PRECISION REQUIRED

150 tons of precast prove to be an **unbeatable solution** for a homeowner's high-tech groundwater distribution and management system in central Colorado.

By Shari Held / Photos courtesy of Oldcastle Precast

Oldcastle Precast's Loveland, Colo. plant fabricated all the precast concrete components for a Colorado homeowner's elaborate landscaping design project.

For a central Colorado homeowner's dream home – including an elaborate landscaping design – to become a reality, the primary building material for the landscaping project needed to fulfill both an aesthetic and functional purpose. The homeowners not only envisioned a stream meandering around the seven-acre property through three waterfalls, but also wanted a way to keep the water flowing – even when the irrigation ditch runs dry – and manage the flow speed remotely. In addition, the water needed to be distributed and managed from four distinct sources and the water level controlled from seven separate locations.

"There were a lot of moving parts with this project," said Todd Hunter, owner of waterwell and pump installation company Boulder GWS in Boulder, Colo. "The design is about 30% aesthetics and 70% pure function."

The 150 tons of precast concrete elements fabricated for the project made all of it possible.

A SIZEABLE SCOPE

Hunter's groundwater distribution and management piece of the $17 million overall renovation took slightly more than 18 months to complete. The project includes many components for flow and recirculation, including a precast vault and three precast storage tanks. Piping was also installed around the perimeter of the property for water and electrical as needed.

"All the circuits can swap from a city water supply, to a well supply, to a stored supply to a pond supply," Hunter said. "There are multiple layers of functionality."

The pumping equipment allows the precast tanks to be filled at different values, ensuring the owners won't exceed the allowed amount of water the state of Colorado lets them pump from the water wells.

1. The precast components were delivered in eight loads on flat-bed trucks.

2. Traffic control required a minimum of 9 feet passable street space.

3-6. Workers installed the precast tanks and vault in 1 1/2 days. The products were installed like an assembly line.

7. The installation crew worked 4 feet below groundwater. The water was continuously pumped out of the excavation area until the job was fully installed.

8. Precast concrete fulfilled both the project's aesthetic and functional requirements.

"You have three large, heavy tanks and a pump vault that **have to match** all those pipelines and elevations. It was a **pretty technical** job."

– Matt Lahrs, *Oldcastle Precast*

PRECAST: MATERIAL OF CHOICE

Hunter didn't consider any material other than precast concrete for the three 10,000-gallon storage tanks and pump vault. He has completed a number of similar infrastructure projects where precast concrete was his material of choice.

"I could cast in place, but how would I do that below groundwater?" Hunter said. "How would I achieve the necessary quality control? And how would I complete it in a timely fashion?

"All those challenges indicated precast was the best way to go about it. Precast is really hard to beat."

A DEMANDING FABRICATION PROCESS

Oldcastle Precast's Loveland, Colo. plant produced the precast components for the project. All components were fabricated with 6,000-psi concrete and reinforced with steel rebar – mainly 5/8-inch diameter.

Each tank component consisted of four elements: tank, lid, riser and riser lid. The tank alone measured 21 feet, 2 inches long by 9 feet, 10 inches wide and 9 feet, 6 3/4-inches tall, including lid. Altogether, the tank and lid weighed 72,500 pounds. The risers were fabricated with cast-in aluminum hatches for easy access. With the risers, the height of a tank was nearly 13 feet.

Oldcastle used an adjustable steel form that can produce tanks ranging in size from 5,500 to 15,500 gallons to produce the one-piece bottom that each storage tank boasts.

"That's rather unique for the Western United States," said Matt Lahrs, estimating and sales for Oldcastle Precast, Loveland, Colo., noting that one-piece-bottom tanks are a specialty item for the NPCA-certified plant. These tanks are typically used for car washes and as water storage for fire safety in the mountains.

Since the form and the resulting tank are so large, workers set up the form in a custom pit in the ground.

"That's so we can get the height to pull the product out of the form after it's produced," said John Hirsbrunner, site manager of Oldcastle Precast's Loveland and Platteville, Colo. plants.

Once the form setup passes a series of quality control inspections, it's ready for the concrete to be poured the following day.

"There's a lot of yards of concrete in each pour," Hirsbrunner said. "We pour it first thing in the morning to get a nice, solid continuous pour so we don't have a cold joint in the concrete."

The manufacturing challenge was to ensure all the openings would line up perfectly with the piping. There was very little room for error.

"You have three large, heavy tanks and a pump vault that have to match all those pipelines and elevations," Lahrs said. "It was a pretty technical job."

It took Oldcastle six months and nearly 15 versions of drawings to ensure everything would match up.

"We had to build it right," Hirsbrunner said. "There was a lot of engineering involved. Not just our engineers, but all the engineers involved with the project had to work together to make that happen."

Rather than include the openings in the fabrication process, Oldcastle opted to core them after the tank was taken out of the mold to ensure the required precision was met. Coring also streamlined the process.

"If we had had to identify where every single hole needed to be prior to production, we'd probably still be in the design phase with Oldcastle," Hunter said.

Aluminum panel forms were used for the pump vault. It consisted of the base, riser and a lid. The lid also served as the base of the control building, which was built over the vault. The pump vault measured 11 feet, 4 inches long by 9 feet, 4 inches wide by 12 feet tall and weighed approximately 60,000 pounds.

In July 2017, Oldcastle delivered the precast elements to the job site in eight loads on flat-bed trucks.

PUTTING IT ALL TOGETHER

Installing the precast tanks presented major logistical challenges. The property is located in an urban neighborhood, and Hunter had to keep the impact of the construction to a minimum. The 265-ton crane used to lift the tanks and place them 13 1/2 feet below ground, through the trees and on the other side of the fence had to be positioned on a city street. Traffic control required a minimum of 9 feet of passable street during the process.

"We crowded that crane as tight as we could get it to the curb and came in at 9 feet, 2 inches," Hunter said.

The pumping equipment had to be put together and placed as a package systematically. In addition, the technical aspects of placing the tanks so the pre-manufactured, flanged piping was accurately lined up was as exacting as anticipated.

"The placement had to be precise," Hunter said. "By precise I mean exactly correct. All the pre-manufactured pieces had to mate up like a big tinker toy set."

Workers used 2-foot jigs to lay the pieces so there would be a consistent separation between each. Everything was built perpendicular and square to that center.

"You measure once and put it all together," Hunter said.

And the conditions weren't ideal. The installation crew had to work 4 feet below groundwater. Water was continuously pumped out of the excavated area until the tanks and pump vault were fully installed, plumbed and backfilled.

Despite the challenges, it took workers only 1 1/2 days to install the tanks and vault. The installation was coordinated like an assembly line – once the precast elements were set in position, the fittings slid into place.

"Precast afforded us the luxury and opportunity to spend our energies doing a concise design to allow for a streamlined installation," Hunter said.

A JOB WELL DONE

"If I were an architect I'd use a lot more concrete," Hunter said. "It's robust. The mass is there.

"It's sensible. It's not insanely expensive. It's obviously readily accessible. And fabrication and installation, once you get past the design phase, is generally pretty quick."

He also has nothing but praise for the Oldcastle team that helped ensure that piece of the project was a success.

"They are awesome," Hunter said. "They performed impeccably on a difficult project with a high level of detail."

Oldcastle enjoys the opportunity to overcome new challenges.

"Working with Todd is a pleasure," said Lahrs, who has worked with Hunter on two previous projects. "He gets some of the most unique jobs I've ever seen. It's wonderful to get such unusual jobs and be able to work through the technical difficulties to make it work." **PI**

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