Featherlight™

marine grade interior panels

- Dimensionally Stable
- Lightweight
- Ready for veneer or final finish
- Code approved manufacture available

Specifically designed for non-structural interior applications Featherlight™ Marine Grade panels have been developed to optimise weight and dimensional stability, making them ideally suited for the construction of interiors for luxury and high-performance motor and sailing yachts.

Featherlight Marine Grade Panels are 1200mm x 2400mm, and are available with a choice of phenolic-impregnated paper honeycomb, PVC X-linked foam or rigid end-grain balsa cores to provide superior levels of stiffness, and thermal, or acoustical, insulating properties.

The panels are finished with either hardwood veneers or peel-plied, reinforced epoxy laminates. The timber-faced panels are supplied with a sanded, calibrated surface that is ready for decorative veneer application, painting or secondary bonding with decorative laminate.

Featherlight Marine Grade Panels are manufactured in a controlled environment and under-go strict Quality Inspections, at all stages during the manufacturing process, to ensure dimensional stability and consistent thickness. Panel thicknesses were chosen to meet industry requirements and to suit standard joinery fittings.

Custom thicknesses can be manufactured, on request, and for example, are ideal for the construction of light, strong and very stable doors which maintain their original dimensions and can be configured to provide excellent acoustic properties.

Oscar Azzura 100' Featherlight FP016

Designed by Frank Mulder
Built by Azzura Yachts

Applications:

- Furniture
- Non-structural bulkheads
- Cabinetry • Partitions
- Ceilings • Tables
- Doors

Custom thicknesses can be manufactured, on request, for specific applications such as doors and tables.

Featherlight FP impregnated paper-honeycomb core (54kg/m³) with hardwood veneer on both sides

Order Code	Overall Thickness	Nominal Weight kg/m²
FP009	9mm	3.6
FP013	13mm	3.8
FP016	16mm	4.0
FP019	19mm	4.2

Featherlight FB rigid end-grain balsa core (150kg/m³) with hardwood veneer on both sides

FB009	9mm	3.4
FB013	13mm	4.0
FB016	16mm	4.4
FB019	19mm	4.9

Featherlight FX AIREX® C70.55 PVC foam core (60kg/m³) with hardwood veneer on both sides

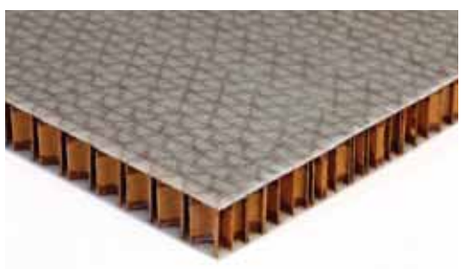
FX009	9mm	2.8
FX013	13mm	3.0
FX016	16mm	3.2
FX019	19mm	3.4

- Featherlight Panel size 1200mm x 2400mm
- All timber used in the manufacture of Featherlight Composite Panels is harvested using sustainable methods.
- vdL Composites reserves the right to alter specifications without prior notice.

Featherlight panels surfaced with fibreglass and carbon reinforcements are laminated with a high-performance epoxy resin that has excellent adhesion to the balsa, honeycomb and foam cores, and provides excellent damage tolerance. The laminates are finished with peel ply to protect them from contamination, and to reduce preparation of the surface prior to secondary bonding of veneers or final finishing.

Featherlight FH phenolic impregnated paper-honeycomb core (54kg/m^3) with 1 layer of 600g biaxial E-glass on both sides

Order Code	Overall Thickness	Nominal Weight kg/m^2
FH1009C6	9 mm	4.0
FH1013C6	13 mm	4.2
FH1016C6	16 mm	4.4
FH1019C6	19 mm	4.6



Featherlight FF AIREX® C70.55 PVC foam core (60kg/m^3) with 1 layer of 600g biaxial E-glass on both sides

FF1009C6	9 mm	2.9
FF1013C6	13 mm	3.1
FF1016C6	16 mm	3.3
FF1019C6	19 mm	3.5

• Panel size 1200mm x 2400mm

Tolerance for FH1016C6 is +/- 0.2mm Other dimensions, laminates, and closer tolerances upon request.

TYPICAL E-GLASS LAMINATE PROPERTIES Laminate thickness 0.53mm per 600gm		Nominal fibre fraction 62-64% by weight	
	Test Method	Biaxial - Warp (0°)	Biaxial - Fill (90°)
Tensile Strength	**ASTM D3039**	371.9 MPa	327.6 MPa
Tensile Modulus	**ASTM D3039**	21.27 GPa	18.22 GPa
Compressive Strength	**ASTM C-273**	293.8 MPa	255.5 MPa
Compressive Modulus	**ASTM C-273**	21.27 GPa	18.22 GPa

Specialty Featherlight Marine Grade Panels can be manufactured with carbon laminates, and foam or aramid honeycomb cores, for projects requiring superior stiffness and ultra-lightweight

Featherlight FN aramid honeycomb core (48kg/m^3)* with 1 layer of 200g carbon double bias on both sides

Order Code	Overall Thickness	Nominal Weight kg/m^2
FN1006ZX2	6mm	1.46
FN1012ZX2	12mm	1.74
FN1018ZX2	18mm	1.98

* Cell size 3.2mm: hexagonal

Core Mechanical Properties

A selection of core types and densities have been chosen to provide a range of weight, stiffness and cost options. From the economical paper honeycomb, through to the more expensive aramid honeycomb used in weight-critical, high performance projects.

All Featherlight panels provide significant weight savings over traditional plywood panelling.

ARAMID HONEYCOMB Cell size: 3.2mm Shape: hexagonal		
Nominal Density	48 kg /m^3	3.0 lb /ft^2
Compressive Strength	1.9 MPa	275 psi
Shear Strength - longitudinal	0.6 MPa	90 psi
Shear Modulus - transverse	1.0 MPa	150 psi

PAPER HONEYCOMB		
Nominal Density	54 kg /m^3	3.34 lb /ft^2
Compressive Strength	0.9 MPa	133 psi
Shear Strength - longitudinal	1.1 MPa	158 psi
Shear Modulus - longitudinal	115 MPa	16.6 ksi
Shear Strength - transverse	0.4 MPa	63 psi
Shear Modulus - transverse	35 MPa	5.45 ksi

Photography - Andrea Francolini

Rosebud STP65 Featherlight FN

Designed by Farr Yacht Designs
Built by Westerley Marine

PVC CROSS LINKED FOAM AIREX® C70.55			
Nominal Density	**ISO 845**	60 kg /m^3	3.7 lb /ft^2
Tensile Strength perpendicular to the plane	**ISO 527-2**	1.3 MPa	190 psi
Tensile Modulus perpendicular to the plane	**ISO 527-2**	45 MPa	6,530 psi
Compressive Strength perpendicular to the plane	**ISO 844**	0.9 MPa	130 psi
Compressive Modulus perpendicular to the plane	**DIN 53421**	69 MPa	10,000 psi
Shear Strength	**ISO 1922**	0.85 MPa	123 psi
Shear Modulus	**ASTM C-393**	22 MPa	3,190 psi
Shear elongation at break	**ISO 1922**	16%	
Thermal Conductivity @ 24°C(75°F)	**ISO 8301**	0.031 W/m.K	0.21 BTU.in/ft^2.hr.°F

RIGID END-GRAIN BALSA			
Nominal Density	**ASTM C-271**	150 kg/m^3	9.4 lb/ft^3
Tensile Strength perpendicular to the plane	**ASTM C-297**	13.0 MPa	1886 psi
Tensile Modulus perpendicular to the plane	**ASTM C-297**	3.52 GPa	510 ksi
Compressive Strength perpendicular to the plane	**ASTM C-365**	12.67 MPa	1837ksi
Compressive Modulus perpendicular to the plane	**ASTM C-365**	3.92 GPa	568 ksi
Shear Strength	**ASTM C-273**	2.94 MPa	427 psi
Shear Modulus	**ASTM C-273**	159 MPa	22.8 ksi
Thermal Conductivity @ 24°C(75°F)	**ASTM C-177**	0.066 W/m.K	0.453 BTU.in/hr.ft^2.°F

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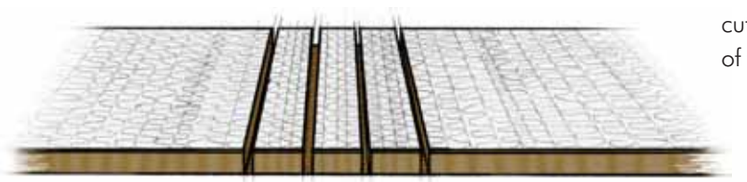
Processing E-glass laminates
Curvatures & Radii

Curved surfaces are achieved without effort by simply kerf-cutting the inside skin. The need for elaborate moulds is not necessary, Featherlight only needs simple jigs to form a variety of corners and curves.

METHOD A: Construction of large radii curves.

Curves that describe angles of 60 to 90 degrees are achievable with no loss of structural integrity.

Step 1: A series of narrow parallel slots (kerfs) are cut into the sandwich panel along the inside of the proposed curve, through the facing skin and core to the rear face of the outside skin. The saw cuts should never break through the outer facing skin, which serves as a hinge.



Initially determine the desired internal angle, and outer corner radius. Following the calculations below, will provide the required details on number of slots, and their spacing, to achieve the required curve.

α – internal angle
0.52 (150°) 1.57 (90°)
1.05 (120°) 2.62 (30°)
s – saw cut width
n – number of slots
t – panel thickness
c – saw cut centres
R – corner radius

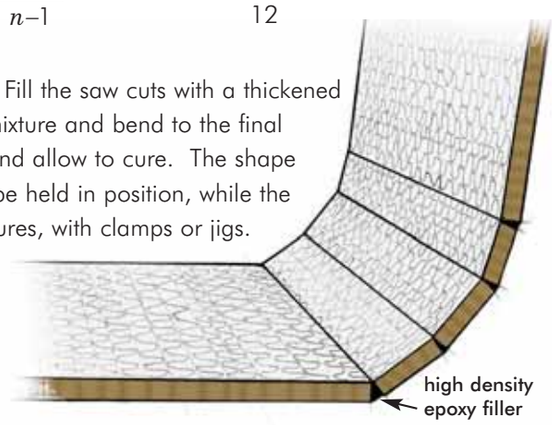
$$n = \frac{t.\alpha}{s} \text{ (rounded)}$$

Example:
$$\frac{16\text{mm} \times 1.57}{2} = 12$$

$$c = \frac{R.\alpha - s}{n - 1}$$

Example:
$$\frac{50\text{mm} \times 1.57 - 2.2}{12} = 5\text{mm}$$

Step 2: Fill the saw cuts with a thickened epoxy mixture and bend to the final shape and allow to cure. The shape should be held in position, while the epoxy cures, with clamps or jigs.

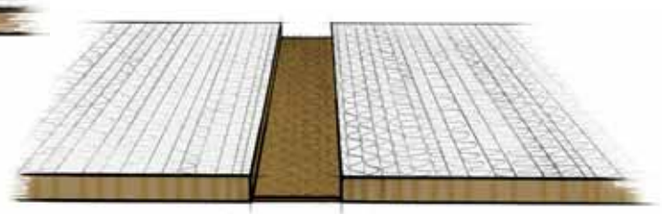


Step 3: An additional layer of fibreglass cloth is applied to the inside of the curve with an epoxy laminating system, covering all the slots and overlapping the end slots by 30 – 40mm.

METHOD B: Construction of small radii corners.

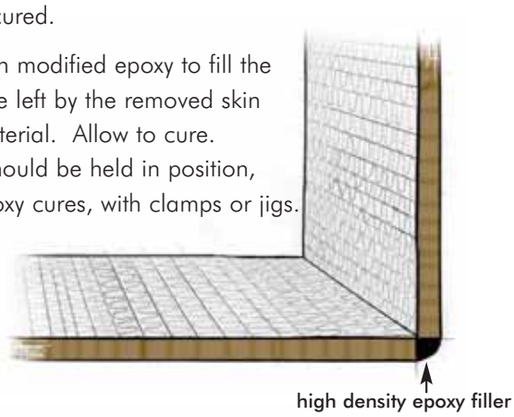
Step 1: A strip of the Featherlight panel is removed by cutting through the facing skin and core to the rear face of the outside skin. The slot width is calculated by:

$$\text{Slot Width} = \alpha.t$$

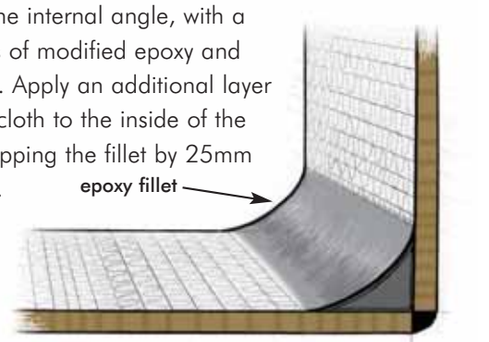


Step 2: The cut should be filled with a mixture of WEST SYSTEM 105 resin with 206 Slow hardener, modified with 409 Microsphere Blend. This combination will produce a strong, waterproof bond that will hold the curve when cured.

Apply enough modified epoxy to fill the internal angle left by the removed skin and core material. Allow to cure.
The shape should be held in position, while the epoxy cures, with clamps or jigs.



Step 3: Fill the internal angle, with a 20mm radius of modified epoxy and allow to cure. Apply an additional layer of fibreglass cloth to the inside of the angle, overlapping the fillet by 25mm on each side.



Cutting

Diamond-coated fibreglass tooling is recommended for best tool life, for example, a jigsaw with a Makita No. 10S Type 150 blade to cut out parts. The best edge finish is achieved with circular saws running aluminium cutting blades, however blade life is greatly reduced.

Joining & Bonding

To offset the individual size of the panel, Featherlight can be supplied with both long edges pre-machined to facilitate joining. The Z-Joint is structurally effective and achieves a smooth and fair surface profile.

A high density epoxy adhesive is specified for joining Z-joints.

Recommended adhesives:

- PRO-SET® Adhesive
- WEST SYSTEM® R105 epoxy resin and 205 or 206 hardener modified with 403 Microfibres

Edge detailing & hardware attachment

Use a T-router with a ball-trace to run along the laminate to remove core. Over-fill the routed edge with a low density filler compound and allow to cure. Sand the compound flush with the skins when it is fully cured.

Timber blocks can be used to replace the epoxy filler in areas where latches or hinges are to be placed.

Storage

Featherlight panels should be stored flat, out of direct sunlight, and kept dry and clean. Panels supplied with fibreglass skins have peel-ply on the surface, which should be left in place as long as possible, to protect them from surface contamination.

Safety

Avoid inhalation and eye contact with machining dust. Wear protective equipment such as hearing protection and safety glasses during cutting operations, and gloves to avoid cuts. Use guards as per machinery manufacturers instructions.

Singularity Lutra 80 Featherlight FN

Luxury interior constructed by
McConaghy Boats & Marxcraft Pty Ltd

vdL Composites
lightweight panel solutions

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