


# Greene & Greene Bedframe





## The centerpiece of our Greene & Greene-inspired bedroom suite, this bedframe features both solid mahogany and selected Honduras mahogany veneer.

By Mike McGlynn

One of the oddities of being a custom furniture builder is that, for the most part, you only end up building the pieces people ask you to — not necessarily the pieces you might want to build. For that reason, I've only constructed two beds in the past 20 years or so. So, I was quite excited when one of my clients asked me to build this Greene & Greene style bedframe.

If you recall the Greene & Greene chest of drawers project I built for the *February 2006* issue, this bed matches that dresser. Later this year, I'll complete the set with a bedside table.

### Rounding Up Materials

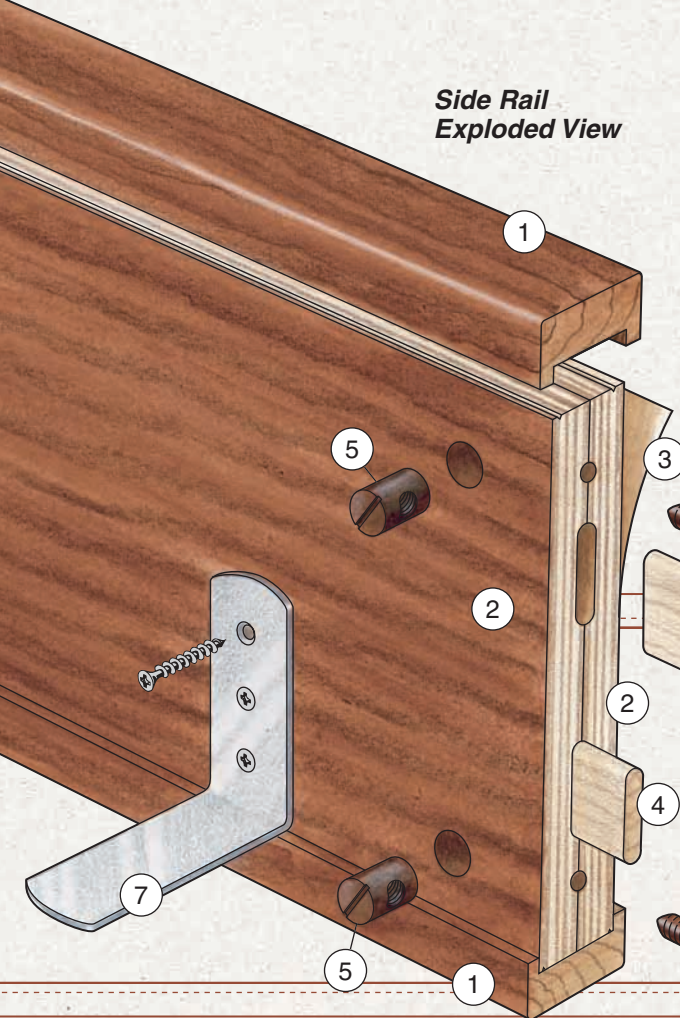
To get started on this project, I needed to select four different materials: solid mahogany, 3/4" plywood, mahogany veneer and solid ebony or African blackwood. The bed requires three thicknesses of solid mahogany: 4/4, 5/4 and 12/4. I spent an inordinate amount of time sorting through piles of mahogany to come up with appropriate boards for this bedframe. My goal was to find straight, color-matched stock. I was lucky to find a 12/4 board that was about 3/4" thick in the rough and very straight. This allowed me to make all the legs from one board so they would match nicely. I also found a wide, straight 4/4 board to harvest all the headboard pieces.

My initial thought was to make the side and toeboard rails out of solid wood, but after thinking it over for a while, I rejected the solid wood idea in favor of veneer-covered plywood for two reasons: Aesthetically it made more sense, as I would be able to get consecutive leaves of veneer so all three rails would match nicely. Additionally, plywood became necessary after sorting through about a thousand board feet of lumber and not finding one board that would work! Surprisingly, I found really nice 3/4" seven-ply plywood at Home Depot for just \$24 per sheet.

Concerning the veneer, one of its great advantages is the size of pieces that are available. I buy my veneer from Certainly Wood ([www.certainlywood.com](http://www.certainlywood.com)), because they often have several different flitches to choose from. In this case, I got six consecutive leaves of Honduras mahogany veneer 12" wide and 10' long.

The last material that I needed was some African blackwood for the plugs. I found a nice jet-black piece at a Rockler store.

### Side Rail Exploded View

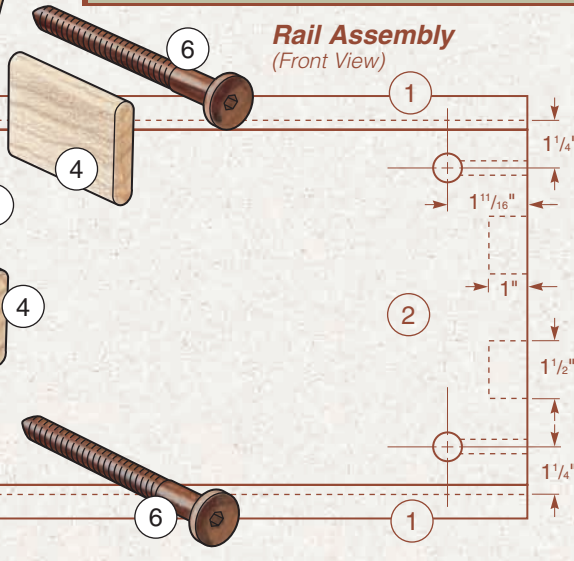


### MATERIAL LIST SIDE RAILS

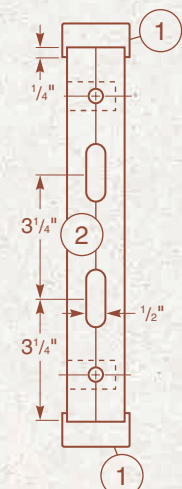
	T x W x L
1 Side Rail Caps (4)	7/8" x 1 3/4" x 79 1/2"
2 Side Rail Cores (4)	3/4" x 9 1/2" x 79 1/2"
3 Veneer* (4)	1/16" x 9 1/2" x 79 1/2"
4 Alignment Tenons (8)	1/2" x 1 1/2" x 2"
5 Cross Dowels (8)	1/4" - 20
6 Connector Bolts (8)	1/4" - 20
7 Box Spring Hangers (12)	4" x 4" x 2" Steel

\* Actual size is provided, but veneer must be cut oversized ... see the directions in the text below.

### Rail Assembly (Front View)



### (End View)



There are two box spring hangers (pieces 7) on the headboard and footboard and four on each side rail.

### Kicking it in Gear with Plywood Side Rails

I started the project by building the plywood-core side rails. This would allow ample time for the solid wood to adjust to my shop's humidity levels. Here's the method to my madness for how I constructed the rails: Cut the plywood into oversized pieces, vacuum-bag glue the pieces of plywood together, vacuum-bag the veneer to the plywood rails, and then trim them to size.

I cut the plywood into pieces that were 1" oversize in both directions. After cutting, I sanded all the edges and corners to prevent the pieces from tearing holes in the vacuum bag. Use 120-grit paper for this job.

Here are a few pointers about vacuum bagging: The most important thing is to have a dead-flat surface to work on. The second trick is to have a well-ventilated platen in the bag. I use a piece of melamine with a 2" x 2" gridwork of shallow saw cuts on the top surface. I also recommend installing a reservoir tank in your system so the vacuum pump doesn't need to run all the time. Despite the advice to the contrary of a shelf full of books, I use blue masking tape to hold things in place and together in the bag. Lastly, use Titebond®'s Cold Press for Veneer glue when vacuum bagging. It's the best veneering glue I've tried.

One of the great things about laminating plywood or solid wood in a vacuum bag is that I can end up with

a nice flat panel instead of the usual plywood warpage. I'm beginning to think that the Holy Grail isn't some jewel-encrusted gold cup, but actually a truly flat sheet of plywood. My Home Depot plywood sheets were flatter than most, but they still had 1/2" or so of curvature from end to end. Put the two concave faces toward each other when you bag the pieces together.

I probably could have vacuumed-bagged all three rails (including the footboard rail) at the same time but, being prudent, I did them one at a time to prevent any potential glue-up disasters. I used a roller to apply glue to both inside faces, let the glue soak in for a minute or so and then recoated. After the second coating, I assembled the pieces and taped their centers and corners with blue masking tape. I put the rail into the vacuum bag, sealed it, and turned on the pump. I leave the pump on for at least four hours. Here in the Southwest desert, where five percent humidity is common, with temperature hovering around 100 degrees, my glue curing time is pretty quick. It may take longer where you live.

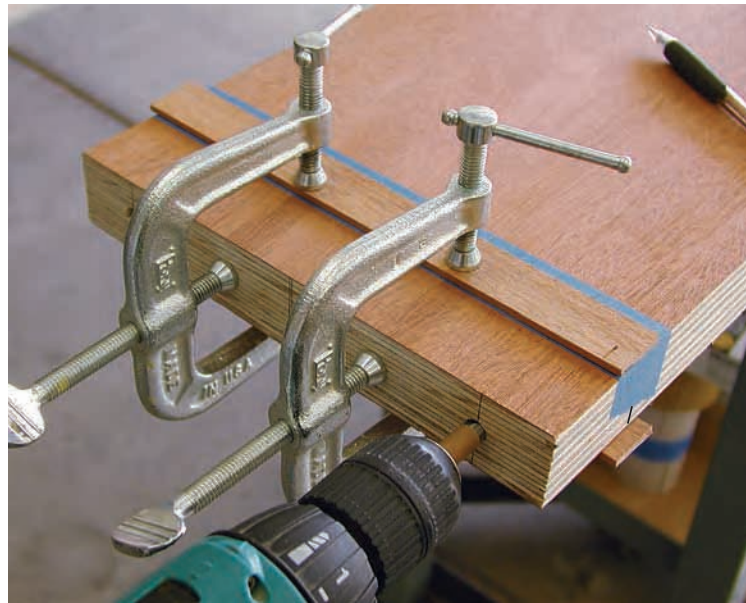
Once the glue cures, pull off the tape and scrape off any excess glue. With the three cores glued up, I laid out the six leaves of veneer to decide how I wanted to cut them to look aesthetically pleasing. To this end, I used a piece of chalk to mark what I thought was the "center"

of the pattern on each leaf of veneer. This is a pretty subjective thing, and I messed around with it for a while until I was satisfied. I should note that, even though the leaves were consecutive, it wasn't as simple as marking one leaf, measuring where my mark was, and transferring that point to the other leaves. They were consecutive leaves, but the grain pattern moved a surprising amount from one leaf to the next. Once the centers were marked, I measured out from that point to mark out the size of the oversize rails. Using a sharp utility knife and a straightedge, I carefully cut out each piece of veneer. Make these cuts in several light passes to prevent the knife from ripping the veneer instead of cutting it.

I glued down the veneer in much the same way as I glued the pieces of plywood together, with the addition of a couple of steps. Using the same glue roller, I applied glue to the plywood core, let it set for a minute or so, and applied a second coat. Don't apply glue to the veneer, as the water in the glue will cause the veneer to roll up into an unmanageable mess. After laying the veneer carefully in place, I taped it down in several places, bagged it up, and let the pump suck down moderately tight. Then I shut the pump off. At this point, starting at the middle of the panel, I took a rubber-headed J-roller and rolled down the veneer and the bag. When everything looked smooth, I turned the pump back on and let it run. I go over the whole panel with the roller one more time after the pump pulls full vacuum.

While I cycled each panel through the veneering process, I rough-cut all my hardwood pieces to slightly oversize dimensions. This further helped the pieces adjust to my shop's climate, so they'd be ready to mill to final dimension. Mark them with chalk to keep their orientation clear.

To finish the veneered rails, I used a block plane and a long straightedge to true up one long edge on each rail. Since I wanted to keep the veneer pattern centered on each rail, I ripped equal amounts off of each edge to reach their finished dimensions. Next I trimmed the ends to length — very carefully — on my table saw.



The author used a "cut-off" drilling jig held in place with end clamps to bore the connector bolt holes in the ends of the side and toeboard rails. A pair of thin scraps prevent the clamp heads from marring the veneer.

To continue with the rails, there are several different joints that needed to be cut on the end of each. I started with the mortises for the tenons. To avoid confusion, I carefully laid out all the mortises, bolt holes and cross dowel pockets on each rail. Marking everything out takes longer, but I find that it prevents potentially disastrous screwups later on. You can cut the mortises with a router jig or chopping them out by hand.

I drilled the cross dowel pockets freehand with a drill and a Forstner bit. To do an accurate job on the connector bolt holes, I made a drilling jig using an end cutoff from the rails. I clamped the jig (photo above) to the end of the rails and drilled the holes with a brad-point bit.

To prevent glue squeeze-out problems later, I cut two glue relief grooves in the edge of each rail (see *photo*, left) on my table saw.

### Making Rail Caps

Once the rails were done, I built the mahogany rail caps. Notice that there's a shallow groove in the caps so they'll fit over the rails. I milled these in several passes on the router table. It was important to sneak up on the final fit so it wasn't too loose or too tight. When you're satisfied with the fit of the rail caps, cut them to length. To prevent the thin lips from chipping out while crosscutting them, just slip a piece of rail cutoff into the groove first.

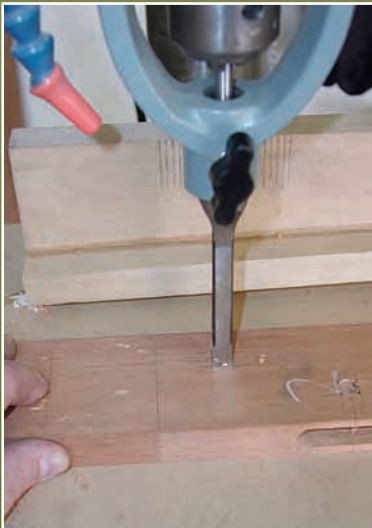


A pair of shallow relief grooves (formed on the table saw using a standard blade) prevent glue from squeezing out when installing the rail caps.

## Combining the Headboard Components

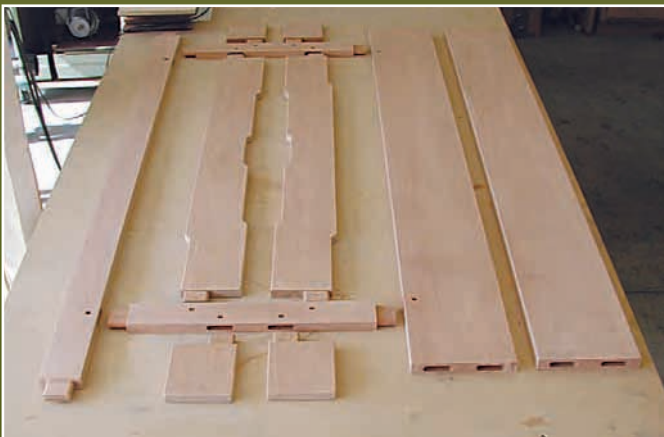


(Above) The short and cloudlift rails attach to the vertical rails with offset loose tenons. Chalk the joints to keep their orientation clear.



(Left) A mortising attachment and hollow chisel bit on the drill press make it easy to bore square holes for the decorative plugs.

(Below) Assemble the headboard in stages, starting with the center cloudlift rails and working outward. Carry out a full dry assembly of the entire headboard first to make sure all the joints fit and close properly.



### Building the Headboard & Toeboard

At this point, I moved back to the solid wood again. Starting with the legs, I milled them to the *Material List* dimensions and cut them to length.

Between all four legs, there are 60 mortises, bolt holes and plug holes to cut. Let me tell you, this really isn't the place to mess up by putting one of these on the wrong face. My solution was to mark them all at once and triple-check my accuracy. Rout or chisel your mortises and then drill the bolt-cap plug holes with a Forstner bit on the drill press. Follow up by drilling the bolt holes. The bolt holes are 3/8"-diameter, whereas the bolts themselves are only 1/4". Having oversized holes here makes the final assembly a lot easier. The only real purpose of these connector bolts is to draw the joints tightly together.

Having learned from experience, I always round over the edges of Greene & Greene pieces BEFORE I cut the little plug mortises! I've had instances where the bearing slipped right into one of the mortises while doing the roundover. Not a lot of fun to repair, believe me. Use a 1/8" piloted roundover bit for this task. Then cut the 3/8" x 3/8" plug holes with a square hollow chisel bit setup on your drill press.

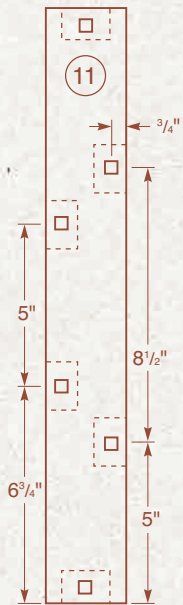
The headboard is the focal point and most complicated part of this bed. As such, there are quite a few small details that you'll have to pay attention to for it to turn out right. I constructed it from the center outward.

I used some 1/4" MDF to make a template for the center cloudlift rails. Take your time to make sure this template is absolutely dead accurate. Trace its shape on the two rails and band saw both rails about 1/16" oversize. Template rout them to final size.

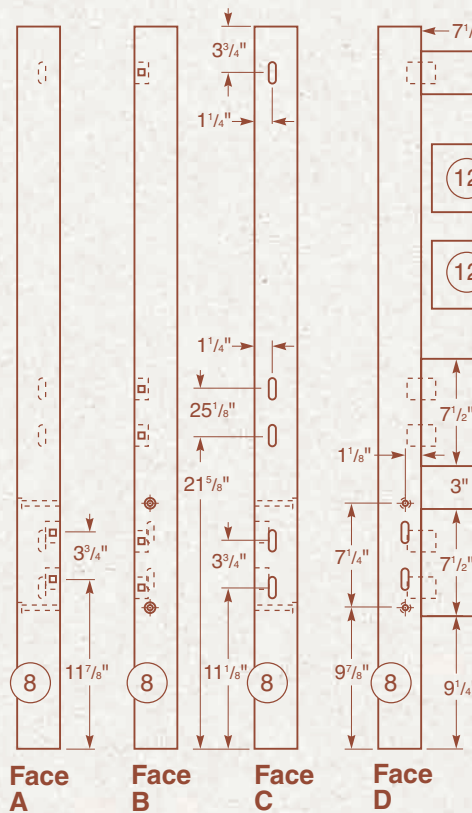
At this point, I laid out the other head and toeboard rails and marked all the mortise locations. (Note: All the headboard and toeboard joints are made with loose tenons that require two mortises each.) The staggered layout of the short and cloudlift rail mortises was necessary to prevent the 1 1/2"-wide tenons from intersecting. I cut the mortises with my horizontal routing machine. If you don't have one, use your router, equipped with a rub collar and straight bit inside a mortising template.

Round over all the edges EXCEPT the two vertical rails, the top edge of the top wide rail and the bottom edge of the top rail. These edges are only slightly rounded over with sandpaper to avoid cutting into the joint space. Then cut the plug holes on the vertical rails with a mortising chisel set up on your drill press.

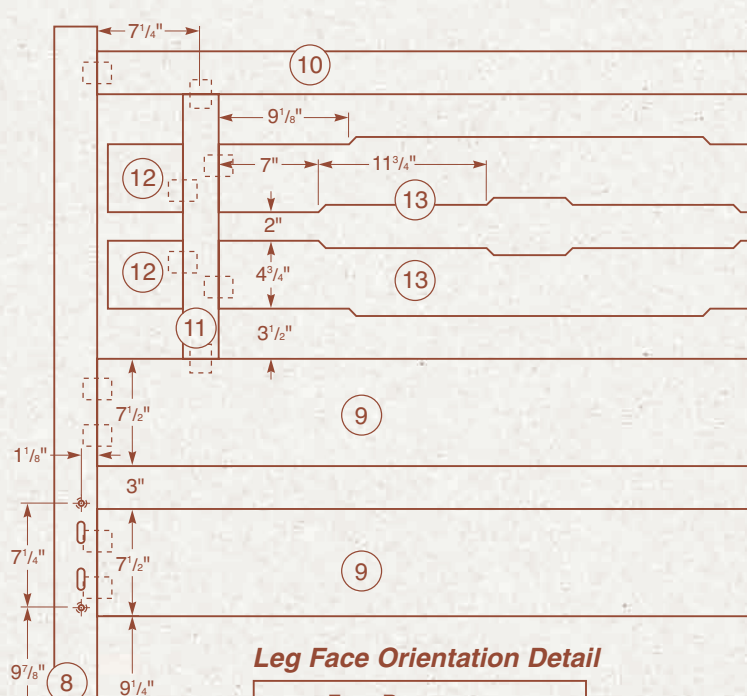
### Vertical Rail Elevation



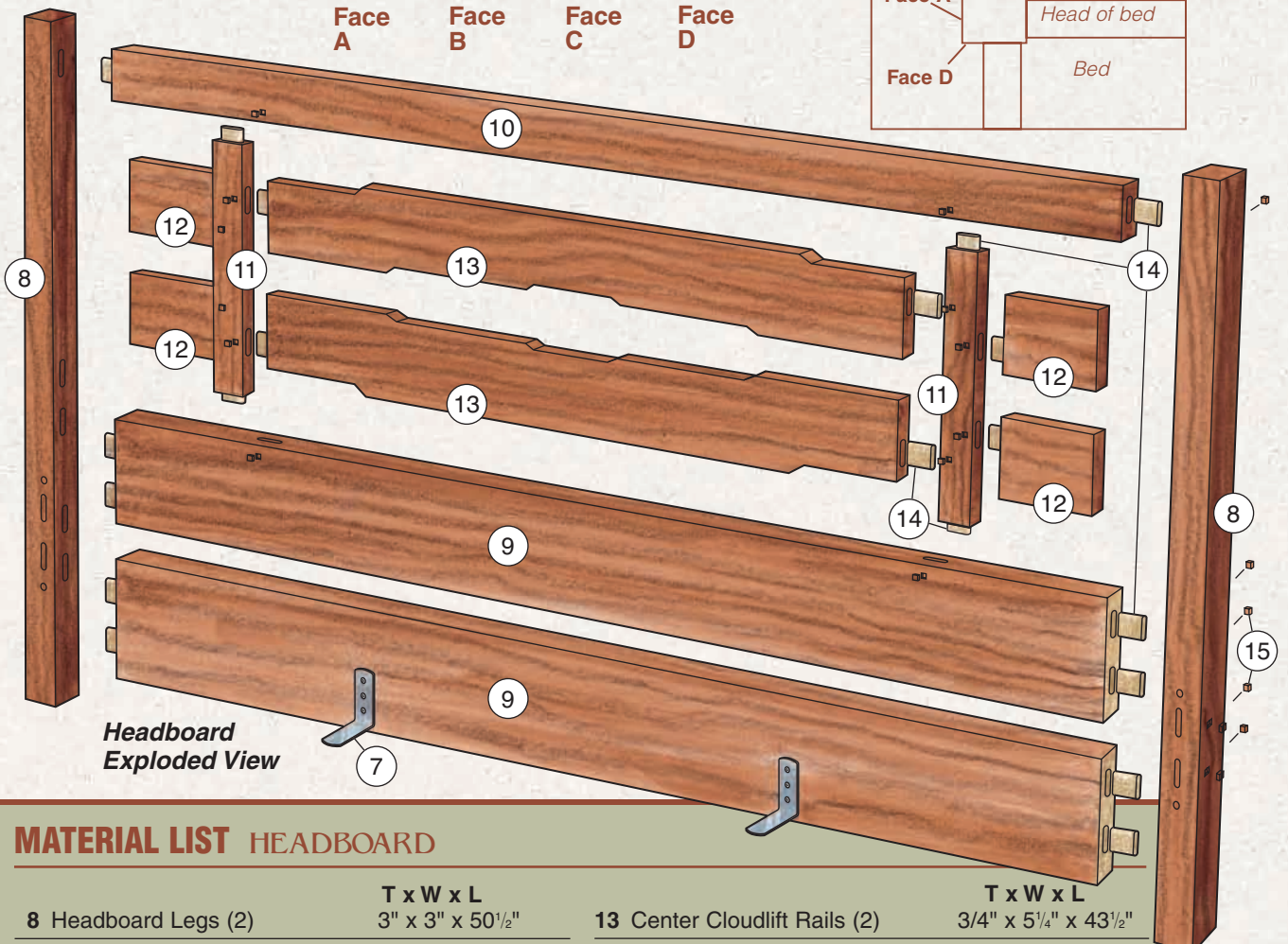
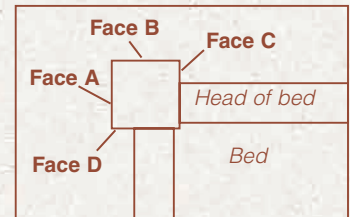
### Headboard Leg Elevations



### Headboard Elevation (Front View)



### Leg Face Orientation Detail



Headboard Exploded View

### MATERIAL LIST HEADBOARD

	T x W x L		T x W x L
8 Headboard Legs (2)	3" x 3" x 50 1/2"	13 Center Cloudlift Rails (2)	3/4" x 5 1/4" x 43 1/2"
9 Bottom Rails (2)	1" x 7 1/2" x 60 1/2"	14 Loose Tenons (22)	1/2" x 1 1/2" x 2"
10 Top Rail (1)	1" x 3" x 60 1/2"	15 Small Plugs (26)	3/8" x 3/8" x 1/4"
11 Vertical Rails (2)	7/8" x 2 1/2" x 18 1/2"	16 Large Plugs (4)	7/8" x 7/8" x 1/4"
12 Short Rails (4)	3/4" x 4 3/4" x 5 1/4"	17 Birch Dowels (4)	3/4" Dia. x 1/4"

## There is really only one way to attain the rich, dark, translucent color that typifies Greene & Greene, and that is with waterbased aniline dye.

Before you move on, give all the parts a thorough sanding and prepare for a complete dry assembly of the headboard, toeboard and rails. You'll need to make loose tenons to carry out this stage. Making loose tenons is easy. I just mill up a long strip of stock that has a nice "tap fit" in the mortises, round over the edges on a router table, chop them to length, and sand the ends a little bit. Voila! Super-strong tenons, production style.

Use clamps, connector bolts, cross dowels and loose tenons to dry-assemble the head and toeboards. I'm sure you'll feel the same sense of relief I did when it all goes together correctly. While taking apart the bed, I carefully marked each loose tenon and its corresponding mortise with a permanent marker so there would be no misplaced parts when it came time for the glue-up.

Then I delivered the bed to the clients, and they were really happy. Oh, did I skip the whole sanding, staining and finishing thing? Man, I wish it was that easy in real life, but the fact of the matter is, the sanding and staining steps are what can really make or break any Greene & Greene project. There's still plenty of work left to do ...

### Preparing for Dye with Careful Sanding

My first step on any sanding job is to raise the grain with a sponge and warm water. This is a good step on any project because it opens up grain that may have been compacted by the planer, and it makes getting rid of planer marks much easier. My first sanding was with 120-grit paper. Use a sanding block for smaller surfaces where your random-orbit sander won't reach. I also did a little detailing work that is a major — albeit subtle — part of the Greene &

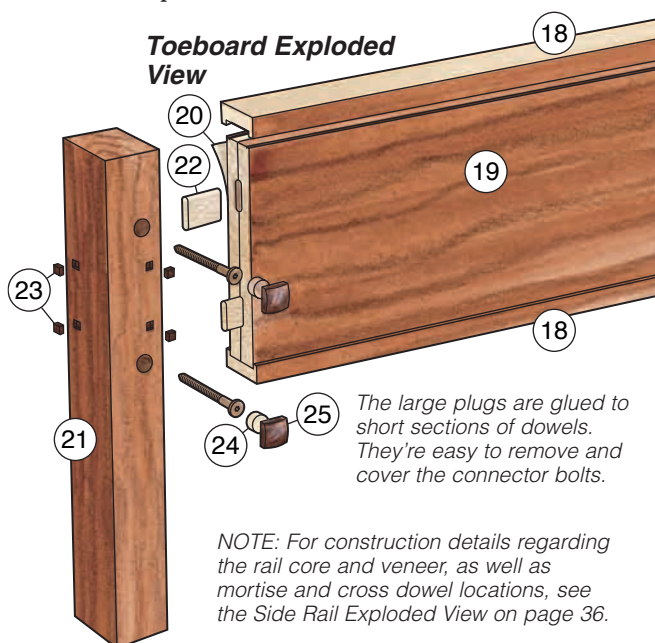
Greene "look": eased corners. The corners on any piece of Greene & Greene furniture are not just simple roundovers but instead are nicely curved to make them have a much more organic, less machine-like, look. I tackle this with a homemade sanding block that has a piece of rubber mouse pad for a face. The softness is perfect for contouring the corners.

After the initial sanding, I raised the grain again. The final sanding now needs to be done with a very light touch to prevent raising more wood fibers. Use 220-grit paper at this stage.

### Moving from Sanding to Applying Dye

There is really only one way to attain the rich, dark, translucent color that typifies Greene & Greene, and that is with waterbased aniline dye. The stain I've used for years is one part Lockwood Red Mahogany mixed with one part Lockwood Brown Mahogany. I also add a couple of drops of dish detergent to help break any surface tension when applying. I've looked at many original Greene & Greene pieces, and this mixture seems to be pretty much dead accurate to their original stain. Each packet of dye powder makes one quart of stain, so I ended up with two quarts mixed. Unlike solvent-based stains, this is approximately enough to stain the Empire State Building! It goes a long way.

There are several things to keep in mind when using this dye. Wear rubber gloves while staining. They will keep dye off your



### MATERIAL LIST TOEBOARD

	T x W x L
18 Toeboard Rail Caps (1)	7/8" x 1 3/4" x 60 1/2"
19 Toeboard Rails (2)	3/4" x 9 1/2" x 60 1/2"
20 Veneer* (2)	1/16" x 9 1/2" x 60 1/2"
21 Legs (4)	3" x 3" x 20 3/4"
22 Loose Tenons (4)	1/2" x 1 1/2" x 2"
23 Small Plugs (8)	3/8" x 3/8" x 1/4"
24 Birch Dowels (4)	3/4" Dia. x 1/4"
25 Large Plugs (4)	7/8" x 7/8" x 1/4"

\* Actual size is provided, but veneer must be cut oversized ... see the directions in the text on pages 36 and 37.

skin, of course, as well as prevent any hand moisture from making a spot on the finish. My preferred method of applying stain is to use a foam brush and then, while the stain is still wet, wipe down the part with a lint-free cotton cloth. If the stain is left to dry on the surface without wiping, the end result will be blotchy. While I'm wiping the part, I make sure to wipe up any dye that may be pooling in a mortise or corner so it doesn't run out and cause a dark area. These are hard to fix later.

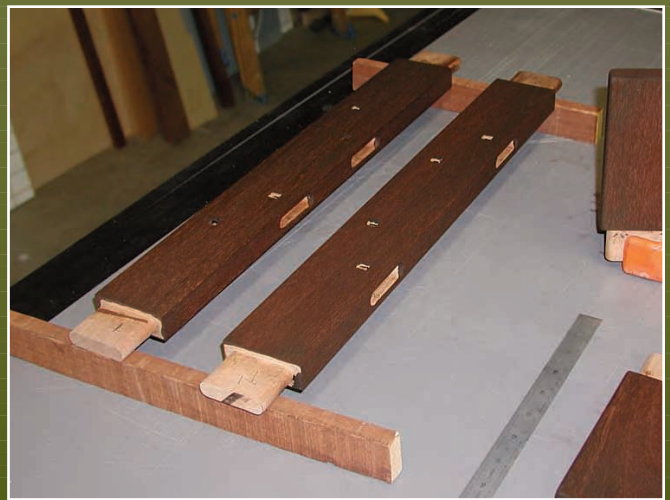
Let the parts dry completely overnight, then very gently buff the surfaces with a fine Scotch-Brite® pad. This buffing smoothes any minute roughness that the dye may have made and makes the final finishing easier. From this buffing stage until the final finish is on, continue to be vigilant about not getting any moisture on the dyed surfaces. Only handle the parts with rubber gloves until the final finish seals the dye into the wood.

### Assembling the Headboard & Toeboard

Start the headboard assembly by gluing the four short rails to the two vertical rails. Once these assemblies dry, glue them to the two cloudlift rails. When this center section dries, glue it to the top and mid rails. The last step is to glue this assembly and the bottom rail to the legs. I used epoxy to bond all these joints. I don't use Titebond for gluing up anything stained with waterbased aniline dye because the moisture in it could ruin the stain if it squeezes out of a joint.



Slip a loose tenon into the short rail mortises so you'll have something to hold onto during staining. A spring clamp works well to hold these rails vertically while they dry.



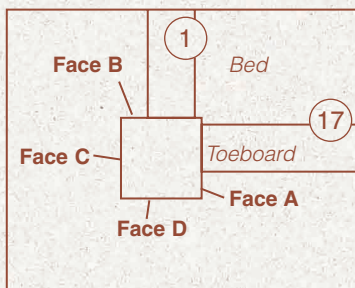
Use strips of scrap to suspend the longer rails by their tenons when you stain them and while they dry. Don't let the wet, stained surfaces lie flat, which could smear or blotch the dye.



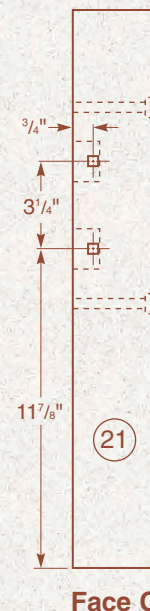
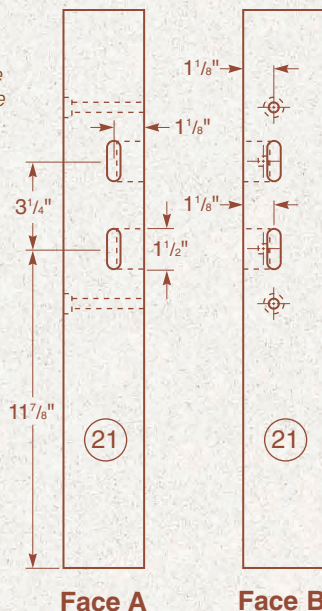
### Toeboard Leg: (Mortise and Bolt Locations)

Follow the diagrams at left to locate the mortises and connector bolt holes on the legs. Notice in the Leg Face Orientation Detail (below) that the rails are set back from the leg faces.

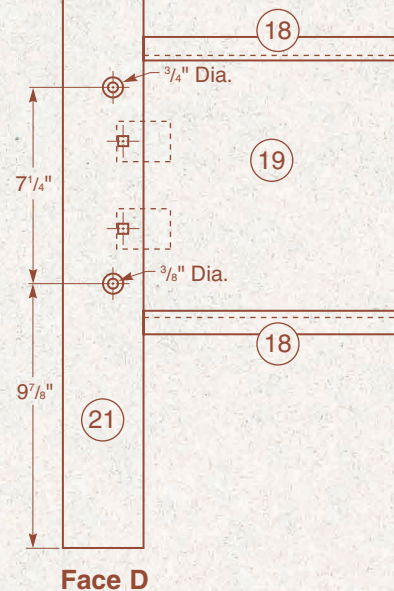
### Leg Face Orientation Detail



### Toeboard Leg Elevations



### Toeboard Elevation (Front View)





All of the leg and rail joints on this bedframe are assembled with loose tenons. The author makes them "production style" in long strips, then cuts them to length.

I just mill up a long strip of stock, round over the edges on a router table, chop them to length, and ... Voila! Super-strong tenons, production style!

### Making All Those Ebony Plugs

Making plugs consumes an amazing amount of time. There are 20, 3/8" x 3/8", plugs on this bed and another eight 7/8" x 7/8" bolt caps. I started the plug-making process with a 3/8" x 3/8" African blackwood stick. I milled this strip about 1/64" oversize. This extra thickness allows me to use a hard block and 120-grit sandpaper to ease the dimension down until I have a nice, tight "push fit" in the plug holes. After squaring up both ends of the stick, use progressively finer sandpaper to dome and polish each end. I finished the polishing with 1,500-grit Micro-Mesh™. Now, use a miter gauge on the band saw to carefully cut off each end to the appropriate length. Re-dome the ends of the stick and repeat. I made the larger bolt caps in a similar fashion.

Here's how I decided to cover the bolt holes in a Greene & Greene fashion: I settled on having the square caps attach to pieces of dowel that have a nice push fit in their holes. I specifically made the counter-sunk bolt hole 3/4" in diameter so I could use a 3/4" dowel for this purpose. Make sure your dowel stock fits the holes well; these caps will remain removable, but shouldn't fall out. To make the dowel plugs, slice off 3/16"-thick disks on the band saw. Sand both sides flat and glue them to the backside of the square caps.

In the meantime, go ahead and install all the smaller plugs. Before tapping the plugs home with a soft-faced mallet, put a small dab of silicone adhesive in each hole. Final sand the bolt caps with 220-grit paper.

### Final Assembly made Simple

Assembling the bed is a piece of cake. Prop up the side rails, slip in the alignment tenons and bolt everything together with the connector bolts and cross dowels. Push the bolt caps in place. Now, stand back to admire your handiwork. Hold off on installing the metal box spring hangers until you set this bed up for use, as they have a nasty habit of reaching out and poking you right in the shin or scratching everything in sight.

I am extremely happy with how this bedframe turned out: It's solid with an understated elegance, and it makes a great partner to the new dresser.



Mike McGlynn, a Las Vegas woodworker, is a contributing editor to Woodworker's Journal.

Epoxy is not waterbased, so it can be safely wiped off without lifting the stain. Before assembling the toeboard, glue the rail caps to the rail cores. Then assemble the toeboard with loose tenons and epoxy.

To finish the bedframe, I applied three coats of synthetic catalyzed lacquer. Carefully sand between each coat with 320-grit sandpaper. Spraying an even coat of finish on the headboard will require some tricky gun work. I had to adjust my spray pattern and flow several times per coat to avoid building up excess finish in different areas. Take your time with the spraying stage. Or, choose a topcoat that is easier to apply, such as wipe-on oil-based polyurethane, if you're not comfortable spraying lacquer.

Woodworker's Journal readers should keep their eyes open for Mike McGlynn's next project: a bedside stand to complete this bedroom suite.

