PANELUX

3 MM SOLID ALUMINIUM PANEL

PROCESSING & TECHNICAL DATA GUIDE

www.mulford.co.nz

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TRANSPORTATION, STORAGE AND PROTECTIVE FILM HANDLING GUIDELINES

To ensure the integrity and finish of PaneLux® A1 pre-coated solid aluminium panels during handling, transportation, and storage, the following procedures must be observed:

Transportation and Handling

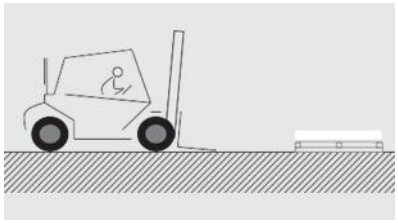
- Handle pallets with care at all times to prevent mechanical damage.
- Use appropriate lifting equipment to avoid impact or deformation.
- Do not drag or slide panels against each other; always lift individually.
- Panels must be carried by two persons, each holding two corners, using clean gloves to prevent surface contamination.

Inspection Upon Delivery

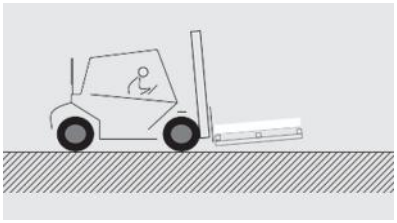
- Immediately inspect all pallets upon receipt.
- Check for signs of damage due to transport or exposure to moisture.
- If moisture is detected, panels must be thoroughly dried to prevent staining or corrosion.
- Report any damage to the transport provider immediately.

Storage Conditions

- Store pallets in a dry, enclosed area, protected from rain, humidity, and any water ingress.
- Avoid sudden temperature changes to prevent condensation forming on panel surfaces.
- Stack a maximum of three pallets of similar dimensions horizontally, placing the heaviest at the bottom.
- Do not store panels vertically.
- Do not place any objects or materials between stacked panels to prevent pressure marks or surface impressions.



Pick up the pallet, slightly raise the forks.



Pick up the pallet, do not draw or push.

Protective Film Handling Guidelines

To maintain surface integrity and ensure effective removal of the protective film, adhere to the following instructions:

- Do not store panels with the protective film applied for more than three months, as extended storage may cause the film to harden and become difficult to remove.
- Avoid exposing stored panels to direct sunlight or temperature fluctuations, as this may degrade the film's performance.
- Do not apply markers, tapes, labels, or any other adhesives to the protective film. Solvents and plasticizers can penetrate the film and damage the lacquered surface beneath.

- Avoid partially peeling the film during handling or installation. Exposed edges may accumulate dirt or contaminants, negatively affecting adhesion or appearance.

Removal Timeframe

- The protective film should remain on the panel surface during fabrication and installation wherever possible to minimise the risk of scratching or contamination.

Temperature Conditions

- Do not attempt to remove the protective film at ambient temperatures below 0°C, as this may cause tearing or incomplete removal.

Protective film should remain on the panel surface during machining, routing, and fabrication wherever possible and should only be removed immediately prior to installation.

Avoid exposing panels to excessive heat during fabrication which may affect protective film performance.

PANEL DIMENSIONS

Aluminium Sheet (Alloy):	3003 – H24
Total Thickness:	3 mm (tolerance ± 0.15)
Width:	1550 mm (tolerance ± 2.0)
Length:	3200 mm & 4000 mm (tolerance ± 3.0 & diagonal ± 3.0)
Weight:	8.1 kg/m2

PANEL TEMPERATURE AND FABRICATION CONDITIONS

Panels stored in cold environments may adopt the surrounding temperature. Where panels have been stored in cold conditions, they should be allowed to stabilise to ambient workshop temperature prior to routing and folding.

The manufacturer recommends fabrication occurs within a panel temperature range of 18 °C to 50 °C. Panels should stabilise above 18 °C prior to fabrication to ensure consistent routing and folding performance.

Excessive heating above 50 °C should be avoided to prevent potential effects on the coating system or protective film.

Low panel temperatures may reduce aluminium ductility and increase the likelihood of coating stress during bending. Fabricators should ensure panels are processed under suitable workshop conditions.

Fabricators should undertake trial routing and folding tests to confirm suitable fabrication parameters for their equipment and workshop conditions.

COATING SPECIFICATIONS AND TOLERANCES

Paint System	Roller Coated
Paint Type	PVDF
Coating Thickness	≥ 26 µm
Pencil Hardness	≥ HB
Adhesive	Class 0
Acid Resistance	5% HCL for 24 hours, no observed change or blister
Alkali Resistance	5%NaOH for 24 hours, no observed change or blister
Salt Spray Resistance	5% Salt for 720 hours, no observed change or blister
Humidity Resistance	Temp 47c (±1c), humidity 96 ±2% for 3000 hours, 1 grade
Exterior Exposure	20 years for colour White, other colours 15 years
Solvent Resistance	100 MEK double rubs, no observed change
Boiling Water Resistance	98c (±2c) for 2 hours
Cleaning Agent Resistance	Isopropyl Alcohol, Ethanol Absolute 46.7% no change*
Abrasive Resistance	≥ 5 L/um
Oil Resistance	No Trial

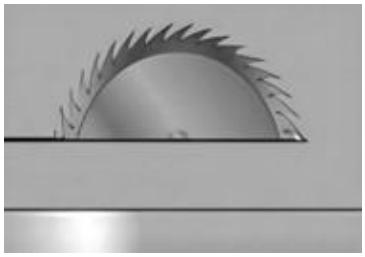
*The Cleaning and Maintenance Guide can be located here www.mulford.co.nz or call 0800 685 3673.

Coating performance relates to the supplied prefinished panel material. Fabrication processes including routing, folding, cutting, perforation or bending may influence coating performance depending on fabrication parameters and forming techniques used.

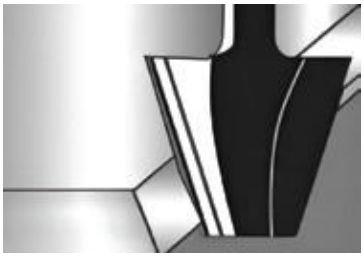
PROCESSING METHODS

Trial routing and folding should be undertaken prior to production fabrication to confirm machine settings, routing depth, and folding performance.

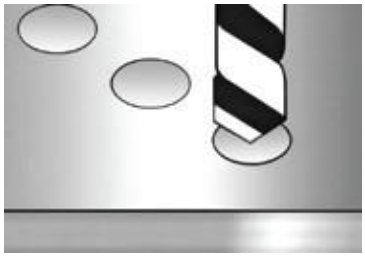
Cutting – Sawing



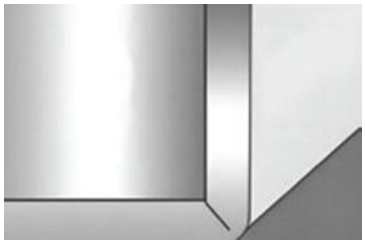
Routing



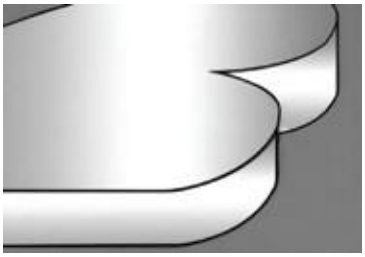
Drilling



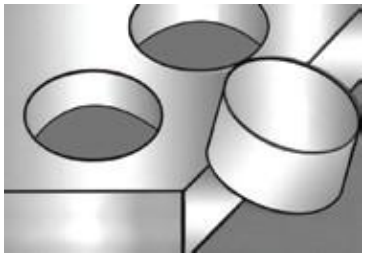
Routing and Folding



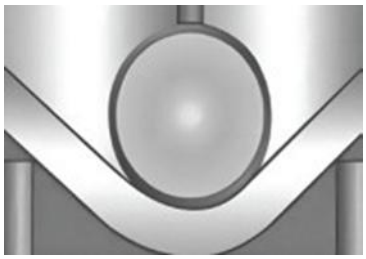
CNC Routing



Perforation



Pressing **Rolling**



GENERAL FABRICATION CONDITIONS

Fabrication of PaneLux® A1 solid aluminium panels should be conducted by experienced fabricators using suitable equipment and controlled workshop conditions.

Fabricators must verify machining parameters, routing geometry, and folding performance through trial fabrication prior to production**.**

Fabrication performance may be influenced by several variables including:

- routing depth and hinge thickness
- panel temperature
- tooling condition
- machine configuration
- forming technique
- workshop environmental conditions

PaneLux® A1 panels should be allowed to stabilise to ambient workshop temperature prior to routing and folding.

The manufacturer recommends fabrication occurs within a panel temperature range of 18 °C to 50 °C**.**

Fabricators remain responsible for verifying fabrication parameters appropriate to their equipment and workshop conditions prior to production.

PROCESSING MACHINES AND TOOLS

Typical CNC Routing Equipment and Parameters

Typical CNC Configuration:	3-Axis Simultaneous-Motion CNC Router
Worktable Format:	Vacuum Suction with Dual Roller Compaction System
Worktable Dimensions (mm):	2000 mm (W) × 6000 mm (L)
Typical Processing Capacity (mm):	1900 mm (Width) × 6000 mm (Length) × 50 mm (Height)
Typical Feed Rate:	**3-**8 metres per minute
Typical Spindle Speed:	Up to approximately 25,000 RPM
Machine Precision:	±0.05 mm depending on CNC equipment.
Recommended Spindle Tools:	Single flute carbide router bits suitable for aluminium machining are recommended.
Tool Material Options:	Tungsten Steel, Alloy Steel, or Diamond-Tipped Bits. Router bit shank size depends on the CNC collet system (commonly 6 mm or 10 mm).

CNC parameters may vary depending on fabrication equipment, tooling, and workshop conditions.

Advantages

The heavy-duty machine frame ensures structural stability and eliminates vibrations, enabling high-precision machining.

- Equipped with a high-performance air-cooled spindle capable of programmable speeds up to 25,000 rpm.
- Closed-loop control of position, speed, and torque enhances processing accuracy.
- Integrated emulsifier system significantly reduces heat and noise while extending equipment life and protecting the material.
- A Z-axis brake mechanism prevents potential damage to the worktable or material in the event of an unexpected spindle drop.
- Three blade holders mounted on the gantry allow for efficient, automatic execution of complex multi-tool operations.

Note

Current standards do not specify mandatory routing depths for the reverse side of solid aluminium panels. Routing depth must be controlled so that the front aluminium face remains intact, and the remaining hinge thickness is maintained within the recommended range, as outlined below:

PaneLux® A1 Panel:

- Routing depth should be controlled so that a remaining hinge thickness of approximately 0.8–1.2 mm remains at the base of the groove.
- Maintaining this hinge thickness allows controlled folding of cassette panels and helps reduce the risk of aluminium fracture or coating stress during bending.

Drilling and Cutting

Tool: Drill Bit – Use an Extreme 2™ HSS-G metal drill bit for drilling into PaneLux® A1 panels.

- Upon completion of the routing process, the V-shape milling cutter is automatically replaced with the drilling bit.
- Ø4.2 mm staggered holes are drilled to accommodate angle bracket fixings.
- The machine then cuts along the panel perimeter to produce a custom-sized (M2M – Made to Measure) PaneLux® A1 panel.
- Clean both the panel and the platform using a low-pressure air blower.

For optimal performance, Air cooling and effective chip evacuation should be used during routing to minimise heat build-up. Cutting fluid or emulsifier systems may be used where appropriate depending on CNC configuration.

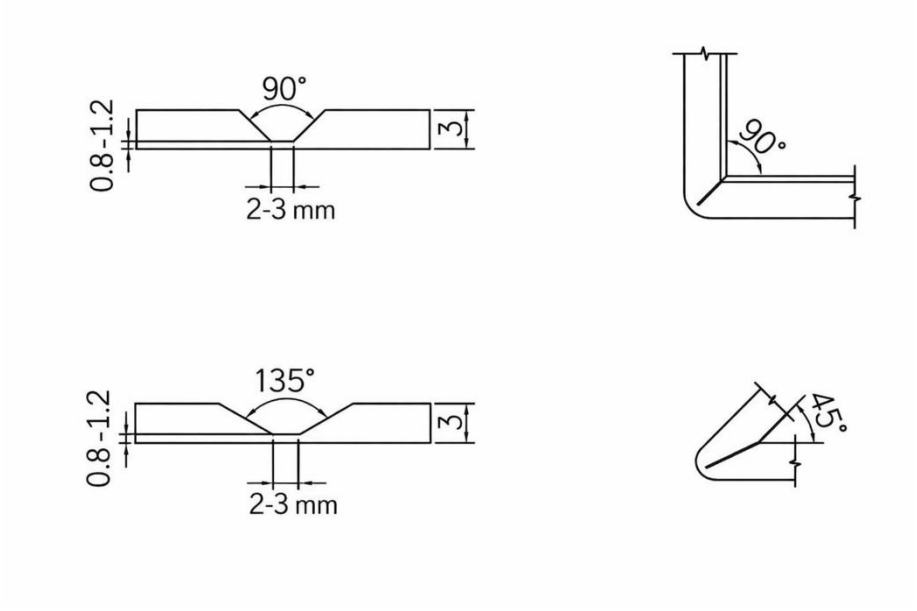
Routing Process

Routing depth must be verified by the fabricator through trial machining prior to production fabrication. Typical V groove routing is performed using a cutter angle of approximately 95° (generally ≥90°). The flat at the top of the groove is typically 2–3 mm, depending on tooling configuration and fabrication equipment.

Typical routing configuration for 3 mm PaneLux® A1 panel:

- remaining hinge thickness after routing: 0.8–1.2 mm
- typical router cutter angle approximately ≥90° (typically ~95°)
- flat at the top of the V-groove approximately 2–3 mm

- Routing must not cut through the rear aluminium skin. The remaining hinge material allows controlled folding of cassette panels and helps prevent aluminium fracture or coating stress during bending.



- Ensure the platform is clean and free of debris to prevent damage to the PaneLux® panel surface.
- Position the PaneLux® A1 panel on the platform and align the starting point for routing. The CNC machine will follow the predefined routing path generated from the tray panel fabrication drawings.

Routing parameters may vary depending on fabrication equipment, tooling condition, and workshop environment.

Tool Condition

Fabricators should inspect tooling condition regularly during production to ensure consistent machining quality. Router bits and cutting tools must be maintained in sharp condition. Tooling should be replaced where wear is observed.

Worn or blunt tooling may cause:

- excessive heat generation
- poor cut quality
- coating damage

Folding

PaneLux A1 panels are typically folded along routed V-grooves to form cassette panels. Folds should be made perpendicular to the routed groove to ensure uniform stress distribution along the hinge. Fold performance may depend on:

- routing depth
- hinge thickness
- panel temperature (recommended fabrication range 18 °C–50 °C)
- tooling condition

Aluminium undergoes plastic deformation during bending. Excessive routing depth, insufficient hinge thickness, or improper forming techniques may lead to aluminium fracture or coating stress along the fold line.

Fabricators must verify routing geometry and folding performance through trial fabrication prior to production.

Minimum Fold Radius

When folding along routed V-grooves the remaining hinge thickness must be sufficient to allow controlled deformation of the aluminium.

Tight bends may introduce visible coating strain along the fold line where the aluminium undergoes plastic deformation during forming. Fabrication parameters including routing depth, hinge thickness and fold radius must be verified through trial fabrication to ensure acceptable cosmetic performance.

Fabricators should verify folding performance through trial fabrication prior to production.

Fabrication Verification

Prior to production fabrication, fabricators should conduct trial routing and folding of sample panels to confirm:

- routing depth
- hinge thickness
- folding performance
- tooling condition
- machine settings

Fabrication equipment and workshop environments may vary between fabricators. Trial fabrication allows verification of fabrication parameters prior to production.

THERMAL EXPANSION

Coefficient of thermal expansion for aluminium: 23×10^{-6} /°C. Thermal movement should be considered during façade design and panel fabrication to prevent restraint stresses within the panel system.

Example movement:

Panel Length	Temperature Change	Movement
1 m	50°C	1.15 mm
3 m	50°C	3.45 mm

CASSETTE DRAINAGE

Cassette panels may incorporate small drainage openings at the base of panel returns to allow water to escape.

- Where drilling or cutting exposes bare aluminium, fabricators should apply a compatible protective coating or sealant suitable for aluminium to minimise corrosion or contamination of the exposed edge.

PROTECTION OF EXPOSED ALUMINIUM EDGES

- Where drilling, cutting, or fabrication exposes bare aluminium (for example cassette drainage holes or drilled openings), the exposed aluminium edges should be sealed to provide additional protection of the aluminium substrate.
- Feiteng recommends applying a clear epoxy protective coating to exposed aluminium edges.
- The protective coating should be applied prior to removal of the protective film where possible, to assist in protecting the surrounding coated surface during application.
- Clear epoxy coatings are widely available through local coating suppliers. Fabricators should ensure the selected product is suitable for use with PVDF coated aluminium surfaces.

BENDING

PaneLux® A1 panels can be bent using a roll bending machine.

- Both three-roll and four-roll machines are suitable for this process.
- The panel is securely clamped between two forming cheeks.
- Bending is achieved by wrapping the projecting edge around the upper clamping cheek or former, using a movable swivel bar.
- The bending radius is defined by interchangeable formers mounted on the upper clamping cheek.
- The minimum recommended bending radius is r = 400 mm.

PERFORATION

Perforation of PaneLux® A1 panels can be conducted using CNC* or NCT** machines, allowing for a wide range of custom designs and patterns.

- Holes with a minimum diameter of 3 mm can be punched.
- The minimum spacing between holes, measured from edge to edge, should exceed the panel thickness to maintain structural integrity.
- When using an NCT** machine, apply an emulsifier to the panel surface beforehand to protect the equipment, punching tools, and the surface coating.

FABRICATION RESPONSIBILITY

Fabrication guidance contained within this document is provided as general technical guidance only. Fabrication equipment, tooling, machine configuration, and workshop conditions vary between fabricators and are outside the control of Mulford or the manufacturer.

Fabricators remain responsible for verifying machining parameters, routing depth, hinge thickness, folding performance, and finished panel suitability through trial fabrication prior to production.

FABRICATION DISCLAIMER

PaneLux® A1 panels are supplied as a material product. Fabrication methods, equipment, tooling condition, and fabrication environment may vary between fabricators. Fabricators must verify machining parameters and folding performance through trial fabrication prior to production. Project specific cassette design, fixing design, structural performance and façade system compliance remain the responsibility of the project designer, façade engineer and fabricator.

FABRICATION VARIABLES

Fabrication processes including routing depth, tooling condition, machine configuration, forming technique, panel temperature and workshop conditions may vary between fabricators and fabrication equipment.

PaneLux® A1 panels are supplied as a finished material product. Mulford and the manufacturer do not control fabrication processes or equipment used by fabricators.

Fabricators are responsible for verifying machining parameters, tooling condition, routing depth, and folding performance through trial fabrication prior to production.