

Weekend Warrior Luthiery, Part 2

When [we last left off](#) I had just wrapped up 3 of the 15 classes in the guitar building series and had a fairly complete body put together. In the weeks since (day 10 was just completed this past weekend) a lot has progressed and my guitar is rapidly approaching a completed state. Since I don't have a lot of space here I'm going to dive right in and summarize weeks 4-10 and illustrate what has happened in the past couple of months.

Day 4 – End Graft and Purfling/Binding

The first step today was to cut and prepare an end graft to cosmetically pretty-up the end seam where the sides meet at the back of the guitar. George routed out the slot while I prepared a scrap piece of rosewood to fit into place. Using a small amount of glue I slid the rosewood piece into place for a nice tight fit, allowed it to dry and later rough cut the ends off. With some basic sanding it's amazing how beautiful that piece made the guitar. Ah, details.



End graft complete and reading for purfling and binding

Next up was the task of installing the purfling and binding on the top and back of the guitar. This step would take the rest of the day—and then some—due to a few setbacks in the way the shoulder route was cut. Using a router with the specific bit, I made the required routes for the purfling on the

back and top. Because the wrong, slightly smaller bit was used on the shoulders, I would later need to use a chisel to bring it to the correct depth. With the purfling cuts made, we moved onto the binding cuts, which are cut based on the shelf created by the purfling cuts. Once all of the appropriate cuts were made, Diana came over and helped glue and tape the purfling/binding into place—definitely a two-person job, and quite messy.

While the body was in the drying stages I moved on to putting the ebony binding on the fingerboard. This was my first experience with the neck and it too didn't go quite as planned. When clamping down the binding to the fingerboard, one end raised up slightly in the drying process and needed to be removed to start over. Easier said than done. George brought out a heating pad and tool to soften the glue (which had only been drying for 30 minutes) and began to pry it off. The glue proved to be surprisingly tough, and it took a good amount of time to get it off.

After removing the tape from the binding I found out the hard way that it was sticking out slightly and the sandpaper hit it and pulled away some of the material. Because this is an area that can easily be seen at the seam of the guitar, we decided to cut a small portion out and splice in a new piece. With that taken care of we packed it in for the day.

Day 5 – More Binding Issues

Thinking it would be an easy day to move forward, I expected to get right on to sanding the body again. Sadly, the binding had lifted up and we needed to glue it back down and fix that small spliced-in piece. After completing that, I did more sanding to smooth out the top and back while carefully making sure not to remove too much of the binding. Excessive sanding would make the black-white-black binding look uneven. Did I mention that sanding took the majority of the day? It did. Scraping and sanding, scraping and sanding.

Day 6 – The Neck!

With the body ready to rock we moved onto the neck and preparing the body to accept it. Because dovetail joints are apparently not made for novices, George and Diana have opted for a mortise and tenon and the use of a bolt-on neck (hey, Taylor does it). George fired up the router and made a beautiful body mortise to allow for the neck tenon. With the neck blank in hand, I made the designated marks for the hanger bolt and drilled a 5/16" hole.



Completely unfinished neck

To ensure a solid connection with the appropriate angle of neck-to-body I carved out a chunk of wood from both sides of the neck where they meet the body. This involved chiseling out a channel on either side of the tenon about 1/8 of an inch away from the heel. This leaves an open area in the middle of the neck with the edges touching the shoulders of the body. The next step was to fit the truss rod into a slot on the neck before putting the fingerboard on. I glued a small, 1/4" wide piece of mahogany over the top of the neck to cover the truss rod up.

Up next was gluing the fingerboard to the neck blank. A fairly simple process, it involved drilling several pilot holes in the fret slots to provide a place to hold the fingerboard in place while gluing (it can swim around a bit and you don't want it to move). After the holes were drilled we used Gorilla glue to hold down the fingerboard and placed several pins through the holes on the fret slots to align it for drying. The fingerboard was held in place with over a dozen clamps and set aside to dry.



Fingerboard clamped to the neck

Day 7 – The Neck...Part 2

Day 7 will forever go down in history for me (and my co-student Rob as well!) as the day you hope to forget but never will. The seemingly simple concept of the neck going on straight is anything but simple. Because the neck must be straight when attaching to the body, you are required to “pull” sandpaper across the neck where each side meets the shoulders of the body. This ensures that the alignment is correct for the nut-to-bridge angle and the strings don’t fall one way or the other to the side of the fingerboard.



Rob pulling sandpaper...again

Using many pieces of sandpaper throughout the day we pulled 10-30 times on each side, then re-checked the angle with a template for straightness. It wouldn't be so difficult if the seam didn't have to perfectly hit flush with the sides, but alas...it does. Each pull takes a little skin off your fingers until you figure out it's a good idea to wear gloves (which I did the following week). If you accidentally (and I did) pull up instead of along the slope of the shoulder it leaves a gap that requires you to repeat the pulling many, many times to smooth out again. Suffice it to say that Day 7 was all about "pulling," and by the time I left, the neck was close but my fingertips were sanded right off. So much for calluses!

Day 8 – The Neck Carve

If Day 7 is on the books for the most tedious day, Day 8 wins the award for the most fun and by far the most rewarding to date: the neck carve. With just a little bit of neck pull sanding left—this time wearing gloves—I was given George's blessing that it lined up nice and straight with the body and soon-to-be bridge area. With that monumental task out of the way, it was time to prepare the neck for carving.

Before I could get to the actual shaping of the neck, we glued on the headstock laminate and drilled the slots out for the tuning keys. This required using a drill press to cut the slots out in multiple passes, which were then cleaned up with a router. The final headstock shape was also routed out and completed. Since the neck started out wider than the fingerboard, a band saw was used to cut off the excess material so it was basically flush with the fingerboard. This raw-looking piece of glued-together woods looks exactly like what it is: a rough-cut starting point for the neck.



Neck shape template

I started taking down the excess wood between the headstock and nut area with a file to get the shape to match up along the chalk lines scored using a plexiglass template. The headstock itself is fairly basic with no intricate carving required. After getting that basic shape taken care of, I was given a 4-sided template that gave the basic neck shape for my classical guitar. The neck is a very personal thing for players, and the template was a guide to get in the ballpark, not an exact scale. “Hogging” out the extra wood with the file was incredibly fun, though I found myself being slightly cautious because I feared pulling too much wood away. Using the template on the nut, 3rd and 12th frets I was able to visualize if the shape was getting close. If any light could be seen through it, more shaping was necessary.



Final neck sanding

Once the basic shape was carved, I was given a long sanding block that was used horizontally across the neck to bring uniformity to its shape. It was exciting to pull the neck out of the clamps and feel it for the first time—this is where the extra time spent getting it to feel right in my hands was worth it. After making sure I had the transitional area from the back of the headstock to the nut area (no volute in my case) it was onto the Spanish heel. Spanish heels on necks are known for having a sharply defined shape and slight curve-back to them. Utilizing the file again, I spent several hours shaping away to get it dialed in. Surprisingly within the day the neck had taken shape from a raw block of wood into a nicely hand-carved neck—a great note to end on.



Smoooooooooth!

Day 9 – Neck and Finishing

Today started out with some odds and ends before getting the neck and body prepared for finishing. Finishing? Already? Well, you have to finish the neck and body before you can assemble the neck and install the bridge, tuners, nut and frets, so here's how it went. The first step was drilling the holes in the headstock for the tuners to fit in place. Since I'm building a classical, I'm using Gotoh 3-on-a-side connected tuners. A handy template from Stewart MacDonald lined up the marks for the holes and the drilling went perfectly. We did a final neck fitting to ensure that it was straight and everything was ready to rock.

This was the first opportunity I had to see the guitar in a semi-built state, which was really inspiring. It looks like a guitar! Because the fingerboard was still hanging over into the soundhole, we did a cut with the band saw to follow the soundhole and I used a file to clean up the edges for a clean look.



The guitar in its first semi-built state (with the fingerboard still extending into the soundhole)

Before we could mask the guitar for finishing, there were a few loose strings to tie up. The first was to taper the headstock near the 6th and 1st string tuners for string clearance. Because of the angle of the headstock, you have to file away some of the wood so there is no string drag before reaching the tuning keys. It also is a pseudo-fancy look, since it shows off the combination of the rosewood headstock laminate into the mahogany neck. Finally the binding required a rounding-over with sandpaper to make sure it wasn't going to cut into my skin when sitting for long hours of playing. There is no right or wrong amount of bevel for this step, just personal taste.

The taping process is simple—just holding down the bridge in the appropriate place and tracing a line to mark where the tape would go. After removing the bridge and taping it off, I used an eraser on the pencil marks. The neck was taped off in the appropriate places, as well as the body, and I was ready for the varnish.

The varnish is an amber stain that brings out the grain, color and intensity of the wood before clear lacquer is applied. I applied one coat of varnish to the back, top and sides of the guitar, as well as the neck, before the day was over. I felt that this day was the most impressive accomplishment to date.



Masked and varnished body drying

Day 10 – Clear Coat

Now that the body and neck had been varnished, it was time to apply the clear lacquer to both. Before the clear could be applied, the guitar was brought outside to inspect for scratches, extra glue or anything that the varnish revealed. At this stage everything will be amplified so it was important to get all of it taken care of before proceeding. More than a few scratches were revealed, so we decided to sand them out evenly. This meant I had to sand the top and back fully and apply another coat of varnish. After it dried, we were on to the clear coats.

It takes a while for the clear coats to dry, but the process is pretty simple: Spray it evenly on the top, sides, and the entire neck and wait for it to dry...repeat. Each time I went through the process there was a 30-45 minute wait, so I got a lot of reading and playing in (they have some really nice guitars there at the shop!). At the end of the day my neck had been sprayed 8 times, the top 3, back 5, and sides 8. It looked a little heavy on the clear (it's sprayed on about .012 to .015"), but I was assured by both Diana and George that the smooth sanding of the clear would leave the guitar with about a .006-.008" coat.



Clear coat drying

That's all for now. As I looked at the body and neck drying at the end of the day I marveled that this instrument has been crafted by my hands. Once again this is clearly a testament to a couple of dedicated teachers, great tools and some serious sweat equity (especially "pulling" the sandpaper part...I still haven't forgotten that). Stay tuned next time for the final installment of the Weekend Warrior! I can't wait.