Building an L-Shaped Stair

Basic construction techniques for a stair with a three-step winder

by Larry Haun

Thirty-five years ago, orange blossoms scented the clear southern California air, streetcars hadn't yet surrendered to freeways, and the once-arid San Fernando Valley just north of Los Angeles was about to be transformed into suburbia by armies of construction workers. As the demand for housing increased almost daily, carpenters developed new techniques to keep up with demand.

A project I worked on back then was a 60-unit apartment house. Each unit had its own L-shaped stairway to the second floor, and each stairway had a three-step winder in it (a winder uses a series of wedge-shaped steps to make a stairway turn 90°). Not knowing how to construct a winder, I relied on my carpentry books for information. Using that information on the job the next day, my partner and I cut and built one set of stairs, but the winders alone took us more than five hours. Now, faster certainly does not always mean better, but that was simply too long. So we set out to find a winder technique that would combine speed with the quality of traditional carpentry techniques. The method we now use is quite simple and results in a stair strong enough to withstand the rigors of long service.

Traditional winder construction methods apply treads and risers to short stringers. Production methods offer a quicker approach.

Merit and demerit—An advantage of winders in a stair is that they shorten the total run, thereby leaving more space at the top or bottom of the stairs (drawing facing page). This is particularly helpful in small homes with limited floor space. The majority of winders I've seen are carpeted later on, but I have also seen many winders covered with hardwoods, even tiles, that look quite beautiful.

Whatever the surface, however, a stair with winders is not without danger. The fact that the width of each tread in a winder varies can present a hazard, unless you take care to step where there's enough tread width to support you. Building codes regulate the shape of treads in winders, though the codes vary from state to state. Some allow a winder to come to a point on one end of the tread. More often, however, codes require the tread be 6 in. wide at the narrow end, or have a 9-in. to 10-in. wide tread at the "line of travel," which is the path a person would likely follow when ascending or descending the stairs (drawing facing page). The line of travel is generally 12 in. to 16 in. away from the narrowest portion of the stairs.

Any stair should feature properly sized and secured handrails, but good handrails are particularly important on stairs with winders (for more information on proper handrail design, see "Design Guidelines for Safe Stairs," *FHB* #65, pp. 66-68).

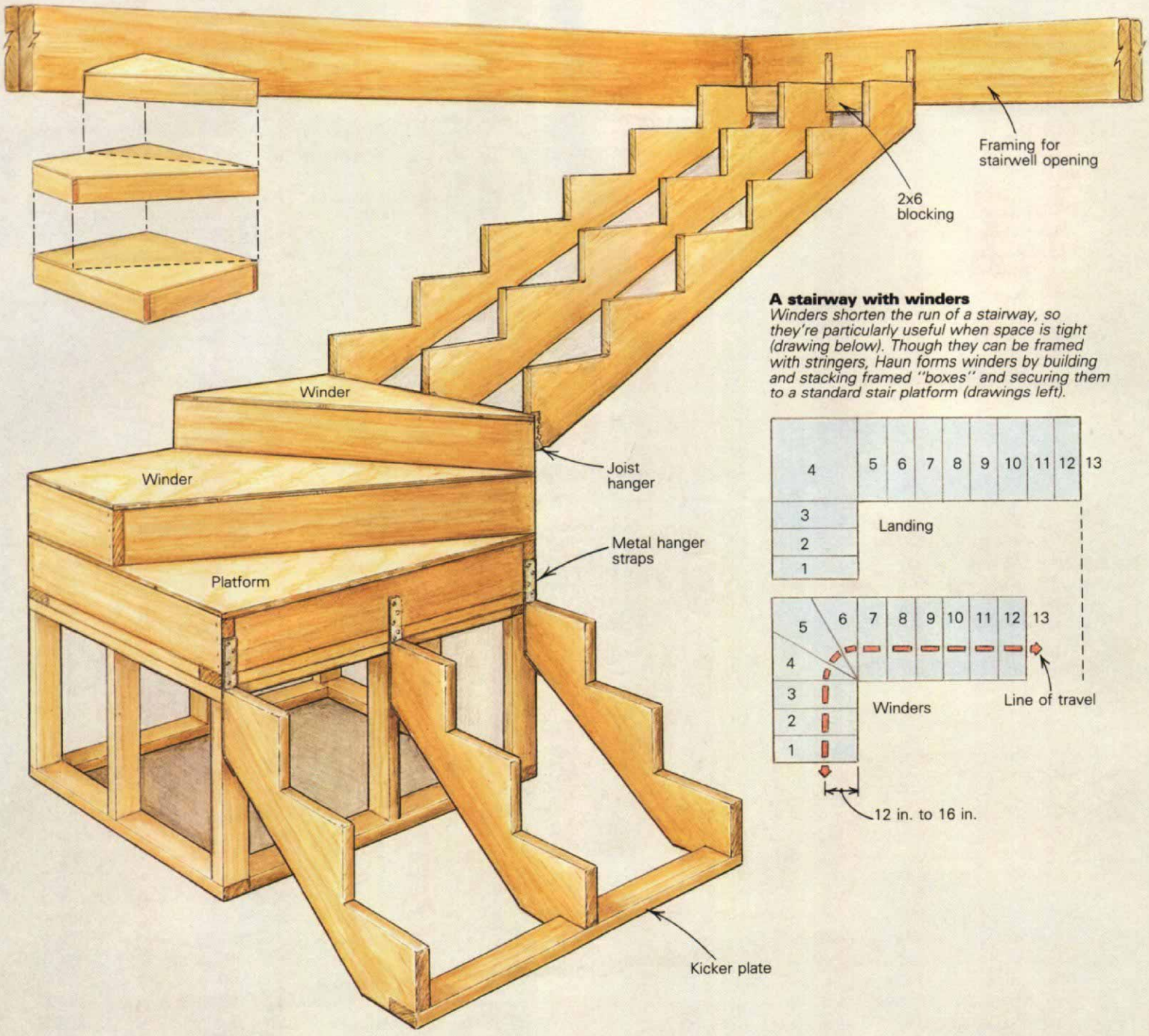
First things first—When building a set of stairs with a three-step winder, begin construction as you would with most any set of stairs. First, determine the total rise (the vertical distance from the first floor to the second floor). Divide the total rise by 7 in., a comfortable and safe riser height for most people. Round this number off to get the number of risers needed in a flight of stairs. Once you know the number of risers, divide that number into the total rise. This will give you the exact rise of each step.

Here's an example. Say the total rise from first to second floor is 108 inches. Divide 108 by 7 and you'll get 15.4. Drop the fraction (.4) because it isn't safe to have a part of a step in a flight of stairs. Next, divide 15 risers into the total rise (108 divided by 15 equals 7.2). So in this particular flight of stairs, there will be 15 risers, and each riser will be 7.2 in. high (7 3/16 in.).

Building a platform—Construction of the winders is straightforward and as easy as building boxes. The first step is to build the platform. Say that you are building a set of stairs in which the rise for each step is 7 3/16 in., the winder begins at the fourth step, and that the stairs are 36 in. wide. Frame a 36-in. square platform for the stairs and deck it off (before nailing down the plywood, I run a bead of construction adhesive along the top of the framing as a squeak stopper). The platform should be 28 3/4 in. high (four risers with a 7 3/16 in. rise equal 28 3/4 in.—simple enough).

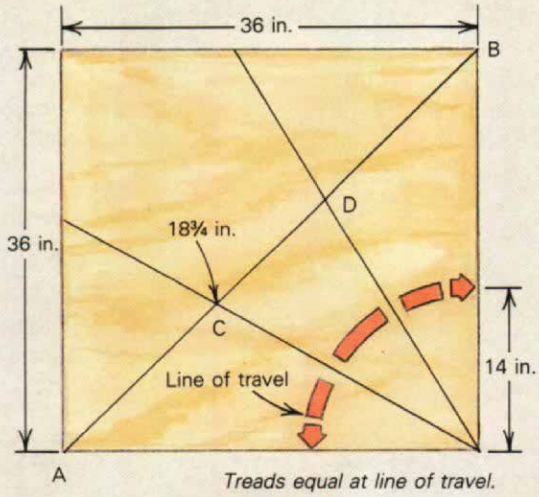
Laying out the winders—Traditionally, carpenters have constructed winders by cutting out stringers, much like they do when building a regular set of stairs. This method is familiar across the country, and many of those staircases are works of skill and art. Production framers, on the other hand, eliminate winder stringers altogether; they simply build three boxes and stack them one on top of another. This is much easier than the traditional method and saves a considerable amount of time. The width of most main stairways is 36

Drawings: Bob Goodfellow

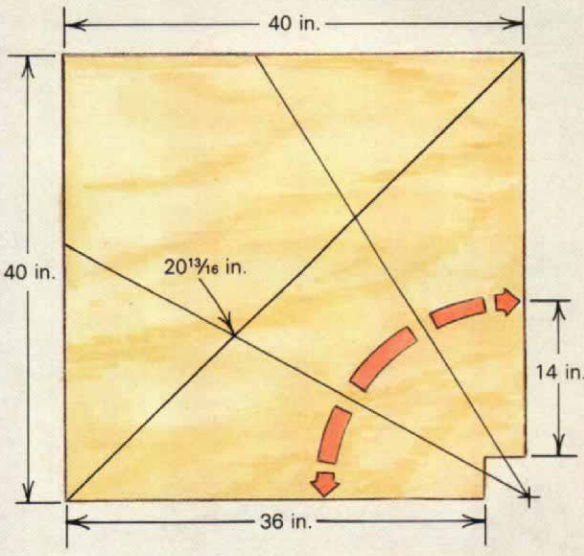


A stairway with winders
Winders shorten the run of a stairway, so they're particularly useful when space is tight (drawing below). Though they can be framed with stringers, Haun forms winders by building and stacking framed "boxes" and securing them to a standard stair platform (drawings left).

Laying out the winders
When laying out the treads, the key design consideration is to ensure that the treads are of proper width at the line of travel, which is the path a person would most likely follow when using the stairs. Building codes generally call for a 9-in. to 10-in. tread width at the line of travel. The methods at right can be used to lay out winders of various dimensions.



Treads equal at line of travel.



in., so I'll assume that width in the examples to follow.

Start with a 36-in. square of ¾-in. plywood, and divide it into treads so the line of travel for each tread is the same. You can make the division using the "hit and miss" method, or you can use a more technical approach.

My hit and miss way begins with a line snapped across the plywood from corner to corner, from point A to point B (bottom left drawings, previous page). Measure 18¾ in. on the diagonal from Point A to find Point C. Do the same from corner B to find Point D. Where did the 18¾ in. come from? After trying lots of dimensions, I've found that this one works to make a comfortable stair. Next, snap two lines: one through Point C and the other through Point D. These lines define the three treads of the winder.

The other method of laying out winders is more versatile and requires some arithmetic, but not much. Take the 36-in. square piece of plywood and divide it diagonally as before. To find Points C1 and D1, multiply the length of the plywood by .52 (36 x .52 = 18.7). In this example, therefore, the distance in from each corner of a 36-in. square is 18.7 in., or about 18¾ in. Snap lines through the points you find to determine the winder layout. You can use this formula to figure out the winder layout of any size square or any width of stair. For example, if the stair width is 30 in., you would need to measure in 15.6 in. from each corner (30 x .52 = 15.6).

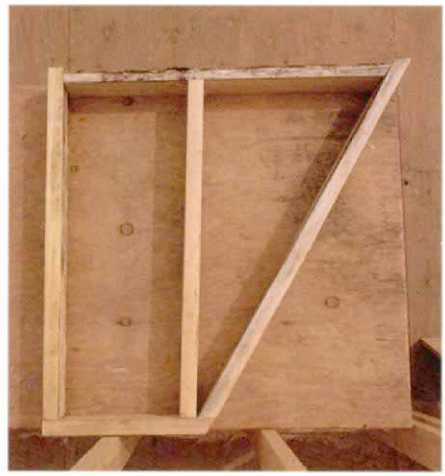
As I noted earlier, building codes frequently call for a winder tread with a width of at least 9 in. or 10 in. at the line of travel. If this is the case, you'll need a 40-in. square piece of plywood to make the platform for a 36-in. wide flight of stairs. You'll have to project the inside corner point far enough out diagonally so there is enough tread width at the line of travel.

Establish the 36-in. width of the stairs on the plywood as shown (bottom right drawing, previous page). Then proceed to lay out the line-of-travel radius and divide it into three equal arcs. Connect points on the arcs with lines leading to the inner corner of the layout to complete the winder layout. This will provide a 10½-in. tread at a 14-in. line of travel.

Constructing the risers—After laying out the risers on a sheet of plywood, cut them out with a circular saw. The rise of the step in our example is 7⅜6 in., so take some 2x8 stock and rip it down to 6⅞6 in. You might as well rip enough to do all of the risers—you'll need about 24 lineal feet in all. The ripped stock will form the actual riser of each step, as well as the "joists" that support successive steps. Once you nail the 2x stock together, sheet the frame with the plywood. Toenail this box to the landing.

Now take the smallest piece of plywood, the one shaped like a piece of pie, and build the last riser with the last of the ripped-down 2x8 stock. Toenail this box on top of the previous one. That's all there is to it—the landing is now a three-step winder (bottom photo, right).

Stacking steps. **The winders are simply triangular or trapezoidal boxes made of 2x framing; plywood forms the steps (photos below). After the stair platform has been framed, the first box is toenailed to it, after which the second box is toenailed to the first.**



Installing stair stringers—With the landing and winders complete, you can cut and attach the stringers for the rest of the stair. These stringers, both upper and lower, are laid out and cut as usual (for more on laying out and cutting stringers, see *FHB* #17, pp. 56-62; reprinted in *Construction Techniques 2,* The Taunton Press). A stringer from the first floor to the landing requires three risers; the fourth riser is created by the landing itself when the stringer is hung from it. Stairs that are 36 in. wide require three stringers—one on each side of the landing and one in the middle—and are usually cut from 2x12 stock.

One way to hang the stringers is to nail an 18-in. long perforated metal strap to the bottom edge of the stringers. This should be a heavy-gauge strap, not plumber's tape or the like. Nail the last 6 inches of the strap to the bottom of the stringer with four 16d nails. Then bend the strap around the backside of the top riser either by hand or with a hammer. The strap should extend above the top tread by about 6 inches.

To locate the stringers on the landing, measure down 7⅜6 in. from the top of the joist and strike a line parallel to the edge. Hold each stringer to the mark, and secure it by nailing the end of the metal strap into the face of the platform with four 16d nails. The straps carry the actual weight of the stairs.

Next, nail a pair of 2x6 blocks (in this part of the country, we call them pressure blocks) to the platform and between the stringers. This block helps keep all three stringers stable until the stairs get their treads and risers. Secure the bottom of the lower stringers with a 2x4 kicker plate. This plate should be as long as the finished stairs are wide. Slip it into a notch at the bottom of the stringer and nail it to the floor.

Another way to secure the lower set of stringers is to use joist hangers. Using a circular saw, kerf the back side of the last riser. Slip the joist hanger into the saw cut and nail it to the joist and then to the landing.

After installing the lower stringers, you can install the stringers that run from the landing to the second floor. The top of each stringer is attached to the second-floor framing with metal straps, just as the lower stringers were secured to the landing. The bottom of each stringer is secured to the landing with a joist hanger. I cut 1½ in. off the bottom tip of each stringer, which allows it to bear nicely on a joist hanger. If the inside stringers are against a wall, we nail a Simpson A35 framing anchor at the juncture of the stringer and the platform.

Securing stringers in this fashion is a tried-and-true procedure; we have been doing it for more than 30 years. The stairs will not come loose no matter how much the wood shrinks and no matter how heavy the load they're asked to support. □

Larry Haun lives in Los Angeles and is a member of Local 409; he was a longtime teacher in the apprenticeship program. Photos by Roger Turk.