

Design and Construction of the Structural Diaphragm Wall at the Red Rock Hydroelectric Project

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Abstract

The Red Rock Hydroelectric Project was constructed at the existing US Army Corps of Engineers Red Rock Dam on the Des Moines River near Pella, Iowa. The Project was completed in 2020. At peak generation, the Project will generate up to 55 MW with an average annual energy output of 178 gigawatt-hours.

A large T-shaped reinforced concrete diaphragm wall was required to form the intake approach channel for the project and retain the upstream slope of the existing embankment dam. In permanent condition, the wall is a 69-foot cantilever with total depth of 130 feet, including the soil and rock socket. The diaphragm wall was also utilized for excavation support during construction of the intake and upstream penstocks. The diaphragm wall panels are nominally 5 feet thick with flange widths of 10.5 feet and stem lengths of 16 feet. Typical concrete volumes per panel were on the order of 750 cubic yards. The reinforcing cages are comprised of a perimeter cage with a secondary inner cage at the end of the stem which includes bundled #18 bars; the completed cages weighed up to approximately 90 tons.

Rachael was the Lead Geotechnical Engineer for the design of the project and served as the Project Technical Lead during construction. She will discuss the design and construction of the diaphragm wall, a critical element for maintaining dam safety during construction and throughout the life of the project.



Ms. Rachael Bisnett is a Civil Engineer with domestic and international experience in the analysis, design, and construction of dams, hydroelectric projects, tunnels, navigation and water conveyance canals, shallow and deep foundations, cofferdams, and permanent and temporary earth retaining structures. She has contributed to all phases of project development, including feasibility studies, geotechnical investigations, detailed design, engineering services during construction, development of operations and maintenance plans, and implementation of surveillance inspection and instrumentation monitoring programs. She holds BSCE (Structures/2008) and MSCE (Geotechnical/2010) from Purdue University.