

The spillway of historic Lake Shawnee Dam near Topeka, Kan., recently received a much-needed facelift with retaining walls. The original spillway was built in the 1930s as a Work Project Administration project to create Lake Shawnee. The lake's outlet channel and dam needed major repair; the rebar of the poured-in-place concrete primary and secondary spillways was beginning to show.

Along the north end of Lake Shawnee lies 2,200 ft of earthen dam. Three drop structures control discharge before going under an arched culvert bridge. The first structure is a 200-ft-long control weir with a 2-ft drop. The next structure is a 200-ft curved weir with a 6-ft drop. The main spillway is a 120-ft curved weir with a 20-ft drop into a stilling basin.

The outlet channel was lined with hand-placed stone that still exists along most of the banks. Only one major repair project had been completed since the lake opened, and years of channel erosion had exposed the main spillway footing. The soil surrounding the dam had a slope of 30 degrees and consisted of sandstone and shale.

"If not repaired, the large spillway retaining wall could be undermined and complete failure of the spillway wall could occur, leading to an emergency unsafe situation," Kansas Water Structures Engineer Joe D. File told the *Topeka Capital-Journal* in 2004.

Spillway Solution

Professional Engineering Consultants P.A. (PEC) was chosen to provide civil engineering design services. Along with Federal Emergency Management Agency, the state of Kansas and Shawnee County provided the necessary funds for the renovation work. The county looked to local Redi-Rock producer Midwest Concrete Materials to provide retaining walls to complete the restoration.

The county chose Redi-Rock due to the product's ability to build walls that minimize the need for geogrid reinforcement while withstanding the constant forces of moving water. Because the dam is a landmark, the county also sought a product that could achieve an aesthetically pleasing look. The massive block size minimized excavation around the dam, allowing construction to progress quickly without creating additional erosion problems.

Engineers decided to utilize a concrete backfill design that minimized excavation while creating a reinforced wall that provided adequate sliding and overturning resistance. A rebar cage was constructed and tied into the blocks' lifting eye. Concrete was then poured, creating a solid unit in the bottom portion of the wall. This allowed engineers to design the upper half of the wall with minimal lengths of geogrid behind the units, thus eliminating the need for the

20-ft lengths of geogrid required for a normal modular wall.

"The most notable change [in the spillway design] was the construction of observation areas on the downstream side of the main spillway. During large rainfall events, the resulting waterfall over the spillway attracted many spectators. Steep banks and slippery conditions created a safety risk for the County Parks and Recreation Department. PEC engineers worked with the county to provide a safe viewing area and to mitigate erosion at the spillway," said S. Earl Tast, P.E., of PEC.

When the 8,000-sq-ft wing walls were completed, they were capped with a concrete platform. Columns and freestanding wall blocks were used to create matching fencing atop the 18-ft-high wing walls for both aesthetics and safety. Visitors are now able to get closer to the spillway.

Project Response

Retaining walls made up \$400,000 of the \$1.6-million project. Tony Emerson of Emcon Inc., the company that installed the walls, said that the response to the spillway restoration has been so positive that Emcon has since completed two more Redi-Rock projects around the lake.

In March 2007, the dam repairs were tested when a storm event approaching the 100-year level occurred. The renovations prevented what could have been a catastrophic failure and turned it into a spectacular show. SWS

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