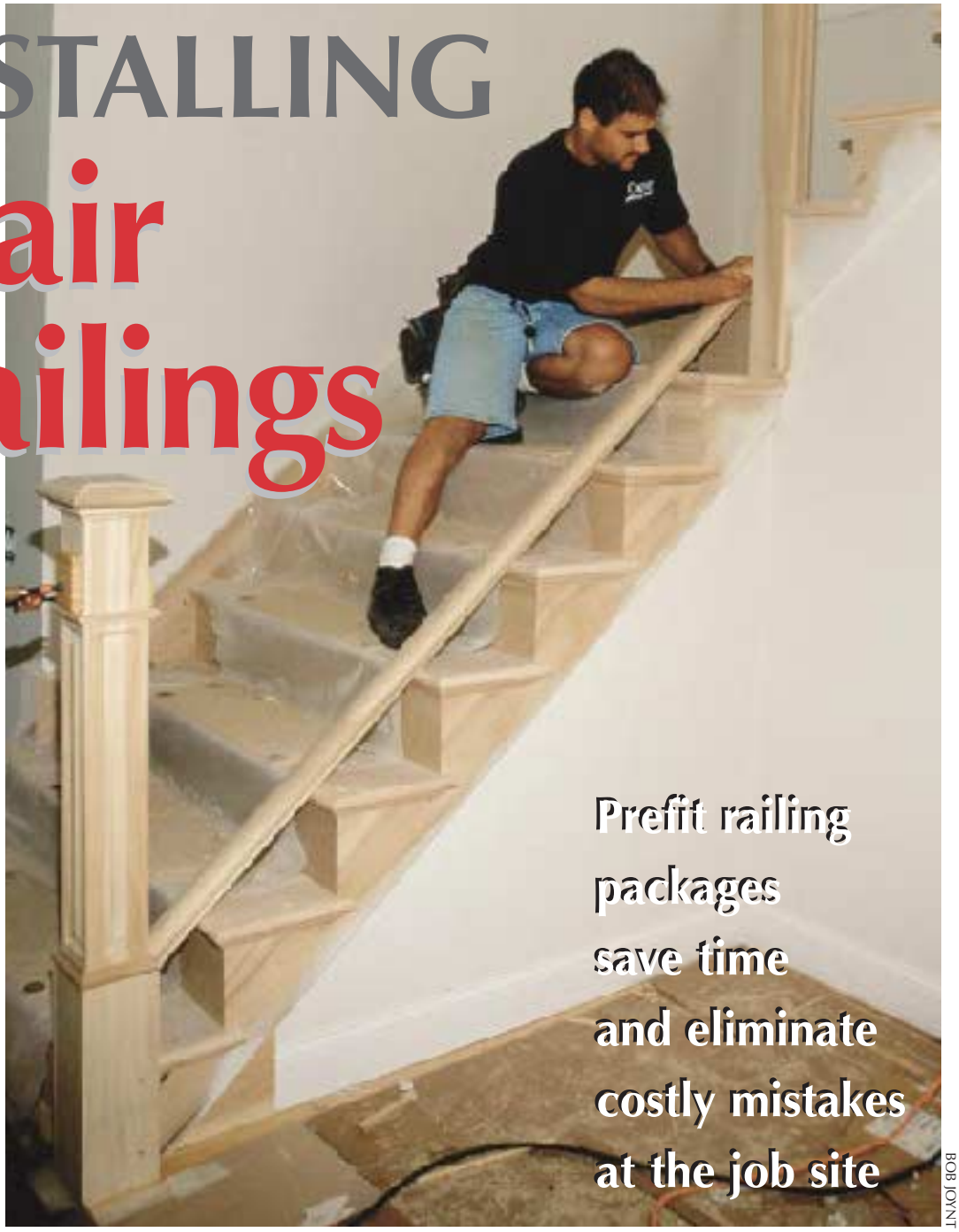
INSTALLING Stair Railings



Prefit railing packages save time and eliminate costly mistakes at the job site

BOB JOYNT

by Paul Alves

I was a building contractor for many years, but now I work as a stair builder for Cooper Stairworks in Somerset, Mass. After many years of installing stairs in the field, I'm now one of the leaders of the production team in the shop.

I was part of the team of stairbuilders on the project described in the article, "Installing Manufactured Stairs" (9/00). A couple of weeks later, after the drywall was in, I went back to the site to install the railing system. This article describes that process.

Like many other stair builders, we will send people to your site to install the stairs and railings if you need that. However, the packages we send out are complete enough that any carpenter can do the on-site work. In fact, even some skilled homeowners have installed their own packages.

We do most of the measuring and fitting in the shop, so the site installation usually takes a day or less, depending on the complexity of the stair system.

Pre-Cut Pieces Simplify Things

Many of the pieces in the railing package are premeasured, pre-cut, and prenotched in the shop, based on the field measurements taken by our site rep. We cut each railing package at the same time as we build the stairs, using the

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Figure 1. The stair shop prefits each railing system to the actual stairs as the stairs are built, so that no complicated layout is needed on site. Here, a shop carpenter test-fits a post to a stair set (left), then checks the plumb cut on a railing (right).

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Figure 2. Posts and stair treads are prenotched at the shop to ensure the proper post location and height, but the posts are drilled on site.

actual stairs to guide us (see Figure 1). The posts are cut to the appropriate height, and notched at the bottom to fit snugly in place. Likewise, the treads on the stair itself are prenotched at the appropriate location to accept the posts. This means it's hard to install the posts anywhere but exactly at the right spot. As long as you've positioned the stairs correctly and are careful to fasten the posts perfectly plumb, everything else should drop nicely into place.

Step by Step

The job shown here was a straightforward post-to-post design. We had to run posts and rails all the way up the steps, which are open on one side, and also around the landing at the top, which is open to below. As always, I took the installation in phases: first the posts, then the landing treads and fascia under them, then the rails and balusters, then the baseboard at the mid-landing, and finally the necessary cove and cap moldings.

In order to be efficient, I complete each phase before moving on: When I'm setting posts, I set all the posts. When I start to install rails, I do all the rails, and so on. That way I'm not running back and forth between different tools and setups.

Posts. The first task is to set the posts. As I mentioned, the posts come prenotched and pre-cut to height, with the caps and any other trimwork already applied. But we drill the posts in the field because different builders use different methods of attachment (Figure 2).

Some builders even use nails to attach the posts. When squeaks do occur, it's usually because the builder has used nails without glue. We prefer wood screws (or long drywall

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Figure 3. Corner landing posts may be thrown out of plumb or square by the drywall and tape. The author checks for plumb and square (top, left and right), then shims or grinds as needed before attaching the post permanently (above, left and right).

screws) and yellow glue. Screws bring the pieces tightly together, while the glue actually does most of the work.

Unlike the posts that attach to the stair itself, the landing post upstairs attaches through the drywall into the framing (Figure 3, previous page). The post should be perfectly plumb and square so when you install trim around it and attach the railings, all the joints can be a simple square cut. Setting these is a little trickier than setting the ones that attach to the stairs themselves, because the built-up drywall mud may cause the angle to be irregular. I always set this post temporarily and check square and plumb. If it's not right, I back the screws out and shim the post or shave it as needed. If the post is in at the top, I can shim behind it, because the fascia will hide the shim; but if it's in at the bottom, I have to grind the top down — shims at the bottom would show. I test-fit everything until it all looks good, then screw it together for the last time.

After all the posts are in, a final check of level is a good idea. If for some reason the floor is out of level, the railings will be too unless you adjust the posts. You could vary the height at which you attach the railings to the post, but it would be noticeable. Instead, if the posts aren't level, I shim up the low ones to even things out (landing tread will hide the shims).

Landing tread. The landing treads come next in the sequence. They come with the package, but they have to be cut to length and attached.

The landing tread has a profile that matches the stair tread on the front edge and the flooring thickness on the back. It makes the transition from stairs to floor at the mid-landing and top landing. It also serves as edge trim for the flooring around the area that's open to below, providing a visual transition. I predrill and countersink each piece for screws, then glue and screw it to the subfloor, plug the screw holes with matching bungs, and touch-sand them.

Treads are usually finished but not painted, so it's important to match the plugs to the tread. Pick plugs that are the same color and species of wood, and align the grain when you insert them.

The landing tread helps lock the posts in place, and it also hides any shims you might have used to adjust the post heights because of floor variations (Figure 4).

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Figure 4. The landing tread helps lock in the newel posts, and hides any shims that may have been used to adjust the post (top). The landing tread must be perfectly level so that no cracks appear at the bottom of the balusters. The author attaches the landing tread with 8d finish nails (above).

Fascia. The next piece I install is the fascia under the landing tread sections that edge the opening. This piece stabilizes the landing tread itself, and also helps lock in the posts. Again, it will hide any shims behind the post where the posts attach to the wall.

I install the landing tread, then the fascia so I can make sure that the landing tread is perfectly level all three ways: out from the floor, side to side, and front to back. When the balusters are put in place, if the landing tread is not level, a crack will show at the joint where it meets the baluster.

The landing tread extends $2\frac{1}{8}$ inches out over the opening, so it could easily sag or rock. So to prevent this, I set a small level on the landing tread, hold the fascia firmly up under it with one hand, and

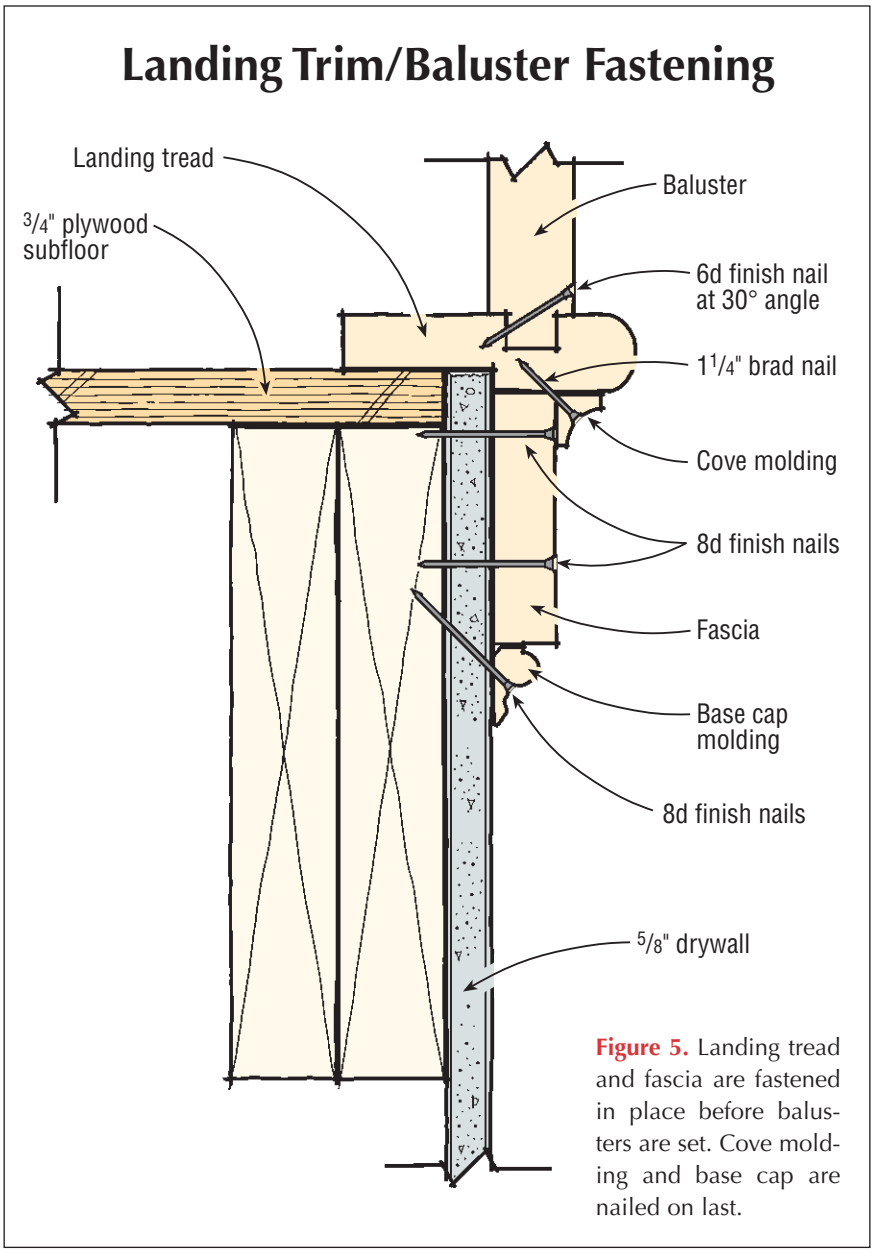

Figure 5. Landing tread and fascia are fastened in place before balusters are set. Cove molding and base cap are nailed on last.

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Figure 6. The author uses glue and screws to fasten the rake rail to the post from below. A block clamped to the post steadies it in place.

nail the fascia on with 8d finish nails. I don't use glue here because I'm fastening to drywall. The drawing in Figure 5 shows how the landing trim is built up.

The little pieces of cove and cap molding I save for later — for now I move to the rails.

The Rail Deal

I start with the rake rails (the sloped ones). These have a pitch cut at the bottom that has already been done in the shop. In case of some discrepancy, the other end has been left long. In the field, I set the rail down on the stairs and butt that bottom cut to the bottom post, then mark the top of the rail where it meets the top post (see photo, page 1).

This method is more accurate and quicker than using a tape. I use the same method on the level railings: I take the actual rail (first checking to make sure again that the posts are plumb), cut a square cut on one end, butt that to one post, mark the other end on the next post, then cut at the mark.

In my experience, the more you measure, the more chances you get to mess up. If you take out the tape, measure between posts, and then go down and measure the railing, there is always the chance that you'll cut it an inch short. Marking the piece in place, how can you go wrong? And since some custom railings cost $14 or more per foot, I don't want to make any mistakes.

After cutting the rake rail, it's time to fasten it in place (Figure 6). This particular rail is placed in the center of the space between the bead and the cove on the post. I mark the center point; then, measuring across the face of the pitch cut and dividing the measurement in half, I come down that distance and make a mark. I cut a temporary block to fit between that mark and the piece of bead molding below, and clamp the block in place. This gives me a place to rest the rail.

When I set the end of the rail against the post (after

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Figure 7. For efficiency and accuracy, the author holds the actual rail in place to mark the cut. Using a measured block to support the rail, he fastens it with screws through the back of the post.

applying glue to the face of the cut), the top end rests against the upper post, and the rail stays in place while I drill it and fasten it with screws.

Again, the rail has not been predrilled for the screws in the shop — that's left to be done on site. That's because some other installer might want to attach the rail some different way; in that case, they wouldn't want the holes. But this is the way we recommend fastening it — screws and glue make a strong joint.

I fasten the top of the rake rail with finish nails, nailing down through the rail into the post. This is a paint grade installation, with poplar rails — if it were a harder wood intended to get a clear finish, I would generally screw into the face cut from the back side of the post.

You can see in the photos that the rake rail has been predrilled for the balusters. It's hard to lay out and drill those holes on site, so we do it in the shop ahead of time. The level rails, however, are not predrilled; that leaves the customer some flexibility in laying out those balusters.

Level rails. From the top of the stairs around the landing opening, we set rails level from post to post. Again, as I set these rails I use a block to support the rail in place.

How we fasten rails to posts depends on the location (Figure 7). At corners, we drill and screw through the post into the butt end of the railing, offsetting the screws slightly so they don't interfere with each other. Where a railing butts to a wall, we apply a rosette to the end of the railing and screw the rosette to the wall (Figure 8). At center posts

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Figure 8. At the wall, the author uses a rosette to attach the rail. He screws the rosette to the end of the rail, then to the wall.

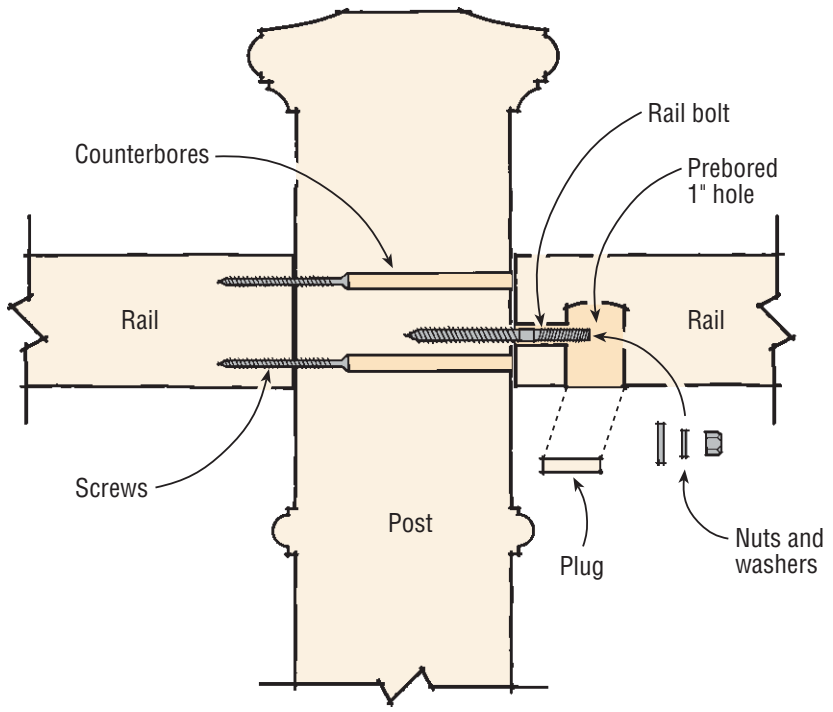

Figure 9. Where two rails meet at a post, only one side can be screwed. The other side is attached with a rail bolt. One end of the bolt has screw threads for attaching to the post; the other end is machine-threaded to accept a nut. A pilot hole for the bolt in the end of the rail and a 1 inch hole for the nut under the rail are prebored at the shop. In the field, the installer has to drill a pilot hole in the post, attach the bolt, and then tighten the nut on from beneath the railing. A plug hides the hole in the rail.

where railings attach on opposite sides, we drill and screw through the post on one side, but on the opposite side we use a rail bolt.

Whoever invented the rail bolt did stair builders a big favor. It's used for blind fastening of rails to posts, and also to join two rail sections together as needed (Figure 9). On one end it's a threaded screw, and on the other end it's a bolt. The screw end goes into a predrilled hole on the post or on one railing section; the bolt end goes into a hole in the other rail. But first we predrill a 1-inch hole under the railing, just big enough to get a nut through. We insert the nut from underneath and tighten it onto the bolt to bring the assembly together.

With an over-the-post rail system, we preset all the rail bolts. Where there's a joint, we attach the rail bolt to one railing and predrill the 1-inch hole in the matching piece's butt end. We preassemble the whole railing in the shop to make sure it's right, then dismantle it and ship it. All the installer has to do on site is put it back together and tighten it up.

Balusters. The treads and the rail have been predrilled in the shop to receive the balusters. The bases of the balusters are level with the rails, but the upper turnings are rail-oriented — the profile follows the pitch of the railings.

In the field, I install the center baluster first, then sight the railing to make sure it's straight (Figure 10). In fact, I like to put a slight crown to it, on the assumption that it might sag over time.

I also double-check the railing height. The rake rail height


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Figure 10. The author slides a baluster into the predrilled hole in the railing, then lowers the pin into the hole in the tread. He sights the rail: It should have a very slight crown.

should be measured plumb from the top of the tread at its tip to the top of the rail (Figure 11). Our local code calls for a 34-inch rail height, but that varies from place to place. I marked my level at the 34-inch height so I can make a quick measurement perfectly plumb without having to use my tape.

If the railing is at the correct height, I proceed to install all the rake balusters. I first measure and cut each baluster to length. Then I take the baluster, line it up with the hole in the rake rail, push it up, slip the pin over the hole in the tread (which we have first squeezed a little glue into), then drop the baluster back down (Figure 12). At the top, I predrill a hole and put in a 4d finish nail. At the bottom, we send in one 6d nail to keep the baluster from spinning. The nail goes about 3/8 inch from the top of the tread, on a 30-degree angle going into the baluster, so it goes right through the pin and connects into the tread.

Level balusters. Unlike the rake rail and the stair treads, the level rails and the upper landing treads are not drilled in the shop. Again, the contractor on site may have his own preference for laying out and attaching these elements, or a discrepancy on site could affect the spacing between the post and the wall. So before I can install those balusters, I have to mark and drill the landing tread and railings (Figure 13).

I use dividers to mark the landing tread, but first I have to figure the spacing. I look first at the spacing of the balusters on the stair treads; I want the landing balusters to be in that vicinity. Say it's 4 1/2 inches: I measure the distance between the landing posts (which happens to be just under 4 feet) and divide that number by 4 1/2 inches to see how many spaces I need to mark off. The answer is 10 spaces so I divide the total distance by 10 to get the interval, which is close to 4 1/2 inches. I set that distance on my dividers and step it off to mark the centers of the holes.

I drill the bottom holes first, then transfer the centers to a story pole that's cut to the length of the rail. I use the story

Measuring Railing Height

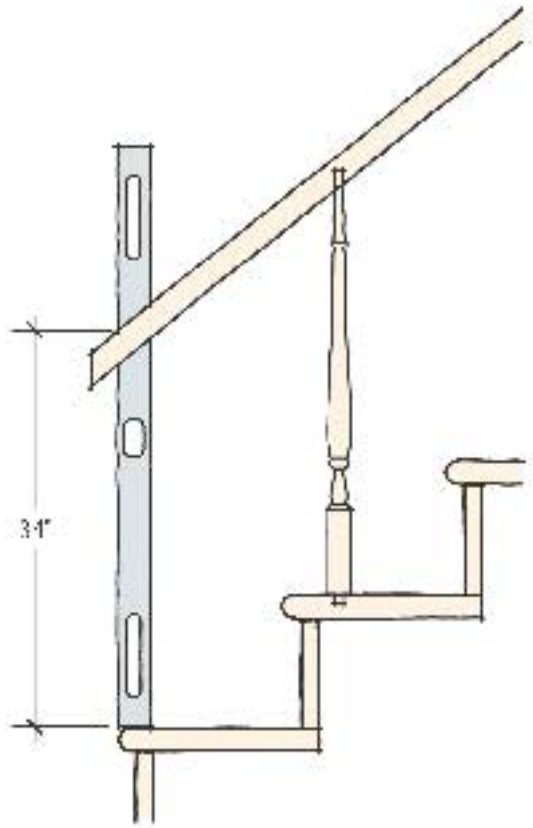

Figure 11. Railing height should be measured from the front and top of the step, straight up to the top of the railing. The author uses his level, which is marked for 34 inches, the code-prescribed rail height in his locality.

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Figure 12. The author fastens the top of the baluster with a 4d finish nail and the bottom with a 6d finish nail.

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Figure 13. The author marks his hole centers with dividers (left), drills the holes, and transfers the hole centers to a story pole (center), then transfers the same layout onto the underside of the rail (right).

pole to transfer the marks to the underside of the rail, and then drill the upper holes.

Finishing Touches

Once the balusters are in, all that's left is a few trim pieces. At the mid-landing, I install a couple of pieces of baseboard. I place the baseboard on two scraps of the actual flooring material to elevate it, so that the flooring contractor can slide his material under there later. Base cap molding goes on above the baseboard. I also apply base cap below the fascia around the upper landing, using 8d gun nails. Here, the base cap is flipped upside down (Figure 14).

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Figure 14. Using 8d nails, the author applies base cap molding around the stringers and landing baseboards. He uses the same material flipped upside down below the stringers on the open side of the stairs, and below the fascia around the open landing.

Cove molding covers the joint where the fascia butts up under the landing tread. Cove molding under the stair treads was already applied at the shop in the same way; but on site I still need to place a couple of final pieces of cove under the landing treads at the top of each run of stairs.

To finish up, I plug all the 3/8-inch countersunk screw holes with wood plugs and sand them flush.

*Stair builder **Paul Alves** is production coordinator at Cooper Stairworks in Somerset, Mass.*