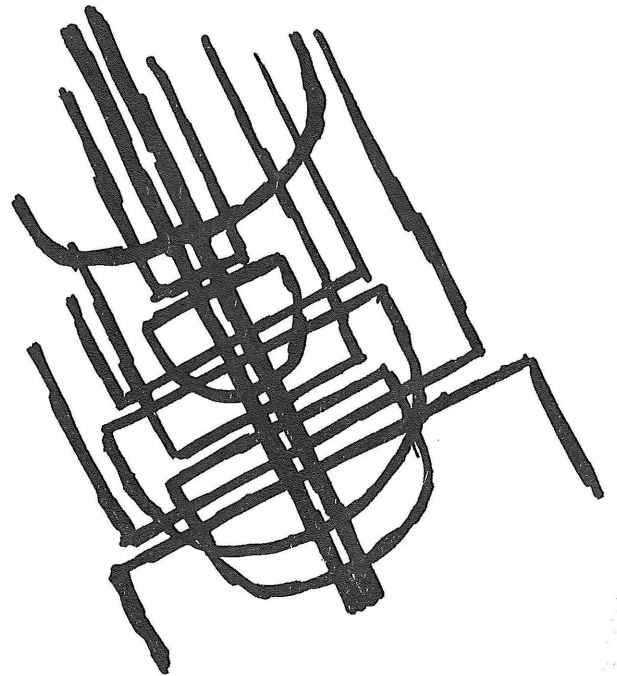
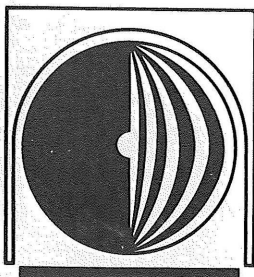


**DYNAMIC STUDIES  
ON THE  
BEARING CAPACITY  
OF PILES**



**PHASE III VOLUME I**



**REPORT NO. 48**

**DIVISION OF  
SOLID MECHANICS    STRUCTURES    AND    MECHANICAL DESIGN  
SCHOOL OF ENGINEERING    CASE WESTERN RESERVE UNIVERSITY**

DYNAMIC STUDIES ON THE BEARING CAPACITY OF PILES

Project Report of Phase III

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## ABSTRACT

An automated prediction scheme is presented which uses both measured top force and acceleration as an input and computes the soil resistance forces acting on the pile during driving. The distribution of these resistance forces acting along the pile is also determined. Shear and dynamic resistance forces are distinguished such that a prediction of total static bearing capacity is possible. Using the shear force prediction a static load versus penetration curve is computed for comparison with the result from a corresponding field static load test.

The method of analysis uses the traveling wave solution of the one-dimensional, linear wave equation. As a means of calculating the dynamic response a lumped mass pile model is used and solved by the Newmark  $\beta$ -method.

Using stress wave theory two simplified methods are developed for predicting static bearing capacity from acceleration and force measurements. These methods can be used during field operations for construction control when incorporated in a special purpose computer. The automated prediction scheme and simplified methods are applied to 24 different sets of data from full scale piles. The piles were all of 12 inches diameter steel pipe with lengths ranging from 33 to 83 feet. Also, 24 sets of data from reduced scale piles are analyzed by the simplified methods. All predictions are compared with

results from static load tests. Correlation is very good for piles driven into non-cohesive soils. For cohesive soils better agreement with static load measurements are obtained than from existing methods.

As a check on the assumed soil response to both pile displacement and velocity results from measurements taken at the pile tip are investigated and discussed. Further, an approach to pile and hammer design is described using the results of stress wave theory.

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