Curved Deck Stairs

A temporary form and laminated plywood stringers make building these stairs easier than you might think

BY MIKE GUERTIN

When I designed a multilevel curved deck for clients, I didn't consider adding curved stairs. I'd never built a set of freestanding curved stairs and wasn't ready to offer that option. But while I was away on vacation, the design plans changed, and my brother Bruce framed the deck. When I returned home from my trip, I learned that Bruce had volunteered curved stairs and that I was responsible for building them. I guess it was payback for having taken two months off.

I'd previously built curved interior stairs that relied on the surrounding walls to support the treads and risers; but exterior deck stairs would have to rely on open stringers. Curved stringers require a form, and I didn't know where to start to calculate the geometry. After a day of swearing at my brother under my breath, an idea popped into my head that seemed too simple to work. And it wouldn't require any more math than a simple rise-run calculation for common stringers.

My plan was to lay out and frame temporary curved walls like those on an enclosed set of curved stairs. Using the walls as both a form and a layout instrument, I could build and cut precise, curved laminated plywood stringers in place.

The plan worked better than I imagined. The rough stairs took less than three days to lay out and build. The system worked so well that I plan to adapt it to build freestanding interior curved stairs in the future. It also can be used to build stairs in a shop or garage that are later moved to a site. □

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Photos by the author, except where noted.

CURVED STUD WALLS CREATE THE FORM

A plywood floor defines the stairs

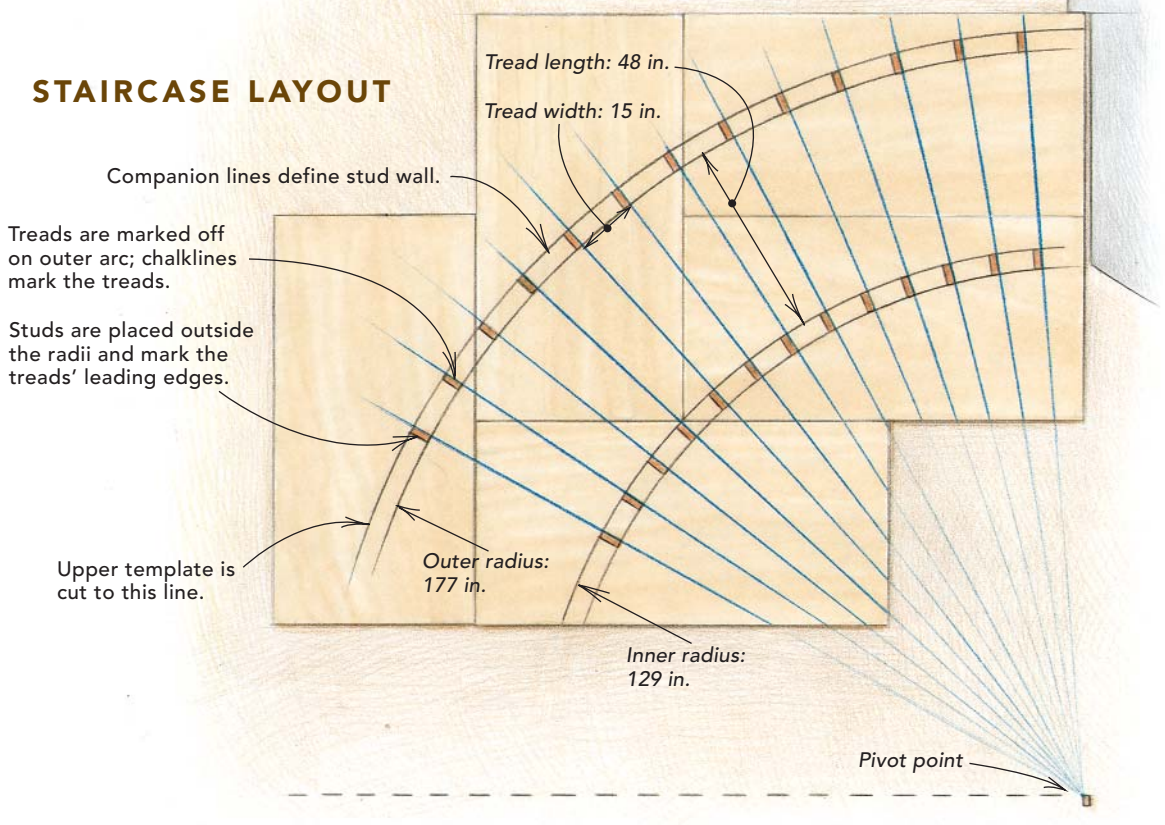
My first step in this process was to establish the stair radius. I covered the ground directly below the stair location with a monolithic sheet of plywood made from two layers cross-lapped at the seams; one edge was butted against and secured to the deck posts. Next, I determined the axis by driving a stake into the ground, parallel to the deck face. Now I could hook a measuring tape onto the stake and draw arcs for the inner and outer edges of the stairs. The tread widths were marked next. I knew the approximate stair run and calculated 7-in. rise, so starting beneath the deck edge, I stepped off 14 15-in. marks on the outer arc, then snapped chalklines between the axis point and the marks. After making a mirror image of the template, I transferred the tread marks to it, raised it in place, and built the stud wall.

Establish radius and treads. *Driven into the ground at a point in line with the upper landing, a stake becomes a pivot, anchoring the tape and chalkline used to draw the stair's shape and treads (photo above left).*

Create a mirror image for the upper template. *After marking and cutting a second identical plywood template, the author doubled the plywood, then transferred the tread marks from the lower to the upper, and snapped connecting lines (photo above right).*

Raising the template walls. *Hoisted atop temporary staging, the upper template is fastened to the deck's rim joist for stability. Studs are screwed to the tread-position marks on both templates. With the walls in place, the studs are braced plumb (photo left).*

STAIRCASE LAYOUT



Drawings: Bob La Pointe. Photo facing page: Charles Bickford.

LAYERS OF PLYWOOD MAKE THE ROUGH STAIR FRAME

Locate the stringers

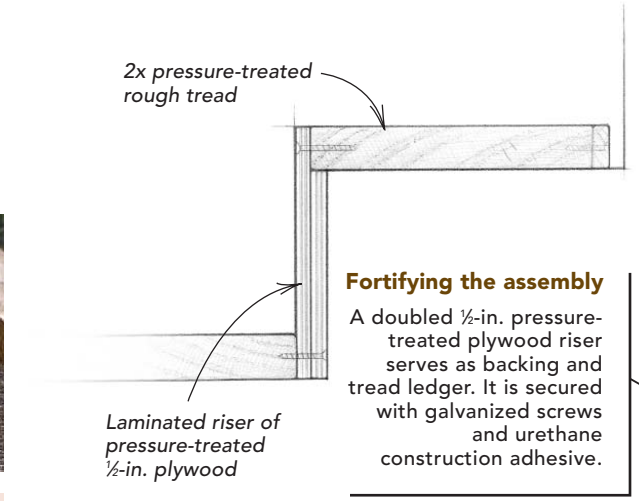
After establishing a level reference line across both walls, I found the stringer location by first subtracting the riser height plus the rough-tread thickness from the top of the deck and marking the first pair of studs, then repeating for each subsequent tread position. The marks then describe the top of the stringer.

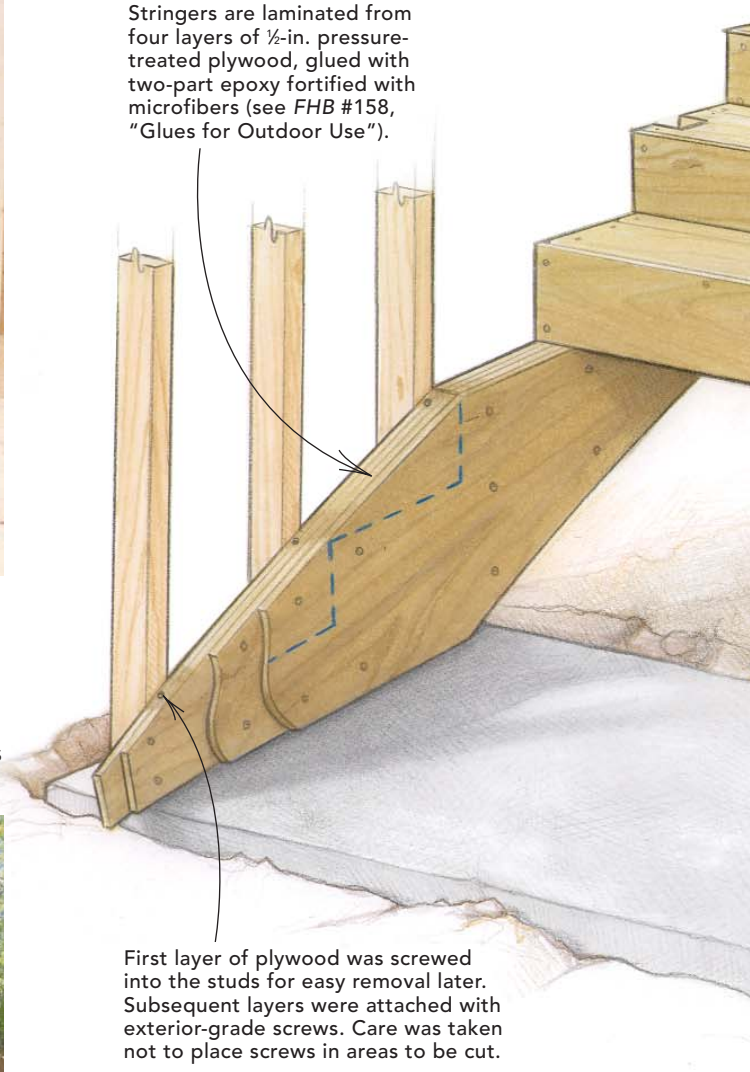
Prebend the stringers. *After ½-in. pressure-treated plywood was ripped to 16 in., the stringer laminations were screwed inside the walls to prebend them (photo upper left). Heel and plumb cuts were made on a template from a short piece of stringer stock. Four laminations were screwed together on each wall.*

Add glue. *After unscrewing all but the first layer, the author rolled on a coat of two-part epoxy (photo upper right), then fastened successive layers with more epoxy, exterior-grade screws, and clamps where needed (photo right).*

Use the studs to mark notches

The point where the stringer and stud's back edge meet is the intersection of the tread and riser. I drew the tread line by carrying a level line from the intersecting point back to the next stud (photo bottom left). The riser cut is drawn plumb from the same point (photo bottom right).





Attaching the stairs to the deck

The stringers were hung from the deck framing by a hanger cleat made of three layers of ½-in. plywood, nailed first into the stringer plumb cuts, then into the face of the rim joist.

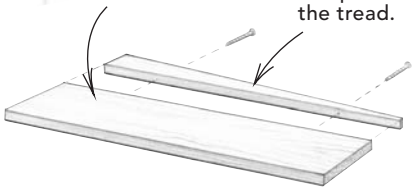
Hanger cleat

Rim joist

Joints are staggered by at least 24 in.

Stringers

Riser cuts must be angled to match the taper of the treads; tread cuts are made at 90°.



Making tapered rough treads

A pressure-treated 2x8 is ripped into a wedge, edge-glued, and screwed to a 2x12.

Notch the stringers. *Setting the circular saw's base to the required bevel, the author cut the risers first, then reset the saw for the tread cuts. A reciprocating saw finished the inside corners.*

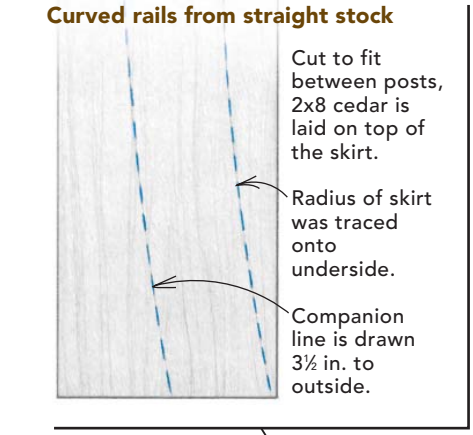
Bulking up the frame. *Beefy rough treads and laminated risers will compensate for the nonstructural composite material used for the treads.*

Dressing up the frame

Bruce Guertin finished the stairs. First, in the mid- and upper-post locations, he cut holes in the rough treads, then marked, notched, and attached the posts. The bottom posts were notched over the first step and screwed in place. Next, he bent and nailed the cedar skirtboards along the sweep of the stringer, then installed the cedar risers and composite decking treads. He built the railings in sections by tracing the stair's radius onto cedar 2x8s in place on a stringer and cutting the profiles on a router table. The balusters were captured between two 1x2s ripped to the same radius; lengths of rail then were screwed to the balusters, and the completed section was installed between two posts.

Bending the skirts with gentle persuasion. *Each cedar skirtboard was attached at the stringer top and worked into shape with clamps, urethane construction adhesive, and stainless trim screws (photo left). After the skirts were done, the cedar risers were nailed in place (photo right).*

One section at a time. *To ensure the correct radius and baluster spacing, each segment of railing was cut and assembled for a specific pair of posts.*



Balustrade cross section

Two router bits, a thumbnail and a beaded handrail, cut the railing profile.

A 1x2 ripped to the same radius captures the 2x2 balusters.

Brass post caps

Two cedar boards (1x12 and 1x8) were used for each side of the skirt, clamped into position, and attached with urethane construction adhesive and stainless trim screws.

Secure the posts

The 4x4 cedar posts are notched to the inside of the stringers, flush with the exterior and secured with 3x ⅜-in. lag bolts and urethane construction adhesive.

The three intermediate posts are supported by concrete footings that were dug after the stringer was in place; the bottom posts sit on a concrete pad.

Bottom post

Post notched over rough tread and riser

2-in.-deep notch

4-in. exterior-grade screws, countersunk and plugged

continued

Reader Response

Considerations for outdoor stairs

I found your cover story on curved deck stairs generally informative (*FHB* #162, pp. 82-87), but as the president of a company that manufactures stairs, I believe the author neglected to mention several important items.

First and foremost, when we design this type of exterior stair, we make every effort to ensure the proper draining of water. Normally, we make the treads and risers without glue joints and leave a 1/16-in. space between tread segments. On the staircase featured, we would have drilled draining holes in the substructure. Alternatively, we would have sloped the tread to shed water slightly.

The connection of the stringers to the concrete pad also is very important. The stringers should be held up from the concrete and bolted through a metal clip buried in or fastened to the concrete.

The method of rail layout using a flat elliptical piece works only if those intermediate posts are used. The actual geometry requires a helical rail (a twist). The lack of twist on this job is hidden at the rail/post intersection.

For the stringers, we have found that Honduras mahogany is a superior choice. It is strong, easy to work, and naturally rot resistant. We use ipé or jatoba (Brazilian cherry) for tread material. Both are available in 5/4 and make excellent treads.

To avoid rot, we generally mount the balusters on a V-shaped surface and make a corresponding V-cut in the bottom of the balusters.

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