

Chapter 4 Constructing the Blades

Laminating the Blades

Laminating the wood blocks that comprise the blades is fairly straightforward. You will need three wood clamps that can open more than 7.5" (six if you wish to do both blades simultaneously). Coat all mating surfaces with epoxy thickened to mustard consistency, place all pieces on a flat surface and clamp (see

image 4-1). Place waxed paper underneath the blade so it doesn't adhere to the work surface.

Image 4-1



Clamping blocks and shaft to form the basic blade structure.

Ensure that the blocks are bonded to the right location on the shaft by measuring 9' 6 1/8" down from the handle end and make a mark. The extra 1/8" provides a margin for error if any of the pieces shift while clamping. When clamping, use a square to ensure the end of all the blocks line up with this mark. Also, make sure the blocks all lie flat against the work surface. You may need to press down on them while clamping to ensure they remain flat.

Shaping the Blades

Carving the blades is a step-by-step process that takes time, but is not as challenging as one might assume. There is a series of templates to guide you through the wood removal process, and it is just a matter of methodically completing each stage. By the end, most of the wood will be removed, leaving an elegantly shaped and strong blade.

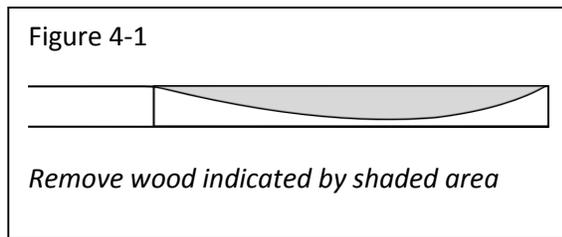
The cross section images in the plans provide a visual reference for the shape of the finished blade, however, these are not used as templates to assist with actual shaping. Instead use the templates 1-5 and the instructions below to shape the blades.

Step 1 (Template 1) Wood removal above blade topside

Measure exactly 9' 6" from the handle end of the shaft and make a mark on the top of the blade block (it should be right near or at the edge). Use a carpenter's square to make a perpendicular line across the top of the block at this location. Continue the line down both sides. Be sure that the oar blade is sitting the right way up to avoid making a painful mistake! This is determined by looking at the shaft – the thickest (forward) side/strip should be on the upper side of the shaft.

Cut out Templates 1A and 1B (one for each side). Begin with one edge of the blade slightly overhanging the edge of the table. Line up the front edge of the template to your pencil line and tape in position. Use four or more thin strips of masking tape (cut the pieces lengthwise to make thinner) to tape the template securely in place. Use a pen (pencil wears off too easily, and this area is later trimmed off, so don't worry about ink stains on the final surface) to carefully mark curve along the top side of the template. Repeat on the other side using the other template. The gaps caused by the tape can be filled in after the template has been removed (using the template as a curved edge guide).

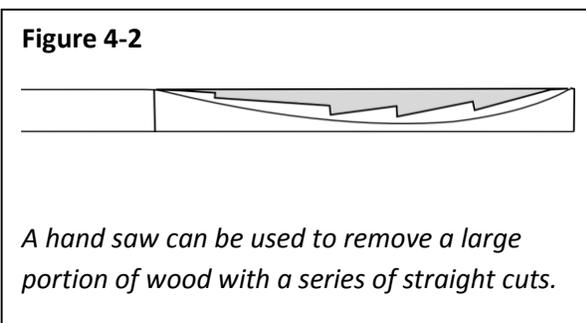
Gently remove the templates and repeat with the other oar.



After scribing the curved line on both sides, the next step is to remove the wood above your pen line. Leave 1/8" wood above the line which will be removed later. There are several ways to remove the wood. A band saw with an 8" cut can be used (make sure you are fully comfortable using a band saw, as this is a tricky cut and you don't want to mess up at

this point). A grinder with a wood removing head can also be used for fairly quick wood removal. Continually check down both sides to make sure that you don't go below your markings, and use a straight edge to check that you are removing wood evenly across the top.

Alternatively, a hand saw and block plane can also be used to remove the wood in a series of steps (see Figure 4-2). It takes a little longer, but works just fine. We used this technique making two sets of oars.



It is important the saw is sharp, and continually check both sides to make sure you don't cut below your pen line. When the angled saw starts getting too close (between 1/8" and 1/4") to the pen line, make a vertical cut down from the top, and then begin another slanted horizontal cut. The vertical cuts are the ones you need to pay the closest attention to as the saw can remove wood quickly.

After removing a substantial portion of the wood using the hand saw, use a block plane to rip across the grain (from one side to the other) to remove the remaining wood. Planing across the grain will leave a very rough surface, but this is fine as long as you leave at least 1/8" excess wood above the pen line. The excess wood will later be sanded down leaving a smooth surface. Depending on the type of wood and grain orientation, some wood will plane down more roughly than others. If you find large chunks are ripping out, make sure to only plane to a depth where the finished surface will not be affected.

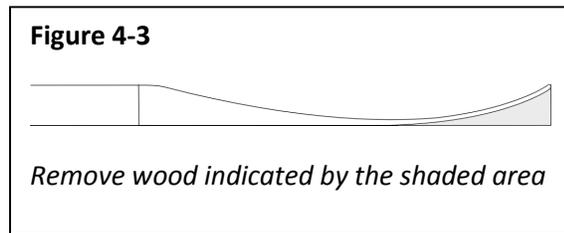
Regardless of what tool you use to remove the wood, as you get close to the pen lines use a straight edge to ensure that the top surface is fairly level from one side to the other.

Use a flexible sanding block (available in most building supply stores) and 80-100 grit sandpaper or a random orbital sander to level and smooth the surface. If you are using a random orbital sander,

complete the final bit with the sanding block to ensure a level fair finish. Leave just under 1/8" wood above the pen line. With each step for wood removal, a slight bit of excess wood will be left, which will be removed at the end in the final sculpting/finishing step.

Template 2 wood removal

Cut out both templates and, as with template 1 place into position and tape with narrow strips of masking tape. The narrow end of the template is quite flexible, so use the line from template 1 as a guide to carefully align the top edge of the template. Use a pen to carefully scribe the curve indicated.



Removing the wood from this convex curve is much easier than the concave face on the top half. A hand saw or power tools can be used to remove a substantial portion of wood with a block plane used for cleaning up. Alternatively, if you're feeling energetic, a block plane (planing in the grain direction) can be used on its own to remove all the wood in

reasonable time. Use 80-100 grit sandpaper to remove the final bit, leaving just under 1/8" from the pen line. Use a straight edge to ensure the surface is flat from one side to the other.

Template 3 Wood Removal

After completing this step, your collection of wood and glue will finally start to look like oars. Cut out template 3 and lay it on the top side of the blade. Center it and line the forward edge with the line you have drawn 9' 6" from the handle end. The template shape has been stretched slightly to accommodate the curve of the blade since it is a 2 dimensional representation of the blade outline. Tape the template in position and mark its outline with pen.

Use a jigsaw, coping saw or other to cut the blade outline out. Cut 1/8"-1/4" proud of the line, and the remainder will be trimmed later.

Template 4 Wood removal

A large portion of the curve of the upper blade face that you have shaped does not actually represent the blade surface, but the top edge of the reinforcing spine. More wood will need to be removed from both sides of this spine to form the blade face (see image 4-2). There are two components to the scribing for this step. You will mark the outline for the curve using template 4 along both sides, and you will also mark a rectangle in the center which, for the time being, this wood will be left intact.

Cut out templates 4 and tape into position with the bottom of the template flush with the bottom of the oar block (see figure 4-4). The template should be

Image 4-2



Wood is removed from both sides of rectangle comprising upper spine.

positioned so the vertical line is exactly 19.5" back (straight line) from the tip of the blade. Mark the curve with a pen.

Figure 4-4

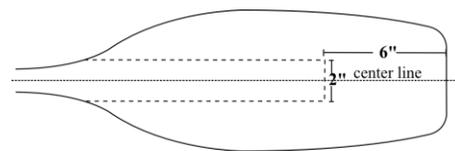


Dotted line indicates location to scribe curve marking upper surface of blade

Next, you will mark a rectangle in the center on the top side of the blade (see figure 4-5). This indicates the area where the wood will remain intact until it is later shaped. To create the rectangle, first draw a pencil line down the center of the oar. Be sure it is

centered at both ends. Next, measure 6" back from the tip and make a mark. This marks the end of the rectangle. The sides of the rectangle are measured 1" out from the centerline, or two inches apart. Since the pencil lines will wear off easily, use a pen to scribe the center line and rectangle sides starting 1" back from the end near the blade tip. Don't use pen for the end of the rectangle since little wood is removed here and the marks may be visible in your finished work.

Figure 4-5

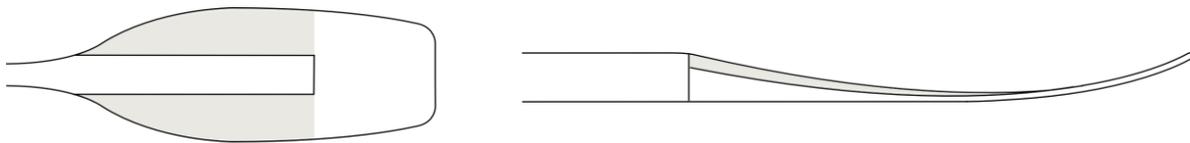


Mark centerline and dotted rectangle. Wood is removed from both sides of rectangle.

After marking the top edge of the blades and the spine, you can start removing wood the wood (see figure 4-6).

A standard block plane can't be used for wood removal because of the concave curve. A plane with a curved base can be used, however, this is not a common tool. Instead, a sharp half inch chisel can be used to efficiently remove wood to the required level. Be sure the chisel is very sharp, and as you get close to

Figure 4-6



Shaded area indicates where wood is to be removed. Keep surface level and smooth as possible. Use flexible sanding block for final removal, and bring to 1/8th" from your line.

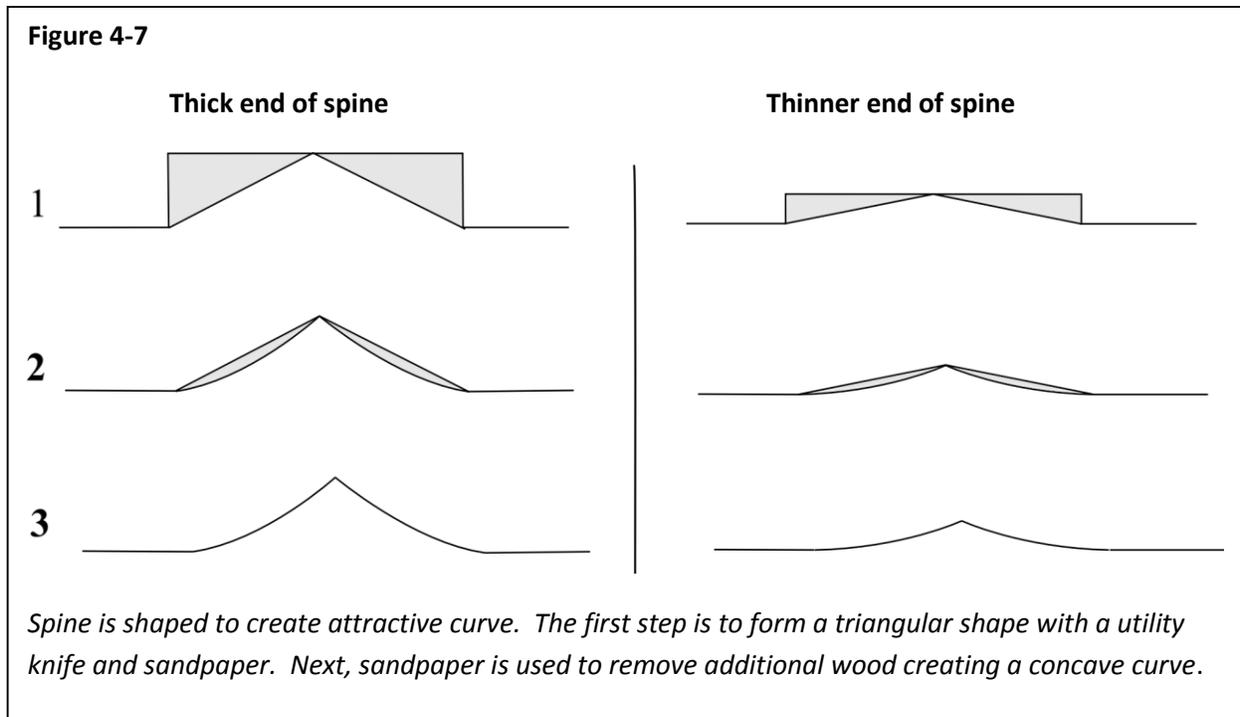
the level of the pen line decrease the angle of the chisel relative to the wood to avoid gouging, and try to make a level smooth surface.

As you are chiseling down, repeatedly draw a utility knife along the edge of the rectangle to create a clean edge. Be careful not to score deeper than the depth of the wood to be removed, otherwise the score lines will be visible in your finished work. Use a flexible sanding block with 80-100 grit sandpaper

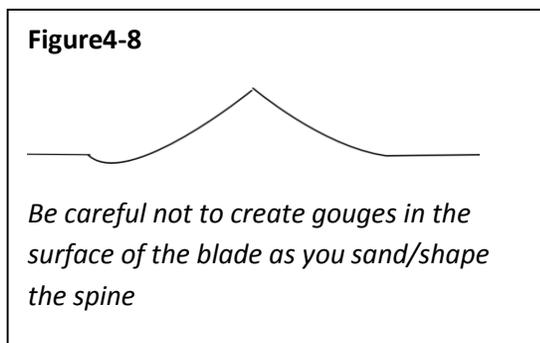
for the final smoothing and wood removal. Leave enough wood to be just under 1/8" proud of your line.

Shaping the Spine

You are now left with a rectangular cube shape in the middle, which reduces in thickness towards the blade tip. This will be sculpted into the shape of the spine. Figure 4-7 illustrates the series of steps to create the finished spine shape.



Make sure that the center line is clearly visible as you begin shaping the spine. Re-scribe if necessary. The first step is to use a sharp utility or carving knife to shave a triangular ridge as illustrated in figure 4-7. Pay extremely close attention to make sure you don't slice off the tip of the triangle, i.e. don't cut through the scribed center line. To ensure the sides of the triangle/ridge are even and fair, wrap a piece



of 100 grit sandpaper around a tongue depressor and slide it up and down lengthwise. Be sure when you are sanding not to remove material too low, creating a gouge in the blade surface below (see figure 4-8).

One way to help create a smooth transition between the blade and the spine, is to run the flexible tongue depressor wrapped in sandpaper across both surfaces, pressing firmly, so it conforms to the shape while sanding. Be careful to keep the sand paper clear of the

spine tip. The objective is to create a clean crisp ridge along the top.

The final step is to continue sanding along the length applying pressure with your finger tips to create a concave curve along the length of both sides of the spine. Continue until the shape of the spine is satisfactory (see image 4-3).

Image 4-3



Forward spine nearing completion.

Template 5 Removing Wood from the Underside

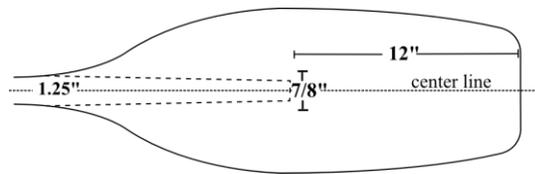
Removing wood from the underside is almost the same as the step above, however, the lower spine is shaped differently (an easier shape to create).

Template four marks the edge of the underside of the upper portion of the blade. Tape it in position so the upper edge is aligned precisely with the line on the wood marking the upper side of the blade. Scribe a line

marking this lower curve on both sides.

Next, as with the top, you will mark a rectangular shape which will be formed into the spine. Unlike the top side, the sides of the rectangle (or more accurately described quadrilateral) are not quite parallel, instead coming closer together near the blade tip. Create a center line, and measure back 12" from the tip. Here, the side lines should be 7/8" apart, so make two marks 7/16" out from the center line. Measure 20" back from the blade tip, and make marks 1 1/4" apart (the width of the shaft) and use a straight edge to scribe lines between these points (see figure 4-9).

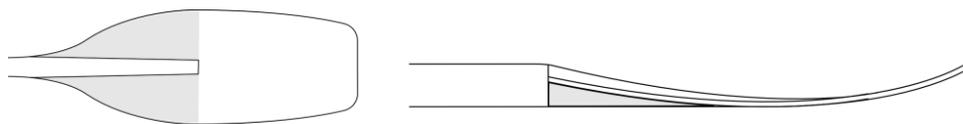
Figure 4-9



Dotted line indicates scribe lines marking back spine.

Next, using a chisel, block plane (a block plane is much more useful on this convex curve), utility knife,

Figure 4-10



Shaded area illustrates where wood is removed.

and sanding block remove the wood as illustrated in figure 4-10. Leave just under 1/8th proud.

The edges of the spine can be rounded with utility knife and sandpaper to have a ½" radius (see fig 4-11)

Figure 4-11



Lower spine is shaped as illustrated

Wrap a tongue depressor in sandpaper and run along the length to ensure smooth straight edges and fair curves (see image 4-3).

Image 4-3



Shape of lower spine nearing completion

Final Blade Shaping

The shaping of the blades is almost complete now. Use a flexible sanding block and course sandpaper to remove remaining wood down to the pen lines (use templates to re-scribe if the lines have worn off). Use a straight edge to ensure that the blade surfaces are flat and even thickness. Also examine the spines and do any final sculpting required to produce fair clean surfaces. Do not round the blade edges yet. This is done after the fiberglass is laid.