2010 Outstanding Pool & Recreational Project

Soundview YMCA

By Bill Drakeley

The Soundview YMCA selected the Drakeley Pool Company to construct a multiple-pool facility in Branford, CT, in the fall/winter of 2009. The charge was to complete the pool structures within a very short window of opportunity to meet a June opening date the following year (2010). This quick turnaround was driven by the current economy and the availability of funds. Like most YMCAs, budget forecasting is entirely contingent on pledged donations and gifts from the general membership and friends of the YMCA. The community at large had no facility in the local area and was experiencing an expanding population, particularly among young families. The YMCA had an immediate opportunity with some quality pledges that demanded state-of-the-art pool construction with verifiable performance results. These contributions were time-contingent based on many economic factors. To be selected for the construction, the Drakeley Pool Company had to show a history of quality construction, using processes that displayed speed of application while still maintaining superior structural stability and durability. This construction also had to include sustainability benefits and LEED technological practices. An immediate suggestion to the building committee and design team was that shotcrete construction would satisfy both of these requirements.

Foreground: competition pool using sustainable formwork in forming and excavation phase. Background: watertight lap pool in curing phase

In dealing with pool contractors, architects and engineers often don't trust the installation to be successful without major oversight from the "licensed professionals." Based on the lack of education and standards in the pool industry, the performance of commercial pool shotcrete has been nothing short of dismal.

With that first impression, the first step was educating the YMCA building committee and design team on mixture design, application, and installation, including curing and strength gain of the shotcrete process. Once the education of the shotcrete process began, the Drakeley Pool Company received an immediate acceptance and an appreciative vote of confidence. Half the battle—at least in this case—was correcting a misunderstanding of the process and expected results. These misunderstandings by both the design community and builders alike are what keep the pool shotcrete industry from reaching acceptance.

Preparations for the shotcrete process went as follows (the two pools were constructed sequentially through the shotcrete application phase):

1. Excavation and placement of drainage stone was completed first. All groundwater was removed by dewatering and pumped off site. The site has a high groundwater table and the native soil is expansive with a high clay and silt content.
2. Using the clayey soils as an advantage, the forms were driven into the cohesive material and the moist soils were used as the backside form. As speed was a necessity, moisture content and any slope creep were kept to a minimum. Rough-sawn lumber was used for forming, including 2 x 4 in. (50 x 100 mm), 1 x 6 in. (30 x 150 mm), and 3/4 in. (20 mm) plywood. All forms were rigid with no vibration and able to accept the high velocity of the shotcrete application (375 ft^3/ min [11 m^3/min] compressor, wet-mix shotcrete process).
3. Steel reinforcement was No. 5 (No. 16) and No. 4 (No. 13) Grade 60 (Grade 420) deformed bars 6 in. (150 mm) on center vertically in the walls and 12 in. (300 mm) on centers in the floors for both pools. The wall thickness below

the upper bond beam was 12 in. (300 mm). The bond beam thickness (allowing for installation of stainless steel gutters) was 18 in. (450 mm). All steel and guide wires were rigid with little or no vibration during shotcreting. Rigid reinforcing steel installation is key to preventing voids and shadowing during the shooting process.

4. The shooting sequence started when the first of the two pools was ready for concrete placement. In this case, it was the teaching/therapy pool, to be followed by the competition pool. The approach was to shoot the radius connecting the wall to the floor first and then the bond beam. The mixture design was a portland-cement-rich mixture (800 lb/yd^3 [475 kg/m^3]) with 3/8 in. (10 mm) aggregate and sand in a well-consolidated non-gap-graded design. Compressive strength values were to be a minimum of 4000 psi (27.6 MPa) after a 28-day wet cure. The tests for both pools produced 5800 psi (40.0 MPa) compressive strength at 7-day breaks. The total amount of shotcrete materials placed was 318 yd^3 (244 m^3). The equipment used in the shooting was an Allentown PC20 Powercreter and an Ingersol-Rand 375 Compressor. The line size for the shotcrete was a 4 in. (100 mm) hopper discharge with two reductions to a 2 in. (50 mm) line. Reductions were gradual and the last 3 to 2 in. (80 to 50 mm) reducer was made where the line entered the pool shell (allows for ease of line pumping). The concrete installations were done by ACI Certified Nozzlemen trained through the ASA Nozzleman Training Program.
5. After forms were removed, the curing process began immediately. Soaker hoses and sprinkler systems were set up and both shells were continuously wet-cured for 3 weeks. After curing, staging was set for the iron workers and the general erection of the building structure. The general contractor was instructed to fill both pools halfway with water. This helped maintain the curing process while the pool shells sat dormant and covered. Each pool shell surpassed the minimum required compressive strength values and was watertight prior to any finishing textures or surface applications.

The pools were to be built for very fast water flow, which minimized friction. All corners of the pools were to have a sharp radius meeting the exacting standards of the new stainless steel perimeter gutter systems. These radii smoothed the water flow (non-90-degree corners) and made for a very fast, very competitive pool and/or a warm teaching pool with great flow and turnover.

Shotcrete phase of the lap pool

Shotcrete construction was key for the pool strength and flow requirements. The complex shape requirements were easily accomplished as opposed to the cumbersome cast-in-place methodology otherwise required.

Thinking green (there can't be a worse term chosen for the pool industry) was an essential part of the presentation to the YMCA's committees and had to be included in the construction and

Stainless steel gutter installation

Radius gutter installation above radius shotcrete corner

Tested plaster installation over watertight concrete

design. Sustainability benefits had to be shown to be considered and awarded the project.

The sustainability of the shotcrete process on the Soundview YMCA had a positive impact on the forming and electrical portions of the project. In general, using shotcrete construction reduces the requirements of lumber used for forming because, at most, one-sided forms are required. This reduction in formwork was enhanced in every corner of the two pools. Shotcreting into the radius, using the one-sided forms, and then hand-shaping the inside surface of the radius allowed for minimal use of wood supports, which certainly kept a few trees in the forest. The one-sided forms were reused for the second pool.

The sustainability benefits related to the electrical requirements of the pool filtration can be traced back to the use of the radius shapes of the pool shell. By reducing the friction that the water must be pumped in and around certain piping will in turn reduce the amount of energy required to pump the water. With these new mechanical systems installed, it was essential that the shotcrete portion of the pool corners be an exact radius match to the adjacent mechanical systems; thus, the reduction of corners equals a reduction of energy required and ultimately saves the YMCA consumable, measurable electrical costs.

The shotcrete process was essential to the successful performance of these pools. The factors that influenced the acceptance of the shotcrete on the project were:

- High moisture and cohesive qualities of soils;
- Early strength and water tightness of the shotcrete pool shells;
- Ease of producing the radius corners needed for ease of water flow and friction loss concerns; and
- Timing for construction and installation.

This pool project had to incorporate the new pool design that revolved around radius steel mechanical systems and had to be installed in less than 1 year. Smooth radius corners were easily formed and shot with the wet-mix shotcrete process, which produced a well-consolidated, low-porosity, high-strength pool shell. This would have taken a typical concrete cast-in-place contractor twice the amount of time and would likely have increased the budget. With the shotcrete process, the YMCA was given long-term product performance without breaking the bank.

The Drakeley Pool Company uses the Soundview YMCA as an example of proper shotcrete construction that owners, designers, and engineers can not only agree to but also heartily support in their future projects.

Finished hot competition pool

Finished cold competition pool

2010 Outstanding Pool & Recreational Project

Project Name
Soundview YMCA

Project Location
Branford, CT

Shotcrete Contractor
Drakeley Industries, LLC*

General Contractor
ORL Construction

Architect/Engineer
Drakeley Industries, LLC*

Material Supplier/Manufacturer
Tilcon

Project Owner
Central CT Coast YMCA

*Corporate Member of the American Shotcrete Association

Bill Drakeley *is a third-generation Watershaper and President of Drakeley Industries and Drakeley Swimming Pool Company in Connecticut. He is a Genesis 3 Platinum Member, an American Concrete Institute Certified Nozzleman, an ACI-approved Shotcrete Examiner, an ASA Board member, and his company is a Corporate member of ASA. Drakeley is an Instructor for the Genesis 3 Construction School, with a focus on the shotcrete process. He has been a Contributing Writer for* Shotcrete *magazine's "Pool & Recreational Shotcrete Corner" and has had projects featured in* Luxury Pools *magazine,* Better Homes & Gardens, *and* Aqua *magazine. Drakeley Pools was the recipient of ASA's "Outstanding Pool & Recreational Project" from 2005 through 2008 and again in 2010.*