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Interpretation of the Pile Loading Test Using Creep

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ABSTRACT

Pile loading test is the most accurate method to evaluate the pile bearing capacity. However, if there is no clear failure load for pile loading test, the ultimate load is generally estimated by some interpreted methods. Several methods are available interpret the pile load test (Kulhway, 1995), but, to-date no consensus on the best interpreted method. In this paper, several interpretation methods were used to interpret the compression and tension full scale pile loading tests in soft rock. Beside, the creep-based method was also used to interpret the pile loading tests. The results show that the creep rate of creep ultimate load is about 8.2 mm/min (log scale).

KEY WORDS: Creep, pile loading test, plunging load, creep ultimate load.

INTRODUCTION

Pile foundation is usually used to carry the heavy structure. The bearing capacity of pile foundation plays an important role for pile design. Generally the bearing capacity of pile could be evaluated by pile loading test, analytic method, or dynamic methods (Codotu, 2001). Pile loading test is the most accurately method to determine the bearing capacity of pile foundation.

There are two kinds pile loading test, one is acceptable test or proof test. Another one is the preliminary pile test (load transfer test). The purpose of the former one is just to check or identify the design load with the available safety factor. The preliminary pile test is conducted to gain detailed information on load transfer in side and base resistance, performance, and the maximum test load generally cause the pile to reach the failure or ultimate condition.

Load-displacement curves obtained from pile loading tests on deep foundations can exhibit any one of the shapes shown in Figure 1. Curve A shows a clear yielding or failure loading. The ultimate bearing capacity can be determined easily. However, if the load-displacement curve resembles B, the ultimate resistance of the foundation is difficult to evaluate. Drilled shaft data often resemble type B. If there is no clear failure or ultimate load occurred during the pile loading test, the ultimate load is generally evaluated by some interpreted methods. Kulhawy(1995) indicated that there was more than 41 methods for determining the ultimate load of a pile from load test result, but there is no consensus on the best or standard method of interpreting the ultimate or failure load. In this study, one compressive and one uplift full scale pile loading tests were conducted to assess existing interpretation methods. In addition, the creep-based interpreted method was also used to evaluate the test results.

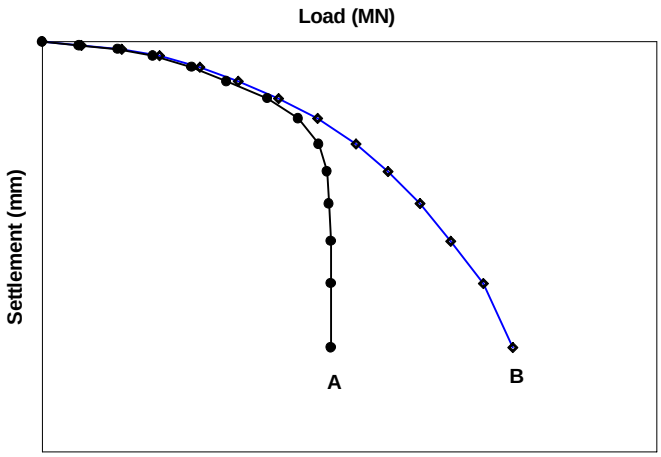

Figure 1 Typical load vs. settlement curve (Ku and Lee, 2004)

TEST CONDITIONS

The test site was located at Shinchu County, Taiwan. The famous Shinchu Science Park, the high-tech industry center is near by. The site geomorphology feather is foothill. There are three layers in this test site. The thickness of top soil, loose silty sand, is about 2m. Beneath this layer to the depth of 5.8m is mainly brownish yellow weathered silty mudstone. From the depth of 5.8m to 20m is a layer of soft gray silty mudstone. The unconfined compression strength of soft rock range from 441kPa to 1297kPa, its average is about 903kPa (Table 1).

The compression test pile CP2 and tension test pile PT2 were installed