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An improved remoulding method for unsaturated cohesive soils

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Remoulded specimens are prepared in laboratory soil tests generally by proctor compaction. However, the disturbance due to this process on unsaturated cohesive soil (except for some special soil ,loess, swelling soil etc.) can be so large as to render the strength test results almost meaningless compared with that on coarse-grained soil. In order to eliminate the negative effects on soil strength resulted from traditional remoulding method and thus provide a better reference for engineering practice, an improved method is required to make the strength of remoulded soil and that of natural soil much closer.

Normally, the soil sample would be compacted at a certain moisture content into a mould to achieve the specified dry density in specimen preparation. Studies show that the specimen prepared by such means is marked by a significant stratification and see insufficient water-soil interaction, which would consequently lead to a massive loss of matric suction.Given this realization, a new method simulating the natural dehydration process is introduced in attempt to recover the matric suction of the specimens, thereby enhancing their strength. Two more steps are added compared with the traditional remoulding method, that is, saturation and dehydration. After the water fully passed through the pores in the saturation process, the specimen would lose certain amount of moisture and achieve the required dry density at the same time by a self-designed device, which is able to exert pressure on air gradually and dehydrate the soil in a circulating way.

In this work a series of shear tests on different saturation of silty clay collected from Three Gorges area, China, was conducted using the improved method to verify its feasibility and practical effects , the undisturbed soil and traditional remoulded specimen as contrast naturally. The results show that the strength of undisturbed soil would decline linearly as the water content grows. On the other hand, the strength of traditional remoulded specimen rises initially from a very low level then fell dramatically with an increasing moisture content, which is far less likely than that of undisturbed soil. And as expected, the improved specimen shows a good similarity not only in strength scale but also the change rule under varied saturation degrees with undisturbed soils, which proves a successful recovery of matric suction and enhancement of soil strength.

Overall, an improved remoulding approach is presented to evade some defects of the previous remoulding method. It is believed that more accurate results could be obtained if shear tests were conducted based on this idea.