Interface Behavior from Suction-Controlled Direct Shear Test on Completely Decomposed Granitic Soil and Steel Surfaces

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Introduction

A soil-structure interface is defined as the contact surface between a soil and a structure through which stresses are transferred from the soil to the structure or vice versa.

In this paper, the shearing behavior of completely decomposed granite soil and steel interfaces is examined using a modified suction-controlled direct shear apparatus. We aims to investigate the influence of counterface roughness on the failure envelopes of soil-steel interfaces.

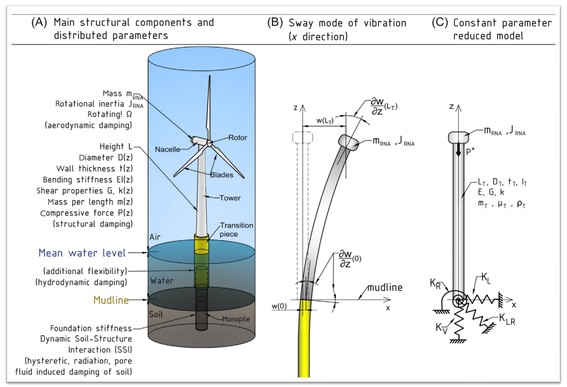

Figure 1: Offsore Wind Power (Prakhya & Bhattacharya, 2021)

Methodology

Test Materials

Soil: Locally available completely decomposed granite (**CDG**) soil was used.

Specific Gravity	2.59
Liquid Limit	31%
Plastic Limit	21%
Maximum Dry Density	1.84 Mg/m^3

Counterface: A square stainless steel plate, The normalized surface roughness (R_n) is defined by by Kishida and Uesugi (1987)

$$R_n = R_{max}/D_{50}$$

Behaviors of Unsaturated Soils

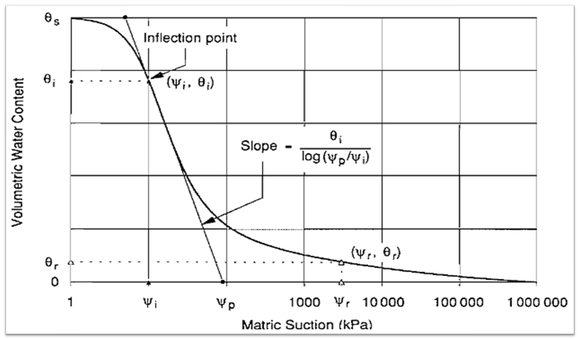

Figure 2: Water Content Verus Matric Suction (Fredlund & Xing, 1994)

Loading Path

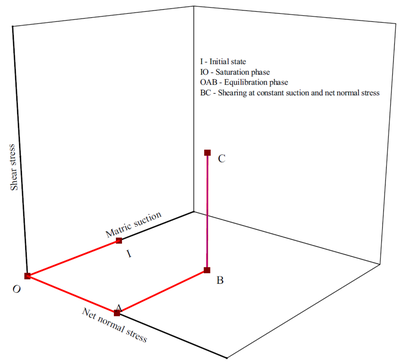

Figure 3: Sketch of the loading path

Test Appratus: MDSA

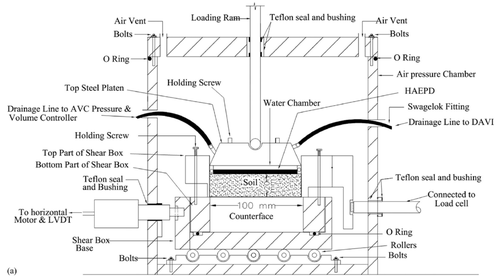

Figure 4: Schematic Diagram of MDSA (Modified Direct Shear Appratus)

Results

Experimental Results

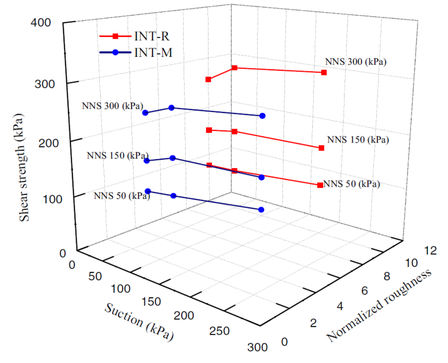

Figure 5: Shear strength

Findings

- Matric suction and NNS significantly influence the hardening/softening behavior;
- Counterface roughness significantly influences the shear behavior and interface shear strength;
- The interface dilation has a significant impact on the interface shear strength;
- The optimum normalized counterface roughness that possesses maximum interface shear strength is not unique.

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