SECTION 7 - JIG & SETTING UP

7.1 Making the jig

7.1.1 Refer to the jig schematic drawing No. 055/003/04.

7.1.2 The purpose of the jig is to provide a means of setting the frames up in their correct positions, accurately vertical, accurately square across the vessel and with their centrelines straight and dwl level. The jig also provides the means to mount the transom and laminate up the stem and backbone of the vessel.

7.1.3 The jig drawing shows certain sizes of timber - you do not need to stick to these particularly, as long as the primary objective is achieved to build a firm and accurate means of setting up the frames etc. You can usefully use secondhand timber for making the jig. As well as the principal timbers shown on the drawing, you will need a fair bit of other timber for braces and struts.

7.1.4 Make the base of the jig and set this up level both across and lengthways. The jig base should if possible be set up about 500mm off the floor of the workshop, so that you can get inside the boat as she is planked. If you wish to fasten the jig rails direct to the workshop floor then we suggest that you lengthen the posts etc. by, say, 400mm - so that the top of the jig base to the dwl is 1100mm instead of the 700mm shown. Fix braces or ply gussets across the corners to make sure it keeps square and fix the jig base down so that it can't move about or twist out of shape.

7.1.5 Mark the centreline of the boat on the jig base cross rails. A length of timber (say 150 x 25 planed up) can be fixed to the length of the jig base and the centreline marked on it. Mark the frame positions on the jig base, accurately square across the base.

7.1.6 Once the base is set up, the post for Frame –640 is set up. This is a single post on the centreline. The aft face of the post should be the finished frame thickness (nominally 20mm) ahead of Position –640, so that the aft face of the frame finishes up at Position –640. Fix a substantial rail across the jig base and fix the post for the frame to it. Fit temporary braces to hold the post firm and upright in both directions.

7.1.7 Get out the two shaped sections of the post on to which the apron will be laminated. These consist of a longer angled-back section and a shorter horizontal section. The shape of the outer faces of the sections is given in the two tables on the drawing. The sections are shown as made from 45mm finished material; don't use any narrower than this because the apron is 60mm full width - if you can use 60mm wide material then all the better.

7.1.8 Fix a substantial rail across the jig positioned so that the back of the angled-back section can be just housed into it with the fwd face of the angled-back section in the correct position (82mm aft of Zero at 700mm above the dwl).

7.1.9 Fix the horizontal section into place on the top of the frame post and join the two sections together. Reinforce the join with a chock across the corner. Brace the stem post assembly out to the sides of the jig base. There is considerable pressure on the stem post when the apron and stem are laminated so it does need to be strong and very firmly braced.

7.1.10 Fix the blocks on the aft face of the post - on at +25 and the other at +573 from the dwl.

7.1.11 Now set up the transom post at the aft end of jig. This are set up and braced in much the same way as the stem post assembly.

7.1.12 Note that the top of the transom post is cut off level so that the top of the stern knee can sit on it. Fit the block at dwl +504 - the top face of this block is square to the transom post - not parallel to the dwl

7.1.13 Fix the pairs of posts for the frames. Note that these are all on the aft faces of the frames - so the fwd faces of the posts are at the frame positions. Fit the posts the distances apart given on the drawing.

7.1.14 Fit the cross rails across the posts. Make sure that all the rails are level across and firmly fixed (best screwed). The ends of the cross rails finish flush with the outsides of the posts. When the rails are all fixed, the centreline should be transferred accurately on them.

7.1.15 Fit the steady rails, housed into the posts - these are to help keep the frames square across the boat. The rail lengths are shown on the plan view of the jig.

7.1.16 Make sure that the posts and rails are all braced firmly.

7.1.17 The frames and transom can now be fitted to the jig. As you do this, it is as well to cover with shiny brown parcel tape any parts of the jig, additional rails, braces etc. that the frames sit against and which may get accidentally bonded to them.

7.2 Fitting the frames & transom

7.2.1 Hang Frame –640 on its post and adjust it so that its centreline is plumb over the boats centreline marked on the jig. Secure the frame to the post - use ordinary cramps, or clamps made from a block just thinner than the frame thickness screwed to the post; then screw a length of timber to the block protruding over the frame to trap the frame firmly against the post. brace the frame so that it is held firmly square across the jig. Fix (screw) the braces just below the shelf notch and running forward down to the jig base.

7.2.2 Hang Frame –1280 on its posts and hold it square with braces to Frame -640

7.2.3 Continue with the rest of the frames, clamping each to the jig posts and rails and bracing them firmly square across the boat.

7.2.4 Mount the transom on its post. You will have to drive a couple of screws through the transom into the post - if you bore for these with a Stanley "screwsink" then they can be doweled up after the boat is taken off the jig. Brace the transom firmly square across the boat.

7.2.5 Now completely brace the frames one to the other with temporary braces screwed in place. These braces can be quite light timber (say 30 x 10) as they will come off as the various structures are fitted to the hull. Fit one set of braces around the boat just below the sheer notches and another each side of the backbone notches. Check to see if the frames are reasonably firm - if necessary fit some diagonal braces again running from frame edge to frame edge. Test the frame faces with a straight-edge to check that they have remained vertical.

7.2.6 Make a short length of chock, shaped to take the ends of the apron laminations. Make the chock 300mm long and shape the face to the following heights:

Position -640	-79
Position -700	-89
Position -800	-105
Position -900	-119

Fit the chock on to the aft face of Frame –640, so that its face is flush with the face of the apron notch in the frame. Secure the chock in position (rest it on a piece of temporary timber running from a chock on jig post –640 to a temporary rail across the fwd faces of jig posts –1280).

SECTION 8 - BACKBONE

8.1 Apron

8.1.1 The apron is 60mm full width and 24mm moulded depth - it is made from 4 6mm laminates.

8.1.2 Cover the face of the jig stem post assembly with shiny brown parcel tape.

8.1.2 Get out a piece of 6mm thick material and try it round the jig. How it will bend will depend on the timber itself and the moisture content. The timber needs to be dry (12% or less) for WEST system laminating, but this unfortunately makes it much stiffer. heating the laminate with a hot air gun will improve its plasticity considerably - then leave it cramped to the jig until it cools so that it takes up a permanent curvature. If the 6mm thickness laminate will not go round sensibly, then it will be necessary to reduce the thickness of the laminates. We need to keep the finished depth of the lamination the

same, so you can use 5 laminations at just under 5mm thick or 6 laminations at 4mm thick - or 8 laminations at 3mm thick.

8.1.3 Once you have got the thickness right, get out the material for the apron laminations. Mark the position of the aft end of the apron on the jig (about -700) and measure round the jig to get the length of the laminates - make them long enough to run from dwl + 700 at the top to at least –850 at the heel. Make the laminates 60mm wide.

8.1.4 Now have a dry run (no glue) trying all the laminates cramped around the jig to make sure that you have enough cramps etc. You will need some pieces of ply (covered in parcel tape) to be cramped each side of the laminates, to keep them in line with each other as when they are wet they will tend to slide sideways - say one set in the middle and one at the bottom. Also nail some extra side bits to the jig stem post at the middle and bottom to make the width up to about 120mm. Mark off the laminate width (60mm) and drive a small nail in each side - this will keep the first laminate accurately on the centreline of the boat. The laminates need to be a slightly loose fit in the notch in Frame –640 so that they pull down easily.

8.1.5 Now we can laminate the apron up. Mix up the WEST and divide it into two; mix WEST/#403 microfibres with one half. Wet out the outer face of the first laminate and lay it down on the bench. Wet out one face of the second laminate and then apply WEST/#403 to the wetted out face of the first laminate; lay the second laminate WEST face down on the first laminate. Wet out the second face of the second laminate. Wet out one face of the third laminate; apply WEST/#403 to the upper face of the second laminate and then lay the third laminate WEST face down on to the second. proceed in this manner until all the laminates are done.

8.1.6 Apply WEST/#403 to the apron notch in Frame –640 (sand the edges first so that the WEST gets a good key to the already WESTed edges). Pick up the pile of laminates and lay them on the jig. Get one end in position and cramp the laminates down to the jig. Pull the laminates round and keep on cramping them down, working from one end progressively so that they pull round sliding one over the other. As you proceed you will probably need to fit the fit the side cramps and cramping pieces (cramp these fairly lightly until the laminates are pulled down fully). go over all the cramps and pull them home - but remember that excessive pressure is counterproductive as it just squeezes all the WEST out of the joints. The fact of pulling the laminates down to the curve of the stem will by itself provide much of the necessary pressure. Clean off all excess WEST and leave to cure. Cure should be at least 15 hours at a minimum 10ºC - preferably longer and preferably 15ºC. It is helpful in cold conditions to arrange a cover over the lamination and put a small heater beneath - the fully enclosed tubular heaters are ideal for this purpose.

8.1.7 Once the lamination has cured the cramps can be removed, but before removing the top one, bore off for a temporary screw into the jig stem post. This screw should be right near the top, so that the inner stem laminations do not cover it up. Mark the aft end of the apron at Position –820 and saw off square. The bevel on the end can be chiseled

off later when the boat is the right way up. Also later on the inner pair of laminations can be cut back as shown on drawing 055/003/01; or the whole end can just be beveled off - it is not of structural significance, but just how it looks best.

8.1.8 Clean the sides of the lamination up and mark the boats centreline around the outer face.

8.2 Inner stem

8.2.1 The inner stem is wider than the apron and the side will be beveled off to provide a surface for the planking to sit on (this is called the faying surface) The thickness of the laminations should be the same as those for the apron and the finished moulded depth will be 24mm. Make the laminations 100mm wide for the moment.

8.2.2 The inner stem will fade into the apron at Position –480. So measure the length of the laminates to start about 100mm aft of this position and finish at dwl + 700.

8.2.3 Cover the outer face of the apron with parcel tape so that the inner stem laminates do not bond to it - the cured lamination is removed from the jig and the faying surfaces beveled off, before being permanently bonded to the apron.

8.2.4 Laminate up the inner stem in much the same way as you did the apron. You can drive nails into the jig side pieces 100mm apart to keep the first laminate on the centreline.

8.2.5 Once the lamination has cured, it can be removed from the apron for cleaning up and beveling. Before doing this however, mark the boat's centreline on the outer face and, measuring up from the jig base, mark in the dwl, wl 100, wl 200, wl 300 and the sheer at dwl +596; also mark in Positions -300 and -480. Transfer these marks across the sides of the lamination - level across for the waterlines and sheer and upright vertically for the Positions.

8.2.6 Remove the inner stem and transfer the centreline, the waterlines, the sheer and the Positions across the inner face. Set out the widths of the inner face on the inner face (see the table on drawing 055/003/01); the full widths of the inner face are the "Width 'A'" dimensions. The width at Position -300 is 96mm (48 x 2); let the width run out to the full 100mm by Position -480. Cut the aft end of the lamination off at Position -480

8.2.7 Set out the 60mm full width on the outer face of the lamination. Now plane the sides of the lamination off to the lines of the inner and outer face widths to give the faying surface bevels.

8.2.8 Fit the lamination back on the apron, making sure that the aft end is in its correct position. Mark the top to cut off so that the screw securing the apron to the jig is just clear. Remove the lamination and cut the top off to length. Note that all the laminations will be cut finally to length when the boat is off the jig.

8.2.9 Strip the parcel tape off the face of the apron and clean the surface up thoroughly and then wipe it over with acetone. Then bond the inner stem to the apron, wetting both surfaces out before applying WEST/#403, and cramp in place until cured. Do make sure to get the inner stem bonded on exactly centrally. clean off excess WEST before it cures.

8.3 Mast step

8.3.1 Get out the material for the mast step 25mm thick. Cut the step to length and the bottom to shape (see 055/003/01). Cut the mortise for the mast heel

8.3.2 Fit the step into position into the housing in -1920 and through the notch in -1280. Support the very fwd end with a block on to the temporary support for the apron aft end chock. Make sure that the upper face of the step is level.

8.3.3 Bond the step into the notch in place.

8.4 Hog

8.4.1 The hog is a single thickness piece of timber 25 thick x 120 full width. It can be scarphed out of two lengths of timber if necessary - make the scarph length 6 times the thickness (150mm) minimum. Be sure to wet out the end grain of the scarph very thoroughly before bonding with WEST/#403. leave the joint cramped up until it is fully cured - several days at minimum 10ºC, better 15ºC. The position of the scarph along the length of the hog is immaterial.

8.4.2 Now plane off the bottom face of the inner stem from full depth at a point Height -30, Position -295, to nothing at Position -480.

8.4.3 Lay the hog in the notches in the frames - ease any where it is tight so that it pushes down into the notches quite easily. Push the hog up against the transom and then cramp it down fully on to the frames (at least from –2560 aft). Mark the transom angle on to the end of the hog.

8.4.4 Remove the hog and cut the aft end to the transom angle. Fit the hog back in the frames, hard up against the transom. This time cramp it fully home on all the frames and down on to the mast step and the apron/inner stem. Make sure that the frames aren't being pulled out of position by the action of cramping the hog into place. Mark the fwd end; release the hog and cut the fwd end to length.

8.4.5 Now bond the hog into the boat, wetting all bonding surfaces (and specially the end grain to the transom) out thoroughly and abrading any pre-WESTed edges, before bonding with WEST/#403. Clean off excess WEST.

8.4.6 Once the WEST has cured remove the cramps and clean the sides of the hog up if necessary. Mark the boat's centreline along the outer face of the hog and then measure

off and mark the width of the keel (50mm full width, 25mm offset) each side of the centreline.

8.4.7 Take a stiffish batten, long enough to span at least four frames. Lay the batten on the frame edges pressed hard against the side of the hog and running fair from frame to frame; tack the batten in place in place. Mark along the batten (the underside of the batten - the side nearest the sheer) on to the side of the hog. This line will be the line of the faying surface bevel on the sides of the hog. Repeat this process both sides of the hog, full length of the boat.

8.4.8 At the fwd end, plane off the outer face of the hog from full 25mm depth at Position –480 to nothing at position –295 - check the shape of the curve with a batten bent around the outer face of the inner stem and on to the outer face of the hog to get a fair line.

8.4.9 Plane off the faying surface bevel of the hog from the line of the keel sides on the outer face hog to the line of the frame edges on the sides of the hog, leaving a flat surface 50mm wide down the centre of the hog for the keel to sit on.

8.4.10 Mark the slot in the hog for the centrecase. The slot is 1440 long plus 40mm each end for the centrecase posts. So the slot will start at Position –1920 and finish at Position –3440. The slot is 45mm wide. Note that the slot in the keel will be 25mm wide and only 1440mm long, because the centrecase sides and posts pass through the hog but sit down on to the top of the keel.

8.4.11 Bore a Ø10 hole at each end corner of the slot, using a spade bit and holding the drill vertical, not square to the face of the hog. The easiest way to drill vertical is to set up a short length of batten vertical fore-&-aft and athwartships close to where you want to drill and get a colleague to sight the drill vertical for you against the line of the batten. Cut out the slot, using an electric jig saw with the correct blade for a clean cut in 25mm thick timber. Have a trial run on a piece of scrap timber to make sure your jig saw is cutting square to the base - adjust it if necessary. Cut the slot right close to the line if possible.

8.4.12 Chisel out the ends of the slot square. If you cramp a piece of scrap timber across the underside of the hog, you can chisel through on to this without splintering the end grain of the hog out. Clean the sides of the slot if necessary with a wide paring chisel, to give a parallel sided slot as near to 45mm wide as you can get it - err on the wide side rather than too narrow. When the boat is turned over, we shall open the inside of the slot out slightly to a bevel, so that a “wedge” of WEST will remain when the centrecase assembly is inserted.

8.5 Stem

7.8.1 The stem is laminated up on the outer faces of the hog and the inner stem. The procedure is much the same as for the inner stem and the apron. The aft end of the stem

lamination is stepped so that the inner and outer keel laminations bond on with a staggered joint.

8.5.2 The curve around the forefoot is getting less tight now, so the laminations can be thicker. However, if you had to use thinner apron and inner stem laminations then you may well need to use thinner stem laminations. Try a 10mm lamination round and see if it will go without too much strain, or breakage. If it won't, then use a greater number of thinner laminates.

8.5.3 Laminate up the first half of the the laminations (or the first three if you are using 10mm laminates). The top of the lamination can run to the same point as the inner stem laminates.

8.5.4 After the WEST has gone off, cut the aft end off square at Position -600. Laminate on the rest of the laminates, starting the aft end a bit further fwd, to cut back after curing to Position -450.

8.5.5 Cut the aft end of the stem lamination to give a staggered joint to the keel laminations, as shown on 055/003/01. clean up the sides of the stem. After the hull is skinned, the sides will be profiled off as noted on the drawing.

8.6 Keel

6.8.1 The keel is 50mm deep (measured from the outer face of the hog) up to –2328 and then starts to get steadily deeper, reaching about 195mm deep at the aft end at –4253 (this equates to a draught of about 207mm from the dwl). The aft end is cleaned off flush with the aft face of the transom and at the transom angle. The forward end is butt joined to the stem in two steps of 25mm thick and 150mm apart

6.8.2 The keel is basically two full-length laminates each 25mm thick x 50mm wide. The first of these is applied directly to the hog, with a butt join to the stem at –600. The greater depth of the keel aft of –2328 is then built up from successive layers of 25 x 50 material - or a single solid deadwood. The final full-length 25 x 50 laminate is then glued on. The keel sides are beveled off (see note 2 on drawing 055/003/01) after the hull is planked.

6.8.3 Flatten off the bottom of the transom to 50mm wide.

6.8.4 Get out the material for the inner keel laminate. Fit the fwd end into the staggered joint fwd. The aft end can overhang the transom and be cut off later.

6.8.5 Bond the keel laminate into place, wetting out etc. as usual.

8.6.6 Once the WEST has cured (<u>not before</u>), mark and cut out the centrecase slot. The slot in the keel is 25mm wide and 1440mm long. It starts 40mm astern of Position –1920 and finishes 40mm ahead of Position –3440 (so it runs from –1960 to –3400)

8.6.7 Bore a Ø25 hole at each end of the slot, vertical athwartships and fore-&-aft (see ¶8.4.11). Jig saw the slot out and clean up the sides and ends, generally as you did the (wider) slot in the hog (¶¶8.4.11 & 8.4.12). But don't make this slot over width, try to keep to a parallel 25mm. The slot will be cut in each laminate of the keel after it is bonded into place but before the next laminate is glued on. With the keel made up from several laminates, the sides of the slot are probably not going to be perfect - but you won't be able to see in there and provided the centreboard goes up and down nicely, then the function is fulfilled. It is also a good idea to apply one or two coats of WEST to the inside of the slot as you go and sand these smooth.

8.6.8 Now we have to build up the back end of the keel. This requires six 25mm thick laminates. The first of these starts at –2328; the second at –3075; the third at –3440; the fourth at –3715; the fifth at –3945; and the sixth at –4130.

8.6.9 So glue on the first of these, starting it at –2328 and letting it run aft to at least the transom angle continued down - leave it about 25mm long. The slot can be cut out, generally as outlined in ¶8.8.7 above - but of course the forward end is open. Mark in the position –3075 across the surface of the laminate. Draw a straight line on each side of the laminate running from the outer face of the laminate at –3075 forward to the inner face at –2328. Then plane off the top surface to the line - so that the thickness of the laminate is zero at –2220 to full 25mm at –3075. In fact, better to plane to within about 1·5mm of the line for the moment - planing finally down to the line when all the laminates (bar the outer full-length one) are on and the whole length of the keel can be faired.

8.6.10 Glue on the second laminate, starting at –3075 and running aft to clear of the transom angle projected down. Cut and WEST the centrecase slot. Mark the position –3440. Draw a line on each side of the laminate from the outer face at –3440 to the inner face at –3075. Plane the laminate to within 1·5mm of the line.

8.6.11 Glue on the remaining laminates in the same way, planing each one down as you go along. There is no longer a slot in any of these laminates. Once the last laminate is glued on, project the angle of the outside of the transom down the sides of the laminated keel and draw a line each side. The last laminate should finish up 25mm thick where its outer face crosses this line - so draw a line on each side of this last laminate from the outer face at that point to the inner face at –4130 and plane down to within 1·5mm of that line.

8.6.12 The underside of the outer full length laminate is a straight line from –2328 aft to –4280, where the transom line projected down crosses the outer face of the sixth short laminate. In theory this is all the lines progressively marked on the keel sides in ¶8.6.9 to ¶6.8.11 joined up but this may have got a bit out of true along the way, so it is probably best to draw a new line on each side of the keel. This should run in fair to the start of the curve on the first full-length laminate. Plane the outer faces of the short laminates off to the line, taking care to keep the outer face square to the sides.

8.6.13 Also run a plane over the butt join of the stem to the first full-length keel laminate so that the outer face is a fair line. Any odd discontinuities where the laminates finish can be filled with WEST before the outer laminate is glued on.

8.6.14 Fit the forward end butt of the outer full length keel laminate and then glue the laminate on as before. Mark cut and WEST the centreboard slot keel. Continue the transom line down for the full depth of the keel and trim off the aft end. If the angles etc. do not produce a keel finishing exactly at the correct depth and at position –4253, this is not so very important.

8.6.15 Clean the keel side up - but do not profile them until after the planking is completed and the centrecase runners are fitted.

SECTION 9 - SHELF

9.1 Fitting the shelf

9.1.1 If you don't have long enough timber for the shelf, the scarph it up from two lengths - scarph 6 times the thickness. Make the shelf long enough to allow for a bit of fitting at the fwd end. Make sure that the timber for the shelf is wide enough. The notches are 50mm but have a habit of creeping a bit deeper sometimes when beveling them. So, before getting the timber out, just check the depth of the notches and make your timber accordingly. In any case it does not matter if the shelf is, say 3mm too wide as this will get planed off when the hull is sheered down - i.e. when the sheer is planed off fair with the boat the right way up. Don't make it more than this however or else you will make yourself a lot of work planing the top edge off!

9.1.2 Where the shelf runs up to the stem, the height of the top edge is a little different from the height of the underside of the deck on the centreline, because of the deck camber. The top inner corner of the shelf is 592 above the dwl where it meets the aft face of the inner stem (compared with the centreline height of 596 on the drawing 055/003/01).

9.1.3 The fwd end of the shelf blades off on to the inner face of the inner stem. Its thickness is such that its outer face should be flush with and fair into the faying surface of the inner stem, and the inner face of the shelf will just snug into the "corner" formed between the apron and the inner stem.

9.1.4 Fit the shelf around the boat in the shelf notches up forward but with the aft end lying over the transom. Push the shelf fwd until the fwd end is hard against the inner stem. Cramp the fwd part of the shelf into the notches. Be careful when bending the shelf round that the frames are not pulled out of position. if you have trouble getting it round, just let the aft end lay away from the boat for now, supported so that does not break.

9.1.5 Mark the stem angles back off on to the shelf, using a “dummy” if necessary. Remove the shelf and cut the fwd end. Fit it up again and adjust as necessary until you have a reasonable fit.

9.1.6 There is not much to fasten the fwd end of the shelf to, so make a tapered chock to fit between the inner face of the shelf and the side of the apron. Drill off for a couple of fastenings (say 2" x 8g s/s screws), through the shelf and block into the apron.

9.1.7 Now, with the fwd end correctly in position we need to mark the aft end. If the shelf is difficult to pull round, fit the fwd end on the other side of the boat and then use a spanish windlass to pull both aft ends in together.

9.1.8 A spanish windlass is a length of thin rope tied in a loop around the two parts to be pulled together. A strongish bar (e.g. a good screwdriver of a length of say Ø6 steel bar) is inserted in the loop and twisted round and round so that it tightens the loop up. Arrangements have to be made to prevent the bar untwisting - perhaps a bit of string to a fixed object. if the corners of the timber are sensitive to damage protect them in way of the rope, else a groove in the timber will be formed.

9.1.9 At the transom the shelf will lay on the edge of the transom until it is cut to length. Make sure that the shelf is at the correct height. This will be the deck thickness (6mm) down from the “Sheer” height (top of deck) on the transom drawing 055/004/07. 6mm vertical is 7mm down the angle of the transom. Top of deck is at 505 above the dwl so top of shelf will be 498 above the dwl (all measured up the transom angle).

9.1.10 You will have to estimate the line to cut the aft end of the shelf as the action of pushing the shelf a further 12mm in will alter the angles etc. a little. the shelf does not have to be a perfect fit because the transom beam will provide a backing for the join in due course.

9.1.11 Once you are happy with the fit of the shelf it can be bonded into place. It is probably best to drive some (permanent) screws from the shelf to the frames to hold the shelf in place while the WEST is curing. Use two 1" x 6g or 1·25" x 6g screws and drill off for these before the WEST is applied. Be careful to drill them parallel to the frame faces so the screws don’t break out of the sides. At the aft end, screw a temporary piece of timber to the outside face of the shelf, and screw this temporarily into the transom edge.

9.1.12 Now bond the shelf in place with WEST/#403, wetting out thoroughly as usual. If the shelf was hard to pull round, leave the spanish windlass (or windlasses) in place until the WEST cures.

9.1.13 Fit and bond the other side shelf.

SECTION 10 - PLANKING

10.1 Inner skin.

10.1.1 The inner skin is 6mm Cedar or Douglas Fir strip planks fitted close.

10.1.2 There are usually three possible types of strip planking available (and in the UK, only in Western Red Cedar).

10.1.3 The first simplest style is square edged - simple rectangular profile planks, say 6 x 15. This is very easy to plane up yourself from baulk material. The only disadvantage with simple rectangular planks is that they need some form of plank-to-plank edge fastening to ensure that they run in line with each other. People (usually manufacturers of profiled systems) may tell you that square edge is unsuitable because a gap will open up on the outside as the planks lay round the girth - this is of course true but the gap is so small as to be of no consideration - in any case it fills naturally with WEST as the skinning continues.

10.1.4 The second type has one convex and one concave edge. The theory is that the convex edge sits in the concave one of the previous plank, which thus helps to keep the planks in line with each other. The concave edge also makes a good reservoir for the WEST, so that it doesn't all run away down the plank faces. Finally the concave/convex edge system is supposed to allow the planks to lay round the girth of the boat better. This last claim is not of practical consideration - and in fact because of the feather edges, convex/concave often produces a less god internal finish that plain square edge carefully done. You will also hear that the concave/convex edges are of a special geometry - again we have not found this to be true. We have found equal success (or otherwise) with stuff machined up ourselves using simple matching convex and concave cutters (which we grind ourselves) in a spindle moulder.

10.1.5 The third type (sometimes called speed strip in the UK) has a tongue on one edge and a groove in the other. It is in fact a slightly modified version of plain old tongue-&-groove matching. The tongue is only about as deep as the groove is wide and has a rounded off edge. This allows the planks to rotate slightly one on the other so that they can lay nicely round the girth. The function of the tongue-&-groove is (as with the convex/concave) to make the planks run nicely together - which it does very successfully. The groove also acts as a reservoir fot the WEST. This type possesses the best features of the previous two types - the nice clean square inner edge of the square edge type and the guiding function, WEST reservoir function and no requirement for edge-to-edge fastenings of the concave/convex. The only criticism that we have heard of this type is that it is possible to get voids (i.e. lack of WEST) in the grooves - but careful attention to pouring the WEST in the grooves should obviate this. If you can't obtain this type - and we do recommend it - then it is not difficult to make yourself (given a spindle moulder). You can grind the cutters yourself from blanks (use the Whitehill type head). You will need to make up a few sample bits first by hand to get the geometry right - but it is not very complicated. The planks should be 6 x 25, or a bit wider, say 6 x 30. The actual width is not too important as long as they are all the same.l.

10.1.6 Machining your own planking may sound a nuisance, but it does give you greater choice of timber - to get a lighter coloured interior by using Douglas Fir for example, or Yellow Cedar, rather than the rather dark Western Red Cedar.

10.1.7 We are assuming that you are using tongue-&-groove type strip. But there is little procedural difference whichever type you use - just that with simple square edge (our next preference after tongue-&-groove) you will need to drive edge fastenings. If you are to do this use brass or stainless panel pins. The longest you can usually obtain these is 30mm, so the widest you planking can be is about 20mm - you wouldn't want to go much wider at only 6mm thick in any case.

10.1.8 The first plank will be bonded on with its edge flush with the edge of the sheer. We shall lay the planks groove uppermost, so that we can pour the WEST into the groove and it will mostly stay there. So on this first plank, the tongue will need to be planed off. The planking may not be long enough to go round in one length. There is no need to scarph the length of plank together - just simply butt them. the butts will be well supported by the previous and next planks, as well as the two diagonal outer skins. Stagger the butts well - by a minimum say of 200mm (though in practice a greater distance should be easy to achieve).

10.1.9 The planks will be bonded to the frames (and any other bits of structure available). It is also convenient to nail or staple them to the frames and structures. We prefer nails for this job - brass or stainless panel pins, or nylon nails

10.1.10 With a boat of this style, with a traditional stem, the plank ends fwd will have to be fitted. With a more modern style boat the stem is all internal and the planks just run over it to be cut off flush afterwards. The same is true to a certain along the backbone where our skin has to be fitted up to the keel. However, even on a more modern style boat, the planks have to be fitted to each other down the centreline, so here at least we don’t really have any more work. At the transom, the planks can be left just overlength and trimmed back flush later, after the WEST has gone off.

10.1.11 So, fit the first plank, with its edge flush with the top edge of the shelf. Fit the fwd end first, angled off to suit the stem. Let the aft end overhang the transom a bit (say about 20mm). Bond the plank to the shelf, and the apron and transom faying surfaces fastening it as necessary Wet out the bonding surfaces as usual, including the fwd end of the plank (and any butt ends) and then bond with WEST/#403.

10.1.12 Fit the first plank on the other side. Indeed, we shall always keep the two sides of the boat about evenly planked - don’t plank up all one side first, else you may tend to pull the frames out of square.

10.1.13 Get out the second plank and fit the fwd end (and any butts). Wet out the two edges with a small brush (cut the hairs off quite short); wet out the surface of the plank and the ends, the shelf, and the transom and apron faying surfaces. Then run WEST/#403 into the groove of the previous plank and apply WEST/#403 to the surface

of the plank etc. Make the WEST/#403 thinnish mayonnaise consistency so that it will pour satisfactorily. Fit the plank up. pushing it well down into the groove of the first plank; fasten as necessary. Repeat on the other side.

10.1.14 With the third plank we are getting away from the shelf and so the planks from here on will be bonded to each other and to the frames, transom and stem. When the plank is being fitted up, mark the frame positions etc. on the plank so that you know where to wet it out. It is usually easier to apply the WEST/#403 to the frame edges and the transom and stem faying surfaces (as well as in the previous plank groove), rather than to the surface of the plank.

10.1.15 It takes a plank or two to establish exactly the best consistency of WEST/#403 and how much to apply so as not to get voids, but on the other hand not to have vast amounts going to waste and running down the planks. Clean off the excess as you go, don't leave it until later. A rag damped with acetone or WEST solvent can also be useful to wipe over the inside off the planking from time to time, but don't be so vigorous with this that you wipe the WEST out of the plank seams.

10.1.16 With square-edge planking you must take care that the planks run flush with each other on the inside, so you will need to hold them while you drive the edge fastenings. If you are working single handed you will almost certainly need to devise clips of some sort to hold them flush together while you nail them. The simplest is a piece of thin ply with a 6mm wide slot cut out of it, which you just push over the planks. If you have a helper, then one of you can hold the planks flush while the other nails

10.1.17 Tongue-&-groove planks should stay running even with each other by virtue of the tongue-&-groove - however just keep a check as you fix the planks to make sure that this is so. Apply a few clips if necessary.

10.1.18 As you proceed with the planking you will find that you will gradually have to apply edge bend to the planks to get them to fit down tightly on the previous plank. The amount of edge bend will gradually increase until you get to the point where it is too much for the plank, or is starting to produce distortion in the planks. At this point we need to fit some 'stealers' until we are back straight again. The reason for all this is basically that the girth of the boat is greater amidships than it is at the ends.

10.1.19 A stealer is a tapered plank that (usually) does not run full length. In this case the stealers will most likely be widest in the middle and taper down each end - rather like a half-moon shape.

10.1.20 To make the first stealer, get a length of plank out, probably about half or three-fifths full length. Let it lay on the previous plank, so that the tongues at the ends are sitting in the grooves in the previous plank. Edge bend the plank so that the maximum gap between it and the previous plank is at the maximum the apparent plank width (i.e. the width you see, which is the total width less the depth of the the tongue). Measure the gap from the mating edge of the stealer, not the edge of the tongue. Tack the

plank in position like this. Now, using a dummy which is the apparent width LESS the tongue depth, dummy the shape of the edge of the previous plank on to the stealer. This line will be the edge of the tongue on the stealer.

10.1.21 Remove the plank from the boat and cut it out to the marked shape. Then machine the cut edge to form the tongue. The resultant plank should now fit into the previous plank, with the tongue in the groove all along.

10.1.22 If you are not going to form a tongue on the stealer (because you maybe don't have the necessary spindle or router), then fix the plank up as described but dummy off the using a dummy the apparent plank width. Then remove the plank and cut to the dummied line, which will remove all the existing tongue and reproduce the just the mating edge. Then when fitting the plank you will need to edge fasten it as if it were the square-edge system. You will need to fill the groove on the previous plank, preferably with a spline of timber WESTed in.

10.1.23 Another alternative is to run a groove in the shaped edge of the stealer and insert a double width tongue - this is probably quicker than fitting a spline in the previous plank groove and rather more satisfactory. And you are more likely to have a grooving cutter available than a tonguing cutter. If you are using a router for this purpose it is much easier if you make up a table and mount the router under it, with the cutter sticking up. Then with a simple fence, you can pass the timber over the router, rather than trying to move the router along the timber. This applies whenever you are routing small, difficult-to-hold, or difficult-to-handle pieces of timber - it is easier to pass them by the router than pass the router over them. If you have a spindle moulder or an overhead or table router, then you don't have a problem.

10.1.24 Continue fitting stealers, each of which will have less edge bend and be longer than the precious one, until you get to full length again with very little, or no, edge bend.

10.1.25 Then start to strip plank again in the usual way. One set of stealers may be sufficient and take enough girth out to get you to the keel. Or you may have to put a second set in.

10.1.26 There are other methods of setting out strip planking. The most usual alternative is to lay a "king plank" around the bilge, with little or no induced edge bend. You can mark the run of this by bending a wide (but thin) straight edge around the bilge; as the straight edge will not easily edge bend you are finding the shape of a straight line around the boat - it will look a bit like a banana shape on the boat. Fix this king plank and then plank above and below it. because you are starting in the middle like this you may then be able to plank right out without any stealers, or at most one set down towards the keel. This system works very well, but we don't feel that the internal appearance in the upper part of the hull is so good. Instead of running roughly with the sheer, the planks are sweeping up at the ends, with more and more banana shaped looking planks as

they near the sheer amidships. We find this a bit disconcerting, giving the impression of excessive sheer.

10.1.27 Going back to our original method now, as you near the keel, you will start to need to fit the ends to the keel. This will probably happen first up fwd with a gradual transition from fitting the ends to the stem, to fitting them up to the keel. It will also happen aft eventually, so you will be getting (banana shaped) planks that need fitting at both ends.

10.1.28 As you are planking you may find that the shape of the boat looks peculiar. This is because you are looking at curves that you are unused to. We are used to the shapes of diagonals, waterlines and buttocks, but the run of strip planking is none of these, so we do not have any inbuilt expectation of shape or feel for it. these peculiar shapes usually disappear as you complete more and more of the planking and the boat starts to assume its true 3-dimensional surface shape. Only if you think that there is a definite bump or hollow developing do you need to get concerned at all. This shouldn't happen because we know that the boat is fair - the computer says so and, more importantly, previous boats have been so.

10.1.29 There is one area that can get unfair rather easily however and this is around the forefoot. Boats like this with fairly full lines and quite upright stems are changing shape very quickly in this area, so a quite tiny can show as an unfairness. If the strip planks seem to be running unfair in this area, then it is worth checking with a batten to try and sort the problem and clean a bit of material off the apron or the first frame (whichever you need to cure the problem). Elsewhere, on the boat with the gentler curves, minor errors (indeed often quite big ones) will not show up so much.

10.1.30 Once you have completed the inner skin strip planking and allowed the final WEST to cure off, sand the outside of the hull thoroughly but not heavily. The purpose is to remove any excess WEST, odd bits of timber sticking up, minor angularities etc., not to reshape the boat. More damage (to the hull shape) can be done at this stage with a sander than one would imagine. Once the hull is smooth, run you hands over it - you will be surprised how sensitive your hands are and how small an inconsistency they can pick up. Mark any areas that you think are unfair and run over them preferably hand sanding, not machine sanding. Trim the ends of the planking off round the transom, flush with the transom aft face. Dust the hull down and WEST fill any crevices, dents etc. Sand gently over again, dust down and WEST coat the entire hull surface. Allow to cure and sand smooth.

10.1.31 You are now ready for the next skin.

10.2 First diagonal skin.

10.2.1 The first diagonal skin is 3mm Khaya veneers laid at about 45º over the outside of the strip planking. The final skin will be the same, but laid at 45º in the other direction (i.e. at about 90º to the first diagonal skin) over the outside of the first diagonal skin. It is

immaterial structurally which diagonal you choose first - most people like to have the top ends of the final skin pointing fwd.

10.2.2 The diagonal skins are usually stapled on. the staples can be left in the first diagonal skin, but are removed from the final one. Use stainless, bronze or nylon staples, preferably in an air operated staple gun. The staple should have about a 10mm crown (the distance across the top) with 6mm legs for the inner skin - they can have 8mm or 9mm legs for the outer skin if required. You will need a surprising amount of staples, especially for the inner skin as they do not get a very good hold (poor in Cedar, much better in Douglas Fir). It is difficult to be precise about this - but you will probably need about 30,000 to 40,000 staples in all; they usually come in boxes of 10,000.

10.2.3 Before starting to lay the diagonals, you will need to experiment with the staples and gun. Take a piece of Khaya veneer and try stapling it to a piece of cedar. Staple across the grain of the Khaya. Adjust the air pressure until the gun drives the staple just below the surface of the Khaya. You have to press the nose of the gun firmly against the timber to get a proper drive.

10.2.4 A second tacking stapler is also useful - this is the same type of machine but driving longer staples. You will need lots of squares (say 30 x 30) of thin ply or hardboard and the staples need to be longer by the thickness of these (say 9mm if using 3mm hardboard). You will use these when you want to tack a veneer in place for fitting etc., so that you can easily remove the tacking staples.

10.2.5 The most usual place to start the diagonals is roughly amidships with (as in this case when there are two layers of veneer) the top end pointing aft. The angle is not too important - just guess at 45º. Mark a 45º line at your starting position, using a batten bent round the hull.

10.2.6 Now that the hull is a complete surface, you can veneer one side first and then the other. Do all of the first veneer skin however before proceeding to the second.

10.2.7 Just as the strip planks needed edge bending and then edge fitting, so will the veneers. because they are wider however (typically 100mm to 150mm) and thinner, you will not be able to induce much edge bend before they wrinkle up.

10.2.8 There are several methods of fitting the veneers. Perhaps the simplest is to edge fit each one. A common alternative is to edge bend as many as possible, then leave a gap and start straight again and so forth - finally going back and veneering in all the gaps. Some prefer to dry fit a group of veneers and then have one good WESTing session; others prefer to WEST bond each veneer as it is fitted. The method we prefer for a small boat is to edge fit each veneer and bond it on as you go. This is not so tedious as it sounds, because edge fitting is very easy and you are always up-to-date on your WEST bonding. It is probably a little more wasteful of WEST.

10.2.9 So, get the first laminate out at a width that will use your veneers economically - not much narrower than 100mm and not much wider than 150mm. Lay it round the hull with one edge near enough on your starting line marked on the hull. Tack it in place with the end close up to the keel and mark off the keel angle. If you have a helper, then life is much easier because the veneer can usually be held in place, reducing the amount of tacking you need to do. Also mark the sheer line on the veneer.

10.2.10 Remove the veneer and cut the keel angle on the end. Cut the sheer end - leaving it perhaps 25mm long.

10.2.11 Wet out the surface of the veneer and then apply WEST/#403. A good even coat is required; you may find that a notched spreader is useful here - you can make these from bits of plastic laminate with about 3mm notches spaced with 3mm in between. The WEST/#403 consistency should be mayonnaise. The hull has already been WEST coated and sanded so it should not require any wetting out or further attention, apart from a wipe over with a solvent dampened cloth from time to time.

10.2.12 Lay the veneer back on the hull and push the end firmly up to the keel and tack a corner in place. Smooth the veneer down round the hull so that it runs roughly on the 45º line on the hull and tack the top end. Return to the keel end and start to staple the veneer down on to the hull working from the middle line of the veneer out to the edges. You will need staple spaced at about 40mm from each other in both directions. Keep the outer staples just in from the veneer edges. Press the veneer down with you hand as you staple so as not to get bumps of WEST or bubbles of air trapped under the veneer. Once you are about half way to the sheer, remove the tack staple at the sheer, so that the veneer can slide smoothly over the hull. Make sure that you are not driving the staples so hard that they are piercing through inside.

10.2.13 Clean off the excess WEST. As with the strip planking, you will get to know the right amount of WEST to apply so as to get a good wet bond but not too much excess.

10.2.14 Have a feel and tap over the veneer to find any bumps or bubbles. Often these can be fixed with a tacking staple or two through a square of hardboard (covered in parcel tape or similar). If not you can make a cut in the veneer, perhaps cutting a very thin lens-shaped piece out and then pulling down the edges with staples. If for some reason you miss a defect, it can be dealt with later on when the WEST has cured - especially on this skin which is going to be covered up.

10.2.15 Get out the material for the next veneer and lay it alongside the previous one. Mark and fit the keel end, and cut the sheer end off about 25mm long. The veneer will now lay against the previous one either touching somewhere in the middle and with gaps top and bottom - or gaps in the middle and touching top and bottom. Use a dummy about as wide as the widest gap (an odd bit of veneer does fine for this) and dummy the shape of the edge of the previous veneer on to the new veneer. take the veneer off the boat and cut the edge to the marked shape. You can use a Stanley knife for this, but we

find these tend to run off with the grain rather than follow the line. If the amount is small (an as we are fitting each veneer, it usually is) the a small thumb plane is often the quickest. Or push the veneer through the circular saw, with a small diameter (say 150mm) fine toothed saw in it. We prefer a thumb plane well sharpened and set fairly coarse, and the veneer laid on the bench.

10.2.16 Once you have fitted the edge just try the veneer back in place to check that you have got a good fit. As you get practised, you won't need to do this, just bond the veneer straight on from the first fitting.

10.2.17 Bond and staple the second veneer on alongside the first one. Clean off the excess WEST etc. as usual. Then proceed to the next veneer. Every now and again, say every seven or eight veneers, you may like to go back and trim the sheer off closer to the shelf.

10.2.18 Continue in this way until all the veneers on one side are fitted. As you go fwd, you will gradually be fitting the veneers to the stem rather than the keel. Aft, they will overhang the transom to be cut off once cured. If the angle of the veneers starts to get extreme, then fit a tapered veneer or two to restore it near to 45º.

10.2.19 Veneer the other side in the same way.

10.2.20 Once both sides are veneered and trimmed and the final WEST has cured, sand over the hull to remove excess WEST etc. The edges of the veneers may have curled up a little and these will need sanding down. Any bumps that are full of WEST (i.e. don't tap hollow) can be sanded flat. Any hollow bumps should be cut out and either WEST fill, or have a piece of veneer let in and bonded in. make sure all the staples are flush (or below) with the surface of the hull. It doesn't matter if you sand the crowns off any that are proud, just leaving the legs in the hull. WEST fill any small gaps, crevices etc. and sand smooth. Dust down the hull and WEST coat all over; sand lightly when cured.

10.3 Outer diagonal skin.

10.3.1 This is fitted at 90º opposed to the first diagonal skin. And this time the staples are removed. Otherwise there is no real difference in the process.

10.3.2 By now you should have got pretty good at fitting the veneers and bonding them on, which is excellent as we hope to get the best finish possible on this outer skin, so the fewer glitches, bumps etc. the better. Also, the better the edge fit of the final skin veneers, the easier is the final finishing of the hull. With this skin take more care fitting the ends of the veneers to the keel and stem as well

10.3.3 To remove the staples we need to staple them through something. You can use polypropylene binder twine but this tends to leave a dent in the veneer under each staple and often only pulls one leg of the staple out. The best material we have found is heavy

duty parcel binding tape. This is usually about 15mm wide, with a nylon crisscross reinforcing laminated in it. It is used in mechanical parcel binders. You do need a heavy duty grade - the lighter grades just split lengthwise when you staple through, or break off when you come to pull the staples out. The tapes are stapled at the keel end and run down the length of the veneer in rows about 40mm apart, with the staples driven through them. With luck and care, when it comes to remove the staples, you can pull on the end of the tape and lift all the staples in that row right out. If at all possible have a test run to ensure that you've got the right tape.

10.3.4 So, proceed with this skin generally as before, making the best job you can of it.

10.3.5 Once the WEST cures, remove the staples - you don't need to wait until the whole skin is finished but can just remove the previous day's batch as you go.

10.3.6 Once this skin is finished, go over it carefully to remove any rogue staples and then sand the whole surface as before. WEST fill any crevices etc. - hopefully not too many on this skin - and re-sand. Ensure that any gaps in the hull skin join with the keel and stem are carefully filled. WEST/#406 silica makes a smoother filler than WEST/#403.

10.3.7 Have a final trim round, sand and dust down - and then WEST the hull one coat. When this is cured, sand lightly.

SECTION 20 - CENTRECASE RUNNERS, STEM & BILGE RUNNERS

11.1 Centrecase runners

11.1.1 The centrecase runners fit each side of the keel, on top of the planking. Their purpose is to swell the width of the keel in way of the centrecase. The bottom face of the runners will be flush with the face of the keel .

11.1.2 They run the full length of the centrecase, extending 200mm fwd and aft of it each end.

11.1.3 Get out the basic material for the runners, allowing a extra depth for bevelling the top faces (to the skin/keel bevel).

11.1.4 Establish the bevel required - say every 200mm - set this out on the runners and bevel off the top faces. Fit the runners up and adjust as necessary to get a good fit. Plane a small chamfer off the inside top corner, to ensure a tight fit up into the keel/skin "corner".

11.1.5 Bond the runners to the skin and keel sides - fit spacers in the centrecase slot if cramping right across.so that the slot is not squeezed together.

11.1.6 When the WEST has cured, clean off the outside face of the runnerss flush with the face of the keel.

11.2 Bilge runners

If you are going to glass cloth the hull don't fit the bilge runners until after you have done this.

11.2.1 The bilge runners can be any reasonable size - say 30 wide x 25 thick. They are screwed (use 11/2" x 10g) about every 125mm) and bonded on to the skin at about 400 out from the centreline. Their actual extent lengthways is not particularly important, but from Position –1500 to position –3200 will be about right.

11.2.2 The last 100mm each end can taper from 25mm thick down to 12mm.

11.2.3 You can fit brass strip (25 x 3 or similar) to the underside of the bilge runners. Bore off for this at about 100mm intervals - but don't screw the strip down until the hull is finished off and WESTed. When you do screw the strips on, bed them on Sikaflex 212.

11.3 Profiling the stem.

11.3.1 This is profiled off as noted on the longitudinal structures drawing.

11.3.2 Finally sand the runners, keel and stem up smooth and WEST one coat. Allow to cure and sand lightly.

SECTION 12 - FINISHING OFF

12.1 Glass cloth

12.1.1 Now we have a choice about whether to incorporate a glass cloth membrane in the final WEST coating system. This is not necessary structurally at all but it does provide abrasion resistance and it also helps the WEST coatings to wick over the staple holes (which although very small can be a nuisance with the WEST forming "fish-eyes" round them). So we recommend incorporating a thin woven glass cloth with the second WEST coat.

12.1.2 Use a fairly open weave cloth about 250 g/m2 to 300 g/m2 in weight. Your WEST supplier should be able to recommend the most appropriate weave - it mustn't be to tight a weave or else you will have difficulty wetting it out.

12.1.3 You can dry lay or wet lay the cloth. With dry lay you lay the cloth on the dry hull and apply the resin over it and work it down through the cloth. With wet lay, you

coat the hull and lay the cloth on the wet resin and work it up through the cloth We prefer wet lay.

12.1.4 On the hull, the cloth lays best like the diagonal veneers, draped in lengths at about 45º, opposite to the final veneer direction.

12.1.5 The keel, deadwood and stem should be glass clothed before the hull and the cloth allowed to run about 25mm on to the hull skin, to a nice neat finish.

12.1.6 Start with the aft keel area. You may need to radius off the keel edges a little more to help the cloth drape easily.

12.1.7 Mask the hull a parallel 25mm away from the keel. Get out the length of cloth you need. When you cut the cloth stick a wide length of masking tape where you want to cut and cut down the middle of this - the cloth will then be prevented from fraying out. Large scissors (about 250mm or so blades) are best for cutting glass cloth.

12.1.8 You may find that slow hardener #206 is better for this job as it gives you more working time. You will also need some ribbed rollers (#811) or washer rollers (#812) for wetting the resin through the glass. Wear gloves as you have to handle the glass cloth with WEST on it.

12.1.9 Apply a good heavy coat of WEST on the area to be glassed. Lay the cloth in place over the keel and press it down along the bottom face. Roll it down gently with the ribbed rollers, forcing the WEST to wet through the cloth. Smooth the cloth down the sides of the keel on to the hull and work it into the WEST coating with the ribbed rollers until the cloth is very thoroughly wetted out. As the cloth wets out you will find that it can take up more shape - so go back to any areas that wouldn't lay properly the first time around. With slow hardener you have plenty of working time so don't panic - just keep working on different areas and it will gradually fall into shape.

12.1.10 If there is not enough WEST to come through fully, you can apply some extra on top and work this well in with the ribbed rollers. Don't use the rollers too fiercely or else you will start to fluff the cloth up.

12.1.11 Allow the WEST to cure 'green' before you do any trimming off. It is very easy then to trim excess cloth off with a sharp Stanley knife (and a straight edge for long cuts). Once the WEST has fully cured sand the edges on the hull skin to as feather edge.

12.1.12 Now cloth the rest of the keel, running 25mm on to the hull skin.

12.1.13 The stem is a little more difficult and is probably best done in short lengths the width of the cloth wrapped round the stem horizontally. You can overlap the joins and sand them smooth after they are cured. Or you can wait until the WEST has started to go off but is still just flexible and then cut through both layers of the overlap

with a sharp knife and straight edge. Remove the excess from the top layer and then peel back the top layer enough to remove the excess from the bottom layer. Press the top layer down again and it should be a perfect butt join. You will need to apply a little more WEST to the join and lightly roll over it with the ribbed roller. This latter system only works when you have the time to get at the join at just the right moment in the cure process - if you can't manage this, just leave the overlap join and sand it off later.

12.1.14 Cloth the transom, wetting the cloth out so that it is turned on to the hull by 25mm.

12.1.15 Now we can turn to the hull. Start by getting a length of cloth out somewhere amidships. Cut one end to the keel angle and drape the cloth down over the boat. Cut the other end off roughly to the sheer. Leave the cloth a bit over length each end. Get out several such lengths.

12.1.16 WEST the area of hull that you have cut the cloth for. Drape the first piece of cloth and work the WEST through with the ribbed roller. Do the same for the other lengths. Have plenty of WEST at the overlaps.

12.1.17 As the WEST is getting sticky, go back and cut the keel ends of the cloth off to fit just up to the keel side but not turn up it. WEST these ends well down.

12.1.18 Now go over the whole area with the roller, smoothing out any air pockets or any puckered areas. As the cloth wets out it will become more flexible and drape to shape easier.

12.1.19 If you have time, deal with the overlaps now - if not leave until the WEST has fully cured. Do make sure the cloth is thoroughly wetted out - apply extra WEST if needed.

12.1.20 Continue until the whole hull is glass clothed both sides.

12.1.21 Once the WEST has fully cured, go over the whole hull and deal with any defects, sanding off overlaps etc. Tidy up all the edges especially around the transom and up against the keel and stem. The sheer will be finally cleaned off when the boat is the right way up.

12.1.22 Once the hull, keel, stem etc. are smooth and any defects WEST filled and sanded off, apply two further coats of WEST, sanding between coats. This should entirely fill the weave of the cloth and leave a smooth surface. Before the final coating is is a good idea to mark the waterline and boottop.

12.1.23 If your cloth was a very open weave this may not be the case. So, after the first of these final coats, skim over the entire hull with WEST filler. WEST/#410 microlight is the easiest to trowel and sand - but it is not recommended if you are going to overcoat with a dark colour. In this case use WEST/#407, perhaps with a small amount

of #406 silica mixed in to improve smoothness. Don't apply vast amounts of filler but trowel over the whole surface with a wide bladed trowel knife, just filling the cloth weave and scraping off as much excess filler as possible. When the filler is well cured, sand over the whole hull and apply one or two more WEST coats.

12.1.24 Finally sand to a smooth matt finish overall, ready to start the final paint systems. Before the final coating is is a good idea to mark the waterline and boottop - see §12.2

12.1.25 If you are not going to lay glass cloth, then we recommend four WEST coatings, sanding between each. You will need to go carefully over the hull after the first (and probably again after the second) coat to spot fill the staple holes. A general trowel over the hull surface (as ¶12.1.23) is possibly the easiest way to catch all these. You can with advantage add #420 aluminium powder or to the final coat, to increase the hardness of the coated surface. Or, below the dwl, you can add #425 copper compound which perform the same function and also increase water resistance and act as a foundation for the antifouling. Before the final coating is is a good idea to mark the waterline and boottop - see §12.2

12.2 Marking the waterlines

12.2.1 The waterline is marked at 50mm above (nearer the sheer) the dwl. This will be the antifouling line. The boottop (if required) is painted parallel vertically to the waterline. This will mean that the actual width on the planking will vary according to the hull angles, but that viewed level, the boottop will appear parallel.

12.2.2 The waterline and boottop line are marked in pencil before the final WEST coating, so that they are permanent.

12.2.3 Rig up two posts just aft of the transom and two posts just fwd of the stem. The posts should be a reasonable distance apart - say 2000mm - and fixed firmly and braced fore-&-aft. The posts do not need to be dead upright, but it is just as easy to make them so. Nor do they need to be exactly square to the centreline.

12.2.4 Fix a long board (say 25 x 150) across the posts each end. The planks must have a straight top edge and must be set on the posts so that they are level across. They should be positioned vertically so that their top edges are 50mm above the dwl - You can measure this off the jig rails. The planks need to be about 3000mm long if possible, sticking out about equally each side of the boat.

12.2.5 The basic method of marking the waterline is to stretch a thin strong line from the top of the aft plank to the top of the fwd plank. Adjust the line sideways so that it just touches the hull about amidships. Tick off this point on the hull. The move one end of the line in and the other out, so that the line just touches the hull about 100mm to 150mm away from the first place. Mark this point. Continue in this way, moving the line so that

it lies tangential to the hull at about 100mm to 150mm intervals, marking each point off on the hull.

12.2.6 Unless your planks are very long, they will not be wide enough to mark the ends. You will need to set up a third post each side. These will have a length of level plank fixed to them, the inner end of which can rest on a waterline mark already made on the hull. You will need to set these up first as near the stern as possible and mark the waterline round the hull to the transom. Then move the third set of posts etc. forward and repeat the procedure round on to the stem.

12.2.7 To mark the waterline in fully, you will need a batten and several people to hold it in place. Hold the batten around the hull so that it lays fair over the waterline marks. Mark the waterline in.

12.2.8 To mark a vertically parallel boottop, you follow exactly the same procedure with the planks set the boottop width higher - or easier, with a boottop thickness block held on top of each of the planks. If you use blocks under the line, then you can mark the boottop at the same time as the waterline, which saves setting up the planks etc. twice. A good width for a boottop would be about 30mm.

12.2.10 The waterline can be marked straight across the transom. To look traditional, it can be marked in a half-moon rather than a straight line. Boottops are not usually marked across the transom - and certainly not if the water is marked as a half-moon.

12.2.11 Then have a final sand over the hull and the final full WEST coat.