

Case Study: The Importance of Good Flashboard Design for Dam Safety, a Dam Owner's Perspective

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O'Shaughnessy Dam was originally designed as an 879-foot-long uncontrolled concrete gravity spillway with short earth embankments at each abutment. The dam was built to provide a water supply reservoir for the City of Columbus in 1925 and is located on the Scioto River in Delaware County, Ohio where the upstream drainage area is 980 square miles. In 1946, 3-foot high flashboards were added to the dam which were then replaced with 3.5-foot high flashboards in 1992 to increase the amount of water impounded to 4.8 billion gallons. During a FERC 5-year Consultant Safety Inspection carried out by an independent consultant not intimately familiar with the history of the dam it was pointed out that a critical dam stability case may be represented by conditions just prior to flashboard failure and it was recommended this condition be evaluated. Subsequent stability analysis of O'Shaughnessy dam for this condition showed that in fact sliding stability for this case resulted in the factors of safety slightly less than FERC requirements but even more concerning was the fact that predicting the exact point of failure of the flashboard pins was not reliable. Since the flashboards provided much needed additional water supply removing them was not an acceptable option. The flashboard pins were redesigned to fail at a lower headwater elevation to achieve adequate factors of safety against sliding for this stability condition. A new debris boom was installed to help protect the weaker pins from impact forces from logs or other debris floating down the river. The structural design of the flashboard pins was opposite of normal structural design whereby structural elements are generally designed not to fail. Strength testing of the steel pins was performed during construction to determine the actual steel properties upon which flashboard pin failure was calculated. The flashboard pins were then milled to the geometry necessary to induce failure at the design headwater. These modifications to the flashboard design improved the factor of safety to meet FERC requirements. Good design allowed The City of Columbus to keep the flashboards on the dam to maximize the water supply while keeping the downstream citizens safe from possible instability of the dam. This presentation will review the approach used to analyze pin failure modes and provide an overview of the pin and flashboard design and their installation.