Nova Scotia Energy Research and Development Forum 2012

Ali Roshanfekr, Dalhousie University

Title: Hydraulics of Rockfill Spurs
Research Advisor: Dr. David Hansen
Category: Marine Renewable Energy

Non-overflowing rockfill spurs are river engineering elements used to passively manage or alter water-level patterns in rivers, especially in reduced-flow rivers. This structure is designed to block the river only partially, starting at the shoreline and extending only partway across the river. They can be used for protecting river banks and enhancing fishing areas by reducing the velocity of the flow behind them. Rockfill spurs can also improve near-field upstream water levels and have far less impact on the riverine environment than full-closure barrages. So-called flow-through rockfill embankments have become sufficiently common that matters of safety that must be considered in their hydraulic design are explicitly discussed in Section 8.5 of the latest Canadian Dam Safety Guidelines. However, there are no CDA design guidelines specifically for the hydraulic viability of spurs.

Previous researchers have focused on the hydraulics of progressive closure. Little attention has been paid to the internal and downstream face hydraulics of rockfill spurs, as a function of the desired upstream water level. The proposed research has aimed to study the hydraulics of rockfill spurs in five areas: (a) the quantity of flow that will move through the spur (Q_{spur}), (b) the nature of the three-dimensional phreatic surface within the structure, (c) the nature of the seepage face on the downstream side of the structure, (d) the nature of the three-dimensional seepage pattern inside the structure, and (e) the stability of individual particles residing under the downstream seepage face.

The results of seeking to understand and quantify these various phenomena are presented herein, from the point of view of seeking to improve hydraulic design methods, so as to reduce potential environment impacts and to enable to formal evaluation of the safety of such structures.