

Where Form and Pour Stops

By Ryan Oakes



Fig. 1: Where Forms and Pour Stops

DESIGN

Though our primary business, Revolution Gunite, specializes in dry-mix process shotcrete, we also own a design firm called Waterforge, Inc. In this firm, we develop architectural conceptual plans and engineered construction drawings, mostly for swimming pools and other watershapes, including foundations and complicated site conditions.

Often, this side of our business creates unique opportunities for shotcrete...by the ocean, unique homes, perhaps a garden for an eccentric client, or a pool hanging off a cliff.

This project is one of those, right on the side of a beautiful mountain, deep in the Appalachia region, in one of the most coveted and secluded neighborhoods off the Blue Ridge

parkway... A neighborhood, for perspective, with 6,000 acres and less than 10 homes.

That's not what make this project so special though. What's really interesting is that the owner has a firm that specializes in form-and-pour concrete. These guys don't just pour concrete, they build big, complicated projects.

Their 20,000 ft² (1900 m²) mountain home has lots of form-and-pour concrete and as you might imagine, they self-performed all that work. In fact, they had considered self-performing the concrete portion of their pool construction.

After one design firm failed to bring something appealing, they began their search, found us, engaged with us and loved the plans we produced. Once we had construction drawings complete, it was time to estimate the cost for the project.



Fig. 2: First the pool floor was shot along with a gutter wall, which allowed the forming of the shelf and additional bar



Fig. 4: Air lance operator keeping the corner free from rebound until the nozzleman places material in the corner. High quality diaphragm water valve ensures a sensitive control of mix water



Fig. 3: Rain protection with a tarp. Nozzleman with an air lance operator at his side, keeping the adjacent material clean. Complex forming

DESIGN DETAILS & CONSTRUCTION METHODOLOGY

At this point, our client was still fairly adamant that they would provide all concrete, until they began to study the plans.

This was not a standard pool in a flat back yard, rather it was to be a second-floor level pool, perched approximately 17 ft (5.2 m) above finished grade on a steeply sloped hill on top of a mountain. There would be a vanishing edge detail on three sides of the pool, a perimeter overflow spa



Fig. 5: Pour in place catch basin and foundation walls with forming above for shotcrete placed walls and catch basin floor



Fig. 6: Finishers working in spa under rain and shade tarp. Upside down boots keep tarp from punching through



Fig. 7: Rebound removal

with contoured benches and numerous therapeutic jets, a shallow water shelf, steps, some unique gutter and vertical trough details along with a catch basin, an equipment room below the pool and most interestingly some vertical panels, intersecting the vanishing edge wall of the pool.

When it comes to swimming pool construction, the standard method in the United States is to place the concrete using the shotcrete process, dry-mix or wet-mix, it doesn't matter. Form-and-pour is not usually used on swimming pools, though it's certainly possible and is often a technique used for commercial fountains. This pool design was very different with some unique challenges, for example, vanishing edge walls are typically topped with an angle and we like to use a 30° slope tipped in toward the waterside.

There were also several questions that we needed to address, such as:

- You can fill linear forms with an 8 in. (200 mm) slump and super plasticizer, but can you then level the fresh concrete off the top of the forms at a 30° angle?
- Can you shape a bench to that of a person's relaxed angle. Perhaps, but in how many pours?
- Can you create vertical walls, freestanding without forms, with small gutters to channel water to a basin 17 ft below the pool?
- Can you do all that and make it watertight?
- And most importantly, can you do it cost effectively?

After taking this project to their engineers, project managers, and construction field superintendents, they realized this project would have to be shotcreted. There really wasn't another practical option.

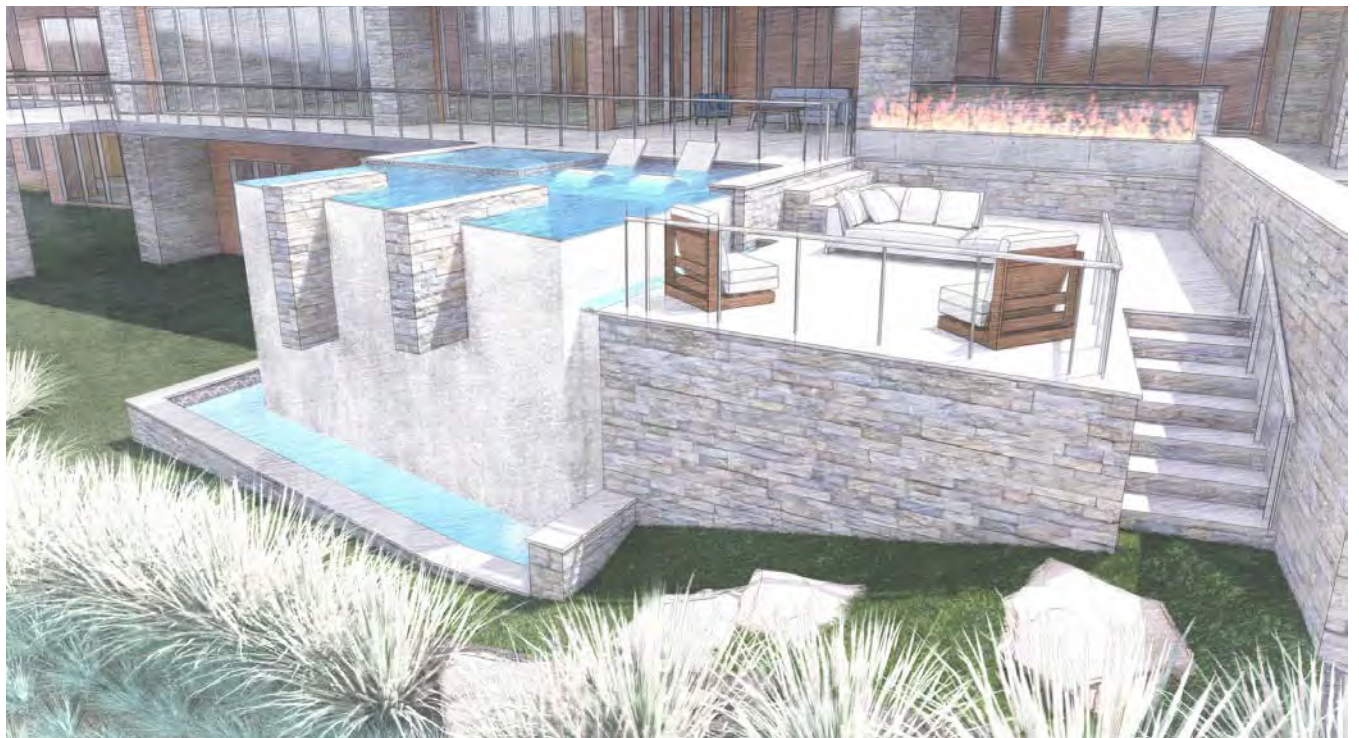


Fig. 8: Architectural concept

The shotcrete process will always be the best method for placing quality concrete to create durable, watertight swimming pool shells. The high velocity shotcrete placement of the concrete allows for excellent consolidation with full encasement of reinforcing steel, plumbing and electrical conduit and other embedments as well as being able to place a strong, low permeability concrete mixture with a low w/cm.

WHO ARE WE?

The client came to us initially to build the project, or the components of the project that they didn't want to build.

We had just decided after 20 years of being a design-build company, to stop building pools. We found our chi. We decidedly are a shotcrete company (Revolution Gunite), a pool pebble plaster company (Revolution Pool Finishes) and a design company (Waterforge, Inc). We are 3 companies, but we focus on niche markets within our industry. We would no longer be a turnkey pool builder.

THE RIGHT PARTNER

Given that we would not be building this project, we were hired to find the right builder or partner, so to speak, for the project. The project drawings were sent to three pool builders to bid on. The owner settled with Artisan Pools from Kitty Hawk, NC due to their flexibility. This suited us really well too, since Artisan also is a quality shotcrete contractor and they really understood how to set up the forms for such a complicated shoot.

Though the project was nearly impossible for a form-and-pour method, but it was still complicated even for the



Fig. 9: Intricate shapes can be placed and finished in one shoot



Fig. 10: Architectural concept



Fig. 11: Intersecting planes shot in place with pool shell

shotcrete process. It involved a great deal of coordination between the owner, Artisan, and us. For starters, the home was remote, on the side of a steep mountain with limited access. Rebound, a natural byproduct of the shotcrete process would need to be removed, not just tossed down the mountain, so a telescopic forklift was employed to hold a rebound collection box. Being in the Appalachian Mountains, an afternoon shower was not only possible but expected. To that end, temporary tarps were always ready to be deployed, and they often were.

THE PROCESS

Even using the shotcrete process, we had to stage the pool shoot over two separate days. The unique benefit of using the shotcrete process is that we can shoot new material over pre-existing concrete, whether next day or 10 years later and still achieve a monolithic and watertight shell. Several steps are needed to achieve full bond between sections, such as having a roughened surface to shoot to upon, having a saturated surface dry (SSD) condition on the bond plane, and keeping the area clean during the placement process with use of an air lance. Once the shell is complete and in a hardened state, it is crucial to water cure the project. This not only helps reduce shrinkage but also helps ensure that free cement is hydrated, improving long term strength and reducing permeability. To accomplish the water curing, Artisan flooded the project, a method we really like better than sprinklers or soaker hoses.

Once the pool shell was in place and cured, the construction would continue for many months to create a very special and unique pool for the client. This project created not only a spectacular view of the mountains beyond, but a new perspective for the client regarding concrete placement methods.



Fig. 12: Water Curing shell by flooding the project

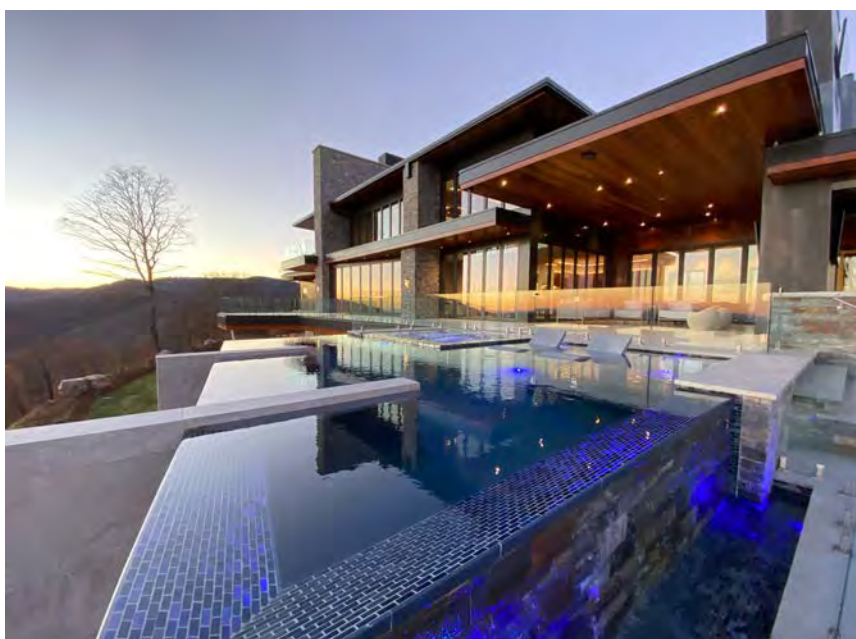


Fig. 13: Intersecting planes mimic perpendicular lines of home architecture



Fig. 14: Dusk in the Blue Ridge Mountains



Ryan Oakes is a professional Watershape Designer and President of Clearwater Construction Group, Inc., Revolution Gunite, and Revolution Pool Finishes, all of which are award-winning firms in their respective trade. Oakes is a faculty member at Watershape University, where he continually aims to raise the bar in the swimming pool and the watershape construction industry. As a member of the leadership team for the International Watershape Institute (IWI) and through educational outreach to a vast pool builder network throughout the United States, he aims to improve the building techniques and methods of constructing swimming pools. Oakes is a member of ACI Committee 322 Code Requirements for Concrete Pools and Watershapes, ACI 506, Shotcreting, and ACI Subcommittee 506-H, Shotcreting Pools. He serves on the ASA Board of Directors and also serves as Chair of the ASA Pool & Recreational Shotcrete Committee and the vice-chair of the ASA Contractor Qualification Committee.

2021 OUTSTANDING POOL & RECREATIONAL PROJECT

Project Name

Where Form & Pour Stops

Location

Blowing Rock, NC

Shotcrete Contractor

Revolution Gunite

Architect/Engineer Company

Waterforge, Inc

Material Supplier Company

Revolution Gunite

Equipment Manufacturer Company

Gunite Supply & Cementech

General Contractor Company

Artisan Pools and MBI Builders

Project Owner

Private