**Experimental study on limitation of internal erosion in dams by upstream zones of well-graded soils**

The limitation of the progression of internal erosion in zoned dams, potentially caused by an upstream zone built of coarse, well-graded soils with non-plastic fines, is assessed using a new test cell. This device allows two types of tests to be conducted: the flow-limiting erosion test (FLET) and the crack-filling erosion test (CFET), which are designed to study the isolated influence of the flow-limiting action and the crack-filling action, respectively. The specimen is subjected to water flow along a hole drilled in the core and the upstream zone. In the CFET, the specimen additionally includes a downstream filter. Three upstream materials with non-plastic fines, a core and a filter are examined. The results of nine FLETs and nine CFETs are presented and analysed. The FLETs show the clear influence of the compaction water content, fines content and gravel content of the upstream soils in their capability to provide the flow-limiting action. The CFETs show that the specimen using the coarsest upstream soil (with 21% non-plastic fines) compacted on the dry side is capable of stopping the progression of erosion, enabling a partial crack-filling action. In all other test conditions, the filtering mechanism due to erosion of the upstream soil provides an important limitation of the erosion process. Based on the tests, practical recommendations to assess the influence of upstream zones on the limitation of internal erosion are proposed.