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Frame-and-Panel Bed

A project plan
for building
a classic bed



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Frame-and-Panel Bed

Design rests on faceted legs with compound curves

BY DAVID FAY

My favorite designs have come to me unexpectedly, in a flash of an idea, far away from the drafting table. The ensuing challenge to develop that vision into a finished product requires a lot of time spent refining what may seem like small details.

I begin with a sketch, nothing fancy or beautiful. The back of an envelope or napkin will do. Drawing this way frees me from the constraints of trying to perfect the piece; all I'm after is getting the inspiration down on paper.

If the piece is a commission, the next step is listening to the customer. That often influences the dimensions of a project. For this bed, the customer wanted a queen-sized frame that could accommodate a fu-

ton mattress or a standard box-spring and mattress set. As a result, I had to make the bed rails wide enough to accommodate an adjustable inner rail.

A dimensioned drawing comes next. Although an accurate drawing can help me visualize a piece, this two-dimensional tool has limitations. That's why I build a full-scale model of any tricky parts to work out design and construction needs and to perfect technical skills.

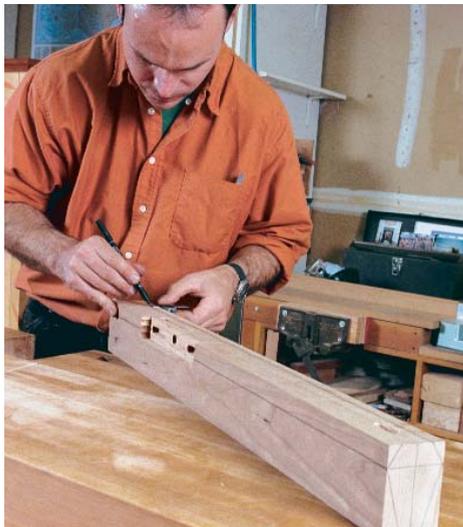
The model allows me to evaluate how the details relate to the rest of the design. For example, I used a model to determine the proportions of the posts and rails. I experimented with the reveal at various widths. A $\frac{7}{8}$ -in. reveal looked chunky, and a $\frac{5}{8}$ -in. reveal looked skinny. But when I



A bed made in three types of wood. The frame-work, including the posts, is made of cherry. The panels are resawn, slip-matched pear wood. Accent strips along the inside of the frames and along the bottoms of the bed rails are granadillo.

SHAPING THE BEDPOSTS

Establish the outside curve ...



Lay out the bedposts. The six-sided shape is drawn on the end grain first, then the lines are carried over onto the faces.

tried a $\frac{3}{4}$ -in. reveal, it looked right. I also used the model to determine the size of the granadillo reveal as it related to the panel and posts and rails. Using the model, I was able to refine subtle details and their proportions. There's nothing scientific here, no golden rules. It's a matter of trial and error and trusting your instincts.

Cut the joinery, then begin shaping

The bedposts are thick at the top and get skinnier near the floor. As the thickness changes, the widths of the two faces also change. But one thing stays constant: the width of the outside edge or reveal.

All of the joints that involve the bedposts are machined while the stock is still square. These joints include the tenons for the upper and lower rails of the headboard/footboard, the mortises in the bedposts, the tenons on the long rails (see the story on p. 78 to learn how to make the hidden post-to-lower-rail joints) and the grooves for the panels.

Next, lay out each post's six-sided profile on the end grain (see the left photo above). Then connect the lines from end to end along the outside of the post—use a black, thin-line pen, which is easier to see than a pencil line.

The posts have three straight, flat sides (inside edge and the two adjoining sides), two curvy sides (on each side of the outside edge) where the plane twists and a curved, tapered side (the outside edge



Cut the outside curve first. Bandsaw close to the line.

... and grind the facets



with the $\frac{3}{4}$ -in. reveal). Whenever possible, I make templates to lay out and cut curved parts (see the story on p. 77). I use the templates to trace layout marks, and then, after bandsawing parts to rough dimensions, I attach the templates to the stock and use them with a pattern-cutting bit.

Mark the outside facet of each post using a template and bandsaw the waste (see the



Attach the template to the post. Clean up using a router and pattern-cutting bit.

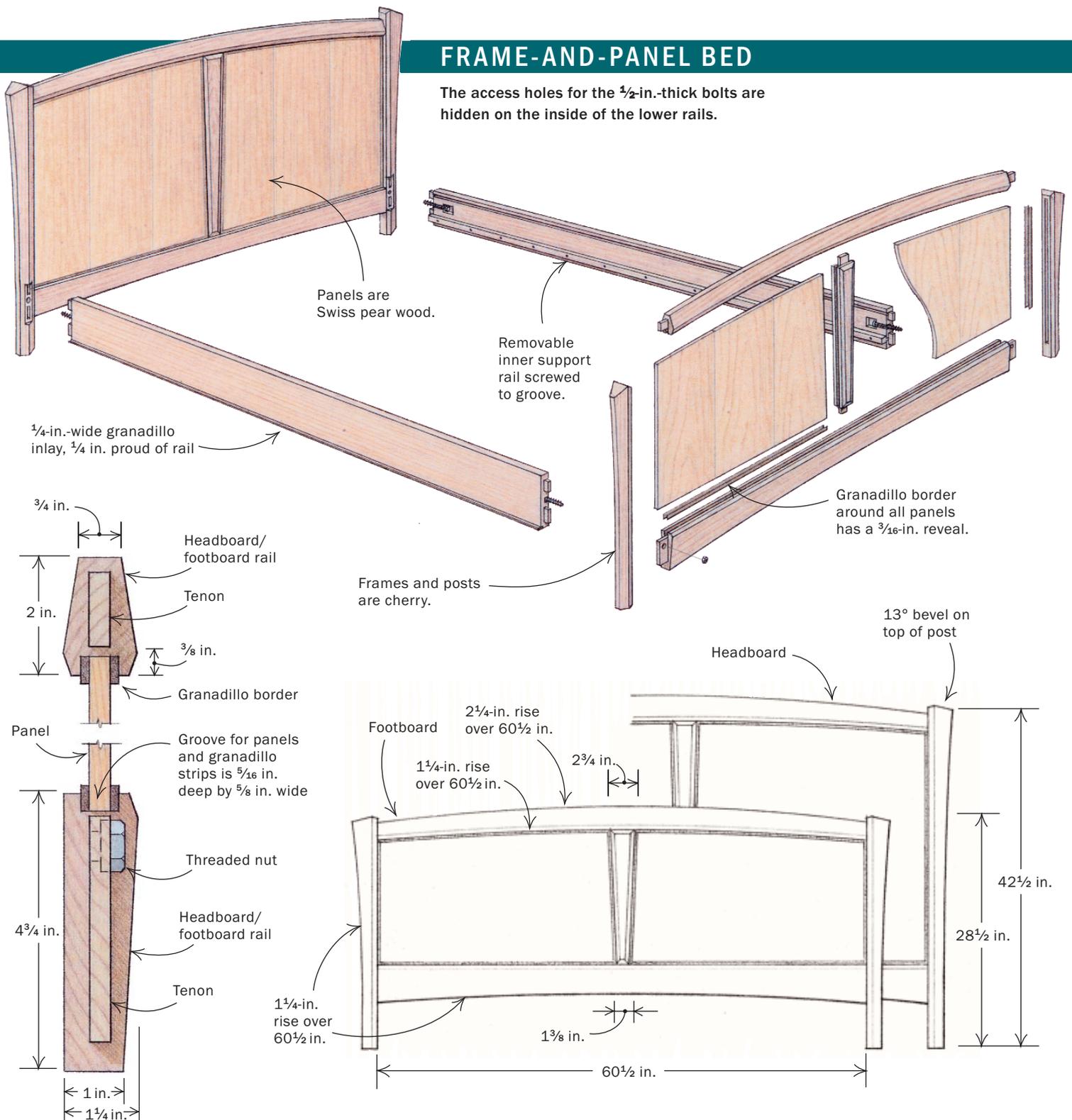
Shape the facets with an angle grinder. A 24-grit sanding disc removes material quickly. Use long, fluid motions and take light passes.

middle photo above). Fair the curve by attaching the same template and trimming the post with a pattern-cutting bit, as shown in the right photo above (screw the template to the waste portions of the post). Remove the template and draw the last set of layout lines on the outside face.

Use a router with a 45° bearing-guided bit to remove as much stock as possible

FRAME-AND-PANEL BED

The access holes for the $\frac{1}{2}$ -in.-thick bolts are hidden on the inside of the lower rails.



from the corners of the post. Next, use an angle grinder with a 24-grit sanding disc to rough in the shape (see the bottom photo on p. 75) on the two facets of each post that curve and twist. Use long, fluid motions with this tool and don't stop in midcut. Otherwise, you end up with flat spots that break up the curve. With a light touch, you can grind smoothly and get very close to the layout lines. It takes some practice to

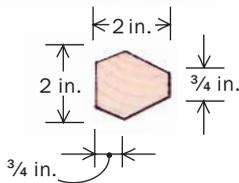
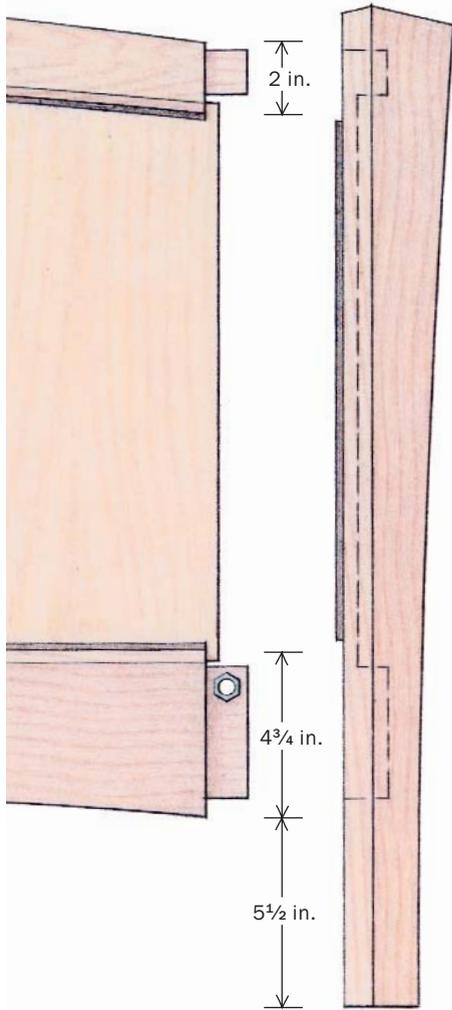
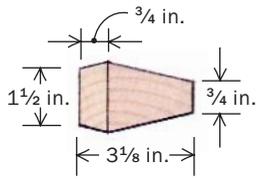
get a feel for shaping with a grinder, and I fine-tuned my skills using scrap stock.

Clean up the post—A No. 50 Nicholson pattern-maker's rasp is used to fine-tune the shape. A rasp is small enough that you can follow the twist on each post.

To find high and low spots left by the grinder, draw diagonal pencil lines across the faces of each post. The rasp works best

cutting in short, diagonal strokes. When the deep scratches left by the 24-grit disc are gone and the curves of the posts look fair, move on to a hand scraper, paying close attention to the layout lines. Hold the post up to a light to see how it's coming along. When you run into domed sections, remove material using long, fluid motions.

Clean up further using a small sanding block. I prefer to use a small piece of medi-



um-density fiberboard (MDF) with cork glued onto the face. It's small enough (approximately 1 in. by 1 1/2 in.) to maneuver along the changing curves of the post. A large sanding block tends to straighten the curves instead of following them.

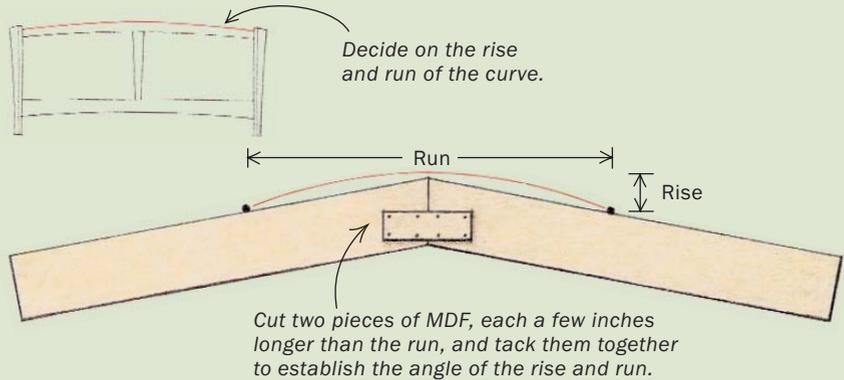
Start with 180-grit sandpaper and follow up with 220 grit. If you find rasp marks on the surface, go back to the scraper, which works faster than sandpaper. Finally, use a



Routing curved templates

You don't have to figure out the radius of a curve as long as you know the rise and run. With this method, you can make perfect templates for curved work, especially wide-radius curves. Because the method involves a trapped cut, there is some danger that the router might want to find its own path, so be prepared to turn the tool off immediately if it starts getting away from you.—D.F.

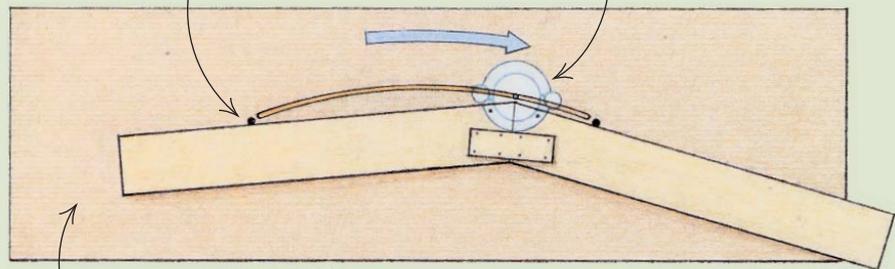
Make the jig



Cut the template

Place two nails or round shelf pins onto the template stock at a distance equal to the length of the template plus the diameter of the router bit.

Attach a plunge router (equipped with a 1/2-in. straight bit and 5/8-in. template guide) to the jig, orienting it so that the bit just touches the intersection.



Use 1/2-in. MDF for the template stock. Be sure it's long enough to support both wings of the jig.

Place a large sheet of scrap below the template stock to avoid cutting the workbench.

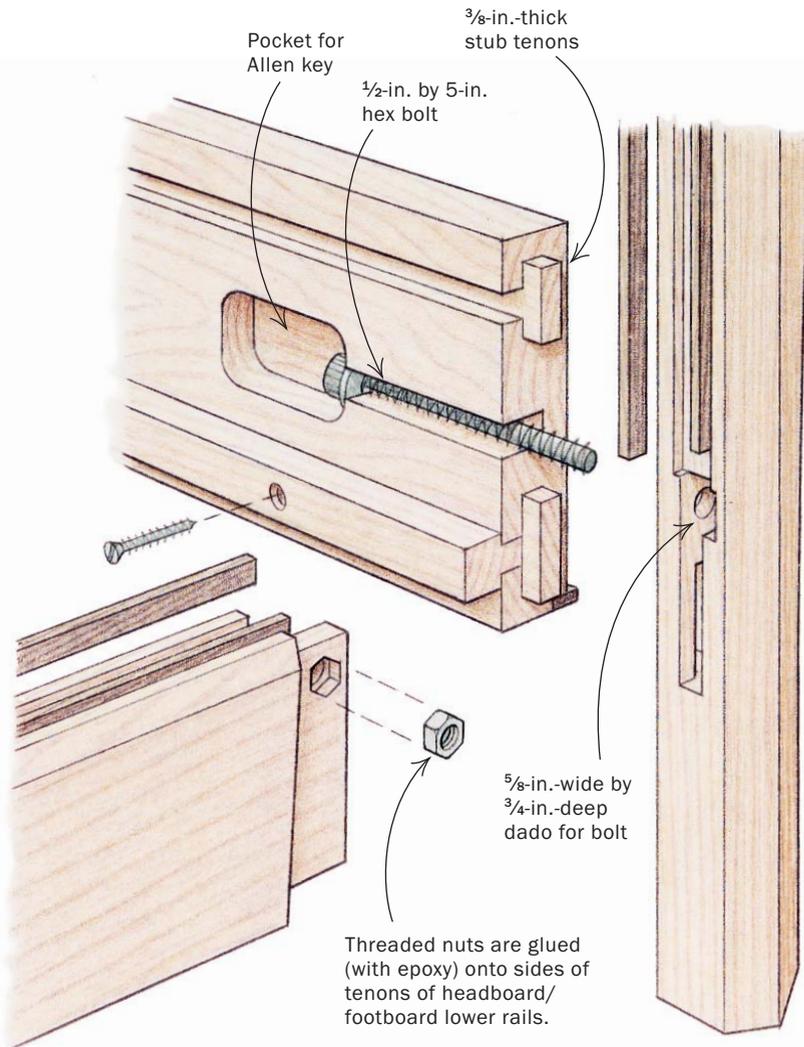
Set the jig down and push it up against the pins. Turn the router on, plunge in about 1/8 in. and push the jig to the right, keeping it in contact with the pins. Repeat, taking deeper cuts until you cut through the template stock. Don't let the router bit contact the pins. Finish cutting out the template on a bandsaw.



Hidden bed-rail-to-post connection

Decorative caps made to cover bolt holes in bedposts work fine, especially when used on traditional-looking furniture. But I didn't want a cap to detract from the fluid shape of the posts of this bed. A friend, Mike Laine, showed me how to get a strong joint using mortise and tenons coupled with captured nuts and bolts. The joint is secure and leaves no trace of its mechanics once the bed has been assembled and a mattress or futon installed.

Refer to the drawing on p. 76 for the size and location of the joinery, which is cut while the stock is still square. Clamp and dry-fit the posts to the lower rails of the headboard and footboard, one at a time. Then, on the drill press, align a drill bit with the already drilled bolt hole in the post and drill through the tenon of the rail, being careful not to drill too deeply.



Remove the lower rail and thread the bolt through the hole and into the nut. Scribe the outline of the nut onto the tenon. The mortise for the nut captures only half its thickness; any more would weaken the tenon. To make room for the protruding half of the nut, enlarge the mortise in the bedpost around the nut with a small router and finish up with a chisel.

The bolt is housed in a dado cut into the lower rails, centered between the two tenons. Mortise around the head to give you enough clearance to reach in with a hex wrench and cinch everything down. Check the joints for fit, then epoxy the nuts in place, being careful not to get any glue on the threads.—D.F.

small piece of folded 220-grit paper and hand-sand the surface with the grain. Hand-sanding is important because your fingers will sense any high or low spots. Lastly, break all of the edges with a rigid sanding block and 220-grit paper, just enough to make the edges inviting to touch yet still crisp to the eye.

Cut the top of each post on the chopsaw, then sand it smooth with a rigid (no cork) sanding block, which will bring out the figure of the end grain.

Headboard and footboard also have six-sided parts

The upper and lower rails for the headboard and footboard are curved and have six sides to match the posts (see the drawings on p. 76). The procedure for building the headboard and footboard is similar to the posts. First, cut the joints while the stock is still square. (The only exceptions are the center stiles. Take their measurements off the frames of the headboard and footboard after dry-fitting them. Cut the mortises for the center stiles by hand.) Then mark the six-sided profiles on the shoulders of all of the tenons.

As you did with the posts, make a template to help lay out and cut the curves of the headboard and footboard rails. Mark the curves using the template, then rough-cut the parts on the bandsaw. Finish up by attaching the template to the stock and use a pattern-cutting bit and router. Before shaping the facets of the rails, cut the slots for the accent strips and panels using a router with a slot-cutting bit.

The same methods and tools used on the posts are used to mark, cut and shape the rails. The center divider is cut like the rails; the tenons are cut first on the tablesaw. Then the tapered angles are cut; the bevels are shaped with a grinder.

A granadillo border separates frame from panel

The panels in this bed are made of Swiss pear wood, and the frame, posts and rails are made of cherry. Although in time the cherry will darken more than the pear wood, the contrast in color between them, after milling, is subtle. To separate the two woods visually, the frame is inlaid with strips of granadillo, a deep, rich, purple-brown wood. The strips of granadillo surround each panel. A strip of granadillo is also inlaid along the bottom edge of the bed's rails.

INLAY ADDS CONTRAST



Degree of separation. Granadillo provides contrast and separation between the similarly toned cherry and pear wood.



Before the joint is assembled. The granadillo strips are glued into the grooves for the panels using a battery of small spring clamps.

Mill the granadillo strips wide and long. (Rip all of the granadillo straight; the strips will bend to conform to the curve of the rails.) Then clamp up the rails and stiles and take your measurements for the granadillo. Cut the strips to size, then glue them in place using lots of spring clamps. Where the strips intersect, use a butt joint.

Take measurements for the panels while

the headboard and footboard are clamped together. Then transfer these measurements onto 1/4-in.-thick particleboard or plywood and cut these out on the band-saw. Because of the number of curves, there's usually a bit of tweaking to get everything right. Once you have a good fit, use the 1/4-in.-thick panels as templates for the real thing.



Movable inner rail accommodates two types of mattresses. Placed in the lower groove, the rail is positioned for a box-spring and mattress set. In the upper slot, the rail accepts a futon (using slats for support).

The pear-wood panels are resawn and slip-matched. Leave about 1/8 in. of extra space for every 12 in. of panel to allow for expansion and contraction of the wood. When gluing up the frame, put a dab of glue in the center of each rail's groove to keep the panel centered.

This bed frame is compatible with a futon or a box-spring and mattress set. To allow for that, cut two dadoes—one high, one low—on each long rail. For the futon, two removable inner rails are screwed to the upper grooves. (You'll also need slats to support the futon.) For use with a traditional mattress set, the inner rails are attached to the lower groove, and the box spring rests on the inner rails.

Finish with hand-rubbed oil

I used a low-gloss tung oil to finish the bed, applying three coats over three days. When applying the first coat, the wood will be thirsty and absorb a lot of finish. Apply a liberal amount of oil to one section at a time, such as one panel. Rub off the excess after a couple of minutes and move on to another section. After a day, go over the entire piece with a green 3M scrub pad, lightly rubbing off raised grain and built-up oil.

On the second day, apply a thin coat of oil, again working in small sections, and wipe with a clean cloth after a few minutes. For a splotch-free finish, remove the excess before it begins to dry and get gummy. On the third day, apply a final coat, the same way as the second, but use even less oil. When using oil, less is better. □

David Fay builds custom furniture in Oakland, Calif.