

Shotcrete versus Cast-in-Place for Pools

By Mason Guarino

Shotcrete and cast-in-place (CIP) concrete have both been used over the years to create the pool shell structure in swimming pool construction. Both shotcrete and CIP can produce a good-quality finished product with attention to material selection and placing quality. Concrete placed via the wet-mix shotcrete process rather than cast would be slightly modified to allow for lower slump and increased pumpability. The real differences in the two placing techniques stand out during the pool construction phase. The shotcrete process can shorten construction time, significantly reduce formwork requirements, eliminate post-form-stripping concrete surface touchups, create a monolithic structure, and eliminate the need for additional steps that CIP typically requires.

One of the most time-consuming steps in the concrete construction process is forming. Forming adds two steps to the pool construction process: formwork erection before casting, and formwork dismantling and cleaning after casting. CIP forming also requires both sides of the concrete walls to be formed and the forms are much more complex because they must be designed to handle the high internal pressure created by the fluid concrete filling the forms. In comparison, shotcrete requires forming only one wall surface and it is much lighter construction because it withstands much less pressure. Shotcrete forms only need to be rigid enough to handle the force of the shotcrete spray being applied without excessive vibration. Because the shotcrete forms are only one-sided and less substantial, much less formwork is required and the form stripping process is much quicker and with less waste (Fig. 1).

CIP walls frequently require touchups of water and air bubble voids, or areas that were not fully consolidated at the surface after forms were removed. This is so common that all specifications now have a section to cover how it should be done properly. With shotcrete, the final finished surface is the same exposed

surface that the shotcrete crew places and finishes as they progress. The desired finish is chosen prior the start of the shotcrete process. The most common finish is a standard rod-cut finish. The rod-cut finish produces a straight and plumb wall with a rough texture. This rough texture is optimum for two reasons: second to a gun finish, it is the fastest way to finish a shotcrete wall; and it creates a great surface to later bond a tile or marcite plaster finish. CIP forms can leave two undesirable finishes when the forms are removed. There can be either excessive honeycombing that needs to be repaired prior to the final finish, or the forms create a smooth finish that will need to be roughened so the final finish will adhere properly. Sometimes finishing the final shotcrete surface will require a little more time during placement, as compared to surface touchup of CIP, but that is acceptable because shotcrete finishing produces the desired final finish with a more consistent appearance.

Swimming pool shells are structural concrete components and need to be as strong as reasonably possible. Swimming pools are fairly short in length and exposed to moisture throughout their life, so they do not experience excessive shrinkage or temperature movement and do not typically require expansion or contraction joints. Because most swimming pools do not require movement joints, they can be built as monolithic structures. Shotcrete is the only way to create a true monolithic structure for a pool, especially large pools. Shotcrete, when applied properly, has no construction joints. Swimming pools can take multiple days to finish and, with proper attention to shooting the pool floor and walls between sections, can be constructed as a complete monolithic structure. Large monolithic floors can easily be CIP and then completed with shotcrete walls to create a large monolithic pool. Large pools can easily have 300 to 600 yd³ (229 to 459 m³) just in the floor, and with a good flatwork crew, can

Pool & Recreational Shotcrete Corner



Fig. 1: Typical formwork for pool construction

easily be placed in 1 day. With proper attention to surface preparation at the floor-wall intersection, shotcrete walls can be built so there is a monolithic joint between the pool floor and walls. With the shotcrete process creating a monolithic joint, waterstops at the pool floor-wall joints are not needed as they are with CIP. Anyone who has experienced installing a bulb-style waterstop knows that this is very time-consuming and the waterstop itself can be expensive.

All aspects of shotcrete swimming pool construction help to create a stronger pool that is built faster. Faster forming practices, less surface touchup after forms are stripped, and fewer items installed to ensure the pool is as waterproof as possible contribute to shotcrete being the best way to build a pool structure. Shotcrete also commonly gains strength much faster than CIP concrete due to a higher cement factor and lower water-cementitious material ratio. It is not uncommon to see shotcrete hit the specified 28-day compressive strength in 7 days. This allows forms to be stripped faster and the pool can be backfilled more quickly.

When the cost of shotcrete versus CIP in a swimming pool are compared for larger projects, the author does not believe that shotcrete is substantially less expensive. However, because it can produce a pool with superior durability and strength in less time, shotcrete is the concrete placing process that clearly needs to be the method of choice when building a swimming pool.



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 swimming pool construction. 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 currently serves on ASA's Board of Direction and is an ACI Certified Nozzleman.