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Pile testing in South Africa

Figure 1 Equipment for the 'rapid' pile test up to 1 500 kN

TESTING PRACTICE in South Africa to determine the load capacity of piles has fallen significantly behind some other countries. Our code of practice, SANS 1200f, describes just two methods: the sustained load and the continuous penetration test, but the latter only gives the maximum load capacity and is seldom used here. In addition to these two standardised tests, the 'dynamic' load test has been occasionally used on driven piles here. In this test a falling mass gives a sharp blow to the pile (force duration approx 5 milliseconds), and measurements are made of its response with sophisticated instruments. Interpretation of the measurements into a prediction of the static load behaviour of the pile is complex, and for the South African tests was done in the United Kingdom.

Overseas the 'dynamic' load test is commonly used to assess all types and sizes of piles, not just driven ones.

A relatively recent innovation that has not yet been used in South Africa is the 'rapid' load test, which applies a force over a period of approx 150 milliseconds, and is intended to move the pile sufficiently to bring at least the side shear resistance to its maximum value. The force is generated by rapidly accelerating a large mass from the top of the pile using rocket fuel. A small rig for doing this is shown in figure 1. The longer time period over which the force is applied enables a simpler interpretation to be carried out than is the case for the 'dynamic' test.

A third development is to carry out either the sustained load or continuous penetration test using a hydraulic jack within the length of the pile, as shown in figure 2. This removes the necessity for generation of an external reaction for the jacking force from either anchors or a heavy weight.

Efforts are being made by Wits University, with the assistance of the piling fraternity, to increase the quantity and quality of pile testing done here, the objective being to derive the benefits of improved efficiency and reliability of piled foundations. The development of inexpensive hydraulic jacks, displacement and strain measuring devices has enabled internally jacked tests (in which these devices are cast into the concrete and therefore irrecoverable) to be offered as a service to the geotechnical profession and piling industry. The results of the tests are put on the Wits web site for the benefit of all. For example, figure 3 shows the graphs of side shear stress v displacement for various strata depths on a site from such a test. These graphs can easily be used with the 'load transfer' method of modelling pile behaviour to refine a pile design.

Research is also being carried out into a method of carrying out 'rapid' load tests, using a falling mass striking and a form of 'shock absorber' to produce the desired length of time for the application of force to the pile. If this can be made to work, then South African practice will, in some respects, have overtaken that used overseas. □

Figure 2 Pile under test by an internal jack

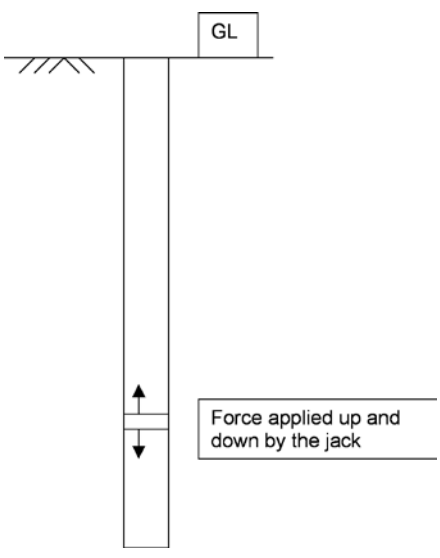
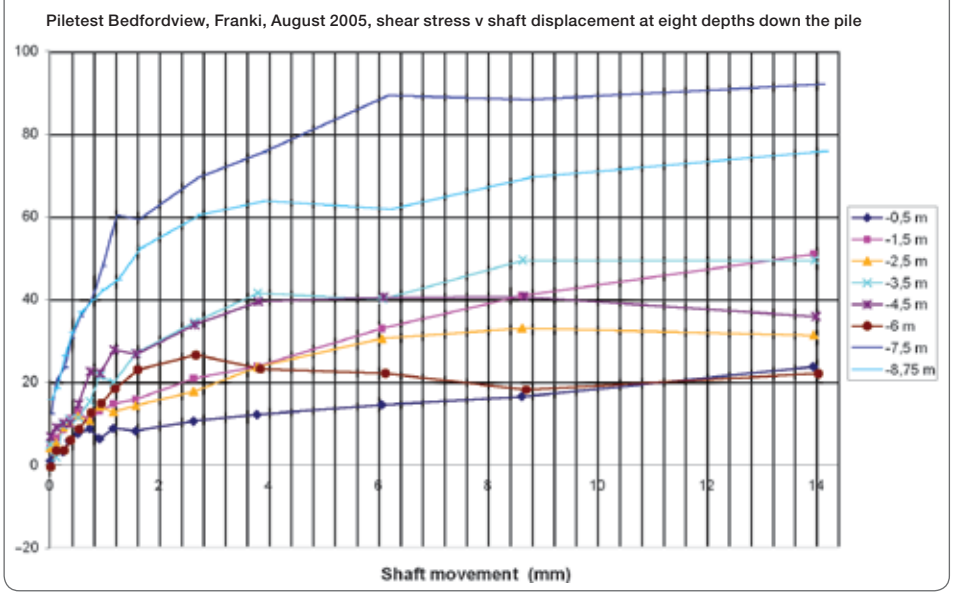


Figure 3 Results from an internally jacked pile test



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