Building Curved Decks

Templates and flexible synthetic lumber make the job easier

by Jason Russell

When I began building decks in 1991, curved deck details weren't very common. But as materials and tastes have evolved, more and more of my clients have asked for rounded features—from sweeping borders with matching railings to circular deck furniture—to create a more sophisticated backyard setting.

Traditionalists working with wood bend boards by making a million kerf cuts or by laminating multiple thin layers together in curved forms. In the wet Pacific Northwest where I work, those techniques can result in rot or delaminated lumber, or both. I prefer to work with PVC and composite lumber, which I can more easily bend to shape, using heat when necessary.

Design and Layout

I am not a math wizard, never took calculus in school, and couldn't care less about using a calculator to figure the hypotenuse of anything. I'm reasonably savvy with a computer, though, and plan most of my deck designs using Realtime Landscaping Architect.

Typically, the curved portion of a deck is a segment, or arc, of a circle. After I've made a scaled drawing of the design—easily done on graph paper as well as with CAD—I extend the arc to create a complete circle (**Figure 1**). There are a number of ways of determining the circle's diameter mathematically, but my CAD program does that work for me. Once I know the location of the circle's center and the length of its radius (the distance from the circle's center to any point on its circumference), I can recreate the arc in full scale as I frame the deck.

Framing

The best way to accommodate a curved rim joist is to cantilever the deck joists over their support beams and trim the joists to length in place. To prevent the curved portion of the deck from feeling like a trampoline, I follow our local building code (typically a cantilever is limited to one-fourth of the joist span).

Normally, we space joists 16 inches on-center or less, depending on the deck's engineering. Cantilevered joists create uplift forces, so we fasten the joists securely to the ledger with hangers, and fasten the ledger properly to the house. We also toenail joists to the support beams, pressure-block every bay, and add metal hold-downs as needed.

Depending on the design and the location of the circle's center, or pivot point, I then make either a beam compass or a template, and scribe the arc right onto my framing.

Beam compass. When the pivot point is located on the deck itself, I use a straight deck board of the same length as the radius to swing an arc (**Figure 2**). If the radius is greater than 20 feet—the maximum length of most decking stock—I'll use a metal or reel-type tape measure instead. To locate the pivot point, I refer to my scaled drawing of the deck.

Unless the framing is carefully laid out, the pivot point for scribing the arc on top of the joists will often end up in a location between joists. When that happens, I install cross-blocking or a piece of scrap plywood on top of the framing so I can drive a screw at the pivot point. Then I hook my tape on the screw, pull the tape out the distance of the radius, and mark both sides of the top of each joist.

If I'm using solid stock instead of a tape measure, I drive a longer screw through the stock into the framing at the pivot point. I leave the pivot screw a little loose so I can rotate the board around the deck framing. A square cut on the end of the beam compass makes it easy to mark the cut angles on top of the joists.

Template. But what if I want to add a curved deck that's 16 feet deep to the back of a 50-foot-wide

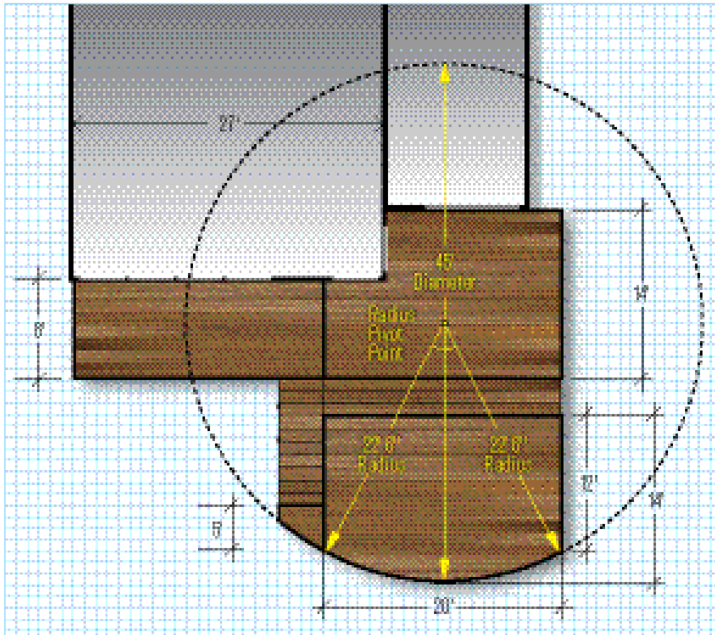

Figure 1. The curved portion of this deck is an arc of a larger circle. CAD programs make it easy to locate the center of the circle and determine its radius, but math or even simple graph paper works too.

Figure 2. The author screws a beam compass—a length of 2-by or decking stock equal to the length of the radius—to the pivot point at the center of the circle and uses it to mark the circle's circumference on the joists.



Figure 3. Rim joists are typically made up of 2-by composite or PVC decking stock ripped to match the width of the framing (above) and fastened to the ends of the joists with 3 ½-inch-long structural screws (top right). Clamps are often needed to bend the rim joist around a tight radius (bottom right).

house, where the pivot point is located somewhere inside the house? When I can't draw the curve by pulling the radius from a pivot point, I create a template instead.

To do that, I lay a sheet of plywood on flat ground. From the plywood's approximate center, I measure out a distance equal to the radius and pound a stake into the ground at that point. Then I hook my tape to the stake, pull it back to the center of the plywood, and trace the arc. After carefully cutting out the curve, I trace it onto two additional full sheets of plywood and cut them out as well.

Later, once I've framed the deck, I'll lay the three parts of my template on the joists—with the third cut sheet overlapping the other two—creating one large continuous arc with the radius I'm aiming for. I lay out my plywood patterns starting at the point of the circle farthest from the house and work back toward the finish points, as determined by my plans. Depending on the layout, it may be necessary to clip the end off one of the sheets of plywood to get the cut template close enough to the corner of the house. The modified template can then be flipped over to mark the other side of the layout. By starting with square, full sheets of plywood, I can usually square up the center sheet to the deck frame, which makes the process easier.

This technique doesn't produce a perfect curve, but it's close enough for deck work. I've never had anyone look at my finished framing and say, "Hey Doc, your deck radius is off by ⅜ inch."

Rim joist. Once I've marked the joists, I subtract the thickness of the rim joist, then determine the bevel angles for the cuts with a Speed Square. Some angles will be only a few degrees less than 90 degrees and easy to cut with a circular saw. For the most acute angles, I'll use a chain saw, which is much faster and easier than making multiple cuts with a circular saw or finishing up cuts with a reciprocating saw.

After cutting the framing to my radius, I fair out the curve by bending 2x6 deck boards on edge to the curve of the cut joist ends (**Figure 3**). If the radius is fairly tight, I heat the decking with heating blankets to make it more flexible (see Heat Forming Options, page 30).

Heat Forming Options

My fellow *PDB* author and friend Kim Katwijk introduced me to Heatcon's thermal blanket system (800.556.1990, heatcon.com/industrial/heat-forming-kits) a few years back, and I've been using it ever since to bend composite and PVC boards. If a design includes curves, I try to use TimberTech or (preferably) Azek products, which are the easiest to bend with heat.

One kit—consisting of two 10-foot-long silicone-rubber thermal blankets and one control box—is required to bend a 10-foot-long plank; use two kits for a 20-foot-long deck board. Temperatures and times vary widely, but it typically takes about 35 to 55 minutes to heat an Azek cellular PVC deck board to its bending temperature of between 225°F and 275°F (see *Tool Kit,* "Bending Composite Decking," May/June 2007 for more on this system).

I recently built an oven to cook up railing and other components. It's about 8 inches wide and 11 feet long to accommodate the Heatcon blankets—my heat source. I biscuit-jointed treated 3/4-inch plywood for the sides and insulated it with 2-inch-thick rigid foam.

I built the box in one piece, then split it into two unequal pieces to create a lid (be careful not to place any screws where you are going to rip the box). Afterward, I sealed the inside seams with 3M Fire Barrier Sealant to keep as much heat inside as possible. When the sealant was dry, I layered foil skrim kraft paper on the inside of the box for even more heat retention.

I installed a piano hinge all the way down one side of the box, and a couple of hasp closures and a handle on the other side for opening and closing the lid. After laying the blankets in place, I stuck a couple of pieces of mesh wire into the foam sides of the box to keep the blankets from moving around. A plywood box holds the control unit in place.

In use, temperatures inside the box easily reach in excess of 275°F, while the outside of the box stays a cozy 95°F.

For custom bending, the author built forming tables equipped with adjustable clamps (A), as well as an insulated heat box (B) sized to accommodate Heatcon thermal blankets (C). Work carefully; excess heat will deform PVC and composite decking (D).

Figure 4. The author installs blocking at the ends of the joists to provide solid backing for decking fasteners.

Usually I need to build up the rim joist from more than one piece of decking, which generally is not as wide as my framing stock. When I'm framing with 2x8 joists, for example, I rip 2x6 deck boards in half. If I'm using 2x10 framing, I'll rip a board to 4 ½ inches for the bottom section of the rim joist, then conceal everything behind a single piece of 11 ½-inch-wide fascia. I fasten the bent rim joists to the framing with 3 ½-inch #10 Screw Products framing screws, predrilled and countersunk into the composite or PVC material.

Blocking. Usually I install treated blocking on edge between the joist ends to provide a secure place to screw down all the deck boards onto the curved frame. The blocking also provides a handy clamping surface; I use a lot of clamps during curved rim joist installation.

Since fancy curved surface borders are very popular now, I install wide-enough blocking—typically treated 2x8s—to account for the width of the border while leaving enough backing to fasten the opposing field deck boards to. I cut the 2x8 blocking to fit the bay, scribe the arc on the blocking, and cut to the line with a circular saw. If my small Makita 5 ½-inch circular saw can't make the cut, I break out a jigsaw (**Figure 4**).

Afterward, I triple-check the arced section of the deck framing with my compass to be sure the curve is correct. If it is off slightly, I smooth it out with a belt sander and some 36-grit paper (see Reverse Curves, page 34).

If the flat blocking isn't protected against water damage, deck framing in my area will be toast in a few short years, so I cover the blocking with 12-inch-wide Vycor, a self-adhering membrane, before installing the decking (**Figure 5**).

Figure 5. Self-adhering flashing protects the blocking and tops of joists from water damage. This freestanding deck also features an under-deck drainage system.

Decking

To prevent expensive mistakes, I always make jigs to trace curved cut lines on my decking stock. If the deck has curved surface borders, I prebend them in my shop using heat, then lay them out over my traced lines on the deck to verify that everything checks out.

I make the curved end cuts in place using my 5 1/2-inch saw, adjusting the saw to give the cuts a 3-degree back bevel, and always cutting to the outside of the lines. I cut as carefully as I can, but if I need to smooth out the curves later with a belt sander, these steps make doing that easier.

To avoid cutting through the waterproofing membrane over the blocking, I temporarily omit the deck fasteners in border areas and slip strips of cardboard or some other type of spacer between the decking and framing there (this of course isn't possible with hidden fastener systems). I also set the depth of cut so that the saw just barely cuts through the decking (**Figure 6**).

Figure 6. The author often finishes curved decks with a border in a contrasting color.

Reverse Curves

A recent design called for a 10-foot reverse radius. Since the deck had a 15-foot-square footprint, we built the layout box that size, using 2x6s set on edge. Then we rough-cut the framing and laid it in place, without fastening anything together.

To mark the curve on the joists, we made a 10-foot-long beam compass from a 2x4 and swung it from a pivot point located at the open corner of the deck. Then we figured out the angle of each joist cut line and cut the joists to their respective angles. Once everything was cut, we temporarily braced the curved side by screwing a pair of 2x4s to the tops of the joists.

A 10-foot radius is fairly tight, so I heated the Trex 2x6 composite decking before bending it to form the rim joist. Besides holding the joists in place, the temporary bracing offered a convenient clamping surface for pulling the rim joist into place.

Once the rim joist cooled down a little, I fastened it to the joists with Screw Products 3 1/2-inch #10 star-drive screws. Note that when you heat composite decking, the boards expand; when they cool down, they shrink. On this deck, the 2x6 rim joist was tight against the frame at each end when it was hot; after the 2x6 cooled, the gaps between the ends of the curved rim joist and the frame measured almost 3/4-inch.

Figure 7. A faceted railing made up of short sections of straight rail looks fine on most curved decks (above). But when the curves are tight, some rail kits can be heat-formed to match (left).

Rails for Curved Decks

On the project shown here, I finished off the deck with aluminum railing posts and a cable railing system (**Figure 7**). But it's possible to bend composite and PVC rail kits using the tools and techniques described in this article. When bending railing, keep in mind that there are usually different technologies in one rail kit—some parts are PVC-wrapped composites, others are solid PVC products, while others may be made of something else entirely. This makes for variable heating times for the different components.

As you experiment with different products to create your own curved railings and other designs, you'll find it takes time to figure out the best temperatures for bending various materials. Until you find the sweet spot—not too cool, so wrinkles don't form on the inside edge of the part, yet not so hot that the surface gets deformed—you'll likely blow through a lot of expensive material. ❖

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