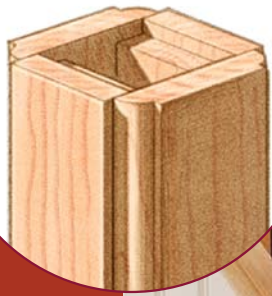
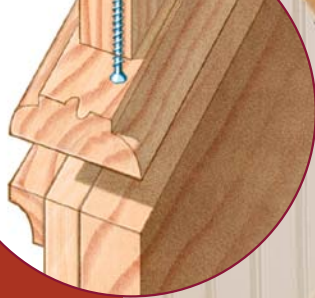




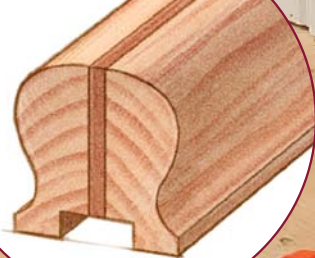
**Newel post**



**Balustrade**



**Handrail**



*"I've come up with a few ways to use everyday lumber to make distinctive railings."*

*The trick is to build up the parts from clear stock and to add details with common router profiles.*



# A Distinctive Stair Rail

How to build a stain-grade and sturdy railing, balustrade, and newel posts on site with stock lumber

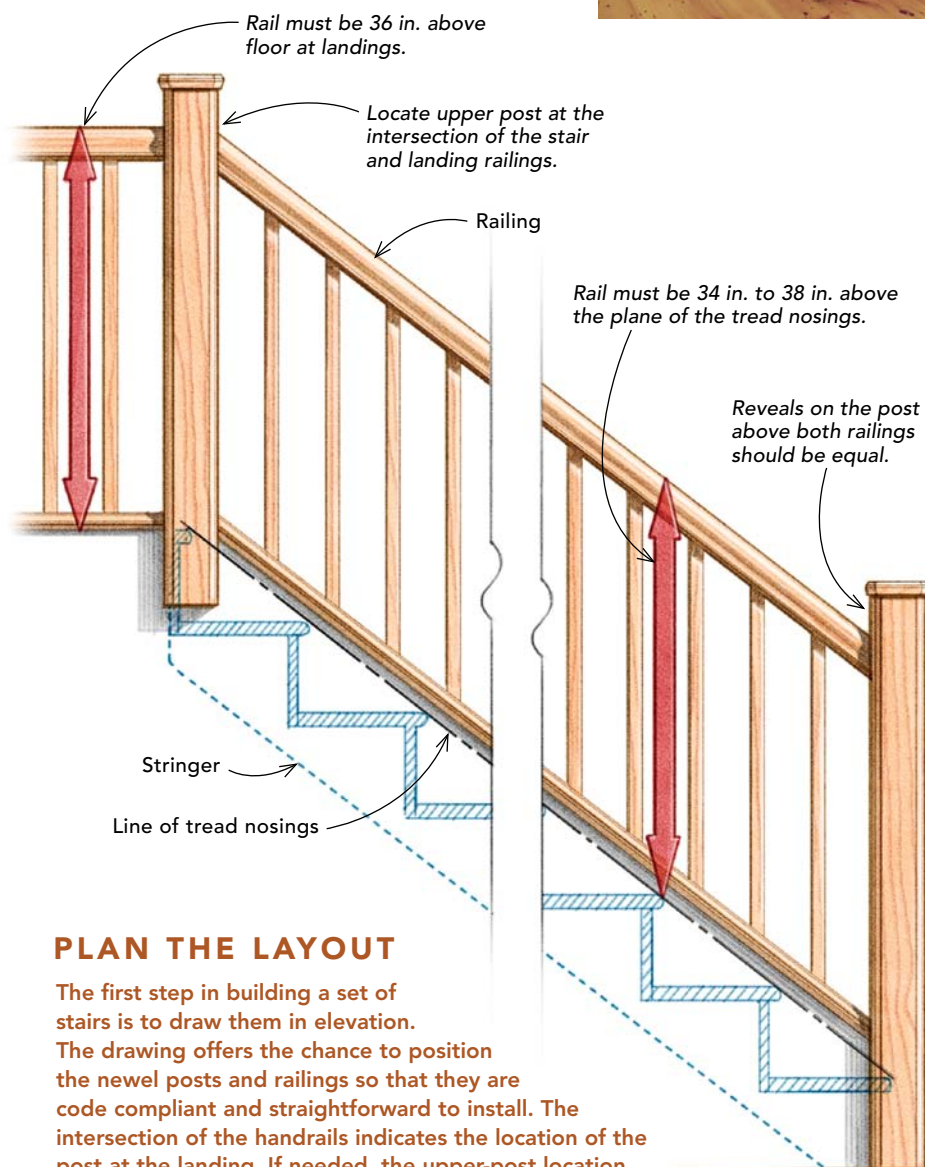
BY JOSEPH LANZA

In my business, I wear a bunch of hats, including that of finish carpenter. Building stairs is a nice mix of design and build, and it's a challenging job. This particular railing was for a set of housed-stringer stairs that I built (*FHB* #214). Most manufactured railing parts tend to have a formal, slightly generic look. They are readily available, but they aren't particularly cheap. If you don't work with them often, they aren't always easy to install. I try to avoid them because stairs and rails are one of the great opportunities to express the character of a house. While I want my stairs to have character, my own character tends to be lazy and cheap, so I've come up with a few ways to use everyday lumber to make distinctive railings that aren't any more work—and don't cost any more money—than most manufactured systems. The railing shown here is made from dimensional yellow pine. It took me about three days to build and cost approximately \$100.

## Figure it out on paper first

I wanted the balustrade to have the same clean, unadorned look as the staircase. Square balusters and posts would support a handrail with a simple profile. The lack of detail also meant that the balustrade could be built on site easily.

On a project like this one, I start by drawing an elevation of the stairs in CAD. Because I'm making all the parts, I keep the stair design as simple as possible. All handrail sections are straight post-to-post runs, with no drops or goosenecks. The handrail heights are determined by code, which specifies 34 in. to 38 in. above the sloped plane of the tread nosings. For landings, the rail-



## PLAN THE LAYOUT

The first step in building a set of stairs is to draw them in elevation. The drawing offers the chance to position the newel posts and railings so that they are code compliant and straightforward to install. The intersection of the handrails indicates the location of the post at the landing. If needed, the upper-post location can be adjusted by adding some portion of a tread at the landing so that the post is attached both to the stair stringer and the face of the landing.

# OFF-THE-RACK STAIR RAIL

The beauty of this stair rail is that it's made entirely of 4/4 and 5/4 stock, usually available at your local lumberyard. The newel posts are built in place, and the balustrade and handrail are assembled and installed separately.

## Laminate the newel post

To build the newels, start by screwing four layers of 3/4-in. plywood to the stringer. Next, cut a piece of the finish 1x stock to the final height of the post, and attach it to the inside face of each post to anchor the railing. Install the remaining three sides of the post after the railings are attached.

The plywood core is wrapped with four pieces of 1x stock cut to the finished height of the post.

Four layers of plywood, each 3/4 in. by 4 in. and cut to a length just below that of the railing height, are screwed and glued to the stringer.

The first piece to be attached is notched so that it rests partially on the top of the stringer.

The post's inside face is scribed to the tread, or vice versa.



## Assemble the balustrade

Square in profile, the balusters are tacked and screwed between a profiled length of 1x at the bottom and a piece of 1x stock at the top that fits into the railing dado.

Top piece, 3/4 in. by 1 1/8 in.

**Built as a unit.** Build the balustrade assembly on a bench or on sawhorses. Tack balusters in place, then secure them with screws.

5/4-in. baluster (1 1/8 in. by 1 1/8 in.)

Bottom piece, 2 1/4 in. by 3/4 in. and profiled with a 1/2-in. roundover router bit

A 3/4-in. by 3/4-in. cove molding dresses up the transition.

1/2-in. beadboard

5/4 stringer stock



## HOW TO CALCULATE EVENLY SPACED BALUSTERS

Begin with a piece of the baluster stock and a scrap of plywood ripped to the target spacing (4 in. is the code maximum). Cut the pieces at the angle of the railing, then place them together and measure the length of the angled

cut—here, 6.5 in. Figure out the number of balusters by dividing the railing length by the length of the cut. (For example, a run of 163.25 in. divided by 6.5 in. equals 25.12 spaces. That rounds up to 26 spaces, so you'll need 25 balusters).

To get the spacing, divide the railing length by the number of spaces ( $163.25 \div 26 = 6.28$  in.), then round up to the nearest 1/16 in. ( $6.312 = 6\frac{5}{16}$  in.), the aggregate of the baluster and the space.

Rip the scrap plywood and baluster to

the adjusted spacing, then use as a gauge.

Center the middle baluster on the midpoint of the rail and work toward both ends. Adjust the spacing as you get closer to the ends; the last space can be off from the planned spacing.





### Sandwich the handrail

An easy way to make a handrail wide enough to satisfy code is to laminate available stock and shape it with a router.

5/4-in. by 2 1/4-in. southern yellow pine

**1** Prepare the stock. Cut the 7/16-in. by 3/8-in. rabbet on both pieces before glue-up.

A 1/4-in.-wide mahogany accent strip also hides the glue-line.

**2** Make a stable base. Flip the stock so that it rests on a full square edge, and rout with a handrail bit.

Handrail bit

3/4-in. roundover bit

**3** Keep the base stable. Turn over the stock, and make multiple passes with the roundover bit.

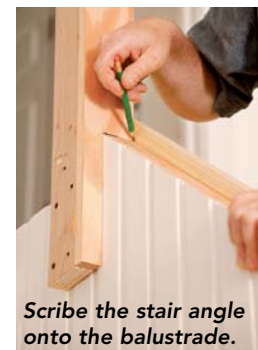


ing must be at least 36 in. above the finished floor. Making a drawing also allows me to plan other elements—newel posts, for instance, which should be located so that the line of the handrail flows squarely through them with equal post reveals above the rail. Posts also need to be solidly mounted to the landing, floor, or stair stringer. Because the posts are built up, my goal is to locate them in a place that won't require floor excavation or bolts.

### Wrap posts, hide fasteners

The posts are square in section, with a core of four layers of 3/4-in. plywood wrapped with 1x stock. First, I glue and screw one layer of plywood to the side of a stair stringer and/or landing, then repeat the process for the next three layers of plywood, checking for plumb as I go. At this point, the posts might seem a little flimsy, but once the facing and balustrade are applied, the posts stiffen up.

Next, I cut a piece of 1x stock to the length of the finished post height and attach it to the post with glue and blind pocket screws on the side where the handrail will land. Having one finished face on the post allows me to attach the balustrade to the post and then to conceal the fasteners when the remainder of the post is wrapped. When the posts get to this stage, I shift gears and make the baluster assembly and handrail.



Scribe the stair angle onto the balustrade.

### Assemble the balustrade in sections

Balusters for this rail are made from the same 5/4-in. by 12-in. southern-yellow-pine stringer stock I used for the rest of the stairs. I figure out how many balusters I need (sidebar facing page) and make a few extra just in case. I cut the 12-in.-wide stock to rough lengths, then rip the pieces so that they're square. The stair balusters are cut at the angle of the intersection between the newel post and the stair stringer. When everything is cut, I sand all parts, ending with 150-grit paper.

To keep the verticals plumb, I hold the top and bottom elements of the balustrade between the bottom of the posts for each section and mark the lengths and angle of cut (photo above). I do the same with the handrail stock, or I use the cut top piece as a template to mark the handrail. After cutting all these parts, I put the handrail pieces somewhere safe so that the cut ends aren't dinged. Using the baluster spacing I have calculated, I make a gauge and start to assemble the balustrade. Starting in the middle, I glue and brad-nail the bal-

### HIDE THE FASTENERS

Once the balustrade sections are assembled, they can be lifted into place. Here's where the role of the longer inside piece of post facing becomes clear. Snugged against the post with a clamp, the top of the balustrade assembly is secured with screws driven into the interior of the post face, then repeated at the lower end. Scribed tight against the posts, the handrail is squeezed onto the balustrade and screwed in place. Glue and finish nails help to strengthen the assembly.



usters in place. After I get three installed, I screw the balusters in place with 1½-in. self-tapping wood screws. I alternate, installing two or three balusters at a time on each side, checking the spacing as I go.

### Laminate the handrail

For short handrail runs (mostly stairs with landings), I sometimes use solid stock. For longer stairs, though, it can be hard to find straight, clear material, and it's even harder to mill it. For longer runs, it's easier to laminate the rail stock. For this rail, I used 5/4-in. southern-yellow-pine stringer stock. (Five-quarter mahogany decking is also a good source of handrail stock. Straight pieces in long lengths are not hard to find.) To build up the rail to 2¾ in. wide, I ripped a ¼-in.-thick piece of mahogany decking and glued it between the two pieces of pine. The dark strip also hides the glue joints and adds an accent.

Before laminating, I cut handrail pieces to rough length, plus an extra 10 in. or so. At this point, I also cut a 7/16-in. by 3/8-in. rabbet into the pieces. I've found that it's easier to rabbet before glue-up and to rip the center strip down to match.

I apply yellow glue to all pieces, then clamp the whole thing together on a long bench. It's important to keep the pieces aligned, so I clamp the assembly side to side and top to bottom. Another method is to screw the pieces together, then conceal the screws with plugs. The trick there is that the screws can be located only at the widest part of the profile, or they'll get in the way of the router bits.

### Profile the rail in stages

To rout the rail, I use two router bits: a 3/4-in. roundover and a profile known as a handrail bit. If all the railing pieces are less than 7 ft. or so, I mill them on a router table. For longer pieces, it's too hard to keep the rail steady for the whole length of the feed, and with the handrail bit, one slip can ruin the whole piece of rail. Instead, I rout the piece by hand. I start with the handrail bit, and I'm careful to leave enough material so that the bearing on the 3/4-in. roundover bit has a place to land when cutting the top profile. I secure the stock between stops on the bench, work slowly, and take multiple passes.

The top roundover bit is big and somewhat scary, so I work slowly and carefully with multiple passes, adjusting the depth of cut as I go

## WRAP THE NEWEL POST

Once the railing assembly is attached to the interior post faces, the remaining three finished sides of the post can be installed.



**Notch around the nosing.** On the tread side of the post, the tread nosing is marked and notched with a sharp hand-saw to accommodate the finished piece. Another method is to cope the post side with a router and tread pattern.



**Ready for the cap.** When the post is complete, blocking is added to support the cap.

until I attain the final profile. After sanding the rails to fair the cuts, I set the pieces aside to work on the baluster assembly.

### Install the balustrade, then the railing

When it's time to install, the balustrade should fit perfectly at the bottom and may be a little loose or tight at the top. I glue and nail the bottom in place, then attach the top, using a clamp if I need to draw the post and balustrade together. I dry-fit the handrail first and then make sure that it is centered, tight to the baluster assembly, and tight at the post. When I'm satisfied, I apply glue to the post faces, locate the rail, and drive two screws through the back of the post face into the handrail.

After the railings are attached, I finish installing the post faces. If I was worried about the posts before, I'm always pleasantly surprised to find that they are now quite solid. The post caps go on last. Here, I made them nice and flat so that they can support a drink. □

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Photos by Charles Bickford, except where noted.