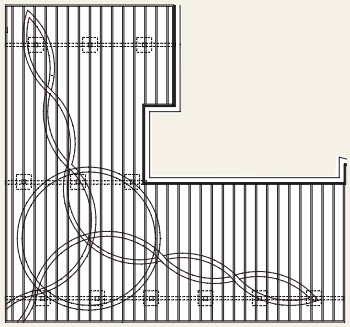
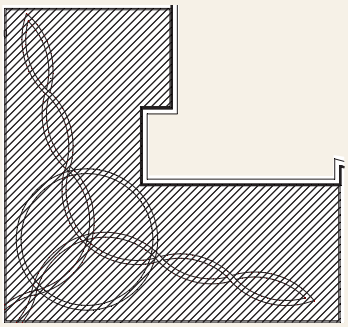
Decks with

FROM CONCEPT TO CURVE

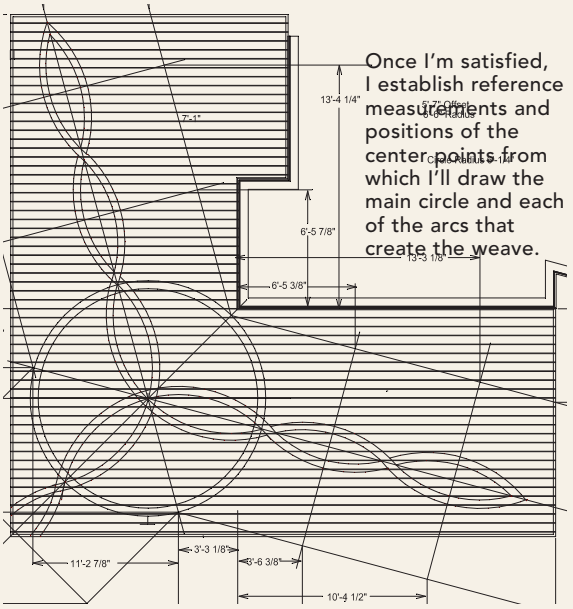
The design for this inlay is based on a simple L-shape. Drawing inspiration from a Celtic-knot design, I created a weave pattern extending down the sides of the L. Although complex looking, this pattern is fairly simple and uses boards bent to only two radii—6 ft. ⅛ in. for the center circle and 6 ft. 5 in. for the weave. I used Azek PVC decking for the curves, with white for the circle, and gray and clay-colors for the weave. A matching weave in the pergola above tops off the design.



I start by overlaying my design on a deck plan with standard 12-in.-on-center joist framing.



Then I experiment with different board directions to get a layout that works with the design.



Once I'm satisfied, I establish reference measurements and positions of the center points from which I'll draw the main circle and each of the arcs that create the weave.

curves

The ability to heat-form synthetic boards on site paves the way to designs that can set a deck apart

BY KIM KATWIJK

It wasn't long after I started building decks full-time in 1996 that I got the opportunity to create a curve. I had designed a beautiful curved deck in cambara for a client who wanted the railing cap to follow the shape of the deck. The logical solution for most deck builders would have been to laminate thin strips of cambara into a curved rail on a bending form. But I wanted to try something completely different: heat-form composite decking to the desired curve.

Composites are made from a mixture of wood fiber and plastic. Because these plastics are not thermally stable, it's possible to heat and bend the decking.

A literal learning curve

My first attempts at board-bending were with Trex. My apparatus involved a 10-ft. by

1 LAY OUT THE ARCS AND INSTALL BLOCKING

FRAME AND MARK THE DECK

After the deck is framed, the center of the circle is marked. Here, the center point falls between joists, so we install a wooden cleat in the space. At the center point, we insert a nail that stands ¼ in. so a tape measure can be hooked over it. With a pencil held at the 6-ft. 9-in. mark, A circle is scribed on top of the joists to mark where the outside blocking will go. This blocking holds down the cut ends of the field boards and runs 3 in. away from both sides of the inlay. This is repeated at 5 ft. 9 in. to mark the inside blocking (the decking is 5 ½-in. wide). Also from the center nail, three stringlines indicate the center of the weaves that will extend to the corner and down each leg of the L.

MARK THE ARCS

A 20-ft.-long 2x4 is secured 5 ft. 7 in. away on either side of each weave's centerline. Nails driven into these strips mark the center points for each arc of the weave pattern. Using the measuring tape hooked over each nail, the layout lines for blocking are drawn on the tops of the joists at 7 ft. 2 in. and 6 ft. 2 in.

BLOCK IN BULK

When blocking for an inlay, it's imperative that every deck board be supported within 3 in. of its cut end. Blocking a circle creates even more difficulties, because some of the boards of the circle run parallel with the framing. This requires creative blocking to make sure there is support for all the ends of each of the deck boards and for the inlay boards that fall in between the standard framing.

An efficient way to work

In a curved design, each piece of blocking is cut with two angles. The most efficient way to do this is for one person to take a piece of 2x6 pressure-treated board, place it vertically over the layout lines where it will be installed, scribe it, number it, and toss it to a sawyer for cutting. Using a Speed Square, the sawyer determines the angle of the cut, sets the chopsaw, cuts both ends at the prescribed angle, brushes the cuts with preservative (such as Jayco Wood Tone Preservative), and tosses the board back to be nailed into place. Still, it took almost a week to install the blocking seen here.

20-in.-dia. Sonotube laid on the flat with #3 rebar shoved through the sides to suspend the decking. Two kerosene space heaters forced heated air into each end of the tube. This method produced uneven heating and more failures than successes.

Next, I tried a water-bath heater. I used a 20-ft. by 12-in. schedule-40 PVC pipe cut in half. I glued four inlets into the half pipe, then inserted a water-tank heater into each inlet. I was able to heat the water to boiling. After an hour of boiling, I was able to bend a 20-ft. composite board in a very large radius—about 15 ft. To get the 5-ft. radius I needed, I had to rip the 2x6 composite boards into three strips, heat them, bend them to a 5-ft. radius, and then glue and screw them back together.

On another project, I tried to get higher temperatures by insulating the pipe and capping it with rigid insulation. This succeeded so well the tank melted.

I gave up on bending deck boards until I discovered the Heatcon bending system at a trade show. It consists of four 8-in. by 10-ft. blankets, two control units, and two temperature probes. Experimenting with this system, I've been able to bend a flat piece of 5½-in. Azek cellular-PVC decking to a radius of 22½ in., opening the door to new levels of artistic expression.

Warranty issues

It's worth noting that manufacturers of PVC decking have not endorsed these methods to date, although Azek worked with Heatcon to develop a heating blanket for bending trim (see sidebar), and offers a tutorial for trim-bending on its website.

According to Azek spokesman Danny Thomas, some independent tests on heat-bent cellular-PVC deck boards suggest there may be a decline in some structural properties in various deck

2 BUILD BENDING JIGS BEFORE HEATING THE STOCK

THE JIG STARTS WITH A PLYWOOD BASE

I lay four 2-in. by 12-in. by 16-ft. boards on the ground 2 ft. apart and shim them level before screwing four sheets of exterior-grade ¾-in. plywood on top. I establish a pivot point that allows the arc to fall entirely on the platform. (Depending on your curve's radius, the point may be on the platform or on a 2x4 extending from it.) I scribe the needed radius on a series of 2x8 scrap boards, then cut along the line with a circular saw. The convex half of the pattern pieces are screwed down to the plywood along the layout line to form the bending jig. This project also required a second jig with the weave radius.

3 HEAT THE BENDING STOCK: LOW AND SLOW IS BETTER

A GARAGE FLOOR IS A GOOD PLACE FOR HEATING

We roll out the 8-in. by 10-ft. Heatcon heating blanket on top of a strip of R-13 fiberglass insulation. (I'll put two heating blankets end-to-end for bending a 20-ft. piece of decking.) Each blanket has lines from the control unit for the heating element and a probe that monitors the board's internal temperature. The probe is inserted in a 1⁄8-in. hole drilled into the side of the board. The decking is laid facedown on top of the blanket; another blanket is laid on top of the board, with another layer of insulation on top.

I select "decking," choose a goal temperature, and an internal temperature (see chart, p.65). The control box maintains the blankets at the goal temperature, and the probe monitors the plank's internal temperature. When the set internal temperature is reached, the box beeps.

USE GLOVES FOR SAFE HANDLING

With the board's temperature now at 220°F or higher, the probe is extracted and the insulation and top blanket removed. The decking—now the consistency of a big, hot noodle—is quickly carried to the bending jig.

4 SHAPE THE PLANK TO THE BENDING JIG

CENTER THE SOFT BOARD ON THE JIG

We pull lightly on each end, stretching the board slightly as it forms to the jig. When bending cellular PVC, radii down to 6 ft. can be done with two people. Radii tighter than 6 ft. need an additional person to keep the center from rolling out of the pattern jig. It helps to have three when bending composite or capstock. The bending process is like a dance: It's done best when everyone knows the steps.

CHECK THE CURVE AND CLAMP AS NEEDED

Using scrap pieces of wood, the bent plank is secured with clamps at each end and, if needed, at other points around the curve. Azek only needs about three clamps; stiffer composites often need more to hold it in place. The plank is smoothed out to make sure it's flat and level with the plywood foundation. If not, the board will form waves that will be noticeable when laid on the deck. It will take about 20 minutes for the board to cool and become rigid. The process is repeated with each board used in the curved design.

boards. Because each application and each manufacturer is unique, he recommends checking with the manufacturer to determine if heat-bending will void the warranty.

I give my clients a five-year warranty on my work, but in 16 years of bending deck boards, I've never had a problem related to this method when used with a deck board from a major manufacturer. The only physical difference I've noticed is an expansion in the thickness of the deck board of about 1/16 in. after heating. This is undetectable when walking on the deck.

Boards that bend best

I've used both easy-to-bend cellular-PVC boards and the more stable composites in many different applications. (See a slideshow of my work by clicking on Magazine Extras at FineHomebuilding.com.) A popular application is to ribbon the outside of a curved deck, often in a complementary or contrasting color. Inlaid deck art, like the project detailed here, is one of the most impressive ways to use curved decking. I've done many inlays, including compass roses, Celtic knots, and multiple deck boards woven to form artistic designs. With curved decks, the need for curved benches goes without saying, and the ability to bend deck boards takes stairs to a whole new level of expression. Even pergolas can take on new twists never before thought possible when you incorporate curved boards to create beautiful overhead artwork.

Kim Katwijk is president of Deck Builders Inc. (artistryindecks.com) in Olympia, Wash. He and his wife, Linda, have been writing professionally for more than eight years. Photos and drawings courtesy of the author unless otherwise noted.

5 PREP THE DECKING FOR THE INLAY

SECURE FIELD BOARDS ALONG INLAY EDGES
With the field decking installed, the center point of the main circle is marked with a small screw on the deck surface and the centerline for the weaves is snapped with chalk. The inlay pieces are cut and positioned on the deck. (3/8-in. gaps between planks allow me to see the blocking.) I let the inlay ends run wild; I'll cut them later.

TRACE AND CUT
Using a carpenter pencil held perpendicular to the board, I draw a cut line on each side of each inlay piece. The width of the carpenter's pencil allows for the proper 3/8-in.gap between the main decking and the inlay pieces. I use a circular saw with a standard blade set at 11/16 in. to cut the decking along the line. The cut pieces are removed, and the inlay pieces are placed and screwed to the joists.

Filling a tight spot

With inlays, you invariably encounter the challenge of fitting in and securing small pieces of decking to make the design work. Depending on the shape, I've attached them with stainless-steel screws through the side, or if blocking was needed, I've used fiberglass industrial grating as a support and glued the piece in.

LEAVE NO LOOSE ENDS
With the inlay boards where I want them, I secure the main deck boards along the length of the inlay to the blocking installed earlier. In keeping with the elegance of this deck design, I used the FastenMaster Cortex Concealed Fastening System. The screws self-cut a hole and set themselves at the right depth so that a plug can be placed in the hole and hammered down to become nearly invisible.

The Heatcon system

Heatcon has been manufacturing flexible heating blankets and controls for industrial heating applications within the aerospace composite-repair industry for the past 30 years. Customers include airlines and the military.

In 2004, Azek Building Products hired the company to design a system to heat-form PVC trim. Introduced in 2005, this simple-to-use kit has become a popular tool for many builders and contractors.

Almost immediately, questions started pouring in about using the kits to heat-form composite decking. Heatcon responded by developing a heat-forming kit for decking based on the same heating-blanket concept as the trim-bending kit. Subsequent tests revealed the need for an internal temperature probe to monitor and regulate a slower heating process for the thicker PVC and composite deck boards.

The HC99-300 deck heat-forming kit that I use retails for $3250 and can only be purchased from Heatcon. That's a steep price, but it quickly pays for itself by bringing your deck-building business to a whole new price point. With it, you can heat and bend an 8-in.-wide by 20-ft.-long composite deck board. The kit comes with four 8-in. by 10-ft. heating blankets, two 120v heat controllers, two thermocouples for monitoring internal board temperatures, two pairs of heat gloves, an operator's manual, and two carrying cases. The kit is portable, light (30 lb.), and easy to transport. You can also purchase a half kit for $1750, which allows you to bend an 8-in. by 10-ft. board.

You will need at least a 20-ft.-long work area and plenty of room on the side for maneuvering the deck boards in and out of the heating-blanket area. You will also need access to two separate 120v, 20-amp outlets to operate the two controllers when bending any deck board over 10 ft. long.

Even with the kit, it's important to remember that bending composite deck or trim materials is an art learned over time. The more you use the system and learn the tricks, the better you will become at it. More information about the heat-forming kits can be found at Heatcon's website (www.heatcon.com).

Which boards bend best?

I've used both cellular-PVC decking and composites in my curved designs. PVC bends most readily, but most composites can be heated-formed to a radius as tight as 10 ft. Co-extruded composites (sometimes called capstock), in which composite material is encased in a low-maintenance plastic shell, are difficult to heat evenly. Urethane decking, such as Lifetime Lumber, cannot be heat-formed. Composite railings can also be bent, but it's best to gain experience before attempting these projects.

Because the material formulas of each deck brand vary, all react differently to heat. I've compiled my observations and that of other deck-benders I know in the chart at right. Generally, the more plastic in a board, the easier it will bend after being heated. Color also plays a big role: The darker the color, the faster it heats up. A dark gray PVC board may heat up in 20 minutes, while a white board of the same material will take over 45 minutes.

Decking type	Brand	Heat-forming ability	Tightest radius	Comments
PVC Internal temperature: 220 to 260°F	Trex Escapes	Good	4 ft. 6 in.	Since it's 100% plastic, PVC decking bends most readily and can make the tightest curves.
	TimberTech XLM	Good	3 ft. 6 in.	
	Azek Harvest Collection	Excellent	3 ft.	
	Azek Arbor and Terra Collections	Good	4 ft.	
	Fiberon Outdoor Flooring	Excellent	4 ft.	
COMPOSITE Internal temperature: 240 to 260°F	Trex Accents	Good	10 ft. 6 in.	All composites will have some spring-back when taken off the mold, so bend them tighter than the radius desired. These boards are very slow to heat up.
	TimberTech ReliaBoard	Fair	12 ft.	
	TimberTech TwinFinish	Fair	12 ft.	
	TimberTech DockSider	Fair	13 ft.	
	Fiberon Professional	Fair	10 ft.	
	Evergrain (Tamco) Decking	Fair	12 ft.	
CAPSTOCK Internal temperature: 240 to 260°F	Trex Transcends	Very poor	15 ft.	High blanket temperatures can melt the coating of these boards before the core is sufficiently heated. Low and slow heat is key here.
	TimberTech Earthwood Evolutions	Poor	11 ft. 6 in.	
	Fiberon Horizon	Poor	12 ft.	