DOWNLOAD PDF PILE DRIVING ANALYZER MANUAL

Chapter 1 : Allnamics â€“ Paaltesten

The Pile Driving Analyzer (PDA) system is the most widely employed system for Dynamic Load Testing and Pile Driving Monitoring in the world. High Strain Dynamic Load Tests, also called PDA tests, assess the capacity of several piles in a single day.

Foundation Monitoring - Pile Integrity Testing Geotechnical Consulting Services Technical Profiles Dynamic load testing using Pile Driving Analyser PDA equipment is a high-strain non-destructive load test method which can be performed during or after pile installation using conventional pile driving equipment. This test can be applied to driven steel, driven timber and even concrete piles eg. PDA equipment calculates the velocity and force signals obtained from accelerometers and strain transducers attached to the pile during driving. PDA testing can be undertaken during initial driving or during re-strike drives after allowing soil setup on the pile for a suitable period of time. For conventional pile design a GRF of 0. This means smaller or shorter piles can be used to carry the same loads as conventionally designed piles. This translates into direct savings in the order of 20 percent on pile foundation materials and associated installation costs. Costs can be even greater with pile length optimization to eliminate the need for splices. A medium sized industrial plant project with driven steel piles originally designed based on a GRF of 0. The to mm pipe piles were to be driven into very stiff till with design depths of 10 to 18 m avg. A design review and PDA test pile program was undertaken. The original design called for about splices for piles over 15 m. The installations were done with standard pile lengths and no splices. Extra PDA testing on production piles verified the design capacities were achieved. A small building project with 46 driven steel piles originally designed based on a GRF of 0. The mm pipe piles were to be driven to refusal in weak bedrock at 8 to 12 m. Standard 12 m pile lengths were proposed with 1 m stickup. During initial driving, the resistance at 11 m embedment did not meet with the original final set requirements, suggesting it was required to splice and extend the piles 2 to 3 m deeper. The piles were allowed to setup for a few days and PDA testing was undertaken to verify the loads. After testing, only 3 of the 46 piles needed to be extended. Similar results have been experienced on many other projects. As a result, PDA technology is rapidly gaining acceptance in the local construction industry. This represents about 15 percent of all the PDA units currently available in Canada. There are three basic types of PDA tests on driven piles: Testing during the full drive of a pile will provide a complete record of the pile installation, including the ability to assess initial capacity and pile integrity along the full length of the installed pile. Testing at the end of installation only verifies the EOID capacity. Pile driving can produce excess pore pressures around the pile shaft which allows for easier installation. As a result, PDA testing during initial drive will usually produce lower capacity results. After driving, the pore pressures dissipate and the friction acting on the pile shaft increases. In some wet soils, the setup gain in capacity can be in the order of 50 to percent. The process is repeated until a reasonable match is achieved between the CAPWAP wave curve and with the measured wave response from the field data ie. A significant amount of judgement has to be applied during the CAPWAP analysis to ensure that the final results make sense in terms of the available soil and groundwater information for the site. For typical building projects at least 2 to 5 percent of the piles should be PDA tested. It should be understood that while PDA testing is relatively unobtrusive, some loss of production may be experienced during testing. If testing is performed during production piling, it is recommended to clearly identify in the tender document that PDA testing will be undertaken, in order to avoid contractor claims for delays. It should also be expected to allow for at least 24 to 48 hours for final verification of piling criteria based on CAPWAP analysis. Alternatively, initial PDA testing can be performed during a separate test pile program completed prior to production piling.

Chapter 2 : The Use of the Pile Driving Analyzer for Installing Pile Foundations - www.nxgvision.com

The pile driving analyzer (PDA) was developed in the 's as a method to directly measure dynamic pile response during driving. As the name implies, it was developed to analyze pile driving.

Geotechnical and materials engineers are no different. As the name implies, it was developed to analyze pile driving and evaluate pile driveability, including the range of stresses imparted to the pile, hammer efficiency, etc. With the development of inexpensive desktop computers, programs were written around the wave equation and estimates of pile capacity, such as CAPWAP, became a part of PDA analyses of pile installation. PDA testing has become a regular part of pile installation on projects in southeastern Virginia especially on waterfront projects. VDOT promotes its use on bridge projects and it is more frequently specified on small projects as well. In addition, it has become increasingly used as a complete substitute for the traditional static pile load test. Geotechnical engineers have been estimating pile capacity during the design phase of a project based on soil boring data, static analyses of pile capacity, and local experience for many years. These efforts provide a reasonable basis for design and load testing has confirmed that this type of analyses is reasonably conservative. The increased use of the PDA on local projects as a substitute for a traditional static pile load test is a trend that should be evaluated by the engineering community. The PDA has indicated ultimate pile capacities even after retapping that are significantly less than indicated by static analyses. We have seen underprediction ranging from a factor of 2 to 8 after a confirming load test was performed. The confirming load tests were ordered after the design engineer was lead to believe that his design is flawed due to the results of PDA testing. The data are used to estimate the bearing capacity and the integrity of the pile, as well as hammer performance, pile stresses, and soil dynamic characteristics, such as soil damping coefficients and quake values. This test method is not intended to replace Test Method D Quoting the USDOT â€" "Static load testing is the only method available to determine the actual static capacity of piles. With this ongoing trend, there needs to be an awareness of what the PDA data is providing. Figures 1 and 2 are plots of data taken from the FHWA publication and are representative of the information presented. A ratio of unity indicates an accurate estimate of actual pile capacity. A higher ratio is underprediction. There was an existing bridge across a drainage canal. A new bridge was to be constructed paralleling the existing span. The new bridge was designed to be supported on 60 ton prestressed concrete piles. The original bridge used the same size piles driven to the same sand bearing stratum also with a 60 ton capacity. The PDA was used as a replacement for a traditional pile load test. The PDA indicated that not only could the pile not achieve an ultimate capacity of tons for a safety factor of 2, it could not achieve an ultimate capacity of 60 tons â€" the design load. This caused the project to stop as the contractor alerted the City of Virginia Beach and the design team that the design was flawed. Fortunately, an actual traditional compressive load test was performed for the original bridge. It was carried to tons with only 0. This indicated that the pile could actually carry significantly more than 60 tons. In this case, the traditional load test allowed the project to proceed after significant concern about design flaws. The bridge was designed using both inch square and inch square concrete piles. The PDA was used to provide pile capacities instead of a traditional load test. The PDA results were erratic, but it indicated that the inch piles had only a 40 kip ultimate capacity. As suggested by GER during our review of the planned testing program, a standard pile load test was performed on the inch pile with the lowest capacity estimated by the PDA. This was Test Pile TP-3 with an end-of-drive estimated capacity of 40 kips that was substantially less than all other test piles by a factor of 3 to 5. The pile was loaded to kips and deflected about 0. Our analysis of the test data using a hyperbolic curve analyses by the Chin method indicates an ultimate capacity closer to kips. The PDA underestimated the actual capacity by a factor of almost ten. The project required an underwater cantilever retaining wall to support an existing retaining wall and Nauticus for dredging as well as mooring dolphins and an access way from the museum to the ship. The PDA was used to determine pile capacity during construction. It indicated that the design length was inadequate to support the design loads. In this case, there was not a traditional load test to use to confirm the design. These piles were driven into the Yorktown formation that is well documented and used by geotechnical engineers for decades as the pile

bearing stratum in many projects. Numerous traditional load tests have been performed to confirm static analyses of pile capacity. Strength and load carrying capacities are well known for this bearing stratum. Since the PDA was the sole source of pile capacity, the design engineer was forced to lengthen all production piles to conform with the PDA results. There are numerous case histories where the PDA has confirmed the design load. The question being asked â€" Should it be a complete substitute for traditional compressive load testing? Why So Much Variation in Results? When the data indicate a wide range of possible pile capacity from the PDA, a reasonable question is â€" Why? The PDA was originally designed to evaluate pile driveability. Can the hammer install the pile without damage to the design depth? To provide a prediction of pile capacity, assumptions have to be made. The damping, quake and other input factors are the key. These factors are chosen based on the soil test borings performed at the site and the types of soils indicated. Values are assigned to the input factors based on these soils. The data from the PDA testing is used to predict the ultimate capacity of the pile. Even load-settlement plots are generated that simulate a compressive load test. The input data are based on correlations with soil type. Site specific data is not available upon which to choose the input factors. Here is where the differences begin. Site specific input factors, such as damping, can be obtained from the results of a static compressive load test. With no load test, site specific factors are not known. The analyses can be performed with changes in the input factors to determine the sensitivity of these factors and their effect on the predictions. Other site specific factors, such as rapid pore pressure response during driving and restriking, and their effect on the dynamic analyses are not known, but have no effect on a properly conducted static load test. We should remember that we are using a dynamic method to evaluate a static property. The literature documents the underprediction issues of the PDA. Authors are proposing new methods where they use actual load tests results to refine PDA predictions with these new methods. Once again, the traditional load test is used as the basis for all predictive methods. Conclusions Where does this lead? The PDA is a very useful tool in evaluating the ability of pile driving equipment to install piles to the desired depth without damage. It can be used to show the variability of likely pile capacity across the site by using the PDA on several test piles installed at boring locations spread across the site. It can be calibrated to be more site specific by calculating input factors from static compressive load tests. Once the output data correlates with the load test results, confidence can be gained in other PDA predictions. It can be used to change the length of piles when test results indicate a savings can be made. This is usually of value on large projects when a small reduction in pile length can result in big savings because of the large number of piles driven. Can it be used to substitute for a traditional compressive load test. Obviously, it is being done. Should it be done? The literature would indicate that the answer is â€" not yet. This newsletter is to inform the final decision maker when this substitution is made, that underprediction is typical, not the exception. When PDA results indicate the design load is too high, should the design be changed, the answer is likely â€" no. For small projects with a limited number of piles, the cost savings of using a higher safety factor, employing the PDA in lieu of tradition load testing, the answer may well be â€" yes. The savings may be real. There are projects where the PDA has been deemed as accurately predicting the load carrying capacity of piles or its use would not have become commonplace. There should be some analysis of the safety factors being employed on the static computations. Another issue is that when obviously flawed results are provided by the PDA, the operator should indicate that it is not providing proper results in these soils at this site. Geotechnical engineers in this area are experienced enough not to make such a large error in pile capacity. To continue to present the PDA as always accurate, brings into question its value on all projects. The PDA is perceived as less costly than a traditional static load test. A value analysis should be performed on the net savings when longer or more piles are used. Some questions should also be asked as to why a test pile costs twice that of a production pile to install. In addition, the use of the quick loading method in ASTM D allows a traditional compressive load test to be performed in about 2 hours â€" not days. There will be those who stand by the PDA being used in local construction as a complete substitution for traditional load testing. Again, the answer is likely â€" no. Perhaps we need to change our standard practice where the load test has been used as the ultimate definer of production pile capacity. Typically, a test pile program is performed and the test pile with the lowest driving resistance is chosen to be load tested. If this pile indicates the design load has been achieved, production pile installation

commences. With the PDA substituting for traditional load testing, this could be modified.

Chapter 3 : Pile Driving Analyzer(PDA)- High strain dynamic pile testing

(4 to 8 channel WiFi data transmission) The Pile Driving Analyser (PDA) is a tool to control the pile driving. It can also be applied for Dynamic Load Testing (DLT) often called PDA Test.

Chapter 4 : Geotechnical Manual: Piling

the pile during driving, that is, the recording and analysis of strain and acceleration induced in the pile by the hammer impact. It was developed in the USA in the late 's and early 's by Drs. G. G. Goble.

Chapter 5 : American Piledriving Equipment Inc.

Louisiana Transportation Conference 1 Pile Driving AnalyzerÂ® (PDA) and CAPWAPÂ® Proven Pile Testing Technology: Principles and Recent Advances.

Chapter 6 : PDA Proficiency Test

Pile Dynamics introduced the idea of collecting dynamic testing data from a job site and immediately transmitting it to a remote office computer back in the late s, and was granted a patent for the first remote data transmitting PDA.*

Chapter 7 : Foundation Monitoring - Pile Driving Analyser Testing

Dynamic Monitoring with a Pile Driving Analyzer Â® (PDA) dynamic testing system also calculates driving stresses, helping reduce the risk of pile damage. If stresses indicate a high potential for pile damage, driving can be stopped and alternative installation procedures evaluated.