

Development of Multi Purpose Large Diameter Sampler and Its Application

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ABSTRACT

A large diameter sampler was developed to take undisturbed samples from not only soft ground but also sandy and weathered ground. The large diameter sampler developed in Korea Institute of Construction Technology (KICT-type large diameter sampler) was manufactured based on the principle of triple core barrel sampling. A specially designed cutting device was used to cut and contain various kinds of samples in the sampler during a sampling and retrieval procedure. By adjusting the stiffness of the spring located at the top of the sampler, the distance between the cutting shoe and auger can be controlled in accordance with the ground condition.

In order to investigate the applicability of the developed sampler and compare the quality of the samples taken by the sampler with that by the traditional thin-walled tube sampler, samples were taken at various sites according to the ground condition. And a series of laboratory tests such as the unconfined compression test, triaxial compression test, oedometer test, large diameter Rowe cell consolidation test (D:150 mm) and resonant column test were performed. The test results showed that the samples by the KICT-type large diameter sampler show higher quality than the samples by the thin-walled tube sampler. And the validity and applicability of the developed KICT-type large diameter sampler was confirmed accordingly.

KEY WORDS: large diameter sampler; undisturbed samples; quality of samples; thin-walled tube sampler; laboratory tests.

INTRODUCTION

Recently, due to rapid industrial development, it is hard to construct various facilities only in sound ground. So the number of constructions in very complicated conditions at a reclamation site, landfill site, weathered rock, and also near the downtown area has been increasing. To investigate the ground characteristics, accurate site investigation techniques are needed because they are directly related to the success of the construction.

To investigate soil properties, in situ tests and laboratory tests are used. Generally, in situ tests show relatively good and conservative results than laboratory tests, but in some medium plasticity clay, it shows opposite behavior (Long, 2006). In addition, in situ tests can minimize

the disturbance of soil. However, it has limitations in that it requires much cost and has difficulty in simulating the stress condition and boundary condition expected during and after construction. Due to these limitations of the in situ tests, laboratory tests were also performed simultaneously.

Disturbance of the specimen during sampling, transportation, storage, and laboratory testing can affect test results defectively. Especially, once the disturbance of soil occurs during sampling, it affects the subsequent testing procedure such as transportation, storage and laboratory testing. Consequently, many researchers have tried to take undisturbed samples; hence, various types of samplers have been made around the world. (Johnson, 1940; Hvorslev, 1949; Serota and Jennings, 1957; Karol, 1970; Broms and Hallen, 1971; Borowicka, 1973; Osterberg, 1973; Lefebvre and Poulin, 1979; La Rochelle et al, 1981; Oka et al., 1996)

It is well known that a large diameter sampler reduces sample disturbance, and the angle of the cutting edge and area ratio are also influencing factors for sample disturbance. Sherbrooke sampler and Laval sampler are the most renowned sampler for taking undisturbed samples from soft ground. In Korea, there have been also attempts to develop a large diameter sampler. But these large diameter samplers have limitations that depend on soil condition.

In this research, a large diameter sampler (KICT-type) was developed for various soil conditions. The detailed feature of the sampler is also introduced. The developed sampler was applied to clayey soil and sandy soil to take better quality samples. The sample taken with a typical thin-walled tube sampler was compared with that taken by the developed sampler. Accordingly, the performance and applicability of the developed sampler was investigated. In addition, laboratory tests with various specimen sizes were performed to confirm the size effect of the specimen on the results.

KICT-TYPE LARGE DIAMETER SAMPLER

The developed KICT-type large diameter sampler is shown in Figs. 1 and 2. The developed sampler adopts the principle of the triple tube core barrel sampling. A sampling tube located inside the auger does not rotate during sampling while the outside auger (bit) penetrates the ground by rotation. During sampling, the spring located at the top of the sampler controls the distance between the cutting shoe and auger bit