall meet the performance required for the atmospheric conditions. Silicone, modified silicone, poly sulfide and polyurethane sealant are used. General performance of these sealing materials is as follows. Regarding the joint design such as joint width and thickness, please follow the sealant manufacturer's specifications.

Surface Treatment



Direct-to-substrate digital printing

As the polyester lacquered FEITENG panel surface is very flat and homogeneously smooth is provides outstanding ink adhesion and is printable on all standard flat bed printers. All standard FEITENG colors as well as most of the decorative FEITENG panel surfaces, e.g. FEITENG silver finish, FEITENG mirror or FEITENG decor; are ideal printing substrates and have proven excellent printing result during the past decade.

Since FEITENG panel is resistant to temperatures from $+80\,^{\circ}\mathrm{C}$ to $-50\,^{\circ}\mathrm{C}$, resistant to water and UV, yellow or distortion through UV lamps does not occur. Hence, digitally printed signs can be used long term and keep their color quality even outside.

Regarding the pre-treatment we recommend the same process as mentioned for screen printing. To avoid fingerprints on the surface gloves are the easiest solution. Various processing techniques such as routing, folding or bending are possible with FEITENG panel-even after printing with solvent based inks.

Screen printing

Stove-lacquered FEITENG panel surface are well suited for screen printing. It is important to remove the protective film and to clean the surface using ethyl alcohol or isopropyl alcohol and a fluff-free cloth prior to printing. The alcohol must not be applied directly to the panel. Between cleaning and printing the alcohol needs approx. 10-15 minutes to evaporate. A lamination of the prints can be useful in order to achieve special surface effects or to improve mechanical or chemical properties.

New idea with new dimensions

The creative potential of FEITENG becomes obvious when processing the material. Small sizes, large formats and even 2000mm widths-FEITENG offers many possibilities and even after printing with adapted inks each format can be cut to size, shaped, formed, bent or folded.

Especially for flat applications: FEITENG digital printing panel

High quality imaging and very efficient at the same time: FEITENG digital comes with an optimized lacquer system for direct-to-substrate digital printing showing excellent ink adhesion which allows advanced printing speed. The higher performance means higher output and lower costs!

Applicable for flat application such as:

Indoor and Outdoor signage Hoardings Photo mounting and laminating Screen printing

Overview of direct digital print advantages

- · Temperature resistant up to 80 °C No distortion caused by UV lamps
- · Weather resistant for exterior use Water retardant and UV resistant
- · Thickness tolerance +/- 0.2mm Allows limited clearance of print heads
- · Cuts easily Clean edges, no deburring necessary
- · Low weight combined with high rigidity Allows wide effective spans
- · Smooth surface optimized for digital printing Excellent print quality - even with very fine detail
- · Extremely flat, strong and rigid No distortion at fixing points
- · Lacquer system optimised for direct to substrate digital printing Excellent ink adhesion

Touch-up Coating Method

Commercial or custom acrylic paints are suitable for repair coating of all finishes of FEITENG PANEL. Typical procedures are as follows.

- a. Clean the surface and remove dirt, if any.
- b. Stir the paint well. Apply paint with brush or pencil-type container.
- c. Dry and cure at room temperature, as in the instructions from the manufacture.

Normally acrylic paints show good adhesion after cured, however the touched-up portion may show a slightly different appearance. As appearance of coating depends on coating method, even an exactly matched paint may show a slightly different appearance to some extent.

In Stone and Timber Finishes, use an intermediate solid color diluted with clear paint for touch-up. The suitable dilution rate is, depending on the color, I 0-90% of clear content. Munsell Number attached to each color may become a guide to find the intermediate color:

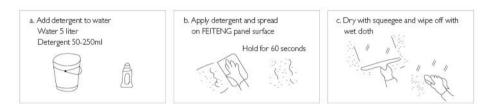
Cleaning Method

(1) General cleaning

Firstly, try water rinse using soft sponge with modest pressure to remove the stain. If the stain remains after dry, then use neutral detergents or household cleaners diluted with water. Typical cleaning procedures are as follows

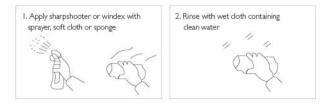
- a. Dilute a detergent or a cleaner to 1-5% with water.
- b. Apply the solution and spread on FEITENG PANEL surface with soft rags or sponges. Wait for 1 minute, then the foam will blacken.
- c. Dry the solution with a squeegee and wipe the remaining solution with wet cloth containing clean water.

According to our test, dilute Magiclean is suitable for all finishes of FEITENG PANEL. Magiclean is a household detergent with pH8 from Kao Corp. If you use other detergent, pre-test it in a small area.



(2) Stubborn stain

According to our test, alkali cleaners such as Sharpshooter and Windex are applicable to strong stain, however Metallic Colors of FEITENG PANEL requires good rinsing with water afterward. It is because in Metallic Colors, non-rinsing may cause a color change due to remaining alkali. In Solid Colors, Stone and Timber Finishes, rinsing with water is unnecessary especially.



A Note

Sharpshooter is a versatile cleaner from 3M(alkali,pH12), and Windex is a glass cleaner from Johnson (alkali,pH11). As these are alkali solutions, prevent eye and skin contact. Follow manufacturer's safety instructions.

If you use other strong cleaners or stain removers, pre-test in a small area. Generally, strong acid and alkali may cause a gloss change, color change, or swelling of coating film. Do not use cleaners containing abrasives. Do not use strong solvents and paint thinners.



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