

INSTALLING

Manufactured Stairs

Factory-built stairs can help you control costs, stay on schedule, and improve quality



A top-quality prebuilt staircase takes just an hour or two for two men to install, and it costs the contractor little more than he would pay for materials alone.

I'm a design-builder in the high-end custom market in coastal New England. For every house or remodel I take on, I create a unique

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design, which includes the staircases.

Like a lot of builders, I used to have my own carpenters build our custom stairs. Then one day, my neighbor Dave Cooper invited me to check out his stair-building shop, Cooper Stairs

(which now has been bought out by Horner Millwork in Somerset, Mass.). With a full-time staff of employees, Dave's company does nothing but build stairs.

When I saw the details Dave was using — precision-routed stringers, fully housed risers and treads, glued tongue-and-groove joinery, and so on — I said to myself, "I'm not giving my customers this level of quality." Though I prided myself on my company's first-class work, I was actually

doing my customers a disservice by custom-building stairs instead of installing the shop-built product. Then I saw what the shop was charging for a stair package, and I realized that I couldn't beat the price either — certainly not for stairs of this quality.

I employ excellent finish carpenters, but I can't expect guys who are building a handful of staircases a year to be as efficient or as accurate as professionals who build stairs every day. In the shop, the materials are always on hand



Figure 1. Curved stairs are built on a wall mockup that is framed using plates cut from a full-scale CAD pattern. Identical plates are sent to the site so the actual wall will match the shop jig. Railings are test-fitted in the shop before the stair is shipped.

Figure 2. Stairbuilders will quote jobs from plans, but they generally send a field rep to the site to verify measurements before starting work.



and the machines and tools are set up for full-time stair building. And a big shop has the volume buyer's advantage: In the real world, I pay almost as much for the materials to build a stair as the shop charges me for the finished item — and that's before I even look at my labor cost.

Bear in mind that there are lots of stair manufacturers around the country. They sell stairs for every kind of house from multifamily tracts to million-dollar palaces. I don't suppose my supplier is unique, but I haven't shopped around much — you should check out your local supplier's operation if you're seriously considering manufactured stairs.

Cost

In my market, prices look something like this (including stairs and railings):



Figure 3. Perfect-fitting tread returns are glued and air-nailed to the treads (left). A tongue on the back of each tread (center) matches a groove routed into the face of each riser. Gluing and nailing these joints, the stair builder makes up a complete set of tread-riser pairs in about 20 minutes (right).

For a straight box stair, to be placed between two framed walls with railings attached to the walls, I expect to pay around \$900 to \$1,000. That's with southern yellow pine risers and oak treads; for basement-grade wood, you could cut that almost in half, but to go up to poplar risers or all oak would add a few hundred to the base price.

For a slightly nicer stair, partially open on one side, the base price is a little more, say \$1,400. Little extras like a bullnose bottom step and railing volute would add about \$300.

If you upgrade a little more and choose stairs that are partially open on both sides, or completely open on one side, then you're up to around \$2,000 (it's the railings that make most of the difference). For this type of stair, poplar risers would add almost \$200, oak risers

more like \$400, and common upgrade options like bullnose steps or volutes bump it up another \$400. At this level you'll get a very nice stair for a good-quality upper-middle-market home.

Let's get a little fancier and talk about an L-shaped stair with a landing, open on one side. Now you're looking at \$2,700 for the basic stair and railings, and the various upgrades could add another \$1,300 to \$1,400.

In a more upscale market, for a 90° curved stair, you're in another ballpark — \$10,000 and up. You're also looking at extra money if you want touches like over-the-post railing transitions. On the other hand, the upgrade to all oak is still probably under \$500.

Curved stairs. We're not going to get deeply into curved stairs in this article, but it's worth a quick look.

When Cooper's shop builds curved stairs, they output a full-scale print of the floor plates for the curved wall from a CAD program, and use that as a template to cut wall plates from plywood. They send an exact duplicate of the wall plate to the site for the framers to use, and then rig up a full-scale replica of the wall itself in their shop (Figure 1). They build the stairs right onto the mocked-up wall, so when the finished item arrives on site, it drops right in place.

Scheduling

Besides cost, another big advantage of manufactured stairs involves scheduling.

When I started out as a builder, I thought of the schedule in linear terms: First the foundation guys come, then the framers come, then the



Figure 4. Stringers are precision-routed on a computer-controlled machine. The treads are securely wedged (left), glued (center), and screwed (right) in place.

plumber comes, then the hvac guy comes, and so forth. But after years in business, I've come to think in terms of layering: "Who can work on top of whom?" That's because, as a rule of thumb, the longer a job takes, the less money I make.

In the case of stairs, a prebuilt installation takes a few hours, while building the stairs on site could tie up my best carpenter for a week or more.

By using a shop-built component, I avoid uncertainty in both schedules and costs. If my carpenter on site runs into a snag on a site-built stair, the whole project stops until he's back on track. A week can easily turn into ten days. This doesn't just blow my cost estimate for the stair itself: By inter-

rupting the schedule, it also creates other costs that you can't even account for. But when I order prebuilt stairs, it's the supplier's responsibility to deliver them on time and on budget. The stair package is a fixed cost that I can predict on the first day of the job.

Ordering Stairs

Here's how stairs fit into my usual time line: As soon as I have a firm set of plans, I fax a copy to the stair shop with a description of the stairs. They send me back a price for the complete package, including railings, and let me know when they can deliver. They also quote me a price to install the stairs, but it's usually cheaper to use my own crew. I pay for an outside installer only

when my own people are tied up on another site. When you do have a manpower problem, though, it's nice to know your supplier can come in and do the job right.

The supplier won't build stairs from plans. After the house is framed, they send a rep to the site to measure the actual dimensions of the opening (Figure 2, page 2). It's the rep's responsibility to make sure the stairs are built to fit.

The time for installing the stairs is flexible. We always build rough stairs when we frame the house so the crew and subs don't have to use ladders to get from floor to floor. We tear these out when the manufactured stairs arrive, which can be any time after the roof is on, either before or after drywall.



Figure 5. Glue blocks are stapled and glued to every joint from the underside (far left) to add solidity and prevent squeaks. Next, cove molding is finish nailed beneath each tread nosing (left).

Damage is an obvious concern. The manufactured stairs come wrapped in protective plastic, with tread protectors tacked on. It's pretty safe to install them early on, but I still like to wait until most of the subs are gone — no point in tempting fate.

On the installation shown in this article, it worked best to install the stairs after framing and before drywall; railings didn't go on for another month and will be covered in a future article.

How the Stairs Are Built

When I saw the way the stairs were put together in the shop, I was impressed with the efficiency as well as the quality of the process. With

every tool set up for its specific purpose and all the materials on hand, the production process moves right along.

The most skilled workers handle the complicated curved stairs, there's one man trained to run the computer-controlled machinery that cuts and routs the stringers, and one highly experienced woodworker hand-carves most of the custom railing transitions.

Dedicated tools make first-rate joinery possible. For example, tread returns fit very tightly because the matching pieces are milled on the same router using different jigs.

And although the work goes faster than it ever could on site, the shop uses connection details that few builders

employ. Tongue-and-groove tread-riser joints are glued as well as nailed (Figure 3, page 3). Tread and riser ends are fully housed in dadoes in the stringer, and are held snugly in place with wedges, glue, and screws (Figure 4). After everything's fastened, the installer adds reinforcing glue blocks on the back sides of all the tread, riser, and stringer joints (Figure 5).

The bullnose riser assembly is a good example of the blend of efficiency and quality. The process involves routing and kerfing out a strip of 1-inch finish plywood for the riser, bending it around a radius form, gluing and nailing the whole assembly in place, trimming the butt end to length, and attaching the finished

riser to the staircase (Figure 6). It probably takes less time for a worker to do this in the shop than it would take a carpenter on site to set up his power tools.

On-Site Installation

You can figure on two people taking part of a morning just to install the stairs (Figure 7). Railings might take the whole afternoon. If you've got a bigger set of stairs, like a full 90-degree radius stair, you'll need some extra labor on hand to help with the lifting. And, of course, expect the fine work to take longer.

By the way, if the stairs are big, remember to leave a way into the building. I forgot that once, and we had to cut a large curved stair in two pieces just to fit it through the door.

Before you place stairs, a last check of openings and of plumb and level is a good idea. On the job featured here, the installer was confused for a minute because someone had removed a post under the floor to pour the basement slab. Every time the installer tried to shim up the landing, the floor below dropped instead — until it dawned on him that he needed a temporary post in the basement.

But if the framing is on the money, as it should be, installing a staircase is like installing one cabinet: Get it in place, check all your dimensions and spacing, check level and plumb, fasten it, and you're done.

With a two-piece assembly, as soon as the lower run is tacked and clamped in

place, you can walk on it (carefully!) while you're putting in the upper section. The joint where the two sections meet has to be dead-on plumb and level, and shimmed flush as needed (Figure 8). This location is a good place to put fasteners, because the landing newel-post will cover them up later.



Figure 6. Kerfed plywood is bent around a pre-made form to make a bullnose riser.



Figure 7. Two men can easily carry and place a typical straight staircase (left). For large or complicated staircases, you may need more manpower. The installer pins the lower staircase section in place, using a scrap of landing tread to determine the correct height for the top edge of the riser (right). He places the first screw where cove molding will cover it later.



Figure 8. The joint at the landing newel (far left) serves as a focal point for aligning the entire stair assembly. The installer shims and plumbs this location carefully, then screws through the upper stair stringer into the lower stair riser to firmly lock the joint (left). Fasteners at this point will be covered later by the newel-post.

That center joint is the focus for the whole stairs — you get it right and pin it, and then adjust at the top and bottom of the stairs if you have to. Most of the time in new construction, everything fits right in place, but if there's any planing or shimming needed in a remodel job, do it at the bottom or the top.

The stairs come from the shop with the finish floor height and centerline marked on the lowest riser (Figure 9). If you have to trim or shim that, do it so that the change is minor in the center walking path. By code, you have $\frac{1}{4}$ inch to play with — more than you'll probably ever need. Coming out of the shop,

I've never seen any of the rise or run dimensions on the stairs themselves deviate from dead-on perfect.

At the top, lay a scrap of landing tread on the riser to check the height. The landing tread comes with the stairs and makes the transition from the $1\frac{1}{16}$ -inch tread thickness to the $\frac{3}{4}$ -inch



Figure 9. The installer uses a piece of landing tread, supplied with the stairs, to check the fit at the top (left). A label on the lowest riser (above) shows the finish floor height and indicates the centerline of the stairs.

Figure 10. A cleat glued and screwed to the deck serves to hold the bottom stringer tight to the floor (right). Screws into the cleat through the face of the stringer will be buried behind flooring and molding. Screws into the studs from underneath are also invisible (below, left). Visible fasteners (below, right) are counter sunk and plugged.



Figure 11. A $\frac{5}{8}$ -inch gap is left for installing drywall around the stairs (right). Precut shims (far right) speed this process.





Figure 12. Before leaving, the stair installer places temporary braces at mid-span in each run of stairs. It's best to build in a crown of perhaps $\frac{1}{4}$ inch to allow for slight settling and framing lumber shrinkage over time.

wood flooring thickness; we install it when we install the floor. The stairs are right when the scrap lies flat on the subfloor and fits just right on the riser.

Fastening. The stairs are fastened to the wall studs at the side, under the steps if possible (Figure 10). We also pin them to the landing, and to a cleat screwed into the subfloor behind the bottom riser. Drywall screws seem to work fine for all these locations; when we have to place screws in the stringer above the steps, we countersink them, then plug and sand. Never use nails instead of screws — that's the one thing that is likely to cause squeaking over time.

All around the staircase, we use $\frac{5}{8}$ -inch shims at the fastening points to hold the assembly away from the framing (Figure 11). That lets us slide drywall behind the stairs later. The joint

between wall and stairs will eventually end up being covered with a cove or quarter-round molding.

Support. On the job we're showing, the shop's installer put temporary bracing under each run of stairs at mid-span (Figure 12). If it were one long run, he'd have put in two braces. It's a good idea to shim the supports to create a slight crown, say, $\frac{1}{4}$ inch or so; as lumber shrinks, everything tends to settle and sag a little.

If my crew were installing, we'd probably frame up the wall right away, just like any other stud wall, with the top plate right up under the stair treads and with a $\frac{5}{8}$ -inch gap between the framing and the stringer to accommodate drywall. Again, we'd shim slightly to create that crown.

Making the Choice

Depending on your situation, you may have good reasons for wanting to build stairs yourself. If you're a builder who loves being a craftsman, and if stairs are a big source of satisfaction, you might not want to give that up.

But the reality of my business is that I have to provide the best quality I can within a limited budget. As a small-volume custom builder in a tight labor market, I have to use my skilled workers as efficiently as possible. I can't afford to keep a finish carpenter on staff just to build stairs. Manufactured stairs give me and my customers the best value available, and I see no reason to go back.



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