Relation of shear wave velocity by bender element test and residual effective stress

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ABSTRACT

In this paper, we attempt to evaluate the sample quality of natural cohesive soils by means of shear wave velocity from Bender Element (BE) test under unconfined stress conditions. Results from this evaluation are compared with those using suction (residual effective stress \(p'_r\)) and deformation modulus \(E_{50}\) obtained from UC test. It is revealed that \(p'_r\), \(E_{50}\) and \(V_s\) \((G)\) values are closely correlated with each other and \(G\) value is mainly governed by \(p'_r\) value, provided that change in void ratio is small.

KEY WORDS: Sample quality, Bender element, Shear wave velocity, Shear modulus, Residual effective stress, Unconfined compression test, Over consolidation ratio

INTRODUCTION

Sample quality is a very important issue for obtaining reliable geotechnical parameters. Many researchers have tried to establish methods for evaluation of sample quality, in terms of, for example, strain at failure from the unconfined compression test, volume change caused by applying the in-situ effective overburden pressure \((\sigma'_v)\) and so on. However, these traditional methods are mostly destructive tests: i.e., once these tests are performed, the sample cannot be used again. Instead of these tests, the shear wave velocity \((V_s)\) from the Bender Element (BE) test has recently come to attention, because the test is relatively simple and time required for the \(V_s\) measurement is very short. In addition, the test is non-destructive so that the specimen after measuring \(V_s\) can be used for other mechanical tests to obtain geotechnical parameters.

![Figure 1. Soil profile and main properties of Mihara soils](image)