Building Stairs with Stock Parts

by Bill McLearn

Part 1: Skirts, Treads, and Risers

Ed note: This is the first part of a two-part story. The second half, covering the balustrade, will appear next month.

I build all my stairs using stock parts. Over the past eight years I've built stairs using parts from four different companies. I now use only Morgan parts (Morgan Products, Oshkosh,Wisc.), because they are readily available and I've had good luck with them. From Morgan I buy the entire rail system — newels, balusters, and all the rail pieces — as well as the starting (bottom) step. I make the stringers and skirtboards myself from dimensional stock, and I buy most of the treads and risers from my local lumberyard.

Planning and Ordering

To order stair parts you must know the layout and dimensions of the stairs, and the style and finish scheme (paint versus stain) for both the stairs and balustrade. In this half of the article I'll deal only with ordering and installing the treads and risers and making the skirtboards.

Figuring rise, run, and number of stairs. In building any staircase, you must first know the dimensions of the space where the stairs will fit. From this you can determine the best layout. The stairway I describe here is an L, with one 90-degree turn halfway up the staircase — what's known as a "wide L" staircase. It's open to the foyer on the inside of the L, and enclosed by walls on the outside. This is a typical layout for a colonial with a large foyer.

The next thing you need to know is the total rise of the staircase — the distance floor-to-floor. In this house the floor-to-floor height is 110 1/4 inches.

Once you know the layout and the floor-to-floor height, you can figure out how many steps the staircase will need and the exact rise and run of each step. There are several formulas and guidelines for determining rise and run. The rule I use says that the width of the tread plus the height of the riser should equal between 17 and 18 inches. A second guideline I follow is that the most easily climbed stairway has a riser a little under 8 inches high.

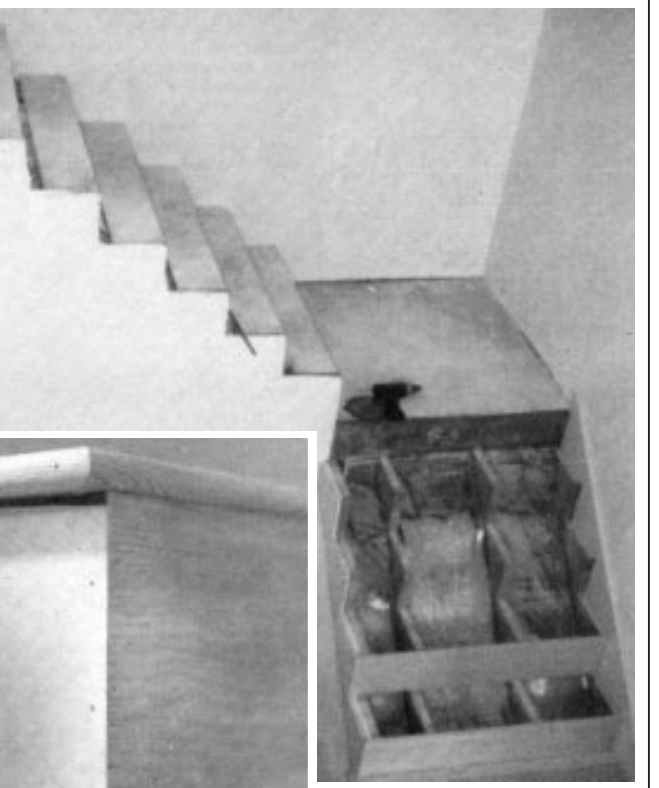
Because the code in my area requires a minimum 10-inch tread width, I generally use a run of 10 inches. To arrive at a rise between 7 and 8 inches, I divide the total rise (the difference between floors) by 8 inches, and then use the next highest number of risers. For instance, in this house, dividing the floor-to-floor height of 110 1/4 inches by 8 gets us 13.8, so I used 14 risers.

I then divide 110 1/4 by 14 to get the exact height of each riser: 7 7/8 inches. So for the staircase described here, the rise of each stair is 7 7/8 inches and the run is 10 inches. Rise-plus-run falls between 17 and 18 inches, and the rise of each step is slightly under 8 inches.

Since there is always one less tread than riser, this staircase has a total of 13 steps, including the landing: six up to the landing, the landing, and six more to the second floor.

Choosing the finish. It pays to know the finish plan early, since it dictates the choice of materials. Typically I use pine for surfaces to be painted and oak for any parts to be stained.

For this job, the owner and I decided to stain the rail, newels, and treads, and to paint the risers, balusters, skirts, and trim — a common finish scheme for traditional stairs.



This wide-L stair has two runs of six steps each, split by a landing. The exposed miter joints where the finish skirt meets the risers (photo inset) demand careful workmanship in laying out and cutting.

Ordering. With the above information in hand, you can order all the materials — structural and finish —for the staircase. I use 2x12s for the rough stringers, which I cut and hang during framing. As usual, I tack on temporary rough treads for my carpenters and subs to use, until the time comes to finish out the staircase.

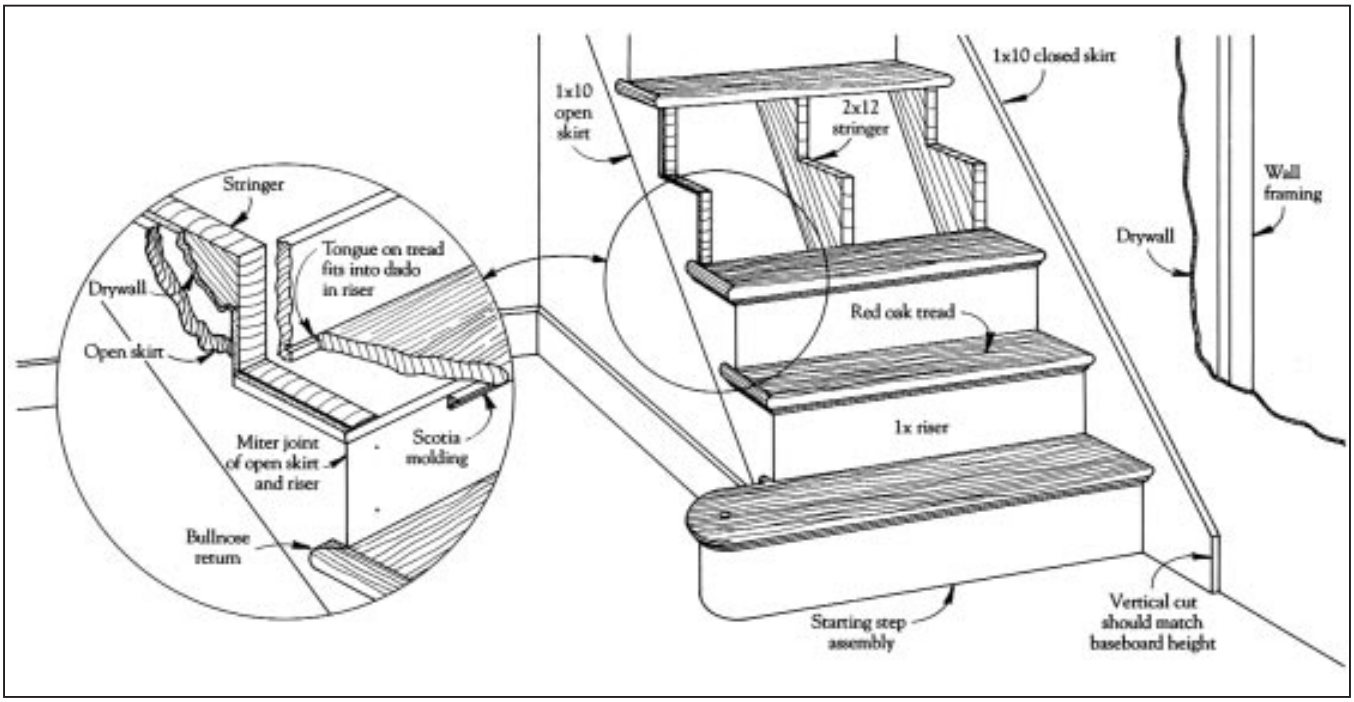
In the area where I work, south of Boston, I can usually get all the finish parts for a stairway in seven to ten days by ordering through a local lumber company. The lumberyard I use also stocks treads and risers in oak and yellow pine.

I use 1x select pine for the painted risers and skirts, and 4/4 oak for the treads, to match the finish floor. Both risers and treads should be ordered longer than the stair will be — say, 48-inch risers for a 42-inch stair. This gives you some room to scribe if necessary against the closed skirt, and a generous overhang on the open-skirt end to make your cuts to length.

I order the treads 11 3/4 inches deep. This allows for a 1 1/2-inch overhang in front and a 1/4-inch tongue at the back. The tongue fits into a dado routed into the face of the next riser. (This is explained under "Treads and Risers," below.) You can cut these dados and tongues on site with a router, but I purchase treads and risers pre-milled from my lumberyard.

I also order a bullnose return molding that I use to cover the end-grain of the treads. The bullnose return comes in strips that you cut to length with a miter saw. The strips come in various widths; I use 1 1/4-inch-wide.

The other stock molding I use is a 3/4-inch scotia, which I use to trim out beneath the overhang of the



Anatomy of a staircase. *Understanding the sequence of construction is important. After the rough stringers are in place, the author first installs the closed skirt, and then the open skirt with its carefully cut miters. Risers and treads follow, with the tread always installed after the riser immediately above it. Note that each riser, as well as the tread cut on the open skirt, sits about 1/16 inch lower than the bottom of the tread above; this ensures that the tread rests firmly on the stringers. The gap is covered with the scotia molding.*

tread, leaving a final overhang of 3/4 inch.

I get the rest of the parts I need from Morgan: newels, balusters, handrail, and, in this case, a starting step assembly. When you order parts from Morgan, the company sends you templates that help in positioning the more difficult parts, such as the bottom newel post and the surrounding balusters that support the volute — that spiral at the end of the rail. Morgan also supplies a "Stairway Manual," with helpful instructions on how to plan, lay out, and construct its stair kits.

Time to Work

I like to build my stairs in a lull that I schedule just before the painters come — stairbuilding is complex enough without distractions. With all the stair parts at hand and the subs out of the house, I start with the skirts, treads, and risers. The stringers are already installed. It usually takes me three or four days working with a helper to build this stairway, once the stringers are up.

Skirts. The closed skirt (the one against the wall) is the first finish piece to be fit. This can be either a *housed stringer*, with routed grooves for the treads and risers, or a *finish skirtboard*, against which the treads and risers are butted. I typically use a finish skirt, made from 1x10 select pine. If you back-cut the ends of the treads and risers slightly and anchor them well, the joints where they butt the skirt will stay tight.

When hanging the rough stringers, I purposely leave a heavy 3/4-inch space between the wallboard and the first stringer. This greatly simplifies cutting the closed skirt, since all you need to figure are the marks for the bottom horizontal cut and the vertical cuts at each end. I measure by making the horizontal cut at the bottom — cut at the same angle as the carriage stringer — and then slipping the skirt into place alongside the stringer to mark the vertical cuts in place. The vertical cuts at either end must match the height of the surrounding baseboard. If a one-piece, 4-inch baseboard is used, for instance, the vertical cut should be 4 inches tall.

With the skirt cut, I slide it again into the 3/4-inch space I left between the stringer and wallboard and tack it into place. I don't drive any nails flush or set them until the entire stairway is done — you may need to move something later on.

Outside skirt. This outside or "open" skirt is another piece of 1x10 select pine. It pretty much follows the profile of the stringer, except that there's a vertical cut at the bottom where it meets the starting step. Also, the rise cuts are miters.

To mark the cuts for the outside skirt you trace the profile of the stringer. It's easier to do this before you hang the stringer. But if the stringer's already in place, you can do it by tacking the skirt against the stringer. Either way you need to make the riser lines extremely accurate. These cuts will meet the risers in a 45-degree mitered joint that will be exposed.

The riser marks that you transfer from the stringer will mark the short, inside edge of the mitered cut. You need to account for this when tracing the stringer against the skirt by setting the stringer's sawtooth edges (the points where the riser and tread supports meet) along a line that is at least an inch back from the top edge of the 1x10. That will leave enough room for the mitered cut to extend out to its front edge.

If the skirt is on the left-hand side of the stairway (going up), as it is in this case, you'll have to make the mitered cuts either by hand, or with a power saw that swings to the left, such as a worm-drive saw or a Porter-Cable "Saw-Boss," the only sidewinder I've found that swings to the left (see Figure 1). In any event, you will have to finish these cuts with a hand saw. Use finish blades all around. Leaving an extra 1/16-inch on these riser cuts will help make the joints tight.

I can usually get all the finish parts for a stairway in seven to ten days

Remove about 1/16-inch extra from the tread cut so that the treads will rest on the stringers rather than on the finish skirt; the gap will be covered by scotia molding. With all the cuts made, tack the skirt in place with 8d finish nails.

The Starting Step

In this stairway, I used a bullnose starting step with a rounded end, Morgan part M-779V. The assembly includes a riser and tread, with the tread already bored for the starting newel. The starting step comes ready to install, but you must cut the riser and tread to fit the particular rise and width of your stairway.

I add 3/4 inch to the riser dimension to account for the finish floor, then cut the rise down to size — in this case, 8 5/8 inches from the bottom of the riser to the top of the tread. For this cut I use a sabre saw, since it gives me better control when cutting the curved end.

To cut to length, I place the riser section of the starting step on the floor, butt it in place against the closed stringer, then measure the gap between the return curve and the open skirt. Then I pull the step out and cut this distance off the closed skirt side of both riser and tread.

Before I anchor the starting step, I have to install the riser of the second step, because the starting step butts against it. This involves scribing and cutting a butt cut at the closed stringer end and a 45-degree miter where the riser meets the open skirt. (Cutting and

Figure 1. *Here the author carefully cuts the open skirt using a Porter-Cable Saw-Boss, which tilts left like a worm-drive saw.*

Figure 2. *A tongue on the tread fits into a dado in the face of the riser, making for a clean, tight joint.*

Figure 3. *To make the joint between riser and open skirt as tight as possible, the author scribes the riser cut directly off the skirtboard; the line is then transferred to the front of the riser for cutting.*

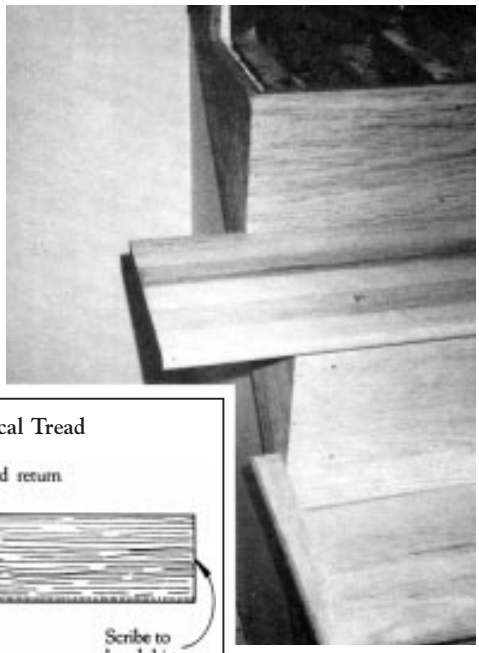


Figure 4. *The upper tread is set snugly into place to mark the cut for the bullnose return. The lower tread shows the finished bullnose return (detail inset).*

installing risers is described in detail below.)

With the first regular riser in place, I set the starting step against it and recheck the fit. Then I mark the center of the newel post hole onto the subfloor, pull the starting step aside, and drive a finish nail through the mark I made. I'll later pull this nail through from the basement, then drive a screw up from below to anchor the starting newel.

structural adhesive (Liquid Nails) to the stringers, predrill for 8d finish nails, and tack the step in, first double-checking to make sure the newel hole is positioned correctly.

Treads and Risers

I've found treads and risers fit best when there's a dado in the face of the riser near the bottom and a corresponding tongue on the tread (see Figure 2); the tread sort of pivots into the riser for a snug fit. The one riser that doesn't get a dado is the first riser above the starting step; the factory edge of the starting step simply butts up against it.

Installing risers. After the starting step is in place I install the riser of the third step. I cut the closed-skirt end first, using a slight backcut, then butt the riser against the skirt. If the fit is good at the closed-skirt end, I mark the miter to be cut at the other end by tracing a line where it meets the open skirt (see Figure 3). I transfer this line to the face of the riser, then cut the 45-degree miter with a circular saw.

After double-checking the fit, I apply some Liquid Nails to the stringers, then tack the riser in place. I use 4d finish nails at the miter, nailing in both directions, and 6d or 8d through the riser's face — two nails at each stringer.

Installing treads. Now comes the tread. Again, I test-fit the end against the closed skirtboard, scribe if necessary, and make a slight backcut, just as with the riser. Then I use a chisel or knife to cut a notch into the open skirt's mitered edge where the riser's dado meets it — essentially continuing the dado through the skirt so that the tongue on the tread can fit in properly. When doing this be careful not to crack or break through the open skirt; a small break will be covered by the tread's bullnose return, but a major crack will announce itself.

When I'm satisfied with the fit at the closed skirt end, I'm ready to cut the tread to length. To mark the cut for the bullnose return, I put the tread snugly in place (see Figure 4), then mark on the back edge the point where it touches the outside edge of the skirtboard. Then I pull the tread out and square a line from that point straight out to the tread's leading edge. Finally, I come back on that line 1¼ inch (the width of the bullnose return) from the front edge and draw a 45-degree line out to the leading edge to match the miter on the bullnose return. That 45-degree line and the squared line extending back from it mark the cut.

I put the tread back in place and double-check the location of those lines. Then I cut them, using a table saw for the long cut and a hand or jig saw for the miter cut. It's easier to cut this 45-degree miter if you've left the tread a little long, so that the saw bites the wood on the front edge, not at a corner.

When the tread is cut I apply Liquid Nails to each stringer and set it in place. Butting it tightly against the closed skirt, I predrill and nail it down with 8d finish nails — two per stringer.

Follow with risers and treads until you reach the landing or the top of the stairs.

Installing returns and scotia. Cut a closed 45-degree miter at one end of a short section of the bullnose return. With the return in place, mark the other end at the exposed corner where the open stringer meets the riser of the next step. Make an opposite 45-degree cut. Finally, cut a triangular mitered piece 1¼ inch long to fill the space behind the rear miter. Pre-drill the return, glue, and nail with 8d finish. Attach the end piece with glue only, as it's too small to nail — again I use Liquid Nails.

I cover the joints at the underside of each tread — both face and end return — with ¾-inch scotia. You can miter the return or cope it. I prefer a miter, because it's a cinch to cut with a power miter box.

The Landing

The landing, though technically a step, is essentially a section of floor surrounded with baseboard. I use a ¾ x 4½-inch piece of oak bullnose at the leading edge, and fill in behind later with oak flooring. Remember to leave a 1½-inch overhang for the scotia. The second flight up is a repeat of the first flight. ■

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Now I place the starting step back into place, making sure the newel hole lines up with the finish nail in the subfloor. I usually do a test-fit at this time by pushing the starting newel into place. I often find I have to sand or rasp either the hole or the newel to get the newel in; don't overdo it, though, or you'll lose the tight fit you want.

After this last check, I'm ready to nail the starting step in place: I apply

Bill McLearn has been a contractor in Hull, Mass., for twenty years. He started building stairs from stock parts eight years ago.