QUALITY ASSURANCE

SESSION LEAD PAUL HOLSCHER (DELTARES) / CIHAN CENGIZ (DELTARES)

Presented papers:

Validity of Dynamic Load Test (DLT) on H-piles. Presented by : T. Nguyen

ABSTRACT

The author evaluated H-pile load test data from three (3) sources: 1) Florida database of 641 H-piles from public bridges with Dynamic Load Test (DLT), 2) FHWA database of 23 H-piles having both DLT and Static Load Test (SLT), and 3) a private sector project with detailed DLT and SLT results. The need for this study originated from occasional very large divergence between DLT results and static analyses results of H-piles in several projects. Upon detailed evaluations it is concluded that the observed large divergence is not due to correlations discrepancy, but rather the invalidity of the DLT results for certain H-piles, especially for 1) long H-piles with penetration depth exceeding 30 m, the piles may behave as plugged in the static condition, but as unplugged during dynamic loading event; 2) short H-piles, the conventional lumped CASE damping factor in conventional range should not be relied on for these piles.

Advantages in Using Thermal Integrity Profiling Stress Wave Paper 2022. Presented by : G. Piscsalko

ABSTRACT

There are several different integrity test methods available for assessing drilled shafts/bored piles, ACIP/CFA piles, and diaphragm walls and panels. Each of these test methods offers both advantages as well as limitations for the applications. Many times, the integrity method is chosen without a great deal of understanding on what the test can truly indicate and equally important, what the test method is unable to highlight. This paper will outline the various test methods along with the advantages and limitations for each and will focus on the capabilities and advantages of using Thermal Integrity Profiling as the primary deep foundation integrity testing method. As the Thermal Integrity Profiling method is deployed widely throughout the world, it is important to understand the method and all the capabilities and limitations. The Thermal Integrity Profiling method will be explained in detail along with case histories where Thermal Integrity Profiling was implemented.

Improved interpretation of high strain dynamic test results using high frequency displacement monitoring of closed ended piles. Presented by : R. Damen

ABSTRACT

Signal matching of high strain dynamic testing (PDA) results requires the input of a pile driving set. Traditionally, this is measured manually, which leads to considerable systematic errors in the measurement of set. The development of high frequency displacement monitoring equipment allows for much more accurate measurement of set and temporary compression. This paper discusses pile testing data of closed ended piles, using high frequency displacement monitoring in conjunction with PDA testing. It was found that the (apparent) set measured at approximately 200 milliseconds differs from the final set measured at 1 second after impact. Incorporation of this data into the signal matching process and the subsequent correlations with driving formulae resulted in a more consistent match. The possible causes for the difference in set, as well as implications for pile verification are discussed.

CASE STUDY OF THREE BIDIRECTIONAL STATIC LOAD TESTS FOR BORED PILES AT SABANA COSTA RICA. Presented by : Millan / Coto

ABSTRACT

Three bidirectional static load tests (BDSLT) were executed on bored concrete piles, as part of the permanent foundations for two buildings sites located at the Sabana, San Jose, Costa Rica, separated at a relatively short distance of about 1 km. Unit skin friction values obtained for both sites, principally for the “Lahar” layer show that in general, friction pile capacity from the tests is higher than anticipated per static calculations from soil borings geotechnical parameters correlations. Results from the tests were also compared with dynamic load tests (DLT) executed at other two sites in the surrounding area, and with a Finite Element (FE) Analysis that model soil-pile interaction for one of the projects. On the other side, some construction issues were detected on one of the sites, which negatively affected the end bearing capacity, but being that pile friction was higher than anticipated, the required overall pile capacity was accomplished. The BDSLTs results of these tests help to better understand the geotechnical behavior of the soil layers in the Sabana. Moreover, they also show that is possible to optimize the design and construction of other bored pile supported buildings and structures on the zone.

Validity of the Beta Method to determine pile damage. Presented by : G. Verbeek

ABSTRACT

In 1979 the Beta Method of pile integrity was published. The basic idea behind this method is that stress waves propagating through a foundation pile will be reflected on cracks in concrete piles. As the crack becomes more extensive, so do the reflections. In the ultimate situation of a fully cracked pile, no waves will travel through the crack and the stress wave will be fully reflected. The Beta Method is then calculating the reflection rate (reflected as percentage of the original peak force) and the outcome is presented as a reliable integrity indicator. However, from both theory and practical experience it can be shown that applying the beta method to indicate pile damage will give false negative and false positive results. The former is unwanted because sound piles will be rejected, which will cause grief to the piling contractor. The latter will result in the fact that damaged piles are accepted as sound, where that shouldn't be the case, obviously increasing the risk of failure. The paper will once again illustrate this, through theory as well as practical examples, and then conclude by making suggestions for a practical pile damage assessment on a job site using low strain dynamic testing.

Integrity of Bored Piles Under Tension. Presented by : O. İnanir

ABSTRACT

Instrumented pile loading tests can give a better understanding about the pile load-transfer mechanism. It gives also opportunity to assess the integrity and durability issues of the bored pile under tension. When a reinforced concrete bored pile subjected to high tension forces, it might reaches to tensile stress capacity of concrete and cracking occurs at a weakest section. The formation of cracks influences the load-displacement behaviour of piles under tension load and it causes difficulties during interpretation of pull-out tension test results. The full shaft resistance capacity can only be taken into account when it reaches the required relative displacement along the pile for fully mobilized shaft resistance and crack deformation. Especially for long piles this cannot be achieved in the acceptable pile displacement range. Thus there are different tendencies in various design manuals to limit the pile capacity under tension by applying higher safety factors or by lowering the resistance factors. However, these approaches might not always guarantee crack free design under service load. In this study an instrumented pile pull-out tension test results are briefly presented from crack formation and propagation aspect. Crack opens when the tensile deformation from applied loads reaches the tensile deformation capacity of concrete (Borosnyoi and Balazs, 2005, Bicocchi, 2011). In addition to this study, authors have also experienced between 50-150 microStrain values for crack formation at piles during pull-out tension test with different concrete characteristics and different steel content (Inanir, 2018). Bicocchi, (2011) also reported similar findings with strain gauge measurements while flexural bending crack formation at piles. The position of the SG and the influence zone of the cracked section might affect the measured value during first crack formation. It might also be a good practice in design to limit the elongation of reinforced concrete body of the pile which is subjected to tension. In other words limiting the mobilized strain (between 50-100μstrain) in the pile for crack free design might ensure an improved pile performance and material durability, but on the other hand this is preventing from taking advantage of the reinforcement tensile capacity.

Case Study of Using Static and Dynamic Pile Load Tests as Quality Assurance of Existing Piles for SRT Red Line Project, Thailand.

Presented by : P. Kitiyodom

ABSTRACT

This paper discusses a case study of using static and dynamic pile load test method as quality assurance of existing piles in Bangkok subsoil conditions for SRT Red Line Project, Thailand. The SRT Red Line Mass Transit project is a commuter rail system which most of the railway are run alongside of the halted Hopewell Project. The existing piles from Hopewell Project in some location cannot be avoided due to limitation of working area and was decided to be used as part of a foundation of elevated structure of SRT Red Line Project. Therefore, reliable verification procedures have been conducted on two representative existing pile starting from parallel seismic test, dynamic pile load test and static pile load test to ensure quality and load carrying capacity of existing piles. The comparison of load settlement curve between static and dynamic load test have been performed. Good agreement between the results obtained from dynamic load test and static load test have been observed. The results indicate the reliability of the dynamic pile load test to be employed as a quality assurance tool for other existing piles to be used in the SRT Red Line Project.