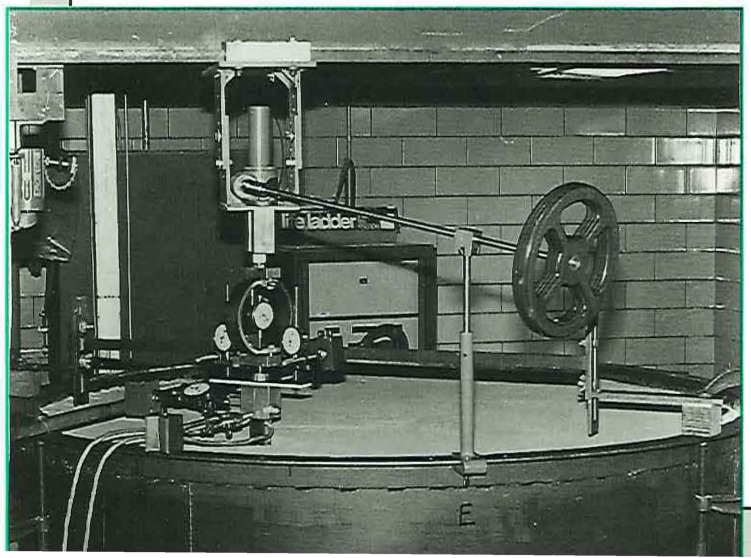
Pile Foundations

Current FHWA pile research is concentrating on developing improved design methods for testing a pile group as an interactive element. The objective is to obtain fundamental information on pile group action in clays and sands, including pile load/settlement and load transfer data. Data pertaining to distribution of loads to each pile, soil movements, total and pore water pressures in the soil, and failure modes are being used to calibrate state-of-the-art computer models and design procedures.

A major part of this research concerns the investigation of scale effects to determine appropriate scale factors. The effects of scale on correlating model behavior with full-scale test results are very complex because they do not conform to the laws of similitude and simple dimensional analysis. Identifying and defining these scale effects involves a number of interrelated factors such as pile geometry, group configuration, soil properties, method of pile installation, and to some extent load test procedures.



The current laboratory study involves the design and fabrication of instrumented model piles to simulate the geometry of piles that were load tested to failure (single control piles and in groups) in sand and clay soils in the FHWA full-scale field programs. Correlations will also be made with centrifuge model test data obtained from an FHWA research program.

Spread Footings

Current research involves a load-testing program to monitor the settlement behavior of instrumented model footings (from .3 m^2 up to 1 m^2) on a compacted sand subgrade in the outdoor test pits. The objective is to conduct a comprehensive evaluation of the behavior and efficiency of spread footings with special emphasis on demonstrating reliability and cost-effectiveness. A comparison of predicted settlements to measured values will also be made to evaluate and improve the accuracy and reliability of current theoretical predictive techniques.

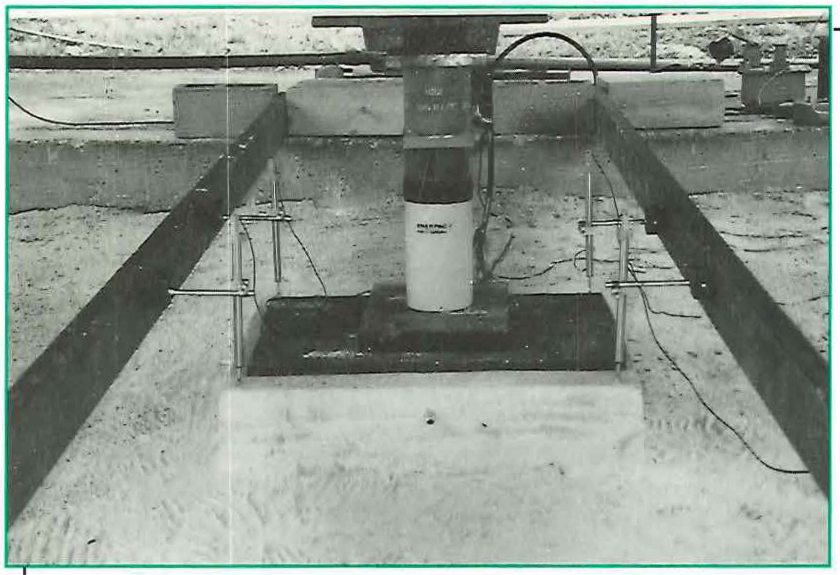
The footing size, depth of embedment, and distance below the footing to the water table are varied over a wide range of sand densities to determine the factors that govern the predictability of settlement occurrence for a footing supported on compacted sand. An investigation of the beneficial effects of placing a layer(s) of geosynthetic reinforcing grids in the sand beneath the footings is also underway. Comparisons of bearing capacity increases and settlement reductions, especially nonuniform settlement or tipping of the footings, will also be conducted.

April 1995

GEOTECHNICAL

Laboratory

U.S. Department of Transportation
Federal Highway Administration



The Geotechnical Laboratory

The Geotechnical Laboratory at the TFHRC includes the soil mechanics, soil behavior, and foundations testing facilities. The primary functions of the laboratory are to determine mechanical properties of ground materials, and to evaluate soil-structure interaction for bridges and retaining walls. In addition the laboratory can perform rock mechanics, geophysical, and in situ testing of various ground materials.

Laboratory facilities are capable of conducting all of the standard tests for characterizing ground materials. In addition, model tests of piles, drilled shafts, spread footings, and reinforced soil retaining systems can be conducted in large laboratory tanks and outdoor test pits. Automatic pile drivers and load testing reaction frames are available to conduct evaluations of load/settlement relationships of instrumented foundation systems.

The outdoor facility consists of two, 5.5 x 5.5 x 6 m test pits with concrete walls and drilled shafts anchored in bedrock for reaction loads up to 255,000 kg. The pits are filled with sand or clay to support either shallow or deep foundations systems for the experimental test programs. The pits are served by a test control building which houses the data acquisition system and the load testing equipment.

The indoor facility houses several 1.5 m diameter by 1.5 m deep steel tanks for testing smaller scale models in both sand and clay. Loading is provided by a 16,250 kg reaction frame and a specially designed jacking system that allows for the precise measurement of extremely small loads in both compression and tension (extraction tests). The equipment will be updated during a major rehabilitation project starting in 1996.

Researchers from the laboratory perform comprehensive load-testing studies on deep and shallow foundation systems to observe performance and to obtain load/settlement behavioral data for analytical studies to improve foundation design procedures. Data is stored in recently developed data bases for future analysis by staff using a number of new computer modeling techniques. The data base will provide a valuable standard against which new and existing design procedures can be compared.

Turner-Fairbank Highway Research Center

Research and Development
Turner-Fairbank Highway Research Center
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Operated by the Federal Highway Administration's (FHWA) Office of the Associate Administrator for Research and Development, the Turner-Fairbank Highway Research Center (TFHRC) is the Nation's primary highway transportation research and development facility. Located in McLean, Virginia, just inside the Capital Beltway, the Center consists of a number of world-class testing and laboratory facilities. The FHWA built and operates these facilities to support the expertise of scientists, engineers, academicians, students, and others who are working on important highway research. Their efforts help make the world's largest highway system safer and more efficient.

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