2020 Honorable Mention

Grotto Pool Project

By Andy Duck

When one of our core builders called us to announce their prospective client's desire to completely redo their beach house on the Sound in Corolla, NC, they mentioned that a new concrete pool would be part of the project. Steve Daniels, of Renaissance Construction Company, Inc., had his designer, Paul Gilbertson, send us preliminary information on the prospective property and the client's wish list for the backyard. To call it a transformation is a significant understatement.

Renaissance had been contracted to completely renovate the entire house, top to bottom, inside and out. The client wanted an exterior transformation that included a mini resort themed backyard. At this point we became keenly aware that the existing concrete pool and everything else in the rear of the property was slated for complete demolition. While we understood we would be starting from scratch to transform this Sound front property into an active area that encompassed much more than just the pool, we didn't quite grasp the overall complexity of the project. That is, until our first meeting with the client.

Being an executive of one of the largest home building firms in North America lends itself to inherent knowledge of the construction process. From materials and applications to cost elements, Steve Daniels came up from field residential framing to corporate executive over the course of his career, which gave him confidence in what he was about to ask for.

Our client sent the builder a bar and kitchen conceptual design that is reminiscent of a restaurant in Baltimore, MD. Open aired, sleek, and semi-modern, he was interested in having the bar lower than the kitchen galley, and to also serve as a swim up bar from the pool. His other wish list items included a large party spa integrated with some water sports capabilities and, oh yeah…a rock grotto with a slide. "No problem," we told him, "Sounds fun! Let's start designing!"

We immediately integrated the extremely angular aspects of the bar/kitchen area with a free form shaped pool. We thought the radial lines of the pool would transition smoothly to what we predicted would be a rather, free form grotto element. We also thought that adding random boulders here and there would create a good transition between the three contrasting elements. Sitting and jumping rocks were discussed and the concept was born.

Being based in a coastal beach community on the Outer Banks of North Carolina, we do not have a lot of rock in our

immediate area, so the decision to use shotcrete to create the rock and boulder aspects of the grotto was a no brainer. Being veterans to the shotcrete field, we knew it was a great fit for both the structural and subsequent carving and final finish. However, we also knew that we did not possess the experience in the stone and rock carving to pull this off on our own.

After some research, we contacted a few subcontractors that specialize in faux boulder and rock work, as well as one of our allies and friends who had just completed an ASA award winning project that specialized in the artistic shotcrete approach to creating faux rock. We fleshed out some basic budgetary ideas from all the providers, along with some photographs of finished projects and set up our first face-to-face meeting with the client.

We were pleased the client was very happy with our design direction regarding the pool, spa, and bar. He understood and agreed that shotcrete for the impending grotto was the right direction to pursue. With that, we laid out our idea for a simulated cave with exterior rock steps up to a sitting vista that had a slide to reenter the pool without the walk of shame (back down the stairs). He loved it and we moved on to presenting the completed project photos we had received from the shotcrete carved rock vendors, along with the proposed budget for the size and scope we were anticipating to fit the space. Afterwards, it was time to pick a shotcrete contractor for the grotto element.

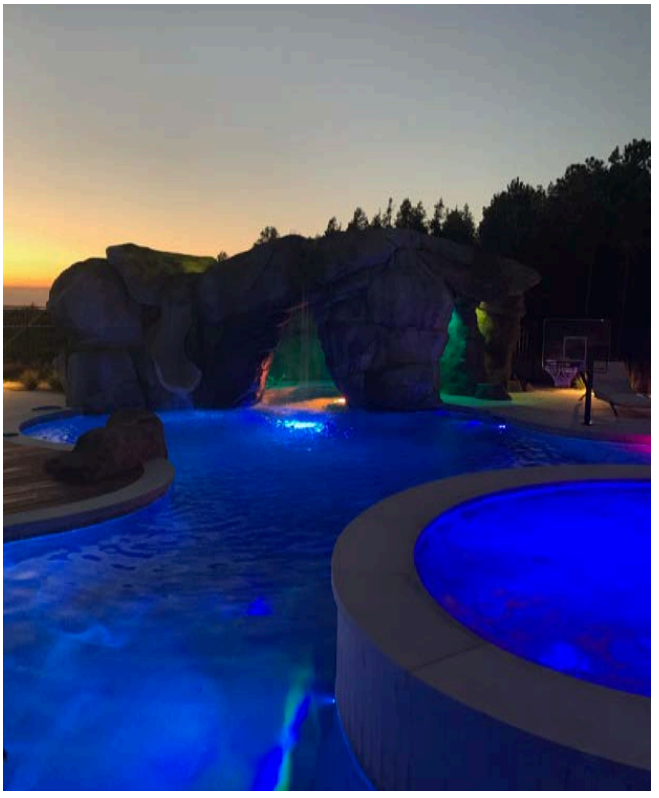
Overwhelmingly, the client chose to work with our associates at Clearwater Construction Group in Chapel Hill to design and develop the grotto and cave concept we had envisioned. Ryan Oakes took the lead on the conceptual idea and process, and we enlisted Dan Pitts from Ocean Rock Industries to consult on the design and shotcrete work, as they had previously worked together on a larger project in Purlear Creek, NC (project winner of the 2019 ASA Outstanding Pool and Recreational Project Award Recipients). Ryan Oakes, Anna Ploghoft, and their associates jumped in to create a

GROTTO POOL PROJECT - MARRYING CAST IN PLACE CONCRETE WITH SHOTCRETE, BOTH WET AND DRY MIX APPLICATIONS

three-dimensional (3D) rendering of our concept for the grotto while the rest of the pool construction got underway.

Very early in the process, after reviewing the site conditions and a geotechnical subsurface conditions report, it was determined that the entire structure would need to be pile and grade beam supported. Varying degrees of layered peat and unsuitable soils, coupled with groundwater and storm surge potentials all played into the decision to support the more than 750 tons (680 tonnes) of concrete, steel, and water that were designed for the backyard construction. Kitty Hawk Engineering handled the structural engineering for the entire pool project and specified wooden 8 in. (200 mm) piles driven to a minimum depth of 20 ft (6.1 m) below the concrete grade beams. After Millstone Marine completed the piling installation, we planned to build the 18 in. (450 mm) by 24 in. (600 mm) concrete grades beams by forming and pouring in place. However, working with Kitty Hawk Engineering, we decided to use the form-and-pour method only for the bottom half of the structural grade beams. The upper half of the beams would be shotcreted with the floor of the pool. By placing the concrete pneumatically, it allowed us to achieve good consolidation around all the steel reinforcement engineering in the beams as well as a good bond to the form-and-pour grade beams. We self-performed this part of the work using wet-mix shotcrete.

Once the initial grade beams were completed and we had finished backfilling and installing the gravel subbase to compaction specifications, we began forming the pool and spa. We called upon Revolution Gunite from Burlington, NC to provide and complete the dry-mix shotcrete process for these



aspects of the project. Being over 120 yd^3 (92 m^3), and with reload access almost two hours away, the decision was made to complete the floor on one day and the walls with ancillary features the next day. The floor casting had keyways cut into the transition where the subsequent vertical shotcrete would take place the next day and all reinforcing bars and forms were cleaned with the air lance before shotcreting.

After the pool and spa shotcrete was completed, we removed the formwork, backfilled partially to plumbing elevations, and began water curing the pool shell. Once we had completed the remainder of the plumbing, lighting conduit and piping runs, we began backfilling with the pipes under pressure. Also, being in a sandy soil, the water from flooding the pool for water curing was reused to provide "flood" consolidation of the sand, intermittent with vibratory plate compaction. This provided a sturdy subgrade for all the subsequent marble pavers selected by the client.

As mentioned, during all the pool shell construction, Clearwater Construction Group had been busy finalizing the 3D design for the grotto. They put together some sectional views with dimensions highlighted so we could finalize the proposed footprint and subsequent layout parameters for the entire cave structure. Kitty Hawk Engineering once again crafted a piling design to support the grotto structure and Millstone Marine remobilized for the piling installation. We basically repeated the grade beam process we used for the main pool shell. Once the grade beams were complete, we line pumped a spread footing under the entire cave feature.

At this point, it became an art project considering we were working from a 3D model as the main plan. We broke the structure into 48 in. (1200 mm) grids on the slab, completed a basic layout plan, and installed the slide to the manufacturer's specifications. We then turned the 3D concept into reality by hot-wire carving EPS geofoam and gluing the pieces together and to the slab with spray foam adhesive. Clearwater and Revolution Gunite once again stepped up to the plate to assist us in crafting the final look of the foam "boulders,". Considering our main consultant Dan Pitts from Ocean Rock Industries in Squamish, BC, Canada had been barred from participating in the project due to COVID-19, the Revolution and Clearwater guys were essential to this project moving forward. Ryan Oakes and Peter Oakley (renowned stone sculptor, artist, and rock climber) moved into the area for the duration and really helped us understand the creative process, as they had previously worked with Dan Pitts on other projects. Specially crafted reinforcing bar tools were used to create the metal framework for the faux rock with lathe and mesh. Ryan showed us how to create reinforcing bar trusses to arch over the dome of the cave. These would support the weight of the concrete and water that would be on top of the cave feature. After installing all the applicable plumbing and lighting runs, as well as ensuring that all the steel was properly bonded for safety and to meet code, it was time for the structural shotcrete application.

We decided to use the dry-mix shotcrete process for the majority of the structural concrete and the wet-mix process for the structural coating over the free standing dome structure. Each method of shotcrete placement was a good fit for the respective applications. The dry-mix process allowed us to stop and start at our leisure and insured a good consolidation of materials around the reinforcing bars. However, we knew the velocity of the dry process would surely pass through the lathe and reinforcing bar shell over the dome structure. The wet-mix process allowed us to shoot the dome from the topside onto the lathe with the plan to shoot the interior of the cave with the dry-mix process as overhead shotcrete.

Of course, after the structural shotcrete was complete, the carve coat shotcrete began. Again, we selected the dry-mix process for the stopping and starting aspects, as well as shooting hard enough against the already installed structural work to ensure a good bond. As always, the air lance was critical to control rebound and overspray, and all concrete surfaces were clean and brought to a saturated surface dry (SSD) condition before shotcrete placement. There were many man hours spent on pressure washers cleaning the surfaces to remove any overspray, rebound, etc. Getting a good bond on the final carve coats were crucial for a strong durable concrete section. Once the fresh dry-mix was applied to the carve coats, Ryan, Peter, and whomever was allocated as "carve helpers of the day" went to work putting the final details in place. This was truly an artform. Creating shadows, overhangs, changes of plane, and everything that makes the end product look real were meticulously labored over.

After all the shotcrete was completed, we began the staining and painting processes. A multitude of colors were base coated on the new concrete structures. So much detail was put into this aspect of the project, it is difficult to express. The application of thousands of "dots" and even creating lichen patches on the Northern faces all lent to the final product looking like it was natural and always there, despite being located on a barrier island that was mostly a sandbar. Our goal was to make the pool seem like it was created around the existing rockwork cave as a transition to the bar area and rest of the hardscaping. Landscaping plans had been drafted by Joseph Richardson, the landscape architect.

The results of this 10 month process were the epitome of design build. Having the trust of the general contractor and the client allowed us to make the necessary changes along the process. By harnessing the strengths and benefits from the various concrete installation and shotcrete placement methodologies, we were able to complete this one-of-a-kind watershape in monolithic concrete. The flexibility of the shotcrete applications was essential to the construction and produced the highest quality finished product. We will most certainly be integrating both wet-mix and dry-mix applications in our projects for the foreseeable future.

2020 HONORABLE MENTION

Project Name
Grotto Pool

Location
Corolla, NC

Shotcrete Contractor
Revolution Gunite* & Artisan Pools NC, Inc.*

Architect/Engineer
Artisan Pools NC, Inc.*, Pillar Design Studios, LLC, Clearwater Construction Group

Materials Supplier
Revolution Gunite* and C&L Concrete

Equipment Manufacturer
REED*

General Contractor
Renaissance Construction

Project Owner
Keith Neiman

***ASA Sustaining Corporate or Corporate Member**

Andy Duck: *The Artisan Group, Ltd.; Artisan Pools NC, Inc.; Artisan Concrete Services, Inc.; and Artisan Skateparks*