



How To Make An Electric Guitar Neck

Before we dive into building the neck for an electric guitar, I'd like to take a moment to discuss a couple of important items. First, you need understand that building guitars is like any other project requiring fabrication and assembly, in that you should follow each step in the order recommended. You could be a maverick and change order, but you'll run the risk of making some mistakes that could possibly ruin your guitar. For example, if you rout the neck pocket into the body before making the neck, you might have a problem getting the two to fit together properly. Even if you are working from a precisely drawn plan, there's a good chance that some of the parts you'll be making won't match the plan exactly. Such is the nature of woodworking. But, that's okay. If you follow the steps as I present them, you'll be able to adjust for inaccuracies without having to scrap your project and start over. I've already made the mistakes and it's my hope that through this series of articles, I can help you achieve success without stumbling as I did when I first started building electric guitars.

The second important item is safety. Woodworking can be uncomfortable and even dangerous if you fail to take the proper precautions. Always wear safety glasses and hearing protection. Avoid loose fitting clothing, tie back long hair and get rid of any jewelry that might get caught in a power tool. Read all of the manuals for the tools you'll be using and follow the manufactures safety recommendations. Remember, if you destroy your hearing or lop off a finger or two, that guitar you're building won't be of much use!

Now that I've made the lawyers happy, let's get started build an electric guitar. The first part we're going to make is the neck. Why the neck and not the body, which, after all, is the coolest looking part? The reason is because we'll use the neck as a

guide or template for routing its pocket into the body later on.

To make the neck, we'll begin with the fretboard. Regardless of whether you're going to be using Ebony, Indian Rosewood, Maple or whatever wood you've selected, the board should be around 3 inches wide, 24 inches long and 1/4 inch thick. If go with a thinner board, you may not have enough depth for the fret wire slots. And if you use a thicker piece, you'll have to plane it down.

Start by drawing a center line along the board's length. Then, transfer the fretboard's dimensions from your plan to the board using the center line for placement. Make sure the lines you draw are clearly visible by using either a white or black pencil depending on how dark the wood is.

Use either a bandsaw or a jigsaw to cut out the shape making sure you stay at least a 1/16 of an inch outside the lines except where the board ends at the nut. Here you should cut to the outside edge of the line making sure your cut is square to the center line. So why do you need to cut outside the lines along the



Mark the fretboard shape and cut outside the lines with a bandsaw or a jigsaw



The fretboard ready for slots and a radius

by placing a piece of tape on the blade just above the teeth. Begin sawing by gently pushing and pulling the blade back and forth. It's a back cutting blade, so most of the cutting will happen on the pull stroke. Stop cutting when the edge of the tape touches the surface of the fretboard. Continue cutting each slot as described until you've finished all of the slots. Give yourself an hour or two to do the work. If you get tired, take a break since fatigue will lead to inaccuracy.

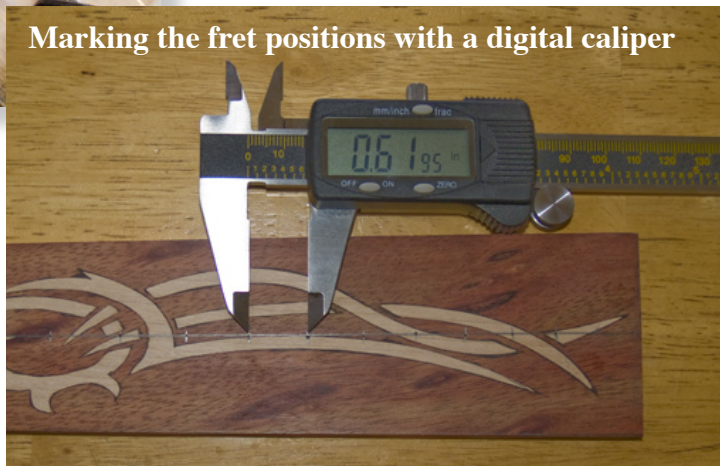
Once all of the slots have been cut,

fretboard's edge and heel? We do this to prevent the neck and fretboard from getting too narrow during the final shaping and sanding of the neck.

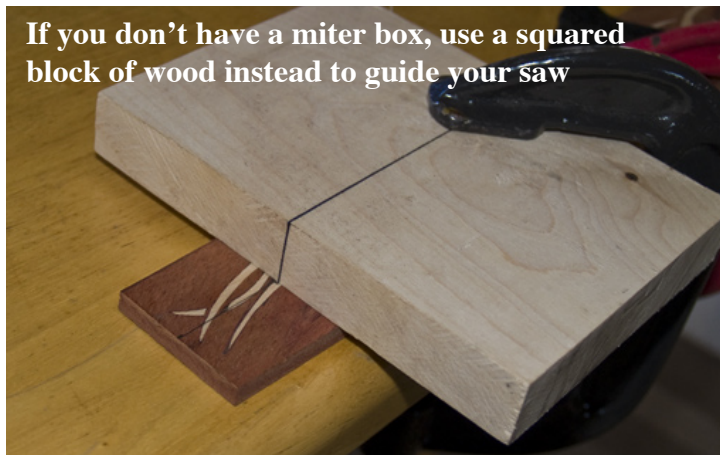
After you have cut out the fretboard, redraw the center line, if necessary, and get ready to mark the position of the frets. To do this, I'd recommend using an online fret calculator like the one available for free at stewmac.com. Enter the number of frets and the scale length and you'll get the precise placement of each fret in relation to the nut as well as to each other. I like to use the measurement from one fret to the next. That way I can use my digital calipers to carefully mark the position of each fret slot. An alternative method is to purchase a fret ruler from Stewart MacDonald or Luthiers Mercantile International.

When you have the fret positions marked and remember, they need to be accurate to within a thousandth of an inch, the next step is to saw the slots. To do this, you'll need a fret saw. I use a Zona model 350 as it has the required kerf, which determines the width of the cut, of .022 inches. That's the size you'll need for most fret wire tangs.

The surest way to cut the slots accurately is to use a miter box. Place the board into the miter box and make sure the center line on the board is square to box's sides. The first fret mark should be positioned directly between the blade slots. Double check that the board is square and clamp both the box and the fretboard to a sturdy table so neither will move. Now you can slide the saw blade into the miter box's slots. Make sure the blades teeth are resting directly on the first fret mark. The depth of the slot is determined by how tall the fret wire tang is. You can mark the depth



Marking the fret positions with a digital caliper

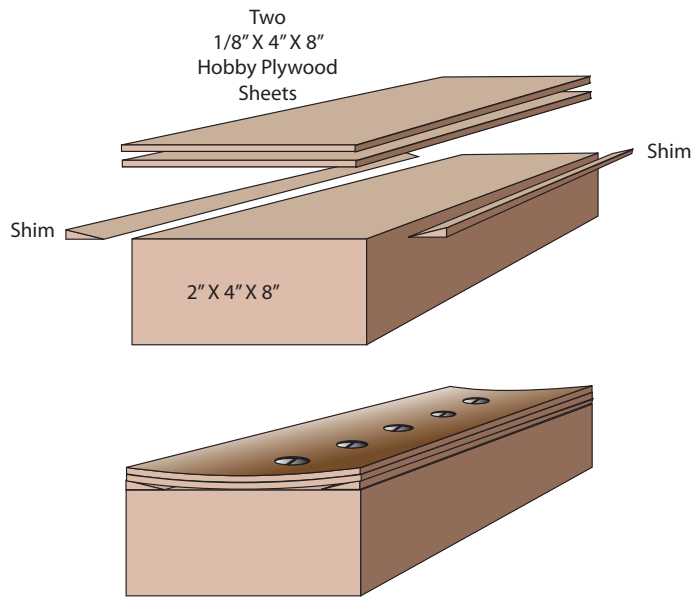


If you don't have a miter box, use a squared block of wood instead to guide your saw



Take your time cutting each slot

How to make your own radius sanding block



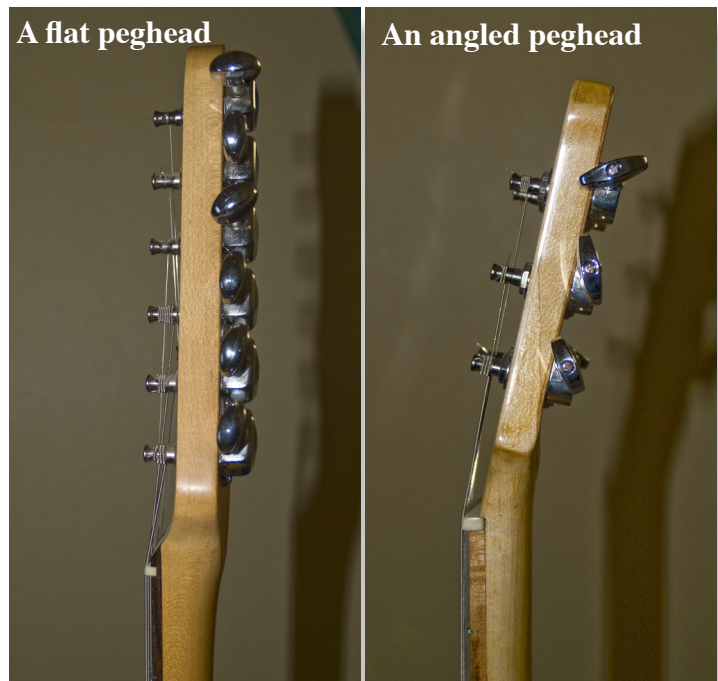
Luthier Checklist page at eguitarplans.com.

To use your radius sanding block, start by attaching an 80 grit sheet of sandpaper to the radius sanding block. Next, firmly attach the fretboard to a worktable with double stick tape. I like to use a narrow table like the Black and Decker Workmate so I can switch sides periodically. This helps to ensure an even radius. Use long and even strokes, moving the radius sanding block from the heel of the fretboard toward the nut end and back. Count your strokes and after about 20, switch sides and repeat. Every so often, stop to check your progress with your radius template. Check the curve between every two or three fret slots along the board's entire length. Don't be surprised if the edges appear to turn downward more sharply than the center of the board. If this happens, cover about a quarter of an inch of

the next step is to radius the fretboard's surface. Contrary to what you might think, fretboards are not flat. They have a slight curvature from side to side. This curvature (radius) can be determined by either player preference or by the bridge you plan on using. If your bridge has a fixed radius, find out what it is from the manufacturer and that's what you'll go by when you radius the fretboard. If your bridge's radius can be adjusted, you can make the radius whatever you want. Keep in mind that the amount of radius will determine playability. If you are able to make the radius whatever you want, do yourself a favor and try out different guitars to get a feel for the radius that works best for you.

There are a several ways to radius the fretboard. Some methods involve complicated jigs that cut the curve with a router. These work great if you're running a production line, but if you plan to make only one guitar you'll need only a radius sanding block and a radius template both of which are available at Stewart MacDonald or Luthier Mercantile International. You can also make your own sanding block and template. For the sanding block, use a couple of 1/8" thick, 4" X 8" sheets of hobby plywood and a 2" thick, 4" X 8" block of wood. Attach the plywood sheets to the block with a row of wood screws down the center of the 8" length. To get the radius, insert shims between the plywood and the block along the 8" long edges in order to raise just the edges of the plywood. The thicker the shims, the greater the curvature of the plywood. Check the radius by using a radius template, which you can make from a free download off the

the fretboard's edges with long strips of masking tape. Continue to sand as before, only now the edges will be protected while the center is reduced. Keep checking the radius with your template and when it's as close as you can get it, remove the tape and switch to 150 grit sandpaper. After you've sanded away the 80 grit scratches, make one last switch to 220 grit and sand the radius nice and smooth. The key here is to get the radius as close to perfect as possible. This will reduce the amount of fret dressing later on. After you finish sanding, you'll probably have to go back and add some depth to the slots with your fret saw since you removed a fair amount of wood generating the radius.



At this stage, you can set the fretboard aside. Now it's time to get started on making the neck.

There are a lot of different ways to make a guitar neck and the method you'll choose will be determined by the style of peghead and how the neck attaches to the body. I'll give an overview for each technique, but for the sake of brevity, I'll only detail my favorite method as it can be used for any kind of design.

With regards to the peghead, there are two styles: the flat Fender style and the angled Gibson style. The Fender is the easiest to mass produce, but requires string tees to pull the strings down so they won't pop out of the nut slots. The Gibson approach solves this problem by angling the peghead down from the nut.

To make a flat peghead requires the top 1/4" or so of wood be removed from its surface either by sawing, routing or planing. The angled peghead requires either a very thick slab of wood to accommodate the peghead, or a thinner board with the end cutoff at the necessary 10-15° angle. The end is then flipped over and glued back in place, giving you an angled peghead.

In terms of attaching the neck to the body, there are three methods: bolt-on, set-in and neck-through. The bolt-on has the advantage of convenience. You can replace the neck if it becomes damaged. The set-in also allows for replacement, but because it's glued in, there's a good deal more involved than the bolt-on. And finally, there is the neck-through design where neck replacement is all but impossible. The advantage of the neck-through is the perceived notion of maximum tone and sustain. However, in my experience, tone and sustain are the product of good design and careful component selection. If you think a neck-through design will guarantee great performance, you'll only have part of the equation.

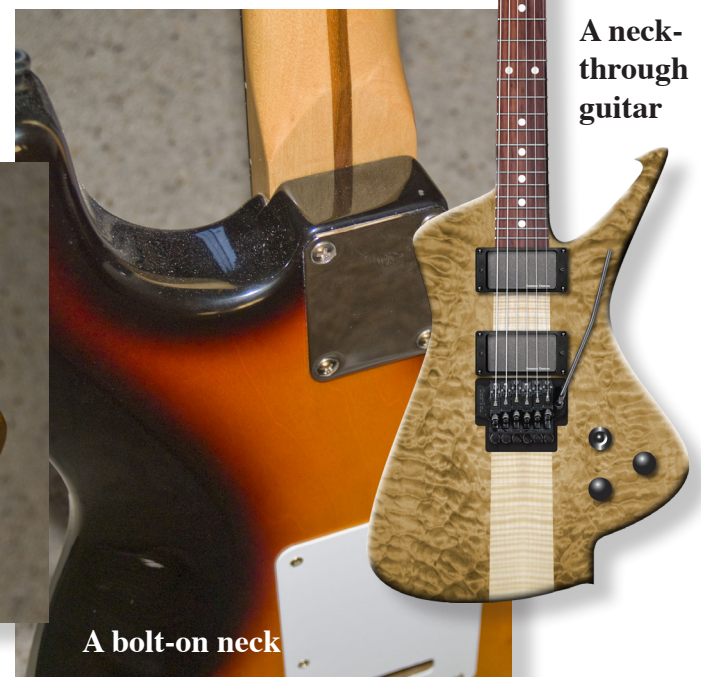
To make the bolt on neck requires a board both wide and long enough to cut out the shape. Since it only needs to be 3/4" to 1" thick, a board will be easy to find. Simply cut out the neck, rout the truss rod slot, shape the contour, glue on the fretboard and you're ready to bolt it to the body with 4 heavy duty wood screws.

The set-in design uses a block-shaped tenon, which extends back from the heel of the neck. This tenon is part of the joint for attaching the neck to the body. The other part is a pocket routed into the body for the tenon to be glued into. These type of necks can be made the same way as the bolt-on, but they require that an extra piece of wood be glued at the heel to make a block thick enough for the tenon.

A neck-through design will require a single board long enough, wide enough and thick enough to carve the neck and the rear extension where the body wings will be attached. The body wings are the curvy parts of the body above and below the pickups and bridge. This approach can be a bit more difficult to make, especially if the neck will require a downward sloping angle.

So what is my favorite way to make a neck, you ask? The method I use is simple and can be used to make any type of neck design. Instead of an overview, I dive right in and tell you how it's done.

Start with a side view profile drawing of your neck. Your guitar






Mark your neck board with five identical profiles

neck of course! This is something you should have drawn in your plan earlier. If you are using a plan from eguitarplans.com, you'll have a profile ready to use. You can print out a copy of the plan and cut out the profile or you can transfer the measurements to the wood you'll be using. Speaking of wood, you'll need a board that is $\frac{3}{4}$ " thick and long enough and wide enough to allow you to cut out 5 identical profiles. Do you see where I'm heading? If not, you will in a second. Draw the profiles accurately onto the board. Next cut them out with either a bandsaw or a jigsaw, making sure you cut along the outside edge of the lines. You don't need to give yourself as much extra space as you did cutting out the fretboard, but it's always safe to have a bit of leeway.

After cutting out the five profiles, glue them together side-by-side and clamp with "C" clamps every couple of inches. Let the glue dry for 24 hours. Then, remove the clamps and presto, you have a neck blank that's ready to finish. One of the cool advantages of this method is having the ability to use different woods together in the same neck. Imagine what Purpleheart and Wenge will look like side by side! On a side note, I have heard people say that a neck made from multiple pieces glued together isn't as strong and doesn't transmit tone or hold sustain as well as a single slab. That's nonsense. Today's wood glues make for a bond that far stronger than any wood out there. And as far as tone and sustain are concerned, as long as the surfaces are clamped tightly together so that there is no gap between them while the glue is drying, there will be absolutely no problem with tone and sustain.

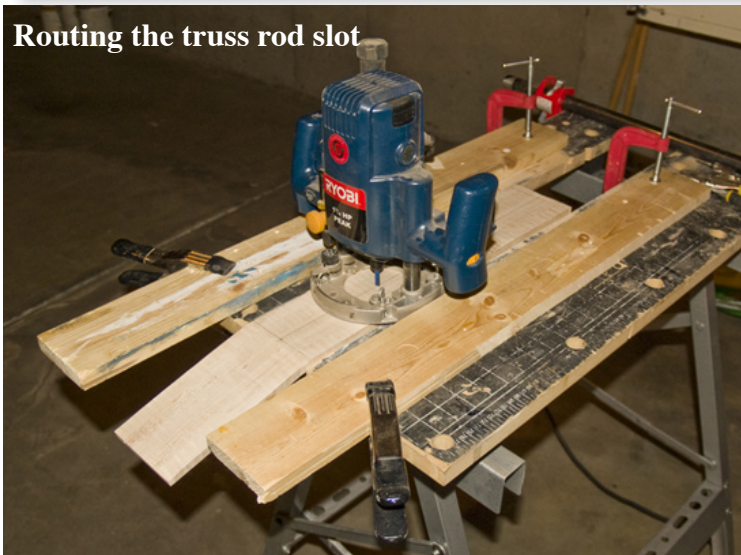
Let the glue dry a good 24 hours before you start to whittle the neck into shape. I know some of you



Cut out the profiles with a bandsaw or a jigsaw



Glue the profiles together, side-by-side



Routing the truss rod slot

are thinking, "I have to use a pocketknife to carve my guitar neck?" Actually, no you don't. I just like to use the term whittle because it's what my grandpa would've said. Truth is, we'll be using modern tools to quickly and accurately shape the neck. And the tools of choice here are the bandsaw/jigsaw and a belt sander. And for those who want to do as much by hand as possible without electricity, grab a wood rasp instead or use it in conjunction with the sander. Other Luthiers like to use a spokeshave because it cool to say, "I used a spokeshave," but I'm a firm believer in modern convenience.

Start by transferring the measurements of your neck from the plans to the blank. Some people like to

The finished truss rod slot



Use your fretboard to make the neck's shape



make a template, which is fine if you're planning to copy the guitar more than a few times. But if you're only making one, you can save time by skipping this step. Next, use your bandsaw or your jigsaw to cut out the shape. Make sure you cut along the outside of the lines like you did when you cut the profiles. If you plan on making a set-in neck, you'll need to shape the tenon accurately. The tenon is a rectangular shape at the neck's heel, which is designed to fit tightly into a pocket routed into the body.

Once you've finished cutting out the neck's shape, the next step will be to rout a long slot for the truss rod. Begin by measuring your truss rod's length, width and thickness to determine the slots dimensions. It's important to note that a truss rod must fit snugly into the slot so it won't rattle when the guitar is played. Next, transfer the truss rod's length

and width dimensions to the flat part of the neck where the fretboard will eventually be glued. Make sure the position of the slot is centered down the middle of the neck. The length of the slot will be determined by the length of the rod only and does not include the adjustment nut. Instead, a hole for the adjustment nut will be drilled into the peghead, just in front of and below the where the string nut will be placed. The diameter of this hole should equal to the diameter of the adjustment nut.

To rout the slot, start by clamping the neck firmly to your workbench. Then, clamp two long and straight boards on both sides of the neck so they run parallel to the slot. These two boards will act as guides for your router so they'll need to be snug to your router's base, which will allow you the slide it over the slot marks without any side-to-side play. Start by routing the slot in several passes. Each pass should be no more than an eighth of an inch deeper than the previous pass. When you've reached a depth equal to your truss rod's height, stop and check to make sure the truss rod will fit flush with the surface of the neck where the fretboard will be glued. You'll have to use a ruler since you haven't drilled the hole for the adjustment nut yet.

After routing the slot, use a power hand drill to bore out the access to the adjustment nut. If you are using a flat, Fender style peghead, you'll probably need an extra long bit to drill the hole. Make sure you position the hole so that it enters the front of the slot exactly where the adjustment nut will reside. Measure and mark this very carefully before you fire up the drill.

Once you are satisfied the truss rod will fit properly, set it aside for the time being. You'll install it later just before you glue on the fretboard. Now, it's time to shape the contour of your neck.

When I talk about neck contour, what I'm referring to is the back of the neck where your fret hand is positioned while you play. The most common shape preferred by the vast majority of players has to be the simple "U" shape. There are other shapes, which have been used by Luthiers over the years, but if this is your first guitar building project, I'd recommend staying with the classic "U." You can try out different shapes on future projects, but I wouldn't recommend doing so until you get a feel for making a contour.

The most important consideration when carving the contour is getting the shape right without exposing the truss rod channel. If this happens, you'll have a nice piece of firewood. To prevent this from



Rasping the contour

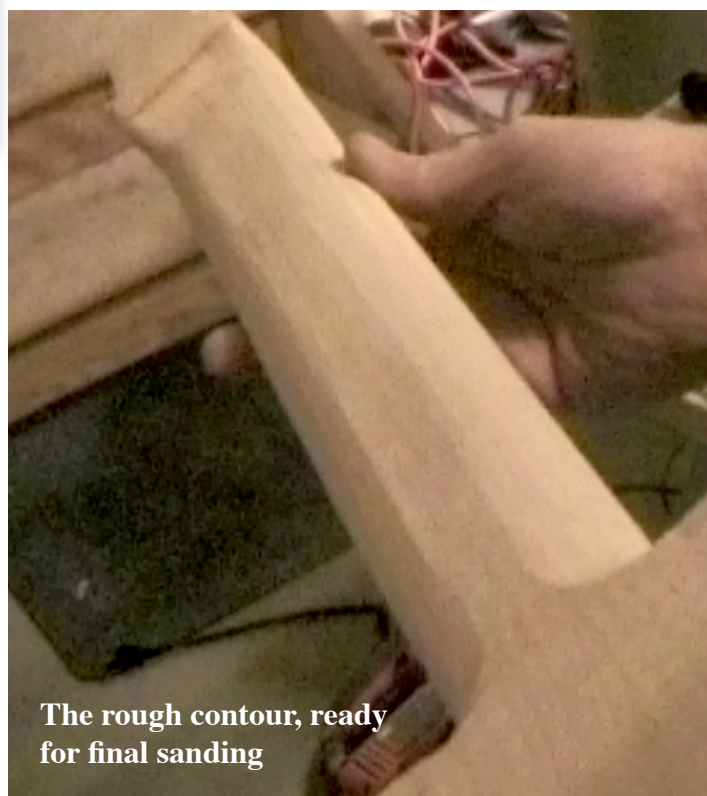


Belt sanding the contour

sander and an 80 grit belt as it really hogs out the wood fast. But be very careful as it can get away from you. Try it out on some scrap wood first to get a feel for what to expect. Otherwise you can use a wood rasp or grandpa's spokeshave. Keep checking the thickness of the neck at the 1st, 7th and 14th frets with your digital calipers. Also, try and stay away from the edge where the fretboard will meet the neck as well as the heel and the peghead. The edges will be dealt with later. As for the peghead and heel, I would recommend using a wood rasp to blend the contour. Look at other guitars to see how this was done. I like to use a pencil to draw a line where the contour should end and the flat surfaces should begin. Of course this area should be blended and not a hard line.

When you think you have the contour right, hold the neck in your fret hand and see how it feels. You should also dummy the fretboard into place to get an accurate idea of the neck's total thickness. If you're satisfied, switch to hand sanding with 120-150 grit paper and finish with 220. We'll eventually sand all the way to 600 grit, but that will come later. First we have to install the truss rod and glue down the fretboard.

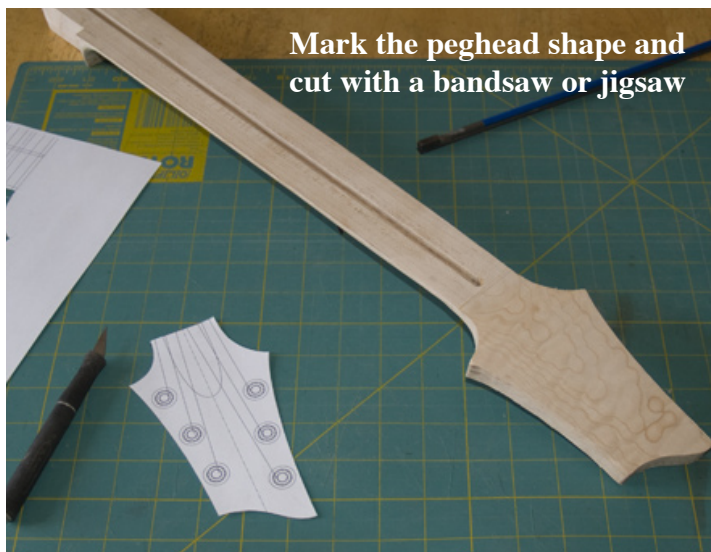
Before you install the truss rod, give the surface of the neck where the fretboard will reside a good rubdown with some 150 grit sandpaper wrapped around a block of wood. You'll need to get the surface nice and flat. Next, squeeze out a bead of silicon glue



The rough contour, ready for final sanding

happening, you might consider making templates to check your progress. To do this, draw a horizontal line on a sheet of paper. Along this line, mark both the width of the neck at the first fret (you'll have to dummy your fretboard into place to do this), and the center. Next measure down from the center of the horizontal line and mark the bottom of the truss rod slot. Now you can connect the marks indicating the edges of the fretboard with a line that curves under the truss rod slot mark. Give at least an eighth of an inch clearance below the truss rod mark. Use your digital calipers to measure the distance from the horizontal line to the lowest point on the curve. That's how thick the neck will need to be at the first fret. Repeat this procedure at the seventh and fourteenth fret. That way you'll get a nice even contour from the nut to the heel.

To make the contour, I like to use a portable belt



Mark the peghead shape and cut with a bandsaw or jigsaw

squeeze clamps to start with here since “C” clamps may cause the fretboard to move. Apply the squeeze clamps and double check to make sure the fretboard is still square. After about ten minutes, apply the “C” clamps, one every couple of inches. That should work out to 4 clamps per side. Tighten up the clamps (don’t go overboard!) and let the glue dry for 24 hours.

When the glue has dried, remove the “C” clamps and gently block sand the sides where the fretboard meets the neck with 150 grit sandpaper. Then switch to 220. This will smooth the transition between the neck and fretboard without the risk of the two becoming too narrow.

At this point, you’re almost finished with the neck. All that’s left to do is install the frets and the tuners. That will come later. For now, grab some sheets of 320, 400 and 600 grit sandpaper, sit out in the backyard in the warm sun with some Django Reinhardt on the stereo and sand your new guitar neck to perfection.

That was a lot to cover in one article. Don’t be surprised if you have to read it several times to pick up everything.

Be sure to join me for the next article when I’ll be discussing the finer points of carving the body and routing the all important neck pocket.

For more information about electric guitar building, visit my web site at eguitarplans.com. There you find a selection of unique and original electric guitar plans available for download at a very reasonable price.



Use plenty of clamps to glue on the fretboard

into the slot. Not a lot, just enough to fill in around the truss rod when you install it. Speaking of which, do that right now before the glue sets up and wipe away the excess. After the glue has dried, cover the top of the truss rod with $\frac{3}{4}$ inch masking tape so that a $\frac{1}{4}$ inch of the neck on each side is also covered. This will keep wood glue away from the truss rod. Apply the wood glue to the surface around the truss rod slot and spread it around with a piece of cardboard or an old credit card. Peel off the masking tape and notice how the wood surrounding the truss rod slot is clear of any glue. Now you can take the fretboard and lower it into place. Don’t wiggle it around or you’ll get glue into the truss rod. Make sure the fretboard is square to the center line on the neck. Of course, you’ll only be able to see the center line at the heel and peghead, but that should be enough to check squareness. I like to use



The finished neck, ready for frets and holes for the tuners