

# Foolproof Handrail Layout

by Don Zepp

**A full-scale drawing eliminates the guesswork — and the math**



I was 21 years old when I started my stair-building company, and in the 10 years I was in business, we installed over 7,500 flights of stairs. The majority of these stairs had an “over the post,” or continuous, railing that was assembled from stock rail parts. Using stock parts, a continuous rail can be assembled to fit just about any stair configuration imaginable.

The key to a successful handrail installation lies in accurately determining the height of the newel posts. Early in my career as a stair builder, I tried a number of mathematical approaches. Eventually, however, I realized that the easiest and most foolproof method involved making a full-scale section drawing of a portion of the stairway for each newel post. This “full scale” system uses stock stair parts as templates.

## Layout Preferences

Determining the location of a newel post is not an exact science, and experienced stair builders have their own techniques. My preference is to align the centerline of the newel post with both the face of the riser and the face of the stringer (see Figure 1). This will allow room for all finish risers, treads, scotia molding, brackets, and return nosings to “die” into the newel post and help “lock” the post in place.

The location of balusters is also a subjective decision. I like to align the face of the “lead” baluster on each tread with the face of the riser (Figure 2). Make sure you know your local stair codes — some stairs may need three balusters per tread to meet the code-required spacing.

## Creating the Drawing

To create a full-scale drawing of the stair, I start by taping two 5-foot pieces of red rosin paper to the subfloor. Using a framing square and a 4-foot straight-edge (a 4-foot level will work), I make a drawing that includes four steps, four risers, the centerline of the newel post, subflooring, and floor framing (Figure 3).

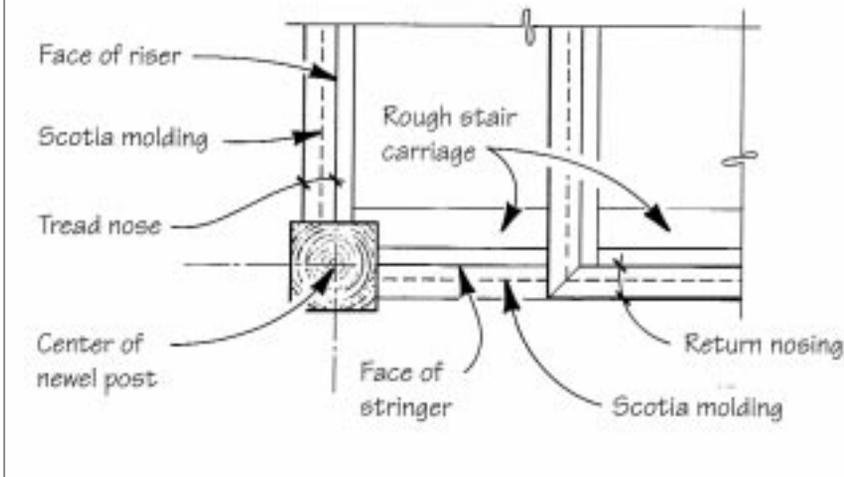
It’s important that the drawing represents the conditions as they exist. Stairwell rough openings and floor heights often differ from what is shown on the blueprints. Don’t assume that you can work from an enlarged version of existing construction drawings.

## First Things First

I first draw a line on the rosin paper that represents the *underside* of the handrail, extending the line beyond the centerline of the newel. I use stock balusters to determine the height of this layout line (see “Production Tips for Balusters”).

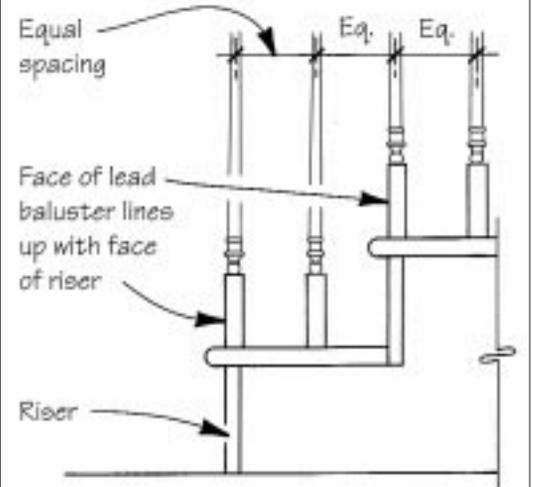
The finished rail height must meet your local code requirements, of course. Codes will vary, but stair-rail heights

## Newel Post Position



**Figure 1.** Aligning the centerline of the newel post with the faces of the riser and stringer allows the finish risers, treads, scotia, brackets, and return nosings to die into the newel.

## Baluster Placement



**Figure 2.** The author prefers to align the front edge of the lead baluster on each tread with the face of the riser.

between 30 and 38 inches (measured vertically from the nosing of the treads) are usually acceptable. The rule of thumb I used is that the rail height at the center of the tread should be about the same as the height of the horizontal

railing at the landing. (But *always* check your local codes for proper rail heights.)

### Fittings as Layout Tools

To establish the height of the starting newel, place the starting easement

on the drawing, and using a framing square to keep the easement “level,” align the dowel pin hole with the centerline of the starting newel (Figure 4). Slide the easement down this centerline until the curved underside of the easement meets the rail line, and make a horizontal mark where the pin hole intersects the centerline of the newel. This is the height of the starting newel.

Next, mark the tangent point where the underside of the easement meets the rail line, and use a pitch block to lay out the cut (Figure 5).

Establishing the height of the landing newel is a similar procedure. Place the one-rise gooseneck with cap on the drawing, align the pin hole with the centerline of the landing newel, and slide it down until the curved underside meets the rail line (Figure 6). Mark the intersection of the pin hole and the centerline of the newel, and you’ve got the height of the landing newel.

Again, mark the tangent point on the underside of the gooseneck and use a pitch block to lay out the cut. The pitch block can also be used as a guide when cutting rail fittings with a power miter saw (Figure 7).

### Finding the Length of the Rail

With the height of the newels established, it’s time to cut and fasten them in place. You don’t need to measure the height of the newels; just lay them on the full-size drawing, mark where they hit the subfloor, then plumb and scribe them in place. After they’re cut, fasten

## Production Tips for Balusters

As a production stair builder, I was always on the lookout for time-saving techniques. The items listed below helped me shave time off of the tedious task of baluster installation.

### Out-of-the-Box Baluster Layout

When laying out a handrail for a single flight of stairs, I would often use stock *uncut* balusters to determine the height of the rail — instead of using a predetermined railing height. This would save me from having to cut one of the two balusters at each tread. Here’s how it worked.

Balusters are available in a range of stock lengths; I used 31- and 34-inch lengths for most of the rake rails I installed. Each tread has a long and a short baluster. I would place two pairs of uncut balusters on the full-scale drawing of the stairs, spaced properly on the tread. Then I would lay out the handrail line so it crossed the top of one of the balusters at just the right spot —  $\frac{5}{8}$  inch down from the top of the baluster, to allow for the proper

penetration into the rail. By laying out the handrail height this way, I could avoid trimming half of the balusters.

### Consistent Cuts

Always double-check your rail layout, and make sure the layout line for the underside of the rail is *parallel to the stair angle*. When the handrail is laid out and installed properly, every pair of balusters will be the same length. If the handrail is not parallel with the stair angle, you’ll burn up valuable time measuring and fitting each individual baluster.

### Plumb Bobs Rule

Baluster layout begins on the stair treads, and is then transferred to the underside of the handrail. There’s probably a hundred different ways to transfer the layout marks, but take my advice and use a plumb bob. It doesn’t require batteries, needs no adjustment, and never gives false readings.

—D.Z.

them securely in place (for more on this, see "Fastening Newel Posts," 5/94).

With the newels in place, set the easements on the newel pins, and measure for the rake rail. Cut the rail to length, and use handrail bolts to fasten the fittings to the rail. (See "Installing Handrails" in the Fall '96 issue of JLC's *Tools of the Trade* magazine for more on fastening rails.)

### Buttoning Up the Balusters

To lay out the balusters, draw lines on each stair tread that represent the centerlines of the balusters, then draw a centerline on the underside of the completed handrail. With the assembled rail in place, hang a plumb bob from the rail's centerline, and mark the location of each baluster on the underside of the rail.

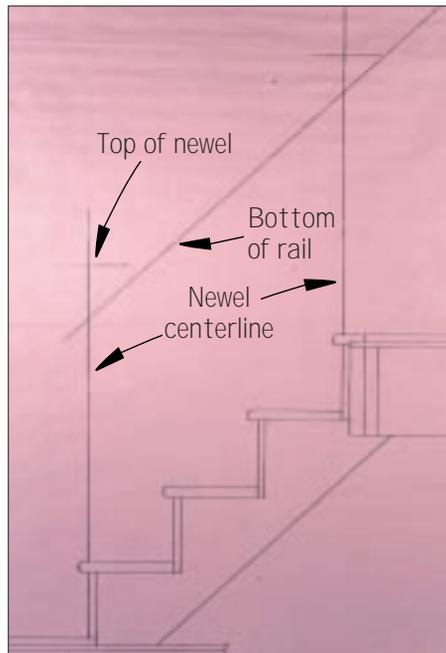
Remove the handrail, turn it end for end (the starting easement at the top and the gooseneck at the bottom), and lay it upside down on the stairs. Holding your drill plumb, bore all the baluster holes. Be sure to drill the holes at least 1<sup>3</sup>/<sub>8</sub> inches deep; this allows each baluster to be slid up into the handrail, then pulled back down into the tread pin hole. (This is a much easier method than installing the balusters in the treads first, then trying to fit them all at once into the holes in the railing.)

### Multiple Flights

This full-scale layout method works very well for multiple flights of stairs connected with a continuous handrail. No matter which direction the flights turn, you can lay out all the newel conditions at full scale in a straight line on the floor.

When riser heights differ between flights (as they often do), the height of the rake rail will vary slightly at each flight, but can be laid out to fall within the acceptable limits. It's best to start your layout with the shallowest pitched stair — the distance to the top of rail will increase with the steeper flights. ■

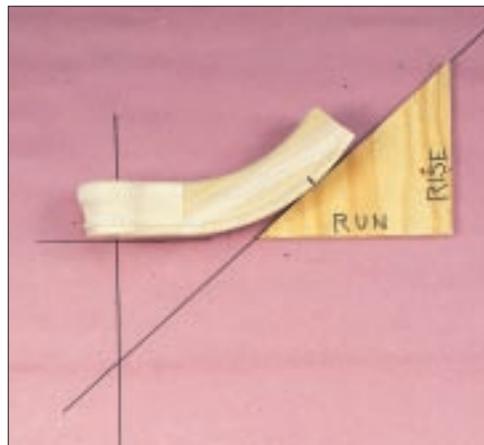
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**Figure 3.** The full-scale drawing should include treads, risers, the centerline of the newel, subflooring, and floor framing. The lines representing the top of the newel and the bottom of the handrail are added during layout.



**Figure 4.** To find the height of the starting newel, center the dowel hole in the starting easement over the newel centerline. Using a framing square to keep the easement level, slide the easement down until its curved underside touches the rail layout line. Make a horizontal mark where the pin hole intersects the newel centerline to establish the newel post height.



**Figure 5.** To lay out the cut on the starting easement, use a pitch block and mark a perpendicular line where the easement meets the rail line.



**Figure 6.** Use the same process to find the height of the landing newel and mark the cut on the gooseneck.



**Figure 7.** The pitch block can be used as an angle guide when cutting curved easements. The miter saw remains set at 90 degrees.