BY RACHEL CONLY AND HEATHER THOMPSON

Photo: Ted Cushman

Replacing an Underbuilt Foundation

We are a builder and a designer living on an island off of Portland, Maine, and often work together on custom projects. In a recent summer-cottage remodel, the value of our experience working as an integrated team quickly became evident—especially when things got complicated.

The proposal was fairly simple. The owners of this seaside home, built in 1900, wanted to rebuild a weathered and worn porch from the roof eaves down to the ground **(1, 2)**. We would also enclose a portion of the existing porch to extend the living space, and renovate the kitchen. The house is an existing, non-conforming structure located within 75 feet of the area's high-tide line—in other words, inside the City of Portland's Shoreland Zone (as mandated by state law). Consequently, we were not allowed to expand the building's footprint, and all new construction needed to take place within the home's existing dimensions.

FOUNDATION FACTORS

The house was built on concrete piers. Some of them were obviously tilting **(3)**, and the home's floors were uneven. Clearly, the foundation had moved in response to winter frost action in the clay soils. As a result, the house was hinging at the first floor, toward the beach. So, right from the start, the scope of work grew to include an investigation of the existing concrete piers (which had been replaced once already, improperly, not long ago) to determine whether they all reached 4 feet in depth (as required in Maine) and whether they were set on solid footings.

We knew we would have to fix a select few, but after some digging, we discovered that none of the existing concrete piers extended below the 4-foot frostline. Many were only 18 inches deep. We also didn't find any spread footings under the piers. So, Heather wrote up a change order to cover the cost of replacing every pier.

While the crew dug, we puzzled over soils and drainage. The site is very wet; it


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sits right next to a salt-water bay, with land sloping uphill behind it. Rain and snowmelt create surface flows onto the site, and ever-present groundwater is moving downhill toward the ocean. In rainy periods, the home's small front yard, adjacent to a road that passes between the house and the gravelly beach, gets soggy. In winter, that water freezes into a sheet of ice.

To maintain existing vegetation prized by the owners, digging was limited; our original plan for addressing drainage was to elevate the grade around the house using an "L"-shaped retaining wall and footing. One leg of the "L" would replace the foundation piers along the east side of the house with a poured concrete frost wall footing. The other leg would run along the edge of the road (the downhill side of the property), and serve as a new concrete retaining wall. We would place fill to mitigate ground water and create an uphill swale to divert surface flows around the property. The retaining wall along the road would also help prevent plows from pushing snow onto the property in winter, which exacerbates the problem.

ZONING CONCERNS

Our initial drainage plan hit a snag called "Shoreland Zoning." Creating a swale and adding that much fill to the site would expose us to the city's regulations for a "Level I" site plan review process—and the street-side retaining wall would kick us up into an even more extensive "Level II" review. The dollars were adding up. The proposed work would be costly, even without the additional red tape. Fill is expensive (and everything costs more on an island)—and we would need ancillary survey services.

So, we scaled back and instead decided to install a French drain on the uphill, south side of the property, starting behind the house and extending as far west along the perimeter of the yard as the city would allow without requiring further site plan reviews. Since daylighting was not feasible, without spilling onto the road or a neighbor's property, the French drain would terminate into a drywell.

It is important to note a sub-story here. The original plan (the house scope, swales, and retaining walls) was backed by a wetland specialist and approved by the DEP (Department of Environmental Protection). However, the city has its own formalities and procedures. So, while not the most effective solution, the French drain strategy would have less impact (stripping, grading, grubbing, excavating) on the natural state of the yard and would help us balance performance, cost, and compliance—by reducing the water on site and steering clear of a more costly site plan review, while still meeting environmental standards.

Since the frost wall supporting the home's porch—within the existing footprint—was already approved on all accounts (DEP, Shoreland Zoning, building code), as long as we didn't place fill in the front yard, we agreed to move forward and build that part of the project. If the owners ever decide to invest in the fill and the more intricate drainage system and approval process down the road, that wall is ready to go.

In building the wall, we had expected to hit ledge just a foot or two below grade—at least at the uphill end of the wall. But, it turned out that the heavy clay soil was deep—so deep that we had to dig down to

Photos: 1 & 3, Rachel Conly; 2, Shane Fenton


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below the frostline, build wooden forms **(4)**, pour a spread footing **(5)**, and form up and pour our stepped frost wall **(6)**.

Excavating for that foundation wall made the drainage problem on the site more evident. We didn't have a particularly rainy fall; the puddles you see in the photos are typical at this location even in a light rain. Puddles also indicate tidal and ground water.

WEATHER WORRIES

Peaks Island, where we work, is a vacation destination with relatively few year-round residents. Most of the homes we work on are summer vacation houses. Customers do not want you to build in June, July, or August. So that means most of our projects—and certainly the big jobs—happen in the fall, winter, and spring, and we're always racing to finish excavation and concrete work before a hard freeze. This year, we were lucky: We were able to get the frost wall poured in November, before freezing weather set in. By the time it got really cold, we were decking the new porch **(7)**. Unfortunately, the freezing weather did hit before all of the concrete piers under the house were replaced. The cold weather, combined with the drainage issues, compounded the difficulty of digging and pouring in that low space.

The hard part of pier replacement is digging in unforgiving crawlspaces, which are typical on the island and familiar to Heather's crew. On one crawlspace job, the crew had to cut the handles on their shovels short and crawl on their stomachs beneath the house to get started. This time, we hired a local subcontractor and his crew, who dug

Photos: Shane Fenton


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the piers out by hand, one at a time. That crew also set disc-shaped precast concrete footings in place, 6 inches thick by 24 inches in diameter.

After the holes were dug, water and fine mud seeped into them and then froze. When Heather's carpenters, Shane and Chris, were ready to pour new piers, they had to start by breaking surface ice and pulling it out in chunks, and then pumping out the remaining mucky water. Once that grunt work was out of the way, the job was simple. Shane and Chris just had to drill holes into the footing disks **(8)**, hammer ⅝-inch rebar into the holes, set Sonotube forms over the rebar **(9)**, backfill around the bases of the tubes to stabilize them, and fill the forms with concrete **(10)**.

Working under the floor in the crawlspace slowed things down. It's muddy work: The thick, sticky clay collects on everyone's boots and clothes. Shane and Chris had to mix concrete outside in a portable mixer, then carry the wet concrete into the house in five-gallon buckets, dump the buckets out onto a board next to each tube, and push the concrete mix into the tube with their hands. They plumbed the freshly poured piers under the existing floor frame supports and braced the tubes with 2x6 lumber **(11)**. After the piers set and cure, they'll reframe the posts down onto the new piers.

Rachel Conly is owner of Rachel Conly Design, a high-performance residential design company. Heather Thompson is owner of Thompson Johnson Woodworks, a high-performance custom building and remodeling company. Both are based in Portland, Maine.

Photos: Ted Cushman


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Revitalizing an Urban Row House

BY ROB CORBO

The problem with row houses is usually light. We do a lot of work on inner-city row houses, and these buildings typically only have windows on the narrow front and back sides, so the interiors tend to be dark and gloomy. On a recent project, we were tasked with bringing in as much natural light as possible to the lower two floors of a four-story row house. We accomplished this by opening up the entire back wall on two floors **(1)**. While we expected the process would be similar to past projects (see "Retrofitting an Oversize Door in Structural Brick," Oct/14), this was the first time we had attempted to remove two stories worth of brick. The result of opening up this wall and removing some interior framing did provide what the clients wanted—more light and added "volume" **(2, 3)** for what had been a cramped and dingy interior **(4)**.

When my clients purchased this building a couple of years ago, the existing interior was in rough shape, though not without charm. Fairly elaborate plaster molding ran throughout the upper three floors **(5)**, and part of our task was to save as much of this ornate plasterwork as possible.

As is typical on these older buildings, the floors were out of level by as much as 2 inches over the building's width of 14 feet—a complicating factor that we would have to accommodate when framing in for the new window wall.

OPENING THE WALL

To start, the existing first-floor windows and wall framing were removed, exposing the three-wythe brick wall on the interior side. Next, we carefully removed enough of

Photos by Rob Corbo

the outer brick **(6)** to fit the first structural steel channel for what would eventually be a built-up steel and 2-by flitch-beam assembly **(7)**.

With the outer steel channel in place, the remaining two brick wythes were removed from the inside, allowing us to install 2-by stock and a second steel channel for the flitch-beam assembly. The assembly was bolted together, completing the flitch beam **(8)**. The finished masonry opening was roughly 10 feet wide by 17 feet high.

NEW DRAINAGE AND SLAB

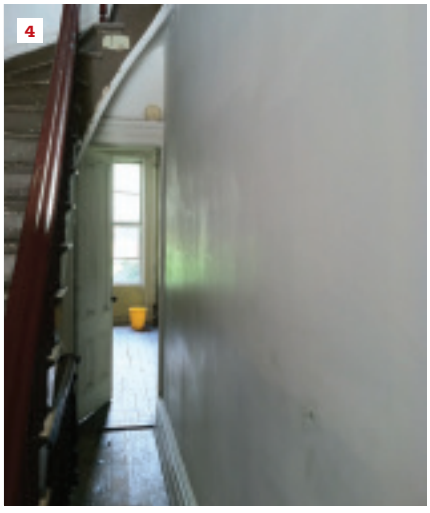
Drainage to keep the grade-level basement dry required new drain lines and a new slab **(9)**. The under-slab prep work consisted of running the storm run-off and wastewater in two separate, parallel lines with check valves to the street as required by the city. We joined them together just before they exited the basement into one line to the city sewer—the storm and sewer lines are still one and the same in Hoboken, N.J.

After the plumbing rough-in was complete, we prepared to pour the new slab by installing compacted gravel, a vapor retarder, rigid insulation, and welded-wire mesh. When it was time to pour, the concrete was off-loaded onto a temporary, site-built chute **(10)**. We had to close down the street for a day for the concrete truck, and this required that we hire an off-duty police officer to keep the peace.

REFRAMING

We started reframing on the first floor. As with most of the row houses we work on, the existing floor framing runs parallel to the front and back walls and is pocketed into the side party walls. At stair locations, the joists are mortise-and-tenoned into a header for the stair box-out. Usually this header is undersized and ends up splitting along the pocketed mortises. To remedy that, we install a new LVL header and re-attach the existing joists with hangers, as we did here **(11)**.

Next, we turned our attention to framing within the masonry opening to receive the new doors. Rather than infilling with a bunch of 2-by stock, we installed a couple of LVLs ripped (we took off about ¾ inch) to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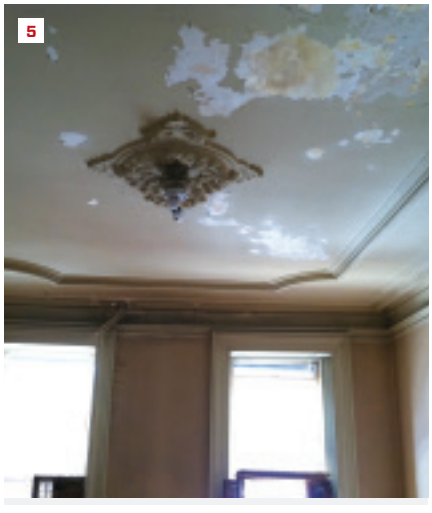
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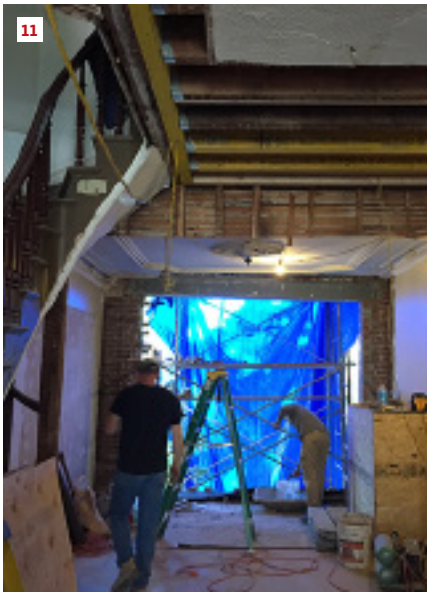
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match the existing joist depth **(12)**. We weren't too concerned about compromising their structural integrity; in this case, the LVL was essentially just blocking. However, the clients are thinking about adding a deck off the kitchen in a year or so, and the LVL should provide good anchoring for a ledger, if they choose to do that.

We installed steel angles to support each end of the LVLs, securing the angles to the brick with lag bolts and shield anchors **(13)**. We then sistered the inner LVL to the existing floor joist and fastened the LVLs together with structural screws.

WINDOW WALL

Starting at the garden level, we began installing the sliders. We had to contend here with the out-of-level first floor, as can be seen in the decreasing series of cripples above the door **(14)**. Normally, we build everything as close to level and plumb as possible. But in this case, the clients were willing to live with the settled floors because they wanted to leave as much of the existing plasterwork in place as possible. And in the end we were able to hide the discrepancy on the exterior.

With the garden-level door installed, we moved on to the kitchen slider. The first-floor ceiling height allowed for an 18-inch-high finished transom above the door **(15)**. This helped bring in more natural lighting.

INTERIOR WORK

On the first floor, we removed an existing hallway and closet separating the living room from the kitchen (see again photo 4, page 32), which contributed to the congested


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feel in the center of the house. We opened up this area, installing an archway at the kitchen entry **(16)**.

Most of the new plaster crown was installed in this central area, though there was quite a bit of patching and rebuilding of existing crown throughout the house.

Plasterwork usually runs us anywhere from $100 to $150 per lineal foot. Our plaster sub typically makes crown molding on site in 3- to 4-foot sections. To form the crown molding, the sub pours plaster into molds, as he does for more complicated profiles, like these with egg-and-dart trim **(17)**. He does this extrusion work on an 18-inch-wide by 6-foot-long table. The sections of crown are butt-joined together and fastened with drywall screws. The seams are then filled with joint compound and sanded. In addition to the molded sections, he also works by hand, extruding the plaster with a knife cut to match the existing profile **(18)**.

To finish the exterior, we applied a "lintel" over the masonry opening to match the existing window heads (see again photo 1, page 30). For this we used a two-coat stucco—a Portland-cement-and-sand-mix scratch coat, set in mesh, with a tinted finish coat. Finally, we installed a temporary Juliet balcony, which will serve as a guardrail until we build the deck off the first-floor kitchen next year.

Rob Corbo is a building contractor based in Elizabeth, N.J.


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