Pressure-Treated Foundation Repair

Where soil conditions permit, a wood-framed foundation may do the job of concrete

Built by the previous owner, the unreinforced block walls of this garage (top) had been pushed in by frost heaves. With cold weather closing in, the author chose to rebuild the north wall, which was only partially below grade, using pressure-treated wood (above). This also made it easier to match the house siding and to install insulation.

by Rick Stacy

Permanent wood foundation (PWF) systems have some advantages for new construction. The cost is comparable to laying up block walls, but a PWF can be erected year-round by the same crew that frames the house. It's also easier to insulate and apply finishes to a pressure-treated foundation.

But those of us in the remodeling end of the industry don't need to feel left out in the cold. Certain types of renovation projects lend themselves to a PWF, as I recently discovered when I contracted to rebuild an attached garage. The garage had been a do-it-yourself project for the previous owner, and the unreinforced 8-inch block walls had cracked and bowed inward severely due to poor drainage, frost heaves, and soil pressure. A recent rainstorm had also burst an interior cistern that was supporting the ceiling, leaving the joists dangling.

Cold weather was approaching, so the deteriorated walls had to be replaced in a hurry. Because only half of the north wall was below grade, I chose to replace it with pressure-treated framing instead of blocks. Soil conditions were suitable (consult an engineer, because this is not always the case), and the homeowner liked the idea since he could easily insulate the wood walls to make the garage into a heated work area.

South Face

While the weather was still cooperating, I decided to get to work on solving the perimeter drainage problems and pouring new footings. After excavating around the walls and bracing the ceiling joists, my crew and I installed a 4-inch perforated drain tile set in gravel. We wrapped both the tile and the gravel in a filter fabric, a method I prefer over using prewrapped drain tile because it is less likely to become clogged with fines. We tied the new drainpipe into the existing house drainage, and laid a new discharge pipe to daylight in the front yard. We covered the fabric-wrapped drainpipes with crushed stone and a layer of straw, ensuring a dry job site for the rest of the project.

At the homeowner's request, we built a veritable fortress on the south and east sides of the garage, where the old block walls were built into the hillside. Before starting the demolition, we jacked up the roof about 1 1/2 inches and installed a temporary wall. As we removed the old 8-inch blocks, we restacked them against the hill, creating a crude retaining wall about 2 feet from the original building line (see Figure 1). We filled the cores with crushed stone, which made the blocks that much more solid and prevented any of the topsoil from settling. In addition to solving the block disposal problem, this makeshift retaining wall was surprisingly effective in holding back the hillside, which had a tendency to slump during rainstorms. The wall also kept dirt from contaminating the crushed stone backfill that we placed full height against the new block wall.

Buttressed wall. We reinforced the existing footers with new concrete, and built a new wall using 12-inch blocks with horizontal wire reinforcing at all joints and a #4 rebar in every core. At every third block, we substituted a 16x16-inch chimney block, forming a series of supporting buttresses to counteract the thrust of the hill. We reinforced each buttress with four pieces of rebar and filled the entire wall with concrete.

Although we removed 2 feet of roof above the new wall to gain access to place the rebar and pour the cores, the working space was too small to install standard J-bolt anchors. Instead, we drilled holes in the sill plate and dropped

Hybrid Foundation

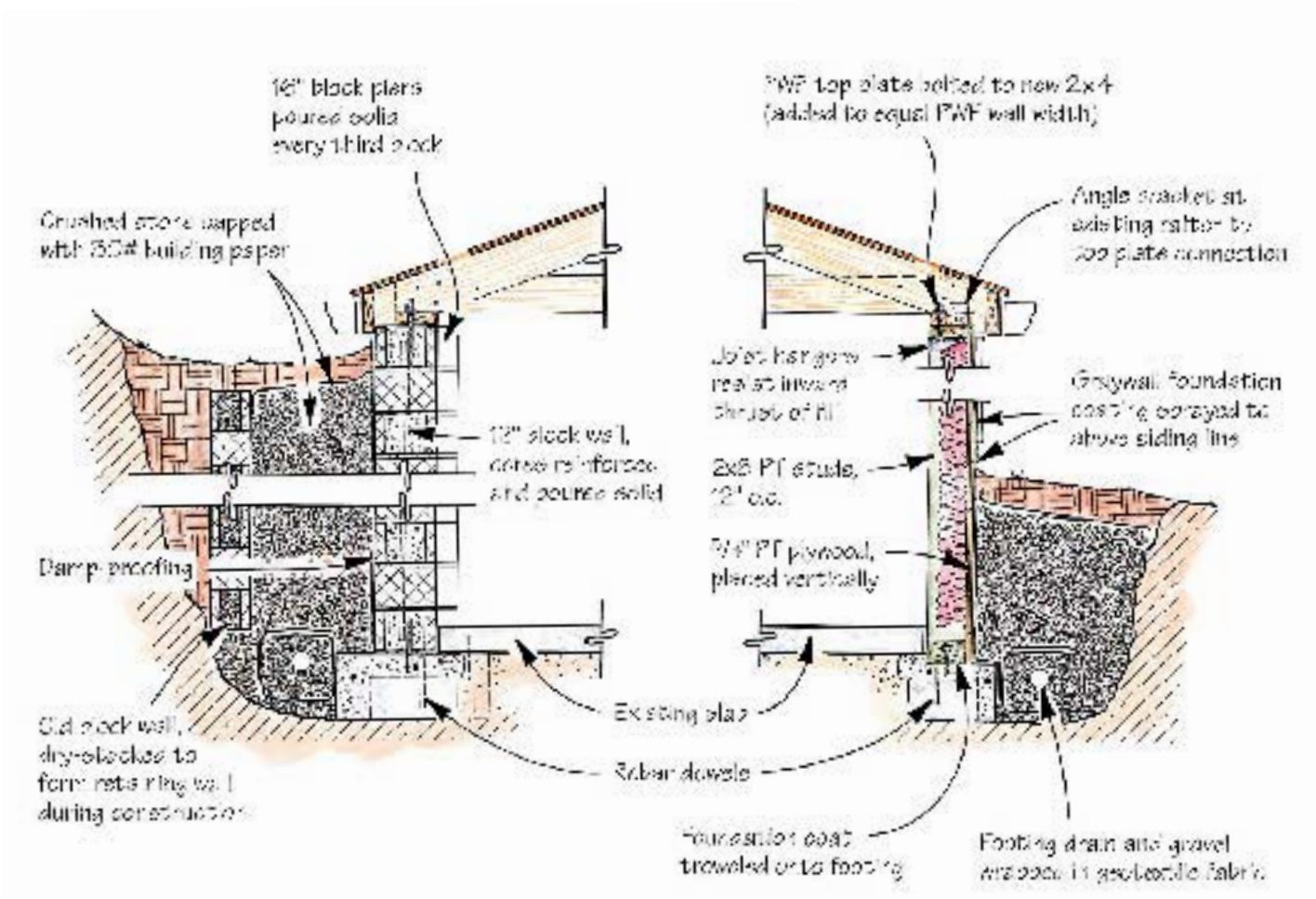

Figure 1. Blocks from the demolished south wall, at left, were restacked to form a makeshift retaining wall several feet away from the building, providing working room and keeping soil from contaminating the drain tile. The new 12-inch block wall was reinforced with a series of 16x16-inch chimney block buttresses. A PT foundation was chosen for the north wall, where there was less soil pressure.

5/8-inch threaded rod through into the wet concrete. The rods were suspended from the plate with a nut and washer, which we tightened after we lowered the roof back into place. Just before setting the last course of block, we stapled foam sill sealer to the bottom of the sill plate to ensure a tight seal.

North Face

The north side was where we planned to use the PWF system. After renailing all of the ceiling joists to the rafters, we jacked up the roof and supported it from the ceiling joists on a temporary wall built about 2 feet in from the exterior wall. Since the upper part of the existing wall was wood, we left it in place so we could close up the garage with a few sheets of plywood and heat the building as we poured the new concrete.

Concrete vs. gravel footers. PWFs have traditionally been built over gravel footers to ensure adequate drainage under the wooden plate. The gravel also prevents the sill from wicking moisture, a common problem with concrete footers. Although the existing concrete footers needed reinforcing, they were already in place, so I felt it made sense to use them instead of gravel. I also liked the idea of a wall sitting on something more substantial than a gravel base. Besides, keeping the sills in place on a gravel base is little tricky, whereas sills can be firmly anchored to concrete footers using galvanized anchor bolts.

Before setting any forms, however, we drilled all of the existing footers and pounded in #4 rebar dowels. We then laid two horizontal rebars in each trench, running the ends into holes drilled into the existing basement foundation. We tied the other ends to the protruding dowels to lock the footers together (Figure 2). As further protection against moisture, we spread trowel-consistency foundation coating along the edge of the slab and on the footers prior to bolting down the pressure-treated plates (Figure 3). To keep groundwater away from the wood wall, we laid drain tile just below the top edge of the footer.

Figure 2. In the new footings, horizontal rerod was tied both to the basement foundation and to pins drilled into the existing slab.

Figure 3. A trowel-applied foundation coating keeps the PT sill from wicking moisture from the footing.

Framing

We built the walls using 2x8s on 1-foot centers, fastened with hot-dipped galvanized nails. To save on cost, we used standard grade lumber for headers and top plates that would be at least 8 inches above the finished grade. All below-grade lumber was pressure-treated, and any cut edges were field- treated with preservative.

We doubled the stud next to the existing basement wall, bolting it in with several concrete anchors and isolating it from the concrete with foundation coating. To resist the inward thrust of the fill, we used joist hangers to fasten studs, jacks, and cripples to the top plates and to windowsills (Figure 4). The hangers weren't necessary at the bottom, since I'd designed the footer height low enough so that the studs were locked against the existing slab.

We applied the plywood vertically, keeping any cut edges above grade. Horizontal runs of plywood would have required blocking at the seams. According to the *Permanent Wood Foundation Design Manual* (available from the Southern Forest Products Assoc., 504/443-4464), hot-dipped galvanized nails are permitted for fastening plywood that is 8 inches or more above grade; stainless steel fasteners are recommended everywhere else. I used stainless steel screws because they were easier to obtain from local suppliers. We were careful not to overdrive the screws in the treated plywood, to avoid exposing the untreated inner layers. Overdriving screws also cre-

Approved PT Lumber

Obtaining lumber approved for a foundation system usually requires making a special order. Most lumberyards only carry pressure-treated lumber with a preservative retention rating of 0.4 pounds preservative per cubic foot (pcf) of wood. But lumber for use on foundations should have a pcf retention of 0.6 pounds.

When buying wood for a PWF, check the treater's stamp and be sure it bears the notation "C-22." That's the number of a standard created by the American Wood Preservers Assoc., 3246 Fall Creek, Grandbury, TX 76049; 817/326-6300) to cover foundation-grade lumber. Locally, that kind of wood can be as much as twice the price of in-stock, 0.4-pcf pressure-treated lumber.

ates little craters that are tough to cover later with spray-on foundation coating.

We sealed the joint between the new plywood and the existing basement wall with a bead of tar. (A rubberized sealant would have been a better choice. Tar-based products may be incompatible with the rubberized coating we used on the wall's exterior.)

After the wall was plumbed and braced, we lowered the roof. I was worried that the narrow sill to which the rafters had been attached would not resist the thrust of the soil, so we beefed up the existing sill by sistering a new 2x4 alongside it. This increased the width to match the top plate of the new 2x8 wall. We fastened both sills with 16d nails about 16 inches on-center, then bolted the new top plate on 3-foot centers. We finished the connection with angle brackets where the rafters met the existing sill.

Figure 4. Joist hangers were used at the top of studs to resist the thrust of the fill (above). The PT plywood was run vertically, to avoid the need for blocking (left).

Closing Up

Choosing a foundation coating proved to be one of the more difficult decisions on this job, since there's very little research available on anything besides polyethylene sheeting. I was against using poly film because of the added expense of finishing the exposed portion of the wall to blend in with the existing structure. Our final decision was to use Graywall rubberized coating (Rubber Polymer Corp., 1135 W. Trail Extension, Akron, OH 44313; 800/860-7721). I felt that, from a distance, this coating would be visually compatible with the house's existing block foundation (Figure 5). And since this coating is more flexible and crack-resistant than tar-based products, I felt it would work well with the new pressure-treated wall. Despite the lack of research on Graywall's long-term performance, the product's inventor and two foundation coating contractors all assured me that it had been used successfully on PWFs.

Jeff Easterling, vice president of marketing at the Southern Forest Products Association, had advised me to provide good drainage and to prevent any moisture from becoming trapped between the foundation coating and the plywood. Since we backfilled against the wall with gravel all the way to grade, then sprayed the Graywall high enough to be covered by the finished siding, I felt the wall was adequately protected against moisture problems.

The Graywall applies easily enough, although it runs if it's sprayed on too heavily. A few runs that would have been ugly in the above-grade areas smoothed out a bit as the coating cured. The manufacturer recommended a three-step process for coating plywood: First, shoot the seams with a coat of Graywall, then add a layer of geo-textile material to the seam after the first coat is tacky; finally spray the entire wall with more Graywall compound. (The company also makes a caulking mastic for use on the seams.)

The Graywall coating must cure thoroughly before backfilling, otherwise it might be damaged. The fill must also be well compacted, because later settling can tear the rubbery membrane. To prevent damage from sunlight, we sprayed all of the exposed Graywall with a clear, UV-resistant coating called Rub-R-Proof, also made by Rubber Polymer Corp.

Insulating was one of the last steps to completing the job. We held the batts up off the baseplate a couple of inches to allow for air circulation. When the wall is thicker than the insulation, install the batts toward the exterior of the wall cavity to prevent condensation on the sheathing. It's also a good idea to place a vapor diffusion retarder over the studs before installing the interior wall finish.

Figure 5. To prevent leaks, the author coated below-grade PT plywood with a rubberized coating, then sprayed it with a clear UV-resistant finish.

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