SUMMARY REPORT 125-6(S)

INVESTIGATION OF SOIL DAMPING ON FULL-SCALE TEST PILES

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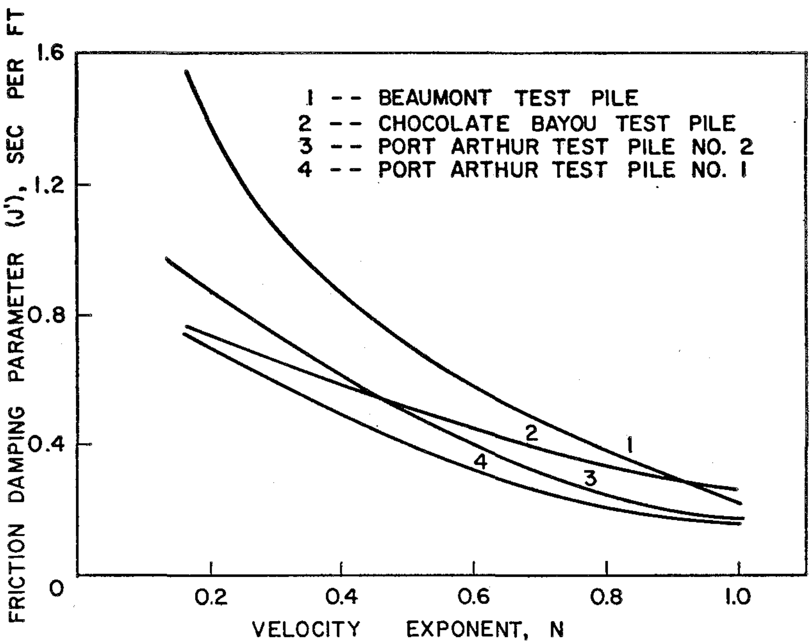

Friction Damping Parameter Versus Velocity Exponent for Piles Embedded in Clay.

Cooperative Research Program of the
Texas Transportation Institute and the Texas Highway Department
In Cooperation with the
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Investigation of Soil Damping on Full-Scale Test Piles

by

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This investigation was conducted under Research Study 2-5-67-125 entitled "Bearing Capacity for Axially Loaded Piles" which is a cooperative research endeavor sponsored jointly by the Texas Highway Department and the U. S. Department of Transportation, Federal Highway Administration. The broad objective of this study is to develop a procedure whereby the bearing capacity of an axially loaded pile can be determined for any combination of soil and driving conditions.

Research Report 125-6 presents the results of an investigation to determine the applicability of two different mathematical models which describe soil damping characteristics. Soil damping parameters are needed for use in the computer program for studying piling behavior by the wave equation analysis.

Relationships between the friction damping parameter J′ and the velocity exponent N are developed. Three metal shell piles and one square concrete pile embedded in highly plastic clay are analyzed, and an average value of J′ is determined. The point damping parameter J for a square concrete pile and a hollow cylindrical concrete pile embedded in highly plastic clay with the tips in sand is investigated.

The wave equation computer program is also used to predict the bearing capacity for all six piles. The predicted capacity is compared with the load test results in order to evaluate the mathematical model used to simulate the soil damping characteristics.

Specific conclusions are made for the types of piles and soils which are considered. Based on wave equation analyses of the four piles embedded entirely in highly plastic clay, the following conclusions are made:

1. An average value of $J' = 0.2$ seconds per foot can be used with $J = 0.15$ seconds per foot and $N = 1.0$ to predict bearing capacity within acceptable limits.

2. Differences in pile materials and geometries do not appear to affect the friction damping parameter.

Based on wave equation analyses of the two piles driven through a layer of highly plastic clay with the tips embedded in sand, the following conclusions are made:

1. For the case in which a point damping parameter J of 0.15 seconds per foot was used, unreasonable values of the friction damping parameter were obtained; i.e., $J' = 2.74$ seconds per foot.

2. Using a value of $J' = 0.20$ seconds per foot as determined in the investigation of piles embedded entirely in clay, higher values of point damping were obtained; i.e., $J = 0.95$ seconds per foot and 1.55 seconds per foot.

The following recommendations are made concerning future research on the subject:

1. There is a great need for additional field test data obtained from instrumented piles driven entirely into cohesionless materials and instrumented piles driven through an upper clay layer with their tips embedded in cohesionless soils.

2. Future pile tests should include a measurement of the tip resistance whenever possible.

3. Where practical, future pile tests should include a static load test as soon after driving as possible and at a minimum of ten days after driving, with two weeks or more the preferred time interval. This test should be conducted concurrently with redriving the pile so that predicted bearing capacity can be correlated with measured capacity after soil set-up has occurred.

The published version of this report may be obtained by addressing your request as follows:

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