The interpretation of a quasi-static pile load test with respect to the effect of excess pore water pressure

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The excess of pore water pressure during a quasi – static pile load test even in sand ground has been confirmed by in-situ measurements [1, 2, 3]. Its importance in predicting the derived static bearing capacity of a pile from the quasi – static test is also remarked [4].
In this paper, the influence of the excess of pore water pressure will be investigated, by using a dynamic finite element simulation of the test. The simulations are performed with a finite element procedure created by Hölscher, 1995 [1], which couples the wave propagation and consolidation theory. The final result of this study is a proposal for the implementation of the effect of excess pore water pressure in the interpretation of quasi – static pile load test.

The paper starts with a simulation of a quasi – static pile load test case history, where the response of the pile, soil and pore water pressure are measured. The results of simulation agree well with the measurements. The feasibility of the finite element program is confirmed.

Secondary, the dependency of excess of pore water pressure during a quasi – static test on soil properties, geometry of pile and loading rate will be examined.

Thirdly, the effect of excess pore water pressure on the interpretation of the quasi-static test using a single degree of freedom (SDOF) model like the Unloading Point Method (UPM) [5] is discussed. The SDOF model is preferred because of its simplicity in practical applications.

Finally, some case histories are given to show the usefulness of improvements.

References

[1] Hölscher, P. Dynamical response of saturated and dry soils, Ph.D thesis, DUT, 1995.
[2] Holeyman, A.E. Technology of pile dynamic testing, Keynote lecture, Proc. of the 4th Int. Conf. of Application of Stress-wave Theory to Piles, 1992, pp. 195-215
[3] Matsumoto, T., 1998. A FEM analysis of a Statnamic test on open-ended steel pipe pile. Proc. 2nd. Int. Statnamic Seminar, Tokyo, pp. 287-294.
[4] Research Activities Toward Standardization of Rapid Pile Load Test Methods in Japan. Proc. 2nd. Int. Statnamic Seminar, Tokyo, pp 219-235.
[5] Middendorp, P., Birmingham, P., Kuiper, B., 1992. Statnamic Load Testing of Foundation Piles. Proc. 4th Int. Conf. Application of Stress Wave Theory to Piles, the Netherlands, pp. 581-588.

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