On the Job

Retrofitting a Lally Column

by Mike DeBlasio

Many of the old wood-frame buildings in my region were originally built on full-basement masonry foundations with masonry piers supporting the first-floor carriage beam at midspan.

It may seem that a brick pier makes an ideal choice for this task, especially when compared with a decay-prone wood post. But over time, many of these piers have deteriorated in response to the effects of rising damp, which is the movement of ground moisture up through the concrete footing into the brick. Once that happens, salts in the mortar — typically calcium sulphate — can dissolve, leaving a crystal deposit in the pores of the brick. Gradually, the crystals accumulate enough that the pressure inside the pores shatters the brick. Efflorescence — that white powdery calcium dust that appears on the surface of masonry exposed to moisture — is a clear indication of rising damp.

I'm occasionally called on to replace these piers. We often find light-duty adjustable steel columns installed under the beam as a stopgap measure against settling. These columns are not meant for permanent application, and they're not usually placed on a structural footing. So we install concrete-filled Lally columns on top of new poured footings.

I don't like to jack up old wooden beams that have sagged over time. The wood fibers have usually taken a set, making the beam impossible to straighten, if it was ever straight to begin with. Jacking would just crack the beam and the plaster in the rooms above. Instead, we install our steel replacement posts so as to transfer the load without any need to lift the floor system in the process. But simply wedging the plate and post up on a new footing and grouting under the plate won't preload the column, which is critical in avoiding any further settling of the structure.

On the job shown here, we replaced the masonry piers with $3\frac{1}{2}$-inch-diameter Lally columns, as specified by the engineer. Lally columns are typically sold with 4-inch-square stamped-steel base and top plates. Raised lugs help center the plates on the column, but they are only about $\frac{1}{8}$ inch high and don't do much to restrain the column against incidental vibration and movement. So we used "Springfield plates," which are 6-inch-by-8-inch-by-$\frac{5}{16}$-inch-thick steel plates with a 1-inch-high welded collar to accommodate $3\frac{1}{2}$- and 4-inch-diameter columns. We had these welded to 9-inch-by-9-inch-by-$\frac{1}{2}$-inch-thick steel plates, with precise $\frac{1}{2}$-inch holes drilled at the four corners for anchoring to the footings.


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We broke through the old concrete slab and dug holes for 24-inch-by-24-inch-by-12-inch-deep footings. When we poured the footings, we added crossing layers of three #5 rebar for reinforcement, but poured only 7 inches of concrete to begin with.

After the concrete set up (about 48 hours), we temporarily shimmed the base plates level on top of the footings so they would lie flush with the floor slab [1] (previous page). Next, we lag-bolted the top plates to the underside of the carriage beam, centered plumb above each footing [2] (previous page). We used steel washers to shim the plate level on the rough beam surface. Because of the dips in the beam and the general irregularity of the basement slab, each column had to be cut to a different height. To measure, we used two pieces of strapping held together with a couple of C-clamps and slid apart lengthwise to gauge the distance between each top and bottom plate. This method is easy and more accurate than a tape measure, and can be transferred directly to the column to mark the cut.

Lally columns are easy to cut in the field with a large-diameter cutter and a pipe vise [3]. The concrete column core breaks off rough, so we use a $4\frac{1}{2}$-inch grinder with a diamond blade to smooth the ends.

While each column was still held in the vise, we clamped a pair of 36-inch-long 2x4 crossties to it, about 12 inches up from the bottom. I like to make the clamps with Dayton threaded rod, which is used to connect concrete forms. It has a coarse thread that allows the nuts to spin with ease and without cross-threading. To either side of each footing, we stacked 6x6 cribbing to support the crossties and hold the column upright in place, with the top captured in the Springfield plate [4].

For both anchoring and adjusting the base plate, we ran 7-inch-long $\frac{1}{2}$-inch-diameter carriage bolts through each hole, with the heads facing down, like legs, resting on $\frac{3}{4}$-inch washers to help spread the temporary load. With each head centered on the washer, like a pivot bearing, we could precisely position the plate above the slab without deflection from irregularities in the concrete [5].

We fit the base plate under the column and snugged it up hand-tight. (I mentioned earlier that I'd had precise, $\frac{1}{2}$-inch holes drilled through the plates. If the holes had been made larger, the legs would tend to heel over and cause problems with adjustment.)

At this point, we could have used the bolts to load the columns, but that's a slow process. Instead, we used a 10-ton hydraulic pancake jack under the base plate [6] (page 54). The ram part of the jack is only a couple of inches high and has a $1\frac{5}{8}$-inch throw. We checked the column for plumb and slowly applied jacking force. A temporary adjustable post shore placed immediately next to the footing under the beam (and nailed


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at the top to prevent accidental spills) provided a simple means of monitoring the load transfer. As soon as I felt some slack in the shoring post, I knew the permanent column was preloaded. At that point, all we had left to do was tighten up the bottom nuts under the base plate, place top nuts on the bolts, and release and remove the jack.

To finish off the footings, we poured the balance of the concrete within $3/4$ inch of the base plate [7]. Once the concrete set, we dry-packed mortar under the plate. In all, we installed 12 posts on this job without cracking any plaster.

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