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SPRING 2017
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The upper courtyard and garden of Quarry House, protected from Connecticut seacoast winds, offer an intimate place to sit, says architect John Tittmann. The home, which sits on a granite ledge, was built by Brian Maresca of Guilford, Conn.

LAYING THE GROUNDWORK

Building a foundation on a challenging site takes planning, patience, and a collaborative attitude

By Susan Bady, Senior Editor

The most desirable custom-home sites usually pose challenges that make for arduous foundation work. Conditions such as steep slopes and rocky soil, along with seismic and other code requirements, affect foundation design and construction.

To ensure that foundation costs don't get out of hand, it's essential for builders to get together with architects, engineers, and trade contractors early in the process. Different strategies may need to be considered before arriving at a solution that is both cost-effective and achieves project goals. And, the plans must be shared with clients as soon as possible to alert them as to how excavation and foundation work will impact the budget.

Rick Larson, owner of Montare Builders, in Littleton, Colo., estimates that foundation work for the home featured in the sidebar on page 46 added 5 to 7 percent to the budget. The lower-level auto showroom accounted for approximately 40 percent of the total budget, but had it been built at the same time as the main house, it would have cost 20 percent more.

"The main house and the showroom were split into two separate projects," Larson says. "Before breaking ground, we did a very detailed, itemized cost breakdown that described everything, so we were all aware of the costs going in."

Earthwork in Colorado's rugged terrain can be unpredictable, he says. "You never know what you're going to hit when you start digging, and a soils report doesn't indicate the hardness of the rock. We had to do quite a bit of excavation and couldn't blast the rock in that particular neighborhood, so we just chipped away at portions of it."

In addition to meeting weekly with a local architect, Larson also has weekly meetings with a structural engineer while the foundation is being planned. "Sometimes we consult with the engineering team on a daily basis, depending on what we run into and the unknown conditions that can occur," he says.

DESIGN AND CONSTRUCTION

RIGHT: A second-story-level window tucked into a dormer on the south side of the house draws direct southern light into the north-facing living/dining area.

BELOW, RIGHT: Large brackets support the roof of this cantilevered outdoor dining area.

PINNED TO SOLID ROCK

Quarry House is a two-story, shingle-style home on the Connecticut seacoast that rests on a sloping shelf of solid granite, known locally as ledge. While it may seem imprudent (if not impossible) to build a home on ledge, it's nothing unusual for Guilford, Conn., builder Brian Maresca.

Blasting ledge is prohibited in that location, so Maresca "pinned" the house to the rock. "We're pretty used to pinning [houses] to solid ledge," Maresca says. "There's a lot of it on the shoreline, where we build most of our homes." The foundation was exposed around the perimeter where it meets the ledge, meaning that the footings built on top of the rock are basically leveling pads that had to align perfectly with the walls above. Maresca says the actual pinning isn't difficult: "You drill holes with hammer drills and anchor short pieces of rebar in the holes with epoxy."

The real challenge was to prevent flooding, since there's no way to keep rainwater from running down the ledge. At the low end of the slope, the basement is high enough to accommodate mechanical equipment; the rest is a crawlspace.

"After the footprint was marked out, we waited for a heavy rain and observed where the low points or collection points were," Maresca says. "Then we put drains made of perforated PVC pipe through the footings at those points, so any water that accumulates under the slab will run out." A layer of crushed stone under the slab creates a drainage plane. Maresca sprayed closed-cell foam on the crushed stone and on the foundation wall up to the subfloor, then poured the slab. "It makes for the driest basement ever," he says.

The slope was a significant driving factor in the design, says John Tittmann, partner with Albert, Righter & Tittmann (ART) Architects,



PHOTOS: ROBERT BENSON PHOTOGRAPHY

Since rock blasting is prohibited in the area, Quarry House was pinned to the ledge with rebar footings that protrude a minimum of 8 inches. All slabs are on a substrate of crushed stone with closed-cell foam insulation sprayed on it and up the foundation wall to the subfloor. The weep holes are 2-inch PVC pipe.

in Boston. "We wanted to put the parking as high as we could without making the driveway unpleasant, and allow enough space for cars to get in and out [easily]."

Tittmann created an arcade from the parking area to the house. "You walk along a courtyard with an inner garden, which creates a positive experience, then you get to the living level, which is fairly close to the main living areas," he says. The living/dining area, kitchen, and master suite are on the first floor, with guest bedrooms above. The home is organized around two courtyards: the arrival/parking court and the upper courtyard, which is a south-facing garden protected from the wind. On the west and north sides, the house sits on the edge of the rock and "is sort of cantilevered off in space," Tittmann says. "You have this feeling of being part of the marshlands and coastal life." On the inward-facing side of the house, there's an intimate, private courtyard where it's possible to sit and listen to the birds.

Respecting the shape of the site, Tittmann made the 3,392-square-foot house long and narrow running from north to south. He determined that the best views were at the north end, where he created a double-height living room with large windows facing north and east. "North light is really wonderful because it's even; there's no glare," Tittmann says. The room also has a high window that faces south and is tucked into a second-story dormer so that it blends in seamlessly.

In his 37 years as a builder, Maresca has never given a client a contract price; he works on a cost-plus basis and provides an estimate that he agrees not to exceed. The technique he used to pin Quarry House to the ledge took precision to execute and added four days to the schedule. But when all was said and done, Quarry House came in exactly on budget. "It was a dream collaboration between architect, builder, and client," Maresca says.

