

BUILDING Squeak-Free Stairs



Over 25 years ago, I noticed two things that I've capitalized on ever since: I liked the creative challenge of building staircases, and others shied away from the task. With hundreds of completed jobs behind me, I've long since developed my own approach to stair building and assembly. Typically, I act as a subcontractor, installing finished stairs for a few quality-oriented builders. In this article, I'll explain my method of installing skirt boards, treads, and risers over a rough stringer assembly.

by Ken Reis

The Perfect Stringer

Typically, the builder has already installed the stringers, which have served as the work stair under temporary, rough treads during framing. I don't think I've ever found a perfect set of stringers waiting for me.

Interlocking joinery and construction adhesive provide tight seams and squeak-free treads

Even if the builder has selected straight, flat 2x12 stock and taken pains to cut the stringers accurately, nature tends to take over. As the lumber dries and shrinks, the cutouts distort out of square, resulting in an inaccurate tread profile. Because of that phenomenon, I'm careful to work from the back of the cutout, leveling the finish tread forward and supporting its leading edge on the riser.

The long stair flights found in many of today's high-ceilinged homes call for especially long, strong, and stable stringer stock. Engineered LVL (laminated veneer lumber) comes in especially handy in this application (see Figure 1). Because of its 1% to 3% production moisture content, shrinkage isn't a problem. Unfortunately, it's not a material many builders use for their average stair. TrusJoist markets a 1³/₄-inch-thick Timberstrand LSL (laminated strand lumber) board specifically for stair stringer production.

To allow both drywall and the finish skirtboard to drop in behind the tread cutouts, the rough stringers should be indirectly bolted to the wall framing, held off by 2-by blocking. The alternative, cutting the skirt board to fit around the tread and riser profile, is far more trouble than it's worth because shrinking, cupping, and breakage are all but inevitable. To make sure the stringers are firmly connected to the wall, I drive in several 6-inch RSS (rugged structural screw) screws, made to replace lag bolts (GRK Canada Ltd., Thunder Bay, Ont.; 800/263-0463, www.grkfasteners.com). Their sharp threads and thin shanks eliminate the need to predrill and help prevent splitting.

Headroom height is a problem I encounter from time to time (Figure 2, next page). It may be a bit tricky to calculate all the floor-to-ceiling relationships during the framing stage, and the discrepancy may be less than an inch, but "sympathy" isn't listed in the building inspector's handbook. If the finished tread thickness will compromise the minimum allowable vertical distance between the stair nosing and the



Figure 1. Although rough stringers are seldom perfect, LVL stringers (inset) are far less prone to shrinkage distortion and are useful for spanning exceptionally long stair flights.



ceiling, I can't proceed until the framing's been corrected.

Preparing the Stock

My first order of business is to examine and rough-cut the tread and riser stock. I cut the lengths about 1 inch longer than the final dimensions and rip the riser stock 1/4 inch wider than the prescribed height for that stair. This is the time to check quantities, make sure everything I need is on hand, and procure any special-order materials. I prefer to acclimate the stock to site conditions for at least one week before I begin installation.

The most common stair I work on is open on one side and closed on the other. I cut the skirts for both sides to length, scribing the ends to fit at the bottom and top of the flight, or between floor and ceiling. I tack the skirts in place temporarily in order to mark the tread and riser locations and the baseboard miters.

Simple joinery. The best way to ensure that no gap opens between tread and riser is to use an interlocking joint. On my job-site table saw, I rabbet a 3/8-inch-square tongue onto the back edge of the tread stock and plow a matching groove near the bottom

Stairway Headroom Clearance

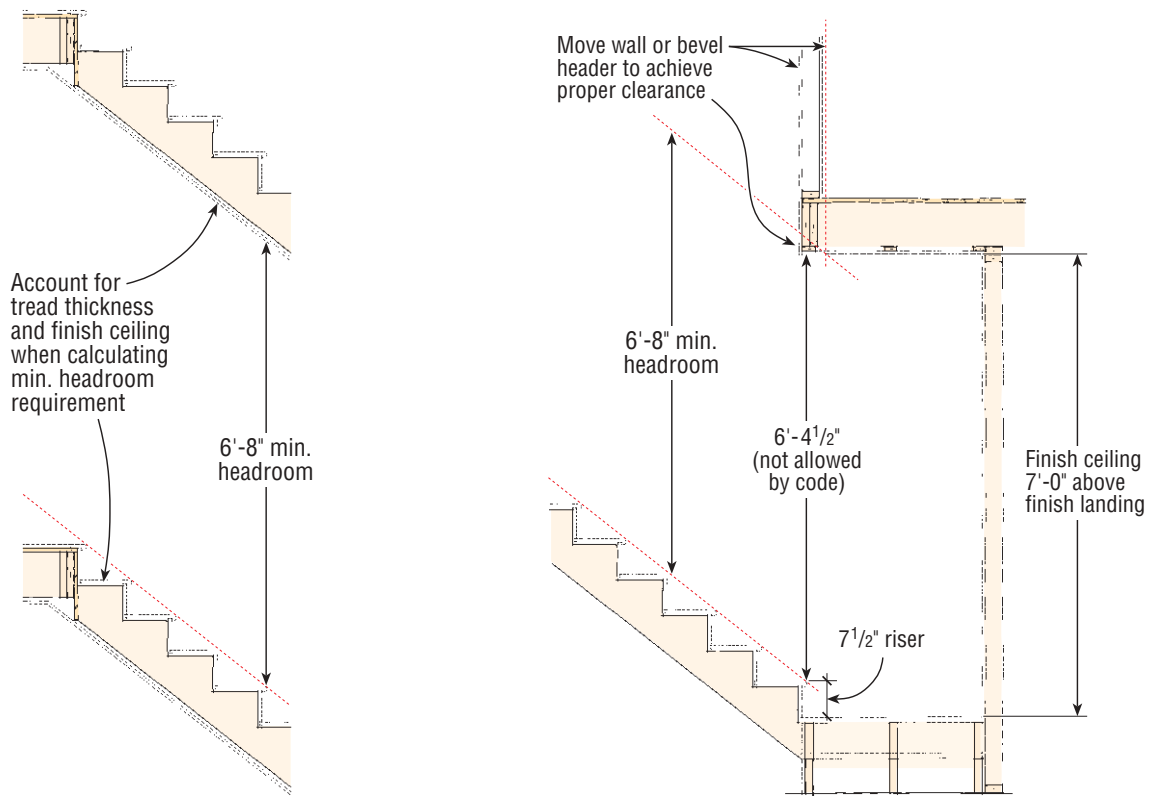


Figure 2. Factor in the finished tread thickness, as well as the ceiling build-down, during rough framing in order to maintain a code-minimum 6-foot-8-inch stairway headroom clearance, measured in a vertical line from the tread nosing.

edge of the risers. The underside of the treads also gets a shallow, 1/4-inch dado, about 1 1/2 inches back from the nosing, to house the upper edge of the riser board. I add the depth of this dado to the height of the riser boards.

For each staircase, I cut patterns from the end of a tread and riser to mark all the tread and riser locations on the closed skirtboard (Figure 3). The inside stringer is routed to house the treads and risers, while the open skirtboard is cut out and mitered back to the risers. I use a site-made gauge — a notched piece of scrap riser stock — to mark the cutout locations on the



Figure 3. Interlocking joinery is key to a tight, quiet stair. Accurate dimensioning of the components ensures that the final assembly is plumb and square. Cutoffs from a tread and riser serve as marking gauges for layout.

outside stringer. The gauge straddles the edge of the skirt, held tight against the rough stringer to mimic the riser board. I plumb the gauge with a level and scribe the outside leg onto the face of the skirtboard (Figure 4). This gives me an accurate cut line for the long point of the miter. I then hold my level to the bottom leg of the gauge to trace the horizontal cut line on the outside face of the skirt board.

Depending on the quality of the stock, I'll sometimes use the actual treads and risers, instead of patterns, to mark the inside skirt board. Certain wood species — reclaimed longleaf yellow pine, for example — tend to cup a bit, and I don't like to fight the stock into place. In such cases, I'll individually trace each piece onto the skirt and number it in sequence. If the tread or riser stock is more than a little cupped, I'll cut a couple of shallow, lengthwise kerfs in the backside to help it "relax."

With both skirtboards marked, I begin the process of cutting and routing. I use a Rockwell Sawbuck, a sliding compound saw with a 16-inch cross-cutting capacity, to cut the mitered outside skirt, carefully drawing the blade along the cut line to the intersecting tread mark (Figure 5). I



Figure 4. A disposable site-made gauge is used to mark the open skirtboard for mitered riser returns. A level line pulled from the bottom of the gauge marks the tread cutout.

turn the blade square to the table for the tread cuts and finish the cutout with a hand saw.

The inside skirtboard is dadoed, about $\frac{1}{4}$ inch deep, to house the treads and risers. I use a $\frac{3}{4}$ - or 1-inch-diameter Forstner bit and a hand-held drill to cut the treads' bullnose profile

first. To plow the recess, I use an 8-inch adjustable wobble-dado blade in my radial-arm saw (Figure 6, next page). The wobble blade does a reasonably clean job of plowing, but the grain of some wood species is prone to tear-out, so I check the cut's quality on scrap lumber. If there's tear-out, I'll



Figure 5. The author uses a Sawbuck to make clean, accurate mitered skirtboard cutouts. The inside corners are completed with a hand saw.



Figure 6. A Forstner drill bit outlines the nosing profile on the housed stringer. The housings are completed with a wobble-dado blade in a radial-arm saw and cleaned up with a straight bit in a hand-held router.

outline the cut first with a regular carbide blade in the radial-arm saw. After dadoing, a straight bit in a router cleans up minor irregularities.

Dry Assembly

Every stage of stair assembly involves fitting, dry assembly, tacking, and disassembly. If I have to trace the full treads and risers, rather than rely on cutoff patterns, I trace and label all the risers first, cut the riser housings in the skirtboard, and tack the risers into place. Then I trace the treads onto the skirt, one at a time, labeling their place in the sequence. Everything gets disassembled again, and I cut the tread housings in the skirtboard. “Three steps forward and two steps back” must have been coined by a stair builder.

With the inside and outside skirtboards tacked into place, I tack all the risers in, checking the mitered and the housed ends for proper fit. If an over-long riser prevents the miter on the next one up from closing, I can go back and trim it. If a wobble in the skirtboard keeps the joint from closing up, I can draw it in with a 2 1/2-inch drywall screw through the rough

stringer. If a tongue doesn't slip easily into the dado, I shave it down. Every piece in the final assembly gets a bead of PL-400 construction adhesive (OSI Sealants, Mentor, Ohio; 800/321-3578, www.osisealants.com) but not until I'm sure everything fits properly.

Rather than completely remove the risers again, I just tap them forward on the nails; run a bead of adhesive on each stringer, the skirtboard housing, and the end miters; and nail the risers home, working from the bottom up. The dadoed skirtboard housing isn't necessarily snug fitting, but its front line is accurate. To make sure the riser follows that line, I can drive a screw into the pocket as a shim, just behind the riser, to force it forward.

First things last. If the underside of the stairway has a drywall finish, I don't install the bottom, starting riser until the final, topmost tread is nailed down. It cost me a good chisel and a tape measure, dropped inside a glued-up stair assembly, before I figured that one out.

After the risers are fitted and nailed, I install the treads, starting at the bottom. I connect each tread at the back edge



Figure 7. When there's no room for a screwgun, the author uses a hand-driven, right-angle ratcheting screwdriver to draw the tread tight to the next riser up.



Figure 8. By piloting the connecting screw at the lower edge of the riser dado, the author takes advantage of the screw's displacement to force the rabbeted tread upward in the groove as it's drawn in, tightly closing the joint. A generous bead of construction adhesive permanently fills the gaps and eliminates movement.

Figure 9. Tread end caps look better than a simple end-grain round-over. They're glued and nailed on after the tread is installed.




through the bottom edge of the next riser up. When space is too tight inside the cavity to point a screwgun at the back of the riser, I use a right-angle, ratcheting screwdriver. I've had it for many years, and it seems tailor-made for the job (Figure 7, previous page).

I predrill the risers for 1¹/₄-inch dry-wall screws, using the bottom edge of the dado groove to guide the drill bit. In this location, the screws force the tread slightly upward in the dado, making the joint tight (Figure 8). A bead of gap-filling construction adhesive in the dados and on each stringer makes the connection permanent and squeak free.

I nail the treads with countersunk 10d or 12d finish nails, after predrilling

to prevent splitting. Colored wood dough conceals the heads. The gap-filling ability of the construction adhesive ensures that the nails won't be worked back up by a springy tread.

End caps. Although tread stock can be purchased with its left or right end rounded over, I prefer to install mitered end caps. Especially when stained, end grain finishes darker than the body of the tread and looks a little crude. Because there are likely to be small differences in the stair width at each step, I mark and label each tread in place for end-capping. I trim and miter all the treads after marking but don't install the end caps until after the treads are installed (Figure 9).

Scotia molding usually finishes the underside of the nosing, adding support to the overhang. And typically, risers are painted and the tread is finished with a clear urethane. Oak scotia under an oak tread gives the stair a "heftier" look, while painted scotia blends with the riser. I use construction adhesive and 4d finish nails to secure the molding. 

Ken Reis is a freelance carpenter and contractor sales agent at Mid Cape Home Centers' Wellfleet branch. He lives in Brewster, Mass.