

Building an eighteen foot cutter

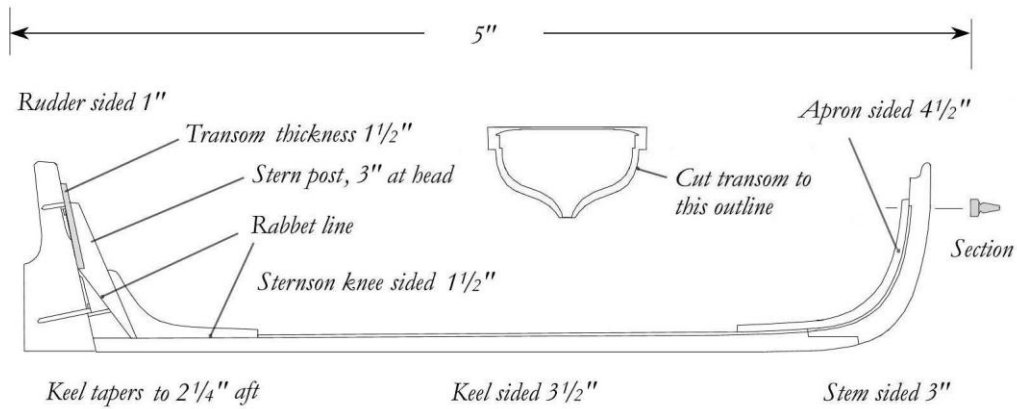
© 2009 David Antscherl

There are many different methods to build small open boats. This is just one of many possible ways to achieve a satisfactory result. Here is a list of useful tools:

Surgical scalpel blade holder	Heat bending tool
#11 blades for the above	Necessary wood, pre-thickened
Swivel vise	Card for templates
Small cutting mat	90% ethanol
Clutch lead holder and 4H leads	Painters' tape
A sheet of 220-grit garnet paper	Swiss files
A sheet of 80-grit garnet paper	Steel straight-edge (6" or 12")
Small bottle of white glue	
An 0 or 00 size quality 'round' brush	
Ship's curves: <i>make them as described in the instructions</i>	

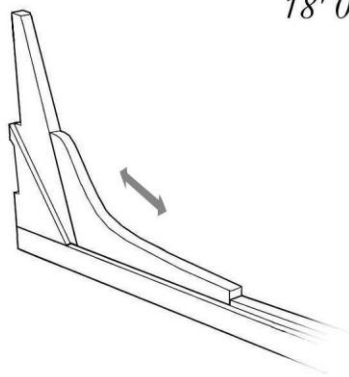
Let us begin with the keel. This is to be cut from stock 3½" thick. (All measurements given here, unless specified, are in scale feet and inches.) Note that the fore end of the keel begins to rise or 'rocker', so that you must allow for this when laying and cutting it out. Do not worry about tapering the keel at this point. Cut the keel piece a little over-length, say by about ¼" full size. Allow the extra length to overhang at the stern. Now mark out and cut the scarp joint at the bow.

The next job is to cut in the rabbet. This is easier to do than on a ship model. It is simply a right-angled rebate. I cut my rabbet with the scalpel. If you've never used a scalpel before, you need to be very careful. The extremely sharp blade was designed for cutting skin and flesh, which it will do very efficiently if you are not careful! It is much keener than your average X-Acto blade, so treat this tool with respect.

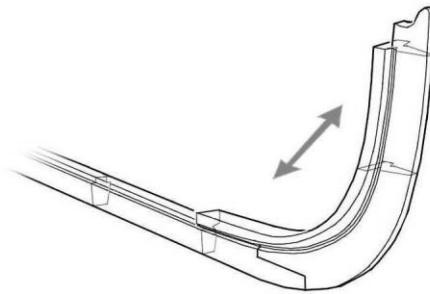


18' 0" cutter, scale 1:48

Backbone



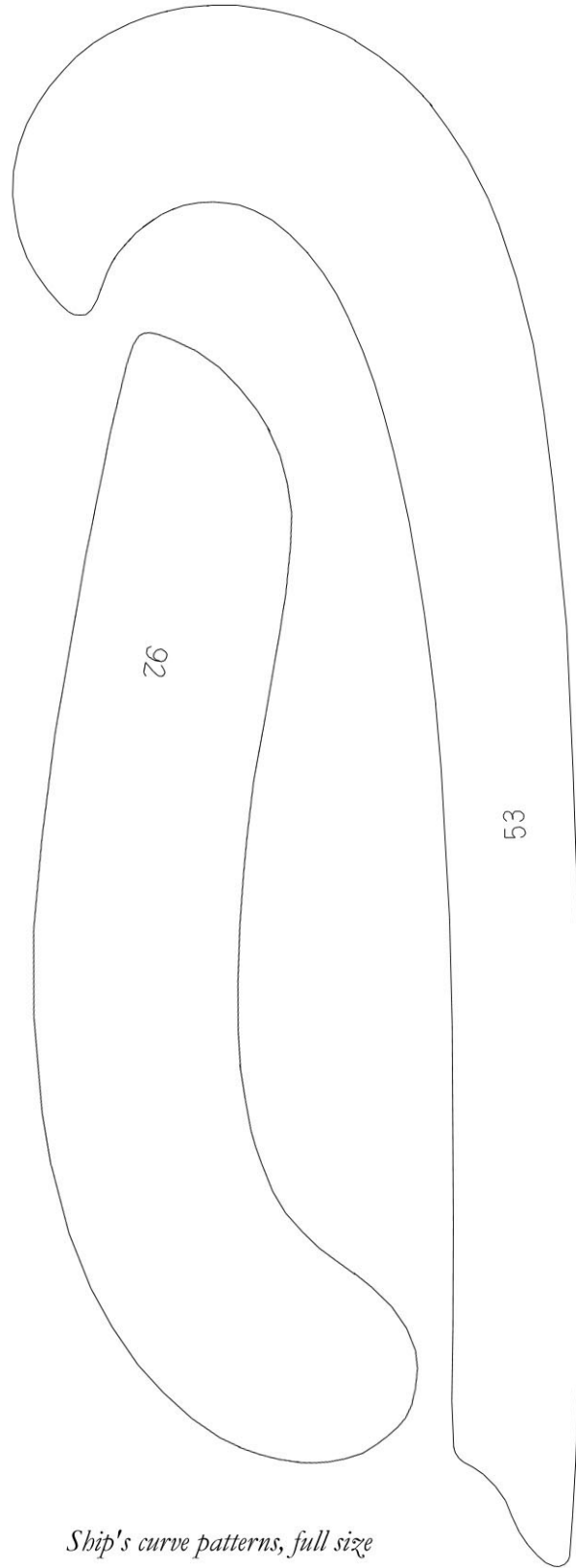
Perspective of sternpost and knee



Perspective of stem and apron

To begin the rabbet, mark out the lower line along the side of the keel with a sharp 4H lead. When marking out, you need to be extremely exact. If not, your rabbet on each side of the keel will be at different heights and the boat lop-sided. Once satisfied with your mark-out, take a metal straight-edge and position it on the keel. You will need to place a piece of card or wood of similar thickness to the keel under the straight-edge as a shim to stop it rocking or slipping. With *extremely* light pressure, run the scalpel blade along the keel to the point where the rabbet begins to rise at the bow. To follow the rise of the rabbet here, follow the instructions in the next paragraph.

In order to cut this curved line, a template is needed. I have supplied patterns for two ship's curves (next page), assuming that you do not have a set of your own. Glue these to a piece of 1/32" (actual) thick model aircraft plywood or clear acrylic sheet, cut them out and sand the edges smooth. These curves will be essential when it comes to cutting planks.



Ship's curve patterns, full size

To complete the rise of the rabbet, use a suitable section along one of your new curves as the template. Turn the keel over and repeat this process on the other side. Now mark out the top of the keel. The rabbet should be 1" deep. Again, position your straight-edge with a shim under it, and run your blade along the line lightly. Repeatedly cut lightly from side and top until the strip of wood separates in a nice curl. If you have handled your scalpel deftly, the rabbet should be crisp and clean.

Next is the stem and apron assembly. I opted to make this in one piece. If you wish to make the two pieces separately, feel free to do so. However, to get a nice close fit at the joint between stem and apron will be extremely tricky. Assuming that you will make this from a single piece, note the grain orientation (grey arrows on the perspective illustration). Mark the combination piece out on 4½" stock. Cut out the scarph joint with the lower edge of the apron and fit this to the keel. Don't cut the rest of the stem/apron to shape yet. (This will allow you to adjust the piece before finishing it so that the stem will be positioned exactly relative to the keel. This is critical for the backbone to fit your plug properly.) Once you are satisfied with the fit of the scarph joint, check that the stem exactly fits over the scale drawing. If it does, cut the rest of the profile out. If not, erase the pencil line, re-draw it in the correct position and cut it out.

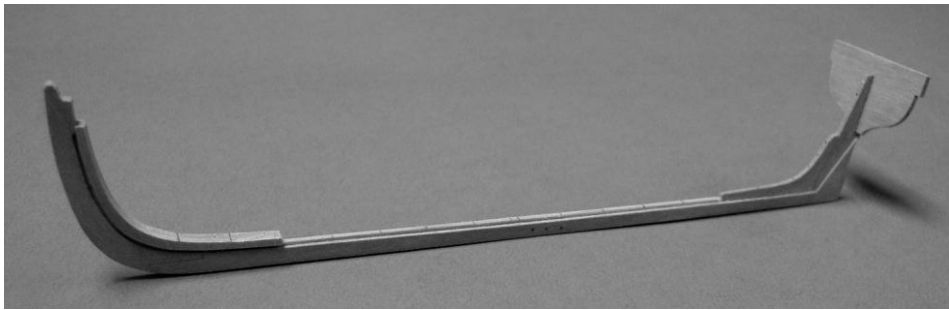
Before gluing up the scarph joint, the stem needs to be narrowed to 3" thick from the aft side of the stem rabbet forward. Mark out the rabbet if you have not already done so, ensuring that both sides match.

Using a ship's curve as a guide, run your scalpel blade along the aft rabbet line on both sides of the stem. With a well-honed chisel, pare the sides of the stem until it is 3" thick. The stem will be tapered later on. Next, mark the fore edge of the stem rabbet and cut this as you did the keel rabbet. Note that rabbet stops below the upper end of the apron. When satisfied with your work, glue and treenail the stem/apron to the keel. As the apron is 1" thicker than the keel, shim the keel ½" up from the bench so that the stem is centered on the keel.

The next step is preparing the keel for the sternson knee. Cut the top of the keel down to the lower rabbet line (see the illustration). Make sure that the top surface is truly level and

flat, and that the cut is exactly according to the plan. If it is 'off', the sternpost will be either too far forward or aft and the backbone will not fit the plug.

Trace and cut out the sternson knee, aka deadwood, from 1½" stock. Make sure that the grain of the wood runs diagonally. Next is the stern post. Trace and cut this from 3" stock. It will also be tapered later on. Cut the rabbet in with scalpel and chisel. Study the perspective drawing first to see how the rabbet angles up the post to the notch for the transom. Cut the angled recess for the rudder iron on the aft edge of the post. It is quite different to those on a ship: study the drawing carefully. Glue and pin the stern post and sternson knee together. Again ensure that the knee is centered on the fore side of the post. Now glue and pin this assembly to the keel. Finally trim the aft end of the keel to the correct angle.



Cutter backbone completed: model by Greg Herbert

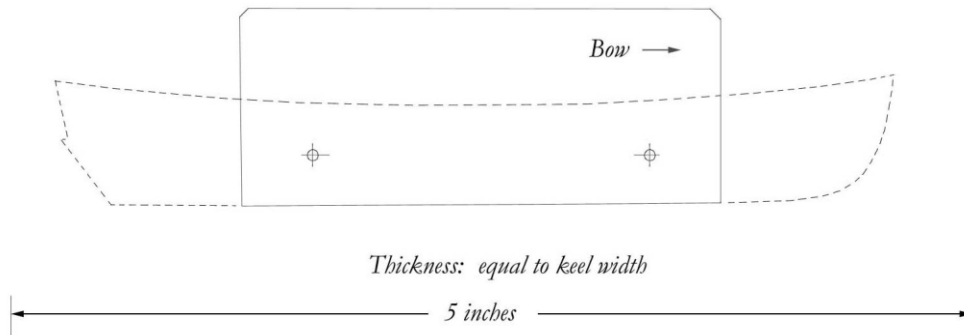
The transom is cut oversized from 1½" stock as shown. Don't make it any smaller or there will be insufficient material to cut a bevel for landing the planks on. The final shape and bevelings will be made later on. Set the transom blank aside for the moment.

Next, drill the stern post, keel and stem for the three ring bolts shown on the plan. Use a suitable size drill, depending on the wire gauge that you use. The ring wire can be of 24 gauge copper or brass wire, the bolt of a finer gauge. Make but do not fit these ring bolts yet.

The last important item to take care of is to carefully and clearly mark out all the station lines on the upper surface of the keel. Glue and pin the transom to the stern post.

Part 2 – Preparing the plug

The inner surface of each half of the plug needs to be sanded smooth, flat and flush with the edges of the other sides. This is easily done. Place a sheet of 80-grit garnet paper on a level surface and ‘scrub’ each half-plug until all excess resin has been removed.

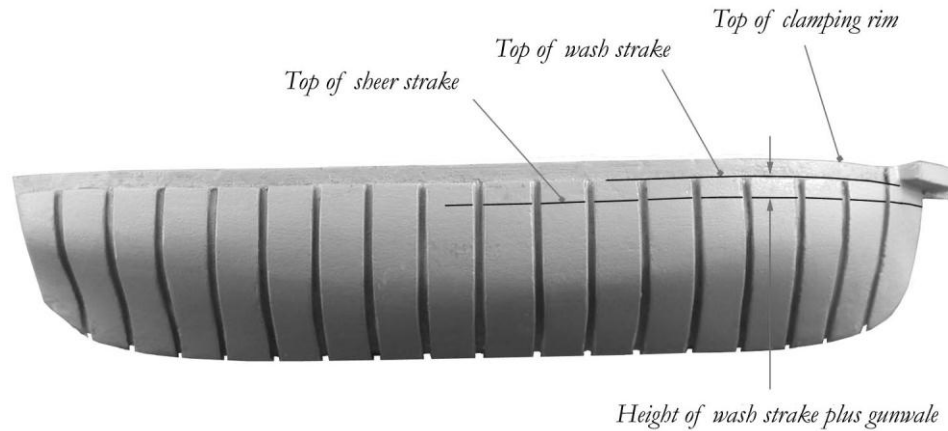


If the locator holes for the dowels have not been drilled, carefully mark out and drill them so that the two sides and center plate align precisely, as shown above. Now assemble your mold. Do not cut off the ‘fin’ protruding from the top of the plug, as this is how the plug will be held in your vise. File out the slot at the forefoot of the bow just enough to accommodate the apron. It should be a nice sliding fit. To complete work on the mold, lightly sand the outer surfaces with fine sandpaper: just enough to remove the gloss and be able to make pencil marks on it.

Part 3 – Inserting the backbone, lining out the planking

If work on the backbone of the boat was accurately done, it should slide into place on the mold nicely. If not, make the necessary adjustments. If there is any gap between the aft end of the plug and transom, fit shims to take up the space.

The next order of business is to line out the planking on the mold. **Note:** *the plug made for the cutter is to the height of the top of the wash strake (dashed line on the draught, refer to page 16).* Before proceeding, you will need to mark out the lower edge of the gunwale, which is the top of the sheer strake, on the plug (illustration on next page). Take off the height of wash strake and gunwale at several points along the hull and join up the points with a smooth line using your ships’ curves.



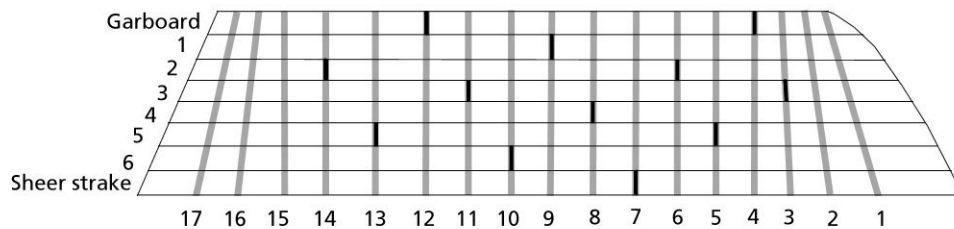
Preliminary mark-out

Eight strakes of planking are about right for this cutter. Cut a few narrow strips of paper to use as tick strips. Bend a strip around at midships, putting one end into the keel rabbet, and mark the half-girth from the side of the keel to the top of the sheer strake. Flatten out the paper and divide this distance into eight equal parts. You can do this using a radiating scale or proportional dividers. Transfer the tick marks onto the mold on just one side for the moment.

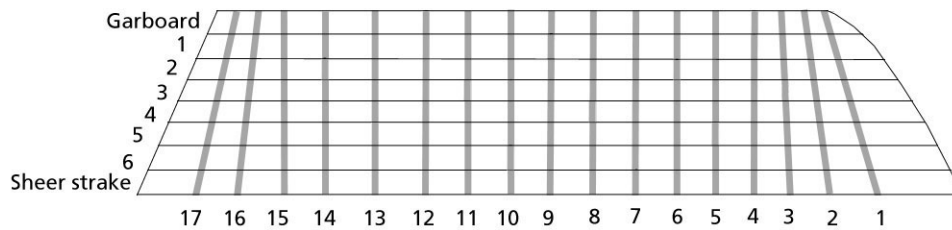
Repeat this process at the first and last square frame positions. Now carefully and lightly pencil the 'seam' lines on to the mold. Run the garboard strake out just ahead of the keel/stem scarp joint. This is the geometrical part of the exercise. Now examine the side of the hull from all angles. While the planking has been marked out mathematically, it may or may not run 'sweetly' to the eye. Adjust the lines of the run of planking until you are satisfied that it looks right visually. This step is part of the art of a good planking job.

There is one point to note. If this model were carvel built, the seam lines are in the correct places. However, this is a clinker-built boat and the planking overlaps have to be taken into account. Allow a scale $1\frac{1}{2}$ " for this purpose ($1/32$ " full size). Redraw each 'seam' line this distance above (toward the gunwale) the existing lines. Then, using your tick strips, transfer the mark-out to the other side of your plug. Again, view things from every angle to make sure that your planking will run smoothly and in manner pleasing to the eye.

The last thing to take care of is the butts of the planking. Just like other planking jobs, there is a careful shift of these butts to be observed. I've provided one possible shift of planking in the illustration (next page), and given an additional blank for you to work out a different scheme for your amusement or education. When satisfied with the shifts, transfer the mark-out to your mold. It will be difficult to pencil inside the grooves for the frames, so place the marks consistently just to one side or the other. The resin plug should not require waxing or other parting agent.

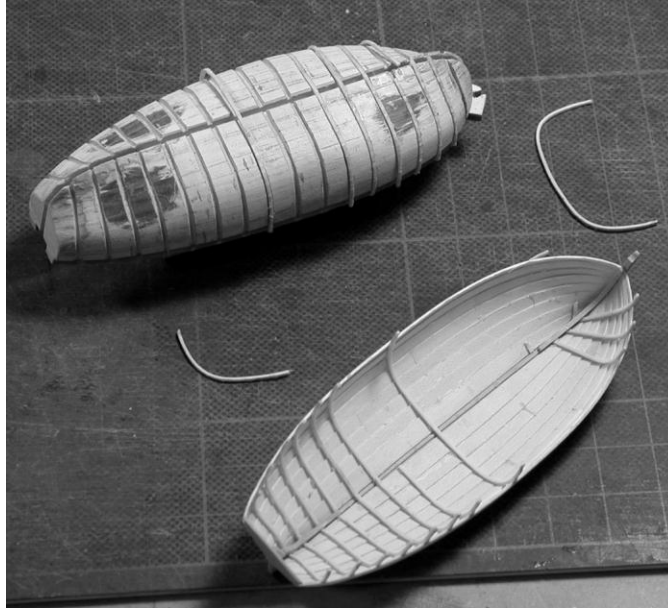


One possible planking shift scheme for 18' 0" cutter



Design your own shift of plank!

If the model were carvel planked, now would be the time to bend in all the frames. However, as there is so little gluing surface between frames and plank, it will be easier to build the hull shell first. When I built my cutter, I put in the frames as I had for the carvel boats. On removing the hull from the plug, most of the frames remained on the mold! You can see the result on the next page. Fortunately, all this was repairable.



The result after removal of the boat from the plug (see text above).

Part 4 – Planking up

Planking can now commence. Begin with the garboard, working from the bow aft. The first thing to do is make a card template of the plank. Hold the plug and backbone in your vise then rotate and lock the vise at a comfortable angle. Take a strip of card somewhat wider than the garboard and trim the upper edge (as you look at it) to fit the rabbet at the stem. Make sure that the garboard does not creep further up the stem than described, or the hooding ends of the other strakes will end up too narrow and spoil the run of planking.

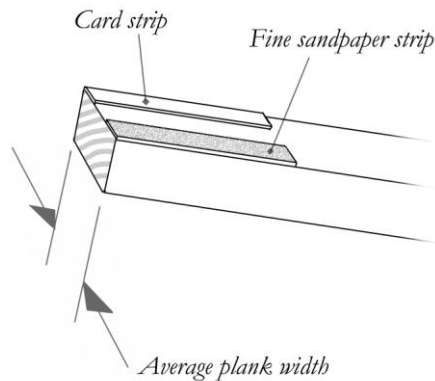
Mark the position of the butt on your card, as well as several other station lines. These are where the frames will fall. Then transfer the width of the plank from the plug to the card. Make sure that the depth of the rabbet and the overlap is included! Join the dots using a suitable ship's curve to complete the outline of the plank and cut it out carefully with a sharp scalpel blade and curves.

Once satisfied with the card pattern, transfer this to 1/64" thick holly stock and cut out the first plank carefully as you did the card pattern. To bend the plank to shape, wet your fingers and moisten the plank. Holly will easily form simply with the moisture and the heat between

your fingers. Let the plank air dry for a few minutes. Using a small brush and white glue, glue the plank into the rabbet.

Repeat this process on the other side of your model. Move on to the next garboard plank aft and repeat the process. The upper (rabbet) edge of the plank should be a straight line this time. Finally complete the strake, if it consists of three planks, with the aftermost plank. Be very careful to fit the aft end accurately into the rabbet of the post. This joint will be obvious in the finished model!

Once the garboard is completed, there is one small but critical step to take before proceeding with the next strake. This is to bevel the lap of the garboard. If you do not do this there will be a gap with the edge of the next strake and the lap will not glue together properly. This will compromise the whole structure.



To make this bevel you will need to construct a special sanding stick. This is made as shown above and will form the bevel correctly. You will need a left and right-handed version of this stick. I made mine two-sided so that I could simply flip it over. You can see the bevel formed in the photograph above. Be sure not to get over-enthusiastic and make the bevel too wide! If in any doubt, make a light pencil line $1/32$ " in from the plank edge. This operation completes the first strake.