Perimeter-Overflow Negative-Edge Pool with Beach-Entry Spa

By Mason Guarino

Fig. 1: Stone underlayment along with the reinforcing bars penetrating out of the first phase of construction so the second-phase pool section could be tied in correctly

Fig. 2: Elaborate reinforcing required by the pool design as we start the second phase of shotcrete

A Camden, ME, home sat alone at the end of a long driveway with little to no property features other than the surrounding forest floor and an elevated view of the ocean. But that was slated to drastically change when the homeowners asked South Shore Gunite Pools & Spas, Inc., to work with their architect and builder to install a spectacular pool. The land had a natural slope to it and, with the ocean view, created an ideal venue for an architectural masterpiece. After some meticulous design and planning to incorporate the project into the natural Maine landscape, the pool concept was complete. The pool would have a negative edge toward the forest side and a beach entry on the house side. The pool design kept the water level with the pool coping and decking around the pool. The final product would have a very dark, natural look to it.

The difficult part was creating the drawings—detailing how to best build the pool to last in the harsh Maine climate with everything functioning correctly. Freezing winter temperatures required a significant foundation constructed with dry-mix shotcrete and clean, crushed stone. The complexity of the pool required it to be constructed in specific phases; the first phase included the negative-edge portion, followed in the second phase by the remainder of the pool (Fig. 1 to 3). The negative-edge feature, including the spillway wall and trough, needed to be constructed first to create a deep footing that would reach below the frost line. In the first mobilization, the trough area was excavated to the required depth and then over-excavated on the pool side to allow us room to construct forms. For the future, well-draining fill material was required under the pool. After excavation, extensive plumbing was installed, followed by form erection and placing of the pool shell reinforcing steel, and then shotcreted with dry-mix shotcrete. Some of the reinforcing steel in the trough wall extended out from the wall to allow for subsequent tie-in with the pool floor.

Next came the pool itself. After the trough and spillway wall were completed, the pool floor area was backfilled with free-draining crushed stone that would prevent any water buildup and potential heaving due to the freezing winter temperatures. Everything within 4 ft (1.2 m) of potential exposure to freezing air temperatures was filled with crushed stone or dry-mix shotcrete, as frost heave does not just affect horizontal sections of the pool but could also impact vertical sections that line the spillway. The pool had a shotcrete perimeter gutter that would later provide the overflow and deck-level water capability. Two pockets on either side of the beach-entry area were constructed to hold natural rocks from the surrounding property to help the pool blend into the landscape. After initial curing and once the pool shotcrete reached the required strength, the boulders were installed. Shotcrete was placed around the boulders to secure them in place (Fig. 4).

The complexity of the pool structure created sections located from well below the frost line to right at and above the frost line. This required extensive structural design, resulting in a lot of reinforcement. The reinforcing steel consisted of two layers of No. 4 (No. 13M) reinforcing bar in the entire pool. The horizontal reinforcement spacing was 8 in. (203 mm) on center and vertical spacing was 6 in. (152 mm) on center. During shooting, a blowpipe was used extensively to keep the outer layer of reinforcing bar clean and prevent any rebound from building up on the bar surface, where it would reduce the quality of the in-place concrete. Overall, with the multiple phases, the shotcrete portion of the job was completed in 5 days.

The customer wanted to have the negative-edge wall act like an aggressive waterfall. Producing the waterfall effect required high flow rate demands that also affected water turnover. Based on the length of the perimeter overflow, the calculated flow rate required to create the waterfall effect was 740 gal./minute (350 L/s). This high flow was provided by a 10 hp pump outfitted with a variable-speed drive to allow for increased energy efficiency and control. The main feature plumbing lines were 8 in. (203 mm) polyvinyl chloride (PVC) to smoothly convey the substantial volume of water. With the high flow rates needed for the waterfall, conventional 2 in. (50 mm) pool returns produced too much turbulence for the vanishing-edge waterfall effect. Thus, additional main drain-type fittings were installed at the bottom of the pool to supply the high-flow-rate return water with minimal disturbance on the pool surface for the vanishing-edge waterfall. There were also multiple main drains for suction and additional drain-type fittings used as inlets. A buried precast concrete surge tank was also used to ensure that an adequate volume of water was available at all times. To blend with the natural Maine surroundings, the tiles and coping stones were custom-manufactured from

Fig. 3: Deep excavation required for forming and, subsequently, filling with free-draining stone to prevent frost heave. Also seen is the dowel reinforcing bar that was tied into the pool floor in the second phase

Fig. 4: Completed shotcrete with large rocks placed

an indigenous stone local to Maine. The majority of the stone was a dark gray with some white veins that fit in perfectly. We installed the coping stones on the shotcrete gutter so the inner stone allowed water to pass over it in a small slot between two rows of stone and then into the gutter. The pool was waterproofed before the final finish of black pebble was installed on the interior. In the rock pockets that would not be able to have a final finish, a more substantial waterproofing product was used.

On projects like this, South Shore Gunite prefers to use its Airplaco mobile batch plants.

Fig. 5: Completed pool from the beach-entry end

Fig. 6: Completed pool from the negative-edge side

When we use Airplaco mobile batch plants, all the worrisome aspects when using ready mix are nonexistent. There is no waiting on trucks, worrying about a truck sitting too long and getting hot, or breakdowns leading to a costly wasted ready mix truck. In certain areas, especially remote locations in Maine, a ready mix truck would be close to an hour old when it first arrived on site, thus allowing insufficient time to use the load of concrete while the material is still in acceptable condition. Our mobile batch trucks have been outfitted with a hydraulic system that quietly powers the Gunite Supply C10 shotcrete guns. Compressed air was supplied by an Ingersoll Rand 825 CFM (390 L/s) truck-mounted air compressor. A six-man crew, including the truck driver/gun operator, is typical on a project like this.

The overall job took about 9 months to complete (Fig. 5 and 6). A lot of the construction was done in the winter under a tent that the general contractor erected over the swimming pool. This allowed the pool construction to be completed more quickly. All shotcrete work took place before the winter weather became an issue. The final product lived up to all of the expectations the homeowners were looking for and then some. This pool is definitely one of South Shore Gunite Pools & Spas' most intricate residential pools to date.

Mason Guarino *started in the pool industry when he was 14, learning how to install reinforcing bar. Since then, he has worked on all phases of the swimming pool industry. Guarino has been with South Shore Gunite Pools & Spas, Inc., full-time since graduating from the Wentworth Institute of Technology with his BS in construction management in 2009. Guarino is an active member of ASA and an ACI Certified Nozzleman.*