

Stickley meets Maloof

Or

Some Construction Tips for Building My Rocker

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There're a number of choices to make when building a rocker. I'll attempt to discuss some of them here.

Rocker arc - The arc of the rocker affects how lively the rocker is, with a short arc giving a livelier rocker, and a longer arc giving a less lively rocker. A lot depends upon the height of the center of gravity compared to the height of the center of arc. The height of the center

of gravity is affected by the seat height and the height of the person who will be using the rocker.

The closer the center of gravity is to the center of arc, the livelier the rocker will be, and the more unstable. So the higher the seat, the higher the center of gravity. The bigger the person using it, the higher the center of gravity. A good, reasonable median for the rockers is about 39 inches radius.

I bent my rockers from 1/8 inch lamina on the form shown below.



Note the recurve on one end, which is just a decorative effect. The recurve should never hit the floor because it will stop the rocker too abruptly.

When gluing with laminates, you will encounter some springback. Springback is the tendency of the wood to return to its original position when the clamps are released. The amount of springback can be estimated from the following formula:

$$y = x/n^2$$

Where: y = the springback deflection
 x = the original deflection
 n = the number of laminates

Note that springback is not dependent on the thickness of the laminates but only on the number of laminates used.

I used nine laminates in my rockers. The final width is 1 1/2 inches so you need to have laminates that are wider than that for the glue up, maybe 1 3/4 inches. The recommended glue is plastic resin (urea formaldehyde).

Seat height - The seat height is a matter of preference and is a tradeoff. A lower seat height allows rocking without having your heels come off the floor but is a more difficult chair to get up from, and perhaps to sit down into. Measured along the front of the leg, the distance from the top of the seat to the bottom of the rocker is 14 1/2 inches. Personally, I will make this a bit shorter in my next rocker, perhaps 14 inches or 13 1/2 inches.

Seat Depth - The seat depth should not be too long, or the seat will hit the sitter behind the knees and be uncomfortable. Nor should it be so short that the person feels like they're falling off the seat. I made my seat 18 1/2 inches from the front to the back slats and that is comfortable for an adult. However, it is a bit on the long side and next time I'll probably make it 17 1/2 or 18 inches.

Seat Cant - The seat needs to be canted backward or you'll feel like you're sliding off the front of the seat when you rock forward. The way you adjust the cant is by making the rear legs a bit shorter than

the front legs. I only shortened my back legs by 1/4 inch. It's not bad but next time I'll do a bit more cant.

If you're going to put the rocker on a sloped porch, add more cant or the rocker will not be comfortable - you'll feel like you're going to slip out of the seat on the forward rock

Seat back height - This is largely a matter of taste but a too short seat back can be quite uncomfortable against the back of your head. On my chair, the top of the crest rail is 35 inches above the top of the seat. Next time, I'll make it 34 inches.

Seat back angle - On most chairs, the seat back is not 90 degrees to the seat - it's usually tilted back just a bit. On a rocker this is not so critical because you put a cant to the whole chair, but I make my seat back about 93 - 95 degrees to the seat. One problem is how do you measure this when the seat back curves. My advice is to just slant it back a small amount and not worry over it.

Seat back slats - The lower curve of the back slats is 7 inches above the seat, and I find that quite comfortable. The second curve is about 20 - 21 inches above the top of the seat and that works well. I bent the back slats on this form which is just the other side of the rocker bending form.



When using a form like this, use clamps and clamp the form to your bench. It will get quite heavy with all the clamps and will fall over unless clamped to the bench.

I used three 1/8 inch laminates for the back slats and the side slats. My slats wind up 1 1/2 inches wide so you need to start with wider pieces since they don't line up perfectly when gluing.

Arm rest height - This is a tradeoff for different size people. My arm rests are about 8 inches from the top of the seat and I find that to be a good compromise for short and tall people.

Side slats - The side slats have a bend radius of about 12 inches, maybe 12 1/2 inches. Here's the form I used to bend them



A couple of books that have some information on chair design are:

"Chairmaking and Design" by Jeff Miller, published by the Taunton Press, 1997. This book is out of print and way too expensive as a used book. There's only one or two pages in the book on recommended chair measurements so rather than buy it, contact me and I'll send you a scan of those couple of pages.

"Architectural Graphic Standards" by Ramsey and Sleeper, published by Wiley. There's a bunch of editions of this book. I have the seventh edition which is not new. The book has lots of information but only a couple of pages that apply to chair design.

I've never seen it, but I've seen recommendations to **"Humanscale 123"** by Diffrient, published by MIT Press. It out of print and not readily available used. Note that **"Humanscale 456"** is not a later edition of this book but a different book with different information.

Construction tips - I do all my bending first - the rockers, the back slats, and the side slats. Before you cut the laminates, mark the wood with a triangle so that you can glue up the laminates in the proper order and orientation. Doing it this way makes the piece appear to be a solid piece of wood. Number your pieces and mark them top and bottom so you can install them in the same order as they were cut from the board. The pattern in the wood then ripples across the back.

To keep the bent wood from being glued to the bending form, I use wide cellophane packing tape (like Scotch tape) on the surface of the form. It works well.

The crest rail is cut from 8/4 material. Before you cut the curves, cut the tenons (I used 3/8 inch thick tenons). Cut them a bit fat so that you can trim to the mortises. The mortises at the bottom of the crest rail for the back slats were cut with a slot mortiser but you can do them by hand. The mortises are cut after the crest rail is cut out of the 8/4 material.

The front legs are made from two pieces of 8/4 material glued together. The legs are oriented so that the glued up portion is on the side, not the front. You want to see continuous grain at the front - not a glue line. To cut the curves at the top of the front legs, I use a side slat as a guide and draw the curve on the front legs from the side slat. This is to make sure the curves match. Cut a short tenon on the top of each leg. I cut mine about 1/2 inch long and about 1 to 1 1/4 inch square. This tenon will fit into the arm.

I cut all the mortises in the legs (front and rear) with a slot mortiser, but again, it could be done in other ways, including by hand.

In assembling the chair, I glue up the back section and the front section separately, then connect them. The back section initial glue up

consists of the legs, the seat support, the stretcher and the crest rail. The front section consists of the legs and the seat support.

Once the front and back sections are glued up, I trial fit them with the under-seat supports, shown in the picture below.



What these do is hold the front and rear sections together - the seat does not provide any structural support to hold the front and back together. Once I have them clamped, I'm ready to fit the side stretchers. I cut the tenons with a tenon jig on my table saw. On this chair, the angle is about 5 degrees from the front leg to the rear leg. Once I have the front tenon cut, I place the side stretcher against the legs, where it will go and mark the length. I measure the angle of the back leg from the vertical with a protractor. Using these two angles, 5 degrees for front to back, and about 8 degrees on my chair for up and down, I set up my tenon jig and cut the tenons. It's very easy to get

confused about the way the tenon goes so have an extra piece of stock so that you can re-cut when you make a mistake. Keep trial fitting until the shoulders fit flat against the legs. Judicious trimming with a shoulder plane or a chisel will get them to fit if the angles were cut correctly.

Next, cut the mortises in the side stretchers. A slot mortiser makes this very easy.

Glue up the front and back sections. You now have what looks like a chair.

Seat - The problem with this seat is that it sits between the legs and cross grain to the seat supports, so you want to make sure it doesn't expand and contract too much. I chose quarter sawn material for the seat to minimize wood movement.

First I glued up the wood, in the normal fashion. The only thing I did special was to make sure that I had one board in the center of the glue-up so that the wood would be symmetrical about the center. Then, I cut the seat square, a bit wider than I would need for the front, making sure that my chosen board was exactly in the center.

To sculpt the seat, I sat on the glued up boards and traced the outline of my butt, with my legs somewhat apart. I then hogged out the wood with a chairmaker's plane, which is a plane with a double curved sole (front to back and side to side). It acts like a scrub plane and takes out a lot of wood with each pass.



The recommendations given to me by more experienced woodworkers were to (1) leave a sharp edge between the sculpted out part and the top of the seat, and (2) make the front scoop-out for the legs wide, essentially the full width of the seat.

Once you have the seat scooped out and sanded to your satisfaction, you need to cut it to exact width and then cut the slanted sides by marking the width of the rear. Remember to account for the width of the legs. Your seat will actually have a flat at the front and back with a tapered cut between the flats. Cut the width so that the seat fits tight between the legs. Your sanding will take enough off to make it a loose, safe fit that accommodates the wood expansion.

Finally, cut the mortises in the back of the seat for the back slats. I did this by drilling a 3/8 inch hole at each end of the mortise and then cleaning it out with chisels.

The trick in installing the seat is to get the back slats to slide into the mortises in the crest rail and the seat without breaking the crest rail. You can help this along by beveling the top and bottom of the seat slats

to allow them to slide into the mortises easier. Actually, it's not too hard.

Attach the seat with glue in the front only - the back slats will hold the back of the seat in place. Use glue on the seat slats, top and bottom.

Arms - The arms are made from 8/4 material. The first thing to do is to cut the mortise which will mate with the tenon cut at the top of the front legs. Clamp the arm piece against the back leg 1/2 inch higher than the final location. Put the arm piece in its correct position on top of the tenon and then trace the position of the mortise from the tenon. Chop and fit the mortise to the tenon. You may wish to cut out the back of the arm at this time so that it fits properly against the rear leg. This will also help you cut the mortise in the exact position. You have a couple of options for attaching the arm to the back leg. One option is to cut the arm flush against the rear leg, which is what I did. Another option is to inset the arm into the leg a small amount, maybe a sixteenth or an eighth of an inch, to hide any errors you might make in cutting the back of the arm. Each has its own problems.

Now you need to shape the arm, which is done by eye, mostly with the chairmaker's plane. Cut, then put in place, then cut some more until you have a shape that pleases your eye. You must be aware of the sides and the need to flow the side slats into the arm as you are cutting.

Once you have the arm shaped, hold up the side slats against the arm and cut them to length top and bottom. In cutting them, try to match them against the curve in the front leg. Fit them into the mortises in the side stringer (number them so you put them back where they were fitted).

Now, insert the side slats into the proper mortises and mark the top against the side of the arm. Cut the "mortise" into the arm. Remember that what's important is the fit at the sides and top of the side slat. If you mess up the depth, for example, you can backfill with strips of veneer and no one will see it - but the fit on the sides and top of the side slat will be very visible. Cut and try, cut and try.

Once you have everything ready, you can glue the arm to the front and rear legs and the side slats to the arm. Glue up the arms one at a time.

Attaching the rockers - Decide how you want to place the rockers - that is, how much will be sticking out the back. It's mostly a matter of taste. Mark the location of the legs on the rocker. Mark the second rocker from the first so that they're identical.

Next, you may want to shape the rockers to taste. I taper the rear of the rockers and put an angle on the side, except where the legs will attach.



I also did a buildup where the legs will attach to the rockers. I did this by gluing some additional laminates at those locations.



To attach the rockers to the legs, I used 3/4 inch dowels. To mark the holes, I drilled a 1/4 inch hole in the center of each leg in line with the leg. I then put a dowel point in the hole and used them to transfer the location to the rocker. Hold the rocker in position against the bottom of the legs and tap the rocker with a soft hammer. You'll see a small hole in the rocker. I then place the rocker against the dowel points again and draw a line down the leg onto the rocker. This is my guide line to follow when drilling the hole for the dowel.

I then drill a quarter inch hole in the rocker in line with the line I drew. Then I use a 3/4 inch drill and drill out the leg and the rocker, following the quarter inch holes.

Now hold the rockers against the side of the legs, in position where they will wind up. Mark the angle of the top of the buildup against the legs. Cut the legs. Trial fit the rockers to the legs and trim the bottom of the legs until they fit against the rockers with no gaps. I found that sandpaper was the best trimmer. I used a chisel to cut the inside of the leg, leaving a 3/16 inch ridge around the outside. Then, I used sandpaper to trim that ridge until the leg fit without gaps to the rocker.

Next, glue the rockers to the legs with dowels. I used epoxy glue to fill any gaps between the holes and the dowels. Overfill the holes so that you get squeeze out when you clamp up. You can trim the squeeze out easily and it will fill any remaining small gaps.

Now, using rasps and sandpaper, trim the buildups so that they flow into the legs.

You now have a rocker, only needing to add the finish of your choice.

Good luck!