New Winders for an Old House

Don't even think about tackling these **space-saving stairs** without a full-scale drawing and a pair of dividers

BY ANDY ENGEL

It was hard to wrap my head around all the complexities of these stairs. Not only were they winders with all their attendant geometry, but the house itself hadn't been plumb, level, straight, or square since the Lincoln administration. And there was some personal stress. Kevin, the homeowner, is my former boss and a capable carpenter himself. You'd probably expect this because he's the editor of *Fine Homebuilding*.

Unlike spiral or curved stairs, winders have straight stringers and turn corners with a series of wedge-shaped treads, usually with a run of common stairs above and/or below them. Instead of turning a corner with a landing, winders squeeze several risers and treads into the same space, thereby fitting into a smaller overall footprint.

Measure total rise at the walk line

Measuring for winders is no different from measuring for any stair that turns a corner. You need to know the distance between the upper landing and the wall opposite, and the amount of room you have to extend the lower end of the stair. This is the total available run. You also need to know the total rise between floors. Because neither floor was level in this house, I measured the overall rise at the walk line—defined by code as being 12 in. from the narrow ends of the treads—and I oversized the top and bottom risers to allow for scribing later.

These stairs were to have housed stringers, meaning the treads and risers fit into mortises routed in the sides of the stringers (*FHB* #114 and online at FineHomebuilding.com). The mortises are angled to accept wedges (or shims) below the treads and behind the risers, which, combined with glue, tighten and bond the joints. I used my regular plywood stair jig to rout the common stringers (sidebar p. 60), but I had to make a special jig for the winder treads (more on this later).

Start with a full-scale plan drawing

Drawing a plan view of the winders full size on a couple of sheets of plywood helps me to figure out the sizes and the angles of the treads and risers, and the pitch of the stringers (drawing p. 58). I draw both

Drawing facing page: Rodney Diaz. Inset photo, facing page: Kevin Ireton.

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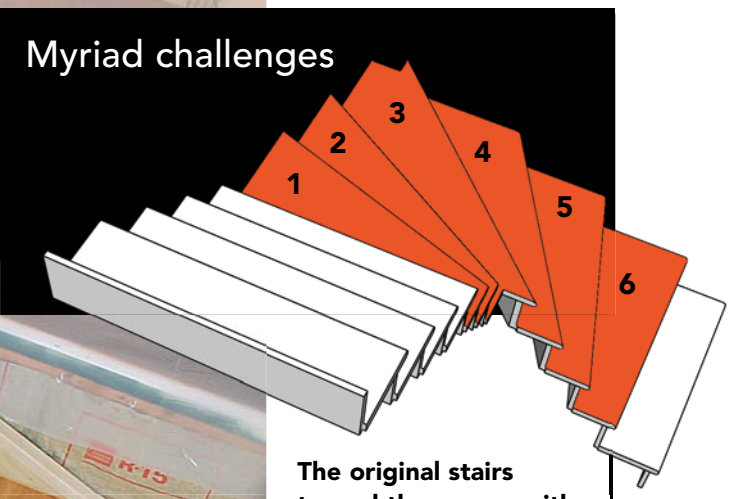

The original stairs turned the corner with three winding steps, but modern codes required six winders for the new stair, which also had to fit between leaning posts and sagging beams. Notice, too, how the bottom riser had to be scribed to the uneven floor (photo below). To see more finished photos and learn about the railing installation, look for the Magazine Extras section on our home page at **FineHomebuilding.com**.

online
SLIDE SHOW

edges of all stringers, as well as a dotted line on each stringer representing the ⅜-in. depth of the tread mortise. The total run of the lower flight isn't known yet, so I extend the lower stringer lines a little farther than I think is needed.

I start my layout at the top, drawing in the common treads first. For housed stringers, the unit-run layout lines represent the fronts of the risers; my unit run on these stairs was 9 in., which was the code minimum in Connecticut. I stop when I'm a foot or so away from the inside corner. Then I draw the walk line, using my dividers (set at 12 in.) to swing an arc around the corner.

Moving to the lower flight, I draw a line square to the stringers representing the back of the top common tread. The back of this tread is the same distance from the corner as the front of the upper flight's first common tread. These two lines are the beginning and end of the winders.

Most codes now require the narrow end of winder treads to be a minimum of 6 in. For housed-stringer stairs, that dimension is mea-

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MAKE FULL-SCALE PLANS

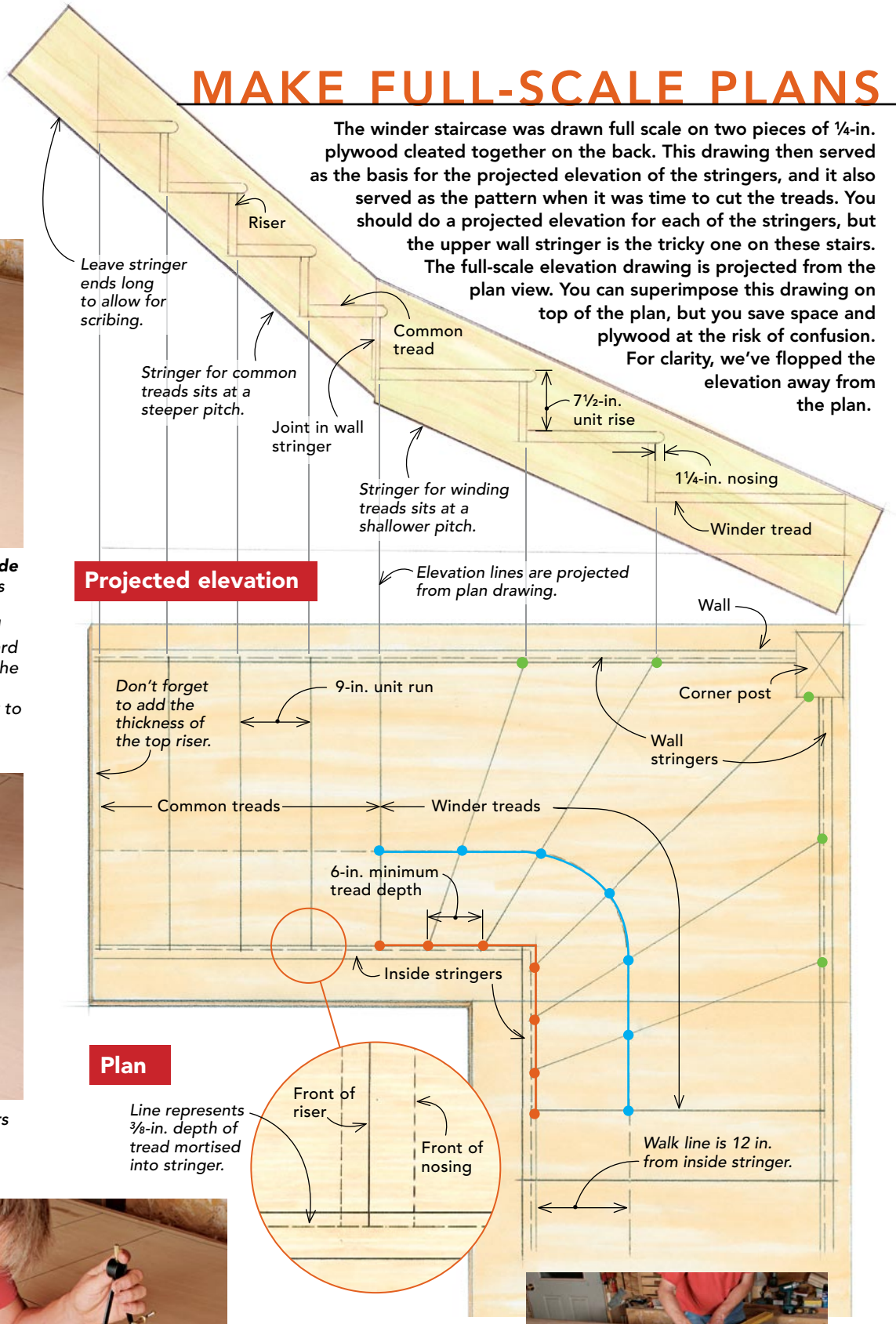
The winder staircase was drawn full scale on two pieces of ¼-in. plywood cleated together on the back. This drawing then served as the basis for the projected elevation of the stringers, and it also served as the pattern when it was time to cut the treads. You should do a projected elevation for each of the stringers, but the upper wall stringer is the tricky one on these stairs. The full-scale elevation drawing is projected from the plan view. You can superimpose this drawing on top of the plan, but you save space and plywood at the risk of confusion. For clarity, we've flopped the elevation away from the plan.

STEPPING OFF THE WINDERS TAKES SOME TRIAL AND ERROR

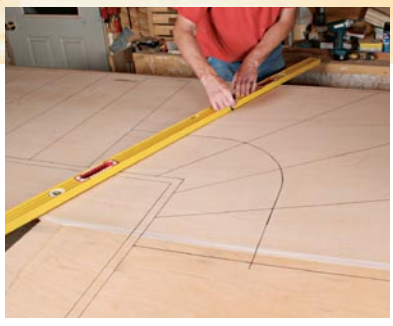
● ***With the dividers set at the code minimum of 6 in.****, the narrow ends of the winding treads are stepped off from the lowest common tread of the upper part of the stair toward the uppermost common tread of the lower part of the stair. You might have to adjust the dividers slightly to come out right.*

● ***At the corner,*** *swing the dividers to the other stringer and continue stepping off.*

● ***Next, set the dividers to the unit run (9 in. in this case).*** *Start at the uppermost common tread, and begin stepping off the winders along the walk line. Odds are that you'll have to adjust the dividers again to get the spacing right.*



● ***Connect the dots using a straightedge.*** *Extend the line all the way between the mortise depth lines on both stringers. These lines represent the front of the risers and the back of the treads. (You draw the tread nosing later.)*



Drawings this page, facing page: Dan Thornton

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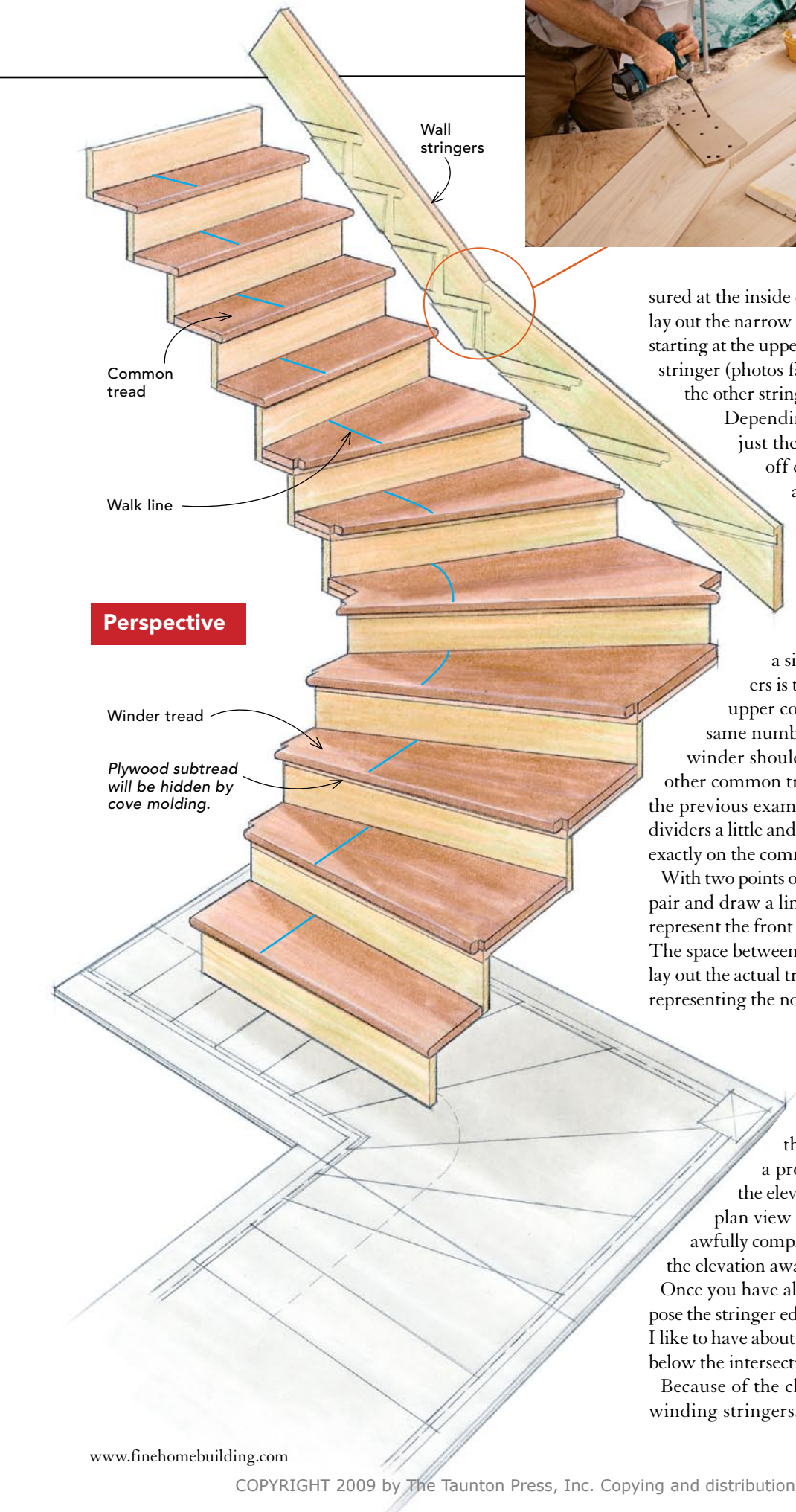

To accommodate the shallower pitch of the winding treads, *the upper wall stringer was made in two pieces. The joint was reinforced with biscuits and a plywood gusset on the back side, and was screwed to the house framing at installation.*

sured at the inside edge of the stringer (not counting the nosing). To lay out the narrow ends of the winders, I set my dividers to 6 in., and starting at the upper flight, I step off the inner-tread widths along the stringer (photos facing page). At the corner, I pivot the dividers to the other stringer and step off an equal number of winders.

Depending on the circumstances, you might have to adjust the dividers until you get the dimension that steps off evenly. If you end up with a ridiculous size that approaches the same size as the common treads, you should rethink things. Try increasing the size of the common treads to decrease the overall run of the winding section. Play around until you get a compromise that brings the winders in at 6 in. or a bit more, and mark those spots on the plywood.

Laying out the treads along the walk line follows a similar procedure. The starting width of the dividers is the unit run of the common treads. Starting at the upper common tread, I step off along the walk line. The same number of steps as taken along the narrow end of the winder should bring the dividers close to but not beyond the other common tread. If I end up beyond, I refigure the stair as in the previous example. Most likely, though, I just need to open the dividers a little and step it off a couple of times until the dividers land exactly on the common tread.

With two points of each tread marked, I align a straightedge on each pair and draw a line that extends between the stringers. These lines represent the front of the riser above and the back of the tread below. The space between the lines is the unit run of the winder treads. To lay out the actual treads later, you need to draw lines parallel to these representing the nosing overhang.

Lay out the stringers

The full-scale plan drawing has all the unit runs on it, so all you need to do to draw the stringer in elevation is to project the riser heights from the existing tread layout, producing what's called a projected elevation. (Note: In reality, when I drew the elevation for this stair, I superimposed it on top of the plan view to save plywood and space. But that results in an awfully complicated drawing. To illustrate here, we've projected the elevation away from the plan for clarity.)

Once you have all the rise and run lines drawn, you can superimpose the stringer edges and calculate what size stock you need to buy. I like to have about 2 in. of stringer above the nosing and about 1½ in. below the intersection of tread and riser.

Because of the change in pitch between common stringers and winding stringers, you might not be able to fit all the treads and

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MAKING A MORTISING JIG FOR COMMON TREADS AND RISERS

The jig has to be 1 in. thick, so I glued together two layers of void-free ½-in. plywood. I began the layout by drawing a right angle, which represents the faces of the treads and risers.

Wedges are 10 in. long *and are tapered at 4°. With the miter saw at 2° and working with the grain, I trim the edge of some 1x scrap, flip the board end for end, and cut again, eyeballing the narrow end at about ⅛ in. thick.*

I continue the layout *by holding the appropriate stock (tread or riser) and a wedge against the initial right angle, and drawing a pencil line that represents the back (or bottom) of the mortise. I add the tread nosing, letting it overhang the riser by 1¼ in.*

To guarantee straight cuts, I clamp down the jig and use a guide. *I start the cut with the saw's depth control unlocked, the sole flat on the jig, and its edge tight to the guide. I lower the saw's motor and blade to their full depth and make the cut. I don't overcut the corners, but instead finish them with a jigsaw.*

I extend the riser and tread cutouts *about 3 in. to 4 in. longer than the actual risers and treads will be. Making the jig larger than necessary for the current stair means that it can be used for other sets of stairs as well.*

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ROUTING FOR WINDERS REQUIRES A SPECIAL JIG

The long-tread jig for the winders is approximately 30 in. to accommodate maximum tread depths of about 2 ft. The cutout is extrawide because of the plywood subtread. Note that there is no cutout for routing riser mortises.

With the long-tread jig clamped to the stringer, *I cut mortises for the winder treads in a clockwise direction with a plunge router and a pattern-routing bit.*

Subtreads support the winders. *The lower corner of the mortise should be squared off with a chisel so that the subtread can align with the riser. I screwed the plywood subtreads to the finished treads through routed slots that allow movement.*

risers for a flight of stairs on a single piece of stock. You usually can get away with using wider stock for the inside stringers, but the wall stringers need to be made in two pieces. Use the projected elevations to figure out where to join the two stringers. On this stair, I used 5/4 poplar in various widths for the stringers, the widest being 13 in.

Subtreads add support

Winder treads are deep, approaching 2 ft. at the wall side. And these treads are hickory, which is one of the most active woods available. If the treads weren't allowed some way to move, they probably would have cracked severely during the first heating season.

To allow for movement, I used a ¾-in. plywood subtread below the hickory. Plywood doesn't move much, so it was safe to glue and screw these subtreads to the stringers and the risers. In the subtreads, I routed slots running perpendicular to the grain direction of the tread and drove screws to keep the two together while allowing the hickory tread to move. Rosin paper separates the two to prevent squeaks. Glue and screws attach the risers to the back of the tread and subtread, the subtread to the riser below, and the wedge to the subtread and the stringer. No glue is used between the tread and the stringer, so the tread can move as needed, sliding along the plywood subtread.

The mortises in the stringers for the winding treads stop at the riser faces, and the tread nosings are notched to fit against the face of the stringer while allowing movement. This stair is in its third heating season with no cracks.

Use a jig to rout the stringers

Like my standard stair jig, the long-tread jig is made from 1-in.-thick plywood (photo above left). The long-tread jig is about 30 in. long and can accommodate maximum tread depths of about 2 ft. The cutout

Old timbers complicated things. *The upper wall stringer had to be scribed to fit between a post at the bottom and a beam at the top, then slid over the corner winder, which was already in place.*

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New ways combined with the old. *Each winder, with subtread attached, was slid into the mortises and locked in place with a wedge slathered generously with glue. At the front of the winders (top inset), the nosing was notched rather than housed to simplify construction. Underneath (bottom inset), pocket screws drew the treads tight to the risers.*

for the nosing is the thickness of the tread, and it overhangs 1¼ in., as on the standard jig. Because of the angle at which it hits the stringer, the nosing of the tread is longer than the mortise. This feature allows for notching the nosing to hide seasonal movement. You'll notice that there's no cutout for routing a riser. Instead, where the riser would meet the tread, the cutout is deepened by ¾ in. to allow for the plywood subtread. The risers under the winders are butted against the stringers to simplify the construction of the stairs.

At the back end, the cutout is made to the combined depth of the tread, the ¾-in. plywood, and an additional 1 in. for the thick end of the wedge. I make these wedges on a tablesaw.

To rout winder treads, I clamp the jig on the stringer so that its top aligns with the tread layout and the notch for the subtread lines up on the riser line. Then I rout in a clockwise direction. The front corner of the mortise requires chiseling for the subtread.

Assemble the stairs in place

Because their stringers ascend at different pitches, winders are astoundingly unwieldy as a unit. It's usually easiest to build them in place, and was particularly so in this case because of a structural post in the corner where the stringers would meet.

I scribed the first wall-side stringer to fit between two timber-frame posts and the bottom riser to fit the unlevel floor. Then I was able to assemble the bottom section—stringers, treads, and risers for the first four steps—on the floor next to the opening. I rolled it into place, checked for level, and screwed it to the wall. The inner stringer was propped up with a 2x4.

In most cases, the second-floor framing would not allow me to install the uppermost tread and riser if the stringers were installed first, so the upper stringers are generally installed as a unit with those two pieces in place. However, the second-floor framing in this old house is thin enough to allow access, so that was one problem I avoided. After joining the two upper stringers with a gusset, I was able simply to slide the upper stringers onto the corner tread, which was already installed.

Each riser in the winding section is a custom fit. I used pinch sticks to measure the distance between the stringers. The angles were measured with a bevel square, and the risers were then cut to a specific fit. Installed, the risers are pocket-screwed to the treads above and to the stringers. □

Andy Engel is the editor of *Professional Deck Builder* (and he's also a former editor at *Fine Homebuilding*). He lives in Roxbury, Conn. This article was adapted from his book *Building Stairs* (The Taunton Press, 2007). Photos by Patricia Steed, except where noted.

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