TAMBEW (Pty) Ltd

METHOD STATEMENT FOR THE DETERMINATION OF THE MECHANICS OF PILE BEHAVIOUR DURING A LOAD TEST ON A BORED PILE

Irvin Luker PrEng PhD
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1 Introduction

When a pile is subjected to any form of load test, it is commonly desired by the engineer responsible for the pile's design to determine how the ground strata are supporting the pile. This information can be obtained by measuring the force in the shaft of the pile at intervals along its length. The difference between adjacent forces is the load transferred into the ground. Hence the average shear stress on the shaft between force measuring points can be calculated, and also the end bearing stress.

By combining the pile displacement readings with the force readings, graphs of Shear stress v. Shaft displacement and End bearing stress v. Toe displacement can be obtained. Using these graphs with the "load transfer" method of modelling a pile's behaviour, accurate predictions can be made of the effects of variations in the pile design. In this way greater confidence and greater economy in the piled foundations can be obtained.

2 TAMBEW method of determining force in a pile shaft

Values of force at a level in the pile are obtained by measuring its longitudinal strain at that level and multiplying the strain by a factor of Force/Strain that is obtained during the actual pile test. One metre lengths of reinforcing steel (called "strain rods") are fitted with a means of measuring strain and (usually) fastened to the reinforcing cage. Two rods, diametrically opposite each other are fixed at each measurement level. Insertion of the cage and pouring of the concrete are unaffected by the presence of the strain rods.

The highest rod in the pile is positioned just below the top of the pile, where the jack (in a conventional load test) applies the load. Ideally the soil round the pile is then dug away so that nothing touches the pile shaft between its top and the level of the middle of the strain rod. Then the load at the strain rod is the same as the jack load and the calibration factor of Force/Strain is directly obtained. However, if it is impractical to dig to that level, graphs of measured strain along the pile, (a graph being drawn for every load stage in the test) are extrapolated to estimate the strain at the top of the pile, and the factor of Force/Strain obtained in that way.

The lowest strain rod is positioned at the bottom of the pile, as close to the end bearing toe as possible. Using the strain extrapolation technique just described, the strain at the toe is estimated, and hence the force at the toe obtained.

The choice of positions of the other strain measurement levels is best done by the engineer responsible for the pile design, for whom the information is being obtained. Tambew's recommendation is to have at least two measurement levels between the top and bottom positions already described. The spacing should usually be wider in soft ground and closer in stiffer ground. More measurement levels need to be included where more detailed

information about shaft shear stress values is required.

3 Measuring procedure during the test

Unless Tambew has undertaken to carry out the whole test procedure, the loading of the pile and the measurement of pile top displacement (to the appropriate standard specification) will be done by the responsible contractor, who is usually the piling contractor.

Tambew will monitor the strains in the strain rods using electronic instruments that are controlled by computer. Two sets will operate in parallel, for additional reliability. A supply of 220VAC electricity for this instrumentation is to be provided by the piling contractor, unless it has been explicitly agreed that Tambew must provide it. Tambew will in any case provide a battery based back-up power supply that can last for eight hours in the event that the 220VAC supply fails. This will enable the 220VAC supply to be reinstated, but during the time that the 220VAC supply is unavailable, the back-up system is only capable of maintaining the results measured and stored in the test so far. No new measurements of strains can be made during this time. This means that the test should be suspended, with the current load on the pile held constant.

Tambew's instrumentation and back-up power system will be mounted in a bakkie, the rear end of which must be able to be within 3m of the top of the pile. The pile contractor is expected to provide security throughout the preparations and execution of the test, and lighting if the test continues into the night. The contractor responsible for the pile test (either the piling contractor or Tambew) will provide cover to the pile top and the support to the pile top displacement measuring devices. If this cover is provided by the piling contractor, provision is expected to allow Tambew to erect a cover between the back of the instrumentation bakkie and the top of the pile.

3 Results presentation

All measured values and calculations are presented in an Excel file, which forms part of the report. The following graphs are included in the file and also given on paper.

(i) A graph of Force in shaft v. Distance down shaft from the pile's top. A line is shown on the graph for each of the loading stages of the test.
(ii) A graph of Shaft shear stress v. Distance down shaft from the pile's top. A line is shown on the graph for each of the loading stages of the test.
(iii) A graph of Shaft shear stress v. Shaft displacement. A line is shown on the graph for each of the shaft lengths between strain measurement points.
(iv) A graph of End bearing stress v. Toe displacement.

Note that:
1 unless the responsibility for the whole test procedure has been given to Tambew, the graph of Top load v. Top displacement will only be supplied by the testing engineer;
2 values of Top load; Top displacement and Time of readings must be supplied to Tambew for graphs (iii) and (iv) described above to be calculated.

A written report is provided, which includes this Method Statement and a description of any variation from expected procedure that occurred.

Note: Click here to back to the website: http://tambew.com/load-testing