



Rock-Solid Stair Posts

Blocking and a long threaded rod reinforce the structural connection between the posts and stringers

by Mike Guertin

Guard posts at the bottom of deck stairs are notoriously wobbly. Often, the posts are just screwed or nailed to the outside stringers, with the bottom stair tread providing the only reinforcement to the assembly. The posts may feel stiffly supported right after installation, but a few seasons of wet-to-dry and hot-to-cold conditions—as well as everyday use and abuse—will take their toll, and eventually, these connections loosen up. That’s why I pay particular attention to how I reinforce the bottom of the stairway and secure the guard posts—I want them to remain solid and stiff for many years.

One approach that many deck builders use to install stable stair guard posts is to bury the post bases deep in the soil

or in a concrete footing. I’ve worked on 30-plus-year-old decks where the buried post ends were still solid, but that’s not always the case. It’s not unusual to see the beginnings of rot in buried pressure-treated posts, even ones that have been installed relatively recently, so if you take this approach, be sure to use wood treated to at least the AWP A UC4B (ground contact/structural use) standard, or even UC4C (ground contact/extreme use) if available. That way, you can be more confident that the buried portion of the posts will remain rot-free for a long time.

You might find it difficult, though, to find PT 4x4 posts suitable for this approach. Some lumberyards only stock wood treated to the UC4A ground-con-

tact standard, which is intended for general use, such as for joists that are close to the ground and posts that rest on footings but that aren’t necessarily buried.

Rather than risk buried posts that can decay unnoticed, I use an above-the-ground post-reinforcing system, where the condition of the posts can be monitored and parts replaced if necessary.

The Footing Stabilizes the Posts

No matter where you build decks, the bottom of the deck stairs must be supported by footings. The 2018 IRC (R403.1.4 “Minimum Depth” and R403.1.4.1 “Frost Protection”) requires that when a deck is attached to a dwelling for support at a ledger, the footings on the deck—including the stairway footings—must reach

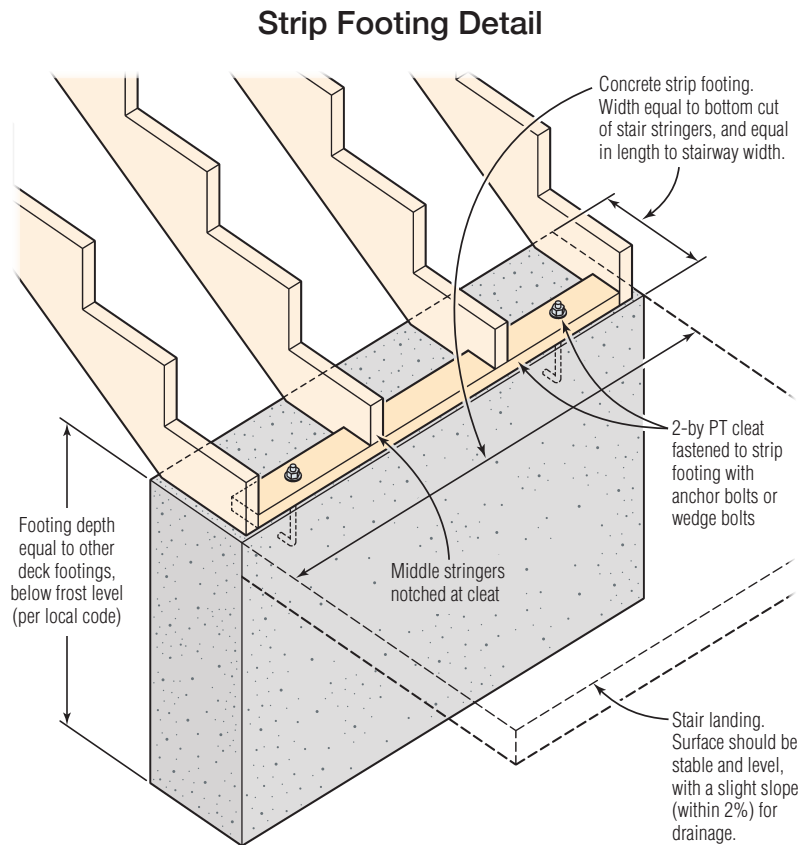
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below frostline. When a deck is free-standing, the minimum footing depth required by code is 12 inches (R403.1.4.1, exception #3 “Frost Protection”).

There are several ways to meet this requirement, and if you live in an area that has a frost-free climate or that has the type of well-drained soil that doesn't expand when frost occurs, a 4- to 6-inch-thick concrete slab landing might be the simplest option (if approved by your local inspector). Otherwise, my favorite approach is to pour a concrete strip footing that is at least the width of the bottom cut of the stair stringers (about 10 inches), the same length as the width of the stairway, and the same depth as the other deck footings (below frost level) (see Strip Footing Detail, right). While this might sound like a lot of concrete, it's not a lot more than if you were going to dig three or four 10-inch-square or 12-inch-diameter footing holes (per DCA6) next to one another, and it eliminates the problem of dirt from the closely spaced holes caving in on the others. (For more on floating vs. fixed footings, read “Deck Stairs on Frost Footings” at deckmagazine.com.)

Connecting the Stringers to the Footing

To provide an anchor point for connecting the stringers to a footing or an integrated footing and landing, I secure a 2x4 (or larger) PT cleat to the concrete, either with cast-in-place HDG J bolts installed during the pour or with expansion anchors that can be installed after the concrete is cured. The 2-by has to align with the front end of the stringers, so it helps to cut the stringers before casting the footings and landing so that you know exactly where to dig. In that case, I install 1/2-inch-diameter generic HDGJ-type anchor bolts when I pour the footing. If for some reason I'm not certain of the stringer layout, the cleat can be fastened to the concrete with expansion anchors (either ITW Red Heads or



Instead of using individual concrete piers to support each stair stringer, the author prefers to dig and pour a monolithic strip footing, which is sized to extend below frost depth and fully support the stringers' seat cuts. The stair stringers are locked to the footing by a PT cleat anchored to the concrete.

Simpson Strong-Tie anchors are typically stocked at the yards near me) after the concrete has cured.

After laying out and cutting the stringers but before installing them, I stack them up and bore a 9/16-inch-diameter hole 2 inches down from the top of the tread cut and 2 inches in from the riser cut. Later, I'll run a 1/2-inch-diameter threaded rod through the holes; drilling the holes before installing the stringers ensures accurate hole alignment.

I cut 1 1/2-inch-by-3 1/2-inch notches at the bottom of the center stringers so that they will fit around the 2-by cleat, and toe-screw them down with framing screws. The two end stringers don't need to be notched—they are simply screwed

to the ends of the cleat with structural screws (**Figure 1**).

Installing the Guard Posts

Once the stringers have been fastened to the footing cleat, the 4x4 PT guard posts can be mounted to the outer stringers. On the job shown here, I mounted the posts inside the stringers, but with this system, it is possible to mount them on the outside of the stringers. To hold the posts in place while I install blocking and the threaded rod, I fasten them to the stringers with a couple of 4 1/2-inch-long structural screws. I plumb them in line with the stringers; in the final step, I adjust the camber of the posts (**Figure 2**).

Next, I install a row of blocks ripped to



Figure 1. After pouring the concrete for the strip footing and stair landing, the author uses anchor bolts to connect a 2-by PT cleat to the footing (above left). When installing the end stringers, he fastens them to the cleat with structural screws (above right). The middle stringers will be notched to fit over the cleat.



Figure 2. The author screws the guard posts to the stringers (above left), then installs a row of blocking that fits tightly between the stringers (above center). A 1/2-inch-diameter galvanized threaded rod that fits through prebored holes in the posts and stringers ties the assembly together (above right).

the height of the stringer from footing to tread cut. The blocks are positioned behind the guard posts in a straight line and fastened through each stringer with 5-inch structural screws about 1 1/2 inches up from the bottom of the stringer and down from the tread cut. I also drive additional 4-inch screws through the back of the blocks into the 2-by cleat.

Using straight 4x4 PT stock for the stair posts and cutting the posts and PT blocking to length on a sliding compound

miter saw ensures that all of the components are square. So even before my final adjustments, the posts are close to plumb.

Using the prebored holes in the outside stringers as a guide, I drill a 9/16-inch-diameter hole through the 4x4 posts, then run a 1/2-inch-diameter HDG threaded rod through the stringers and blocks. When long rods aren't stocked locally, shorter lengths can be joined together as needed with 1/2-inch HDG threaded couplers. With nuts and washers installed at

each end, I snug the rod up, but I don't tighten it down yet (**Figure 3**).

Next, I install a second row of blocking aligned with the front of the risers and on top of the cleat, fastening the blocks with structural screws or framing screws. (When the posts are positioned outside the end stringers, the first blocks run from stringer to stringer, rather than from post to stringer, as on this job.) Another variation I've tried is to cut 1 1/2 inches off the riser face of the intermediate

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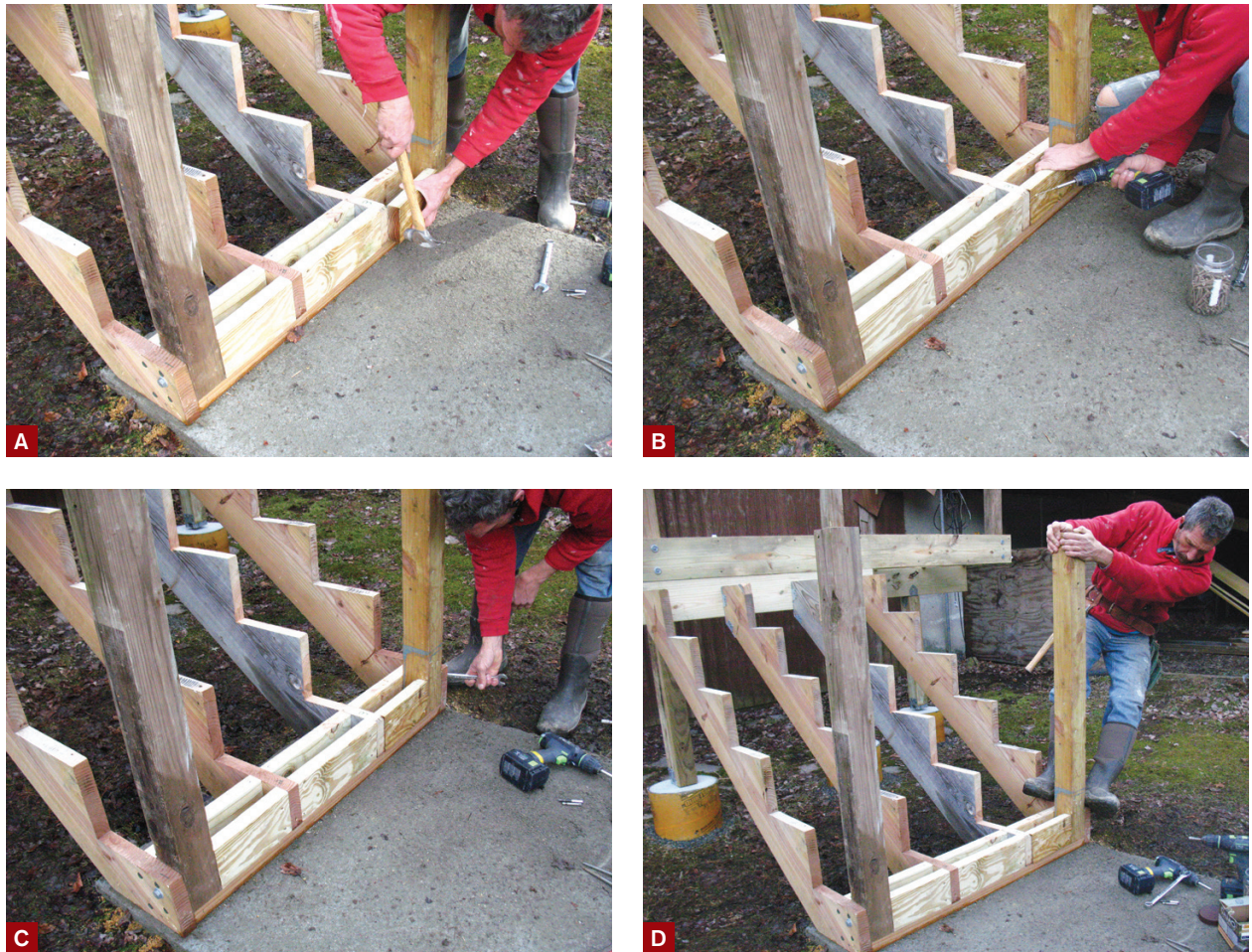


Figure 3. Next, the author installs a second row of blocking, aligned with the front of the stringers, to reinforce the assembly (A). After screwing the blocking to the stringers (B), the author tightens the rod nuts (C), and tests the assembly (D), making adjustments as needed with shims so that the posts are plumb.

stringers so that a single block can be installed from one end to the other.

Finally, I tighten down the end nuts and trim off the excess rod, coating the cuts with a rust-prohibiting coating. Tightening the nuts can cause the posts to camber inward. Final adjustments can be made by loosening the nuts, inserting shims between the outer stringers and the blocks (or between the blocks and posts), and retightening.

Although it's not shown in the photos, I also bore $\frac{1}{2}$ -inch-diameter holes through each block along the front, just above the cleat, so that any water that collects between blocks can weep out.

Testing the Assembly

To get a rough idea of the strength of this assembly, I set up a cable winch to pull on the top of a post, and I measured the load with a spring scale. In my makeshift testing, I achieved a load of about 400 lb. before the washers began to pull through the outer stringer. I think this is plenty strong, but using heavy-duty 3-inch-by-3-inch bearing plates instead of standard-cut washers would help the connection resist a greater force. On most jobs, not as a scientific test but for peace of mind, I give the posts a yank to make sure nothing moves.

Of course, this assembly will secure the posts from moving in an outward direction only; they can still move in line with the stringers under force. So I'm also counting on the guardrail assembly between the lower post and the post on the deck (which is designed to resist force in the direction of the stairway) that will be installed later to reinforce the lower post. ❖

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