Fastening Newel Posts

by David Frane

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At the beginning of my carpentry career, I tried to remove the main stair newel from a 150-year-old building. It was a massive 8-inch-diameter walnut post that had been mortised deep into an underlying beam. My partner and I tied one end of a 3/8-inch nylon line to the base of the newel and the other end to the bumper of a 3/4-ton pickup truck, thinking the job would be easy. Our single length of line soon became two lengths. We tried again, doubling and then quadrupling the line — with the same result, only louder. After a few more tries we admitted defeat, and threw the frayed remnants of our line in the dumpster. As I heard it told, someone else did the job with a chain saw.

The notion that it was possible to "remove" such a post with a nylon line speaks volumes of how little I knew about building in those days. It also shows how strong a well-designed newel can be. If you understand the forces that act on them, you can build sound newels even on stick-framed stairs.

For solid connections, plan ahead and bolt or lag to the framing

Installing Solid Wood Newels

There are two basic types of newel posts: solid and hollow. Solid posts are by far the more common. Most stock posts are made from blanks of birch, red oak, or maple. They have a 3- to 4-inch square cross-section at the top (where they receive the handrail) and at the bottom (where they butt against tread nosings and risers), while the midsection is turned on a lathe. Larger solid posts are available as a special order (I've installed custom-made newels that were turned from 5- and 6-inch blanks).

If you plan ahead at the framing stage, you can get maximum strength by mortising the newel into the framing. With a starting newel, the simplest case is when the newel lands over a joist bay and there's access to the bay from below (see Figure 1). Cut an accurate hole through the subfloor, insert the base of the newel through it, then fasten it to solid framing below. If you're real lucky, there might be a joist alongside the hole in the subfloor; if not, you can install blocking between the newel and the nearest joist, or run solid bridging across the joist bay, then lag or through-bolt the newel to the bridging.

It's best if the fasteners do only part of the job. The most efficient way to transfer lateral loads from a newel to the floor frame is to wedge the newel from all sides with wood blocks. Make the blocks from dry wood and fasten them to the floor frame with construction adhesive and long drywall screws. A

newel that's properly blocked will break before it loosens.

For a landing newel, a good strategy is to hold back the header, making the stairwell bigger. The newel can then be fastened to the header, and the header padded with two-bys (Figure 2). It doesn't have to be notched, so it's as strong as the blank it was made from.

Connections. Lag bolts are the most common way to fasten a newel to a floor frame. The weak links in a lag-bolted connection are the wood fibers around the screw threads and beneath the head of the bolt. Screw threads hold better in dense hardwood than in softwood, so when using lags to fasten newels, it's better to bolt through the softwood framing into the hardwood newel than the other way around (Figure 3, next page).

When lagging through softwood, it's important to spread the stress beneath the bolt head over a large surface area; otherwise the wood fibers will compress and the post will work loose. The best way to do this is to place a large washer beneath the head of each bolt (fender washers work great for this). Another option is to install a scrap of hardwood between the bolt and the face of the joist. Through-bolting is even better than lag-bolting, since it's harder to strip the threads from a machine bolt than to tear lag threads from a piece of wood. Again, large washers are a must.

Note that in all these examples the fasteners are installed below floor level. If it weren't so typical to put clear finishes on newels, they would be much easier to fasten. You could simply counterbore large holes through the face of the newel and lag through the riser to the landing header or rough stringer. Since people don't want to see large plugs on the faces of newels, however, carpenters have to be careful to hide fasteners.

Damage Control: Notching

Now back to the real world. In my experience, the newels almost never land over joist bays; some law of nature must require that starting newels land on top of joists, headers, electrical wires, plumbing pipes, hvac ducts, or some combination of all five. Part of this has to do with specialization: The carpenters that frame the stairs are seldom the same carpenters that finish them, so many stairways are framed with no thought to the newels. Whatever the reason, how-

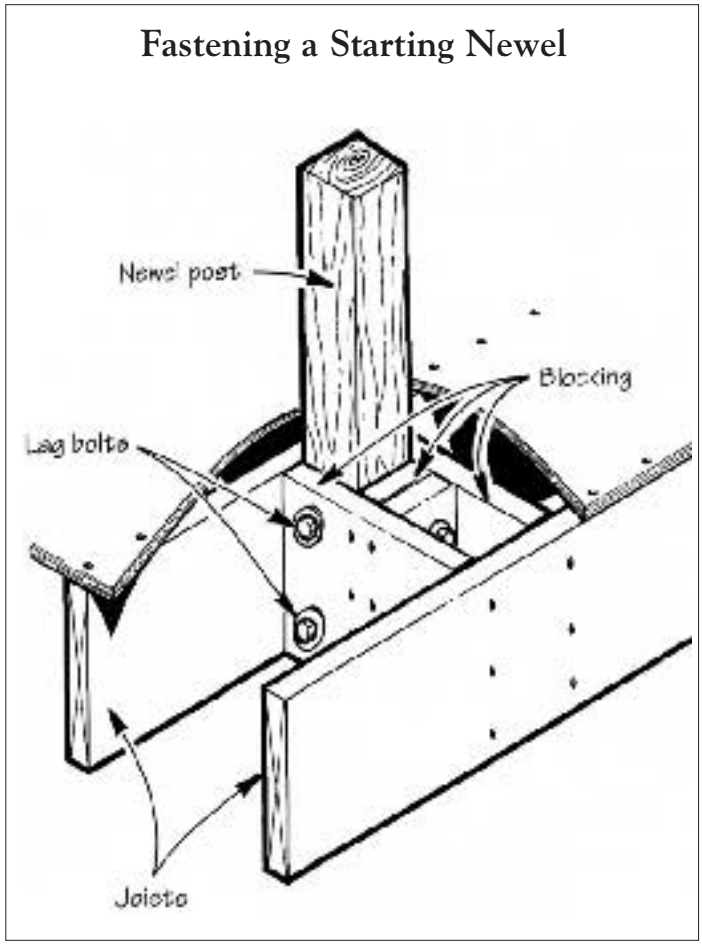

Figure 1. *For the strongest possible newel, arrange the floor framing so that starting newels land over a joist bay. The landing newel can then be bolted to the front of the header without needing to be notched. The author mortises newels by wedging them in place with wood blocks.*

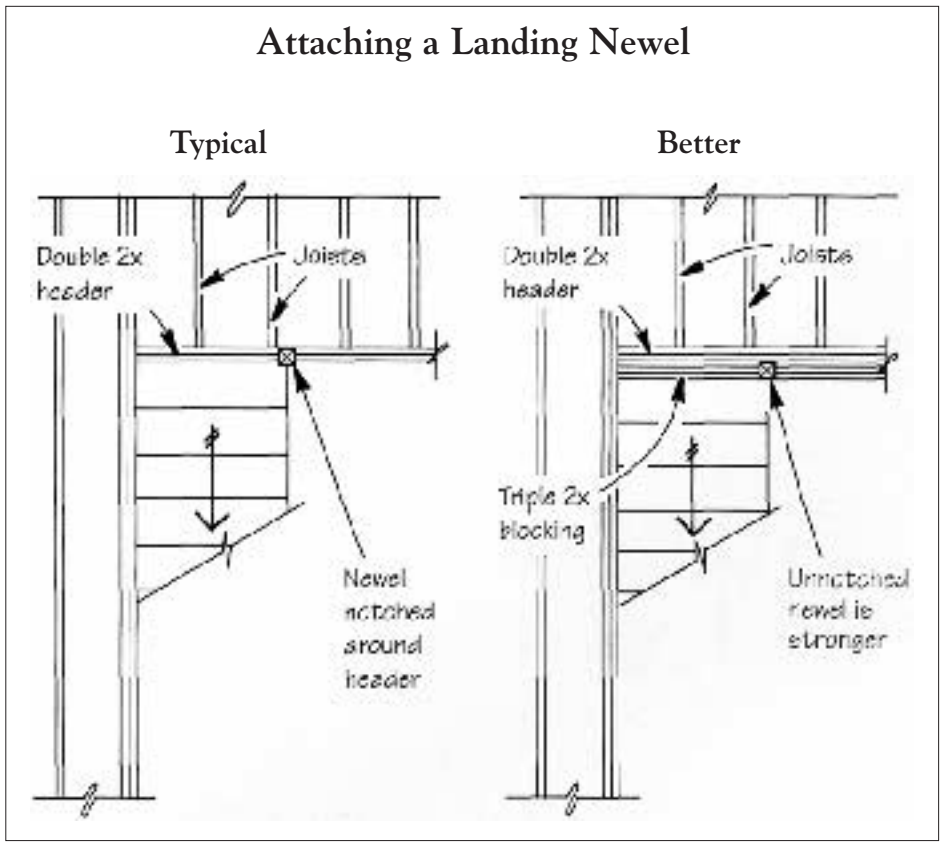

Figure 2. *When stair landings are framed with a double two-by header at the edge, the landing newel must be notched around the header (left). For a stronger installation, the author holds the header back so that the newel doesn't have to be notched, then adds blocking to fill out the landing width (right).*

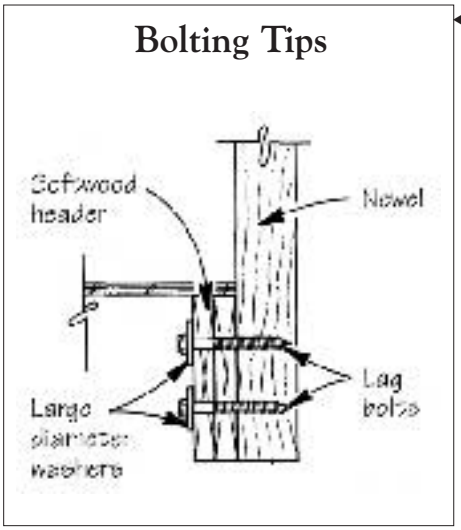

Figure 3. *Lags hold better in hardwood than in softwood, so the author always lags through the framing into the hardwood newel rather than vice-versa. Large washers or hardwood blocks prevent the lag head from crushing the wood fibers in the joist and loosening the newel.*

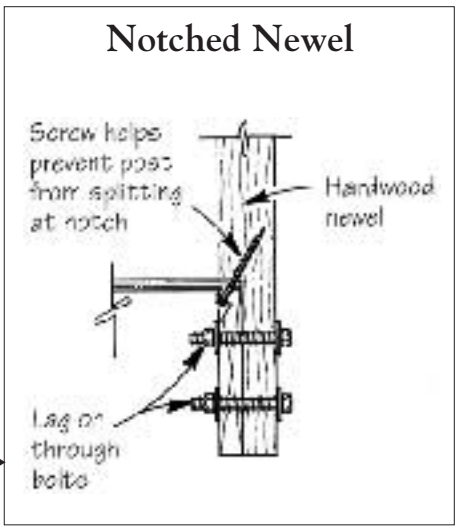

Figure 4. *Screwing from below helps strengthen the shoulder of a notched newel, as long as you can get a tight fit.*

ever, the building inspector won't like it if you notch a joist or header, so you may have to notch the newel. That's where things get interesting.

Because newels take so much strain, you'll want to do as little notching as possible. Remember, a newel is like a pry bar: The longer it is, the greater the leverage exerted at its lower end. If you have to notch a newel around the framing, you've weakened it at the point of greatest stress. Handrails can be used to stiffen notched newels in the direction parallel to the rail, but a bigger problem is the force exerted side to side, or perpendicular to the rail.

Fastening the shoulder to the floor will remove some of the stress from the tenon if you can make a tight fit. About the only way to fasten the shoulder is to toe some screws through it to the framing (taking care to keep the heads below the line of the finish floor), or to shoot them up into the end grain from below the subfloor (Figure 4). Given a choice, I wouldn't rely on handrails or shoulder cuts to stiffen notched newels, but when I'm desperate, I'll take whatever I can get. When no one method will hold a newel post the way you want it held, you have to rely on a little of this and a little of that.

If you want a stronger joint, you'll have to get a little more creative. For instance, I was once confronted with a newel that landed directly over a header. I couldn't notch the header, so I cut a deep slot in the side of the newel to accept the end of the first riser. A plunge router works well for this. Because this newel post was to be painted I was also able to countersink screws straight through the side of the newel into the end grain of the riser. The resulting joint was an upside-down version of the joint between the leg and apron of a table.

Even trickier was the job where a stain-grade newel landed over the top chord of a floor truss (Figure 5). You can't notch trusses even a little; and there was no point notching the post around the truss, because the remaining tenon would have been the size of a popsicle stick.

Instead, we mortised the newel into the subfloor, mortised the riser 2 1/2 inches into the newel, and secured the whole thing with yellow glue and drywall screws. We beefed up the joint by shooting screws into the newel through the back of the riser and the end of the rough stringer, as well as through the back of the newel to the top chord of the truss. We also mortised the cut-skirt into the newel, not so much for strength as to ensure proper alignment and a tight fit. This made installing the newel akin to assembling one of those Chinese wood puzzles where there is only one way to get the pieces to go together. But once the glue had set the newel was as solid as the starting newel on the matching flight — which we had bolted to the side of an underlying floor truss.

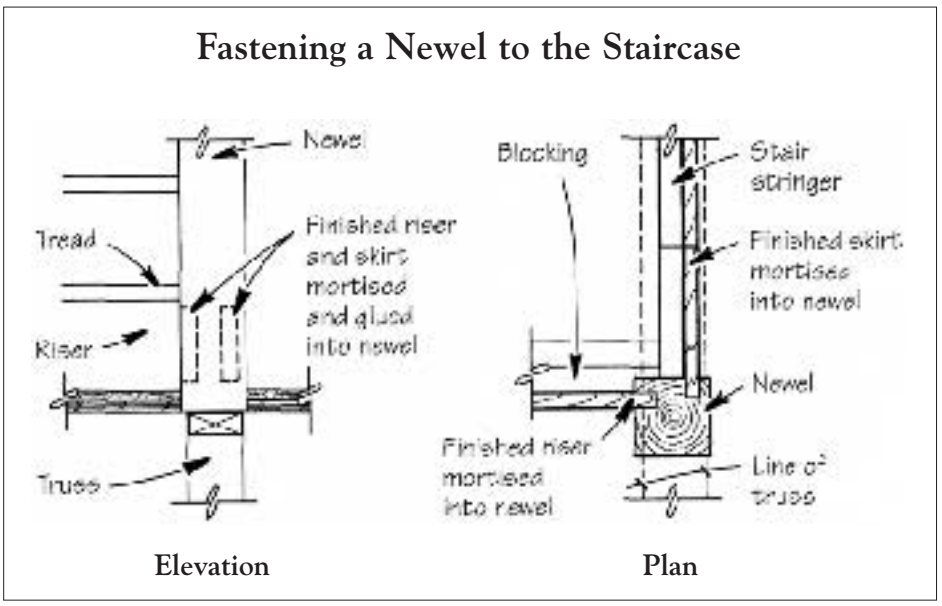

Figure 5. *In situations where it is impossible to attach the newel to solid framing beneath the subfloor, the author mortises the riser and skirt into the newel post. A combination of glue and screws secures the large mortise-and-tenon joint.*

Hollow Newels

Hollow posts generally have large, square cross-sections and are decorated with applied moldings, carvings, and turned finials. The easiest hollow newels are merely a decorative cladding installed over a solid post. The real fun begins where a hollow newel falls over a header or other obstruction.

Attaching Hollow Newels

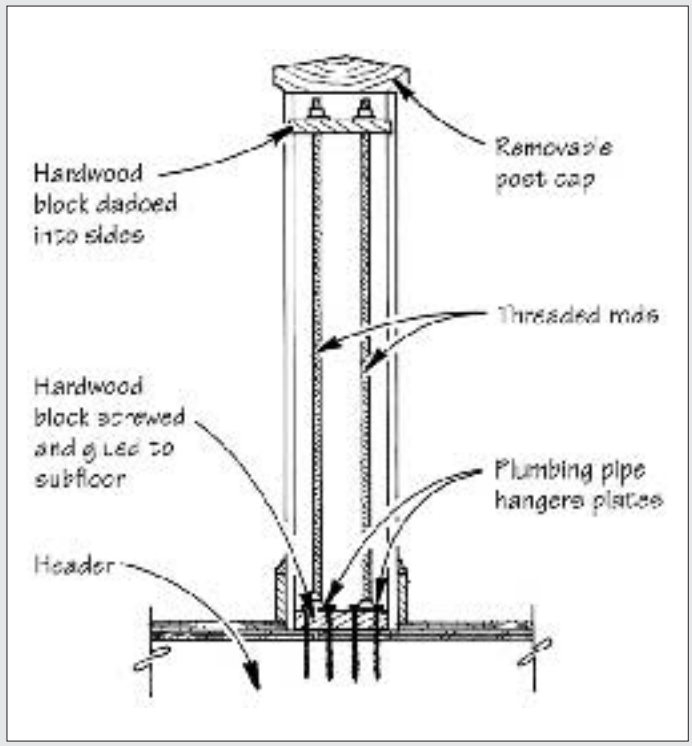

Figure 6. *The author secured these hollow newels (right) to the floor with hardwood blocks, plumbing pipe hanger plates, and 5/16-inch threaded rods (see detail, above right). In the photo above, the threaded rods have been fastened to the hanger plates and are waiting for the hollow newel to be slipped into place.*

When this happened to us on a recent job, we decided to fasten the newel by pulling it tightly to the floor with threaded rods connected to the header below (Figure 6). The newel, which was fabricated in our on-site shop, consisted of four 3/4-inch-thick poplar sides with glued miters. A dado was routed into the upper portion of each side, so that a hardwood block could be set into the post during assembly. We glued and screwed a second hardwood block to the subfloor, with four plumbing-pipe hanger plates screwed to its corners. The hanger plates come tapped to accept a 5/16-inch threaded rod. We screwed the rods into the hanger plates, and slipped the newel over them, feeding them through 3/8-inch-diameter holes we had drilled through the hardwood block at the top of the post. We tightened the nuts on the ends of the threaded rods, pulling the newel solidly to the floor. When finished, it was solid as if it had been mortised deep into the framing. We finished the assembly with a decorative cap that could be removed if it ever became necessary to retighten the nuts.

There are many variations on the technique of using tensioning rods to fasten hollow or bored-out newels, just as there are variations on how to fasten solid newels. The bottom line is that if you can't insert the newel into the framing, you should consider the alternatives before installing finish treads and risers. You'll have to figure it out sooner or later, and there's no point painting yourself into a corner. ■

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