RECO NEWS
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The Reinforced Earth Company

Lake Lenexa Dam, Lenexa, Kansas

Serving as the focal point of the City of Lenexa's "Rain to Recreation" public improvement program, a new 35-acre lake has been constructed within the new 240-acre city park development.

With extensive community involvement at all stages of conceptual design, the Lake Lenexa project was designed to not only provide flood control and improve water quality, but also to provide recreational opportunities for the community within an aesthetically pleasing environment. Architectural plans for the newly created lake included a dam and spillway structure with unique curved alignments and a water feature at the lower level with a pedestrian bridge above that would also serve as a viewing structure.

The original design of the dam included the use of cast-in-place concrete retaining walls to form the spillway structure and stilling basins. However, the initial costs of the dam and spillway structure exceeded the budget established by the City of Lenexa.

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What's inside

Grand Forks Diversion – TechSpan Arch

In May 2005, New Brunswick Department of Transportation (NBDOT) called a tender for re-alignment of Route #17 north east of St.Leonard. The consulting firm Boissonnault McGraw and Associates Ltd. under the direction of the NBDOT, specified a pre-cast concrete arch 9.0 m (30 ft) in span and 4.0 m (13 ft) in rise with a length of 100.0 m (328 ft). The design also included concrete fish weirs spaced throughout the length of the arch structure. Retaining walls were required to retain the embankment fill at either end of the arch structure. Earth cover over the arch would be 20 m (65 ft) at its highest point. This heavy loading would require special consideration for internal design and associated spread footings.

St. Isidore Asphalte Ltee. (SIAL) was the low bid contractor and was awarded the project. Based on previous successful experiences with Reinforced Earth Company Ltd. (RECo), they awarded the design and supply of the Grand Forks Diversion structure to RECo.

SIAL had the opportunity to revise the length of the structure and increase the height of MSE walls to optimize construction time and cost of materials. The optimum design could be achieved with a combination of the various structural components (arch, walls, footings and fish weirs and embankment fills) to maintain alignment, slopes, and grades, and had the shortest manufacturing schedule for material supply. All these aspects were compiled by RECO and SIAL and collectively a decision was made as to the best option on length of arch and wall size.

The new structure alignment was directly through a large rock outcrop. SIAL wanted to explore the possibility of further optimizing the TechSpan and headwall design based on the actual rock profiles. After

Lake Lenexa Dam

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The Reinforced Earth Company (RECo) was contacted by the Dam and Spillway Design / Construction Oversight Engineer, Black and Veatch, to determine if Reinforced Earth technology could be incorporated into the dam design to replace the costly cast-in-place walls while not sacrificing the unique architectural elements of the project. RECo entered into an Engineering contract with Black and Veatch and immediately began collaboration with the dam and spillway contractor, Max Ricke Brothers, Inc., to perform a Value Engineering (VE) study to determine a more cost effective solution to the original design.

The design and material supply proposal provided by RECo included a total of six separate retaining walls for both the spillway and downstream stilling basins with unique and complicated geometry along with differential head drawdown design considerations due to the saturated backfill environment. RECo's previous experience with marine and dam structures subjected to this type of environment played a key role in the ultimate use and acceptance of the technology by the consultant and Owner.

The cost savings realized by the replacement of the cast-in-place concrete retaining walls with Reinforced Earth, along with an innovative proposal by Black and Veatch which incorporated the use of cement-kiln dust mixed with the on-site clay materials for foundation support of the spillway structural slabs. This was effective in reducing the total project costs to within the originally budgeted amounts. Project construction began in the summer of 2004 and completed in the spring of 2006.

The Reinforced Earth Company is proud to have contributed to this unique project by adapting our retaining wall systems to meet the needs and desires of the owner and local community.

removal of overburden, SIAL performed a detailed survey of the rock line. It was determined that the length of arch could be optimized by terminating the structure where the rock line was of a sufficient height to replace a portion of the wing walls. The retaining walls width would be minimized by using the bedrock and a cast-in-place concrete curb anchored to the rock. Using the existing rock profile reduced excavation and subsequently, the structural backfill requirement. The trade-off for reducing the length of the TechSpan was higher headwalls to retain the sloped embankments at the ends of the structure. Reducing the arch length also reduced the amount of spread footing and the quantity of fish weirs needed. This option was preferred by the Department of Natural Resources (DNR) for their fish habitat considerations.

The alternate design was submitted to NBDOT for design review and eventually approved for construction. The new arch structure length of 66.7 m (220 ft) with headwalls area of 475 m^2 (5100 ft^2) was approved for manufacturing in August 2005.

Site preparation began in August 2005 and by mid November, erection of the arch started. Typically 10 lm (30ft) of TechSpan, which equates to 16 pieces of arch, can be installed per day. SIAL installed 29 arch pieces the first day and 77 pieces on the second. A total of 106 pieces installed in two days, which typically would have taken five days to complete. SIAL had previous experience with erecting the TechSpan arch system. Site planning and organization proved to be the key to a rapid installation of the structure.

The keyway was grouted and the retaining wall erected to the second row only. This was the requirement for the fishery window. The new arch structure remained partially backfilled throughout the winter. In the spring of 2006 construction resumed and the balance of the RECo headwalls and wing walls were installed to finish grade.

With the TechSpan arch and RECo walls installed, final paving was completed and Route #17 re-alignment at the Grand Forks Diversion was open to the public in 2006.

International Corner

RECo Provides A Sound Solution

In Haan-Gruiten, Germany (approximately 20 km west of Düsseldorf), a new ring road being constructed required a retaining wall adjacent to a busy rail line. The location of the project in an urban area, required the retaining structure to incorporate a sound absorption feature. Bewehrte Erde (Reinforced Earth's sister company in Germany) offered an attractive solution for this project: a Reinforced Earth system using prefabricated components that would be economical and minimize disruption to the rail line.

The precast panels are the trademark Cruciform shape with an additional 5 cm porous, ribbed concrete sound absorbing layer. High absorption rates of 8db(A) were achieved with the porous concrete. The project required 1,226 m^2 (13,190 ft^2) of panels. The delicate nature of the sound absorbing layer required the panels be transported in a vertical position. A customized panel transporter that was able to ship 12 panels at a time was developed by the Contractor. With a load and transport process established between the nearby precast plant and the site, overall supply proceeded smoothly.

The project was constructed in 2007 and illustrates a sustainable enhancement that can be incorporated into Reinforced Earth walls. It is estimated that this solution was 20% more economical than a cast-in-place (CIP) wall and saved up to 12 months of construction disruption.

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