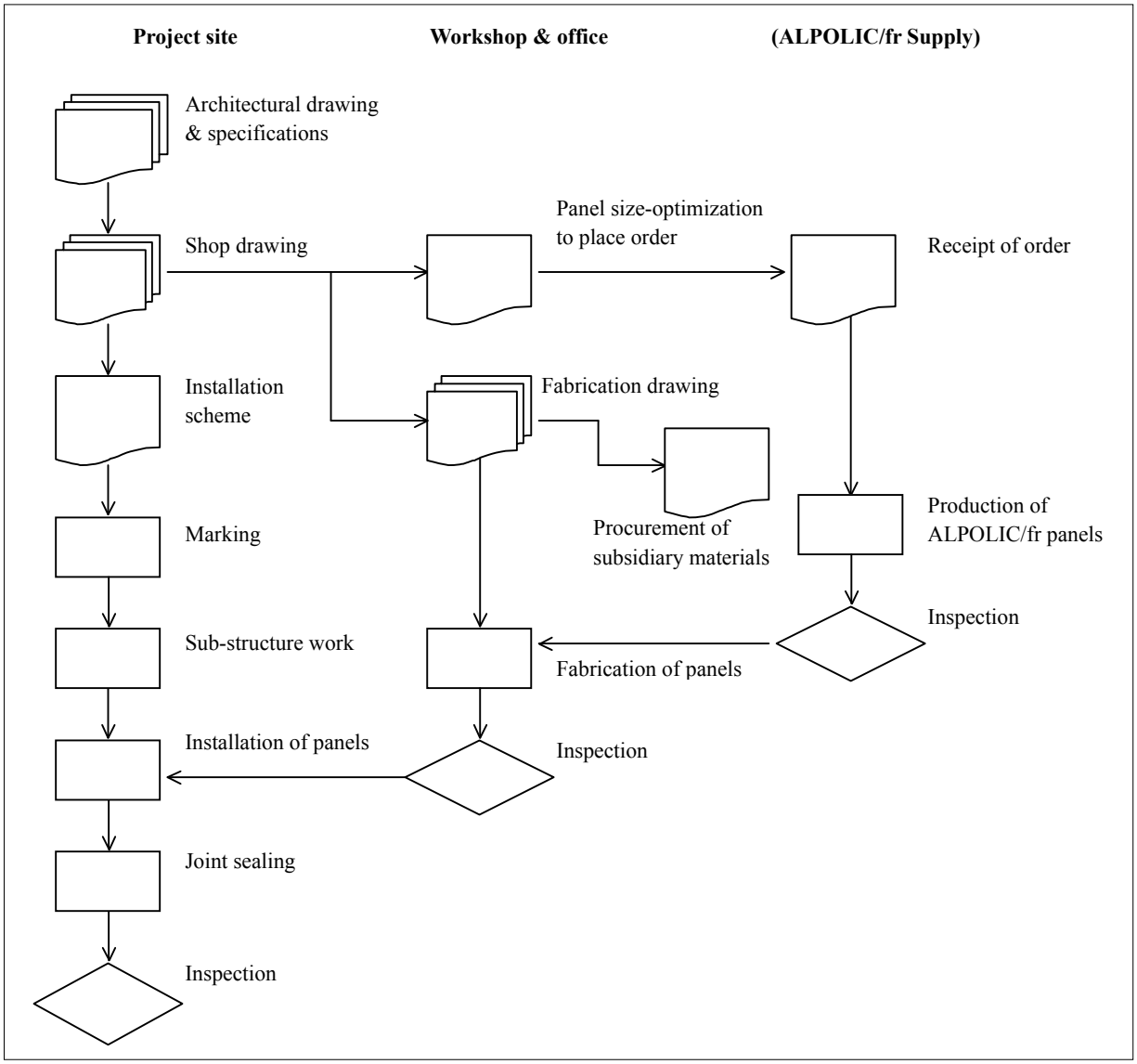
Section 3 Fabrication and Installation

1. Review of overall ALPOLIC/fr works

From tender to completion of the project, various types of ALPOLIC/fr works are carried out at office, workshop and project site. Actually, each work is connected and complicated each other. But typical relation can be simplified as shown in following flow chart.

Flow chart of overall ALPOLIC/fr work



Among these individual works, shop drawing and fabrication drawing is a core work which is influential throughout the overall ALPOLIC/fr work. Panel size optimization is also indispensable for placing order. In this chapter, we would like to review the functions of shop drawing, fabrication drawing and panel size optimization.

(1) Shop drawing

We have to prepare shop drawings prior to installation work. Shop drawing consists of elevations and sections, specifying panel arrangement, type of sub-structure, the fixation details, anchoring method, etc. Before finalizing shop drawings, we have to consult well with the architect and the client about the panel color, panel layout and its fixing details. And besides, we often prepare miniature samples or mock-up

based on the shop drawing for architect's confirmation. After these pre-studies, we submit the final shop drawings for architect's approval.

(2) Fabrication drawing
Fabrication drawing is prepared for internal purpose. There are many styles of drawing form, but every form should permit an efficient drawing work and the drawing should be easily understood by everyone involved in the fabrication without being misunderstood.

From fabrication drawing, we can get information about the subsidiary materials and its quantity as well as the processing method of ALPOLIC/fr panels. In addition, as it can be the common basis of the fabrication, the fabrication drawing can be utilized for a wide range of office works including inventory control of ALPOLIC/fr panels and subsidiary materials, and cost control of fabrication work. Also fabrication drawing can be used for inspection of the fabricated panels.

(3) Optimization of panel size
Soon after the shop drawing is approved, we have to prepare panel list for placing an order of ALPOLIC/fr. The panel list should minimize the waste as well as meet ALPOLIC/fr's requirements on production including the packing requirement. ALPOLIC/fr products will be produced exactly in accordance with this panel list.

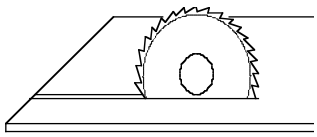
Appendix 1 is an example of shop drawing, fabrication drawing and optimized panel list.

2. Processing method

ALPOLIC®/fr panels can be shaped with ordinary aluminum processing and woodworking machines and tools:

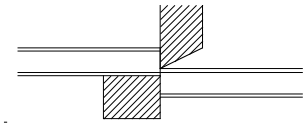
(1) Saw cutting

Running saws and panel saws for woodworking can cut ALPOLIC®/fr panels easily. We recommend the carbide tip blade made for aluminum and plastic.



(2) Shear cutting

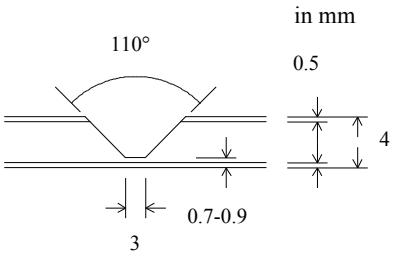
A square shear is the most efficient method for sizing a large quantity of panels. Some shear droop may occur at the cut edge. The appropriate clearance and rake angle is:



Panel Thickness	Clearance	Rake Angle
3mm	0.04mm (0.002")	1°
4mm	0.04mm (0.002")	1°30'
6mm	0.2mm (0.008")	2°30'

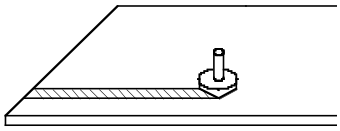
(3) Grooving

It is important to leave 0.2 to 0.4mm (0.008" to 0.016") of core material in U-grooving: namely, the remaining thickness becomes 0.7 to 0.9mm (0.028" to 0.035"). We recommend 110° of a grooving angle for 90° bends. Panel saw or NC router is suitable for mass grooving production



Router and trimmer:

NC router, handy router and trimmer can be used for grooving. Use the above-shaped router bit.

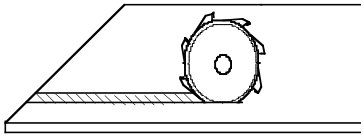


[Example of router bit]

Number of teeth: 2-4
Number of rotations: 20,000-30,000 rpm
Feeding speed: 8-12 m/min (26'-39'/min)
Material: Solid carbide or carbide tip

Groove Cutter:

Panel saw or circular saw equipped with a groove cutter can be used for grooving. Handy grooving cutter can be used as well..

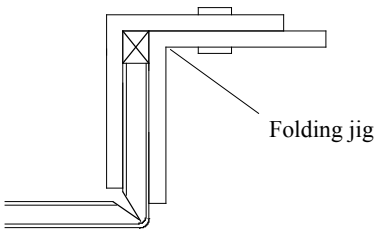


[Example of groove cutter]

Material: Carbide tips
Outside diameter: 220mm (8.66") in diameter
Number of teeth: 18
Number of rotations: 3,000 to 5,000rpm
Feeding speed: 10-15m/min (33'-49'/min)

(4) Folding

After grooving, fold the panel with a folding jig, press brake or plate

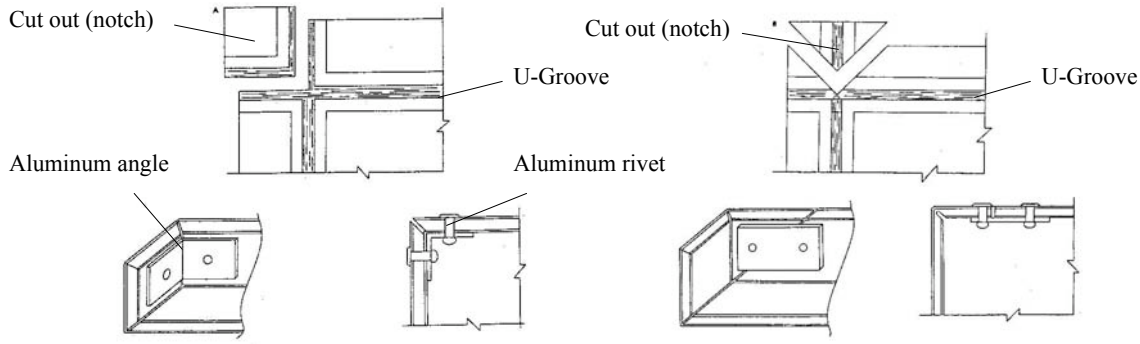


punch. To ensure a straight line on folded corners, fold the grooved panel on a flat table. To prevent the coating from cracking, we recommend that you do the folding at a temperature of 10°C (50°F) or higher.

(5) Rout and return system

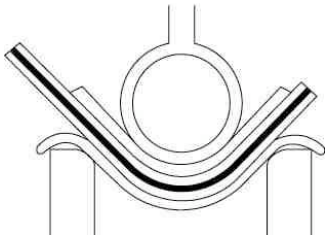
Locate the rout (grooving center) 25-50mm (1”-2”) from the sheet edge, and fold it to form a tray type panel. Generally, the corner detail is selected from two types: 90° square (A) or 45° diagonal (B) as shown below. After assembling, seal the corner with sealant to prevent water leaks.

A: 90° square **B: 45° diagonal**



(6) Bending with press brake

In case of bending ALPOLIC®/fr panel with a press brake, use a top die with the desired radius. The minimum internal bending radius is:

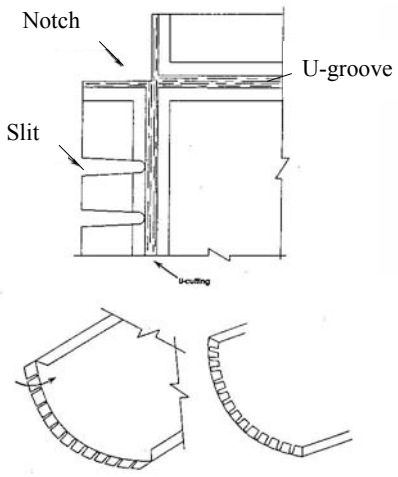


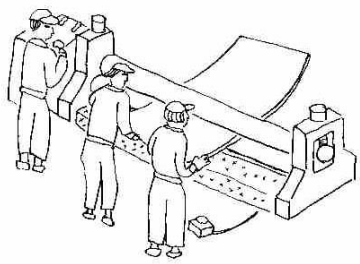
ALPOLIC®/fr thickness	Minimum Bendable Radius (mm)	
	Traverse	Parallel
4mm (.157”)	80 (3.15”)	100 (3.94”)
6mm (.236)	100 (3.94”)	140 (5.51”)

Note: The bending limit of ALPOLIC/fr is slightly larger than ALPOLIC® comprising of polyethylene core, due to the inflexibility of the core.

(7) Bending with three roll bender

For a larger bending radius, use a three-roll bender. Groove and slit the curving edge before bending, as shown in the sketch.





(8) Rivet & bolt

Use an aluminum blind rivet or a stainless steel bolt/nut for your junction. With blind rivet, you can work from the same direction.

When panels are connected with a junction hole, make sure the distance from the hole center to

the panel end (e) is larger than twice the hole's diameter (D) to ensure that a sufficient tensile strength of the hole: namely e › 2D. Refer to **Section 2 Guidance for Design**.

(9) Welding of core material

In ALPOLIC®/fr, the core contains only small content of thermoplastic, and accordingly, it is difficult to weld the core with the same manner as ordinary ALPOLIC® comprising of polyethylene core. Even if it looks welded, the adhesion power is not enough in ALPOLIC®/fr. Therefore, when you weld the core of ALPOLIC®/fr, use a hot-melt adhesive instead of polyethylene rod. Pre-heating of core is essential to get a good adhesion. Please inquire to our office for details.

Suitable machines and tools for ALPOLIC®/fr fabrication is summarized in Appendix 2. Typical fabrication procedures for tray-type panel are summarized in Appendix 3.

3. Installation procedures

(1) General

Installation is executed in accordance with the drawings and specifications of the project. In the event that discrepancy is found in drawings, specifications and the actual conditions at project site, consult with controllers for approval.

(2) Installation procedures

Typical installation process consists of the following procedures:

Installation procedures	Equipment to be provided
Unloading	Truck and crane
Marking	Scaffold
Substructure work	Ditto
Rust inhibiting coating	Ditto
ALPOLIC/fr work	Ditto
Accessories work	Ditto
Joint sealing	Ditto
Clearing and cleaning	Scaffold & it's clearing

(3) Comments on each procedure

a. Unloading

Unload ALPOLIC®/fr panels on roof, each floor or suitable places on site. The unloaded panels on each floor will be just those required for the relevant floor. Fasten the panels together with rope and covering sheet for protection.

b. Marking

Confirm the reference line in the presence of superintendent. Based on the reference line, installation lines will be marked. Installation line will be allotted in accordance with the approved shop drawing.

c. Substructure work

In order to install the substructure, weld steel bracket (for example, L-50×50×4mmt (2”×2”×0.16”t), piece angle, L=70mm (2.75”)) onto hole-in anchor. Weld continuous steel angle (L-40×40×3mmt (1.5”×1.5”× 0.12”t)) onto the bracket. All the angles will be finished with rust inhibiting coating, which conforms to Project Standard. During welding operation, watch the spark dropping on cover sheet and veneer, to prevent from fire. During substructure work, check the level with flush thread and plumb-bob line, or water level, if necessary.

d. Rust inhibiting coating

Apply rust inhibiting paint that conforms to Project Standard onto all the welded points including back and edge.

e. ALPOLIC®/fr work

Mark the installation line in accordance with shop drawing. Fix ALPOLIC®/fr panel onto substructure with self-tapping screw, 4mm (0.157”) in diameter, after confirming left, right, top and bottom of the panel. The fixing interval will be normally 300-400mm (1.0’-1.25’) depending on strength calculation. After confirming the fixed conditions, peel off the protective film and clear the removed film.

f. Accessories work

Bring the accessories to scaffold passage, as allotted in shop drawing. The quantity of accessories brought to scaffold passage must be reasonable to avoid precipitation. The large accessory will be placed diagonally on scaffold.

Mark the installation line onto substructure to meet the position of window frame. The joint line can be ignored in case of aluminium extrusions. Fix the accessory with self-tapping screw, 4mm (0.157”) in diameter, with @=300mm (1.0’) interval. After installation, check the installed level and precision. After the check, peel off the protective film. Clear the removed film.

g. Clearing and cleaning

Clear and clean the working area everyday after work. Especially, whenever the work is completed in the area, transfer the area smoothly to the next procedure, not to hinder the next work. Collect and clear remains to dump point everyday, to transport out from the site immediately.

Sealing work is outlined in Appendix 4.

4. Storing method

ALPOLIC®/fr panels require the similar precautions to solid aluminum sheets in storage, because the skin aluminum must be protected from scratching and corrosion.

(1) In principle, do not unpack ALPOLIC®/fr wooden crate until use. After unpacking, restore remaining panels horizontally into the crate as the original condition. Keep panels flat and avoid warping and bending during storing. Avoid piling different sizes together, as panel surface might be scratched or dented with panel edges.

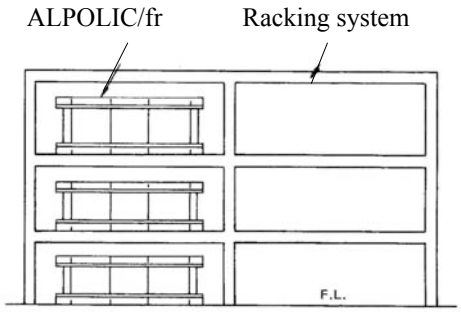
(2) In storing panels vertically after unpacking, lean against a rack, as shown below. Place a rubber mat on the bottom and lean ALPOLIC®/fr panels on a steady backing material. Avoid overlapping panels of different size together. The panel surface might be scratched with panel edge.

(3) Do not store in a dusty place. Do not store in a moist or humid place. Do not sprinkle water in the stored place. Do not lay ALPOLIC®/fr panels directly on floor.

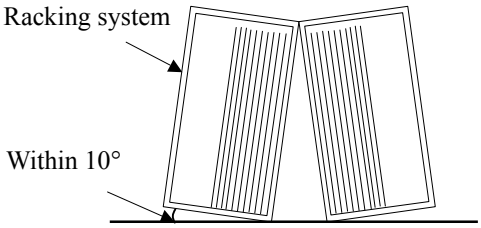
(4) Do not wet ALPOLIC®/fr panels with water. Especially, do not pile wet panels together. In the event of being wet, wipe the panel with soft rag for dry.

(5) Do not stick or use PVC tapes on ALPOLIC®/fr surface even over the protective film. The plasticizer contained in PVC tape can penetrate the protective film and cause a gloss change in the coating.

Flat storing on rack



Vertical rack



(6) Usually, the wooden crate of ALPOLIC®/fr panel can be stacked up to four crates high.

5. General notes on fabrication and installation (Important)

(1) Weatherability of protective film

The protective film on ALPOLIC®/fr consists of two polyethylene layers of white and black. Do not peel off the protective film during fabrication and installation to protect the surface from scratching and soiling. Under normal weather conditions, the protective film will withstand six months' exposure without losing any of its original peel-off characteristics or causing stains or other damages. However, peel off the protective film as soon as possible after completion.

(2) Slight color difference due to coating direction

In the cases of our Metallic Colors, Sparkling Colors and Stone Series, always install panels in the same direction as marked on the protective film. Slight color differences will be noticeable if you install panels in different directions. In our Solid Colors, any color difference due to coating direction is negligible.

(3) Gloss increase due to plasticizer

Do not stick, put or apply PVC tapes, polyurethane sealant and modified Silicone sealant onto our protective film. The plasticizer contained in these materials can penetrate the protective film and cause a gloss change in the coating.

6. General notes on cleaning

(1) Do not use strong organic solvents, such as MEK (Methyl Ethyl Ketone), MIBK (Methyl Iso Butyl Ketone), Triclene and paint thinner. Do not use strong alkali, strong acid or abrasive cleaners. If these solvents and cleaners are used, the paint might be swollen or removed.

(2) Avoid extreme temperature. Heat may accelerate chemical reactions and may evaporate the water from solution. Cleaning under higher temperature may result in streaking or staining. Extreme low temperature, on the other hand, may give poor cleaning effects. Ideally, cleaning should be done on the shaded side of the building under moderate temperature.

(3) Avoid drips and splashes during cleaning. Remove rundown as quickly as possible.

(4) Make sure that cleaning sponges or rags are grit-free, to prevent the coated surface from scratch. Avoid over cleaning or excessive rubbing.

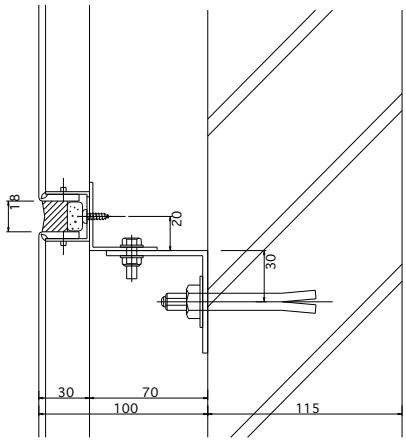
Appendix 1

Example of shop drawing, fabrication drawing and optimization of panel size

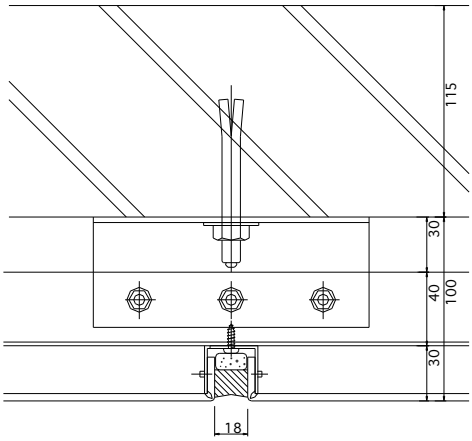
Shop drawing

in mm

Typical vertical joint

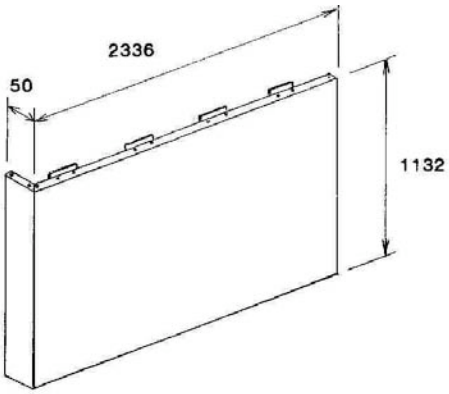


Typical horizontal joint

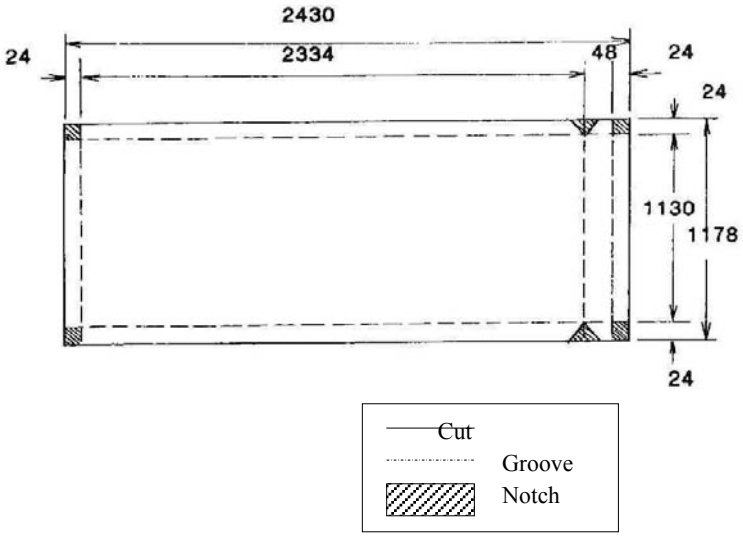


Fabrication drawing

Completed panel



Cutting and grooving method



Optimization of panel size

Material: ALPOLIC/fr 4mm, Champagne Metallic 30%G in mm

		Completed Panel					Original Panel Required				
P. No.	Type	PW	X	PH	Pcs.	Sqm.	PW	X	PH	Pcs.	Sqm.
ND3	F	2,336		1,132	82	216.48	2,460		1,270	82	255.84
NM3	F	2,336		1,182	24	66.24	2,460		1,270	24	74.88
NN8	F	1,982		1,132	11	24.64	1,982		1,270	11	27.72
NO2	F	2,336		662	16	24.80	2,460		1,270	16	49.92
NO8	F	1,982		662	11	14.41	1,982		1,270	11	27.72
ND7	B	2,386		1,132	10	27.00	2,460		1,270	10	31.20
NB3	B	2,336		133	21	6.51	2,460		1,270	0	0.00
WK7	B	2,418		1,214	1	2.94	2,460		1,270	1	3.12
WG7	B	2,418		1,132	1	2.74	2,460		1,270	1	3.12
WG6	B	2,336		1,132	1	2.64	2,460		1,270	1	3.12
WG6	B	2,236		1,132	1	2.53	2,460		1,270	1	3.12
					179	390.93				158	479.76
							1,982		1,270	22	55.44
							2,460		1,270	392	424.32
											479.76

(Note) Panel type indicates the following abbreviations:

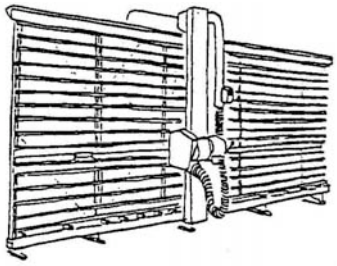
F: Flat, B: Bending

Appendix 2

Equipment list for ALPOLIC/fr fabrication

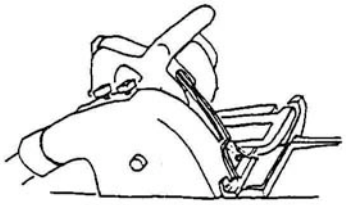
Cutting & grooving

Panel saw



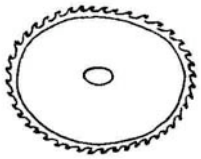
Grooving

Handy grooving machine



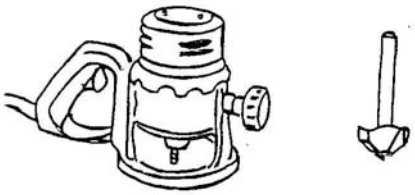
Cutting

Circular saw blade



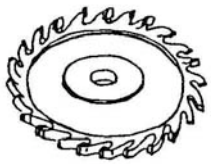
Precision grooving

Handy router & bit



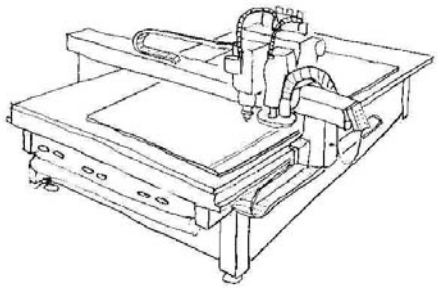
Grooving

Grooving cutter blade



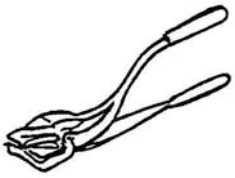
Grooving, cutting and notching

CNC Router



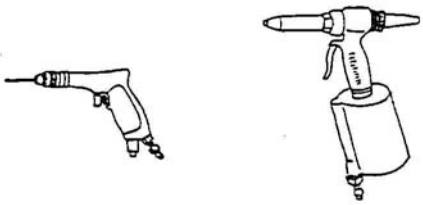
Corner-notching

Notching tool



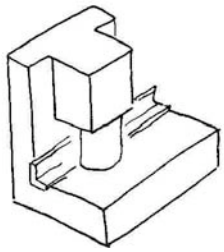
Drilling & assembling

Pneumatic drill & rivet tool



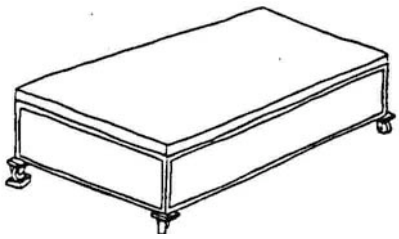
Punching for hanging holes

Punching press



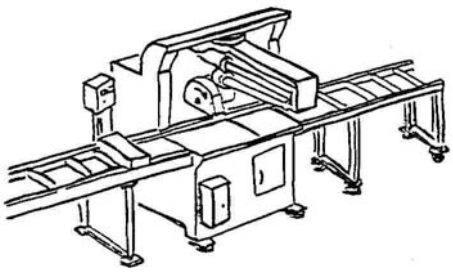
Folding, assembling & inspection

Flat working table



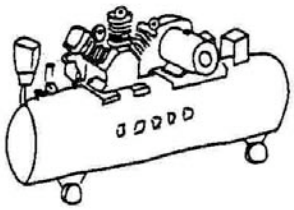
Cutting for aluminum extrusions

Circular saw and dust-collector



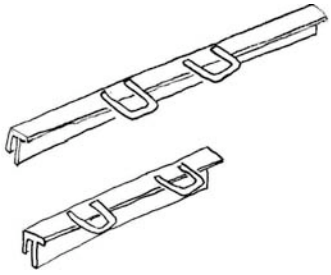
Utility for pneumatic tools

Air compressor



Bending after grooving

Bending jigs



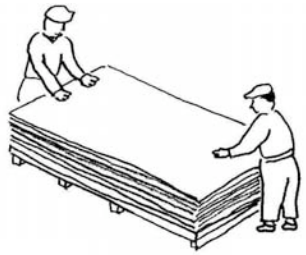
Appendix 3

Typical fabrication procedures

1. Check fabrication drawings

Check up on every fabrication drawing, to confirm the details.

2. Check ALPOLIC/fr panels



Check ALPOLIC/fr panels, to confirm the size, color and quantity, based on the drawing.

3. Marking on panels

Mark the cutting and grooving lines on back of panels, based on the drawing.

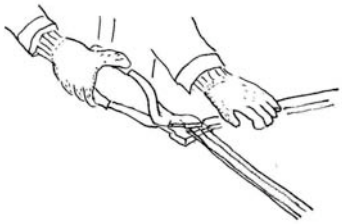
4. Cut

Cut the panel with handy circular saw, based on the drawing.

5. Groove

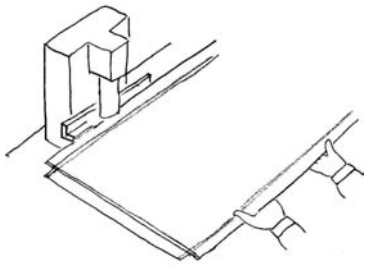
Groove the panel in the back. Confirm the remaining thickness and bending radius with pre-test.

6. Corner-cutout



Remove the panel corner with a notching tool or a punching press.

7. Punch hanging holes

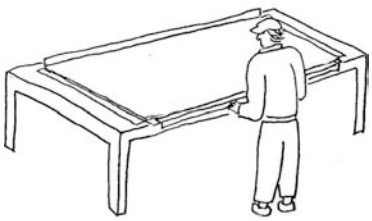


Remove hanging holes with a punching machine, if necessary.

8. Cut aluminum extrusions

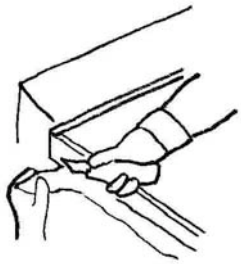
Cut various types of aluminum extrusions, based of the details.

9. Fold



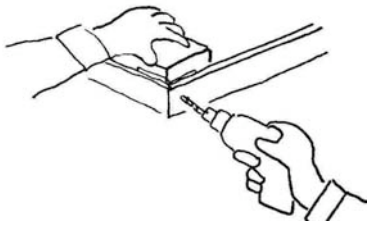
Fold the grooved panel with a folding jig. Confirm the folded corner angle after folding.

10. Cut off protective film



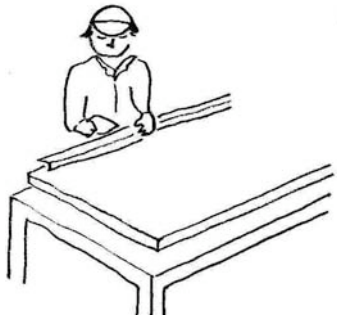
Peel and cut off the protective film of edge with a utility knife.

11. Fix corner angle pieces



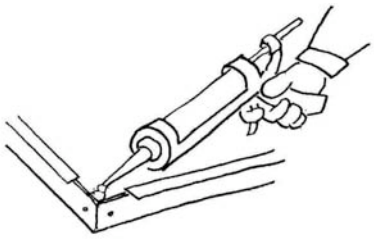
Fix the corner with corner angle pieces and rivets.

12. Fix aluminum flange



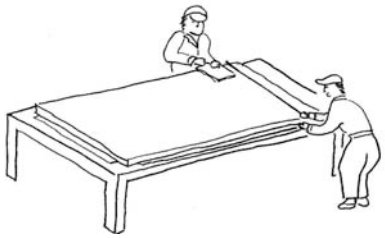
Fix aluminium flange bars with rivets, to complete tray type panels.

13. If necessary, apply sealant on panel corners



Apply a suitable sealant on panel corner from the back, if necessary, to ensure waterproofing.

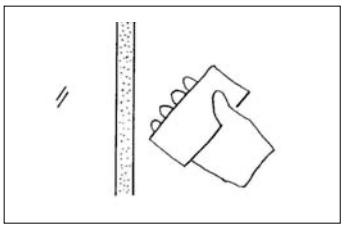
14. Final check



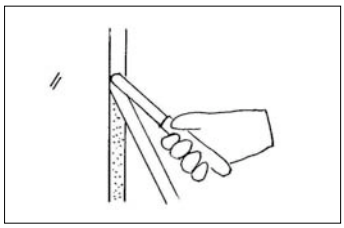
Inspect the completed panels.

Appendix 4

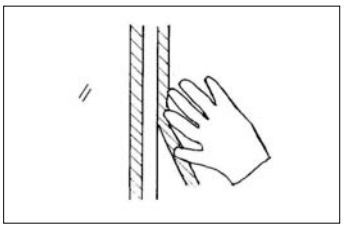
Typical sealing procedures



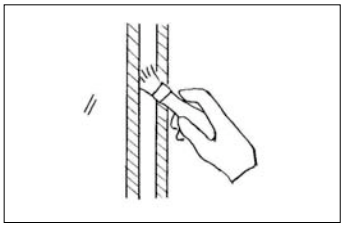
1. Clean work surface
Remove gravel. Clean joints, to remove moisture, oil and dust. Dry the joint, if moist.



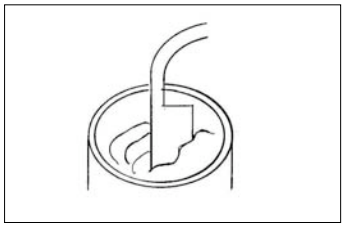
2. Insert back-up material
Back-up material is necessary as a bond breaker to avoid triangle adhesion.



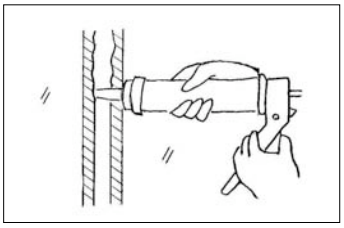
3. Apply masking tape
Apply masking tape to both sides of joint, to avoid smearing the adjacent area.



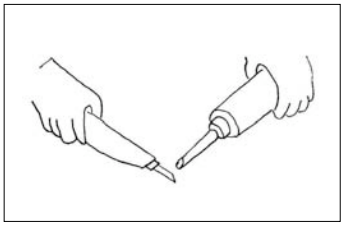
4. Apply primer
Apply primer with brush or spray, if primer is required for compatibility.



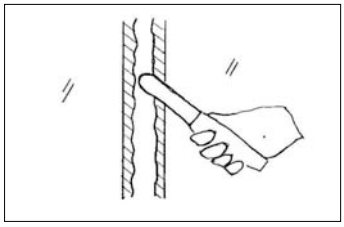
5. Mixing (2-component type)
In case of 2-component type, mix base component and curing agent, and stir it.



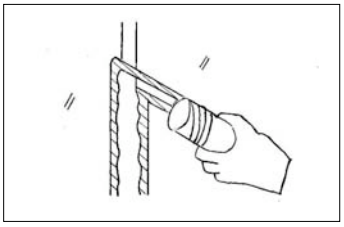
6. Filling operation (2-component type): Before filling, wash and wipe the gun and nozzle to remove smear and oil. Avoid bubble.



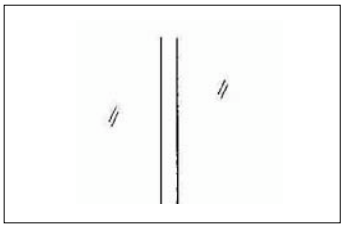
7. Filling operation (1-component type): In case of 1-component type, cut the nozzle at 45° and fit the cartridge into a caulking gun.



8. Tooling
Tooling is carried out for uniform adhesion, clean finish and elimination of bubble.



9. Remove masking tape
After tooling, remove masking tape. Small bar is often used for efficient work.



10. Curing
After completion, the joint is carefully cured until completely hardening.

Note 1. The above is excerpt from a sealant manufacturer's brochure. Refer to manufacturer's brochure for details and particular notice to the sealant.

Note 2. Gloss increase due to plasticizer: Do not stick polyurethane sealant and modified Silicone sealant on ALPOLIC/fr protective film. The plasticizer contained in these materials can penetrate the protective film and cause a gloss change in the coating. During tooling, do not smear protective film with surplus of sealant.