



GEOTECHNICAL LABORATORY FACT SHEET

Research that is Essential, Indispensable, and Connected to our Customers.

PURPOSE

The Geotechnical Laboratory studies the complex interactions between soil and those structural elements made of steel, concrete, and timber used for bridge foundations and retaining wall systems. New materials, new designs, and new methods of construction are tested and evaluated in both indoor and outdoor environments to determine their acceptability and to identify opportunities for improvement.

DESCRIPTION

The Geotechnical Laboratory consists of a standard indoor testing facility and several unique outdoor testing facilities. The indoor facility is capable of conducting all of the standard tests for characterizing soil and rock materials for both production requirements and research studies. One outdoor facility consists of two 5.5-m x 5.6-m x 6.5-m test pits that can be filled with various soils to support the testing and evaluation of either shallow or deep foundation systems of modest size. The pits have concrete walls, sump pumps that control water table levels, and anchorage systems to provide reaction loads for load-testing programs. The pits are also served by a test control building that contains the data acquisition systems and load-testing equipment. There are also two additional outdoor test sites where full-scale bridge piers, abutments, and retaining-wall structures have been constructed for research and testing purposes.

MAJOR COMPONENTS

- Foundations Laboratory
- Soil Mechanics Laboratory
- Outdoor Research Facility
- Geotechnical Database System

SPECIAL CAPABILITIES

Test pits for testing:

- Shallow foundations (including full-scale spread footings).
- Deep foundations, to include the testing of model piles, composite piles, and for conducting Statnamic experiments.

In addition, the Geotechnical Laboratory conducts:

- Ground anchor research.
- GeoGage experiments (to measure soil stiffness).
- Geosynthetic Reinforced Soil (GRS) experiments, to include:
 - Bridge pier research.
 - Instrumented bridge abutments research.
 - Research on bridge abutments with spread footings.
- Automated Geotechnical Information and Design-aid System (AGIDS). This comprehensive database system allows bridge and

geotechnical engineers to quickly and economically obtain geotechnical information from a centrally located source. This information can be used to plan geotechnical projects and evaluate design alternatives. The database contains information for shallow foundations, deep foundations, national geotechnical experimentation sites, publications, and ground improvement.

PRODUCTS

- Produced design and/or construction manuals/procedures for micropiles, drilled shafts, permanent ground anchors, soil nailing, driven piles, and bearing capacity analysis.
- Developed GeoGage to measure soil stiffness. Adapted commercially and currently being evaluated.
- Developed AGIDS.
- Developed National Geotechnical Experimentation Sites (NGES). NGES is a network of six test sites in five States that serve as full-scale laboratories for research in new technologies and techniques related to earthwork construction for bridges, highways, and other infrastructure projects.

ACCOMPLISHMENTS

Current Activities

- Conducting pile drivability and capacity tests on recycled plastic and composite piles for

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scientists and engineers covers more than 20 transportation-related disciplines. These laboratories are a vital resource for advancing this body of knowledge created and nurtured by our researchers. The Federal Highway Administration's Research, Development, and Technology

Service Business Unit operates and manages TFHRC to conduct innovative research to provide solutions to transportation problems both nationwide and internationally. TFHRC is located in McLean, Virginia. Information on TFHRC is available on the Web at www.tfbr.gov.

bridge foundation support.

- Evaluating new load-testing procedures and equipment for determining foundation capacity and bridge settlement potential.
- Conducting load tests on GRS structures to evaluate spacing and connection for current design methods.

State planning and research (SPR) pooled funds will provide research and support for the following studies:

- Completing, updating, and maintaining AGIDS.
- Developing guidance and detailed instructions for using the Deep Mixing Method (DMM), which involves in situ soil treatment (blending soil with cementitious and other materials) to produce soil systems with improved properties.
- Investigating the possibility of using GeoGage (soil stiffness) either in conjunction with or instead of using density as a specification in embankment and pavement subgrade and base course construction.

Future Activities

- Evaluate tactile sensor technologies for measuring strains in retaining-wall systems and shallow foundations for bridges.
- Analyze GRS abutments and piers.
- Evaluate reticulated micropile systems for retrofitting bridge foundations in earthquake areas.
- Evaluate settlement prediction methods for shallow foundations.
- Evaluate rapid foundation installation techniques.
- Evaluate soil design for composite pile foundations.
- Evaluate fiber-optic technologies for measuring stress and strain in composite piles.

EXPERTISE

The Geotechnical Laboratory combines the expertise of civil engineers and geologists in a wide spectrum of geotechnical disciplines. Areas of expertise include:

- Shallow and deep foundations.
- Reinforced earth, including GRS.
- Geotechnical design information assessment and analysis, including database systems development.
- Soil mechanics.
- Ground improvement.
- Soil stabilization, including deep mixing techniques.

LAB PARTNERS

The Geotechnical Laboratory has active partnerships or relationships with several research institutes, the American Association of State Highway and Transportation Officials (AASHTO), the American Society for Testing and Materials (ASTM), individual States and groups of States in SPR studies, universities, trade associations, and private companies.

