Wide-Base Footings on A Wet Site

BY EMANUEL SILVA

The new footings will straddle the existing slab, so part of it needs to be removed to allow access to excavate the holes. First, the author traces the footing's perimeter onto the slab **(1)** and removes the concrete using a jackhammer and sledge **(2)**. Then he digs the footing hole to its required depth **(3)**. Because of the high water table, the hole had to be pumped as it was dug. In the bottom of the hole, a layer of crushed stone will support the footing and keep the pump clear of the soil **(4)**.

Photos by John Simmons

On a recent job, I needed to demolish and rebuild the failing structure holding up a family-room addition. The support beams were rotten and the columns were in bad shape. Before I could proceed, I had to lift and support everything with house jacks and temporary beams. Then I took out all the old columns and dug out the seven original footings, which were much too shallow to offer adequate support for the structure above. At that point, I was almost ready to dig new footing holes. But first I needed to figure out how to handle the site's high water table.

RISING WATERS

To find the best solution, I arranged a jobsite meeting with my local building inspector, who had also run a successful foundation company in the past and was familiar with the local soil conditions. He told me to dig a few test holes the day before the meeting so we could see how much water seeped into each hole. As I dug them, I hit water about 3 feet down, and with the help of a pump, I finished digging to 4 feet, the required depth for footings in the area.

I protected the holes with plywood overnight, and when we met the next day, there was close to 16 inches of water in each hole. Drawing on his experience as a foundation contractor, he suggested a strategy for installing the footings: Use wide-base forms, and before setting the forms in place, pump out the water and add a few inches of crushed stone to the bottom of each hole. Then drop in the form and continue pumping water from the hole while filling the

With the base cut to the right size, a cardboard form is screwed to it **(5)**. The form height is measured from the beam above **(6)** and marked with a length of flashing tape **(7)**. A measuring tape and level position the form precisely in the hole **(8)**.

forms with a stiff concrete mix to a level above the water table. With the pump keeping the water out of the hole, the bottom of the footing could set properly without being weakened by the excess water. Then it would just be a matter of filling the forms the rest of the way, backfilling the holes as I went.

LAYOUT FOR THE FOOTINGS

Before I started laying out the footings, I gathered the materials that I'd need for them. For each one, I used a 28-inch-diameter Bigfoot base with a 12-inch-diameter Sonotube form secured to it. Each form required nine 80-pound bags of concrete, and I cut three 3-foot lengths of 1/2-inch rebar to reinforce each footing.

I started with the center footing of the seven that I needed to install. To locate the footing exactly, I first found the center point both in length and width of the beam overhead, and then drove a screw at that point. To the screw, I attached a length of masonry twine with a washer tied to the lower end to act as a plumb line. The washer added weight to the string to keep it from wandering back and forth.

I positioned the Bigfoot form below the center point with the twine hanging inside the form. To center the form, I measured the distance from the rim of the footing to the string and moved the footing until the measurements were the same in every direction. Then I traced the circumference of the form on the original concrete slab to give me an exact location for the hole **(1)**.

THE BIG DIG

Having some of the hole locations straddle the existing slab complicated the digging process. I started the holes by digging next to the slab and undermining the soil below it. Once I'd removed the soil to about a foot below the slab, I scored the outline of the base with a jackhammer, and then broke through it a little at a time, alternating between the jackhammer and a sledge **(2)**.

After breaking through the slab, I continued digging down into the clay and sandy soil **(3)**. The digging was pretty painless, but once I got down about 3 feet, water began to seep into the hole, making it tougher to dig. I dug down few inches, pumped out the water, dug a little deeper and pumped again. I continued alternately digging and pumping until I reached the required depth of 4 feet.

The bottom of the hole was tightly compacted clay and sand, but with all that water, the soil wasn't stable enough to support the footings. To remedy the problem, I added a layer of crushed stone to set the form on, as recommended by the inspector **(4)**. The stone would also elevate the pump, helping to keep it from sucking up loose soil and getting clogged.

With the excavation requiring so much attention, I realized that I'd have to dig and pour the footings one at a time to make sure the footings were installed properly. This took a lot longer than if I'd dug them all first and poured them in one shot.

BUILDING AND POSITIONING THE FORMS

Before digging each hole, I prepared the wide-base form along with the tube for the column above the base. Bigfoot forms come with graduated ring sizes to fit different diameters of tubes. After cutting the

A backfill layer keeps the form in place for the pour **(9)**. The form is pumped dry and concrete is placed **(10)**. When the concrete is near the top of the form, three pieces of rebar are added to strengthen each footing **(11)**. After the form is filled and the hole backfilled, the top of the footing is brushed even **(12)**.

form down to the required ring size for the 12-inch tube, I fastened a section of tube to the base with screws **(5)** and set the assembly into the hole.

To keep all the footings at a uniform height, I had established a set distance from the bottom of the beam overhead to the top of the footing. I measured down and marked the height of the footing on the side of the tube **(6)**. I measured from the top of the tube and marked that distance at several other places around the tube. Then using a length of flashing tape, I drew a line to connect the marks and carefully cut the tube with a razor knife **(7)**.

POUR AND BACKFILL

The next step was repositioning the footing before the pour. I adjusted the location, using a level to plumb the tube. As before, I measured to make sure the masonry twine was in the exact center of the tube **(8)**. I also double-checked that the top of the tube was at the correct distance from the beam above.

On some of the holes, the water didn't seem to seep in as fast, so I was able to drop the pump inside the form to pump out the water while I mixed the batches of concrete. Following the inspector's advice, I mixed a stiffer concrete batch for the bottom section of the footing that would be in contact with the crushed stone and wet soil. Before shoveling in the first batch of concrete, I backfilled around the form to keep it in position while I filled the form with concrete **(9)**. As the pour progressed **(10)**, I added about a foot of soil at a time, tamping it down with a length of 2-by as I went.

Once the level of concrete reached above the water table, I used a looser mix, pouring the rest of the footing as I backfilled around the form. Before adding each new layer of concrete and fill, I checked my reference marks to make sure the form had not shifted.

As the concrete neared the top of the form, I realized that the top of the footing would end up being much lower than the existing slab, creating a place for water and debris to collect and shortening the life of the wooden posts I planned to install to replace the original columns. The owner was eventually going to replace the slab, but I wasn't sure when that would happen, so I decided to raise the height of the footings by adding on a short extension of tube. Lengthening the form would put the top of the footing high enough to avoid any problems.

Before pouring in the final lift of concrete, I sank three pieces of 1/2-inch rebar into the wet concrete to help strengthen the footing **(11)**. I kept the rebar 6 inches from the top of the footing so that it wouldn't interfere with the anchors for attaching the metal post bases.

I continued to fill the footing form to the top, letting the concrete overflow the edges a bit. I screeded the excess concrete even with the top of the form and let the water rise to the top of the footing. While the concrete was still wet, I brushed the top of the footing with a masonry brush, smoothing it and giving it a broom texture. Then I let the concrete in all seven footings cure for seven days before asking them to support the weight of the porch.

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PVC Miter-Fold Post Wraps

BY NATHANIEL ELDON

In the last 10 years or so, cellular PVC products have been a game changer for exterior trim. Like most products, PVC trim has advantages and disadvantages. As a carpenter, I don't love the material—I much prefer wood sawdust to plastic sawdust. And so does my wife—especially when I come home after working and the fine, white dust statically clinging to my clothing eventually finds our furniture. But dust notwithstanding, you can't beat PVC for its longevity and stability.

One trick that I picked up a couple of years ago while working with PVC trim is miter-fold post wraps. We do a lot of deck and porch work, so I'm often asked to wrap posts with finish trim. I'd heard of another contractor who was making his own miter-fold wraps, so I decided to give them a try. At first, I didn't know what to expect and went through the requisite trial-and-error period before working out the technique.

Each post wrap is a four-sided assembly made out of PVC sheet stock. Using a router, I cut V-grooves nearly all the way through the material to create matched 45-degree bevels, which then fold up to create 90-degree miters.

Although miter-fold post wraps are available commercially, I find it less expensive and more fun to make my own. One local company, Intex Millwork Solutions, makes them in several sizes, cutting the miter joints on a CNC machine.

WHY MITERS?

In my formative years as a carpenter, I was taught never to miter exterior trim, whether you're turning a corner with a fascia or wrapping a post. Even rot-resistant wood such as cedar will eventually cup and cause the joint to open up. Square-edge joinery was always a better course of action with any type of wood.

But with PVC, mitered joints seem to be a better choice. Because PVC doesn't cup or shrink much across its width like wood does, and because of the greater surface area of a mitered joint and the molecular bond of the glue, PVC miter joints stay together. And they're also less visible than square-edge joints.

Photos by Nathaniel Eldon

LAYING OUT THE POST WRAP

On the project shown here, I wrapped nominal 4x4 porch posts to create a finished dimension of about 5 inches square. Instead of using thinner 3/8- or 1/2-inch stock and packing out the post, as I have done when finishing larger posts, I opted to use 1-by PVC material and apply it directly to the 4x4. I aimed to make the inside dimension of each side of the wraps 3 5/8 inches. (In hindsight, I should have made that dimension 3 3/4 inches. I ended up having to do a bit of on-site planing of the yellow-pine posts to remove some dimensional irregularities).

Knowing that the distance between the groove edges had to be 3 5/8 inches (the inside dimension of each side) and that the PVC stock was 3/4 inch thick, I could easily calculate the outside dimension of each side. That worked out to be 3 5/8 inches plus 1 1/2 inches (the width of a groove cut in 3/4-inch stock using a 90-degree V-grooving bit), or 5 1/8 inches. So I laid out the grooves to be cut at 5 1/8 inches on-center.

I make the cuts by running a router against a straightedge. To lay out the position for my straightedge, I first took into account the width of my router base. The 2.25 HP Bosch router that I use has a 6-inch base **(1)**. Then, I simply added half the width of the base, or 3 inches. This put the straightedge layouts at 3 inches, 8 1/8 inches, 13 1/4 inches, 18 3/8 inches, and 23 1/2 inches. I noted these numbers so that I could lay out the rest of the sheets that I'd need to make all six post wraps.

ROUTER SET UP

As mentioned above, I make the grooves for the miter folds using a 90-degree V-grooving bit. If you are going to make your own post wraps using a router bit, I recommend getting a large V-grooving bit with a 1/2-inch shank. The heavier shanks are much safer to use, and the cutter is large enough to make miter-folds in material up to 1 inch thick.

Before I start cutting the post wraps, I always check the depth of the router bit using some scrap of the material that I'll be working with **(2)**. Setting the depth of the cut exactly right is critical. The objective is to cut almost—but not completely—through the stock, creating a joint that is flexible enough to be folded by hand. I generally leave less than 1/16 inch of material. Held up to the light, the bottom of the groove is translucent. Once I've set the depth of the bit, I label and stow away the test scrap with the hope that I'll be able to find it the next time I have a similar job using that stock thickness.

CUTTING THE GROOVES

Routing PVC is dust-intensive, so I always wear protective glasses, and if I'm cutting a large number of sheets, I also don a dust mask—and sometimes even a Tyvek suit to keep my clothes dust-free and my wife happy.

Once the router is dialed-in and the first sheet is laid out, I clamp the straightedge on the layout. Router bits always rotate clockwise, so keep the straightedge to the left of the router when cutting **(3)**. That way, the direction of the rotation pushes the router base


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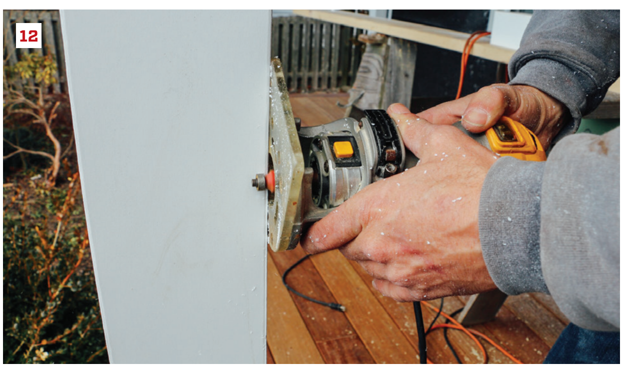
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against the straightedge and keeps the router from walking away from the straightedge.

As I make a pass with the router, I make sure that dust doesn't build up between the router base and the straightedge. Any buildup can push the router away from the straightedge, leaving you with a groove and a miter joint that is not straight and true.

As with most carpentry projects, this process goes much more quickly and smoothly with someone there to help. I was lucky to have one of my carpenters, Justin Cline, available to give me a hand with setting the straightedge, tending the router cord, and sweeping off the dust between passes.

THREE-SIDED WRAPS

After I've cut the grooves, I carefully sweep the dust off the grooved sheets to get them ready for glue. Because we needed to wrap posts that were already in place, the most successful strategy was to install three-sided wraps, leaving the final side loose to be installed later. We sliced the sheets into sections of three sides by running a razor knife down the base of the appropriate groove **(4)**.

To glue the wraps together, I use Christy's Red Hot adhesive in caulking tubes. I squeeze out a bead of adhesive in the second and third grooves of my three-side sections **(5)**. Then I wait a couple of minutes. The adhesive actually heats up the PVC and makes the material in the groove more pliable.

After letting the glue warm up, I fold one side up to make the first miter joint, starting in the middle of the wrap **(6)**. The material sometimes makes cracking sounds, but it should stay together as long as I've made the groove the correct depth. After folding up the opposite side to make the second miter joint, I clamp the three-sided sections together using plywood blocks on the inside of the wrap to hold the assembly square **(7)**.

On that cold and nasty February day, we fabricated the wraps for all six posts in my warm shop and let them cure overnight. The next day, we broke down the clamp assemblies and ran a sharp chisel along the inside of the miters to clean off any excess adhesive that had oozed out. Cline cleaned up the exposed miters with a block plane to remove the small bit of material that was left by the router when the grooves were cut **(8)**.

INSTALLATION

Once the weather decided to cooperate, we headed to the jobsite to install the wraps. I started by sliding the three-sided assemblies onto all the wood posts. I'd covered the beam that supported the porch roof in PVC, making the bottom part $5\frac{1}{2}$ inches wide, which let the post wraps fit in nicely below.

I fastened the PVC assemblies to the posts with 15-gauge stainless-steel nails **(9)**. After running beads of adhesive down the exposed miters **(10)**, I fit in the last sides, fastening them with 18-gauge stainless-steel brads **(11)**. To finish up, I eased all the corners with a $\frac{1}{8}$-inch round-over bit in a mini-router **(12)**.

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