Wadhams Road Bridge Foundation Stabilization

by

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Wednesday, November 2, 2011 at 4:30pm
Room 2355 GGBL

Abstract: The reconstruction of the Wadhams Road bridge posed unique challenges due to historic global instability problems. The original 1939 design of the bridge was for a three-span bridge with a significant volume of new embankment on the south (unstable) slope. Initial placement of the embankment fill caused the slope to begin moving. After this construction was halted, the County Road Commission (CRC) changed the design which eliminated the embankment and added eight spans to the south and one span to the north for a total of 12 spans. The additional spans were supported by pile bents. Over time, movement downslope towards the river was noticed by distortion of the bents. In 1948 and 1949, the Michigan Department of State Highways (now known as MDOT) drove battered piles to resist the forces generated by the global instability of the slope. The system of battered piles did not work. By the mid-70's, the downhill movement had reached a point that required further remediation of the bridge, including loading the toe of the slope with rip-rap. These efforts were unsuccessful. In 2006, the CRC hired URS Corporation (URS) with subconsultant SOMAT Engineering, Inc. to design a bridge replacement. It was determined that it was not economically feasible to resist the forces for the entire bridge width caused by the slope instability. The most economical solution was a two-span bridge with the pier supported by built-up box-section piles designed to resist the earth forces applied to the pile face and sides in combination with the axial forces. The piles were designed to resist enormous bending moments and shear forces. The unique foundation system for the pier consists of eighteen 68 foot long built-up box-section steel piles that are approximately 23 inches wide by 45 inches deep. The piles were inserted into 5 foot diameter excavated shafts. The bottom 21 feet of the shaft was encased in concrete into the stable underlying clay and sand. Pea gravel filled the area around the pile above the socket. The interior of the pile was also filled with concrete. In addition to the piles, the pier footing (pile cap) is restrained by a series of post-tensioned ground anchors that are anchored uphill into the stable soil below the unstable soil. There is no history of similar issues at the abutment locations and therefore they are supported by conventional pile foundations.

***** Everyone is invited – snacks will be available **********