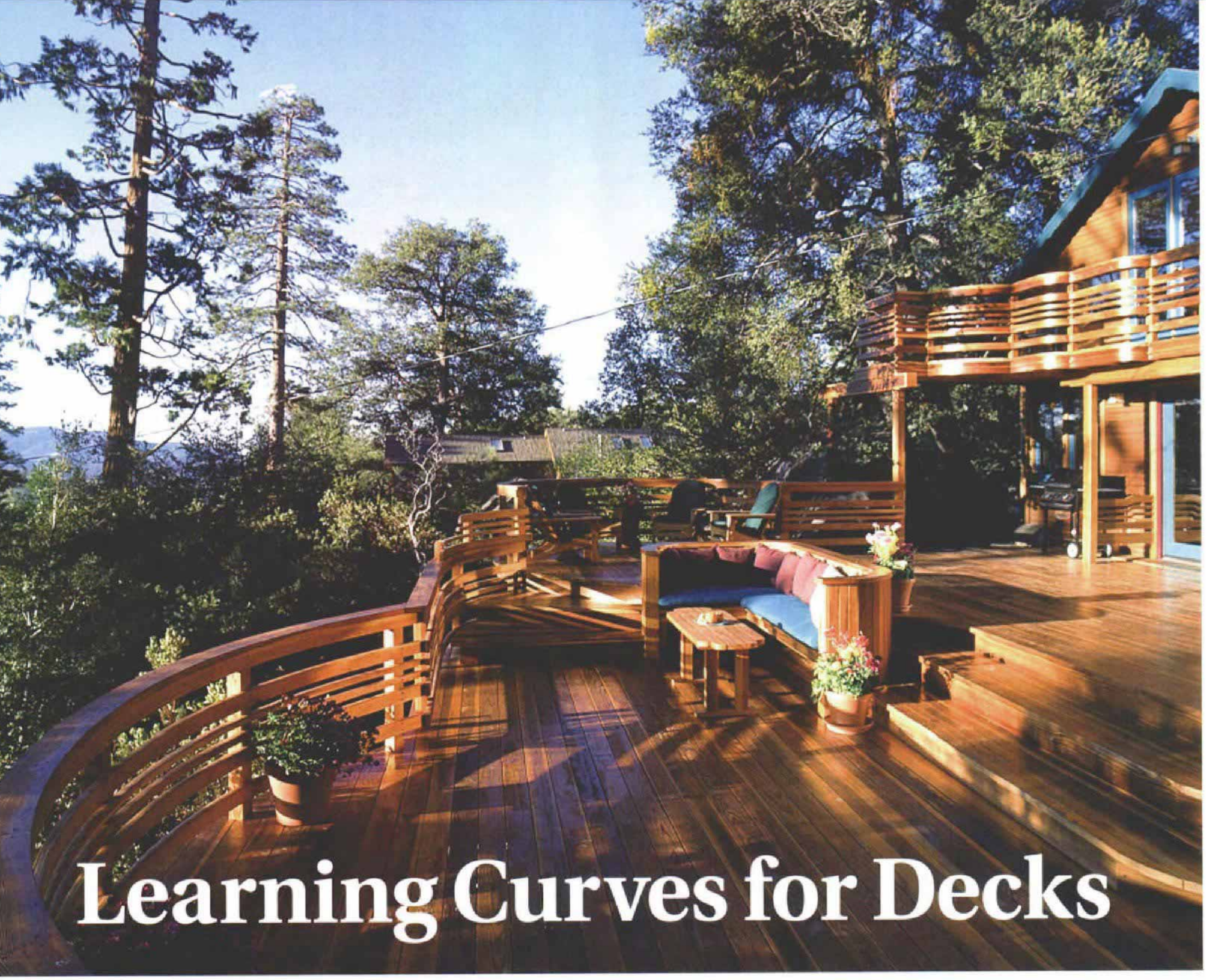


Learning Curves for Decks

Thin stock, waterproof glue and a big 1x4 compass simplify deck curves

BY SCOTT PADGETT

Plumb, level and square. For me, these three building commandments always included an implied fourth: straight. But after 20 years, I found working to these rules less and less of a challenge. Then I discovered curves. Not only do I think them more graceful and pleasing to the eye, but I also have encountered a whole new set of challenges. I've since built more than a dozen curved decks for clients, plus one for myself (photo above). Surprisingly, I've learned that curved work looks harder than it really is.

Standard framing and a 1x4 trammel set the stage

Framing the undercarriage of a curved deck is relatively straightforward. One difference is that you often can't use a single straight girder to support the cantilevered joists of a curved deck. If you did, the joists in the center of the curve would end up cantilevering too far. The solution is to use two or more girders configured in a wide V to support the curves (top photos, facing page).

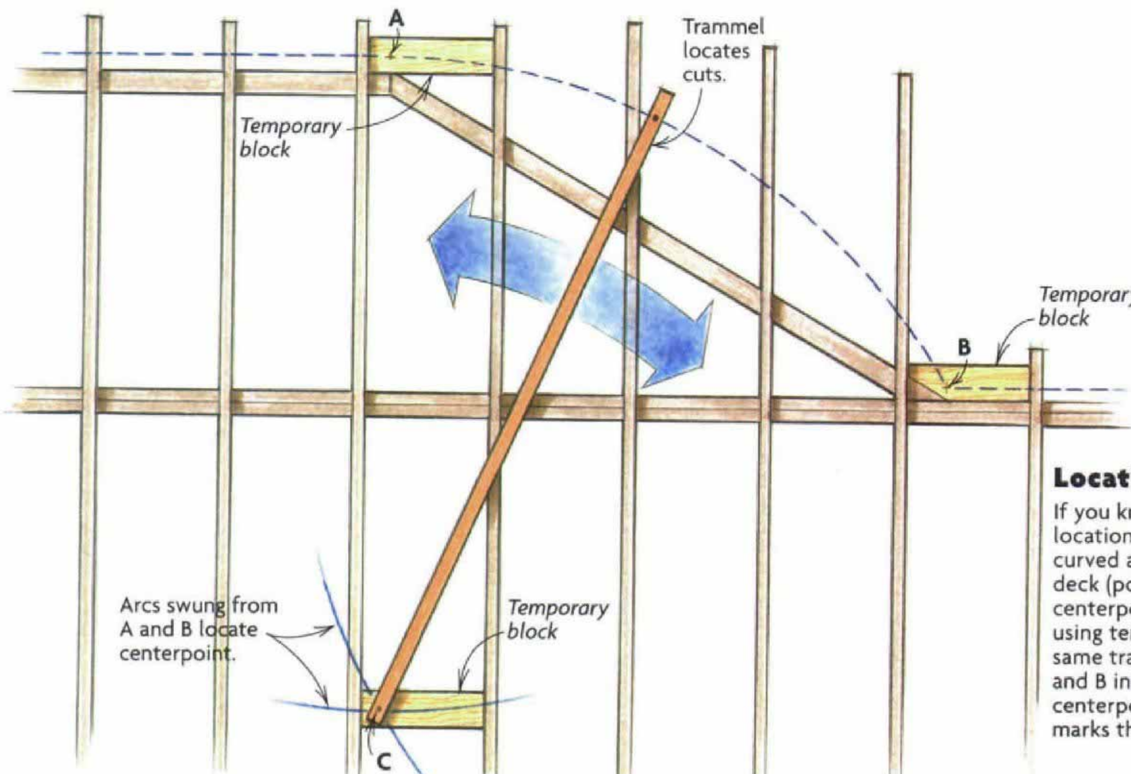
I allow all joists to run long, then cut them to length after marking the correct radius. Working from an accurate scale drawing of the framing greatly simplifies this process because it allows me to select and install joists of the proper length.

After the girders and joists are in place, a trammel consisting of a 1x4 with a nail in one end and a pencil in a hole drilled through the other end is all it takes to lay out the perimeter radius (photo bottom left, facing page). I nail a 2x6 block between joists to provide a pivot point for the trammel (drawing, facing page). The radius is marked on each joist's top edge, and a cutline is squared down its face. The angle of cut will be different for each joist and is easily determined by lining up the blade on the radius mark, then locking in the angle on the saw (photo bottom

Photo this page: Andy Engel

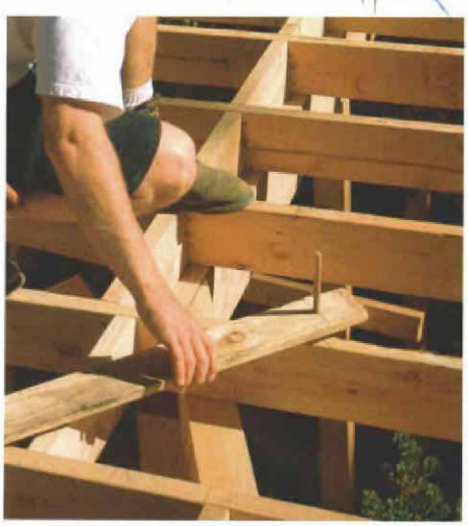
Although curved decks look difficult, the framing is simple enough. The key difference is in arranging the girders to avoid overcantilevering the joists. This is usually done by setting several girders at angles rather than the typical single girder that supports most decks.

Angled girders avoid excessively cantilevered joists. Joist length varies on curved decks, so the author runs them long and cuts them to length in place.

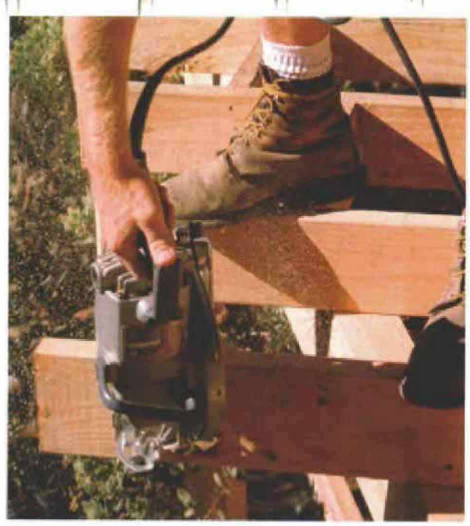


Locating the centerpoint

If you know the radius and the location of the intersection of the curved and straight sections of the deck (points A and B), finding the centerpoint (C) is simple. Drawn using temporary blocks and the same trammel, arcs swung from A and B intersect at C, the centerpoint. Reversing the trammel marks the radius on the joists.



Trammel made from a 1x4 lays out big radii. A pencil placed in a drilled hole marks the radius atop the joists. The trammel pivots on a nail that has been driven in a temporary block (drawing above).



Lines squared down from the trammel marks guide the saw in cutting the joists to length. The bevel of the saw is adjusted for each cut.

Blocking nailed between the joists keeps the ends from flexing as the laminations are bent around them, provides backing for stapling the laminations and makes a solid attachment point for newels.

Photo top right this page: Andy Engel. Drawings: Dan Thornton.

center, p. 61). When all joists have been trimmed, I install blocking between their ends to provide solid bearing for the railing posts (photo bottom right, p. 61).

Select good wood, and rip it into narrow strips for bending

I use air-dried redwood for curved elements. Kiln-drying makes wood more brittle and less resilient, so I don't recommend using kiln-dried wood for curves. Unless I'm steam-bending, when the initial moisture content of the wood makes little difference, I avoid green lumber because of the shrinkage potential. For this deck, I used air-dried 2x6 B-grade redwood as deck boards. I picked out the best boards to rip into strips to be laminated into curved rails and fascias. I chose only wood with growth rings that were 1/8 in. or less apart. Wood with more widely spaced growth rings can split apart at the growth rings while it's being bent.

The tighter the radii are, the thinner the laminations should be. For a 5-ft. radius, I use 1/8-in. thick stock. Quarter-inch thick material bends to a 6-ft. radius, 3/8-in. material conforms to a 10-ft. radius, 1/2 in. bends to a 16-ft. radius, and 3/4-in. thick material takes care of everything larger than a 20-ft. radius. For radii less than 5 ft., I steam the wood to make it pliable enough to bend (sidebar pp. 64-65). For decks with multiple radii, I find it more efficient to cut all the wood to the proper thickness to form the tightest curve. This practice also eliminates the possibility of mixing materials of differing thicknesses.

Also, a 3-in. wide piece of stock of any thickness is more flexible than a 6-in. wide strip of the same thickness (and is also easier to rip on a table saw). The formula above is for 3 1/2-in. or narrower pieces. When I need to make up a wider lamination, I lay the strips together into the lamination (bottom photo). For example, all the fascia on this deck are 1 1/2 in. thick and 5 1/2 in. wide. Instead of trying to work with 5 1/2-in. thick stock, I ripped 2x6s in half; then from the resulting 2x3s, I ripped the twelve 1/4-in. thick strips that formed the laminations.

Defects can cause the wood to fracture, so I inspect it carefully for checks, knots and other defects before ripping it into strips.

The joists are the bending form

To make the fascia, I stapled the first strip to the joist ends with 1 1/2-in. long, 1/4-in. crown galvanized staples. I spread TiteBond II (Franklin International; 800-669-4583; www.franklini.com), a waterproof glue, on the face of the second strip and stapled it below the first. I was careful to keep this strip as flush as possible with the first. Then I spread glue on the strips for the second layer in the laminations (top photo).

Each layer was stapled to the previous layer with the staples spaced to close any voids. Because of the blocking between the joist ends, I didn't have to worry about staples sticking dangerously out of the back of the fascia. I putty the staple holes in the last layer with Color Putty after finishing the deck.

With six layers in place, I gave the glue a day to dry. Then I belt-sanded the joint in the fascia's center, where the 2 3/4-in. strips meet.

Well-anchored newels serve as bending forms for the railing

The next step was to locate newel posts along the curves. I laid out the locations of these posts by measuring the length of the arc with a tape and dividing this number into equal spaces. Because tight-radius laminations exert more pressure on the posts (which serve as forms for all but the tightest radii), posts on a large radius can be set far-

NARROW STRIPS BEND EASILY

To make up this 5 1/2-in. wide fascia, the author glued layers of 2 3/4-in. wide strips side by side. After ripping a 2x6, he resawed the 2 3/4-in. wide halves into thin, bendable strips using a 10-in. table saw.

Waterproof glue and staples make quick, reliable laminations. The glue is applied with a disposable paint roller to ensure uniform coverage (photo above). A helper positioning the strips eases stapling them in the correct location (photo right).

MAKING THE RAILING MIRROR THE FASCIA

Newels, stoutly set and tangent to the fascia, create a bending form for the railing. The railing laminations are glued together at their permanent locations on the newels, and the cap is scribed to fit

Blocking braces the newels. Because the newels are the forms for the railing, they must be braced to stay plumb while the railing is being bent. Bolts will reinforce this connection.

To support a narrow strip during glue up, an extra joist serves as a bench. This strip will be applied to the curved rail, partially completed in the background, then secured with staples while the glue sets.

Pencil scribes the curve on the segmented 2x8 cap rail. Intermediate 4x4 blocks (foreground) support joints in the cap rail that don't fall on newels as well as provide blocking for the top bent rails.

ther apart than posts on a tight curve. On my deck, I set the posts on about 4-ft. centers for the 10-ft. radius section and on slightly less than 3-ft. centers for the 6-ft. radius section.

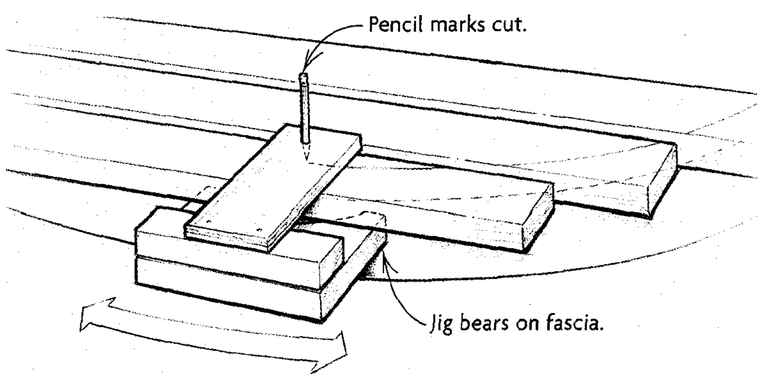
A word of caution: Bending wood can snap it. I work from the inside of the curve so that I'm not in the line of fire if a lamination breaks.

I marked each post in place by holding it tangent to the inside edge of the curved fascia and scribing its bottom to the joist blocking. Then I notched the posts using a bandsaw. When all posts were set, I cut an additional 2x6 block to fit between the joists and against the inside edge of each post to provide support on three sides of each post (photo top left). The posts were further secured with ½-in. galvanized machine bolts.

Before I could bend the railings, I had to lay the deck boards. Curves affect deck-board layout in several ways. Because the newel posts are tangent to the curve, abutting deck boards require notching at different angles. Occa-

JIG MARKS THE RADIUS ON THE DECKING.

After trimming most of the scrap from the decking, the author marks the final curve with this jig (photo right). Two points of its bottom slide along the fascia, and the pencil marks the cut (drawing below). This method ensures that the decking follows the fascia.



Photos top, bottom right this page: Richard Lackey

Tight curves require steam

The most demanding of all the curves occurred at the balcony, where the radii varied from 30 in. to as tight as 9 in. (photo above). These tight curves required steam-bending. I use a low-tech device.

After finding that my Coleman camp stove, was inadequate, I used a 50,000-Btu propane burner for the heat source. A new 2½-gal. gasoline can is the steam generator (top photo, facing page).

A length of radiator hose sized to fit tightly into the spout of the gas can connects the can to the steam box, a 10-ft. length of 6-in. schedule-40 PVC pipe. Caps are glued on one end and left loose on the other. A hole drilled in the pipe's bottom accepts the radiator hose, and four other ½-in. dia. holes let condensate drain and avoid pressure buildup.

A narrow section of aluminum grille, also from the hardware store, keeps the redwood off the bottom of the tube so that steam can circulate. The whole setup cost less than $100.

PLYWOOD FORMS SHAPE THE LAYERS

For curves this tight, it's necessary to clamp the wood to forms. I made mine of ¾-in. plywood top and bottom, with 1½-in. blocks between. The forms were 3½ in. wide, the same thickness as the posts, which expedited the process by allowing the inside and outside pieces to be clamped simultaneously (bottom photo, facing page).

Because I used water-activated polyurethane glue for these rails and because I was going to steam the wood, I cut the railing strips from unseasoned redwood 4x4s. I made them all 3⁄16 in. thick and kept them stacked in the order in which they were cut to keep glue joints as inconspicuous as possible.

Before placing the strips in the steamer, I put ⅛-in. thick wooden spacers between the layers to allow better circulation of the steam. Rubber bands hold the bundles of wood together to ease handling the material.

I fire up the burner and wait until steam begins pouring out of the holes in the bottom of the tube. Then I remove the loose cap, place the bundle of strips in the tube and replace the cap. I use gloves and turn my face away while placing and removing steamed pieces. After about 45 minutes, I remove the hot bundle, clamp the

sionally, a post falling in the center of a deck board demands a pocket cut. I lay out such cuts using a scrap of post and set the angle with a sliding bevel. Once the cuts are marked, I drill a hole large enough for a jigsaw blade and cut the post's hole, back-cutting slightly to ease slipping the board over the post.

I rough-cut deck boards about 3 in. past the fascia. To mark the finish cut, I made a jig out of scrap 2x6, which bears on the curved fascia below (drawing and bottom photo, p. 63). A pencil atop the jig marked an even overhang. A jigsaw with a sharp blade made the final cut, and I belt-sanded the edge smooth and fair. When screwing down decking near the curved fascia, I drove the screws into the blocking so that I wouldn't wedge apart the layers in the lamination.

Horizontal rails preserve the view

I designed my rails to be horizontal because they emphasize the deck's contours. Be careful with this design if you have children who might climb the rail or if you live in an area where horizontal rails are code-restricted.

Bending the railings was similar to bending the fascia. The main difference was that the rails were narrow enough (3½ in. at most) that I could make them from one width of stock. Also, except for the top laminated rail, each lamination consisted of six ¼-in. layers for both visual and physical strength. The rails were bent in place and stapled with

Photo this page: Andy Engel

A new gas can—filled with water—is the heart of the steam generator. A propane burner provides the heat, and a radiator hose brings the steam to the PVC-pipe steam chamber. Holes in the PVC drain condensate and prevent pressure buildup.

Steamed-redwood strips easily bend to tight radii. The author clamps the steamed strips to plywood forms for several hours until the wood cools. Then he unclamps the strips, spreads glue and reclamps them.

pieces around the form and let them cool for an hour or two (photo right).

When the redwood has cooled, I remove the clamps and start applying glue. For this project, plastic tape on the forms and waxed paper beneath prevented gluing the forms, the redwood and the workbench together. Clamps were placed about 3 in. apart, and each assembly was left to cure overnight.

Once the wood is removed from the form, installation is simply a matter of screwing the rail to the posts, then building a cap rail as I did for the larger radius railing.

—S. P.

¼-in. crown galvanized staples sized to penetrate all layers but not protrude.

At the top rail, I divided the six layers so that three layers went on each side of the posts to support both edges of the cap rail. The cap rail was cut from segments of 2x8 redwood, mitered to place the splices over posts or over 4x4 blocks placed between the top rails (photo top right, p. 63). In this case, I used kiln-dried wood to minimize shrinkage and to keep the miters as tight *as* possible.

The larger the radius, the greater the length of each cap-rail segment that could be cut from a 2x8 and still leave a ½-in. overhang. For the 10-ft. radius, each segment was about 24 in. long, and the 6-ft. radius allowed only about 16-in. segments. When all the segments had been mitered and tacked in place, I scribed the curve on the underside of the blanks using a pencil that was taped to a shim and then held flat against the top rail. The cap-rail segments were then removed, and the curves were cut on a bandsaw. During the final installation, I cut a #20 biscuit into each of the miters and applied glue to mating surfaces.

A light pass with a belt sander removed the bandsaw marks and smoothed the curve. I screwed the cap rail into the posts and blocks only, not into the top rail, to avoid splits. ☐

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