

GeoTechTools: The First Place to Look



Arizona Pavement/Materials Conference

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Iowa State University



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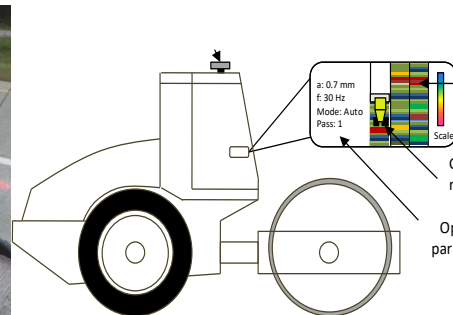
November 17, 2022



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Scope of Presentation

- GeoTechTools Background, Development and Future
- ~~Demonstration of GeoTechTools~~
- Will see screen shots of the system





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geoinstitute.org

G-I and ASCE is committed to the health and safety of our members and event participants. [Details](#)



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Geo-Institute of ASCE: Advancing the Geoprofessional Community

The Geo-Institute (G-I) is a membership organization serving geoprofessionals and the geo-industry. It is one of the American Society of Civil Engineers' nine specialty Institutes and has over 13,000 members.

[About Us](#)

Latest News

6th Annual Web Conference - Registration is going up after November 19, 2021

18 Nov 2021

Geo-Institute

The registration for the 6th Annual Web Conference is going up after Friday, November 19, 2021. So, do not miss this opportunity and register today for the Technical Sessions and Lunch-and-Learns which will be streamed from December 6 to 10! 6th...

[Read More](#)



Director's Cut Scavenger Hunt: Meet your fellow G-I members and win valuable prizes!

03 Nov 2021

Geo-Institute

Director's Cut launched just over a year ago, on October 7, 2020. To celebrate the 50th episode, we're having a Scavenger Hunt! Find the answers to these 10 questions by watching Director's Cut and reading the notes in the video descriptions, and you...

[Read More](#)

3rd International Symposium on Coupled Phenomena in Environmental Geotechnics (CPEG2020) coming up on October 20-21. Register for free until October 15 2021

12 Oct 2021

Geoenvironmental Engineering

Committees

The 3rd International Symposium on Coupled Phenomena in Environmental Geotechnics (CPEG2020), organized by the Japanese Geotechnical Society and the Kyoto University with the support of TC215 Environmental Geotechnics Technical Committee of the...

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GeoTechTools

GeoTechTools is a toolkit of geotechnical information to address all phases of decision making from planning to design to construction. All infrastructure projects can be designed to be built faster, or at less cost, and/or to last longer with the use of these tools.



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Geo-Technologies

- How do you keep up on geo-technologies?
- How do you select one technology over another, or other options?
- How do you know if your consultant or contractor is selecting an appropriate technology?



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Background

A Comprehensive Web-Based Information & Guidance System for Embankment, Ground Improvement & Pavement Applications



U.S. Department of Transportation
Federal Highway Administration





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GeoTechTools >50 Technologies

Case Histories

Photographs

QC/QA
Procedures

Specifications

Technology
Fact Sheets

Design
Procedures

Cost
Estimating
Tools

Technical
Bibliography





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Original Project Vision

To make geotechnical solutions more accessible to public agencies in the U.S. for rapid renewal and improvement of the transportation infrastructure.



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SHRP 2 Renewal Objectives

- 1. Rapid Renewal of Transportation Facilities**
- 2. Minimal Disruption of Traffic**
- 3. Production of Long-Lived facilities**



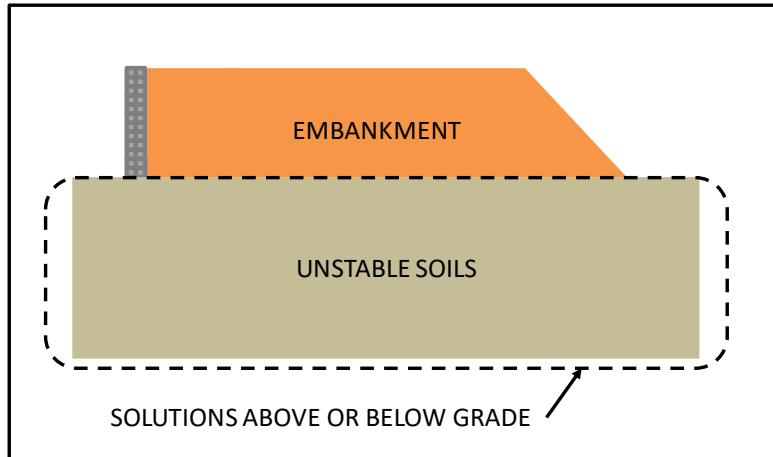
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R02 Project Elements

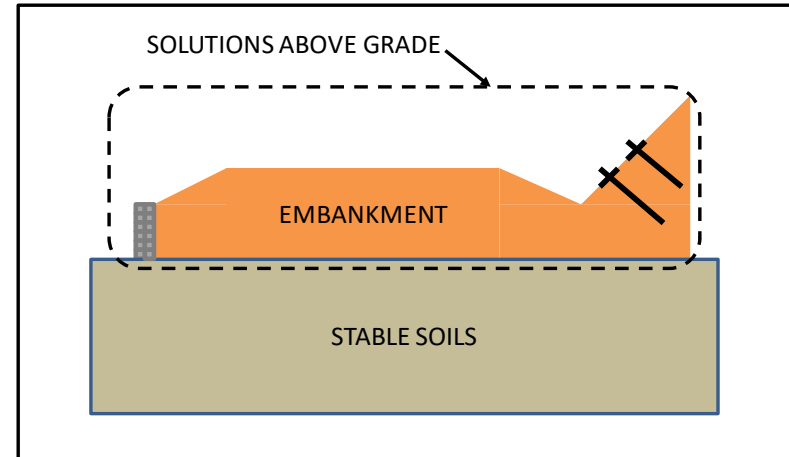
- 1. Construction of new embankments and roadways over areas of unstable soils**
- 2. Widening and expansion of existing embankments and roadways**
- 3. Improvement and stabilization of the support beneath the pavement structure**



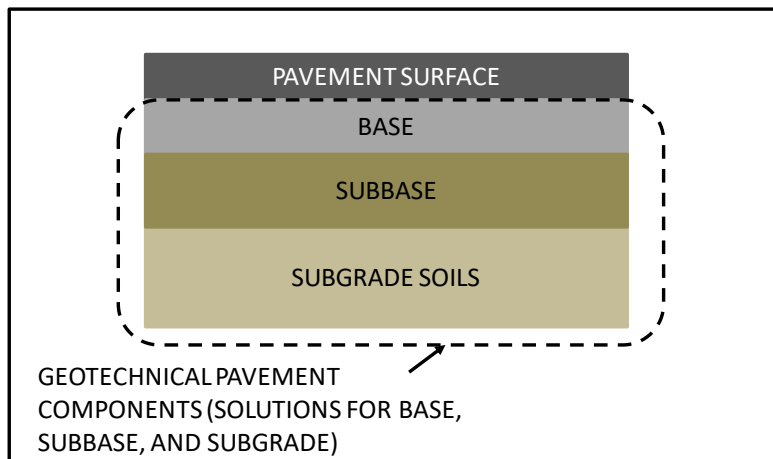
Applications



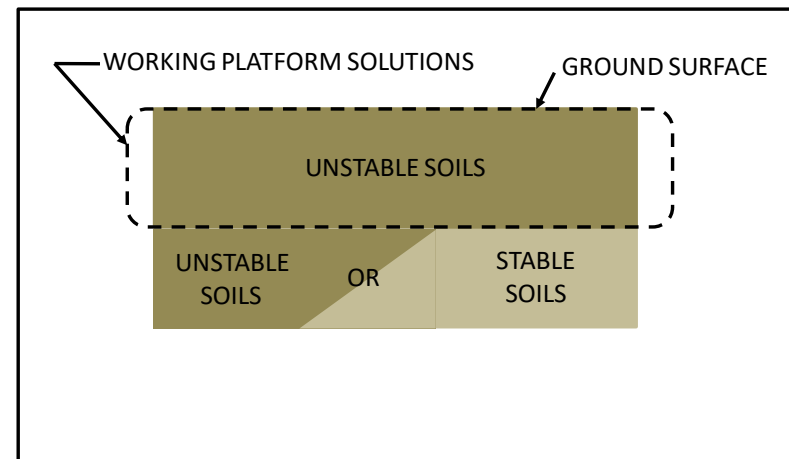
Construction over Unstable Soils



Construction over STABLE/STABILIZED Soils



Geotechnical Pavement Components (Base, Subbase, and Subgrade)



Working Platforms

Technologies Addressed

- Aggregate Columns
- Beneficial Reuse of Waste Materials
- Bio-Treatment for Subgrade Stabilization
- Blast Densification
- Bulk-Infill Grouting
- Chemical Grouting/ Injection Systems
- Chemical Stabilization of Subgrades & Bases
- Column-Supported Embankments
- Combined Soil Stabilization with Vertical Columns
- Compaction Grouting
- Continuous Flight Auger Piles
- Deep Dynamic Compaction
- Deep Mixing Methods

Technologies Addressed (cont.)

- Drilled/Grouted & Hollow Bar Soil Nailing
- Electro-Osmosis
- **Excavation & Replacement**
- Fiber Reinforcement in Pavement Systems
- Geocell Confinement in Pavement Systems
- Geosynthetic Reinforced Construction Platforms
- Geosynthetic Reinforced Embankments
- Geosynthetic Reinforcement in Pavement Systems
- Geosynthetic Separation in Pavement Systems
- Geosynthetics in Pavement Drainage
- Geotextile Encased Columns
- High-Energy Impact Rollers
- Hydraulic Fill + Vacuum Consolidation + PVDs
- Injected Lightweight Foam Fill

Technologies Addressed (cont.)

- Intelligent Compaction
- Jet Grouting
- Light Weight Fills
- Mechanical Stabilization of Subgrades & Bases
- Mass Mixing Methods
- MSE Walls
- Micro-Piles
- Onsite Use of Recycled Pavement Materials
- Partial Encapsulation
- PVDs & Fill Preloading
- Rapid Impact Compaction
- Reinforced Soil Slopes
- Sand Compaction Piles
- Screw-In Soil Nailing
- Shoot-In Soil Nailing
- Shored MSE Walls
- Traditional Compaction
- Vacuum Preloading w/ & w/o PVDs
- Vibrocompaction
- Vibro-Concrete Columns



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End User Products/TOOLS

- **Main product: Web based information and guidance system**
- **Within the system, for each technology:**
 - Technology Fact Sheets
 - Photographs
 - Design Procedures
 - Quality Control/Quality Assurance Procedures
 - Cost Estimating
 - Specifications
 - Bibliography
 - Case Histories



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Audience

- **Public agency personnel at local, state and federal levels**
 - **Primarily Geotechnical Engineers**
 - **Civil/Structural/Bridge Design & Construction Engineers, Pavement Design & Construction Engineers**
 - **Project Managers, Procurement, Research, Maintenance, District Engineers**
- **Consultants, General Contractors, A/E groups**
- **Academics/Students**



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Audience

- **Status**

- Launched 30 Nov 2012
- ~ 10,000 registered users
- Users: 68% geotechs, 7% pavements, 12% structural engineers, 6% planners
- Users: 25% public, 41% consultants, 22% academic, 10% contractors
- All 50 US states; All Canadian Provinces
- Users from > 110 Countries



- **Web site**
 - Learn about technologies, both technical and nontechnical users
 - Investigate candidate solutions, by category classification or using selection system
 - Locate design methods, quality methods
 - Develop cost estimates
 - Develop specifications
 - Technical summaries
- **Locate additional information in references**



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Value Added

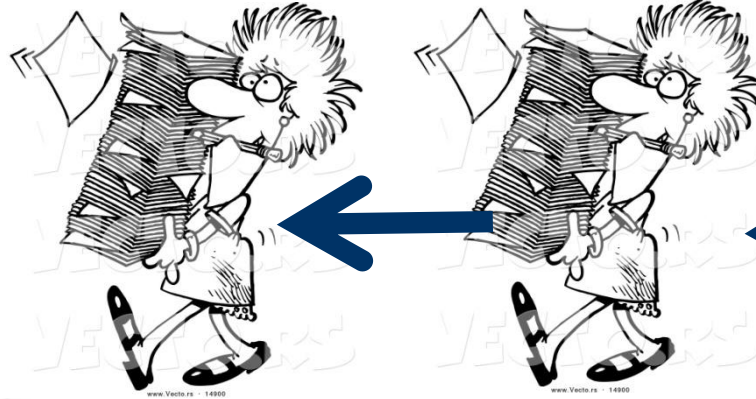
The system collects,
synthesizes, integrates, and
organizes a vast amount of
critically important information
about geotechnical solutions on
a readily accessible website



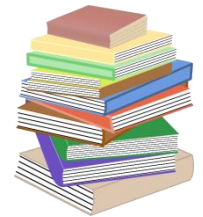
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Research & Vetting Process

1,000s pages
Tech Docs



40 Post-Doc &
Grad Students



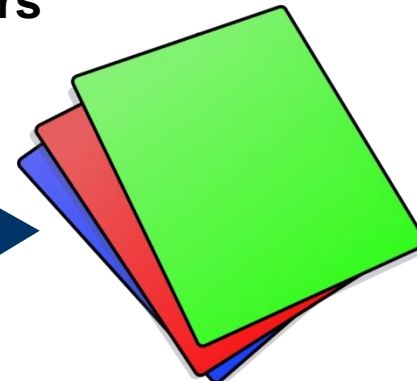
Research
&
Develop



40 Post-Doc & Grad Students
& 12 Principal Investigators
& Advisory Board
& Peer Reviewers



100s page
Summaries



8 Tools – 1 to 40
pages each



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Objectives of the Web-Based System

1. Identify potential technologies for the four Applications. > *50 Technologies*
2. Provide current, up to-date information → *8 Products /Tools for each Technology*
3. Provide guidance to develop a 'short-list' of applicable technologies
4. Provide guidance for project-specific screening
5. Provide an interactive, programmed system



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Recent Developments

- ❖ **New platform in 2018**
 - Designed by web geeks instead of engineers
 - Dynamic dimensioning - use on any device
 - Search capability
 - Reordering of technologies

- ❖ **G-I became host in June 2019**
 - Expansion of elements, i.e., building foundations
 - Location for geotechnical databases
 - Other modules, i.e., Sustainability



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Vision and Mission

- **Vision:** *GeoTechTools* provides geo-construction information and technology selection guidance to engineers, designers and decision makers.
- **Mission:** *GeoTechTools* promulgates a catalog of technologies of geo-construction systems and administers standards to maintain and update information on geo-construction technologies. *GeoTechTools* promotes its use through actively collaborating and sharing best practices in collegial, supportive venues, both in-person and virtually.



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New Front Page

[← Back to Geo-Institute website](#)

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GeoTechTools

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[More about GeoTechTools >](#)

APRIL 2019

The new GeoTechTools provides increased functionality and responsive design to work on any device. We welcome your comments and contributions.

[Submit Comment >](#)



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ASCE

"Advancing the geo-professional community"



Latest Revisions

10/20/17

- Intelligent Compaction 101 video added

10/20/17

- Deep Mixing Methods products updated
- Mass Mixing Stabilization technology and products added
- Liquefaction Mitigation Selection System added

10/20/17

- Added ratings to Technology by Classification
- Added GeogridBridge2.0 design tool to Column-Supported Embankments technology page

[See all revisions](#) >

Technology Catalog

The Technology Catalog provides a listing of all the technologies. Browse the Catalog to get case histories, photos, design guidance, and more for each technology.

[Browse Technologies](#) >

Technology Selection

Technology Selection is an interactive tool to identify candidate technologies for specific geoconstruction applications using project information and constraints. Final technology selection requires project-specific engineering.

[Launch Interactive Selection System](#) >

Contribute

This is a living system; it is updated based upon your input. Users are strongly encouraged to contribute technical updates/corrections, case histories, cost information, photographs, and references to enhance and expand this web-based system. Users are also encouraged to report any bugs or glitches.

[Contribute to GeoTechTools](#) >



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Applications

Construction Over Unstable Soils



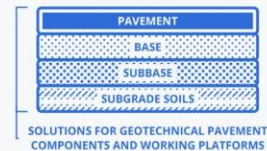
Start with this application ›

Construction Over Stable or Stabilized Soils



Start with this application ›

Geotechnical Pavement Components



Start with this application ›

Working Platforms



Start with this application ›

Construction over Unstable Soils

focuses on methods to support embankment and embankment widening on the foundation, i.e., typically below-grade technologies. Methods include ground improvement and support over the unstable soils. Although the ground improvement is often below-grade, some at-grade technologies are also applicable to this application.

Construction over Stable or Stabilized Soils

focuses on methods for embankment and/or embankment widening construction, i.e., above-grade technologies. Methods include fill placement and compaction procedures, reduction of embankment width/volume, fill earth retention systems, and slope stabilization systems. The ground improvement methods strengthen the embankment materials, allow for geometric constraints such as retaining walls, or stabilize cut slopes.

Geotechnical Pavement Components

focuses on methods to improve pavement construction. Methods include fill placement, stabilization, grouting, and reinforcement technologies. Recycling/reuse of materials in the pavement section are also included.

Working Platforms

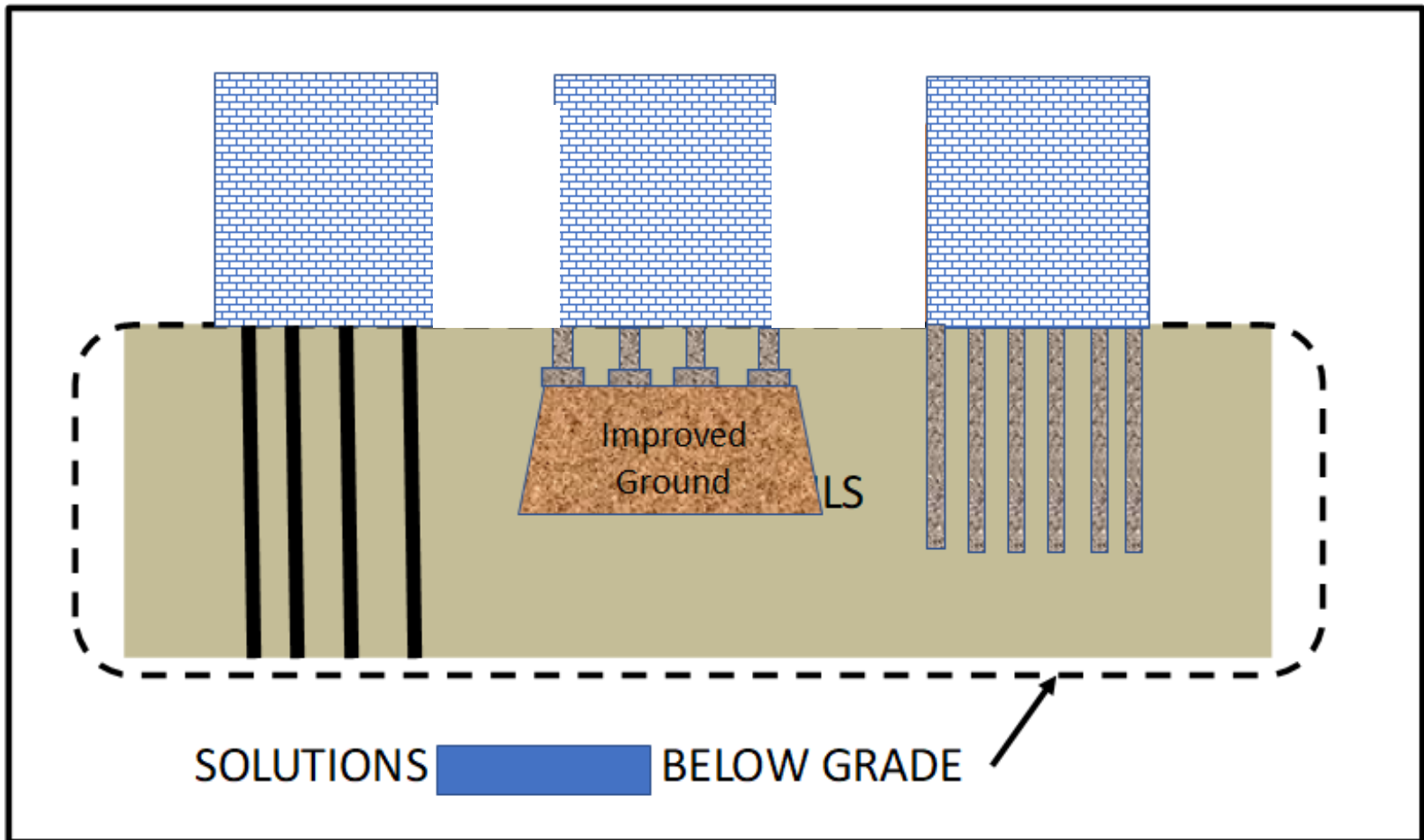
focuses on methods to provide working platforms. Methods include fill placement, stabilization, and reinforcement technologies. Recycling/reuse of materials in the pavement section are also included. Working platforms are also applicable to Construction over Unstable Soils and Geotechnical Pavement Components.



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Potential New Application

Building Construction Over Unstable Soils



SOLUTIONS BELOW GRADE



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Recent Developments

- ❖ Formed GTT Administrative Committee
 - Jeff Greenwald - G-I GTT Project Manager
 - Jim Collin - G-I BoG member liaison to GTT, past President
 - Brad Keelor - G-I Executive Director
 - Dimitrios Zekkos - G-I Webmaster
 - Vern Schaefer - GTT Technical Webmaster
- ❖ Available from the Geo-Institute webpage
- ❖ Same website platform as G-I website
- ❖ Technical committees of G-I are providing updated content, ideas
- ❖ Individual users continue to be invited to provide new case histories, updates, comments, etc.
- ❖ Developed sponsorship program



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2019-2020 Update Efforts

G-I BoG/TCC funded four GTT Special Projects

1. Deep Foundations Committee - development of Drilled Shafts technical materials to integrate into GTT - **still under review**
2. Embankment, Dams & Slopes Committee - development of Strategic Plan - **scratched (Covid)**
3. Rock Mechanics Committee - development of Rock Slope Stabilization Techniques - **~~drafted~~ completed**
4. Soil Improvement Committee - development of a Roadmap for Updating GTT - **completed**



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2020-2021 Update Efforts

GTT Special Projects

1. Sustainability Committee - development of a standalone sustainability module - **completed**
2. Geosynthetics & Soil Improvement Committees - (1) development of 24 new case histories in geosynthetics technologies; (2) Update vacuum consolidation technologies - **both completed**
3. Soil Improvement Committee - develop new technology module on Ground Freezing - **current project**
4. Risk Assessment Committee - development of decision tool to support decision making for static proof-load test programs for deep foundations - not funded
5. Soil Properties & Modeling Committee - update bio-mediated soil improvement technologies in GTT - **current project**



Current GTT Special Projects

1. Geosynthetics Committee - update GeogridBridge 2.0 to GeogridBridge 3.0 (Load Transfer Platform and Column Supported Embankment Design Software) - **completed and on website soon**
2. Soil Improvement Committee - develop new technology module on Ground Freezing
3. Soil Properties & Modeling Committee - update bio-mediated soil improvement technologies in GTT



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GTT Demonstration



Access Technology Selection

Latest Revisions

10/20/17

- Intelligent Compaction 101 video added

10/20/17

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- Mass Mixing Stabilization technology and products added
- Liquefaction Mitigation Selection System added

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Technology Catalog

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Technology Catalog

About the Technologies Listed

+ Show

SHOW CATALOG AS:

All Technologies

Technologies with Ratings

Technologies by Classification

TECHNOLOGY

Aggregate Columns

Beneficial Reuse of Waste Materials

Bio-Treatment for Subgrade Stabilization

Blast Densification

Bulk-Infill Grouting

Chemical Grouting/Injection Systems

Chemical Stabilization of Subgrades and Bases

Column-Supported Embankments



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Technology Catalog

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Technology Catalog

About the Technologies Listed

+ Show

SHOW CATALOG AS:

All Technologies

Technologies with Ratings

Technologies by Classification

RATING SCALE: 1 = VERY LOW 2 = LOW 3 = MODERATE 4 = HIGH 5 = VERY HIGH

◆ Degree of Technology Establishment

◆ Rapid Renewal of Transportation Facilities

◆ Minimal Disruption of Traffic

◆ Production of Long-Lived Facilities

◆ GEOTECHNICAL SOLUTION CLASSIFICATION

> Construction of Vertical Support Elements

> Cutoff Walls

> Densification of Cohesionless Soils

> Earthwork Construction

> Embankments Over Soft Soils

> Increased Pavement Performance

> Lateral Earth Support



Technology Selection

Narrow potential technologies by using the [Interactive Technology Selection System](#) or [the Liquefaction Mitigation Selection System](#).

Users who already know the general project geoconstruction methodology to be used (e.g., lateral earth support) can [view technologies by classification](#) to access a list applicable technologies according to classification.

Always remember these "take-home messages" concerning technology selection, geotechnical engineering, and judgment:

1. Engineering judgment without relevant experience is weak.
2. Engineering judgment without relevant data is foolish.
3. Good judgment needs good data and evaluated experience.
4. Good judgment is essential for the effective use of information technology tools.
5. Good judgment is central to geotechnical engineering, even in the information age.

Interactive Technology Selection System >

Technology Selection System is an interactive tool that has been developed to aid the user in identifying a candidate list of technologies for any application. By selecting this option, the user will enter a dynamic system that narrows the potential technologies through a series of questions.

[Launch Interactive Selection System >](#)

Liquefaction Mitigation Selection System >

This option leads to an interactive selection system that focuses on liquefaction mitigation. This interactive selection system generates a list of unranked geoconstruction technology candidate(s) based on user's input addressing site and project-specific characteristics influencing on technology selection for liquefaction mitigation.

[Launch Liquefaction Mitigation Selection System >](#)



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Applications

Construction Over Unstable Soils



Start with this application ›

Construction over Unstable Soils

focuses on methods to support embankment and embankment widening on the foundation, i.e., typically below-grade technologies. Methods include ground improvement and support over the unstable soils. Although the ground improvement is often below-grade, some at-grade technologies are also applicable to this application.

Construction Over Stable or Stabilized Soils

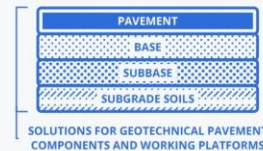


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Geotechnical Pavement Components



Start with this application ›

Geotechnical Pavement Components

focuses on methods to improve pavement construction. Methods include fill placement, stabilization, grouting, and reinforcement technologies. Recycling/reuse of materials in the pavement section are also included.

Working Platforms



Start with this application ›

Working Platforms

focuses on methods to provide working platforms. Methods include fill placement, stabilization, and reinforcement technologies. Recycling/reuse of materials in the pavement section are also included. Working platforms are also applicable to Construction over Unstable Soils and Geotechnical Pavement Components.



Construction Over Unstable Soils

SELECTIONS MADE

Select an Application: Construction Over Unstable Soils

Select an Unstable Soil Condition

Select an Unstable Soil Condition

Select the soil type which best describes the unstable soil condition. Only one soil type can be selected at a time.

Wet and Weak, Fine Grained Soils

Unsaturated, Loose Granular Soils

Saturated, Loose Granular Soils

VOIDS – Sinkholes, Abandoned Mines, etc.

Problem Soils and Sites – Expansive, Collapsible, Dispersive, Organic, Existing Fill, Landfills

POTENTIAL TECHNOLOGY SOLUTIONS

- Aggregate Columns
- Beneficial Reuse of Waste Materials
- Bio-Treatment for Subgrade Stabilization
- Blast Densification
- Bulk-Infill Grouting
- Chemical Grouting/Injection Systems
- Chemical Stabilization of Subgrades and Bases
- Column-Supported Embankments
- Combined Soil Stabilization with Vertical Columns
- Compaction Grouting
- Continuous Flight Auger Piles
- Deep Dynamic Compaction
- Deep Mixing Methods
- Drilled/Grouted and Hollow Bar Soil Nailing
- Electro-Osmosis
- Excavation and Replacement
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- Geosynthetic Reinforced Construction Platforms
- Geosynthetic Reinforced Embankments
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- Geosynthetic Separation in Pavement Systems
- Geosynthetics in Pavement Drainage
- Geotextile Encased Columns
- High-Energy Impact Rollers
- Hydraulic Fill with Geocomposite and Vacuum Consolidation
- Injected Lightweight Foam Fill
- Intelligent Compaction
- Jet Grouting
- Lightweight Fill
- Mass Mixing Methods
- Mechanical Stabilization of Subgrades and Bases
- Mechanically Stabilized Earth Wall System
- Micropiles
- Onsite Use of Recycled Pavement Materials
- Partial Encapsulation
- Prefabricated Vertical Drains and Fill Preloading
- Rapid Impact Compaction
- Reinforced Soil Slopes
- Sand Compaction Piles
- Screw-in Soil Nailing
- Shoot-in Soil Nailing
- Shored Mechanically Stabilized Earth Wall System
- Traditional Compaction
- Vacuum Preloading with and without Prefabricated Vertical Drains
- Vibro-Concrete Columns
- Vibrocompaction



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Founding Sponsors



Sponsors



- **Registration:** Go to geoinstitute.org, click on *GeoTechTools*, register to use at no cost.



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This is YOUR website.

**Be sure to contribute to it
to maintain & keep it up to date.**



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Questions?



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