**Factors limiting the progression of internal erosion in zoned dams: flow limiting by an upstream material**

Abstract

In zoned dams, some types of materials, when located upstream of a damaged core, may impose high hydraulic losses capable of limiting the flows converging toward the flaw in the core. In this paper, the factors influencing flow limiting by an upstream material are addressed experimentally, using the flow limitation erosion test (FLET). The results of eighteen FLETs, on five coarse, broadly graded soils as upstream material, are presented. The laboratory testing shows that the flow-limiting action is strongly dependent on the grading and the compaction characteristics of the upstream soil. The critical parameters are the fines and the gravel content, the nature of the fines, and the compaction water content. Practical rules for the preliminary estimation of the likelihood of flow limiting by an upstream coarse material being effective in stopping the progression of erosion in zoned dams are suggested, based on the results of the experimental study.