Eclipse Bulkhead Construction

Version 6, dated 15th November 2012

Contents

Bulkheads Overview

There are 18 bulkheads in the Eclipse! That is 18 9mm thick panels of plywood installed across one or other of the hulls. In most cases the bulkheads, because of their size, have to be made from two 8ft by 4ft sheets. The bulkheads provide rigidity to the hulls and, of course, divide the hulls up into compartments – e.g. cabins, the galley and the heads. Most of the bulkheads also have openings cut into them. It is a lot of work.

Bruno Corsi's Eclipse Build

These photos are taken from Bruno Corsi's website http://www.gbcorsi.it/default.htm . They help illustrate what we will be doing although we are not going to follow his method exactly. For example, in Figure 1 Bruno has not taken Bhds 2 & 5 to the gunwale as advised on the plans. The problem with not doing this is that the stringers and gunwale may not follow the correct curve. Another issue is that there is no deck support at these bulkhead positions. So we will be producing full bulkheads in these positions. Also, Bruno does not produce a full transom; this does not matter but I do intend to use the space between Bhd 6 and the transom to store light things as well as create watertight compartments for buoyancy – a full transom will therefore be required.

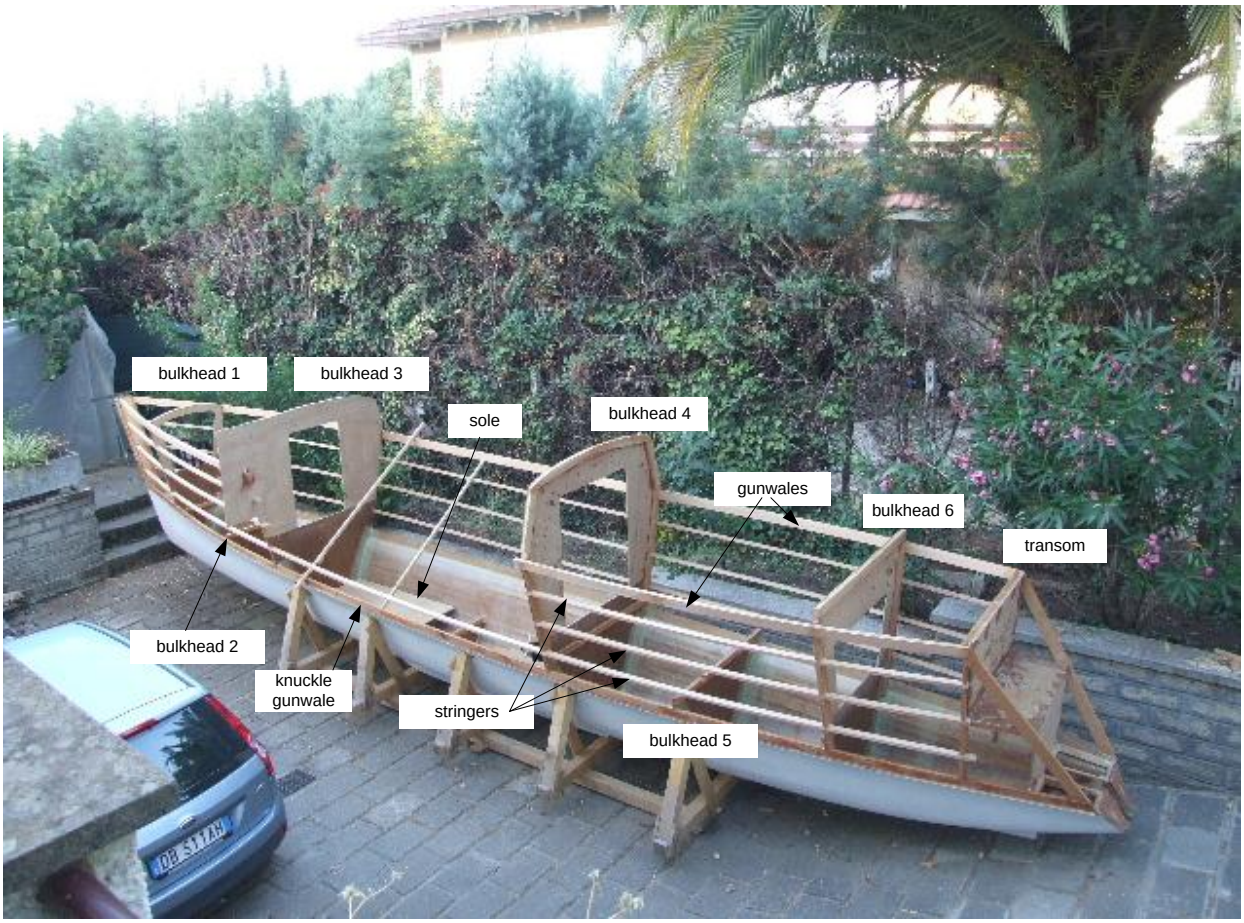

Figure 1: Starboard Hull Showing position of all Bulkeads and the Transom

Note how the gunwale does not exist between Bhds 3 & 4, nor do 2 out of 3 stringers. This is because this section of the hull will be joined to the bridgedeck.

Figure 2: Starboard Hull After Adding Plywood Sheets

Figure 2 shows the bridgedeck cut-out more clearly. It also shows the deck stringers. As one can see, Bhd 3 has a "tab" sticking out beyond the hull sides. The tabs have to stick out far enough from both hulls so that they can be joined by one plywood sheet (of 2500mm long) to give a bridgedeck bulkhead in the Bhd 3 position; forward of this bridgedeck bulkhead will be the anchor and gas lockers (accessible from the deck), aft of this bulkhead will be the bridgedeck cabin. The length of the tabs is important because the aim is to have no more than 2 joins in this bridgedeck bulkhead; the joins will be scarf joints.

There is no tab on Bhd 4, but there could be since this bulkhead is joined to the one in the opposite hull in the same way as Bhd 3. Between Bhd 4 in the starboard hull and Bhd 4 in the port hull is another bridgedeck bulkhead, in which will be the doorway leading from the cockpit to the bridgedeck cabin. We will have a tab on Bhd 4.

Figure 3: Starboard Hull Looking Forward

Figure 3 shows Bhd 1 and Bhd 2. One can also see two deck supports: one between Bhd 1 and Bhd 2 and the second aft of Bhd 2. I am not sure why Bruno has done it this way; better, I think, to have Bhd 2 provide just one deck support. The sides of Bhd2 can be cut away after fitting the hull sides.

Note how the 2”x1” stringers are used with the 1” side fixed to the hull sides, i.e. on edge; we will do it this way for the deck stringers but NOT for the hull stringers. It is better, I think, for internal fitting-out, that the hull stringers have the same width as the gunwales above and below them.

The bulkheads below the knuckle are reinforced with strips of fibreglass where they are joined to the hull. This is not required on the plans but is a good idea, so we’ll do the same.

Figure 4: Starboard Hull Looking Aft

Figure 4 shows the entrance to the aft bunk.

Richard Woods's Plans

In the interests of getting all the information on bulkheads in one place, this section contains excerpts from Richard Woods' (RW's) plans and notes on where we will be departing from these plans. The main differences follow.

- Richard advocates making all bulkheads in 2 sections; the lower sections are fitted first and the upper sections added later with large but joints. We will make and fit complete bulkheads with ply sheets joined using scarf joints. The result should be neater and take less time.
- He suggests cut-outs are made small to begin with and enlarged during fitting out. We will make all cut-outs full size except for those bulkheads (2 & 5) whose sides are removed after fitting the ply hull sides. This will save time although we have to be absolutely sure that the openings are exactly where we want them and are the correct size.
- The design of Bhds 1, 2 & 3 differ on R's plans between the port and starboard hulls. This is because he has a watertight sail locker, accessible from the deck in the port hull and a cabin in the starboard hull. I have decided to make the two hulls identical with a cabin in each. The port cabin will normally be used as a sail locker, but could be slept in if required. I believe this gives better use of space, gives easier access to the port locker and easier access forward for inspection purposes on the port side. Also, having the same design for both hulls should result in a simpler, quicker build.

  Interestingly, I have seen 2 Eclipses and both have a different layout in the port hull from Richard's plans. In one there is a cabin in the port hull similar to the one I am planning; in the other the heads sit between Bhds 3 & 2, with no horizontal division to give a sail locker.

The following figures are snapshots taken from the plans:

- Figure 5: Lower Sections of Bulkheads 1, 2 & 3;
- Figure 6: Lower Sections of Bulkheads 4 & 5;
- Figure 7: Lower Sections of Bulkheads 6 & The Heads;
- Figure 9: Bulkhead 2 Plans;
- Figure 10: Bulkhead 3 Plans;
- Figure 13: Bulkhead 4 Plans;
- Figure 16: Bulkhead 6 Plans

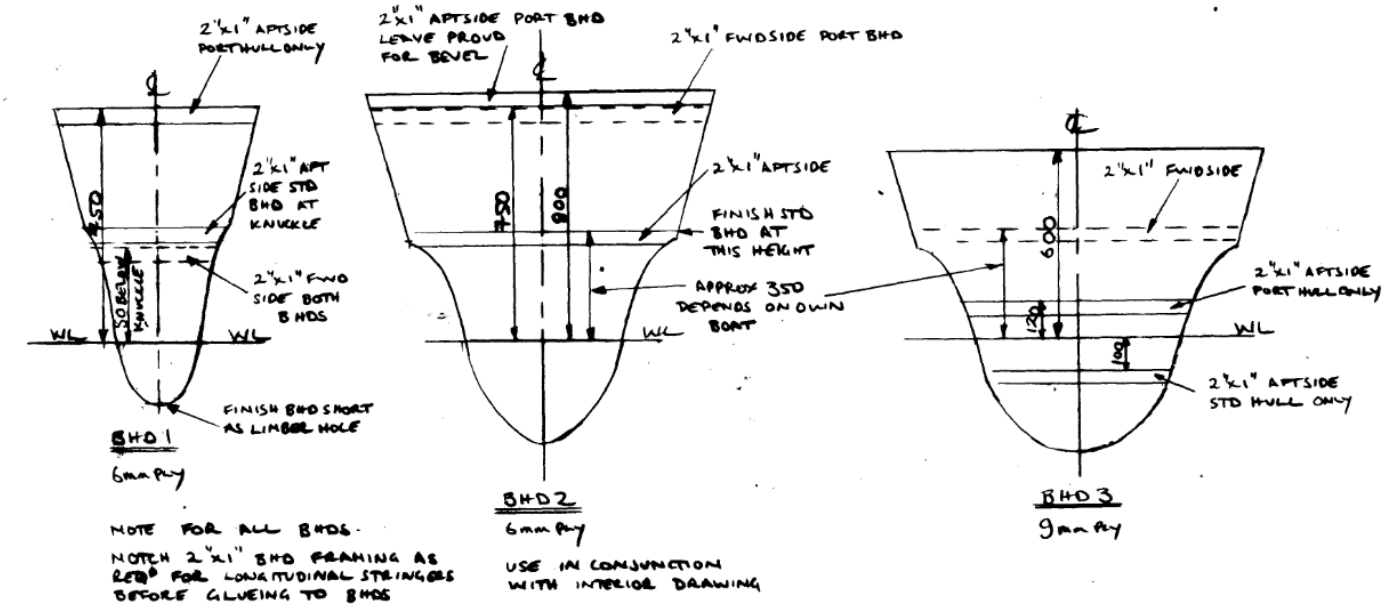

Figure 5: Lower Sections of Bulkheads 1, 2 & 3

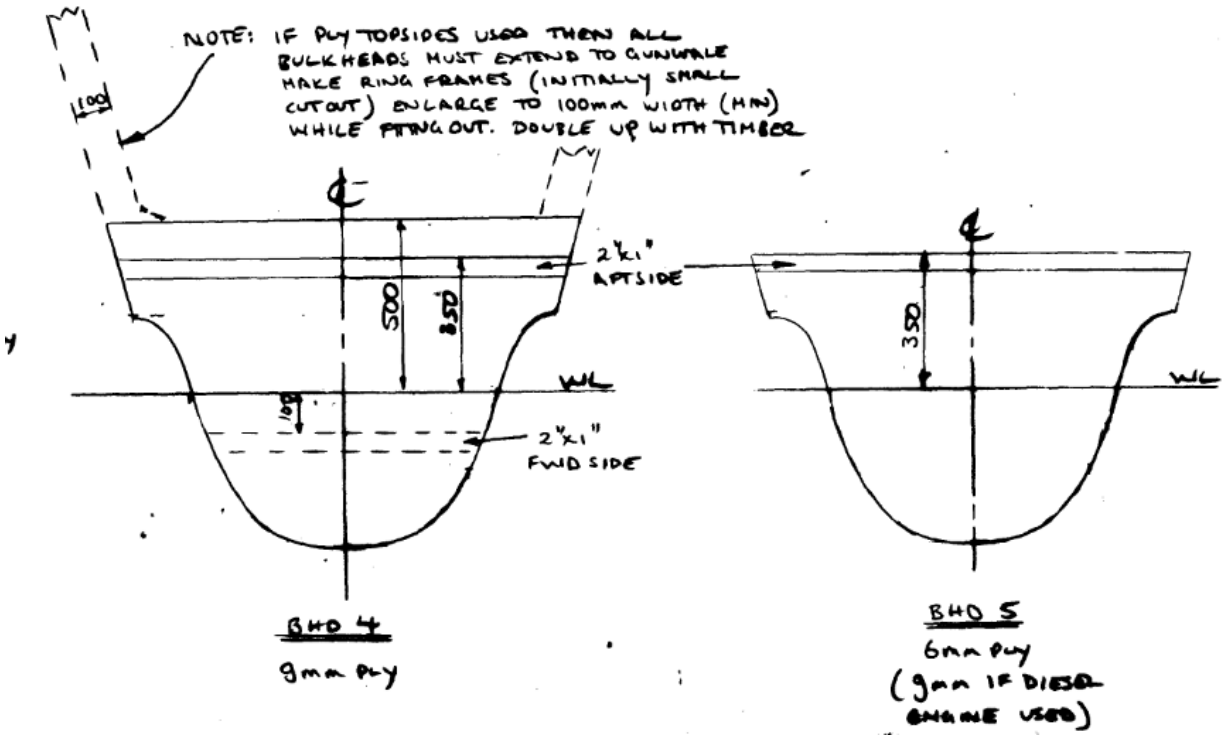

Figure 6: Lower Sections of Bulkheads 4 & 5

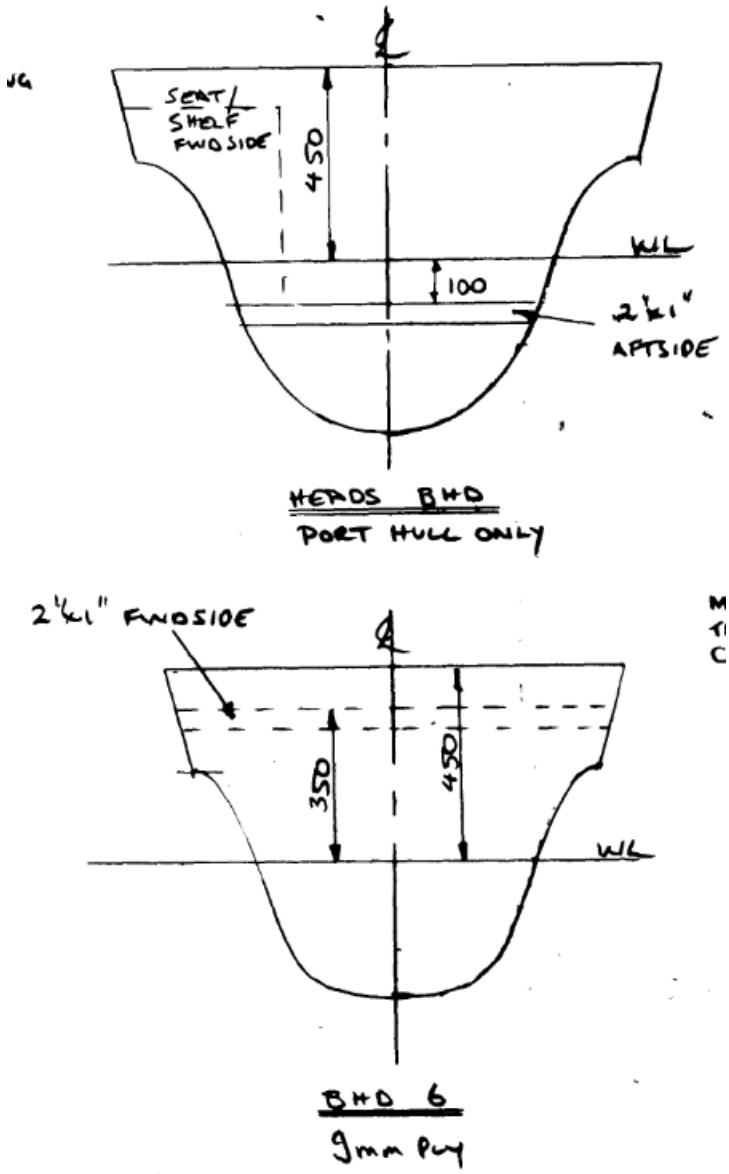

Figure 7: Lower Sections of Bulkheads 6 & The Heads

Procedure for Making Bulkheads

These are general notes on making the bulkheads; for all details see the individual diagrams. The bulkheads should be made in pairs, in the order 1 to 6, followed by the transom. They should be fitted in the same order to both hulls; e.g. do Bhd 1 in the both hulls before moving on to Bhd 2.

1. Mark out curves below knuckle on MDF; cut out template using jigsaw slightly oversize; sand to curve, fit to hull.
2. **If** having to use a scarf joint to join 2 pieces of ply:
    a. Mark out on 9mm ply complete bulkhead oversize; allow for 72mm overlap for scarf joint.
    b. Cut scarf joints and join plywood sheets using thickened epoxy. Scarf joints should be of a width eight times the thickness of the ply, i.e. 72mm. This means the plywood sheets are cut to give an overlap of 72mm. The scarf joints should be cut with the jig.
    c. Mark out on scarf-jointed ply sheet exact bulkhead shape.
3. **Else**, mark out on one 9mm ply sheet complete bulkhead.
4. Use circular saw and fence to cut out all straight lines.
5. Fix template and rout curve below knuckle.
6. Mark out camber for deck using bendy piece of wood on ply; shape using jigsaw slightly oversize, sand to curve.
7. Use completed bulkhead shape in plywood as a template to rout 2nd bulkhead, identical to first, from plywood sheets, scarfed together as necessary.

Now bring on both bulkheads to gether.

8. Using Gorilla glue & screws, add 3”x1” and 2”x1” support timbers along edges where indicated.
9. Mark cut-out as shown. Use 90mm template to get corners. Use jigsaw to remove cut-out slightly undersize and sand to mark.
10. Cut notches as shown. N.b.: notches for the deck stringers should be at right angles to the camber, not vertical as shown on some drawings.
11. Coat entire bulkhead, and all edges with 2 coats un-thickened epoxy, using roller and brush.
12. Fit bulkhead taking great care it is vertical and the waterline is horizontal; try and put 2 silicon bronze screws through the knuckle gunwale into the bulkhead on each side, or brace the bulkhead, so it does not move. The bulkhead should sit on a bed of thickened epoxy. Add fillets of thickened epoxy below the knuckle. Allow the epoxy to cure.
13. Prepare bulkhead/hull join below the knuckle (wash with clean water and a scouring pad, dry & sand); add strips of 600 g/m2 glass cloth 150mm wide. Add 3 coats of epoxy: the first coat wets-out the cloth, the second fills the weave, the third covers; coats 2 & 3 to be applied by brush.

Note all numbers on drawings are in mm. Numbers on the vertical axes refer to distances above and below the waterline. Numbers on the horizontal axes refer to distances from the hull centreline.

Notes on Individual Bulkheads

Bulkhead 1

See:

- Figure 5: Lower Sections of Bulkheads 1, 2 & 3;
- Figure 8: Bulkhead 1 Details.

This is probably the most straightforward bulkhead and should be done first. It is the same for both hulls, and therefore different from the plans; this is because the space between Bhd 3 and the nose will be the same in both hulls whereas in RW's plans the port hull contains a sail locker of very different geometry to the cabin in the starboard hull.

There is no scarf joint in this bulkhead.

All the support timber is on the fwd side of the bulkhead so it cannot be seen from further aft.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 300mm centres from the centre line.

Bhd1 is 8620mm from the stern.

Bulkhead 2

See:

- Figure 5: Lower Sections of Bulkheads 1, 2 & 3;
- Figure 9: Bulkhead 2 Plans;
- Figure 11: Bulkhead 2 Details.

Originally this is a full bulkhead with small cut-out. After fitting the ply hull skin, a large part of this bulkhead is removed leaving just the deck support, from the bunk support down to the keel and a couple of radiussed lugs extending down the sides from the top – see Figure 11. Neither the stringers nor the plywood hull skin should be glued to the bit of the bulkhead being removed. This bulkhead is the same for both hulls, unlike the Plans.

The lugs are reinforced with 3"x1" timber which connects with the 3"x1" deck support timber. All the support timber is on the fwd side of the bulkhead so it cannot be seen from further aft.

The scarf joint is in the ply to be removed which gives us a chance to practice on a joint which is not important.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 300mm centres from the centre line.

Bhd2 is 7620mm from the stern.

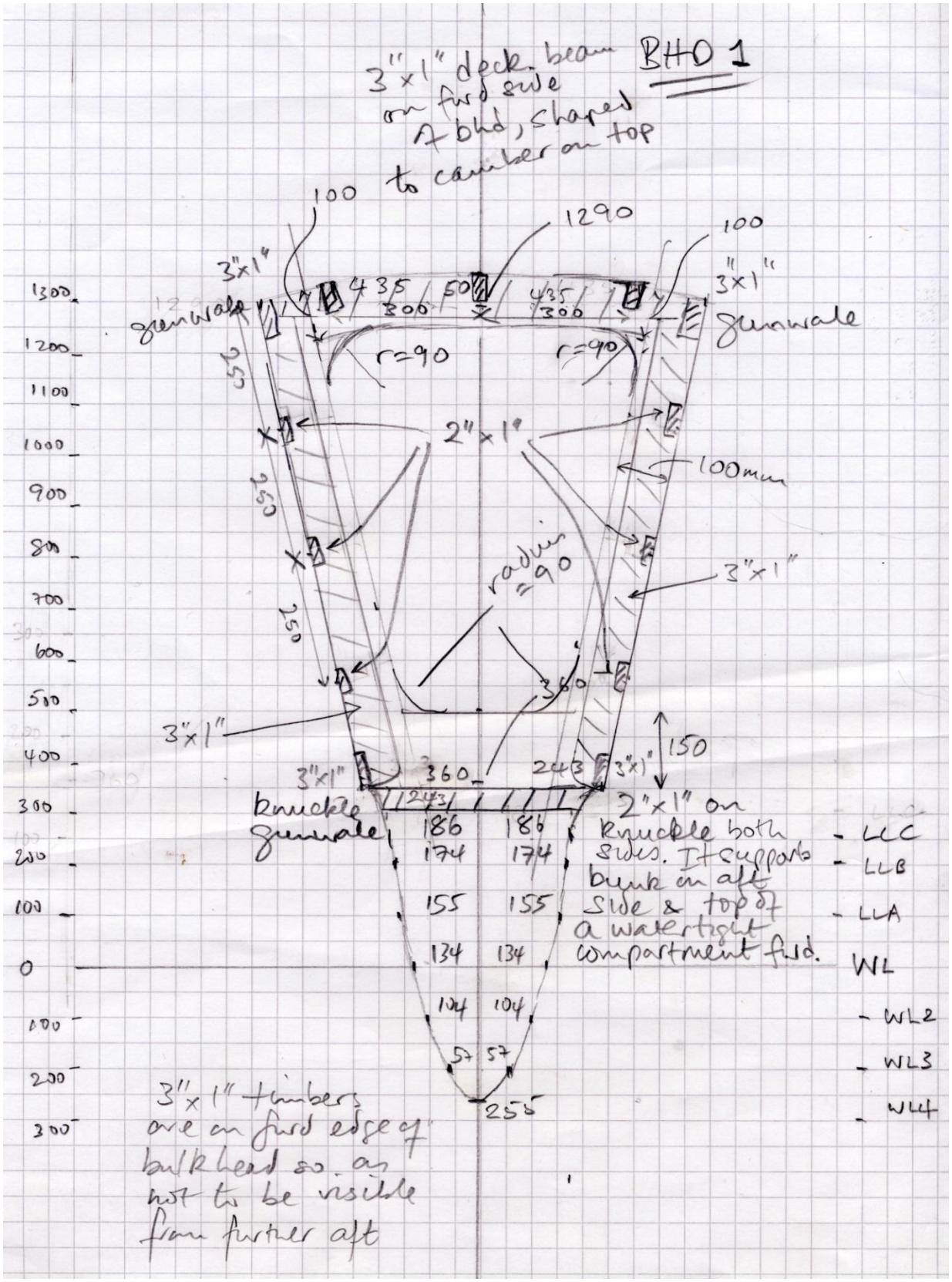

Figure 8: Bulkhead 1 Details

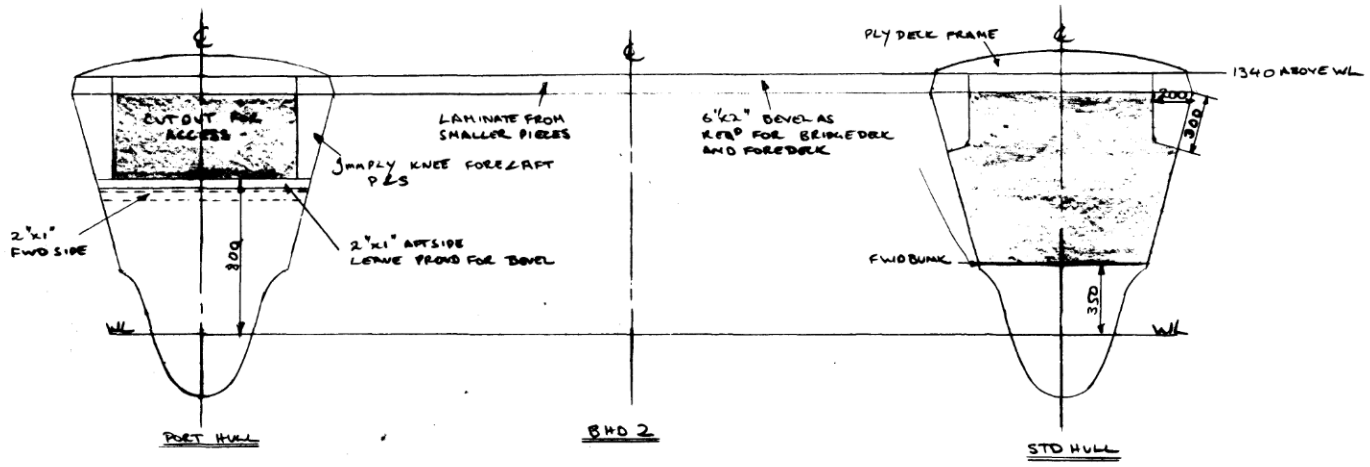

Figure 9: Bulkhead 2 Plans

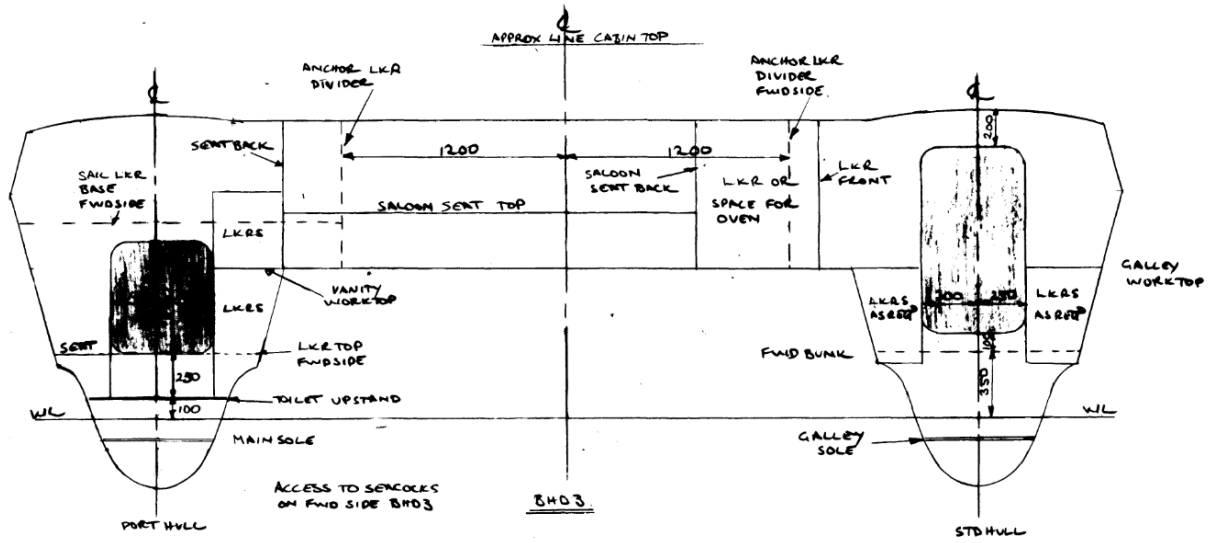

Figure 10: Bulkhead 3 Plans

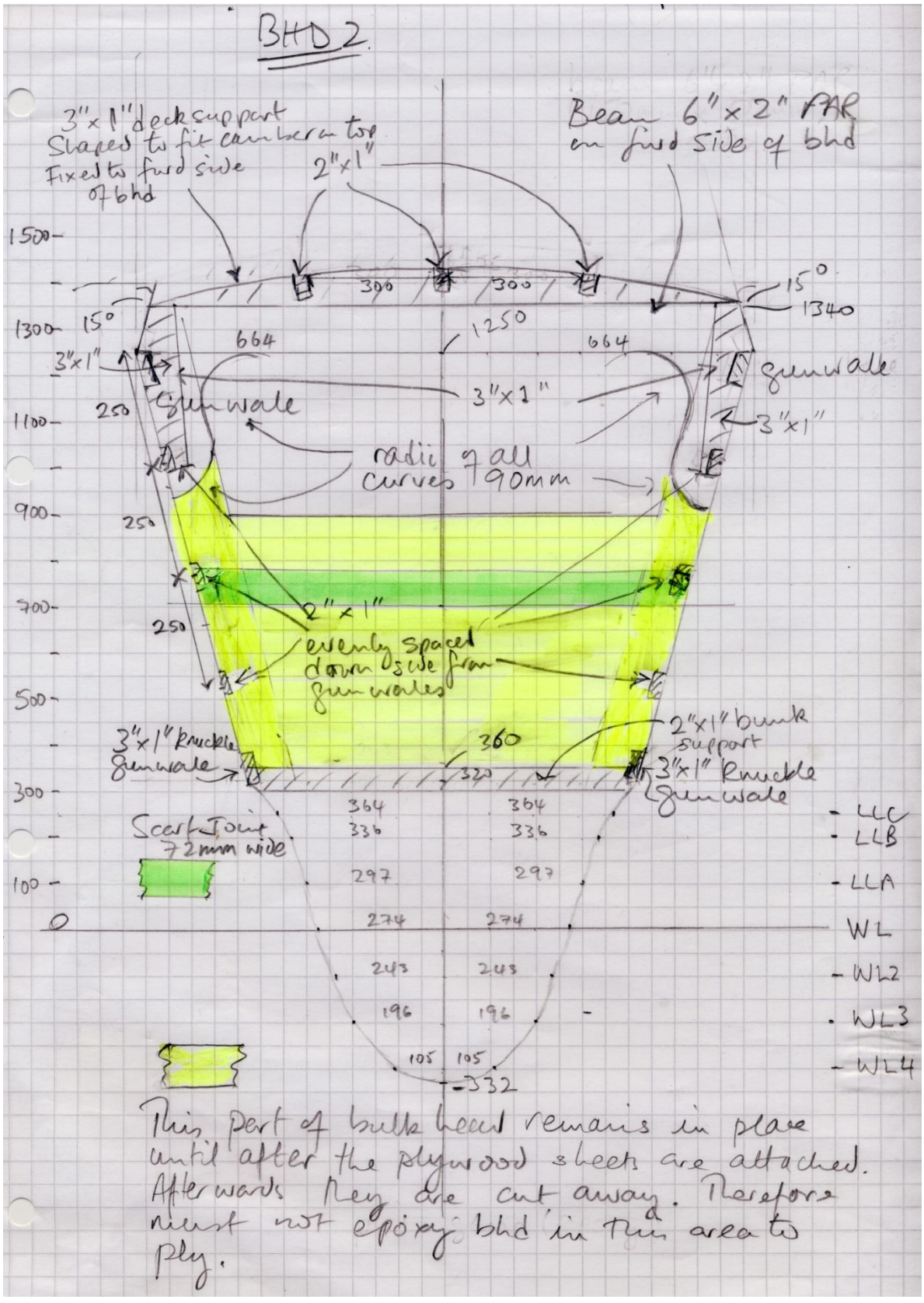

Figure 11: Bulkhead 2 Details

Bulkhead 3

See:

- Figure 5: Lower Sections of Bulkheads 1, 2 & 3;
- Figure 10: Bulkhead 3 Plans;
- Figure 12: Bulkhead 3 Details.

This is a big bulkhead. The "tab" that extends outside the hull will form (eventually) a bridgedeck bulkhead. This bulkhead is the same for both hulls, unlike the Plans.

The plywood sheets are 2500mm x 1220mm. The distance from the centre line of the bridgedeck to the centreline of a hull is 2200mm. For one plywood sheet to join the Bhd 3 in the starboard hull to the Bhd 3 in the port hull, the tab has to extend **at least** 2200-2500/2 = 950mm from the centreline of a hull; allow for the scarf join and this is 1022mm. We don't want the tab to stick out too much, because it might get damaged before the hulls can be joined, but we also want a margin of error, so let's go for 1050mm.

All the support timber is on the fwd side of the bulkhead so it cannot be seen from further aft (apart from the cabin sole support which is on the aft face). Note that the notches for hull stringers and the gunwale are in the 3"x1" support timber **and the ply** on the outside of the hull, but only in the support timber on the inside of the hull; the reason for this is that there is no gunwale or hull stringers in the bridgedeck cut-out. There is one exception to this: the lower hull stringer, which exists on both sides of each hull – see Figure 1. Notches for the deck stringers are in both support timber and ply as for the other bulkheads.

Bhd 3 has one half of a scarf joint on the tab. The other scarf joint is at the edge of a full width ply board.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 300mm centres from the centre line.

Bhd3 is 6620mm from the stern.

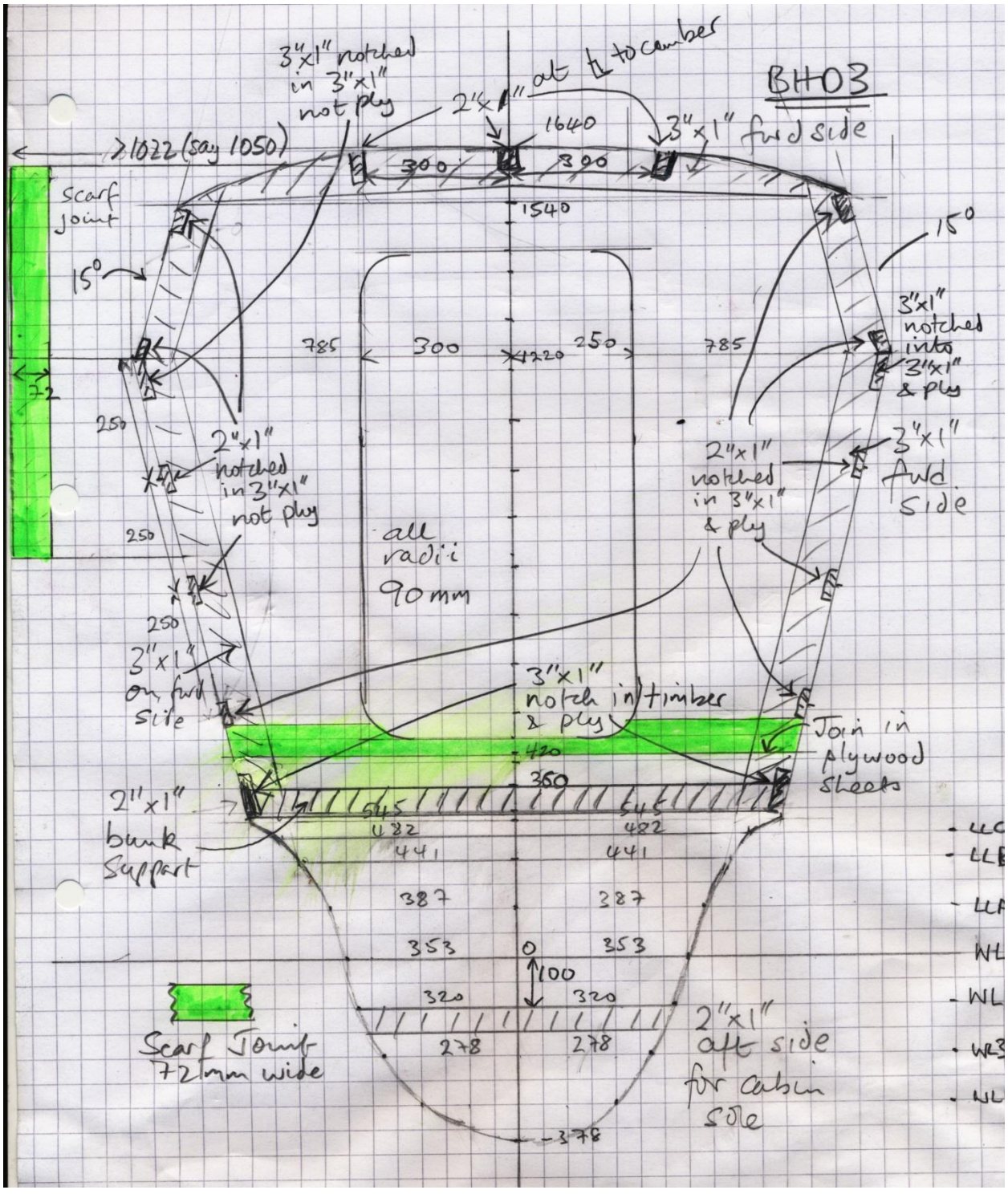

Figure 12: Bulkhead 3 Details

Bulkhead 4

See:

- Figure 6: Lower Sections of Bulkheads 4 & 5
- Figure 13: Bulkhead 4 Plans;
- Figure 14: Bulkhead 4 Details.

This is the biggest bulkhead. The "tab" that extends outside the hull will form (eventually) the bridgedeck/cockpit bulkhead.

The plywood sheets are 2500mm x 1220mm. The distance from the centre line of the bridgedeck to the centreline of a hull is 2200mm. For one plywood sheet to join the Bhd 3 in the starboard hull to the Bhd 3 in the port hull, the tab has to extend **at least** 2200-2500/2 = 950mm from the centreline of a hull; allow for the scarf join and this is 1022mm. We don't want the tab to stick out too much, because it might get damaged before the hulls can be joined, but we also want a margin of error, so let's go for 1050mm.

All the support timber is on the aft side of the bulkhead so it cannot be seen from further fwd (apart from the cabin sole support which is on the fwd face). Note that the notches for hull stringers and the gunwale are in the 3"x1" support timber **and the ply** on the outside of the hull, but only in the support timber on the inside of the hull; the reason for this is that there is no gunwale or hull stringers in the bridgedeck cut-out. There is one exception to this: the lower hull stringer, which exists on both sides of each hull – see Figure 1. Notches for the deck stringers are in both support timber and ply as for the other bulkheads.

Bhd 4 has one half of a scarf joint on the tab. The other scarf joint is at the edge of a full width ply board.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 300mm centres from the centre line.

Bhd4 is 3620mm from the stern.

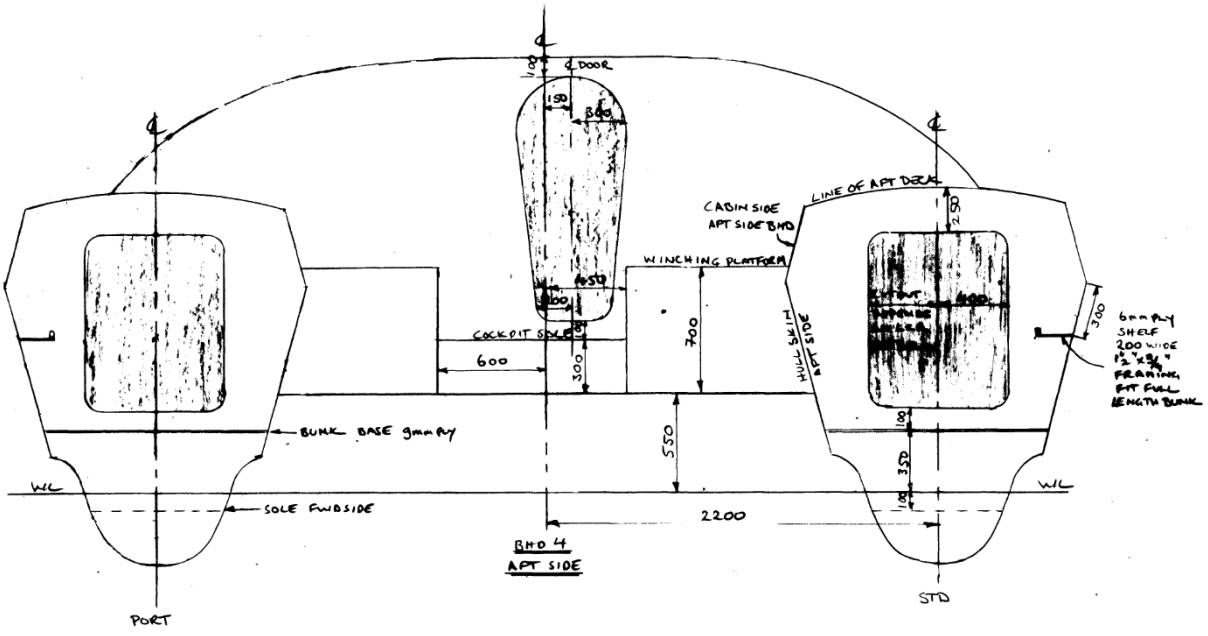

Figure 13: Bulkhead 4 Plans

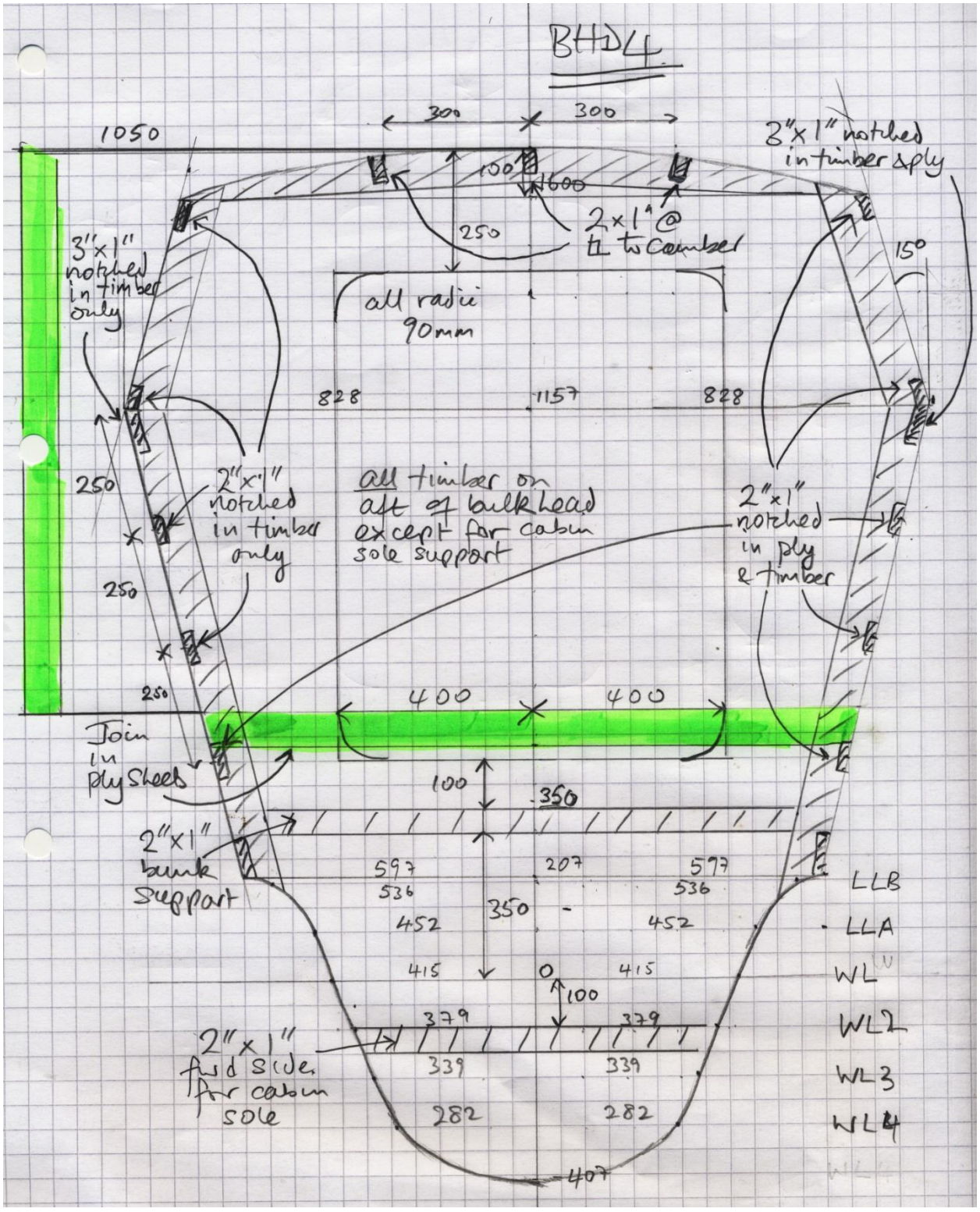

Figure 14: Bulkhead 4 Details

Bulkhead 5

See:

- Figure 6: Lower Sections of Bulkheads 4 & 5
- Figure 15: Bulkhead 5 Details.

Originally this is a full bulkhead with small cut-out. After fitting the ply hull skin, a large part of this bulkhead is removed leaving just the deck support, from the bunk support down to the keel and a couple of radiussed lugs extending down the sides from the top – see Figure 15. Neither the stringers nor the plywood hull skin should be glued to the bit of the bulkhead being removed. This bulkhead is the same for both hulls, as in the Plans.

The lugs are reinforced with 3”x1” timber which connects with the 3”x1” deck support timber. All the support timber is on the aft side of the bulkhead so it cannot be seen from further forward.

The scarf joint is in the ply to be removed.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 400mm centres from the centre line.

Bhd5 is 2620mm from the stern.

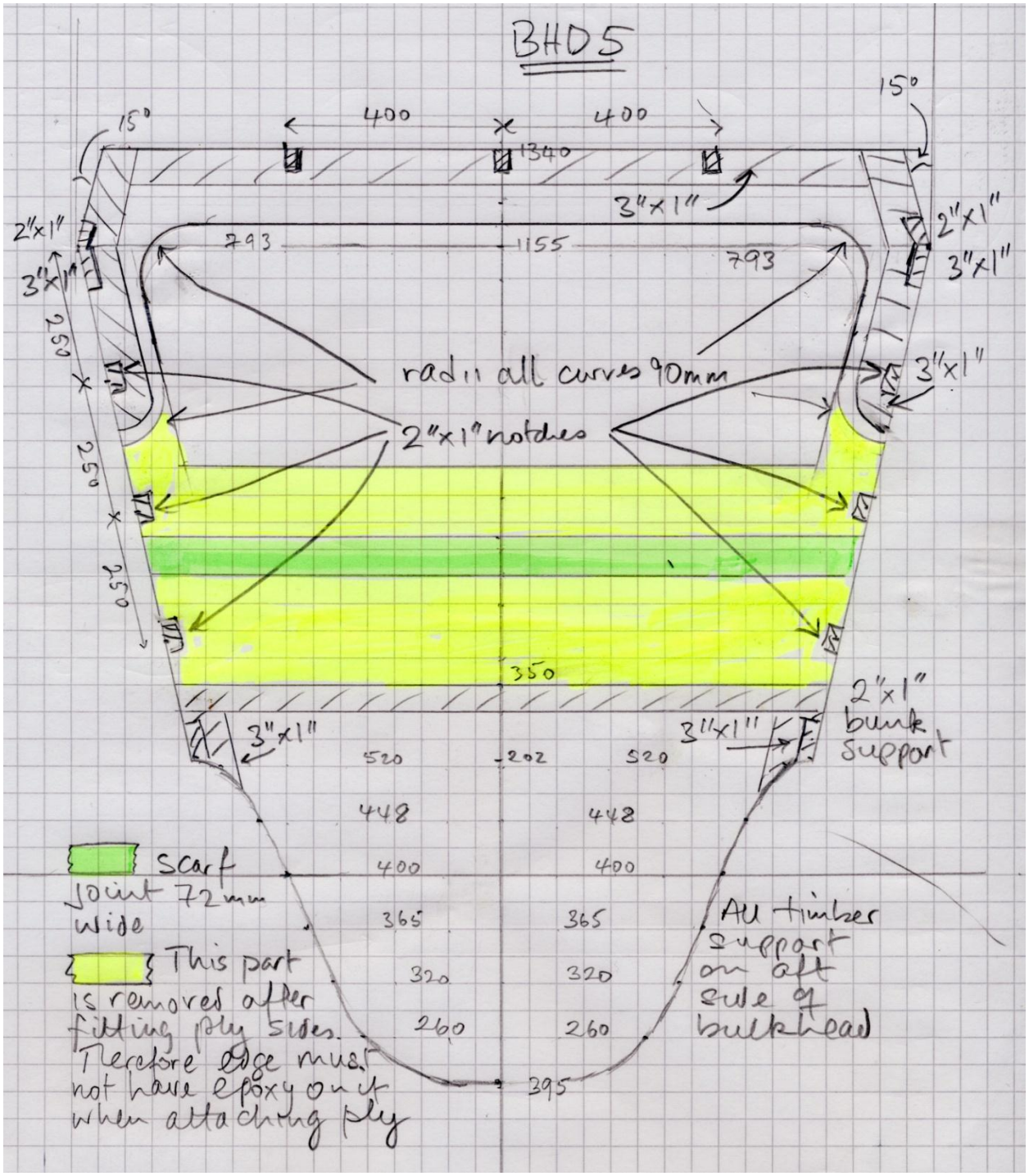

Figure 15: Bulkhead 5 Details

Bulkhead 6

See:

- Figure 7: Lower Sections of Bulkheads 6 & The Heads;
- Figure 16: Bulkhead 6 Plans
- Figure 17: Bulkhead 6 Details.

This is the same for both hulls, but different from the plans. The bulkhead we will do will extend up to and include a deck support, as in the other bulkheads. There will be a cut-out in it with radiussed corners, again like the other bulkheads. The cut outs will enable a user of the aft cabin to access storage on top of a watertight locker between the transom and this bulkhead. The aft been will eventually be fitted on the forward edge of this bulkead.

There is still a need for a scarf joint in this bulkhead.

All the support timber is on the aft side of the bulkhead, apart from the bunk support on the forward side, so it cannot be seen from further aft.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 400mm centres from the centre line.

Bhd1 is 1620mm from the stern.

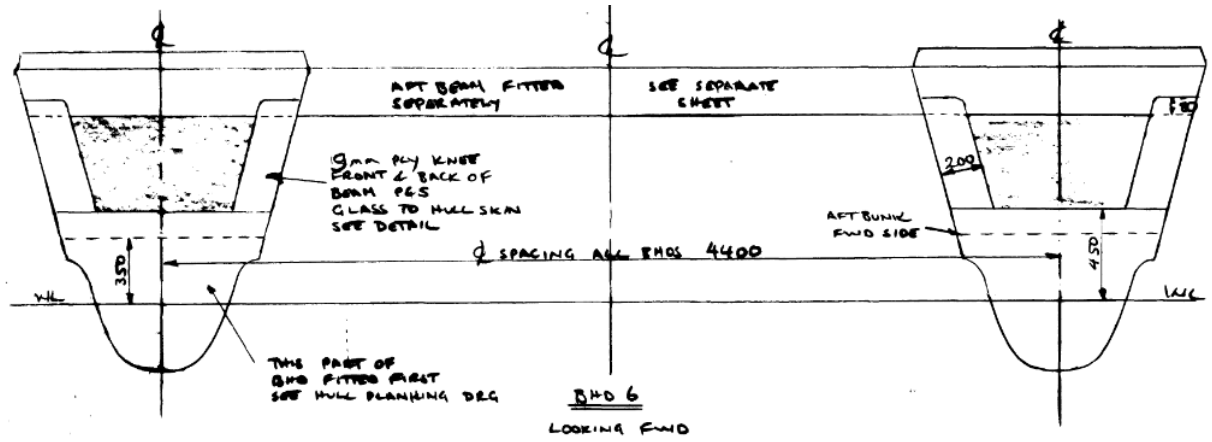

Figure 16: Bulkhead 6 Plans

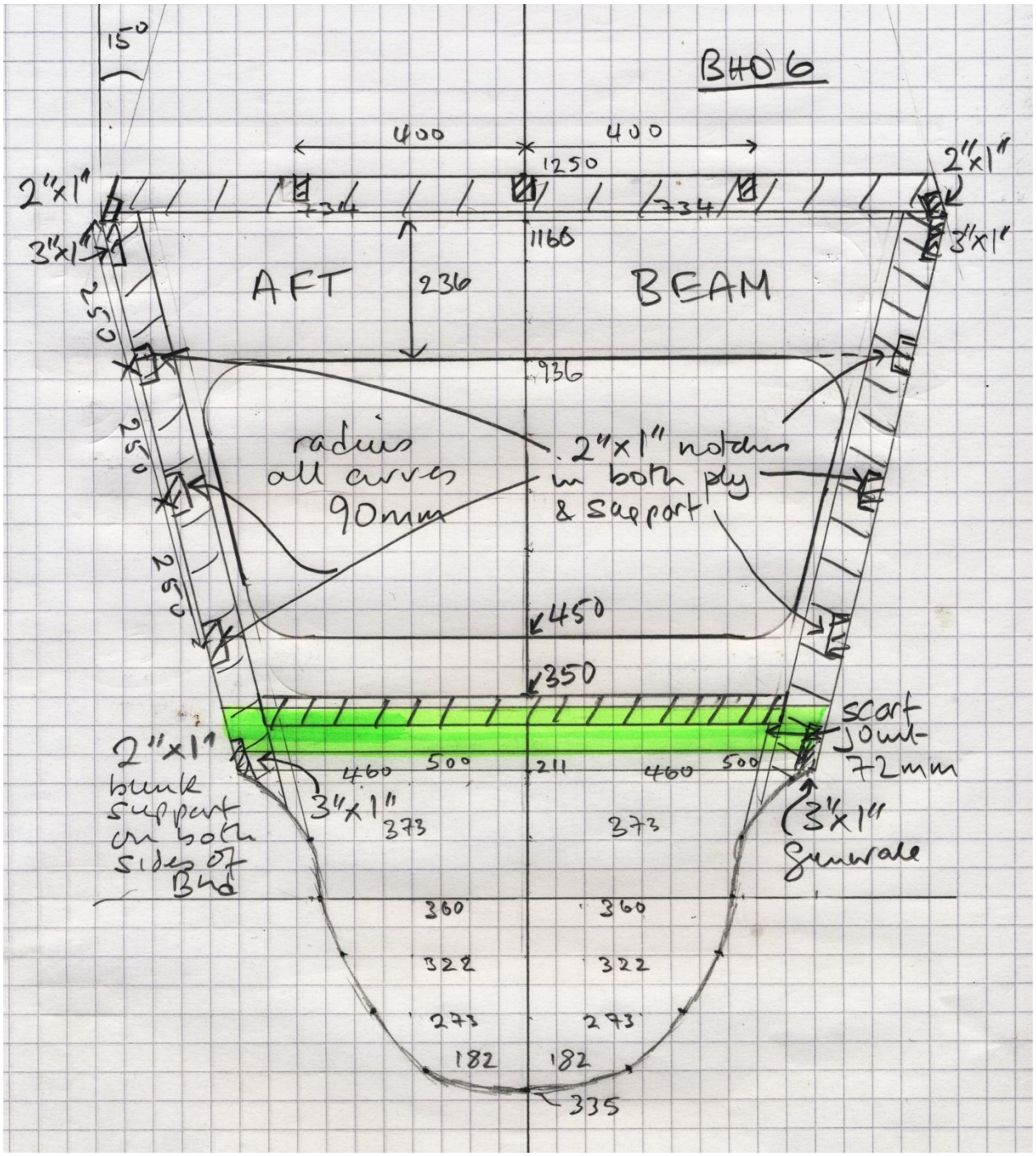

Figure 17: Bulkhead 6 Details

Transom

See:

- Figure 20: Photograph of Transom;
- Figure 18: Detail from Eclipse Lines Plan
- Figure 19: Measuring Transom Profile Below Knuckle.

The Plans give offsets for a transom bulkhead but this is a bulkhead which aligns with the aft edge of the skeg. That is between STN 9½ and STN 10 in Figure 18. A bulkhead in this position is not a full bulkhead since it will not extend to the sheer line.

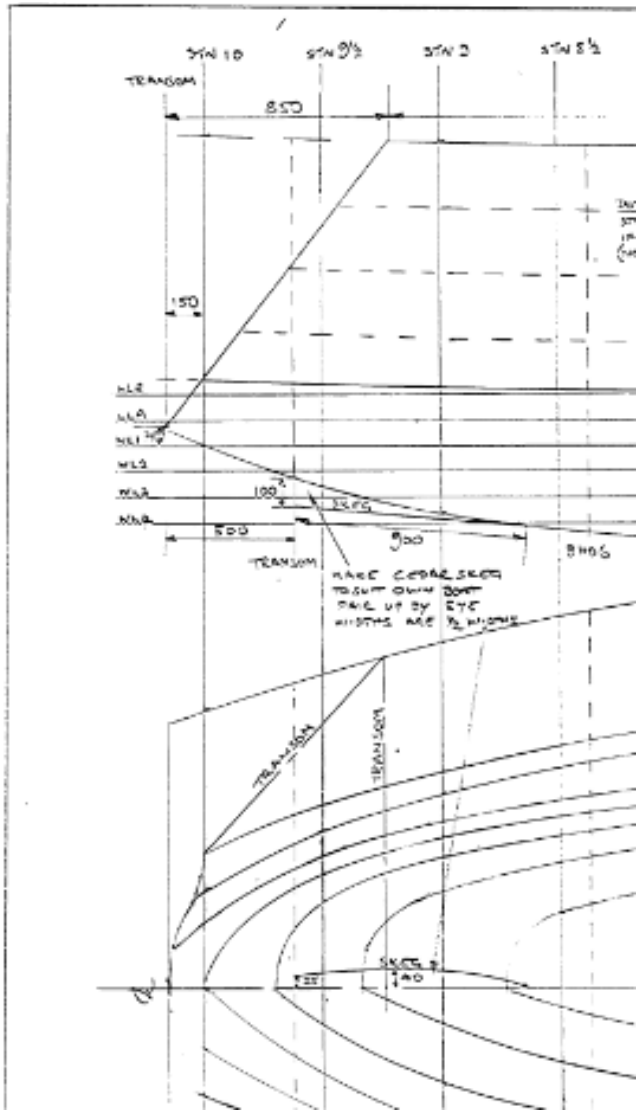

Figure 18: Detail from Eclipse Lines Plan

We actually want a transom bulkhead which aligns with the aft edge of the sheer gunwale, i.e. between STN 9 and STN 9½ in Figure 18; this gives us an important reference point from which we can determine the geometry of the transom steps.

We will make the bulkhead in one piece of ply as follows:

- measure the hull below the knuckle using a “Joggle Stick” & tally board (Figure 19);
- determine the height above the waterline by eye so that the top of the transom bulkhead is in a straight line with the tops of Bhd 5 & Bhd 6;
- the sheer width is the width of the ply (to ensure we can make it out of one sheet of ply), which conveniently falls in between the sheer width at STN 9 & STN 9½.

There is no scarf joint in this bulkhead.

All the support timber is on the fwd side of the bulkhead. Notches for stringers are made in the timber and not in the ply. However there is a notch for the 3”x1” gunwales on the sheer and knuckle.

The hull stringers are on 250mm centres from the sheer. The deck stringers are on 400mm centres from the centre line.

The transom is 820mm from the stern; the plans (Figure 18) say 850mm but we made a mistake in setting up the transom frame (aft of STN 10) so that the LOA is actually 3cm shorter than it should be!

Figure 19: Measuring Transom Profile Below Knuckle

Figure 20: Photograph of Transom

Figure 20 shows how the transom is built. There is no point building the transom until the transom bulkhead is in place.

Cabin Bulkhead

The Cabin Bulkhead divides the galley from the double aft cabin in the starboard hull (Figure 21) and the space outside the heads from the aft double cabin in the port hull (Figure 22).

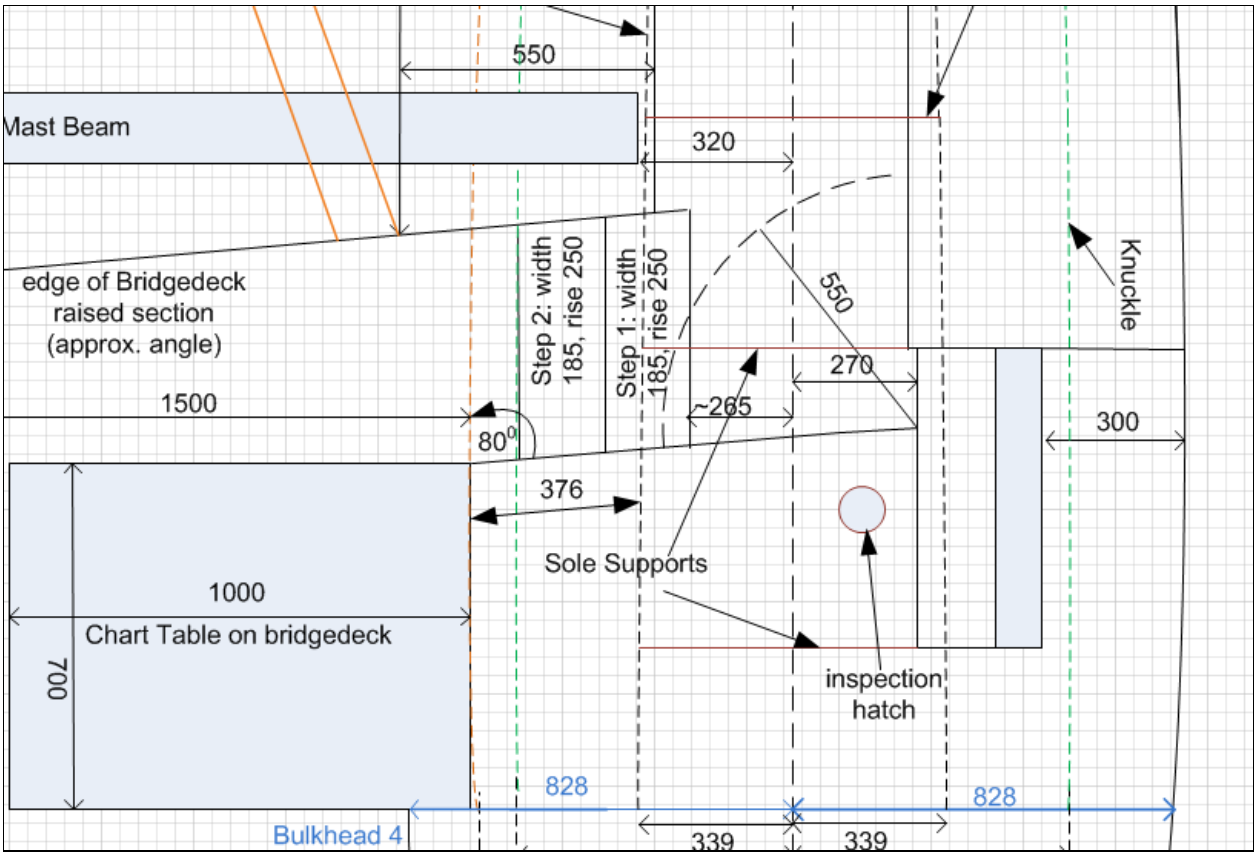

Figure 21: Plan Starboard Hull (Aft)

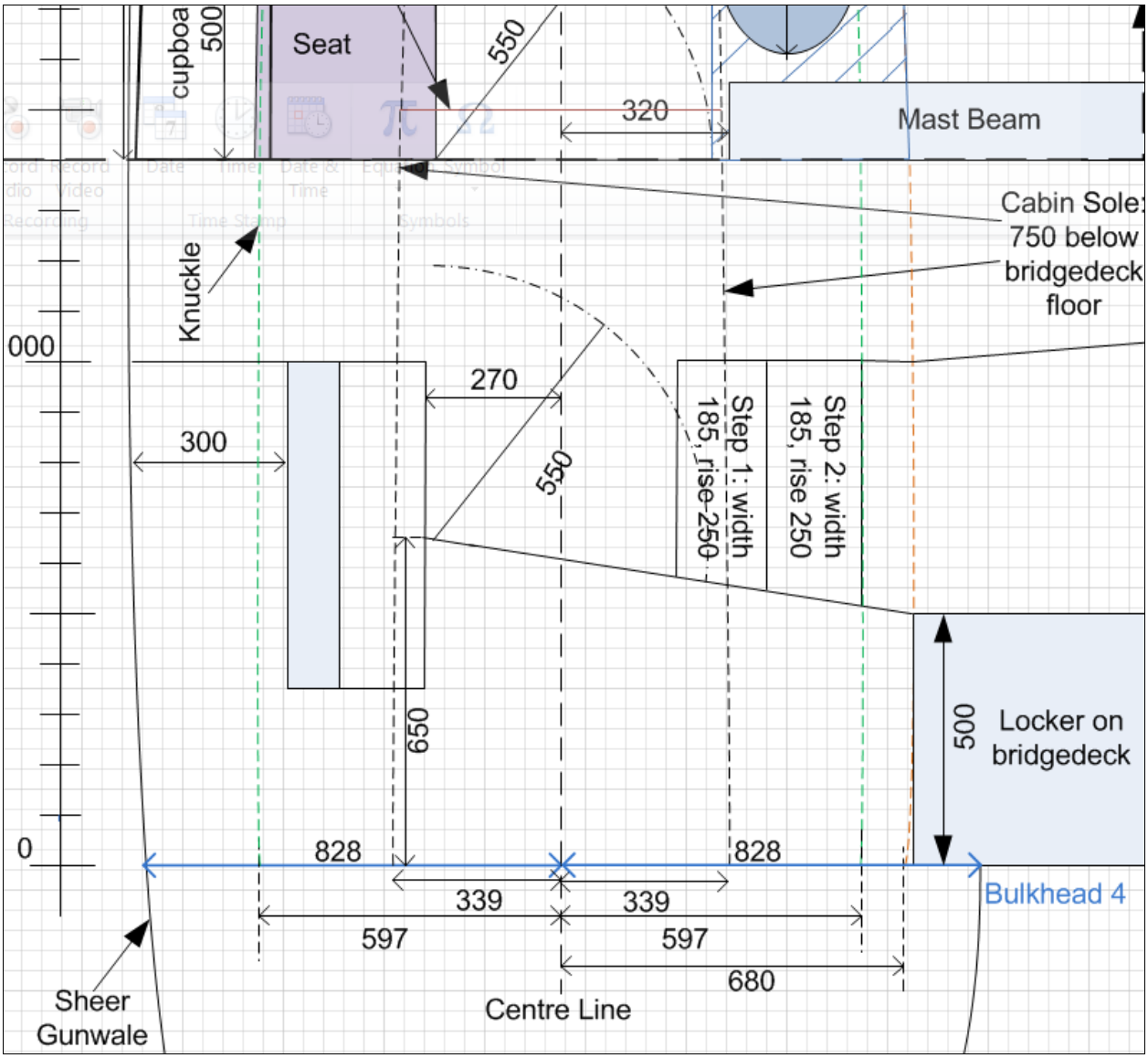

Figure 22: : Plan Port Hull (Aft)

A drawing (not to scale) showing 3 perspectives can be seen at Figure 23.

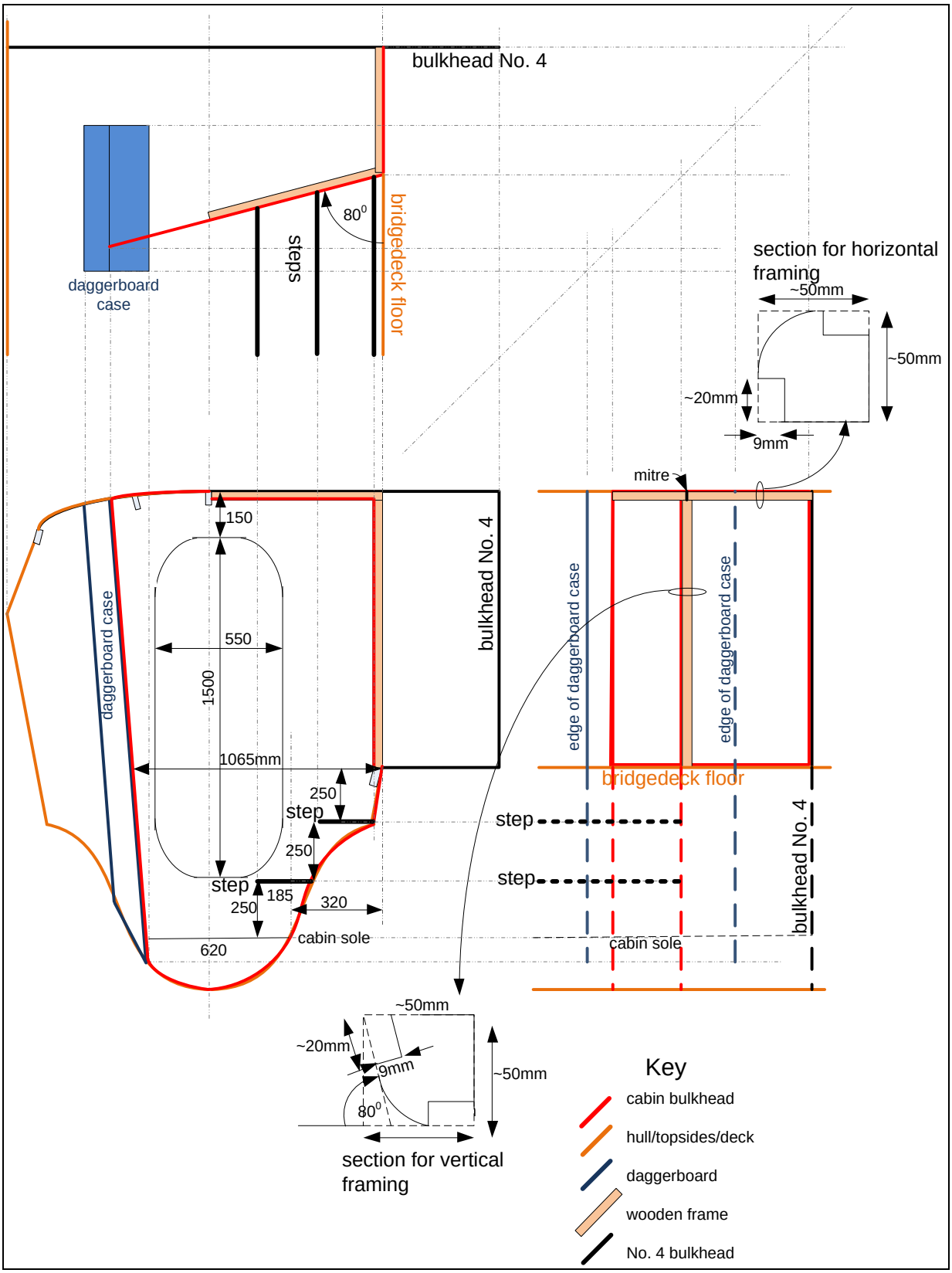

Figure 23: Drawing of Cabin Bulkhead

Procedure for Constructing Cabin Bulkhead

A Suggested procedure is:

1. cut enough 2”x2” Douglas Fir for frame;
2. cut Bulkhead angle on framing upright using table saw;
3. cut rounded edge for framing on router table;
4. cut 9mm rebate for plywood, in the framing, on router table;
5. cut mitre for horizontal framing – this is a > 90^0 angle;
6. glue horizontal framing together using epoxy and round corner to same radius as on upright;
7. fix all framing in position;
8. mark out Cabin Bulkhead on one piece of ply using tally board and joggle stick;
9. cut out Cabin Bulkhead and remove doorway;
10. epoxy Cabin Bulkhead into position;
11. add 2”x1” battens onto No. 4 Bulkhead to take cabin roof and side panels;
12. cut out and glue roof and side panels into position.

Heads Bulkheads

The bulkheads which isolate the heads (lavatory, shower and wash basin) from the rest of the accommodation are done in a similar way to the cabin bulkheads: first a frame is built and then the joggle stick is used to get the shape of each bulkhead. On the one hand they are easier to do since they go straight across the hull, making the framing easier than for the cabin bulkheads. On the other had they are big bulkheads and each requires the joining of 2 sheets of ply using scarf joints.

The plan showing where the heads bulkheads are to go is shown at Figure 24.

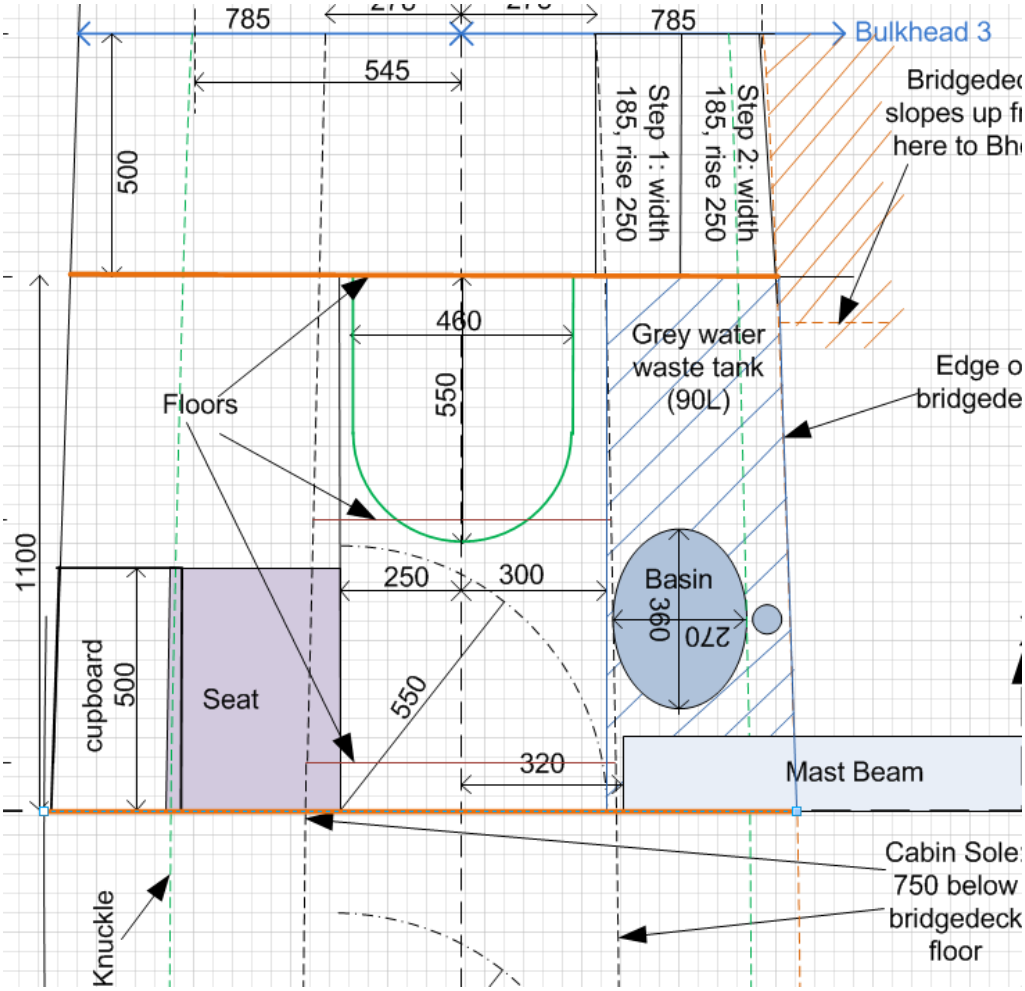

Figure 24:Plan for the Heads Showing Bulkheads – Orange Lines