Fixing Column Problems from the Ground Up

Creative carpentry and inventive engineering help rebuild two-storey columns for another century.

By George Yonnone and Gordon Bock
Photos by George Yonnone

When Jim Raynor of Lowell, Massachusetts, called me in the fall of 1998, he asked if I would come look at a column restoration project that had intimidated every other contractor he knew, because it went far beyond standard carpentry. I told him I was booked up for a year and that I really specialized in structural work and timber frames, not this kind of project. Six months later, Jim called again, asking me to reconsider. The columns, he reported, were compressing into their plinth blocks, and the roof they supported was settling—signs that the situation was becoming an emergency.

Though the columns were huge and stood 9' off the ground on a porch, the real challenge was figuring out how to repair the damage, which was at the bottoms of the shafts carrying major structural loads. Another puzzle was obtaining materials; you don't simply run into town and buy replacement parts for century-old columns. On the two-hour ride home from the inspection, I had plenty of time to think about the solution. Here's how we addressed some of the problems.

Once the columns were removed from the building, the extent of the damage was obvious. The bottoms of many staves were not only unsalvageable, but also missing wood in some areas.

Getting to the Bottom

The three-storey house, which dates to 1902, is a good example of early Colonial Revival architecture incorporating many fine classical features. It is an impressive house, built by William Henry Sprague, a manufacturer active among the mills in Lowell, who later became a successful banker. Sprague died in 1918, and over the ensuing decades, subsequent owners cut the house up into apartments. As a result, it fell into disrepair.

The area that troubled Jim Raynor the most was the southwest side of the south addition. The bases and plinth blocks of the two columns sit on the first floor of the house and support the roof of the overhead porches. Over time, the bases and plinths had deteriorated severely, leading the columns to compress and the roof corner of the addition to settle. As if this wasn't enough, sometime in the past this deck floor, which formed the roof of the lower apartments, had been covered with sheet metal right over the column bases, captur-

Each of the column staves is connected to its neighbors by T-shaped splines, which also had to be replaced once the repaired stave sections were in place. In the past, each column manufacturer had its own locking system.

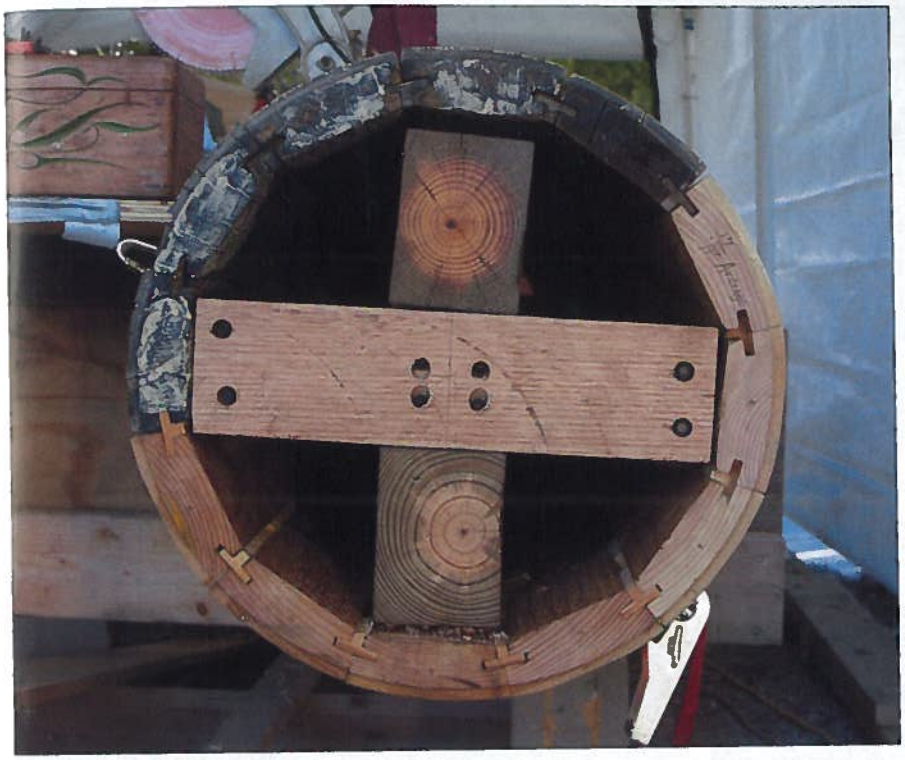
The new stave ends were fabricated to replicate as closely as possible the dimensions of the originals so that they slid into place neatly between existing staves, retaining the structural integrity of the column.

Belt and bar clamps were essential for maintaining the original dimensions and accuracy of the column bottoms as the stave ends were replaced.

Removing the defective wood meant cutting back staves on a 12", 24", and 12" scheme around the shaft so that old and new material would knit together.

ing water in driving rains. As the bases compressed in this saturated environment, the column bottoms got closer to the water, causing them to wick up moisture, deteriorate, and sink more, bringing new wood into contact with the moisture.

This continuing cycle of deterioration was slowly resulting in actual loss of material at the bottoms of the columns, lowering parts of the building as the columns shrank fractions of an inch every year. As part of the overall repairs, it was clear that these two big columns would have to be



Beefing up the post system inside the column included adding two 4x4s as well as a second bar across the bottom to make an X platform.

removed from the building so that we could rebuild their bottoms and return all the mating parts to good condition. The next question was how.

The Real Work Begins

Though figuring out how to remove the two-storey columns from the porch without upsetting the building was an interesting project on its own (and a tale best saved for another time), in essence we jacked the porch roof back up into its proper location and then supported it with a specially constructed screw-jacking system. Next, we tied each column to a line using a timber hitch, a logger's knot, and raised them slightly with a crane to remove them from the deck. Once free of the building, the crane lowered each column to the driveway to be placed in a cradle on the lawn where the real work would take place.

To make the cradle, we traced the top-and-bottom circumference of the two 18"-diameter columns before cutting these half-circles out of two sheets of plywood. When attached to sawhorses, this setup allowed us to support the columns, aligned in opposite directions from head to foot, at working height, where they were ready for closer inspection and repair. Because the work would be ongoing, we erected a pole tent over the columns to shelter them and provide a covered work space during the changeable New England weather.

Each 18'-long column was assembled from a dozen staves made of white pine, with each stave connected to its neighbors by angled splines—thin strips of wood that slide into slots at the sides of the staves. Each stave is very long and fitted together with other staves using staggered joints to form the entire length of the shaft. Once assembled, the whole shaft had been turned to produce a column with pronounced entasis—the gradual convex curving built in at the tops and bottoms of tall, tapered columns to help them appear straight at the sides from a distance.

Once we had the columns under the shelter and fully open for inspection, our suspicions were confirmed. While the tops of the columns were in good shape, there was no wood worth saving on the bottoms, so we planned to repair them by splicing in new material. If we staggered the new stave ends into the column shaft so that the new wood would be interlaced with original wood like locked fingers, the new and old parts would knit themselves together into a structural whole that would be able to carry the structural loads.

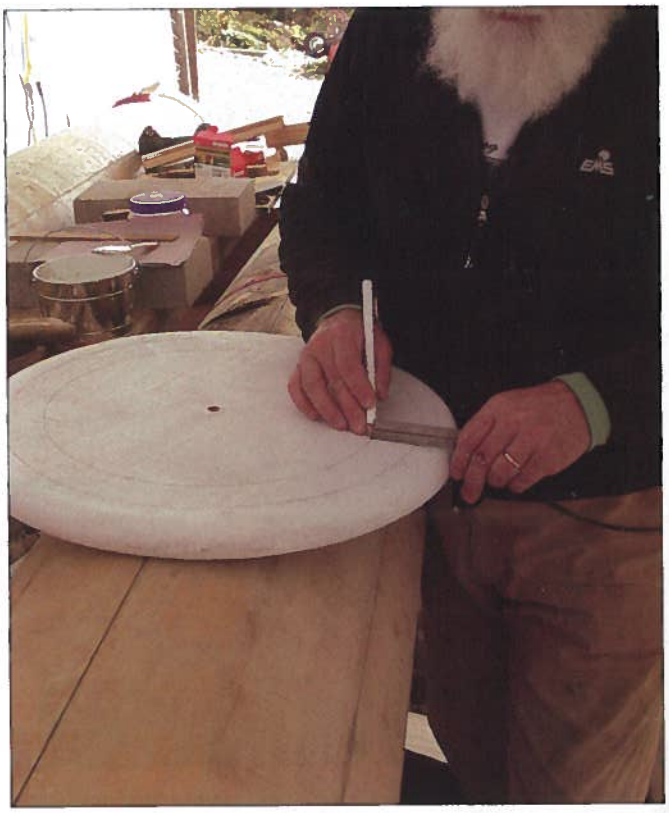
The first step was to remove the decayed wood. Because we needed to leave support material on either side of the new parts, not just remove decay up to sound wood, we decided on a scheme that alternated stave cut-backs between 24" and 12" from the end of the shaft. To sever each stave, I first laid a flexible straightedge across the column and scribed a line. Next, I bored a ⅜" hole to start the cut and then completed it by carefully sawing along the scribed line with a saber saw. Once the stave end was severed, it was a relatively simple matter to pull the defective piece straight out of the column, like removing a piece of tongue-and-groove flooring. I continued around the column in this manner, cutting back every other stave 24" and the others at 12".

Staving Alive

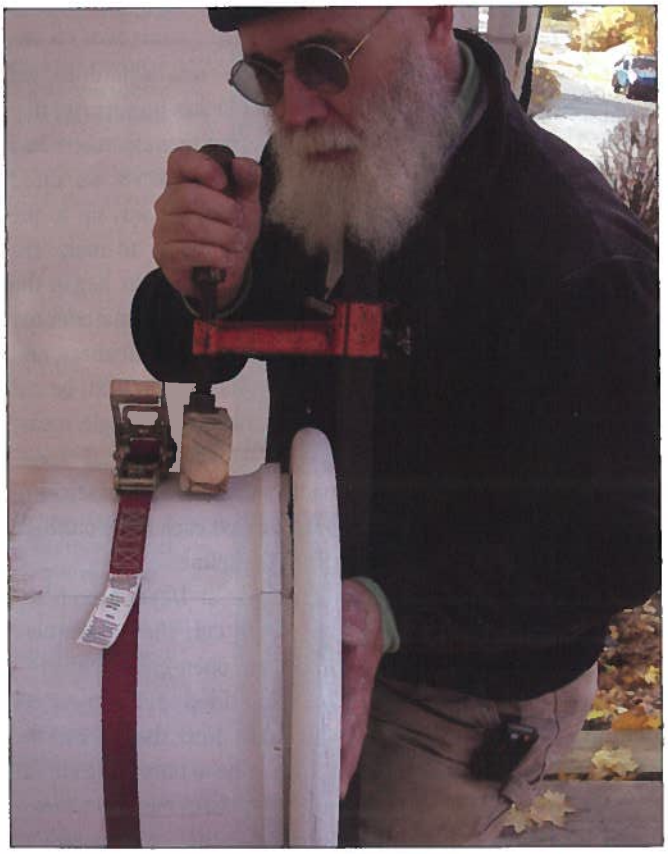
The next question was where to get replacement staves. It was no surprise that phone calls to column manufacturers had proved a dead end. Fortunately, we found a local millwork shop that was up to the challenge of finding a way to make the staves. The owner, Dave Sacco, began the process by first cutting stave material out of pine to the exact width, thickness, and length of the original staves. Next, he cut each stave edge at the original angle, measured from samples of the original staves. Then he made new splines out of sticks of hardwood and slotted each stave on these edges to accept the splines.

Once the folks at Dave's woodshop had all the pieces cut, they assembled them into a rough, open-ended barrel—technically, a 12-sided polygon—held together with straps. Next, they turned the barrel on a large lathe to obtain the curvature of the column shaft, based on measurements of the existing column radius. The columns taper noticeably at the bottom, so Dave also took pains to replicate this taper at this stage. The last step was to

Decay below the column shafts was extensive. The plinths and bases had to be completely rebuilt out of mahogany.



The circular rabbet or channel that was added to each plinth holds the staves together.



Assembling each plinth rabbet onto the column was a matter of carefully coaxing the pieces together with clamps.

The columns, waiting for reinstallation, show a rebuilt bottom with vent holes, next to a top, still in good condition.

shape one end of the barrel in a ½"-thick, square-cut lip designed to drop into the circular rabbet in the new plinths.

With the replacement stave parts in hand, we cut each piece to the correct lengths. To insert a new piece, we tapped it into place working up from the bottom of the column. Then we took newly made splines and tapped them into the slots using a mallet. Because the column staves have to be free to expand and contract, no epoxies or other adhesives were part of the installation process. Though the new staves exactly replicated the parts of the shaft they replaced, there were still anomalies, so we used sanders, an antique compass plane (which planes curved surfaces), and epoxy fillers to blend the old and new wood.

Final Touches

It was our good fortune that the woodshop was game for making the staves as well as the base parts, because these two worked together as critical components. The bottom of each column locks into a channel in the plinth, which not only holds the two in proper alignment but also keeps the staves from spreading. When we had the new bases back from the shop, we placed them on the column ends, scribed the outline of the stave ends, and then sent the bases back to the shop for a final turning of the circular rabbet. Even with careful measurement, there was much testing and fitting of pieces to make the two mate smoothly.

Before the columns were ready to be reinstalled, we took one more step. As built, there was a post composed of two 2x4s running top to bottom inside each column that ended in a block at each end. As a precaution we added two 4x4s to each post to increase its strength. Should the column shaft ever be compromised in the future, these interior posts would now be strong enough on their own to help carry the loads of the porches. Though there was a sufficient ventilation path through the columns the way the house was originally built, we took the same belt-and-suspenders approach when we reinstalled them by adding shims under the bases to increase the vent opening.

Despite the fact that the scope and details of this project were so specific to the building that no one else wanted to consider the work, the basic problems—water leading to wood deterioration in hidden places—are common to many old houses, and something we address every day. If you take the attitude that anything made by humans is capable of being repaired, all you really need is to be inquisitive and creative enough to find a solution.

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Seeing a massive, like-new column deftly lifted into place atop fabricated base parts explains why other contractors passed on the job. The project required not only problem solving and a measure of engineering, but also teamwork among three companies.