

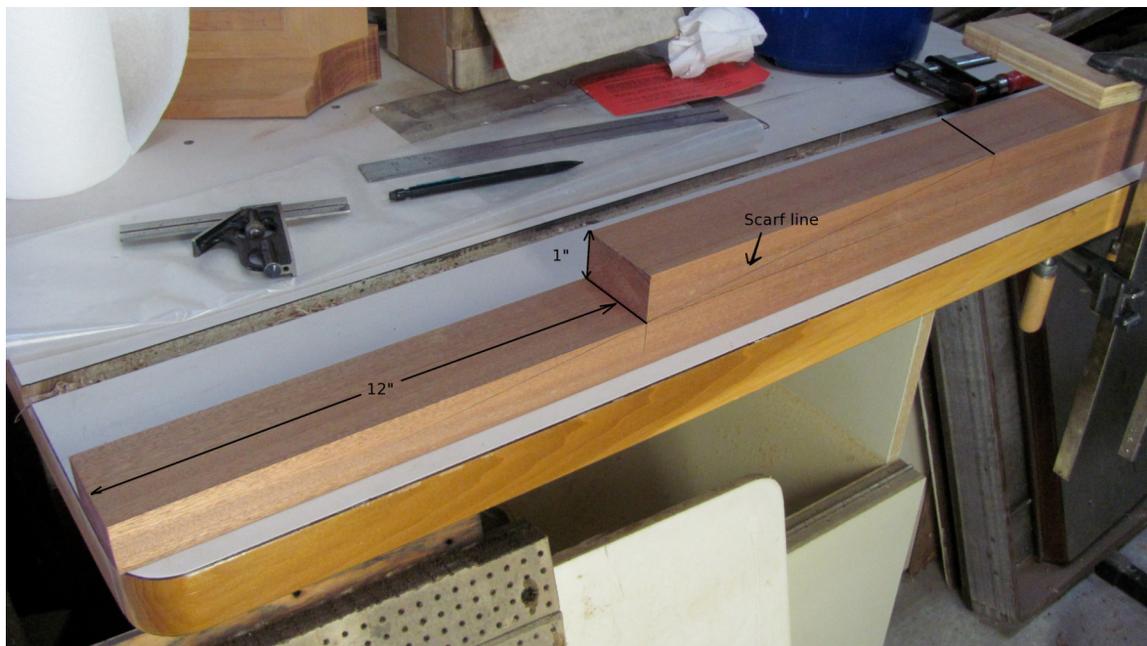
## Cutting Scarf Joints

In wooden boatbuilding, making scarf joints is a frequent requirement. This article describes how I do it when the scarf can be made on the bench.

The pic below shows how we add length to a piece of Mahogany using a 12:1 scarf; i.e., the length of the joint is 12 times the thickness of the piece. Let's assume that the stock is 1" thick, so the length of the joint will be 12". On each piece, we draw a "stop line" across the face 12" from the end. We then clamp one piece on top of the other with the top piece set back 12" from the bottom piece.

Clamping can be an issue since you want the setup to be rigid but the clamps must be clear of the scarf and not interfere with the planing.

Next we draw a "scarf line" along the side of the two pieces, extending from the bottom corner of the bottom piece to the top of the top piece at the 12" line. The scarf line can be seen drawn in pencil in the pic below.



The next pic shows the almost completed scarf. While planing it's important to monitor two things:

1. The angle of the scarf must be 12:1 and
2. The length of the scarf must be the same for both pieces.

We control the angle of the scarf by checking that the planed surface is always parallel to the scarf line drawn on the side of the pieces.

The length of the scarf can be measured directly with a ruler, but as you near the end it's easier to monitor the cut lines at points A and B in the pic below. These cut lines should be square to the face and the distance from point A to the end of the top piece should equal the distance from point B to the stop line of the top piece.



The next pic shows the completed scarf.



The two pieces ready for glue up.



First we perform a trial fit to insure that everything goes well. We clamp one piece to a flat surface with the scarf side up (like the pic above). A piece of wax paper is used to keep the glue off of the bench. Next we bring the mating piece into position (scarf down). Proper alignment here is important – forward/back, side to side. If the mating piece is back too far, the joint will be open. If too far forward the two pieces won't be flush at the top.

Once you're happy with the alignment. Clamp the mating piece in place (dry run). Now make reference marks on the mating piece and the bench so that the set up can be replicated during glue up.

Next we unclamp the mating piece, apply glue to the surfaces and clamp in place. Note that we don't disturb the first piece. It stays clamped to the bench from the start.

As you can see in the pic below lots of clamps are needed during glue up.



The scarf after glue up. You can barely see the scarf joint.



The next few pics show how to extend a piece of planking stock.



Here is how it starts with the extension lying on top of the plank stock.



Here's a view from the other side. Although the top and bottom pieces have different shapes the ends are parallel to each other. This is important in judging the progress as we cut the scarf. The end of the top piece is about 16" back from the end of the bottom piece for a 12/1 scarf on a plank that is 1-3/8" thick. If you look closely, you can see a diagonal pencil line that runs from the bottom of the forward end to a point 16" back from the end of the top piece. This is the scarf line that allows us to monitor the depth and angle of the scarf.



A power plane gets us close followed by careful hand planing – first with a smooth plane, followed by a jack plane, and finishing up with a joiner plane.



Here is the finished scarf.



Finally, the extended plank after glue up. Note that the pieces don't have to be the same size or shape. Equal thickness is important, however.

Notes:

1. It's important that the thickness of the two pieces to be scarfed are the same. Otherwise one piece will reach a feather edge before the other. If that happens just stop planing and proceed with the glue up. In the end, the thicker piece will extend above thinner one and will have to be trimmed.
2. Clamping the pieces during planing can be difficult. You have to keep the clamps far from the joint to provide sufficient room for planing. What can happen then is that when nearing completion, the feather edge of the planks will lift away from the bench. I've tried double sided tape but it doesn't work all that well and it's a pain to remove.
3. Although not shown in the examples above, it's helpful to put a piece of softwood scrap between the setup and the bench. This protects the bench from the plane as you approach the feather edge.
4. The best plane for starting the scarf is one long enough so that the fore foot rests on both sections at the start of the cut. For a 6" scarf (12" total) the joiner plane works well. After a bit, the amount of wood removed makes it hard to push the plane through the work, so shifting to a jack plane is better. Once the scarf is well underway, a power plane can be used to remove the bulk of the wood. A power plane does not work well in the beginning. The throat of the plane is too open

- with insufficient support when starting or ending the cut. So the plane tends to gouge the wood.
5. In the examples shown above, a “scarf line” was used to monitor the scarf angle. For smaller work, a bevel gage set to the scarf angle is easier to use.
  6. For cutting scarfs on the bench, the glue of choice is resorcinol (Aerodux 185), because I can produce tight fits with adequate clamping pressure.

Although it's best to cut scarfs on the bench, sometimes you don't have a choice. The following pics show some examples. In these situations I tend to use epoxy, since I don't have as much control over the fit and clamping pressure.



Here we have a frame that was rotted at the end.



In the same area of the boat, the bulkhead was rotted at the bottom.



The finished scarf joint.