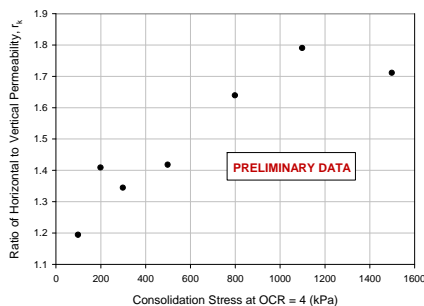


# Stress Induced Permeability Anisotropy Behavior of Cohesive Soil

Amy Adams, Massachusetts Institute of Technology

## ABSTRACT

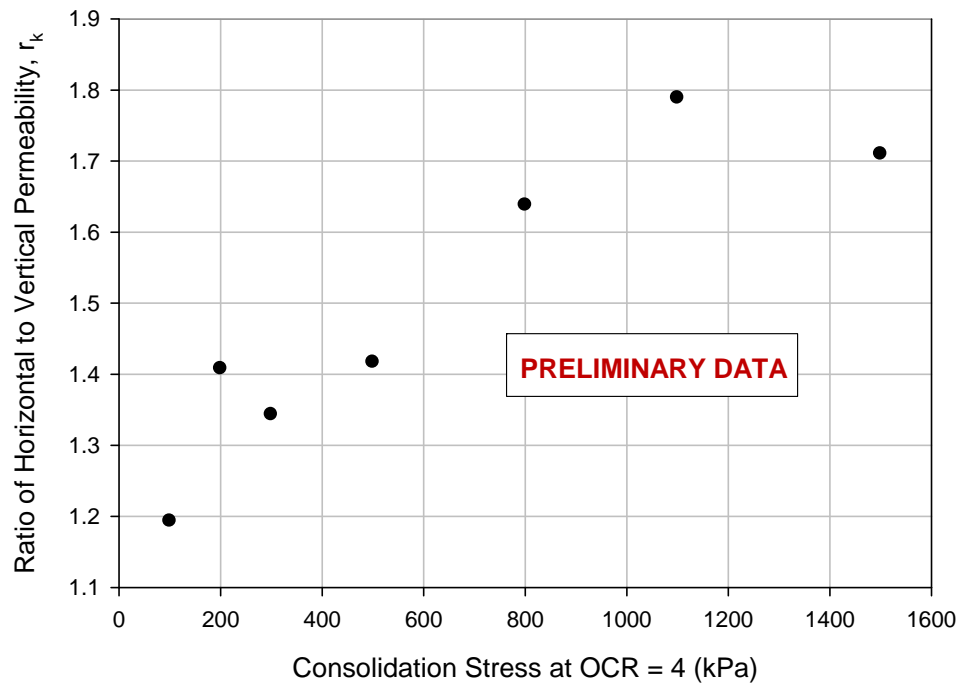
The permeability anisotropy of cohesive soils is a key soil parameter because flow can occur much faster in one direction than another; accounting for only unidirectional flow in permeability related models can thus lead to significant error. Many factors, mostly related to macro and micro structure, are thought to control and cause permeability anisotropy. This work concentrates on the stress-related evolution of permeability anisotropy and the micro structure of a laboratory resedimented low plasticity clay. The permeability anisotropy trend is measured in a constant head flexible wall device using a 5 cm cubic specimen allowing for multidirectional measurements on a single specimen via rotation of the specimen in the apparatus for different set up orientations. The void ratio vs. vertical permeability trend is compared with tests in the constant rate of strain (CRS) device, confirming agreement between the two permeability measurement theories. Results indicate that the ratio between the horizontal and vertical permeability,  $r_k$ , varies between 1 and 2 and increases with increasing stress level. Further research to understand and fully characterize the nature of this relationship will help engineers and scientists better understand and predict the pathways for fluid flow and pressure migration in sedimentary basins.



**Fig. 1:** Permeability anisotropy vs. stress relationship measured for Resedimented Boston Blue Clay using a Constant Head Flexible Wall apparatus and a cubic specimen. The specimen rotated between setups allowing measurement of three (3) directional permeabilities on the same specimen.

**CLICK ON IMAGE FOR  
LARGER VIEW**

### Permeability Anisotropy vs. Stress



**Fig. 1:** Permeability anisotropy vs. stress relationship measured for Resedimented Boston Blue Clay using a Constant Head Flexible Wall apparatus and a cubic specimen. The specimen rotated between setups allowing measurement of three (3) directional permeabilities on the same specimen.