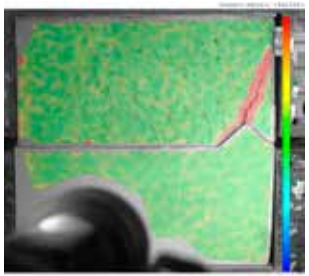
Background

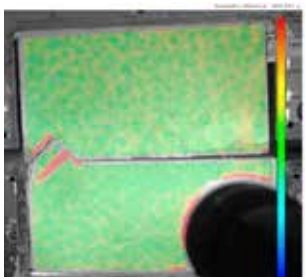
The safety evaluation of concrete gravity dams against sliding is done using the Mohr-Coulomb model. This model despite of several limitations is still in use. Several other models have been proposed to calculate the shear strength of rock joints. However, the scale and amplitude of roughness on a dam foundation is different than a rock joint. Hence, direct application of these models for dams is questionable. This knowledge gap has resulted in making the dam unsafe and upgrading has to be done to meet the current safety regulations.

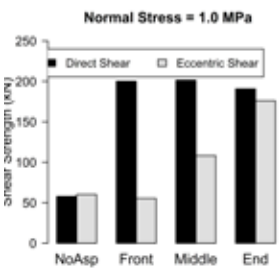
The objective of this thesis is to propose models and methodologies to reliably estimate the shear capacity and to demonstrate their use for reliable safety evaluation of a dam. This PhD is a part of "Stable dams" project at Norut, Narvik.

A series of lab tests were done in 2017 at Luleå Technical University in Sweden to investigate the effect of location of big scale asperity on shear strength. In addition, tests on scaled section of dam are planned to investigate the effect of roughness at different orders. Furthermore, other researchers on the same project are working on 3D analysis of dams and identifying semi destructive and non-destructive techniques for investigating the geometry, material properties and loads on existing dams.

The figures on the right are taken from eccentric shear tests. The two samples have different location of asperity (at the front and at the end). The figure shows that the location of asperity affects the location and mode of failure. Thus affecting the shear strength.







Dipen Bista

Department of Civil and Environmental Engineering

2016 - 2018

Sliding stability of concrete dams

Supervisor:
Leif Lia
Co-supervisor:
Fredrik Johansson

NTNU

PHD THESIS