EXPERIMENTAL INVESTIGATION ON THE CONSOLIDATION AND VERY SMALL–STRIAN STIFFNESS PROPERTIES OF MACAU MARINE CLAY

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ABSTRACT

The value of very small strain shear modulus varies at different loading conditions and consolidation process. In this study, the variation of shear wave velocity was monitored in the consolidation process and the consolidation behavior of reconstituted Macau marine clay (RMMC) and undisturbed Macau marine clay (UMMC) were explored in detail. Conventional consolidation tests in oedometer and CRS tests in Rowe cell were performed for examination.

The experimental results manifest that the coefficient of consolidation in vertical and horizontal direction decreases with the increase of pressure before the pre-consolidation stress and increases slowly after the pre-consolidation stress for RMMC and UMMC.

The test results shows that the values of coefficient of consolidation and permeability in vertical and horizontal directions are almost the same for RMMC and it demonstrates that the RMMC exhibits isotropic consolidation behavior from both conventional and CRS consolidation tests. However, the UMMC taken from Cotai shows slightly anisotropic behavior with respect to the values of coefficient of consolidation and permeability in vertical and horizontal direction obtained from conventional and CRS tests.

Furthermore, odemeters were modified to equip with bender elements to measure the shear wave velocity in consolidation process. The empirical equations related shear wave velocity and very small-strain stiffness measured after 24-hours in oedometers tests were proposed and it is found that they are directly dependent on stress state and stress history. In the primary consolidation, the value of shear wave velocity drops a little immediately upon loading, after which it generally increases approximate linearly with the increase of average degree of consolidation. Meanwhile, the increase of shear wave velocity is very significant after 6 months of secondary consolidation. The test results also show that the increase value of shear wave velocity in secondary consolidation process is a function of time.