SHEAR – FLOW COUPLING PROPERTIES OF ROCK JOINT

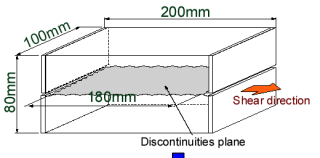
Introduction

Deep underground structures utilize rock characteristics such as stiffness, sealing, durability and isolation. It is important to obtain the permeability of the rock mass, in which underground structures are to be constructed in order to confirm its capacity to isolate. Permeability in rock masses containing multiple joint sets is principally governed by those joints. The permeability of a rock joint fundamentally depends on its behavior in opening and closing, it is necessary to understand the coupling between the hydraulic and mechanical mechanisms.

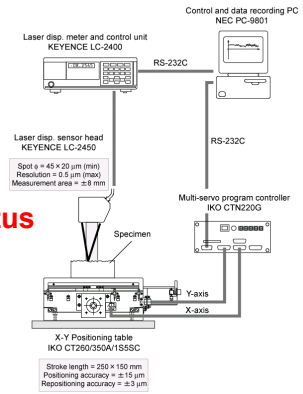
Contents

The shear-flow coupling properties of a rock joint are clarified from laboratory tests. Aperture distribution is determined using joint surface data and a shear-flow coupling model is developed. The shear-flow coupling tests are simulated in order to clarify the mechanisms of shear-flow coupling properties and compared with experimental results.

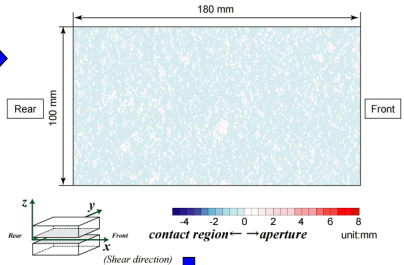
Specimen



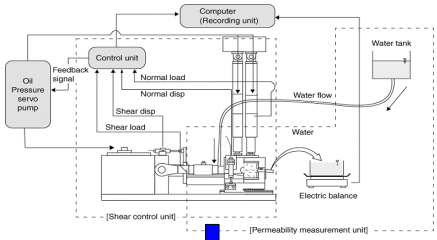
Joint surface measurement



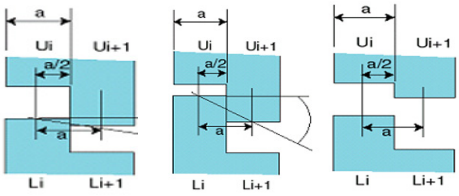
Setting initial aperture



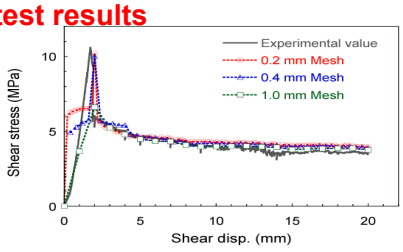
Shear – flow coupling test apparatus



Shear model



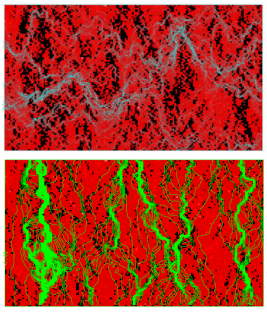
Comparison of simulation with test results

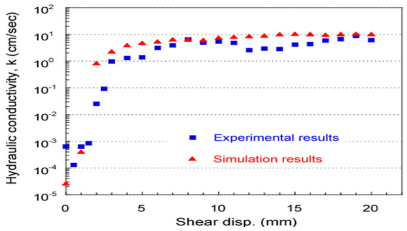


Shear stress versus Sear displacement

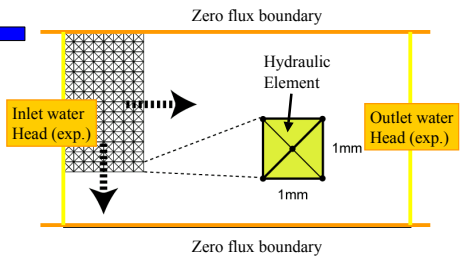
Aperture distribution during Shear displacements

Flow simulation





Flow model



Conclusions

The proposed shear – flow model simulates the variation of shear stress and hydraulic conductivity during shear relatively in good agreement with experimental test results, according to the aperture and contact distribution. Further research for measurement and characterization of joint geometry to accurate simulation of coupling processes is ongoing.

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