Skoota Power Catamarans

By Woods Designs
www.sailingcatamarans.com

Introduction

Power catamarans offer many significant advantages over monohull power boats.

- They are safer, due to their high stability and self draining cockpit. They do not heel when cornering nor trim excessively at speed
- They offer low wake and much improved fuel economy.
- They are comfortable under way with no slamming or broaching in waves and have excellent handling in a seaway while being very maneuverable in harbour.
- They do not roll when fishing or at anchor and are easy and safe to beach.
- They have more deck and interior space for a given length, not just because of their wide beam, but also because they have an essentially rectangular living space.
- Thus they do not have to be as big as a monohull to give the same interior room, performance and safety.

Interior

Skoota 20: Originally designed for our own use as a water taxi/ inter-island commuter It has a small central cuddy which has sitting headroom (standing headroom under the raised main hatch) and room for a double bunk/dinette, small cooker and worktop. It is also ideal for use as a coastal fishing boat.

Skoota 24: This is a centre cockpit design, so that everyone in the family can have some essential privacy. The aft cabin contains a 6ft 6in x 4ft double bunk for the parents, while the saloon has a dinette arrangement and thus two single bunks (each 6ft 6in x 2ft) for children in addition to space for a stove, counter top and sink. There is 4ft 6in headroom in the forward cabin (4ft in the aft cabin) with the hatches closed. With hatches open the forward cabin has 6ft headroom (5ft in the aft cabin).

During the day the toilet (portapotti) is used in the aft cabin, but at night it slides out into the cockpit locker so can be used by all on board (assuming the cockpit tent is in use).

On both boats the cockpit tent and bimini (shown as a sketch on the Skoota 20) are an integral and essential part of the designs. Not only does the tent give another “room” with full headroom, but also, on the Skoota 24, provides dry, private access between the cabins.

The hulls are only used for bulky storage (like an inflatable dinghy), fuel tanks and possibly bait/fish wells. The forward cockpit on the Skoota 24 is a fun place to sit when underway, and, as it is between the bows, is much safer and drier than a conventional bow rider.

Performance

Most power catamarans are planing boats, with all the disadvantages that the type implies. Furthermore they tend to have a narrow, 8ft beam for trailing, so that many of the advantages of the catamaran form are wasted.

The Skootas, on the other hand, use semi displacement, non-planing, asymmetric hulls. The hulls are finer than those used on a sailing boat, because power boats always have power available to get over the hump speed, so low speed, wetted surface friction drag is less of an issue.

Tank testing has shown that there is significant extra drag caused by wave interactions between the hulls (up to 20% at certain speeds) if the hulls are close together. Thus, Skoota has widely spaced hulls, yet will still fit in a standard 14ft wide slip. The hull asymmetry helps fool the water into thinking the spacing is wider than it really is.

Before developing my Skoota range of power cats I studied the available data on "pontoon boats" those popular American power catamarans built from two or three aluminium tubes. I found that a typical 20ft pontoon boat weighs about 1500lbs, so is similar to a Skoota 20, yet needs a 50hp outboard to motor at 19 mph (16.5 knots). Whereas the Skoota goes 15 knots (17mph) with a 25hp.

Or put it another way, the Skoota hull has nearly half the resistance of a similar sized pontoon boat. Proving that proper hull design DOES matter.

The you tube videos listed below show the prototype Skoota 20 in action.

http://www.youtube.com/watch?v=PZxVN4gdNtQ
http://www.youtube.com/watch?v=hh_bp3CDeVs
http://www.youtube.com/watch?v=yvNcA4cfJs4
http://www.youtube.com/watch?v=qiJWquSC-yo

The Skoota 20 motors at just over 15 knots flat out with one on board and comfortably cruises at 10-12 knots.

For the Skoota 24 the computer predicts a 17 knot maximum speed using a central 40hp outboard. Manouverability and general seaworthiness will be similar to the Skoota 20

Although the prototype Skoota 20 has a Yamaha 25 4 stroke outboard, an Evinrude e-tec long shaft engine (25hp on the Skoota 20, 40hp on the Skoota 24) is recommended, in part as it provides more power at lower revs.

Trailing

Skootas length has been kept as short as possible to keep costs and trailing weight down. (There is no point in having a trailable boat to save mooring fees if you need to buy a bigger car to tow it). Furthermore, not every country has the big wide roads like those found in North America, for example.

Skootas fold for trailing in the same revolutionary way that has been used very successfully for over 15 years on similar sized sailing catamarans (eg Wizard, Sango).

In simple terms, the trailer is backed down the slip and as the hulls hit the water their buoyancy pushes them up, thus the boat unfolds automatically as it is launched. During retrieval the boat folds, again automatically, with this time gravity doing the work.

The trailer itself is a simple flat bed with T-section supports to match the cuddy bottom. Flexible mudguards are used to help reduce overall height. A 4 wheel trailer is recommended. Final trailer details will depend on the country of use.

Construction

Not everyone can build complex shapes, but everyone can build in flat panels. So for mass appeal Skootas are built using conventional plywood-stringer-frame construction with all surfaces glass/epoxy sheathed. Fortunately this building method is still the cheapest and quickest.

Because the boat is modular, it can be built in an ordinary garage (lengthened as necessary to build the hulls). Building in sections also has a psychological advantage, especially important for amateur builders, which is that it is quick to build each section, thus progress appears to be fast. Furthermore there is little fairing to do, just smoothing the glass joints.

Conclusion

The Skootas offer: stability, low wake, the ability to maintain high speeds in rough conditions, superb directional stability, a self-draining cockpit, fully buoyant hulls for safety, fuel-efficiency, lots of interior space,.

A clear winner by anyone's standards.

STOP PRESS

A 36ft live aboard cruising version and a 9.3m sports cruiser are now under development.
The Skoota 36 is demountable for transport from the yard to sea or to new distant cruising grounds (fits in two containers).
The Skoota 31 is a weekend fast cruiser or fishing boat
See sketches

Materials Lists

Notes:
All plywood to be best quality Marine grade Gaboon ply. Sheet sizes are 8' x 4', 2440 x 1220. All timber to be at least "Joinery Quality". Unless noted otherwise all timber is softwood, eg Douglas Fir, Sitka Spruce, Yellow Cedar or similar. All timber is "PAR", or "Planed all Round". Thus sizes given are nominal, ie 2" x 1" has a finished planed size of approx 45mm x 20mm. (Note: It is usually cheaper to buy 2" x 1" and cut it in half to create 1" x 1" similarly rip 3in x 1in to make 11/2in x 1in).
Epoxy glue is recommended for all glue joints as it is the strongest and most watertight glue. However, it disadvantages are cost, toxicity, waste and slow mixing times. Thus, except for high stress areas (beams boxes etc) and underwater areas glue joints can be made with polyurethene glue (eg Balcotan) or similar.

Skoota 20 Materials List

6mm ply:
bulkheads 2 sheets: hull sides 10 sheets: cuddy lower sides 4 sheets: cuddy sides/roof 3 sheets
beamboxes 1 sheet

9mm ply:
hull bottoms 1 sheet: hull decks 2 sheets: cockpit/cuddy floor 4 sheets
cockpit seats 1 sheet: foredeck 1 sheet: interior 1 sheet

Totals: 6mm ply 20 sheets 9mm ply 10 sheets

1in x 1in 10m: 2in x 1in 100m: 11/2in x 1in 60m: 2in x 2in 10m
4in x 1in 5m: 4in x 2in 5m: 6in x 1in 3m

25kg epoxy (min): 10kgs 200g glass cloth (min)

Skoota 24 Materials List (approx)

6mm ply 33 sheets (8ft x 4ft sheets of Gaboon/Okume)
9mm ply 9 sheets
Timber 1in x 1in 15m: 2in x 1in 150m: 11/2in x 1in 90m: 2in x 2in 15m
4in x 1in 10m: 4in x 2in 8m: 6in x 1in 5m
Epoxy/fastenings 50kgs (110lbs)
Glass (sheathing and joints) 20kgs 200g/sqm (6oz) cloth

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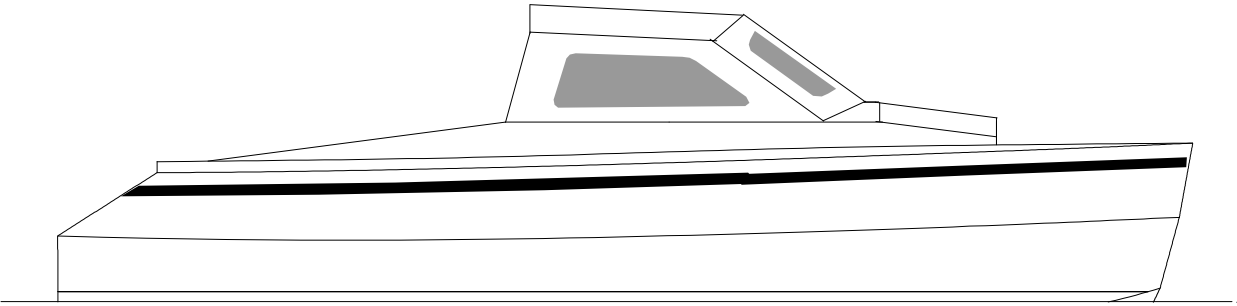
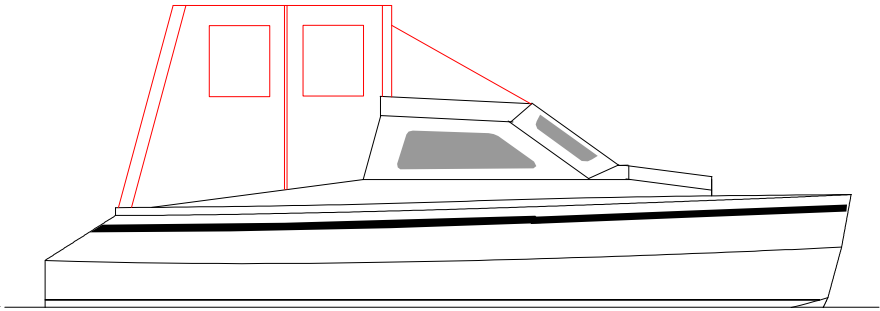
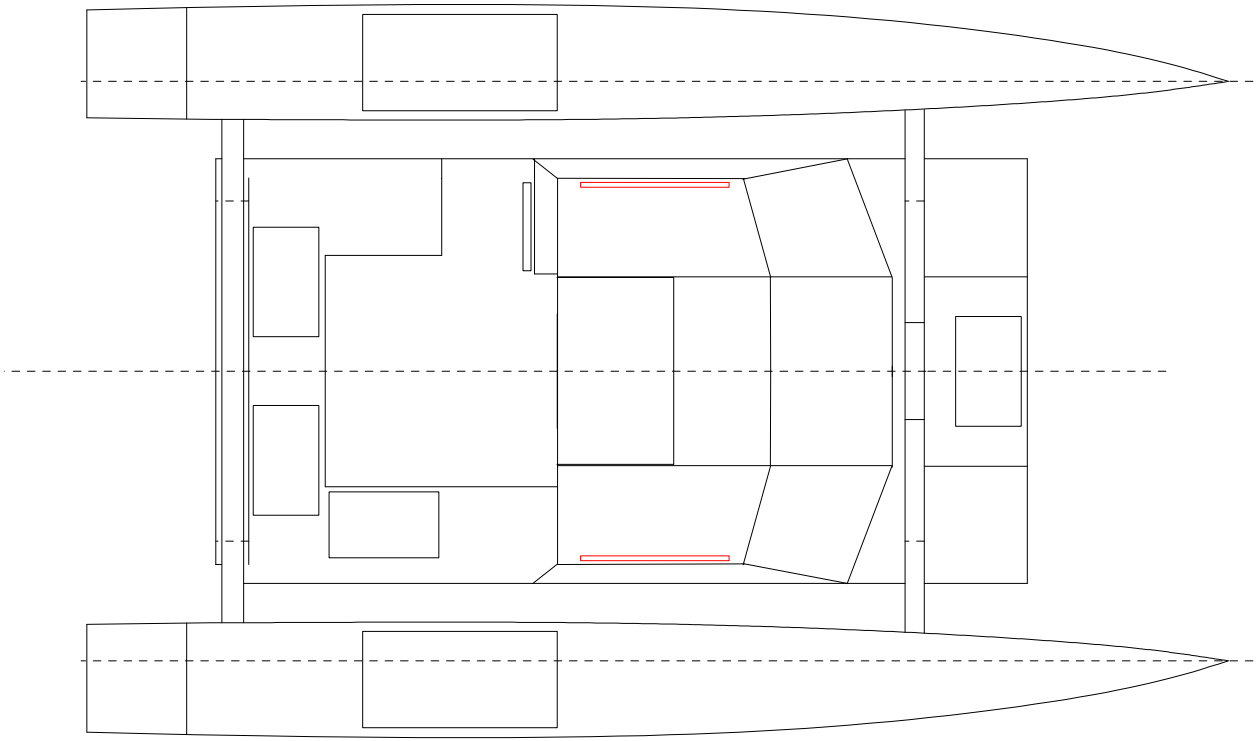
Two men can easily lift a completed Skoota 20 hull. Indeed this one was delivered to us by the builder on the roof of his car.

The photo above was taken as we were moving the Skoota to its winter storage behind our house. You can see how stiff the boat is, one hull is only supported at the transom, the beams hold the rest of the hull up in the air. (The other hull has supports at bow and stern of course). I think you'll agree this is a pretty extreme test compared to what a boat endures when at sea.

These two photos show the prototype Skoota on launch day in September 2010. The walkways still have to be fitted as well as the forward beam cover plates. And obviously it is still cosmetically unfinished.







Engine 25hp
Cruising Speed 10 knots max 15knots
Fuel Consumption 8 mpg at 10 knots

Headroom 1.3m (plus lifting hatch)

Berths 1 double

LOA 5.9m
LWL 5.68m
BOA 3.85m
BWL (per hull) .46m
Draft (hull) .235m

Disp empty 450 kgs
Disp loaded to WL 650 kgs

20ft Trailerable Power Catamaran
SKOOTA 20

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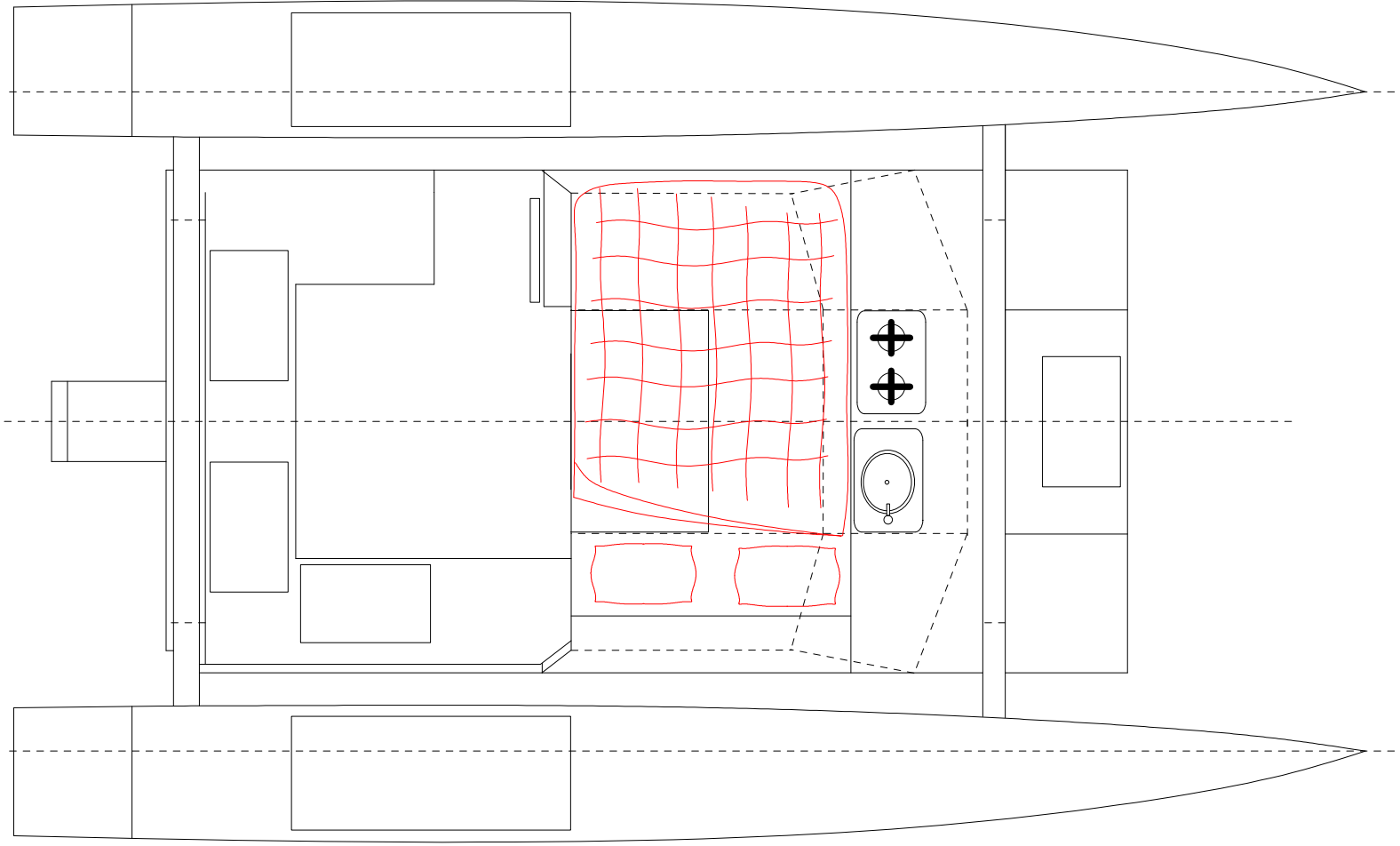

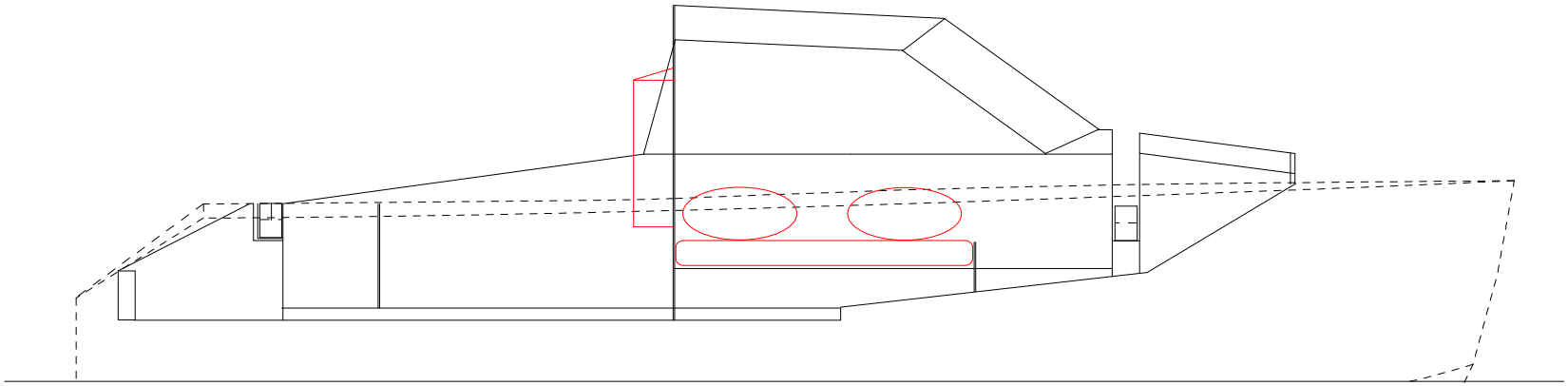

20ft Trailerable Power Catamaran
SKOOTA 20

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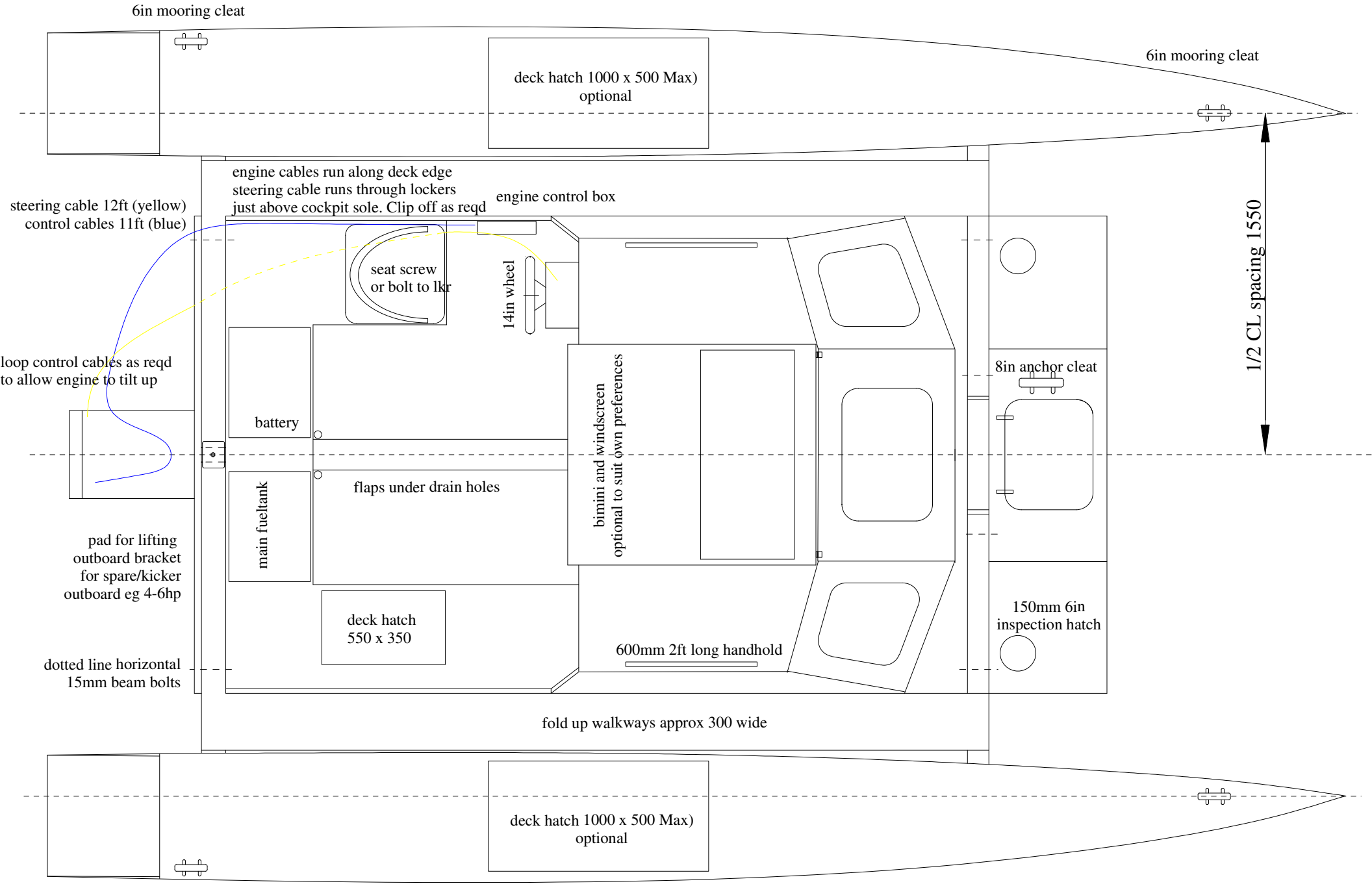
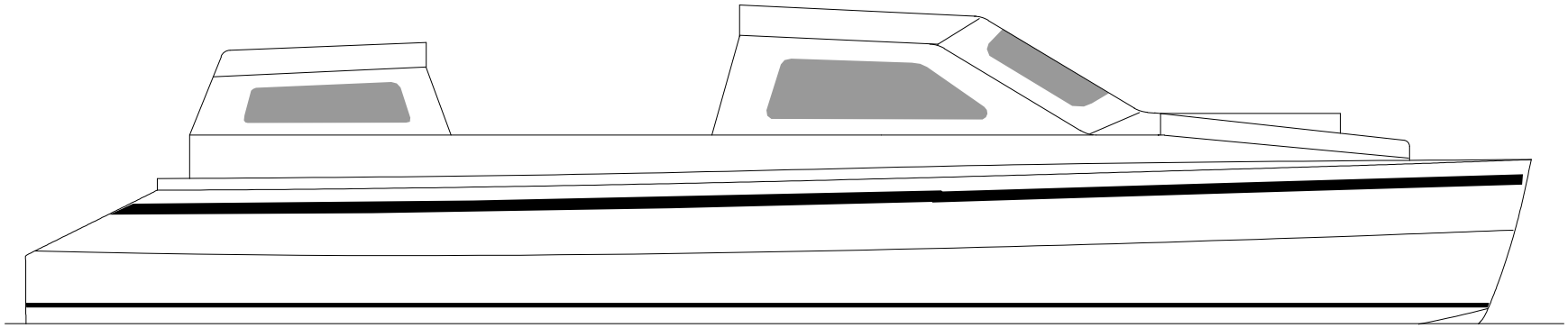


cuddy windows from 4mm (3/16in)
smoked plexiglas/perspex
fit with silicon and 4mm (3/16in) bolts
at 120mm centres.
Allow 35mm min overlap all round

Skoota 20
20 Deck Layout

Nov 2010



LOA 7.52m
LWL 7.25m
BOA 3.95m
BWL 0.5m

Empty Displacement 680Kgs
Loaded Displacement 1190Kgs

Engine HP) 1 x 40hp
Cruising Speed 10 - 14 knots
Fuel Consumption 10 mpg at 10 knots

Headroom 1.35m (plus lifting hatches)

Berths 2 single, 1 double

24ft Trailable Power Catamaran
SKOOTA 24

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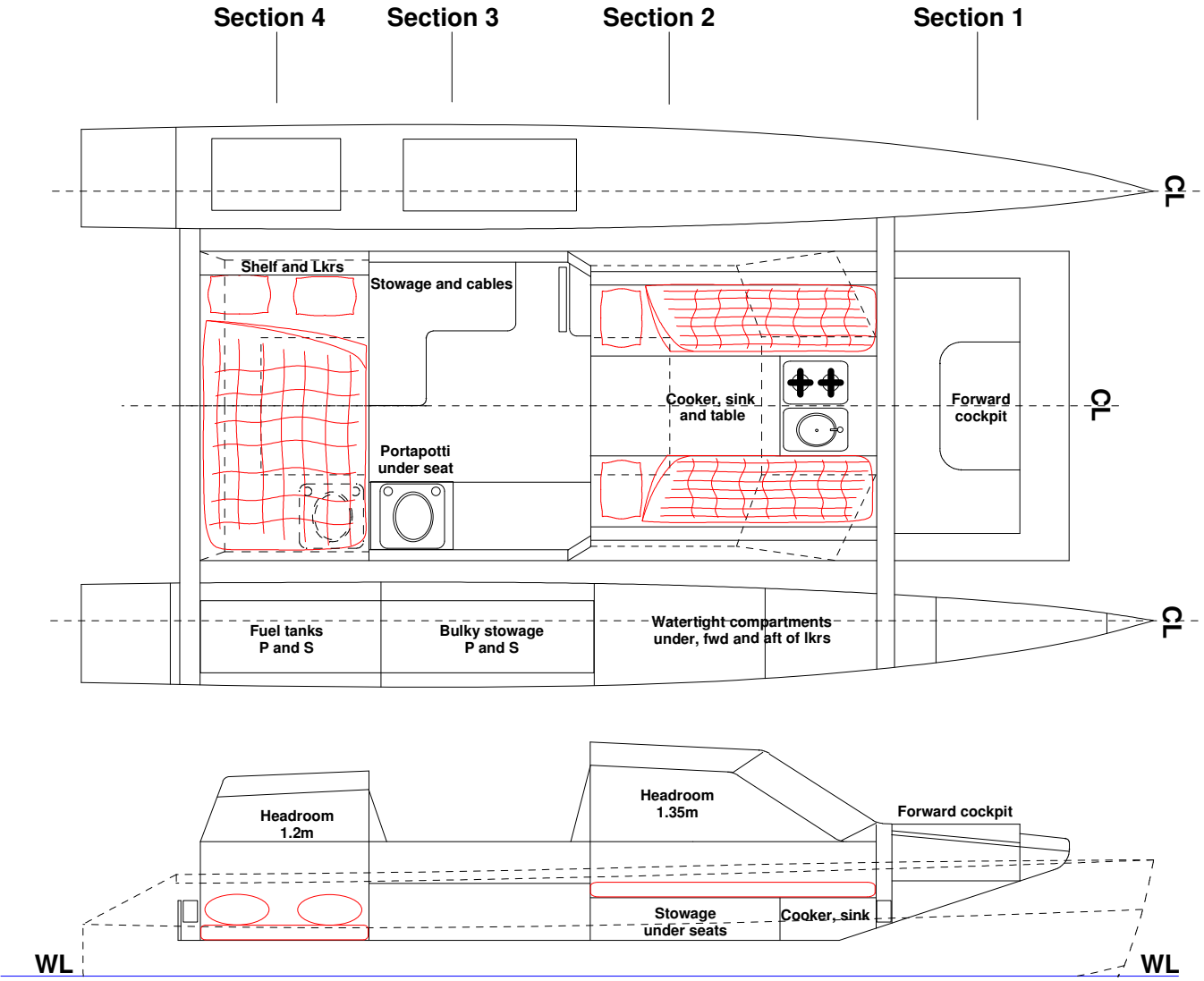
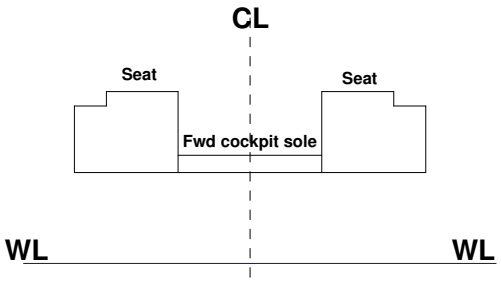
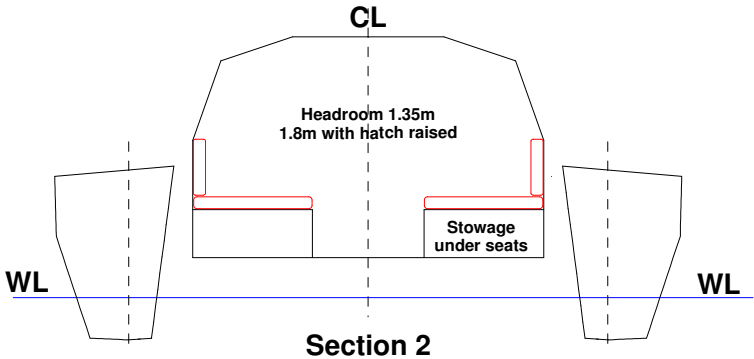




Section 1



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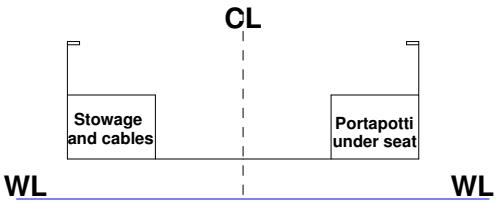

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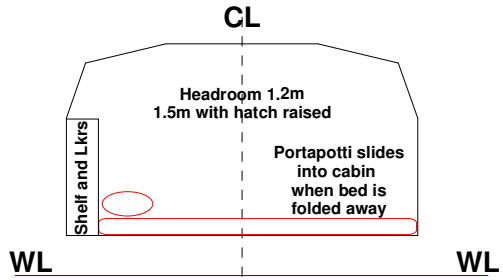

Section 4

24ft Trailable Power Catamaran
SKOOTA 24

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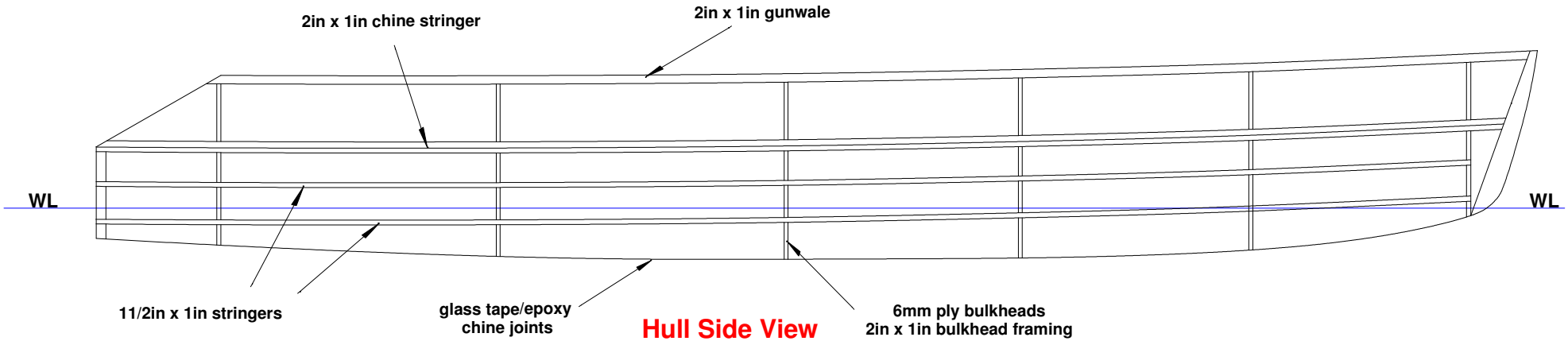
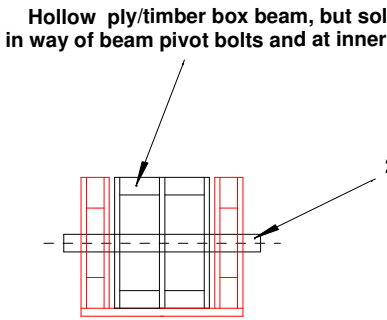
General Arrangement Interior

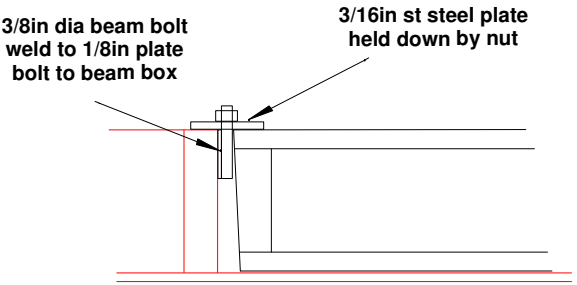


Hull Side View



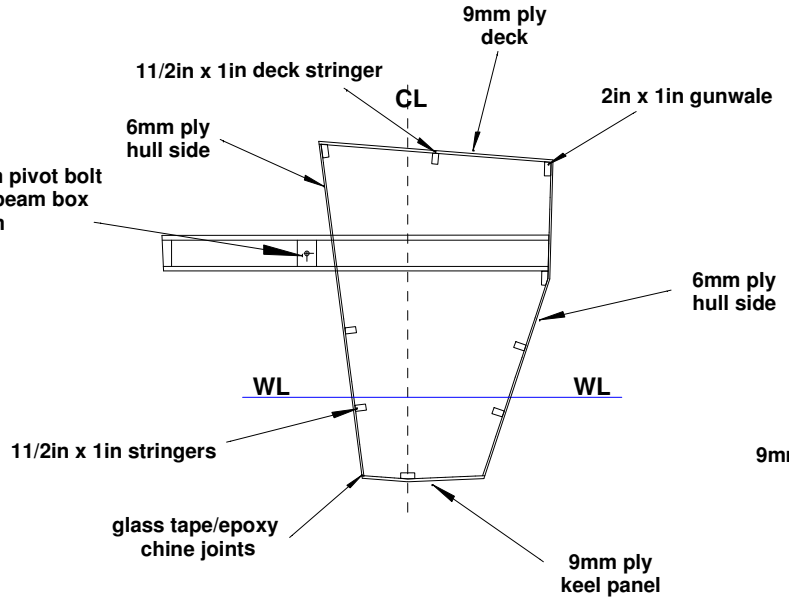
Beam in black
Beam box in red

Typical Beam Connections at pivot bolt

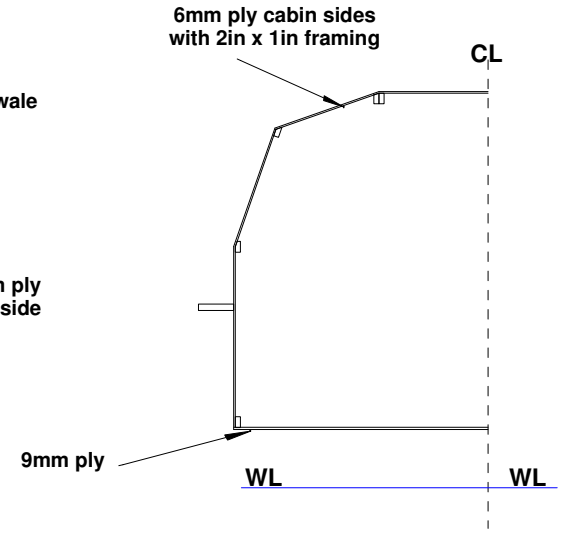


Beam in black
Beam box in red

Typical Beam Connections at inner end beam



Typical Hull Cross Section



Typical Cuddy Cross Section

NOTE: All glue to be epoxy,
All inner ply surfaces to be epoxy coated
All outer ply surfaces to be sheathed with 6oz (200g) cloth

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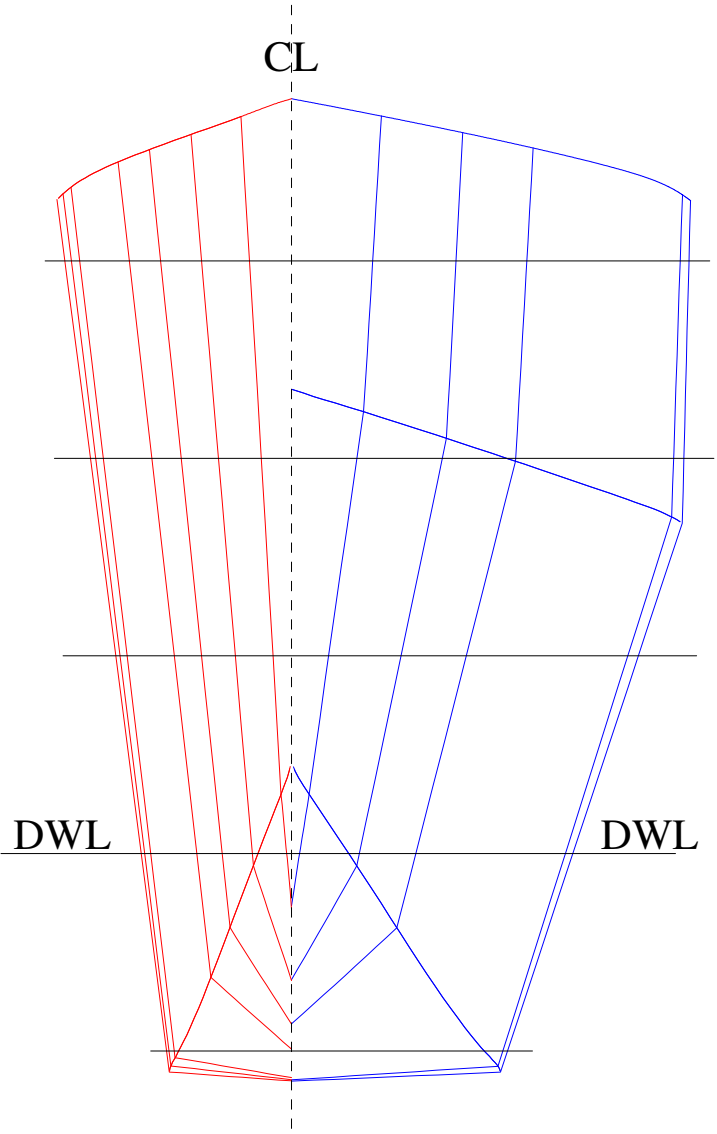
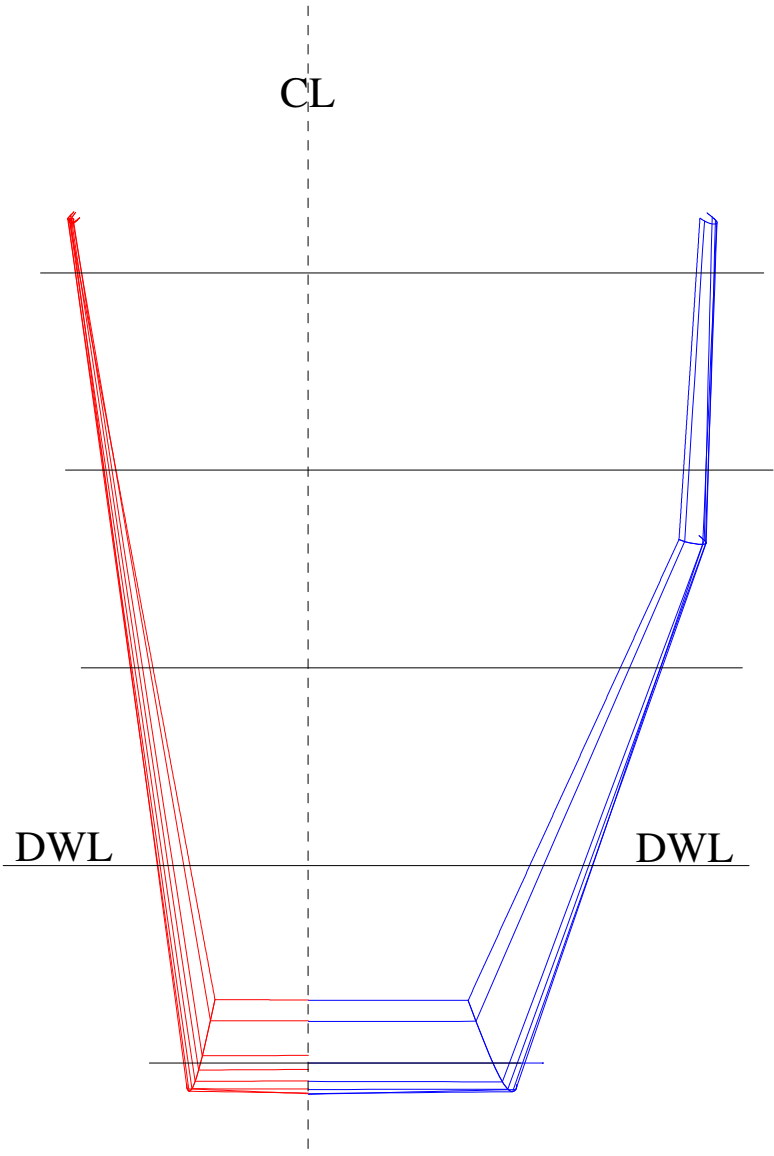
Typical Construction Details
(Skoota 20 similar)



Forward Sections



Aft Sections

NOTE: Red lines are inner hull side
Blue lines are outer hull side
NOTE: not all frames ares shown on this study plan!

24ft Trailable Power Catamaran
SKOOTA 24

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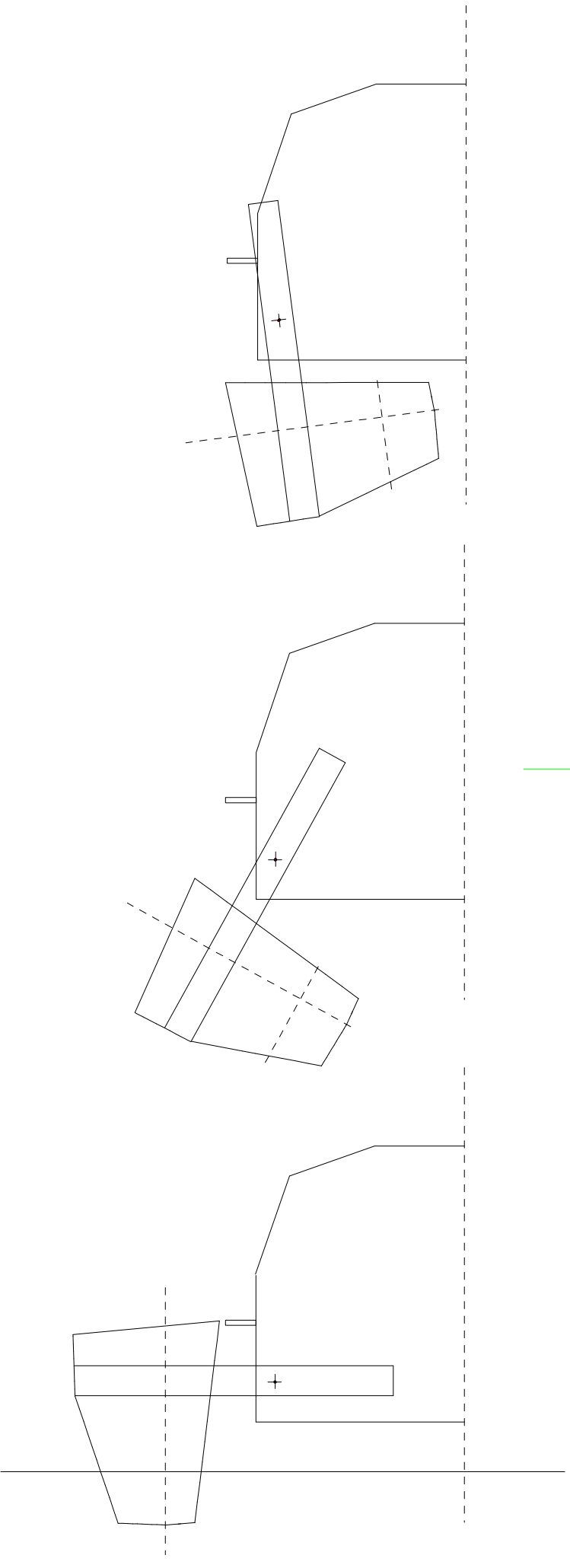
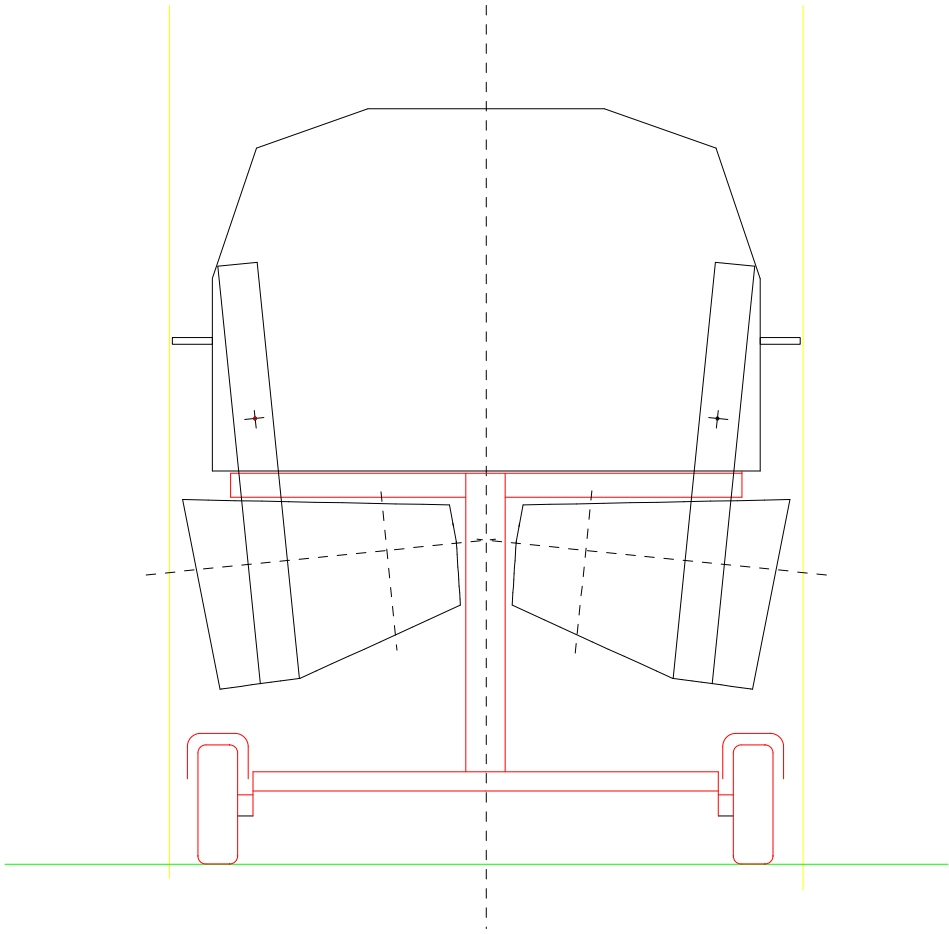
Body Plan
(Skoota 20 similar)





2.9m (9ft 6in) approx from road to top of cabin
Trailer shown in red
8ft width in yellow

24ft Trailable Power Catamaran
SKOOTA 24

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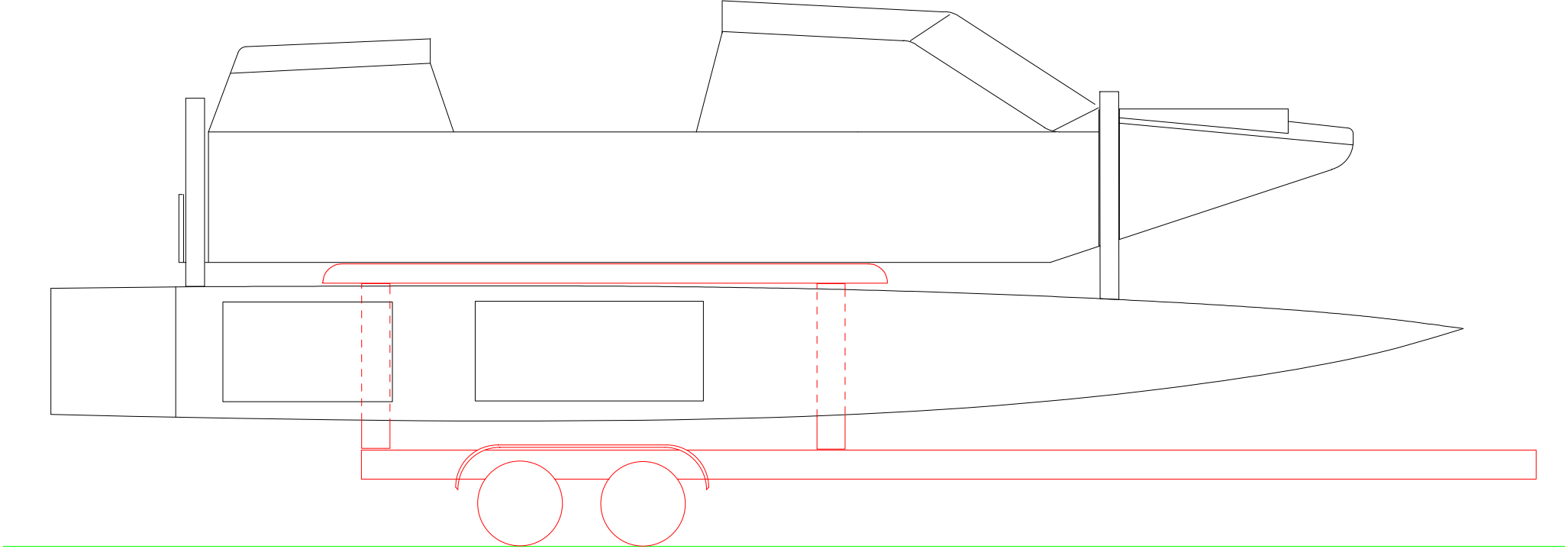
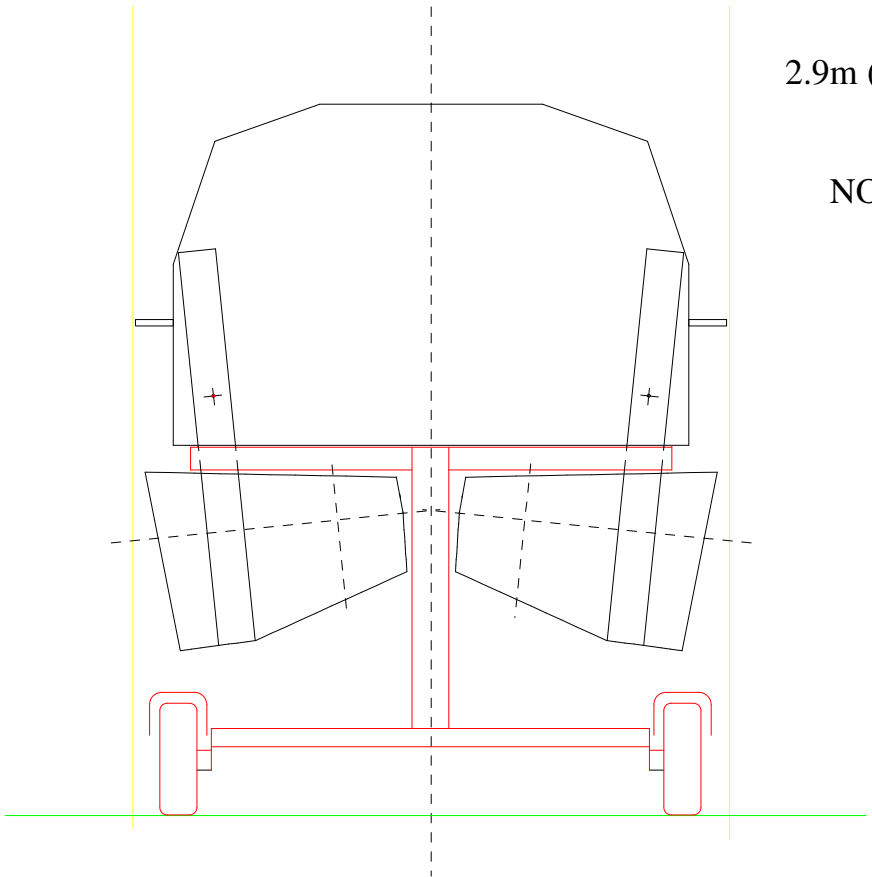
Hull Folding System
(Skoota 20 similar)





2.9m (9ft 6in) approx from road to top of cabin
Trailer shown in red
8ft width in yellow
NOTE: Trailer design depends in part on regulations in country of use

24ft Trailable Power Catamaran
SKOOTA 24

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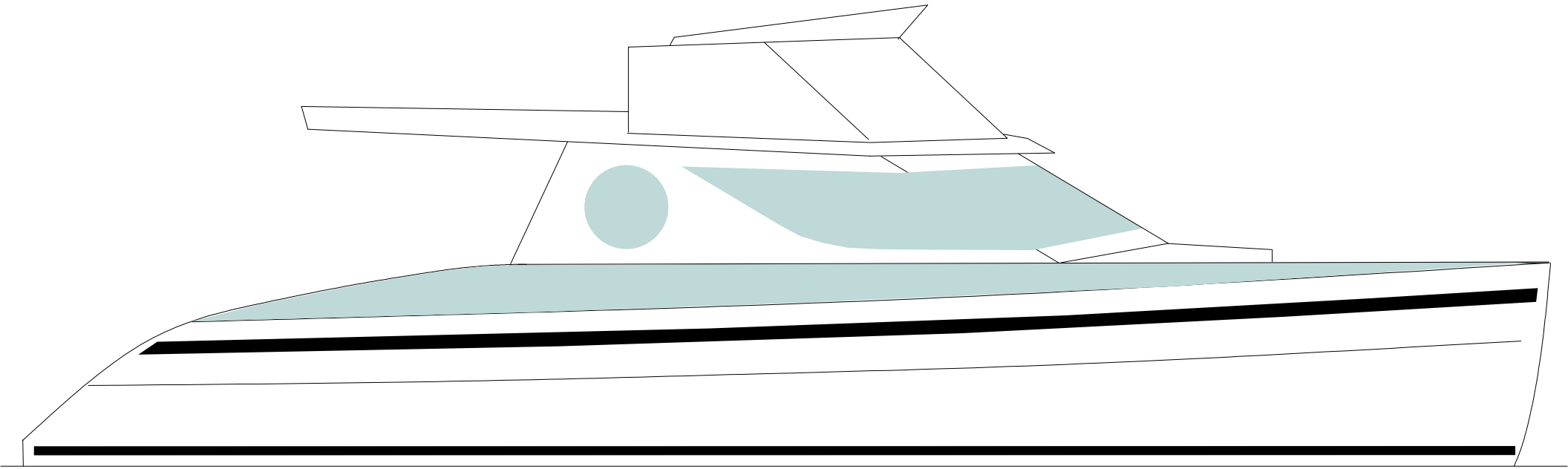
Basic Trailer Concept
(Skoota 20 similar)



LOA 11m
LWL 10.5m
BOA 5.5m
Draft 0.5m

Empty Displacement 2750Kgs
Loaded Displacement 4500Kgs

Engine HP) 2 x 60hp
Cruising Speed 10 - 14 knots
Fuel Consumption 8 mpg at 10 knots

Headroom 2m

Berths 2 single, 2 double

36ft Transportable Power Catamaran
SKOOTA 36

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Provisional Drawing - subject to change

Inner hull panels fitted first because there is no chine so they are easier to fit

Fit lower outer side panel first. Initially leave over deep. Then fit a temporary fairing batten as shown to bottom edge so that top of batten is midway up chine stringer.

Ensure that this batten is fair (Try standing with your head down and look between you legs)
Then mark lower edge panel, remove and saw/plane a fair curve to both top and bottom edges before finally glueing in place. Fit upper panels ensuring they form a fair curve with lower panels

After both side panels are fitted fit keel panel
Note: Aft section is 9mm ply, forward sectiom is 6mm ply
Fit two butt joints as required. Plane bevel as required over joint

Twist forward panels as required
to fit to stringers and keel
Round off chine joints before sheathing

Fit ply topsides using the basic panel layout on Sheet 7
Butt strap the joints with 150mm wide butt straps. Ensure the panels are fair along the joins.

Do a dry fit of panels before finally glueing and screwing to bulkheads, gunwales, stringers and stem
If necessary add extra glass over chine joints and butt straps to ensure strength and watertightness

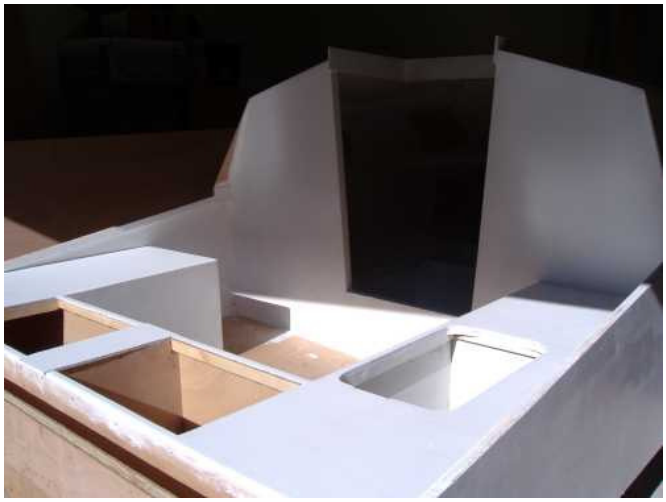
After gluing hull sides and keel panel in place make and fit outer stem.
Round off as required to almost a point. Then sheath hull.
Follow manufacturers instructions. Wear protective clothing, including gloves
Use a foam roller to apply epoxy. Add first coat epoxy to plywood before adding glass
Then wet out glass with more resin as required. Allow time for epoxy to wetout glass.
Use a "squeegee" or scraper to force the epoxy through the glass
Sheath with 200g (6oz) glass in as big pieces as possible (probably 1200mm (4ft) lengths)

Although you will want to turn the hull over as soon as you can,
wait until you have filled/sanded/highbuilded hull!

Photos above/below show cockpit
port locker from 6mm ply and 1in x 2in, 1in x 1in
framing as required.
Note add ply doubler, at least 12mm,
as required, to act as helm seat reinforcing
under 9mm ply decking

Cockpit std locker from 6mm ply and
2in x 1in and 1in x 1in framing as required.
Note central divider must be fitted
to stiffen floor and seat top,
but position can be adjusted as required
to suit own hatch

Cut hole in front for locker
access as reqd (option)
Note: Steering cable will
run through this locker



Right hand photos shows finished lockers
before adding hatch coamings
Note cutout for flush fitting Bomar hatch (optional)

75mm deep 9mm ply hatch coamings
top edge 35mm above deck
Note battery location

Finished locker coamings, helmsman seat
aft beam and basic fixed outboard nacelle

Fit cabin sides, note leave framing
proud to allow for bevels
Make temporary timber frames (eg 4in x 1in)
to hold roof panels and stringers during construction

Use batten to ensure that
aft bulkhead stays square
and spirit level to ensure
temporary frame is horizontal

2in x 1in roof framing, double and bevel as reqd
When all is fair fit cabin front window panels
and then roof panels. Hatch details see later sheet

Cabin shelf acts as forward panel support
bevelled timber joint or glass/epoxy
fitted on 9 mm ply deck panels
Note slot framing to take 6mm ply shelf sides
Alternative to window panel timber joints:
Use glass and epoxy (3 layers 200g glass
120 wide strips each side of joint,
make outer joints first)

Skoota 20
Building Manual 9