MATERIALS LIST AND AREAS OF PANELS WITH CONSTRUCTION SPECIFICATIONS FOR THE

SHUTTLE 31 CATAMARAN

DRAWINGS LIST FOR SHUTTLE 3I CATAMARAN.

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Supplementary sketch to lines plan	lB
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The materials specified in the drawings are as follows:

Materials for construction

200 Satin = 200 gms/m2 4 harness satin weave F glass fibre.
340 WR = 340 gms/m2 woven Roving E glass or 4 harness satin weave
400 WR = 400 gms/m2 woven Roving E glass or 4 harness satin weave
400 Biax = 400 gms/m2 ~-45 degree biaxial F glass
490 Biax = 490 gms/m2 ~—45 degree biaxial E glass
600 WR = 600 gms/m2 woven Roving E glass or 4 harness satin weave
600 Biax = 600 gms/m2 ~—45 degree biaxial E glass
400 UDWR 400 gms/m2 Unidirectional woven Roving E glass
500 UDWR 500 gms/m2 Unidirectional woven Roving E glass.
800 Biax 800 gms/m2 +-45 degree biaxial E glass
CSM = 1.5 oz/sq ft Chopped Strand Mat E Glass fibre.

IN MOST CASES BIAX CAN BE USED INSTEAD OF WR DEPENDING ON AVAILABILITY LOCALLY. FIBRE DIRECTION REMAINS AS SPECIFIED.

Core Material.
Airex R63/80. or Divinycell H80, or Core Cell A500, PVC Closed Cell Foam. Airex is preferred for the hulls and bridgedeck sole and underside of fairings. Divinycell OR Core Cell is best for the decks.

Carbon Unidirectional Carbon Fibre 320 gms/m2. Courtaulds XAS 1 2K filament tow, 100 mm wide.

Kevlar = 230 gms/m2 Kevlar 49, 4 harness satin weave Sized for Polyester Resin.

Resin. POLYESTER ISOPHTHALIC MARINE GRADE.

SHUTTLE 31. MATERIALS.

The materials required for glassing the panels should be taken from the list of areas, and the panel specifications. Cross check to the construction drawings. The panels specification shows an example of a laminate for each panel. For your local area, you may not be able to obtain the exact material specified. If that is the case, use a combination of materials to arrive as closely as possible to the same total weight of glass on each side of the panel, with the same fibre orientation. In all cases on the bulkheads and hull, but not in the top and bottom flanges of the cross beams, Unidirectional Glass may be substituted by Biaxial or Double Bias cloth. Provided that the total weight of glass is the same in the end, and that there is and equal amount of glass in both directions. For example....
Panel D is specified as 1 x 800 Biax @ +- 45 Degrees. This can be replaced by:
2 x 400 UD @ +- 45 Degrees. or
2 x 400 Biax with the fibres +-45 degrees to the vertical or
lx 300 Biax + 1 x 500 Biax, all with the fibres +-45 degrees to the vertical etc.

Fibre direction is always given either to the vertical or to the centre line, as appropriate.

The total amounts of foam required are:

12mm Airex R63.80	110 m2
15mm Airex R63.80	135 m2
20mm Airex R63.80	12 m2
Resin. Polyester.	1000 Kgs

The decks and all areas exposed to the sun can be built in Divinycell H80 or Cre Cel instead of Airex. Airex has better impact resistance than Divinycell, and Divinycell has better resistance against heat build up than Airex.

The flanges in the main cross beam under the mast require Unidirectional glass

AREAS AND CONSTRUCTION DETAIL OF PANELS

ITEM	AREA	PANEL
BULKHEADS	**M^2**	**ref. laminate spec.**
2*FORD TUBE	0.80	D
2*SAIL LKR	1.33	J
MAIN BEAM	8.72	E
BATHROOOM (STBD)	2 46	J
GALLEY (PORT)	3.6	J
CHART AREA (STBD)	2.48	J
AFT BEAM	3.64	D
TRANSOM	O.88	J
2*STERN STEPS	0.92	D
2~FORD BUNK DIVIDE	088	J
2*FORD BUNK END	2.16	J
2*FORD SIDE OF STEPS	2.35	J
AFT BUNK END	1.82	J
SALOON SEAT TRANS.		J
AFT C/PIT SEAT FRNT	0.90	A
FORD C/PIT SEAT FRNT	0 9	A
2*H2O FRNT BHDS	032	A
2*HULL.	55.00	G plus extra
2*DECK	36.80	G
BRIDGEDECKSOLE	12.60	F
FORD. FAIRING	6.20	D
AFT FAIRING	2.81	D
O/BD BOX	2.50	J
0/80 COVER/TABLE	3.70	J
C/PIT SEAT TOP	4.23	J
C/PIT SEAT BACKS	4.20	J
FORD CL B/HD	0.91	D
AFT CL B/HD	0.31	D
2*B/HD 1 m FROM CL	6.80	D
2*FRD VANITY FRNT	1.53	B
2*FRD W/ROBE FRNT	2.90	B
SINK FRNT	0.64	B
OBD GALLEYFRNT	1.61	B
IBD GALLEYFRNT	1.11	B
CHART TABLE FRNT	1.00	B
2*SALOON SEAT FRNTS	1.26	B
SALOON LKR FRNT	1 60	B
AFT VANITY FRNT	0 76	B
AFT W/ROBE FRNT	1 40	B
CABIN LKR FRNT	0.88	B

2*FRD BERTH Top	4.40	A
2*FRD VANITY TOP	0.65	B
2~VANITY UNIT SHELF	0.60	PLY OR F/S
SINK UNIT TOP	0.40	PLY
SINK UNIT SHELF	0.40	4mm PLY
WC SHELF	0.25	4mm PLY
0/SD GALLEY TOP	0.95	PLY
I/BD GALLEY TOP	0.65	PLY
GALLEY SHELVES	1.50	4mm PLY
CHART_TABLE TOP	0.63	PLY OR F/S
CHART TABLE SHELVES	0.60	4mm PLY
2STEPS	0.80	D
SALOON SEATTOP	2.03	A
SALOON TABLE	0.84	PLY OR F/S
SALOON LKR SHELVES	0.80	4mm PLY
AFT VANITY TOP	0.76	6mm PLY
VANITY UNIT SHELF	0.70	4mm PLY
AFTBUNKTOP	2.70	A
CABIN LKR SHELVES	0.44	4mm PLY
SOLES	3.60	C

ADD 25% TO GLASS REQUIREMENT FOR CONNECTIONS+EXTRA GLASS

When you have found the local equivalent materials that are available
Calculate the areas required using this list and the laminate specification.

Laminate Specifications for Shuttle 31 Catamaran.

Note that in all cases the weights given are for the completed laminates,
including resin paint finish and filler etc, as appropriate.

PANEL A **Berths etc**

	Weight kgs/m2	Connection
Standard Boat		
1 x 490 Biax @45 degrees	3.54	3
12mm Airex		
I x 490 Biax @ 45 degrees		

PANEL B **Locker Fronts etc**

	Weight Kgs/m2	Connection
StandardBoat		
1 x 400 WP @45 degrees	3.18	2
12 mm Airex		
I x 400 WR @ 45 degrees		

PANEL C **Cabin Soles**

	Weight Kgs/m2	Connection
Standard Boat		
7mm Teak and Holly faced ply	6.3	3 (top only)
12mm Airex		
1 x 400 WR @ 45 degrees OR		
1 x 600 Biax @ 45 degrees	4.1	3 (top only)
12mm Airex		
1 x 600 Biax @ 45 degrees		

PANEL D **Structural Bulkheads (except in way of cross beams)**

	Weight kgs/m2	Connection
Standard Boat		
1 **x** 800 Biax @ 45 degrees	5.2	5
12mm Airex		
1 x 800 Biax @ 45 degrees		

PANEL E **Main Structural Bulkhead**

	Weight Kgs/m2	Connection
Standard Boat		
2 x 500 UDWR @ 45 degrees	6.4	6
15mm Airex		
2 x 500 UDWR @ 45 degrees		

PANEL F **Bridgedeck**

	Weight Kgs/m2	Connection
Standard Boat		
2 x 400 WP @ 45 degrees	5	See Constr.
20mm Airex		Drawing.
2 x 400 WR @ 45 degrees		

PANEL G **Basic Deck on Hulls**

	Weight Kgs/m2	Connection
StandardBoat		
1 x 800 Biax @ 45 degrees	5.6	See Constr.
15mm Divinycell		Drawing.
1 x 800 Biax @ 45 degrees		

PANEL H **Shelves**

	Weight Kgs/m2	Connection	
Standard Soat			
1 x 330 SATIN @ 45 degrees	3	1	
10mm Divinycell			
1 x 330 SATIN @ 45 degrees			
OR 4mm PLY	2.5		1

PANEL J **Non Structural Bulkheads**

	Weight Kgs/m2	Connection
Standard Boat		
I x 600 Biax @ 45 degrees	4.1	3
12mm Divinycell		
1 x 600 Biax @ 45 degrees		

TOPS IDES OF HULLS
As specified on the construction drawing.

NOTE. In all cases 1 x 800 Biax can be replaced by 2 x 400 biax or 2 x 400 WR. The fibre direction stays at +—45 degrees to Centre line of hull
Please note that you MUST overlap the joining edges of all Woven Roving and Biaxial Materials by 30 mm when you are laying them up. Unidirectionals are butted along the fibre direction, and overlapped 50 mm minimum anywhere where the fibres are being joined.

The Connection schedule Drg. No 14, shows how to join all the panels. As a General rule however — in cases of doubt — use 150% of the equivalent glass laminate of the weaker panel being joined, or ask the designer.

BUILDING IN STRIP PLANKED CEDAR OR DURACORE.

To build the hulls in Strip planked cedar you will have to replace the basic hull which is:

800 Biax at + - 45^0 15 Airex R63-80 or (Divinycel H30) 800 Biax at + - 45^0

With:

600 Biax at + - 45^0 15mm (Finished planed thickness) Cedar 600 Biax at + - 45^0

OR Strip plank with Baltec Duracore (Balsa with 1 mm Cedar each side) 700 Biax at + - 45^0

15mm Baltek Duracore 700 Biax at **+ -** 45^0

The weight gain for each option is as follows:

As Designed total hulls weight	=	380 Kgs	
Cedar Option =		593 Kgs	Wt. gain = 213 Kgs
Duracore option =		475 Kgs	Wt. gain = 95 Kgs

Please note that in all cases for example 600 Biax = 600 gms/m2 E glass 50: 50 biaxial

Laminate specification for Shuttle 31 Catamaran. Wood Epoxy Version.

PANEL A **Berths.**

6mm Gaboon Ply with stringers underneath as shown on drawing 10/5
Stringers are 32mm deep and 20mm wide.
Join to hull with connection 3.

PANEL A **Seat Tops in saloon and in cockpit**

6mm Gaboon Ply with stringers underneath as shown on drawing 10/5
Stringers are 32mm deep and 20mm wide.
In places where the seat is joined to the hull use connection 3. In other areas a stringer of 30 x 30 mm spruce can be USed to join the ply panels.

PANEL B **Locker fronts. etc.**

4 mm gaboon ply. reinforce openings with 4 mm ply 25mm around hole.
Connect with 25 x 25 softwood stringer or epoxy fillet.

PANEL C **Cabin Soles.**

7 mm Teak and Holly faced ply with stringer 32 x 20 under every 250 mm. Or 9 mm ply with 32 x 20 stringers under every 300 mm. Glass to the hull underneath if possible. Use large epoxy fillet on top.

PANEL D **Structural bulkheads** (Except in way of cross beams)

Use foam sandwich as per original specification.

Transom and steps.

9 mm Ply glass transom with connection 5 both sides. Steps use epoxy fillet.

Aft cross beam bulkhead and bridgedeck fairings,

Use foam sandwich as per original specification.

PANEL E **Main Structural Bulkheads**

Use foam sandwich as per original specification.

PANEL F **Bridgedeck**
Use foam sandwich as per original specification.

PANEL F **Basic Decks over Hulls.**
Same basic structure as hulls.

PANEL H **Shelves**.
4 mm ply. Use stringers only where necessary.

PANEL J **Structural bulkheads**.
6mm or 9mm ply as shown on drawing 10/5 Bridgedeck fairing foam sandwich as original spec. Use connection 3 plus extra in areas shown on drawing 16. Increase ply thickness by 6 mm in way of the chainplate. in the area shown as - ply replaces core.