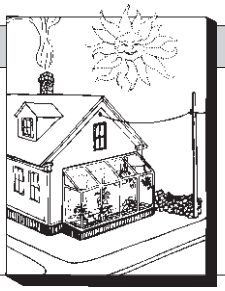
Foundation on a Truck



by Chuck Silver and Terry Brennan

I recently had the opportunity to try out an innovative foundation system. As with many new building systems, I was eager to use it in the right situation, but reluctant to step outside the comfortable circle of my experience. In this case, the client was interested and excited about the option, and willing to try it.

The system is a pre-fabricated, panelized foundation system called "Superior Walls." It was developed by Advanced Construction Technologies, Inc. (537 South Main St., Nazareth, PA 18064). The foundations are custom-made in a factory to your building's specs, and arrive at the site on a flat-bed truck with a crane to assist in assembly. It is purchased "assembled on site," so the only thing the contractor is responsible for is initial site preparation.

What attracted me to the system was the rapid assembly, cost-effectiveness, and ability to achieve R-25 with ease. I had my share of reservations: The system uses no footings and relies on a high-tech caulk to seal between panels. I was also dreading the reception I was likely to get from local building code officials.

Concrete-Stud Panels

The panels are cast in a factory in standard heights of 4 feet, 8 feet 2 inches, and 10 feet, and lengths up to 18 feet, subject to the limitations of getting them to the site. Each panel has roughly the same components as a typical sheathed wood-frame wall, except that it is made of steel-reinforced 5,000-psi concrete instead of wood. The "studs" are 2 1/4 x 6 3/4 inches, 2 feet on-center. They have a strip of pressure-treated lumber set into the face so that drywall can be fastened conventionally.

The "sheathing" is comprised of a 1 3/4-inch-thick concrete skin, and a 1-inch layer of Dow Styrofoam (blueboard), which runs continuously behind the concrete sheathing, creating a thermal break from the studs. The top plate is actually a bond beam and serves to carry the loads of the joists to the nearest stud. At the bottom of the wall, the heavy bottom plate acts as a continuous footing, making conventional footings unnecessary.

What, no footings? Forget about code approval, you might think. But the system has pretty good credentials. It has approval from Building Officials & Code Administrators International (BOCA), and has been accepted by both the Home Owners Warranty Corp. (HOW) and the 2-10 Home Buyers Warranty.

Specifics

Window openings are made at the factory by putting a piece of foamboard into the form to hold back the concrete skin. The panels we received were disappointing in this regard. Little care was taken to assure that the foam was square and placed level, and it showed. The factory that produced our panels was recently franchised, and had only done about a dozen jobs before this one.

Beam pockets are cast into the panel as needed, and a "bolting saddle" is cast into the top and bottom plates wherever two panels are to be joined in the field (see Figure 1). Outside corners are mitered, with a section relieved to receive an inside corner nailer. Inside corners are lap-joined and attached with angle-iron sections and bolts. Access holes of 1 1/8 inches are cast into the studs to simplify plumbing and wiring, and the top plate has holes cast in it on 2-foot centers for bolting the sill plate to the foundation.

Figure 1. *Installers join Superior Walls panels with bolts at the top and bottom. A cast-in "bolting saddle" reinforces the joint.*

Site Preparation

The contractor is responsible for excavation and installation of the 1/2-inch crushed clean stone (4-inch minimum) and perimeter footing drains (at least 8 inches outside the wall) to daylight or sump pump. The drainage system is essential for the system to work. The stone must be leveled to within 2 inches by the contractor; Superior will take it from there.

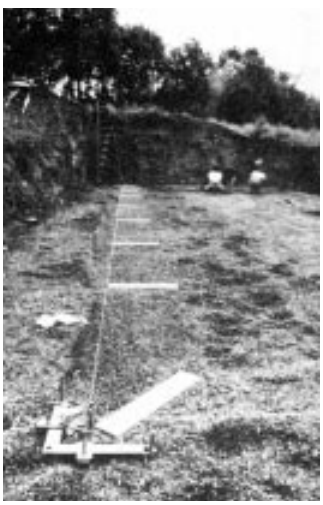


Figure 2. *Superior's foundations start out on a 4-inch-thick gravel pad with perimeter footing drains. The 2x4 blocks shown in the photo serve as screeds to accurately level the setting bed.*

On our job, the garage was in the basement, so there was a large section of foundation wall above grade. Normally, we would pour such a wall 4 feet below grade to rest the foundation on material that wouldn't see frost. With the Superior Wall system, however, the "frost wall" is simply a trench filled with gravel, drained to daylight.

One more thing: The walls are delivered on trailers up to 48 feet long with a total weight of up to 75,000 pounds. The access road to the site must be able to accommodate this (not freshly backfilled, not muddy) if you don't want to witness a catastrophe of biblical proportions.

Assembly

When the crew from Superior arrives, they lay out the building in string, and begin leveling the stone. Two-foot-long 2x4 blocks are set into the crushed stone along the perimeter of the foundation. The blocks are set perpendicular to the walls and would define the top of a 2-foot-wide continuous footing, if there were any poured footing (see Figure 2). A laser level is used to set this blocking, which serves as a screed to level the 1/2 inch stone. Once the stone is meticulously evened to the tops of the 2x4s, they are removed and the recesses carefully filled with stone. The result is a 2-foot-wide, accurately leveled base to set the panels on. This part of the operation takes one to two hours, depending on the accuracy of the initial site work.

Next, the crane carefully places the sequenced panels along the perimeter. The strings have been left in place, and the walls are set right against them. A bead of polyurethane sealant is applied between panels, bolts are inserted into the bolting pockets on the grade beam and footer, and the bolts are tightened, drawing the panels together. The sealant is then applied to both the interior and the exterior of the seam (Figure 3). It is smoothed and feathered, making a waterproof joint.

Figure 3. *A crane lowers the concrete wall panels which are placed carefully against layout strings. The miter joint shown, and all other vertical joints, are sealed with polyurethane caulk.*

Figure 4. *After setting the panels in place, it's time to pour the slab. Note the cast-in-place concrete studs with wood nailers on their interior faces.*

Setting panels on our job took about four hours to complete. The tops of the panels were checked with a 6-foot level. If the stone is leveled accurately, and no one accidentally disturbs it, the panels will be level. It's a good idea not to have too many people wandering about, because walking on the stone "footings" can throw the panels off. As you can imagine, if one panel is off, the process is severely slowed down.

Finishing

After assembly you're done with the Superior crew. The next step is to pour a slab (Figure 4), add the sill (Superior recommends adhesive and anchor bolts), and build the floor deck. When you've done this, the top and bottom of the wall are adequately braced, so you can backfill. Until the deck is on, the longer walls have some flexibility, so reference measurements may not be accurate. In the first and last joist bays that are parallel to the panels, blocking must be installed on 4-foot centers to lock the top of the foundation wall.

Superior Wall claims that no waterproofing is required since 5,000-psi

concrete is waterproof and the joints are sealed. I felt like it would be cheap insurance, but the client was willing to forego the waterproofing.

On the inside, the concrete studwall can be conventionally insulated with fiberglass batts for a nominal R-25. Vapor retarder and 1/2-inch drywall complete the system.

Other Considerations

Because the panel has Styrofoam exposed in the interior, code will require in basements that 1/2-inch drywall be applied to eliminate the potential fire hazard. Although finishing the basement may be simplified with this system, it cannot be put off until later because of this requirement. Since the system is likely to create a stir at your local building department, Superior Wall can provide an engineer's stamp on the foundation plan (for an additional fee).

The one-inch Dow foam, which isolates the concrete's studs from the sheathing, does not extend into the top and bottom plates. This means there is a thermal bridge in these areas unless special measures are taken to avoid it. Below grade, this can be done by gluing some Dow foam on the outside along the base of the wall before backfilling. This area, however, is sufficiently backfilled, is not as critical for heat loss as the area above grade. At the top plate, things are a little trickier. If the building is to have exterior foam sheathing, the foam can be brought down the face of the panel to hinder this short-circuit and, at the same time, seal the pesky air leak between foundation and framing. If the building is not going to have exterior sheathing, the walls could be "kicked out" an inch beyond the deck to permit the flush installation of foamboard outside the first-floor deck and extending down over the concrete bond beam.

If neither of these solutions are appealing, you can add some foam in the interior. Many basement ceilings are dropped anyway to conceal duct6work and plumbing, so the foam wouldn't show. If none of these options is appropriate, you can just decide to accept an uninsulated 2-inch band at the top of the foundation wall.

The Bottom Line

The foundation installed on our job cost about $40 to $45 per lineal foot, counting the trenching, stone, and site prep. Locally, 8-inch reinforced poured walls are running at exactly the same price, including footings. The accuracy of the work was also about the same: within about 3/8 inch in height and within 1 inch on the diagonals. I had hoped for better.

As with any foundation system, comparisons should be based on the total system-insulated and finished if that's the plan. For instance, if you were planning to build a block or poured foundation with an R-25 wall, you would have to add (and protect) 5 inches of extruded polystyrene or build an interior studwall to accommodate 8 inches of fiberglass (if such a size was available) or 5 1/2 inches of fiberglass and 1-inch extruded polystyrene or 3 1/2 inches and...you get the idea. With the Superior approach the stud bays are already part of the system, saving the cost of studs and the labor to install them. In addition, scheduling is simplified in that the foundation is completed in less than a day, and not time is lost waiting for the mason to arrive.

These advantages are comparable to those of the all-weather wood foundation. the main difference in my neck of the woods is that customers are not open to the idea of a wood foundation. ■

Chuck Silver designs custom homes, and Terry Brennan consults on energy design. They currently run training seminars on energy-efficient construction for the New York State Energy Office.