# A flexible wall permeameter test device: design, commissioning and operation

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The susceptibility of soil to seepage-induced internal instability was first tested in simple rigid wall permeameters with limited control of seepage. The susceptibility was determined based on mass loss and forensic analysis of the particle size distribution at the end of the test, without any consideration whatsoever for measurement of flux, pore water pressures or axial deformations. A second-generation of rigid wall permeameters included improved seepage control systems and monitoring of the pore water pressure distribution by standpipes and measurement of the flow rate, to allow for the determination of hydraulic conductivity, often combined with measurement of mass loss and forensic analysis of the particle size distribution at the end of the test. Most of these studies did not apply any vertical stress, although some applied a nominal top load. The current third-generation of rigid-wall permeameters now incorporates an axial loading system with measurement of load at the top only, else top and base of the specimen.

In a companion path of investigation, flexible wall permeameters have been used to examine seepage-induced internal instability in an attempt to eliminate any preferential seepage flow paths along the soil-wall interface of a rigid-wall permeameter, and thus more confidently establish the susceptibility of materials. The ability to control the stress on the test specimen has appealed to more recent investigators, all of whom have sought to investigate the conditions at the onset of instability. For this purpose, the hydraulic gradient, flow rate and eroded mass are monitored, typically in combination with deformation of the test specimen, either by means of monitoring axial or volumetric deformations.

Third-generation flexible-wall permeameters that are equipped to measure volume change of the test specimen represents that state-of-art in advanced laboratory testing. Given the scientific issue of micro-mechanical influences on the location and rate of seepage-induced erosion in an embankment dam, a flexible-wall permeameter is thus essential in laboratory testing for data collection in support of model calibration and verification. We describe the design features, commissioning, and operation of the UBC flexible-wall permeameter, with reference to materials examined in testing and the findings as they relate to seepage-induced instability in potentially unstable gradations.