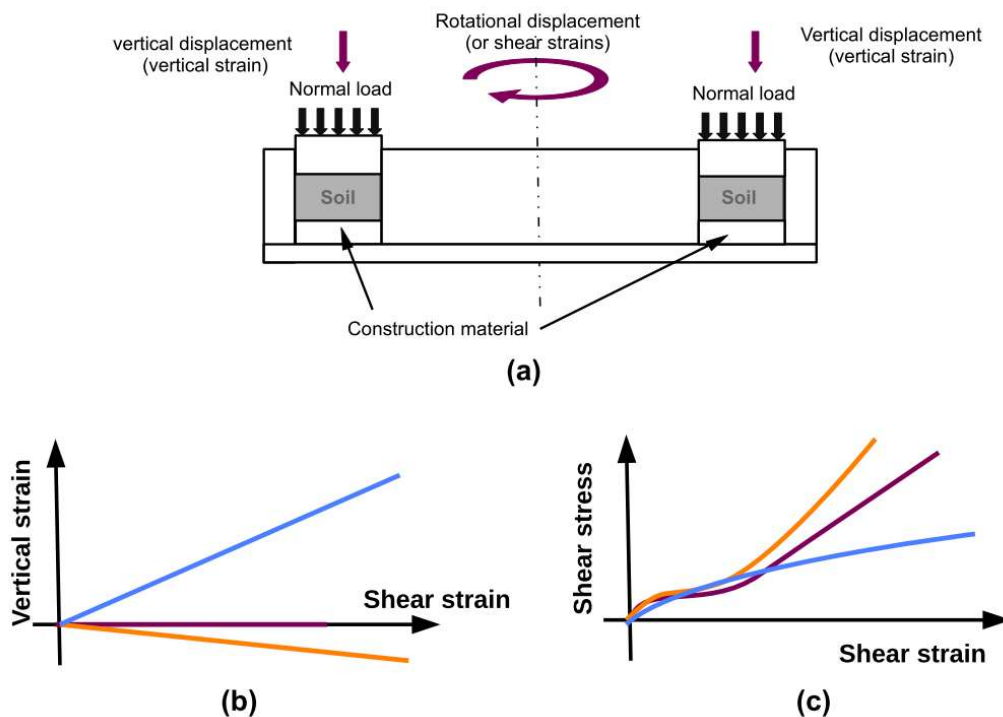


## Large displacement behavior of soil-structure interfaces under different boundary conditions

The analysis of soil-structure interaction (also called interface behavior) is crucial for the appropriate description of the phenomena in the contact between granular bodies and structure. Interface is thin zone where soil interacts with construction material. The interface behavior in terms of stress-displacement relationships is especially important for the design of piles, pull-out of geosynthetics and anchors. There are many boundary conditions related to interface testing. Boundary conditions are all conditions prescribed to the sample before testing, such as shearing rate, interface type, change in sample height, type of shear (direct, simple, torsional), shear strain range, etc. This project introduces a novel condition, called constant dilatancy boundary condition. It uses constant ratio between vertical movement (vertical displacement or strain) and rotational movement (torsional displacement or shear strain) during testing. The ratio between this two quantities is called dilatancy. This is quite unusual form of testing, as typically, the vertical movement is free (such test is called CNL= constant normal load test), fixed (CV = constant volume test) or related to applied normal pressure on the sample (CNS = constant normal stiffness test).

This project aims for testing sand – steel and cohesive soil – steel interfaces for different type of boundary conditions: typical ones (CNL, CNS, CV) as references and new one (constant dilatancy) to investigate untypical interface response which was not previously tested. The other novelty is testing in large strain regime which allows for overall picture of interface strength behavior. The tests will be carried out in specially developed torsional ring shear apparatus. The scheme of the test is presented in **Figure 1**.



**Figure 1.** (a) scheme of testing, (b) different constant dilatancy boundary conditions (ratio between vertical strain and shear strain) and (c) aim of project: looking for interface shear strength relationships.

The results of the project will permit to determine the interface strength under different boundary conditions. Consequently, the presented research aims for understanding novel soil-structure behavior. The achievements of the project can be applied in foundation engineering and design of off-shore structures. Presented project extends current knowledge of soil-structure interface behavior and facilitates understanding of basic interface behavior. The results of the project and the obtained parameters of soil-structure interface behavior can be also used in advanced numerical analysis of insertion problem (e.g. helical piles).