TYING IN A NEW FOUNDATION

Temporary supports become part of the permanent foundation with this simple technique

by Dave Holbrook

Many of the houses I've worked on as a builder on Cape Cod, Mass., date from the mid-1800s. Most of these houses were built on unexcavated ground. The typical foundation of the era consisted of a shallow stone or brick perimeter, quite often with only a brick or two into the grade, and no footing.

These rudimentary foundations are called crawlspaces, but only for lack of a better name, since the clearance under the floor joists is often no more than 6 inches. Because the predominant soil in the area is clean, free-draining sand, it isn't unusual to find one to two-hundred-year old wood in remarkably good condition, dry and relatively rot free (see Figure 1, next page).

Storage space is hard to come by in these smallish houses, with sloped ceilings in the second-floor bedrooms, and access under the ground floor for plumbing, wiring, and insulation nearly impossible. So when homeowners add on, they often want a full basement under the new addition. I've developed a method that allows me to add a full cellar onto an existing on-grade foundation with minimal disturbance to the existing home. In a nutshell, I first excavate and support the transition area on temporary columns. The columns are then encapsulated and left inside the new poured concrete wall that serves as a common wall between the new and the old.

Excavation

On wood-frame one- and two-story houses, there usually isn't an enormous amount of weight focused in any one area, so the materials needed to temporarily support the building are pretty basic. My approach to these jobs is simple: I dig a small hole, knock a chunk of the old foundation out of the way, stick a post under the sill to prop up the house, and move on to the next location.

I typically take my first bite in the middle of the wall where the addition is going. My excavator digs a shallow hole to the bottom of the existing foundation, which is often only about 12 inches deep. After he exposes the footing or timber sill, I jump in to inspect the situation. Sometimes the wood sill is resting on a short brick wall, which usually crumbles away. In one case, the sill was sitting on a short stemwall of site-mixed concrete, which had probably been retrofitted some 60 years ago. I whaled away at the concrete with a 10-pound sledge to judge its condition, and it was as rugged as solid granite. Rather than get into a major battle with a jackhammer, I simply decided to pick up the old concrete along with the building, and incorporate it into the new foundation. Besides, the concrete conformed nicely to the eccentric line of the old sill and floor framing.

Figure 1. Most of the old houses on Cape Cod, Mass., are built close to grade, in nothing more than a hand-excavated footing trench. Because of the stability of the free-draining sandy soil, brick foundations and timber sills have survived intact.

Temporary Support

Once we've established that the sill is in good condition (they usually are), we continue to excavate the first hole down to full-foundation depth. I place 4x8x16-inch solid concrete partition block on its 8-inch face as a pad for the first temporary support, eyeballing to make sure that it's centered inside the footing of the replacement wall. I tamp the block into place to make sure it's on undisturbed ground, then level it up with a torpedo level.

I can now set the first adjustable steel column. Commonly sold at lumberyards under different brand names, these columns consist of two lengths of steel tubing, one fitting inside the other, so that the length can be telescopically adjusted. Two short steel lugs fit crosswise to each other, through predrilled holes aligned in the two pipe

lengths. I always make sure to use both lugs, because using only one might allow the column to buckle (a little caution goes a long way when transferring overhead loads). A cast-iron fitting with a leveling screw fits inside one end, for making final adjustments to the height of the column.

The pair of flat steel plates that come with each column have detents or a stamped ring to center the pipe ends and broaden the bearing surface. The plates also prevent the end of the tube from distorting under load, and provide a pivoting guide to keep the screw centered. There's no top or bottom, but I orient the column with the leveler at the top, rather than at the base, so that it remains accessible for later adjustments (Figure 2).

It helps to have one person hold the top of the column in place under the exposed sill (or the old foundation), while another positions and plumbs the base. After plumbing the column, we tighten the leveling screw, using a wrench to firmly compress the column between the ground and the structure above. With the first column snugly in place, we then repeat the process at successive locations, digging them out one at a time, at about 6-foot intervals.

Because the lifting force at each new column tends to relieve the pressure on the preceding one, I backtrack and adjust the tension on every column to make sure the load is equally distributed. With the excavation along the face of the building complete, I fill in potential weak spots with a couple of extra columns to make sure the entire structure above is well supported.

Returning the Corners

Even if the addition does not run the full length of the old house, we often end up excavating all the way to the corners. Inevitably, the hole always gets bigger than we want it to because of the way the sand slides and caves in. At the corners, we return the footing 2 or 3 feet to provide support back to undisturbed soil (Figure 3, next page). Later the mason will fill in with cor-

Figure 2. Adjustable steel columns on concrete block pads support the building during excavation and concrete forming work (top left). Centered under the old sill, the columns are left in place as part of the new foundation. The screw goes at the top to allow for adjustment after the bottom has been embedded in concrete (top right). The author uses taller columns when the excavation steps from crawlspace height to full height (above).

New Cellar Meets Old Crawlspace

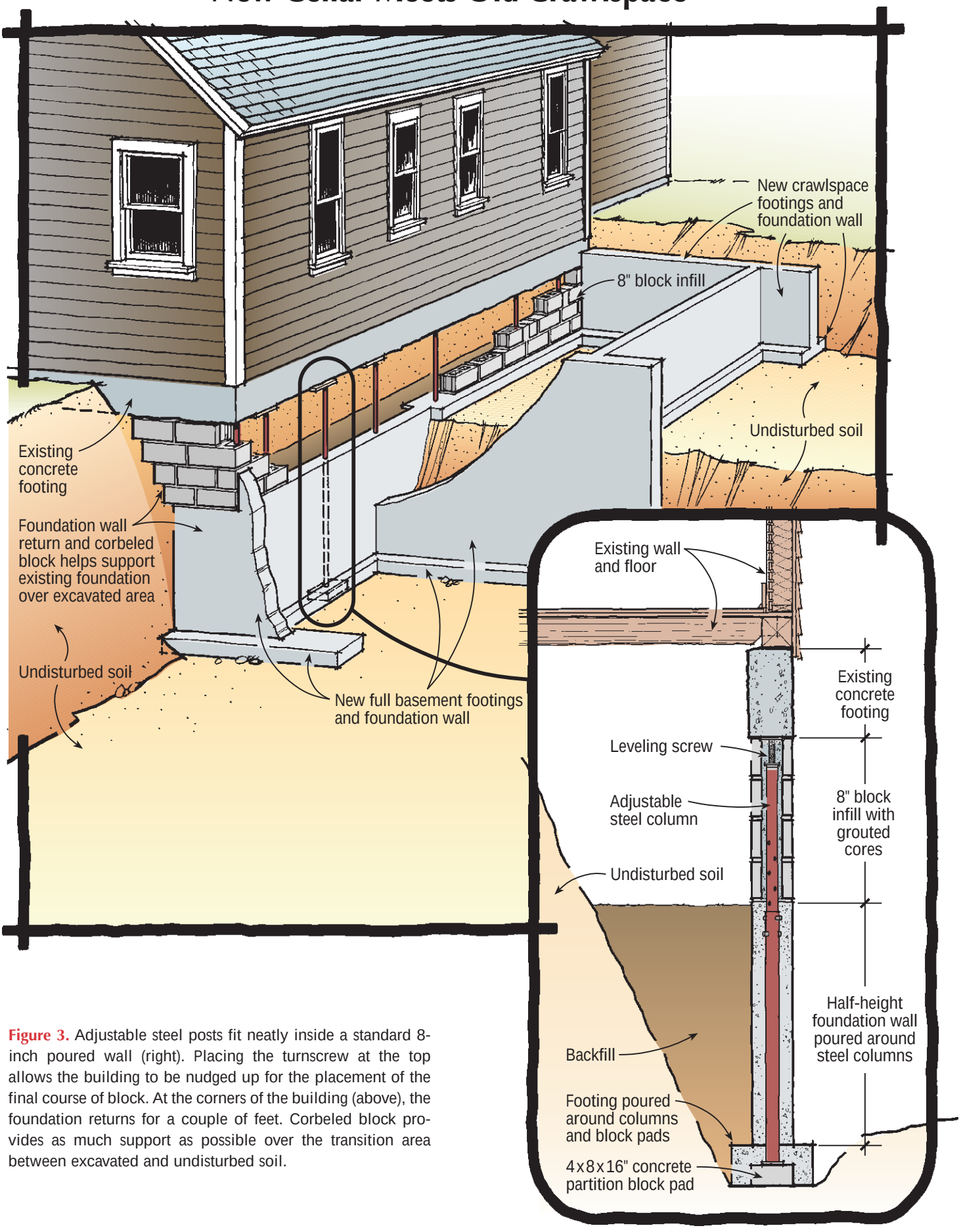

Figure 3. Adjustable steel posts fit neatly inside a standard 8-inch poured wall (right). Placing the turnscrew at the top allows the building to be nudged up for the placement of the final course of block. At the corners of the building (above), the foundation returns for a couple of feet. Corbeled block provides as much support as possible over the transition area between excavated and undisturbed soil.

beled block to support the transition between the excavated and unexcavated areas.

Forming the Footings

Once all of the temporary supports are in place, it's time to form the spread footing. We use 2x10s to form a 16-inch-wide footing centered under the 8-inch-thick wall to follow.

The forms enclose the temporary steel columns, leaving them roughly centered in the footing. We nail on 1x3 spreaders to maintain the form spacing, and shovel sand against the bottom edges to prevent a blowout during the concrete pour.

Once we've got the transition area of the existing house supported, we place an order for concrete delivery on the following afternoon. We then typically spend the next morning setting the footing forms for the rest of the addition. I specify a fairly stiff 3,000-psi concrete mix, with 1 1/4-inch aggregate. (Footings and foundations on the Cape almost never include rebar, but if you use it, now would be the time).

To prevent sand from sliding into the forms during the pour, we cover the tops of the forms with plywood scraps, moving them out of the way as the concrete is placed.

Pouring the Walls

With all of the footings in place, we're ready to set and pour the basement wall forms. I turn the show over to my foundation contractor at this point.

The foundation walls under the new addition are full-height basement walls, and are formed up like new-construction walls. The transition wall between the old and the new structures, however, is usually formed up as a half-height wall, with the steel columns sticking out the top. My mason later fills in the difference with block, burying the steel posts right into the wall (Figure 4). In some areas, the transition wall may only be crawlspace height (around 4 feet), so the mason builds with block from the footing up.

Pouring concrete around the steel supports is no problem: They're only 2 1/2 inches in diameter, so there is plenty of concrete surrounding them inside the 8-inch-thick walls.

A Chance to Level

After the forms are stripped, I'll wait about a week to let the concrete set up. Then I'll go back and use the top of the half-height walls for a jacking platform. Using a couple of 12-ton bottle jacks, two of us work in tandem, lifting the house as needed, a section at a time, to get it as level (or at least as flat) as possible. We use transit readings taken earlier (recorded directly on the wall) and a string stretched at a parallel offset to the rim joist for reference. We jack out as much of the waviness as we dare. You have to be careful and strike a balance: It's better to leave the house a little out of level than

Figure 4. Temporary steel columns are grouted into place as part of the permanent foundation. Gaps in the blockwork provide access and ventilation.

Figure 5. Old meets new at the basement stair landing, on the way down to the full-height cellar (above left) of this addition. On the other side of the wall is the original crawlspace (above right). The excavated area has been backfilled by hand to the top of the poured half-wall. The finished addition sits behind the original house (left).

to wreak havoc with doors, windows, and plaster. It's also possible that in many cases these old houses were crafted a little crooked to begin with.

As we move around with the jacks, we take up the slack with the leveling screws on the columns. We'll typically flex the building up about 1/4 inch beyond the intended final resting point, to allow the closing course of block to be inserted and mortared into place. After the mason sets the final course of block and the mortar hardens, we eased the tension off the leveling screws, and let the building settle onto its new foundation, with the steel columns retired in place (Figure 6).

PT Alternative

On one job, I used pressure-treated wood framing instead of filling in with concrete block. After laying a 2x8 sill over standard anchor bolts in the half-height poured wall, I framed up a short wall up to the underside of the existing floor framing, using 2x8 cripple studs on 16-inch centers. Doing it this way made it a little easier to tie the old building to the new foundation. I used pressure-treated plywood sheathing for lateral bracing, and steel mending plates for wood-to-wood connections.

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