Lowering a Basement Floor

Gaining an extra foot of headroom isn't easy, but it can yield valuable living space

by John Sylvestre

Lowering a basement floor is as difficult as it sounds. First you have to figure out how to support the existing house. Then — after all the finishes have been removed and all the mechanical systems disconnected — comes the fun part: breaking up the slab, excavating dozens of yards of dirt by hand, and underpinning the existing footings. But for clients with a small lot and limited space to expand, it's sometimes the most practical way to add substantial square footage.

On a recent project, we lowered the basement floor by 15 inches, bringing the ceiling height from a marginal 6 feet 8 inches to a full 8 feet. This gained over 800 square feet of usable living space without increasing the home's 24-foot-by-36-foot footprint.

Why only 15 inches? That is typically about the height of two stair risers, which meant we didn't have to relocate the basement stair opening. We also avoided lowering the sewer line, which could have added considerable expense.

Steel Supports

In the original basement, a low-ceilinged family room shared space at the front of the house with a large utility area (1, 2). Replacing the existing furnace and water heater with new sealed-combustion appliances (which don't require flues through the roof) allowed us to dismantle a masonry chimney at the foot of the stairs and move the utilities to the rear of the

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house, next to the laundry area. This created a more logical floor plan and helped enlarge the new family room space. To minimize the need for supporting columns and bearing walls, we planned to support as much of the first-floor system as we could with new steel beams **(3)**.

After removing the wall and ceiling finishes and mechanical systems, we established the final finished floor height. We marked the five interior pier locations, then worked down from this benchmark elevation to establish the top and bottom of the footings.

Before we could excavate for the footings, though, we needed to break through the slab at these locations with a rented jackhammer **(4)**. Later, the concrete sub's crew would finish breaking up the floor and get rid of the debris, but for now, all we had to do was dig five 31-inch-deep holes (15 inches for the floor drop, 4 for the new concrete floor, and 12 for the depth of the new footings). Once the interior footings were in place, we installed the new steel columns and posts and got ready for the next phase — floor removal and excavation.

Excavation the Hard Way

There's no easy way to remove concrete and soil from a 900-square-foot basement — it has to be done by hand. Fortunately, our excavation and concrete sub, John Boyer, wasn't scared off the project and understood the difficult site restrictions.

Part of the reason we were dropping the floor was to minimize the impact we had on the site. Early on, we considered raising the house instead, but dismissed this option because the first-floor level was already nearly 4 feet above grade. With a newly poured driveway on one side of the 40-foot-wide lot, a deck and spa area in the back, and a landscaped parking bay in the front, there was only a small section of yard available for staging material and operating the skid steer **(5)**.

Boyer's crew broke up the rest of the slab floor with their jackhammer, then hand-loaded the debris onto a rented 26-foot-long portable dirt conveyor (Multilift, 800/821-9966, ezliftconveyors.com) **(6)**. Available in different lengths and with 14-, 18-, and 24-inch-wide belts, these machines can be placed at a 30-degree incline and have a capacity of up to 90 tons per hour. We ran the conveyor up through a hole in the block wall that was destined to become a new basement egress window.

Once it was out of the basement, the debris was picked up by the skid steer, loaded on a truck, and hauled away. The three-man crew then shoveled out another 17 to 18 inches of soil

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(approximately 50 cubic yards), a process that took three days of hard work **(7)**. This gave us our 15-inch drop, with an extra 2 inches for the foam insulation that we would install underneath the new radiant slab.

Underpinning the Foundation

Because we were dropping the basement floor lower than the perimeter footings, we had to underpin the existing footings with additional concrete. This meant removing another 12 inches of soil from beneath the entire perimeter of the house. To make space for that extra soil, the excavating crew dug a large hole in the center of the floor.

We wanted to be sure the foundation walls were properly supported during the underpinning process, so we worked in short sections, starting in the corners **(8)**. We were fortunate that the existing soil was a sand-clay mix. Although it's harder to dig, clay tends to hold its shape, which simplified the formwork. We formed and poured the lower part of each section first, using a standard footing mix and laying in #5 rebar as we went. After allowing the concrete in that section to set, we packed the gap between the old and new footing with nonshrink grout to make sure there wouldn't be any settling. Then we added the upper form boards and poured the upper part of the footing, using the nonshrink grout instead of standard concrete **(9)**.

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After forming and pouring the corners, we continued the process in alternating 6-foot sections around the perimeter, placing the rebar so that it extended past the ends of the forms **(10)**. As we filled in adjacent sections, we tied the rebar together to create a continuous monolithic footing. Since we had to chip away part of the old footing to gain access for pouring the concrete, we formed the new footing to maintain the original 20-inch footing width **(11, 12)**.

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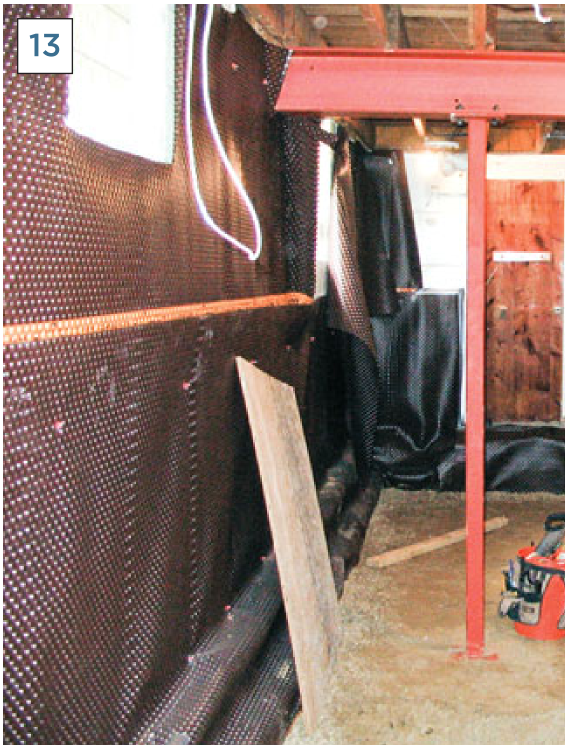
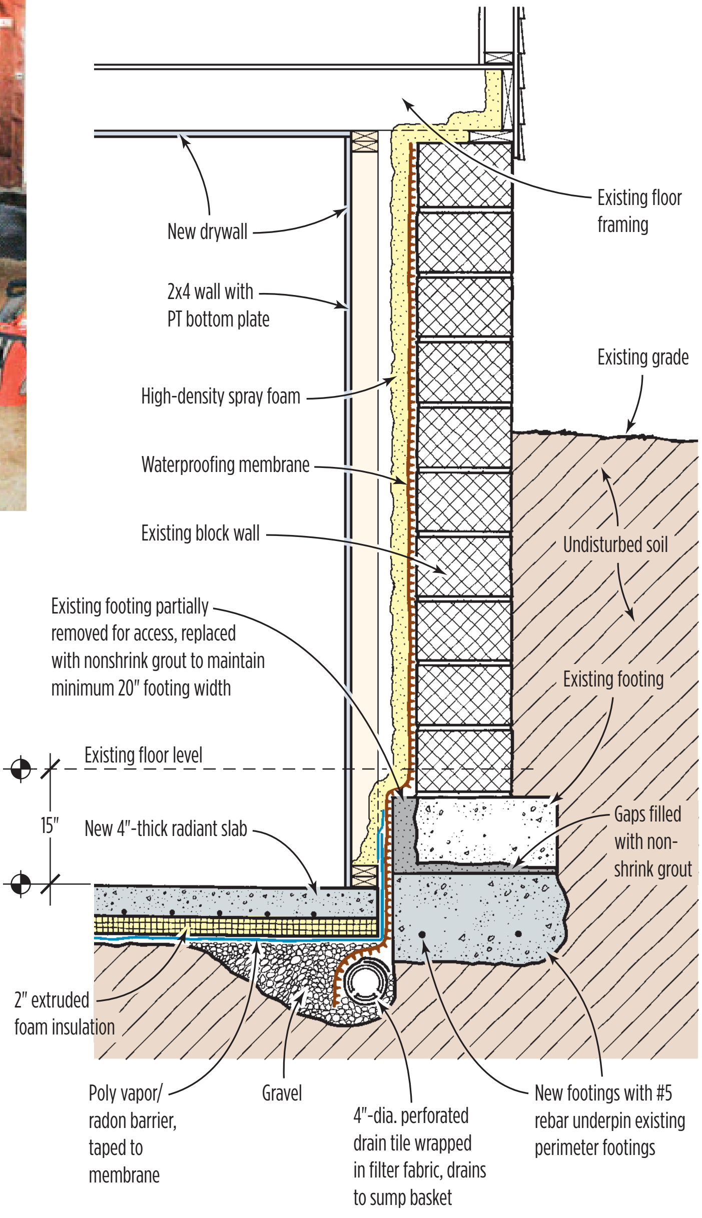


Underpinning and Waterproofing Details

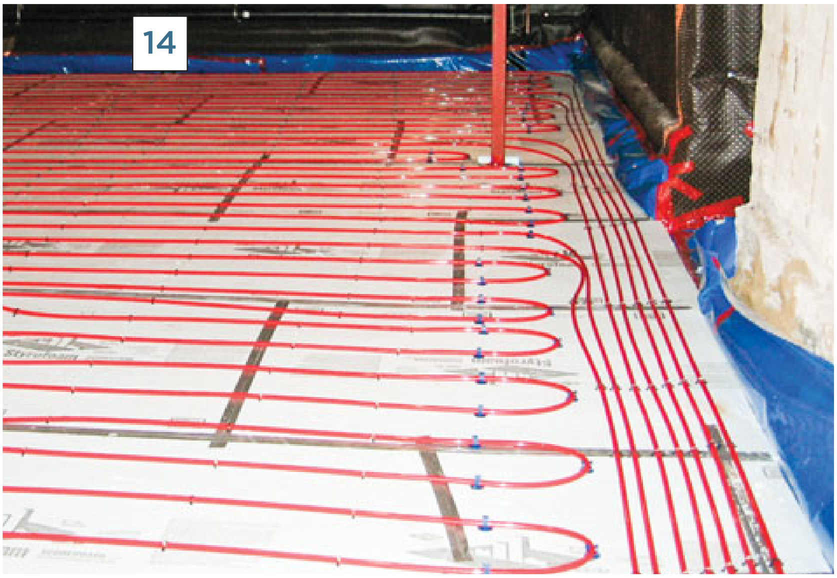


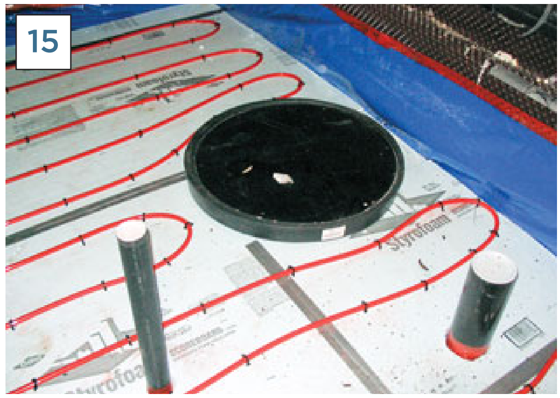
New concrete footings formed beneath the existing ones made it possible to drop the basement floor 15 inches. A dimpled waterproofing membrane fastened to the interior face of the foundation wall and lapped over the new perforated drain tile provides an escape route for trapped moisture.

Waterproofing

One of the biggest concerns in any basement project is below-grade moisture. The existing block wall had already proven to be reasonably dry, so we focused our efforts on managing water that might penetrate the blockwork. First, we installed an interior perimeter drain-tile system, which is easy and relatively inexpensive when there's no slab floor to deal with. The 4-inch-diameter perforated drain tile is wrapped in a filter fabric and encased in gravel, and it drains to a sump basket.

Next, on the interior of the basement walls, we installed Delta-MS waterproofing membrane (888/433-5824, deltams.com). Designed for exterior use, the high-density polyethylene membrane is impermeable and has a dimpled pattern that permits water trapped against it to drain freely (13). The material is reasonably flexible, so we could form it snugly over the steps in the footings. Any moisture trapped between the block wall and the membrane will drain into the perimeter drain tile.



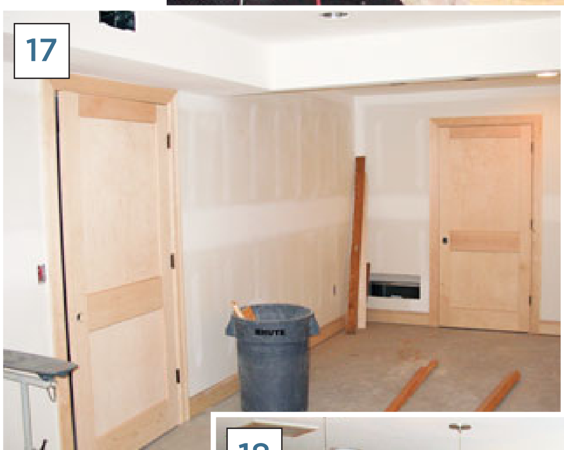


Radiant Slab

Removing the existing slab created a great opportunity to install a radiant floor, a nice upgrade in Minnesota's cold climate **(14)**. Before installing the slab's poly vapor barrier and 2 inches of rigid foam insulation, we trenched and plumbed the new basement sump **(15)**.

After the 4-inch concrete slab was poured, we framed 2x4 walls around the perimeter, placing them far enough in from the block walls to clear the steps in the new footings **(16)**. For wall insulation we went with high-density spray foam, which is ideal for basement jobs because of its low vapor permeance and high R-value.

From this point, the project became a typical basement remodel **(17)**. When we were finished, our clients had a new basement bathroom and laundry area and a spacious new family room **(18)**.



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