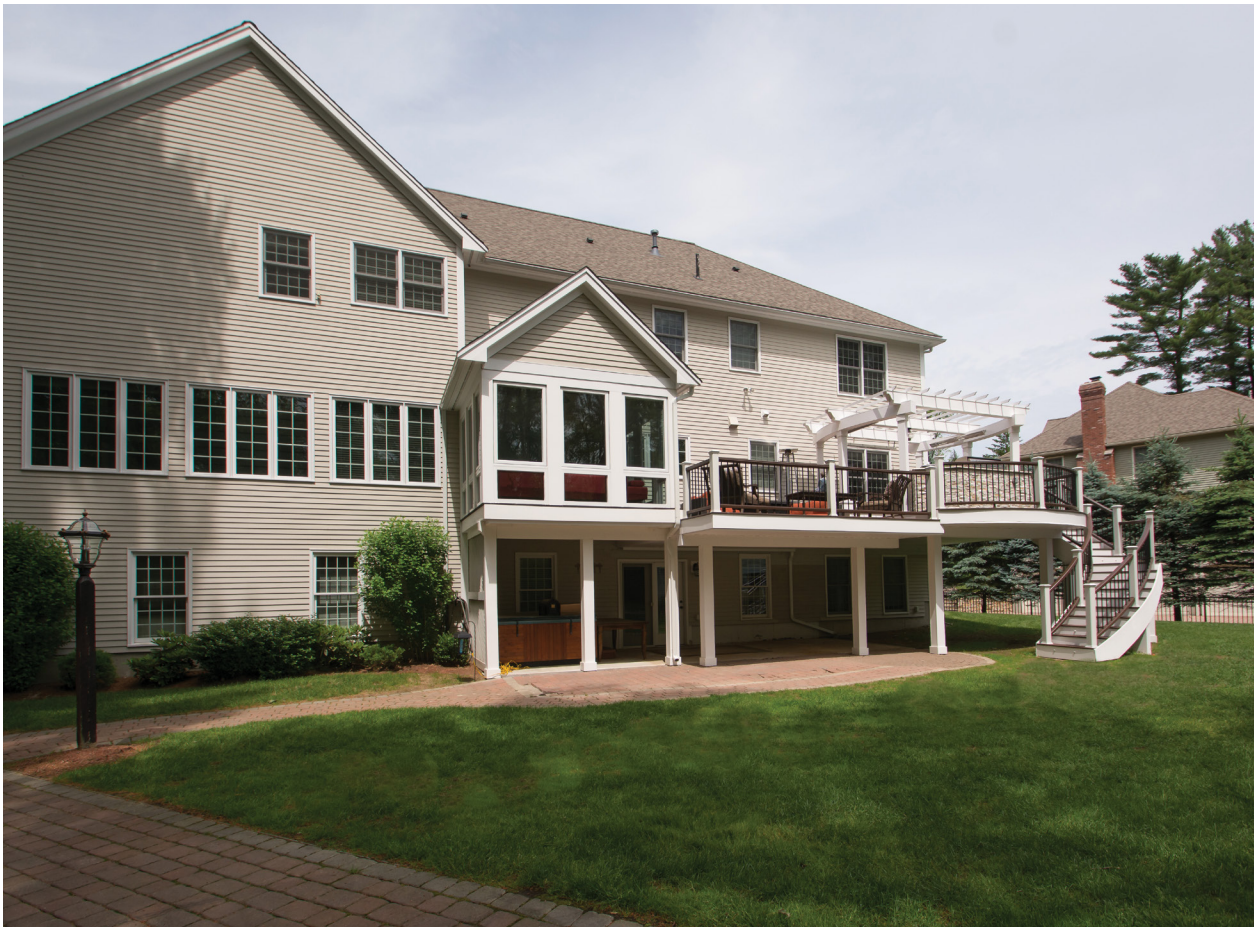

Adding Curves to a Steel-Framed Deck

It's easier than you think to bend steel and dress it up with flexible PVC trim

by Peter Ciaraldi

Our clients wanted to transform their ordinary 12x12 deck into a family living area, with features like an outdoor kitchen and a heated pergola to make the space more suitable for our northern New England climate. Because of the structural considerations in the project—including the weight of the built-in kitchen and the clients' request for as much dry, open space beneath the deck as possible—we chose to frame the deck using Trex Elevations steel framing with RainEscape deck drainage.

Steel framing made forming the curves that figure so prominently in this design far easier than if we had worked with sawn or engineered lumber. In this article, I'll describe how we built the curved stairs, but we used the same basic techniques for the built-in seating, pergola, and the deck frame itself.

Kerfs Are Key

Cold-formed steel framing is very well-suited for framing both large- and small-radius bends. The idea is to simply kerf the upper and lower flanges at regular intervals to make the web of the joist

flexible. For example, to bend the joist to make a large curve with about a 12-foot radius, we cut evenly-spaced kerfs that are about 3 inches apart. For tighter curves, with about a 6-foot radius, we cut the kerfs with a closer spacing, as little as 3/4 inch to 1 inch apart (**Figure 1**).

Of course, after we've finished kerfing the steel joist, the piece acts like a 20-foot-long wet noodle, so we have to handle it carefully to avoid damaging the web. But once it's installed and fastened, we've noticed no strength differences, and we can kerf, bend, and set an Elevations board in a much shorter amount of time than a PT board.

This technique is approved by the engineers at Trex; in fact, we first learned it from them. And they'll check our work: After we develop our framing plans, we send them off to Trex for a sanity check. We compare our version versus theirs and have a chat to fix any discrepancies.

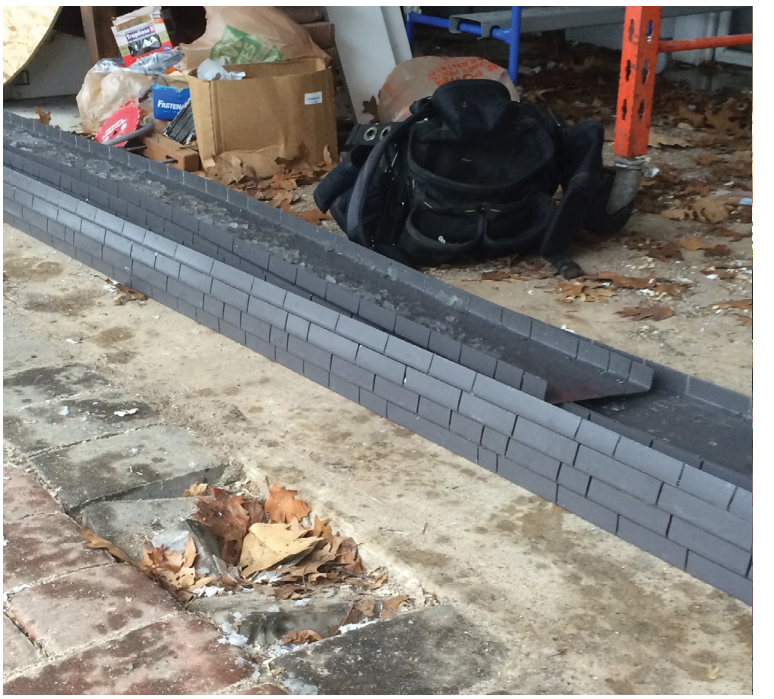

Figure 1. In order to bend the steel framing, the author cuts evenly-spaced kerfs in the upper and lower webs using a circular saw equipped with a ferrous steel blade.

Special Tools

Because we frame a lot of decks with steel, over the years we've invested in all the tools required to handle metal framing (**Figure 2**). For kerfing, the most effective saw we've used is Milwaukee's 8-inch metal circular saw, which has a blade guard that keeps the metal spray down quite a bit compared with a regular circular saw. We equip it with a ferrous steel blade, such as a Diablo Steel Demon or Lenox's steel cutting blade, which typically holds up better than non-ferrous abrasive blades. To minimize oversprays and dings, we try to use sharp blades, typically going through about one more blade per steel-framed deck than we would go through if we were framing a wood deck.

In addition to sawhorses and basic deck-building accessories, special tools for steel framing include a step drill bit, a pair of C-vise grips, and an 18-volt impact driver with a 5/16-inch magnetic drill tip. But probably the most essential

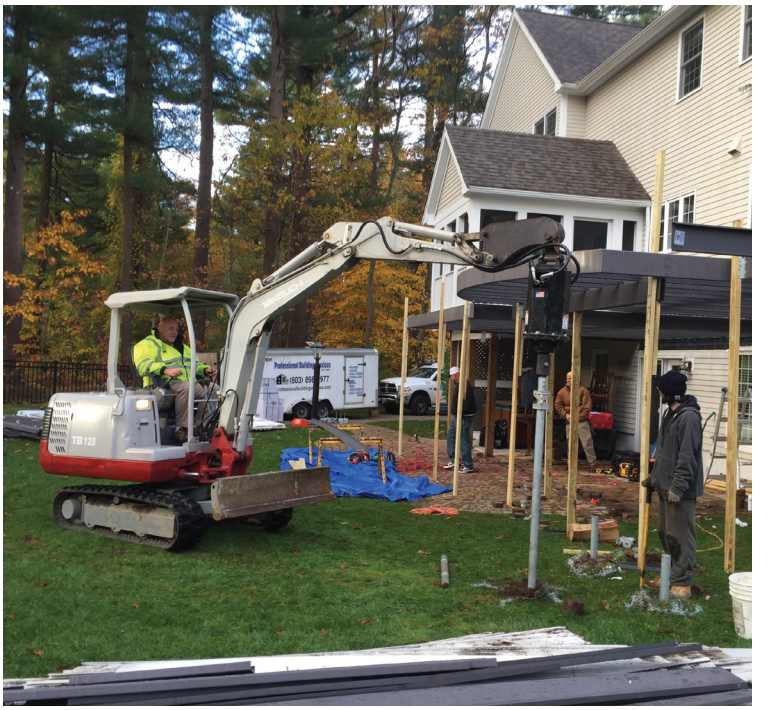

Figure 2. Like the steel-framed deck itself, the landing for the curved stairs is supported by helical piles.

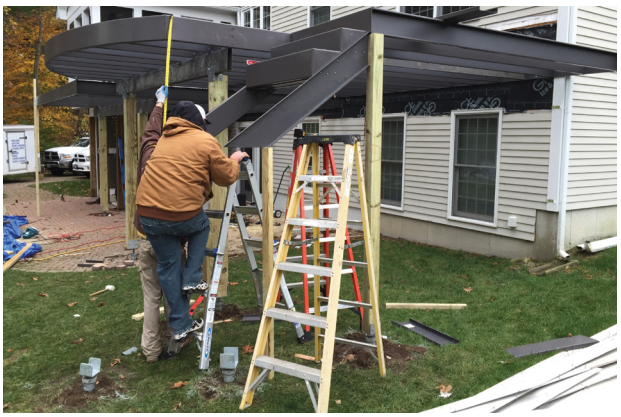

Figure 3. A Trex Elevations stair-stringer assembly consists of both a track (shown being installed) and a matching stringer joist, which will be fastened over the track.

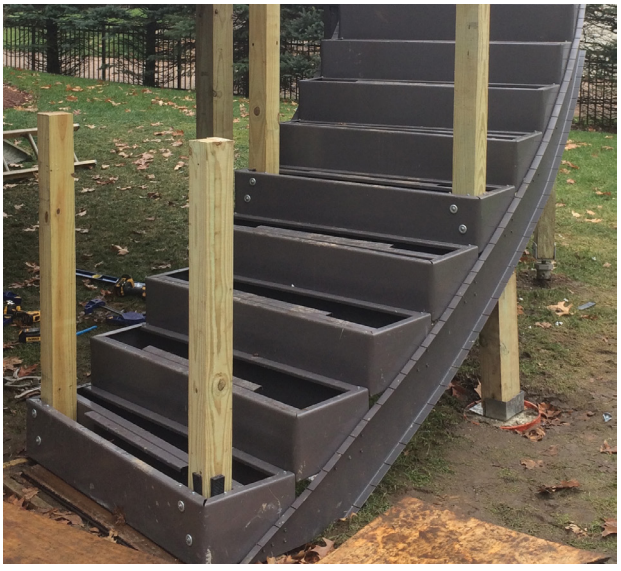

Figure 5. The lower run of stairs curves to match the curve of the deck. The stringer tracks needed to be kerfed so that they could be bent to the proper radius.

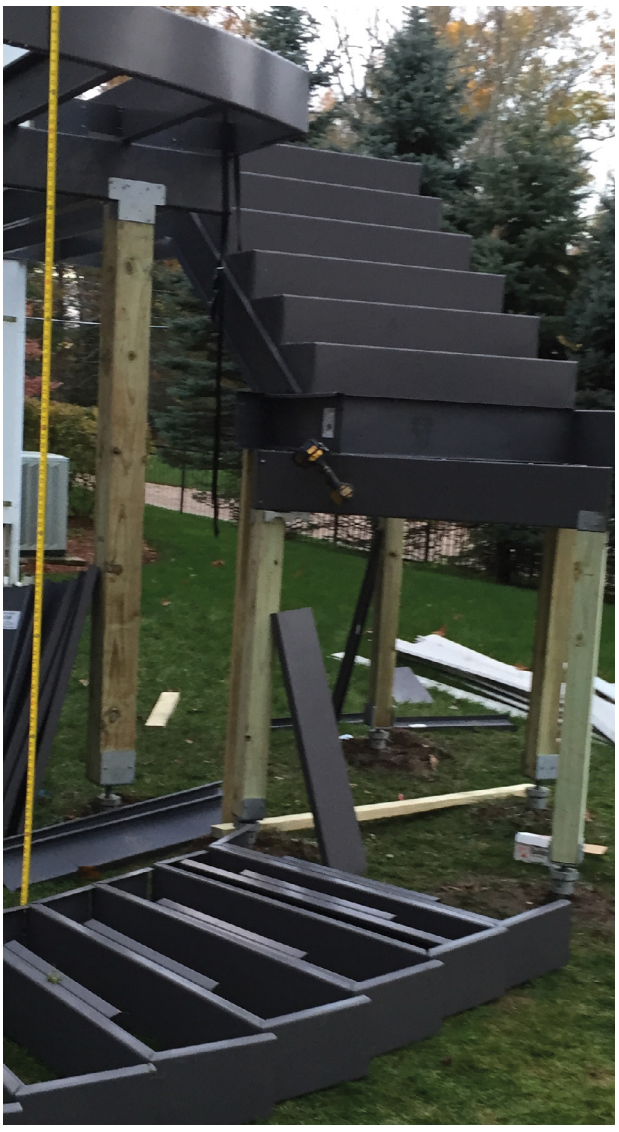

Figure 4. The author prefabricated the stair boxes in his shop using folded sections of track. The boxes are then screwed to the stringers.

tool when cutting steel framing is a pair of safety glasses or—even better—a face shield.

A big oven. To bend decking—and especially railing—we've invested in Trex's CustomCurve system, which includes a metal heating box and a bending table. While a little bulky and fairly expensive (about $8,000 plus shipping for the oven alone), it's much easier to use than other solutions, such as heating blankets, that we've tried. Heating blankets work well for PVC decking, and one of their advantages is that you can lay them end to end when working with longer lengths. For wood composites that require higher temperatures, however, this oven seems to be able to heat the material consistently hotter.

Of course, bending is one thing—making a board look like it wasn't bent in the field is something totally different. Boards tend to wrinkle and heave quite easily if you don't get it right. We always plan on using up some scrap material as we dial in the temperature and time for each product—the process is more art than science.

Stair Framing

Whether curved or straight, steel-framed stairs consist of stacked stair boxes that are fastened to each other and to

the stringers that frame the assembly (**Figures 3, 4, 5**). For these stairs, we figured out the math using Vectorworks software, then fabricated all of the stair boxes back in our shop. The first box always takes a little longer as we sort out the details, but then the rest go together quickly.

Working from dimensions outlined on our shop drawing, we mark and cut pairs of notches measuring slightly more than 90 degrees in the top and bottom flanges of a length of Elevations track. The notches in the perimeter track are located at the corners and allow the track to be bent to a 90-degree angle in each location to form three sides of each stair box. Back-to-back joists that have been screwed together are then inserted in the stair box to strengthen the assembly and provide backing for the stair treads (**Figure 6**). Where rail posts are located, we install an extra joist assembly so that we can lock the posts in place with 3/8-inch-diameter carriage bolts.

Elevations joists measure a true 8 inches, while we typically size our risers so that they are 7 1/4 inches high. This gives us a good 3/4 inch of overlap between each stair box, allowing us to lock them together with our metal screws. This system also allows us to adjust our riser height slightly up or down as needed. Stairs typically take a beating, so we use plenty of fasteners, spacing them every few inches.

This curved stair has two landings, which are essentially just small decks. We took the same approach to building them, using helical piles for support, and using the same steel-framing techniques.

Railings

Typically, the components that need to be bent for a railing include the upper and lower rails, along with the respective infill pieces. For the Trex Transcends rail we used on this project, this totals five or more bends per railing section, so plan-

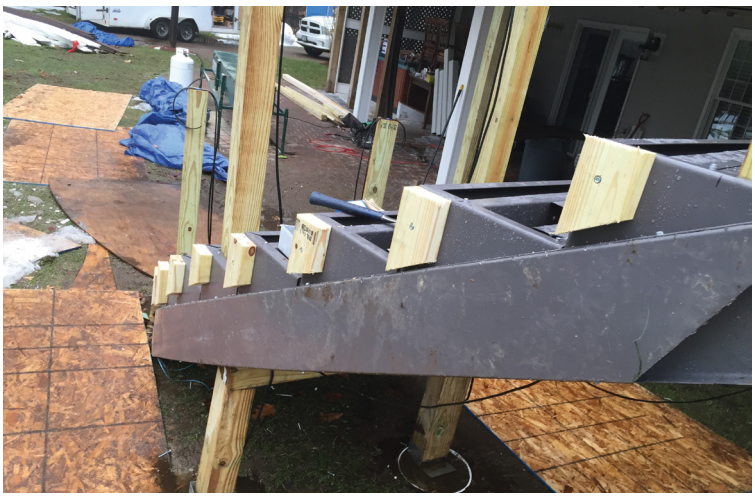

Figure 6. Here, an Elevations joist has been fastened over the stringer track to strengthen the assembly, and blocking has been installed for the PVC trim that will be used to finish the stair.

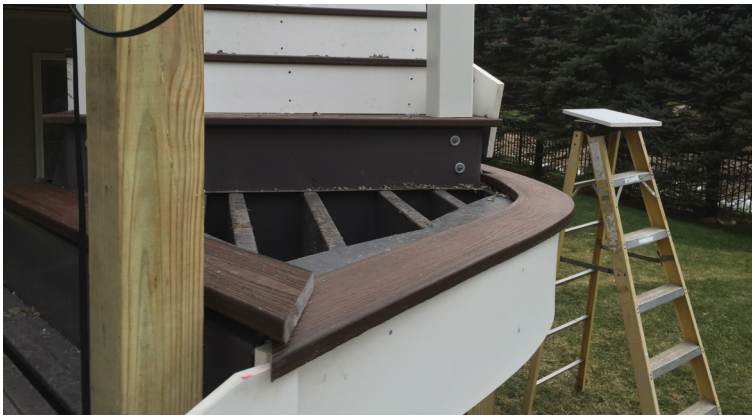

Figure 7. The author used a heating box and a bending table to heat-form the decking for the landing to the proper radius.

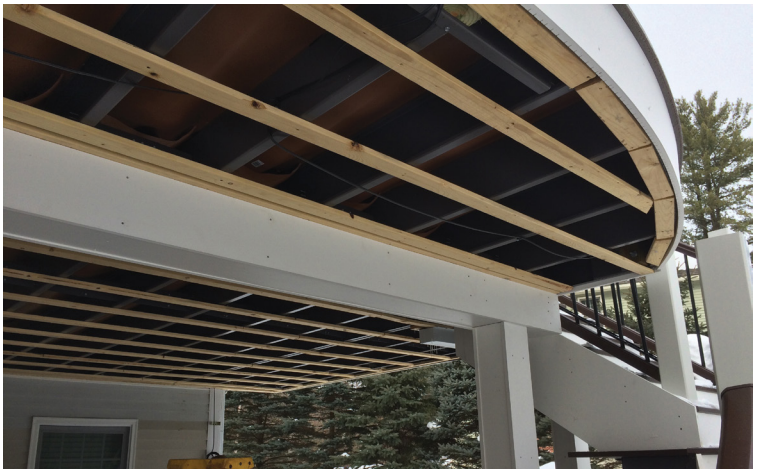

Figure 8. Kerfs cut into the back of the PVC fascia allow it to be bent without breaking, especially in colder weather.

ning ahead and being efficient is critical to keeping the project on schedule and on budget (**Figures 7, 8, 9**).

Using our heating box, we formed the stair's curved railings at the same time we bent the outside border on our bending table, which has adjustable fastening clamps to easily hold our jigs to the proper radius. We try to get as much bending out of the way as possible while the oven is up to temperature and we have the jig in place, so that we only have to set up once per radius. Of course, many of the projects we do have multiple radii, requiring a different table and jig set-up for each one.

PVC Trim Finish

We trim out the steel framing with PVC material that we typically rip from ¾-inch-thick 4-by-8-foot sheet stock. Normally, we can bend the trim around most curves, sometimes by kerfing the back approximately halfway through to make the trim bend more easily. But because this project extended well into the fall, and because some of the curves—such as the radius of the built-in bench seating—were particularly tight, the cold kerfed boards kept breaking when we flexed them.

So as the weather turned colder, we began heating the kerfed PVC up a bit in our bending oven before we installed it. This eliminated the breaking problem and made the process go a lot more smoothly.

Finally, we capped all of the holes in the PVC trim with Cortex plugs. A quick pass over the plugs with 220-grit sandpaper made everything blend together nicely (**Figure 10**). ❖

Peter Ciaraldi owns Professional Building Services, a full-service remodeling company in Salem, N.H.

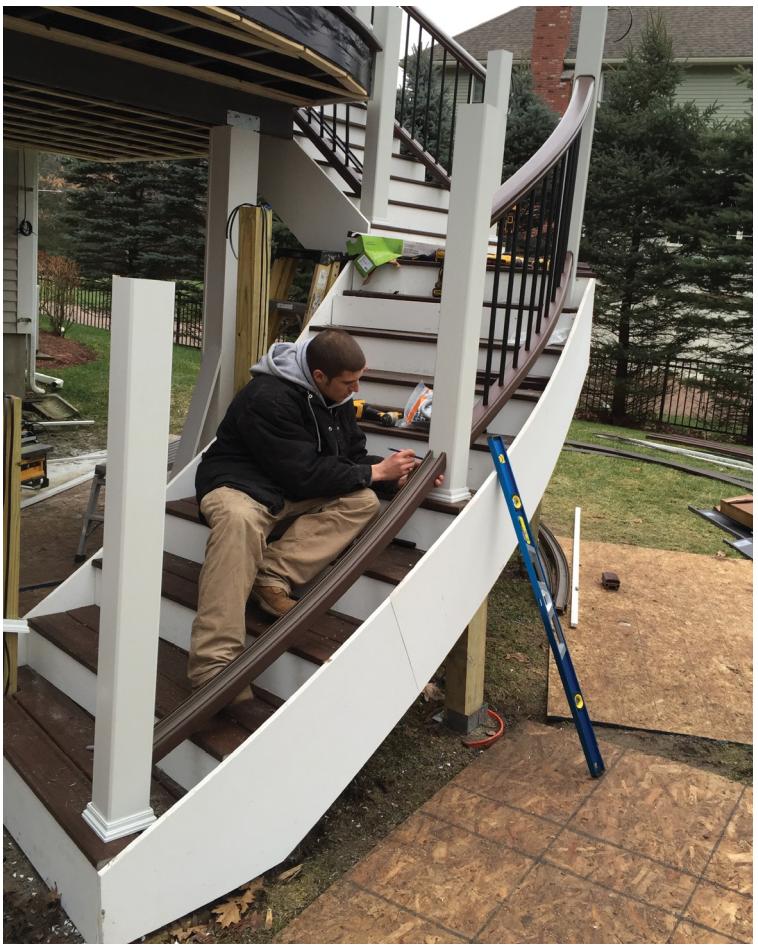

Figure 9. Rail sections also had to be heat-formed to match the radius of the curved stairs. The 16-inch-wide stair skirts were ripped from ¾-inch-thick PVC sheet goods.

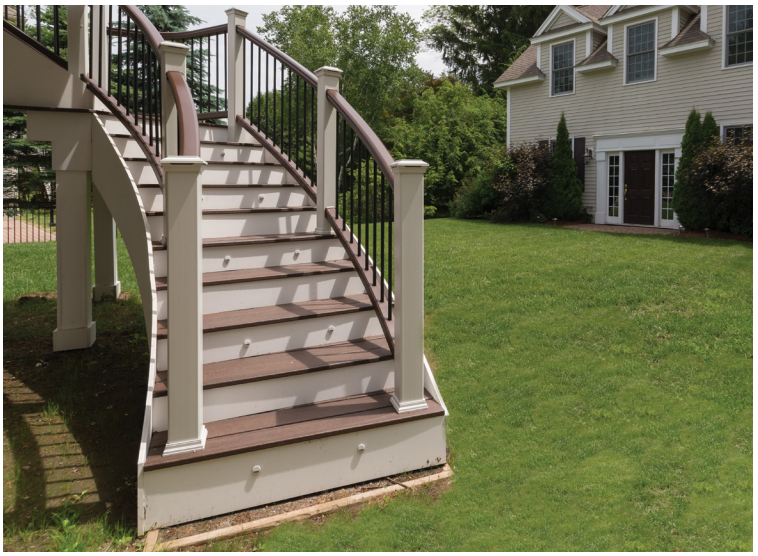

Figure 10. After filling the fastener holes with Cortex plugs, workers gave the trim a final hand-sanding with #220-grit paper.