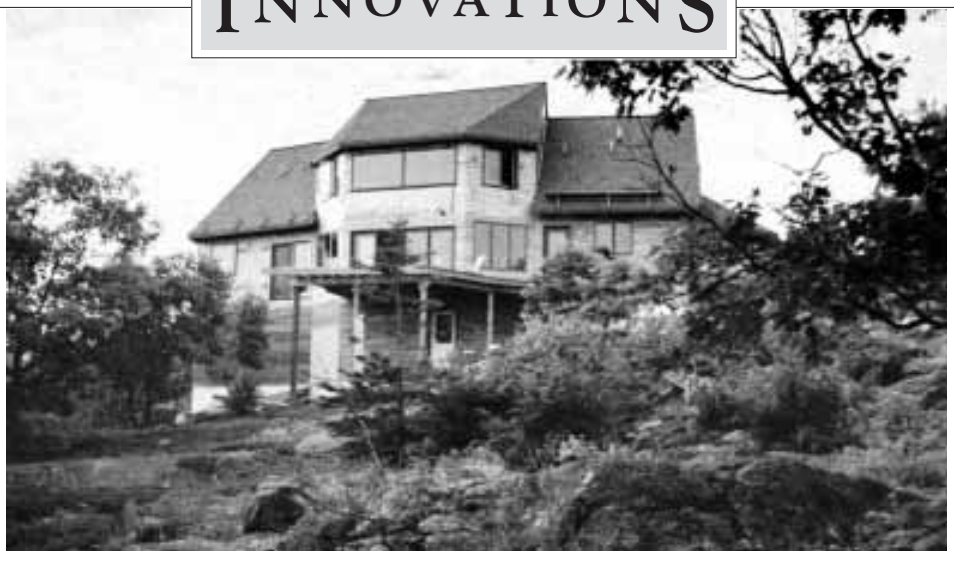

FOAM-CORE BLOCKS OFFERED THE CHEAPEST WAY TO BUILD THIS 17-SIDED FOUNDATION ON SOLID ROCK

Building to Ledge with Foam Forms

by Kevin Codraro

It's hard to imagine forming a foundation with rigid foam blocks, which when filled with concrete provide a structurally sound R-20 wall.

As a builder I have been intrigued with this type of product, particularly due to the high cost of conventional foundation forming where I live in Bar Harbor, Maine. Because Bar Harbor is a granite-bound island, you have few opportunities to dig a standard foundation hole, pour a footing, and start forming up walls. Foundation formwork is costly here even on easy sites.

Stone Site

I had a chance to try out foam forms in November 1988 when my wife and I started building our own home. The site consisted of a thin layer of "blueberry sod" over an irregular granite base. The problem was compounded by a foundation plan that called for 17 wall angles, only two of which were 90 degrees. The house plans were developed on my drafting table over several years and I was very committed to making them a reality.

Estimates for our foundation ranged from $17,000 to $24,000, well out of our budget range. After a bit of research on alternative forming products, we made a decision to go with CreteCore Foam Forms (PO Box 25456, Rochester, NY 14625; 716/248-3919). We considered other similar products (see "Sources of Supply"), but among the regionally available products, CreteCore seemed the easiest to use.

According to the product literature, you pour a standard footing and then stack the tongue-and-groove EPS (expanded polystyrene) foam blocks. They stack up in much the same manner as concrete block, but without the mortar joints. Once stacked, they are braced in accordance with the manufacturer's recommendations and poured with a pump truck (see Figure 1). The bracing required — every 8 feet, both vertically and horizontally — is considerably less than with conventional forms.

Figure 1. *To prevent rupturing or dislodging the foam foundation blocks, a builder uses a 2-inch hose from a pump truck to shoot concrete straight down into the core.*

The blocks measure 4 feet long by 16 inches high by 11 inches wide, and are made of a 1½-pound-density EPS foam (see Figure 2). They are available with wooden nailers on one or both sides for strapping for drywall or sheathing. Each block weighs approximately 4 pounds and has a surface area of 5.33 square feet. It takes one yard of concrete to fill ten blocks. The blocks run about $12 each, delivered.

Engineered Layout

Our desire for a full basement without the extra cost of blasting led us to build over an abrupt elevation change in the granite. This amounted to a 12-foot cliff, which fortunately faced south. By pushing the house out over the edge of the cliff and keeping the back wall of the house on the edge, we managed to get nearly a full basement.

After excavating the thin layer of sod and cleaning the granite, we hired an engineer to plot out the 17 points that marked the corners of the house.

Figure 2. *When filled with concrete, these polystyrene foam blocks provide a structural R-20 wall.*

This was done by submitting the foundation plan to the engineer who, with the help of his computer, calculated the angles and distances from a reference point to each corner of the building.

At the site, the engineer selected a reference point, which was simply a convenient spot where he could set up his transit, and established a relative location for this point by measuring to one fixed corner of the building. With these two points located, he could then shoot the angles and measure off the distances. For this he used a high-tech transit, actually a theodolite, with an *electronic distance meter* (EDM). This "transit with a brain," as he called it, shoots an infrared beam at a prism, which reflects the beam, and "reads" the distance. While I held a stick with the prism on top over the approximate location of our corner, the engineer

Figure 3. *Since the author was building over solid granite, he chose not to use a spread footing, but to scribe the blocks directly to the ledge. The planks are temporary supports to keep the unfinished form from blowing over. The close-up view shows the wooden nailers on the inside face for drywall.*

directed me right, left, forward, back, etc. until the EDM verified each corner. I marked each corner with a star drill and then a circle of orange spray paint. The engineer cost us $100, a few cups of coffee, and about two hours — well worth it considering that every corner was a different elevation on the sloping granite.

Scribing the Block

I decided not to pour a footing as this would mean scribing 200 linear feet of wooden form for both the inside and the outside edge of the footing. Instead we scribed the blocks directly to the ledge (see Figure 3). The granite would provide the best footing and the numerous crevices, cracks, bumps, and depressions would provide an effective key to the granite.

Despite the irregularities in the rock, I still wanted to pin the foundation to the ledge because of the steep slope. But in our situation, we were able to make use of a natural shelf that rose up along the back edge of the foundation. By driving short pieces of rebar into the lip of this shelf and through the rigid foam blocks, we formed an effective hook to keep the foundation from sliding down the hill, without using conventional pins.

We scribed the block in two steps — rough and finish. For the first step we shot every linear foot of the foundation wall, inside and out, with a transit. This gave us the myriad changes in elevation (every point was different) which we noted on a graph-paper sketch of the foundation plan. The grid on the paper marked the one-foot increments of our transit readings. We transferred these marks to each block and cut them with an old pruning saw. EPS foam cuts quite easily with a handsaw.

For the final fit, we had to hold each rough-trimmed block in place as level as we could, and scribe the contour of the ledge. Using this technique, two workers scribed the base blocks to the ledge in about four days.

Then it was just a matter of laying up the remaining whole blocks to the wall height and bracing off the foundation. We used horizontal rebar with every course and double vertical rebar at every corner. The average height of our walls was about 4 to 5 feet. For an average wall height of 8 feet, the manufacturer recommends that 5/8 inch (#5) rebar be installed vertically the height of the wall in every core.

Our bracing was a little jumbled because of the uneven contour of the bottom course. With a level footing, a horizontal 2x4 is laid along each side of the bottom course. Vertical members are then nailed on and braced back to stakes in the ground. Without the footing to work from, we had to improvise. We attached vertical supports every 5 feet with wire through the foam. We then nailed diagonal cross bracing to the face of these uprights and used 2x scraps for blocking between the diagonals and the face of the foam blocks (see Figure 4). A pneumatic nail gun worked well to shoot on the diagonal braces without shaking apart the unpoured wall. Vertical corner braces were prefabbed out of 2x6s and wired on the inside and outside of each corner. Since we couldn't drive stakes, the top of each vertical support was braced back to crevices in the surrounding ledge, or weighted down with stones.

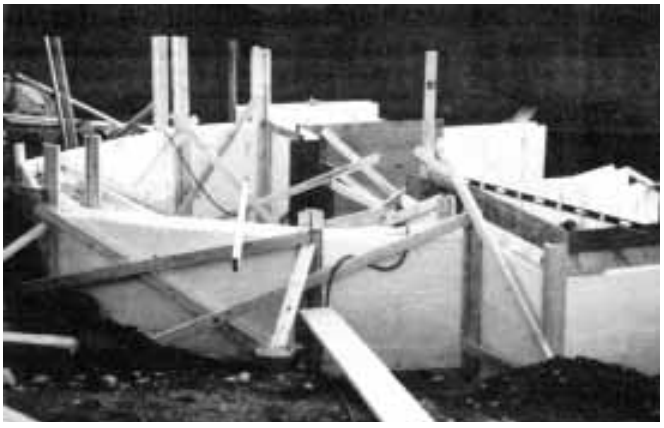

Figure 4. *The bracing required for the foam forms is considerably less than for conventional concrete forms. Here, the author supported the foam forms with vertical 2x4s every 5 feet, braced back to the ledge, with diagonal 2x4 cross bracing in between.*

The Pour

We were now ready to pour. It is imperative that a pump truck be used since it can deliver the concrete directly above each core in the blocks. To prevent rupturing the forms, it is important to make several passes around the foundation with the pump boom, filling only two courses at a time. With a hydraulic boom, the pump truck can pour the entire foundation from one spot, and the hose will shoot straight into each core. By contrast, the chute on a ready-mix truck directs the concrete against the sides of the blocks, which can force the foundation out of plumb.

As the blocks fill, you should compact each column of concrete by pushing a stick up and down to eliminate any air pockets. Screeding the top level and placing anchor bolts completes the job. A couple of days later the foundation braces are removed and you are ready to begin building. The blocks are laid tongue up, so if you screed the top just below the one-inch tongues, the protruding tongues provide a sill sealer when the plate is bolted down.

You backfill as with any other foundation after the perimeter drains are laid. The exception here is with waterproofing, which is done by laying a

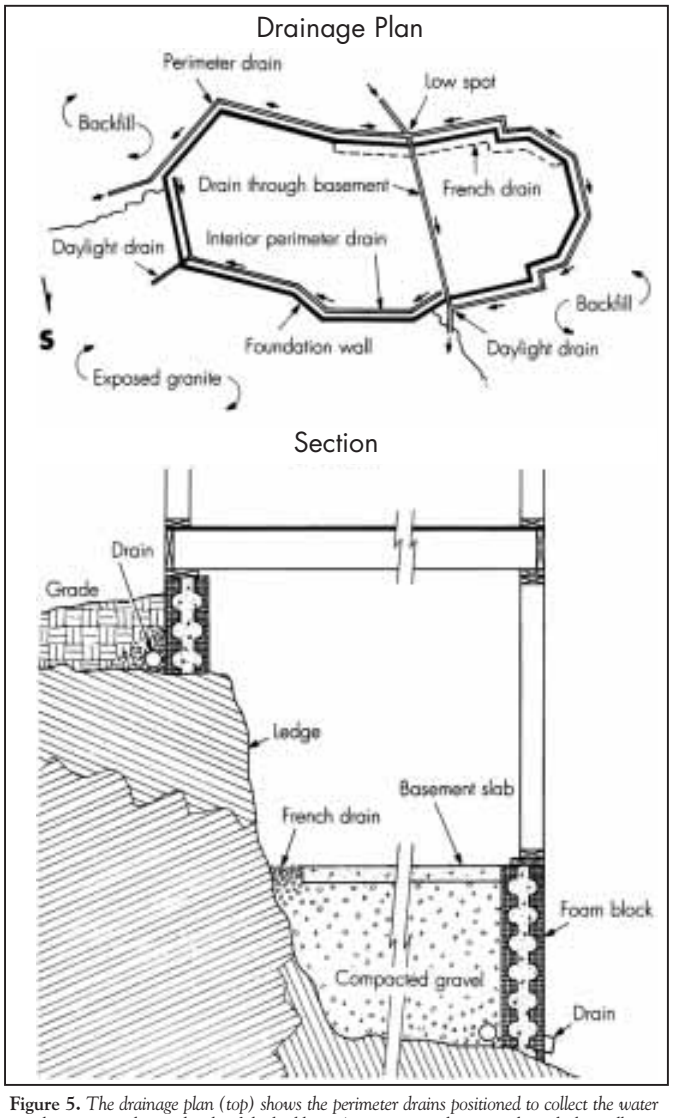

Figure 5. *The drainage plan (top) shows the perimeter drains positioned to collect the water at a low spot on the north side of the building. A pipe carries the water through the wall, under the basement slab, and out the other side to daylight. To drain the exposed granite inside the foundation, the author installed a French drain, used plenty of gravel under the slab, and installed perimeter drains on both sides of the foundation wall (above).*

heavy poly (6 mil minimum, preferably 40 mil) under your perimeter drain and up the wall to grade. Using a caulking adhesive that's compatible with the foam, you attach the poly to the foam blocks, then backfill, taking care not to disturb the poly.

The above-grade portion of the foundation can be coated with a stucco. There are several products on the market specifically designed for application to foam. I used a two-part Conproco system. As with most of these stucco-over-foam products, I had to tape the joints with fiberglass mesh first. I also found that I had to do an entire wall section at a time to get consistent color between batches.

Drainage

Water tends to follow ledge, so we were concerned about drainage. We used lots of gravel under the slab and installed perimeter drains. On the high side of the foundation, the perimeter drain is outside the foundation wall, covered with backfill. Along the exposed, south wall, the perimeter drain runs along the interior of the foundation wall (see Figure 5).

We have a low spot on the high side of the foundation, which collects water. So rather than try to divert the water away, we pitched the perimeter drains to collect the water at this low spot. A pipe carries the water through the wall, into the basement, and out the other side, as shown in the drainage plan in Figure 5.

Inside the basement we had a section of exposed ledge, which we surrounded with a "French drain." This is simply a 6-inch gravel-filled trough between the exposed ledge and the slab. Any water that seeps out of the ledge will be channeled under the slab and out through the interior perimeter drains.

Builders Can Build Forms

The completed foundation supports a 3,200 square-foot, two-story house on one of the highest sites on the island, at a net cost of $6,500, which includes all materials, $1,000 for the pump truck ($95 every 15 minutes), and my labor at $15 per hour.

It is my experience that builders, in general, are much more proficient at squaring, plumbing, and leveling than concrete formers are, and can produce an excellent foundation. Many of the concrete contractors I spoke to who had used similar foam forms complained that the blocks exploded during the pour. In all these cases, the wrong slump concrete (too wet), and the lack of a pump truck with the hydraulic boom, seemed to have caused the problem.

In our pour we never had a single rupture. The key is to follow the manufacturer's recommendations, use your head, and above all, use the pump truck.

If you order a pump truck with a load of concrete, the supplier should send the mix out at about a 3- or 4-inch slump. Don't ask the driver to add water to speed up the pour. While the pump is expensive, filling up the forms gradually is a lot faster than having to deal with a blow-out.

Since building my own foundation, my company has successfully used the foam blocks to pour insulated slab as well. By simply backfilling around the outside of the form, you create a mono-pour slab with a thickened edge for bearing. ■

Kevin Codraro is the principle of Sarah Abigail Associate Builders Inc., of Bar Harbor, Maine.

Sources of Supply

The following companies also manufacture foam foundation forms similar to the ones described in this article:

3.10 Insulated Forms
PO Box 46790
Omaha, NE 68128
402/592-7077

CTS-ConForm Inc.
1640 S. Claudina Way
Anaheim, CA 92805
714/533-3661

Outwater Plastics Industries Inc.
4 Passaic St.
Wood-Ridge, NJ 07075
800/631-8375

PDQ Building Blocks
PO Box 395
Pablo, MT 59855
406/675-2525

Reddi-Form Inc.
250 Canal Rd.
Fairless Hills, PA 19030
215/295-8884

RVG/TWS Inc.
PO Box 261
Chatham, NY 12037
518/392-3407