Geocomp

Technologies to manage risk for infrastructure

Project Brief

Instrumentation and Monitoring for Construction of Smithland Hydroelectric Plant

Client:

E.L. Robinson Engineering;

C.J. Mahan Construction Company

Location:

Smithland, KY

Services Provided:

- Instrumentation and monitoring
- Real-time data reporting on *iSiteCentral*™ website

Value Provided:

- Real-time risk monitoring of performance to ensure safety of 200 to 400 employees at peak of construction
- Large quantities of data taken over time to demonstrate performance of the seepage barrier and identify areas where remedial work was required
- Allowed designers the opportunity to compare the design values to real-time field performance data and adjust design parameters as necessary

Background & Project Challenges

Project Site – May 2011 during 100 Year Flood

Project Site – January 2013

Construction of a new hydroelectric facility valued at $450 million, will generate an annual output of 379 million kWh using three 24-MW bulb-type turbine and generating units. The project will divert water from the existing Smithland Lock and Dam on the Ohio River through the newly-constructed powerhouse in order to create clean, renewable energy for the region.

The entire site was intentionally flooded in May 2011 in order to prevent serious damage to the structure of the cofferdam due to high river levels. The elevation of the Ohio River near the Smithland Dam crested above the 100 Year Flood elevation, a level not reached since 1937. Fortunately, little damage was caused to either the structure or the side walls and slopes, which was confirmed by real-time instrumentation data on *iSiteCentral*™.

Geocomp Role & Accomplishments

Geocomp installed nine in-place inclinometer strings to measure lateral displacements within the vertical profile of the embankment surrounding the 110-ft deep excavation. Thirty-four piezometers were installed around the excavation both inside and outside the slurry wall, cofferdam, and excavation for measurement of pore water pressure to evaluate the effectiveness of the seepage cutoff wall.

Thirteen *iSite*™ data loggers, powered by seven solar panel systems, were installed for storage and transmission of instrumentation data. Robotic total stations monitored twenty-nine prisms at the top of the earth embankment surrounding the excavation to measure settlement and lateral movement.

Real-time data were collected from all instruments. Downloadable charts, tables, and reports were provided on a project website and used for performance monitoring during ongoing construction of the powerhouse to demonstrate stable slopes, effectiveness of the seepage barrier, and functioning dewatering system.

"The 110-ft deep excavation required very deep inclinometers and piezometers to better monitor the movement and pore pressures in the excavation. The instrumentation program was utilized to help designers control the construction activities during excavation for the powerhouse. It was helpful by allowing the advancement of excavation based on the pore pressure and deformation monitoring. The instrumentation program demonstrated the ability to help the contractor work in a safe excavation while giving the designers a chance to verify their design and relax some of the constraints as a result of the instrumentation monitoring." Jamal Nusairat,Ph.D., P.E., E.L. Robinson Engineering