

THE UNIVERSITY



OF HONG KONG

DEPARTMENT OF CIVIL ENGINEERING

SEMINAR

MICRO-SCALE MODELLING OF ONE FORM OF INTERNAL EROSION

by

Dr Tom Shire

School of Engineering

University of Glasgow, UK

Date: August 15, 2019 (Thursday)

Time: 5:00 p.m. – 6:00 p.m.

Venue: Room 6-12B, Haking Wong Building, HKU

ABSTRACT

Embankment dams and flood defence embankments (levees) constructed from soil are critical public infrastructure for flood prevention, water storage and hydroelectric power generation. Internal erosion, also known as piping, is one of the main causes of dam and levee embankment breach during floods. It occurs when soil particles are washed out of an embankment by water seepage, eroding material from within until the embankment collapses. This presentation will consider recent research into internal instability, one form of internal erosion. Internal instability involves the preferential erosion of finer grains in gap-graded or broadly graded materials. The research presented here has used particle-scale discrete element modelling (DEM) to study the fundamental mechanisms of internal instability. The presentation will explore links between empirically-based rules used to assess internal stability and the nature of stress transmission between particles in the soil. It will also discuss approaches used to measure constrictions (pore throats) in filters and the link between the filter particle size distribution and the constriction size distributions. Data from DEM simulations coupled with computational fluid dynamics (CFD) will be presented to explore the critical conditions driving the initiation of instability.

ABOUT THE SPEAKER

Dr Tom Shire is a Lecturer in Geotechnical Engineering at the University of Glasgow and a Chartered Civil Engineer. Tom carried out his PhD research at Imperial College London from 2010-2014, focusing on discrete element modelling (DEM) of granular filters for embankment dams using the open source code LAMMPS. The work was awarded the Unwin Prize for the best PhD in the Department of Civil and Environmental Engineering. From August 2016 to March 2017 Tom was a Research Associate in the Geotechnics section at Imperial College London, focusing on laboratory testing of unsaturated soils. Recent work in granular materials has included supervision of an industry-funded MPhil project to couple DEM with computational fluid dynamics and work to improve DEM for use with high performance computers.

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