PROGRAM

ICTG 2021

VIRTUAL

4th International Conference on Transportation Geotechnics

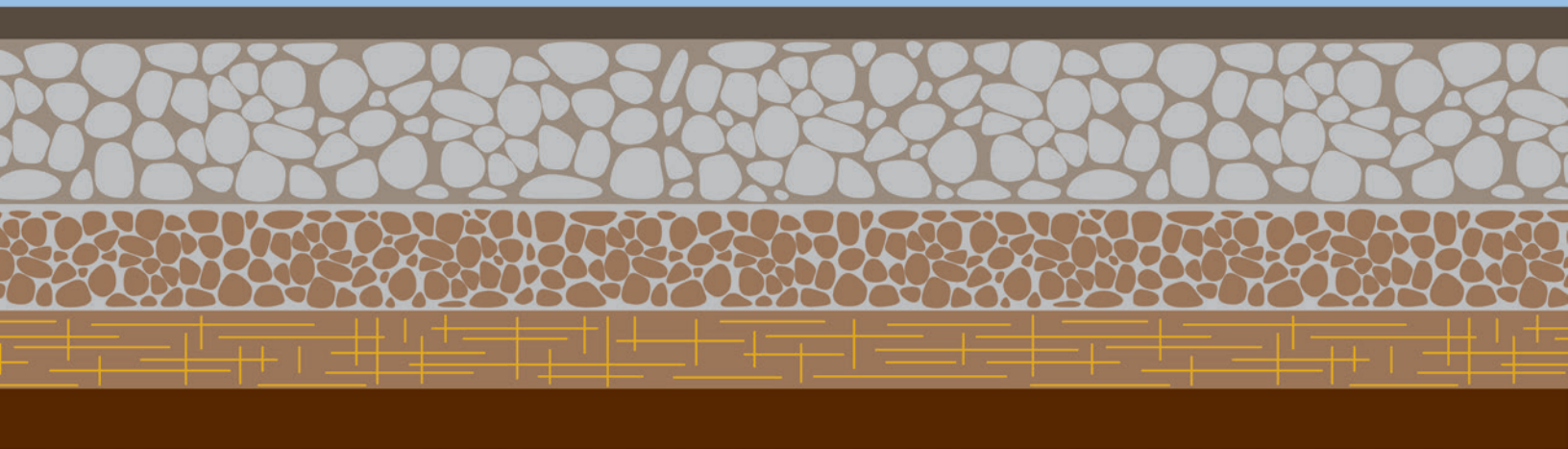
MAY 24–27, 2021 | ICTG2021.VFAIRS.COM

4TH ICTG WEBSITE: www.conferences.illinois.edu/ICTG2021

4th ICTG Program Overview

	Monday, May 24, 2021	Tuesday, May 25, 2021	Wednesday, May 26, 2021	Thursday, May 27, 2021
8:00	WS 1, WS 2, WS 3, WS 4, SC, YTGE	Opening Ceremony	ASCE Monismith Lecture	IGS Keynote Lecture & Special Lectures (x2)
8:30				
9:00		ISSMGE Proctor Lecture	Theme 1 Session 1, Theme 4 Session 3, Theme 5 Session 1, Theme 8 Session 1	
9:30				
10:00		Opening Cermeony for Exhibits & Coffee Break		Coffee Break
10:30			Coffee Break	Theme 1 Session 2, Theme 5 Session 2, Theme 6 Session 3, Theme 10 Session 2
11:00		Special Lectures (x2)	Theme 6 Session 2, Theme 10 Session 1, Theme 11 Session 1, Theme 14 Session 1	
11:30				
12:00	Lunch Break	Exhibit Hall and Poster Session		Exhibit Hall and Poster Session
12:30			Exhibit Hall and Poster Session	
1:00	WS 1 cont'd, WS 3 cont'd, WS 4 cont'd, SC cont'd, YTGE cont'd	Theme 3 Session 1, Theme 4 Session 1, Theme 6 Session 1, Theme 12 Session 1		Theme 1 Session 3, Theme 4 Session 5, Theme 13 Session 1, Theme 14 Session 2
1:30				
2:00			Theme 2 Session 2, Theme 4 Session 4, Theme 7 Session 2, Theme 9 Session 1	
2:30				
3:00		Refreshment Break		Refreshment Break
3:30		Theme 2 Session 1, Theme 4 Session 1, Theme 7 Session 1, Theme 16 Session 1		Theme 5 Session 3, Theme 9 Session 2, Theme 10 Session 3, Theme 11 Session 2
4:00			Refreshment Break	
4:30			Special Lectures (x2)	
5:00				Closing Ceremony
5:30				
6:00				

WS = Workshop
SC = Short Course
YTGE = Young Transporation Geotechnics Engineers



Welcome

Erol Tutumluer

4th ICTG Chairman and Chair of ISSMGE TC202

University of Illinois Urbana-Champaign

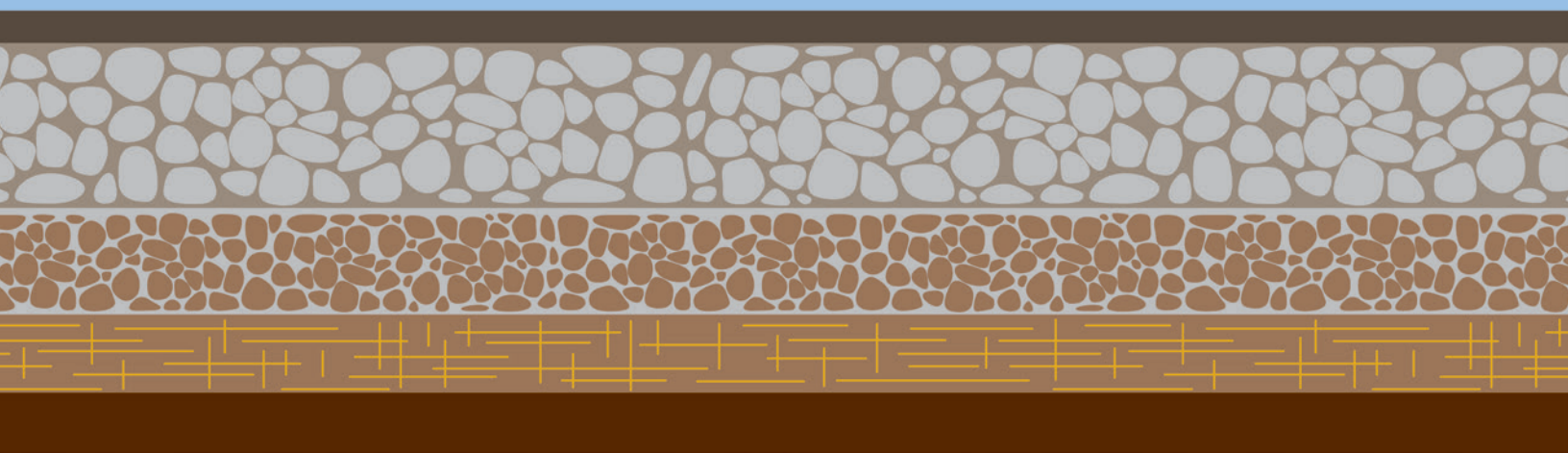
Welcome to the 4th International Conference on Transportation Geotechnics (4th ICTG)!

Originally intendedto take place in Chicago, Illinois, the 4th ICTG is now held virtually on May 24–27, 2021. This is the main conference event of the International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) Technical Committee (TC) 202 on Transportation Geotechnics and it is organized every four years. The primary focus of TC202 is to apply broad engineering to bridge the gap between Pavement/Railway Engineering and Geotechnical Engineering. The ISSMGE TC202 website: www.issmge.org/committees/technical-committees/applications/transportation-

The Transportation Geotechnics International Conference series began under the auspices of ISSMGE Technical Committee (TC) 3 and was initiated in 2008 at the University of Nottingham, UK, as an international event designed to address the growing requirements of infrastructure for societies. The 2nd International Conference on Transportation Geotechnics (ICTG) took place in Sapporo, Japan in 2012 under the ISSMGE-TC202 that followed the TC3 activities for the period 2009-2013, and the 3rd ICTG was organized in Guimarães, Portugal in September 2016. Following this 3rdsuccessful conference, the 4th ICTG in 2021 continues to promote co-operation and exchange of information and knowledge about the geotechnical aspects and address challenges in design, construction, maintenance, monitoring and upgrading of roads, railways, airfields and harbor facilities and other ground transportation infrastructure with the goal of providing safe, economic, environmental, reliable and sustainable infrastructures.

As a virtual event, the 4th ICTG starts on the first day with a meeting of Young Transportation Geotechnics Engineers (YTGE), four pre-conference workshops, and a short course on geosynthetics use in transportation applications. The 3-day conference program includes ISSMGE's 3rd Proctor lecture, ASCE's Carl Monismith Lecture, IGS Keynote Lecture, 6 special lectures, and 176 oral presentations to be delivered in 38 plenary and breakout technical sessions. Furthermore, a poster sessionincluding 48 presentationsand a technical exhibition are also available during these three days for a better dissemination of the latest research and scientific findings and the engineering best practicesby promoting interaction with industry. A three-volume Springer proceedings book,currently in publication process,willinclude fully citation indexed 233 peer reviewed conference papers.

On behalf of the Local Organizing and the US Technical Committees, I wish you a fruitful and enjoyable virtual conference experience, now enriched with scenes of Chicago and the University of Illinois at Urbana-Champaign as the host city and institution, and an unforgettable 4th ICTG during the challenging times of the Covid-19 pandemic (May 24-27, 2021).



Contents

Committees

Local Organizing Committee

Erol Tutumluer, Chair, University of Illinois at Urbana-Champaign (UIUC)

Imad L. Al-Qadi, Director, Illinois Center of Transportation (ICT), UIUC

Chris Barkan, Director, Rail Transportation and Engineering Center (RailTEC), UIUC

Heather Shoup, Illinois Department of Transportation

Jeffery R. Roesler, UIUC

Riley Edwards, UIUC

Issam Qamhia, UIUC

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Hasan Ozer, Arizona State University, Chair of ASCE T&DI Highway Pavements Committee

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Soheil Nazarian, TC202 Member, University of Texas at El Paso

Ted Sussmann, Volpe Center, Federal Railroad Administration

Tuncer Edil, TC202 Member, University of Wisconsin-Madison

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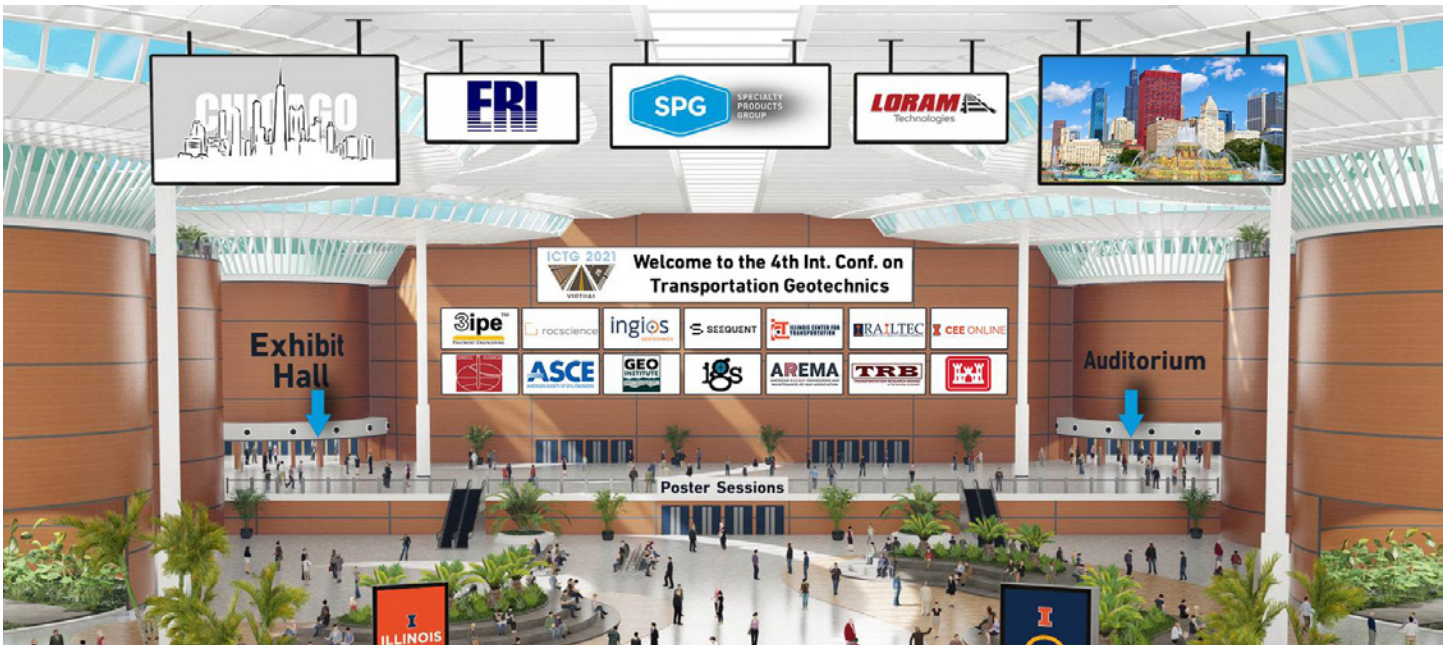

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General Information

4th ICTG Conference Themes

1. Mechanistic-empirical design (road, railways, airfields and harbor facilities)
2. Optimized geomaterial (including hydraulically bound materials and asphalt mixtures) use, reuse and recycling in road embankments and structural layers
3. Sustainability in transportation geotechnics
4. Rail track substructures, including transition zones, and transportation geodynamics
5. Stabilization and reinforcement of geomaterials and its implications in pavement and rail track design
6. Geosynthetics in transportation applications
7. Subsurface sensing for transportation infrastructure
8. Intelligent construction in earthworks technology and management
9. Climatic effects on geomaterial behavior related to mechanics of unsaturated transportation foundations
10. Slope stability and risk management
11. Asset management
12. Deep foundations
13. Retaining walls
14. Tunnels
15. Harbor geotechnics
16. Case histories

Preconference Events

All times given are U.S. Central Time (UTC –5)

Monday, May 24

8:00 AM–5:00 PM

YTGE–Meeting of Young Transportation Geotechnics Engineers (YTGE)—page 25

8:00 AM–5:00 PM

SC–Short Course on Geosynthetics in Transportation Geotechnics—page26

8:00 AM–5:00 PM

WS 1–Workshop on Rail Track Substructure State of the Art Challenges—page 28

8:00 AM–12:00 PM

WS 2–Workshop on Intelligent Compaction Technologies in Earthworks—page 29

8:00 AM–5:00 PM

WS 3–Workshop on Sustainability and Climatic Effects in Mechanistic based Designs of Highway and Airfield Pavements—page 32

8:00 AM–5:00 PM

WS 4–Workshop on Airfield Pavement Design and Rehabilitation—page 34

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Program

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Tuesday, May 25

8:00 AM–9:00 AM

Opening Ceremony

Prof Charles Wang Wai Ng, ISSMGE President

Dr. James G. Collin, ASCE Geo-Institute President

Prof Chungsik Yoo, IGS President

Prof Antonio Gomes Correia, Past Chair of ISSMGE TC202

Prof Ana Barros, CEE Department Head, UIUC

Prof Erol Tutumluer, 4th ICTG Chairman and Chair of ISSMGE TC202

9:00 AM–10:00 AM

ISSMGE Proctor Lecture

Moderator: Prof Erol Tutumluer, University of Illinois at Urbana-Champaign

Railway Track Substructure: Recent Research and Future Directions
Professor William Powrie

10:00 AM–11:00 AM

Opening Ceremony for Exhibits & Coffee Break

11:00 AM–12:00 PM

Special Lectures—Session 1

Moderator: Prof. Imad Al-Qadi, University of Illinois at Urbana-Champaign

Characterization of Geo-Materials for Airport Pavements—Current State of the Art & Future Outlook
Dr. Navneet Garg

Properties Governing the Design of Geosynthetic-stabilized Roadway Bases
Professor Jorge Zornberg

12:00 PM–1:30 PM

Exhibit Hall and Poster Session

1:30 PM–3:15 PM

Sustainable Use of Recycled and By-product Materials

Moderator: Prof. Bora Cetin, Michigan State University

Finite element simulations of Recycled Asphalt Pavement (RAP) materials to be utilized in unbound pavement layers
Andreas Loizos, Brad Cliatt, Christina Plati

Strength Assessment of Quarry Dust Treated Soil-Reclaimed Asphalt Pavement (RAP) Mixture
Mildred Cakuru, Rajab Katuntu Tenywa, Samuel Jjuuko, Denis Kalumba

Geotechnical and geoenvironmental characterization of fine-grained Construction and Demolition recycled materials reinforced with geogrids
Castorina S. Vieira, Paulo Pereira

Effectiveness of Double Layer HDPE Geocell System to Reinforce Reclaimed Asphalt Pavement (RAP)-base Layer
Md Ashrafuzzaman Khan, Nripojyoti Biswas, Aritra Banerjee, Surya Sarat Chandra Congress, Anand Puppala

Durability of Stabilized Quarry By-Products in Base and Subbase Applications
Issam I. A. Qamhia, Erol Tutumluer, Hasan Ozer, Heather Shoup, and Andrew Stolba

A Mixture of Waste Materials as a Construction Fill in Transportation Infrastructure
Miriam Tawk, Buddhima Indraratna, Cholachat Rujikiatkamjorn, Ana Heitor

Railway Subgrades, Track Settlement, and Mud Pumping

Moderator: Prof. Peter Woodward, University of Leeds, UK

The effect of elastic pads and mats on the stress-strain state of railway subgrade
Andrei Petriaev, Anastasia Konon, Vladimir Egorov

An alternative approach to track settlement prediction
Giacomo Ognibene, Louis Le Pen, John Harkness, Antonis Zervos, William Powrie

A Deep Investigation into the Mechanisms and Factors Producing Mud Pumping
Stephen Wilk, Dingqing Li

Railway subgrade characterization through repeated loading triaxial testing
Gino Vizcarra, Luiz Muniz, Thatyane Goncalves, Sanjay Nimbalkar

Settlement of ballasted track with large sleeper spacing
Yoshitsugu Momoya, Kazuki Ito, Shuhei Kikkawa

Mud Pumping in Ballastless Slab Track of High-speed Railway and its Remediation
Zhangbo Wan, Shuhao Li, Xuecheng Bian, Yunmin Chen

Geosynthetics for Soil and Pavement Reinforcement

Moderator: Dr. Mark Wayne, Tensar Corporation

Study of the strained state of bored foundations for weak soils by strengthening the grillage with geosynthetic materials
Sergey Kudryavtcev, Tatiana Valtceva, Semyon Bugunov, Zhanna Kotenko, Natalya Sokolova

Tension behavior of bituminous mixture samples reinforced by fiberglass geogrids in different directions
Reuber Freire, Herve Di Benedetto, Cedric Sauzeat, Simon Pouget, Didier Lesueur

ASIRI+: French National Research Program on soil Reinforcement with Rigid Inclusions
Laurent Briançon, Luc Thorel, Bruno Simon

Behavior of Asphalt Overlays with Geogrids and Geocomposite Interlayer Systems
V Vinay Kumar, Sireesh Saride, Jorge Zornberg

Correlation of geosynthetic index properties to cyclic plate load test performance in flexible airfield pavements
Jeremy Robinson, Jeb Tingle

Numerical simulation of compaction load on stress-deformation behavior of soil geosynthetic composite mass
Truc Phan, Meen Gui, Thang Pham

Maintenance and Management of Transportation Infrastructure

Moderator: Dr. Mike Winter, Winter Associates Limited, UK

Analysis of BIM implementation on railway infrastructures through an application to rail track rehabilitation and inspection
José Neves, Zita Sampaio, Manuel Vilela

Targeted Asset Management On Ageing UK Railway Embankments—Wrabness
Ian Payne, Simon Holt, Isaac Griffiths, Stuart Fielder

Integrated technology geological surveys
Gennadii Boldyrev

Present Demands on Earth Structures in Transport Engineering in Europe
Ivan Vanicek, Yvonne Rogbeck, Joost Breedeveld, Daniel Jirásko, Martin Vanicek

Multi-domain approach for track maintenance and renewal
Amine Dhemaied, Gilles Saussine, Aurélie Schwager Guillemenet, Jean Michel Cornet, Quang Anh Ta, Mathilde Koscielny

Reduction and Analysis of Pavement Profiler Data to Quantify the Bump at the End of the Bridge
Jenn McAtee, Shahjalal Chowdhury, Jennifer Nicks, Mike Adams, Bhaskar Chittoori, Erol Tutumluer, Debakanta Mishra

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3:15 PM–3:45 PM

Refreshment Break

3:45 PM–5:30 PM

Optimized and Recycled Geomaterials—1

Moderator: Prof. Anand Puppala, Texas A&M University

Beneficial Use of Dredged Material in Flowable Fill
Pranshoo Solanki, Juan David Lopez, Harshvardhan Jain, Bhupesh Jain

Analysis of the applicability of USCS, TRB and MCT classification systems to the tropical soils of Pernambuco-Brazil for use in road paving
Roberto Quental Coutinho, Mayssa Alves da Silva Sousa

Crushed Rock Geopolymer as a Future Road Construction Material: An Evaluation of Compaction and Strength Characteristics
Peerapong Jitsangiam, Teewara Suwan, Korakod Nusit, Prinya Chindaprasirt, Sararat Kwunjai

Behavior of Compacted Collapsible Soil After Adding Calcium Chloride
Weijuan Geng, Weiyang Zhou, Jiankun Liu

Study of Deformation and Failure States of Reinforced Mesh Cushion in the Geosynthetics Reinforced and Pile Supported Structure of High-speed Railway
Tai-Feng Li, De-Gou Cai, Zhi-Bo Cheng, Qian-Li Zhang, Yin Gao, Colin Basye, Jing-Yu Liu, Xin-Gang Zhang

The key Technology of High-speed Railway Foamed Lightweight Soil Subgrade
Jianping Yao, Degou Cai, Guanzhi Cheng, Si Li, Jiao Xie

Advanced Characterization Techniques for Geomaterials—1

Moderator: Prof. Reza Ashtiani, University of Texas at El Paso

Statistical analysis of the influence of ballast fouling on penetrometer and geoendoscope data
Jorge Rojas Vivanco, Sébastien Barbier, Miguel Angel Benz Navarrete, Pierre Breul

Validation of photogrammetry-based method to determine the absolute volume of unsaturated soils
Sara fayek, Xiaolong Xia, Xiong Zhang

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Hamid Rostami, Abdolreza Osouli

Monitoring and Modeling of Soil Thermal and Hydraulic Behavior beneath a Granular-Surfaced Roadway
Derya Genc, Jeramy Ashlock, Bora Cetin, Kristen Cetin, Masrur Mahedi, Robert Horton, Halil Ceylan

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Joe Rosalez, Sonya Lopez, Mehran Mazari

Evaluation method of deformation modulus of subgrade soils considering drainage condition
Hiroaki Wakatsuki, Yukihiro Kohata, Daisuke Tamayama, Toshiyuki Mitachi

Dynamic Behavior of Deep Foundations

Moderator: Prof. Jie Han, University of Kansas

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Atsushi Mohri, Kazuki Sakimoto, Takamune Yamaguchi, Yoshiaki Kikuchi, Shohei Noda, Shinji Taenaka, Shunsuke Moriyasu, Shin Oikawa

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Influence of metro vehicle operation on adjacent high-speed railway bridge pier
Guohui Cheng, Yao Shan, xiangliang zhou

Application research and structural optimization of vibration isolation of row piles in high speed railway based on the concept of phononic crystal
Chen Xiaobin, Tang Hao

Dynamic behaviors of piled embankment under high speed train loads
Xiang Duan, Ying WU, Xuecheng Bian, Jianqun Jiang

Settlement and Capacity of Piles under Larger Number of Cyclic Loads
Renpeng Chen, Chunyin Peng, Jianfu Wang, Hanli Wang

Railroad Track Geodynamics

Moderator: Dr. Dingqing Li, Transportation Technology Center, Inc.

The influence of local irregularities on the vehicle-track interaction
Aditi Kumawat, Ullrich Martin, Sebastian Bahamon, Sebastian Rapp

A multi-model approach to analyze railway track-ground dynamics and non-linearity
Chonlatis Charoenwong, David Connolly, Kaitai Dong, Pedro Costa, P.J. Soares, Peter Woodward

Importance of bending stiffness of different track forms
Toshan Rampat, Louis Le Pen, William Powrie, John Harkness

Geotechnical centrifuge and full-scale laboratory testing for performance evaluation of conventional and high-speed railway track structures
Peter Woodward, Andrew Brennan, Omar Laghrouche, Ahmet Esen, David Connolly, Tina Marolt

Mathematical modeling of the short-term performance of railway track under train induced loading
Piyush Punetha, Sanjay Nimbalkar

Investigation into the critical speed in ballasted and ballastless track
Jing Hu, Ying Wu, Xuecheng Bian, Yunmin Chen

Wednesday, May 26

8:00 AM–9:00 AM

ASCE Monismith Lecture

Moderator: Prof. Halil Ceylan, Iowa State University

Flexible Pavement Analysis & Design: Charting a Course Forward
Professor Tom Papagiannakis

09:00 AM–10:30 PM

Mechanistic Analysis and Design—1

Moderator: Prof. Tatsuya Ishikawa, Hokkaido University, Japan

Modification of Japanese pavement fatigue life criteria by considering climate effect in cold regions
Tianshu Lin, Tatsuya Ishikawa, Tetsuya Tokoro, Kimio Maruyama, Chigusa Ueno

A Conceptual System Dynamics Framework to Evaluate Performance of Pavement Foundations under Moisture Hysteresis
Sayedmasoud Mousavi, Majid Ghayoomi, Eshan Dave

Influence of Foundation Layer Properties in a Roller-Compacted Concrete Pavement System Subjected to Heavy Vehicle Loads
Nancy Aguirre, Abbasali Taghavi, Richard Rogers, Cesar Carrasco, Soheil Nazarian

ADeformation and failure parameters of cement-modified loess: application to the calculation of the safety factor of a road structure
Thomas Lenoir, Thierry Dubreucq, Thibaut Lambert, Denis Killinger

Physical modelling of the washboard effect on unpaved roads
Bernardo Caicedo, Gregoire Aguettant

Sensing and Evaluation of Railway Infrastructure

Moderator: Prof. Yuanjie Xiao, Central South University, China

Substructure Sensing in a Rail Bridge
Helsin Wang, Chih-Hsin Hu, Hsin-Chu Tsai, Chung-Yue Wang

Evaluation on the Performance of Asphalt Concrete for the Railway Substructure
Liangwei Lou, Degou Cai, Jie Zhou, Xianhua Chen, Yuefeng Shi

Can one exclude track and rolling stock stiffness for the assessment of dynamic impact forces due to variations in track profile?
Erdem Balci, Niyazi Özgür Bezgin

Asphalt/ballast trackbeds for improved clearance beneath historical bridges for electrification works
Taufan Abadi, Louis Le Pen

Proposition for In situ Evaluation of Geotechnical and Structural Aspects of a Heavy Haul Track
Robson Costa, Jose Pires, Edson Moura, Rosangela Motta, Guilherme Castro, Liedi Bernucci, Luciano Oliveira

Stabilization of Subgrade Soils and Aggregates—1

Moderator: Prof. Renpeng Chen, Hunan University, China

Behavior of polymer-reinforced granular mixtures for railway sub-ballasts
Eivy Alvarez, Xiaobin Chen, Francisco Grajales-Saavedra

Influence of moisture content on strength of stabilised drilling slurry
Mingwei Feng, Juan Wang, Shu Liu, Yunfeng Hu

Experimental study on mass stabilization of soft soil foundation based on MgO-CO2 carbonation technology
Song-Yu Liu, Guang-Hua Cai, Guang-Yin Du, Liang Wang, Jia-Fu Chen, Chuan Qin, Jing Ruan

The water-repellent ability of road pavement material stabilized with synthetic and natural polymers
Korakod Nusit, Peerapong Jitsangiam, Prinya Chindaprasirt

Improving mechanical properties of two Mexican soils by utilizing calcium oxide
Natalia Perez, Paul Garnica, Francisco Javier Castañeda, Mario Enrique Peña

Railroad Tunnels: Dynamic Response and Ground Vibration

Moderator: Prof. Xuecheng Bian, Zhejiang University, China

Investigation on the dynamic response of a high-speed railway tunnel located beneath an airport runway and uneven settlement of the runway
Feizhi Xiao, jizhong yang, Yao Shan

Dynamic stability of soft soil between closely and obliquely overlapped metro tunnels subjected to moving train loads
Hui Li, Quanmei Gong, Honggui Di, Weitao Ye, Zhi Liu

The influence of variation in groundwater table on ground vibrations from underground tunnels
Chao He, Shunhua Zhou, Honggui Di, Xiaohui Zhang

Experimental studies on three types of vibration isolators for the buildings near subways
Tao Sheng, Xue-cheng Bian, Wei-xing Shi, Jia-zeng Shan, Gan-bin Liu

Dynamical response of floating slab track with variation on failure position of steel spring
Xiaolin song, Linfeng Xue, Fangzheng Xu, Jianping Wei

10:30 AM–11:00 AM

Coffee Break

11:00 AM–12:30 PM

Geogrid Stabilization of Unbound Aggregate Layers

Moderator: Mr. Jeb Tingle, US Army Engineer Research & Development Center

Numerical study of deformation behavior of geosynthetic reinforced soil bridge abutments subjected to longitudinal shaking
Yewei Zheng, Patrick Fox, John McCartney

Behavior of geogrid-reinforced railway ballast under train traffic loads
Qiusheng Gu, Kaihui Shi, Xuecheng Bian, Sindy He

Experimental Investigation of the Stabilization Performance of Geogrids for Unpaved Roads with Low Bearing Capacity Subgrade
Süleyman Gökova, Mehmet Saltan, Serdal Terzi, Erol Tutumluer, Volkan Emre Uz, and Mustafa Karaşahin

Rapid Pavement Roughness Measurement of Geogrid-Stabilized Roads
Prajwol Tamrakar, Mark H. Wayne, Garrett Fountain, Aaron Schlessinger, Coady Cameron

Near geogrid stiffness quantification in airport pavement base layers using bender element field sensor
Mingu Kang, Issam I. A. Qamhia, Erol Tutumluer, Murphy Flynn, Navneet Garg, Wilfredo Villafane

Climatic Effects on Road Foundations

Moderator: Prof. Claudia Zapata, Arizona State University

Mechanism of pore pressure increase of saturated granular materials subjected to repeated loads
Chuang Zhao, Xuecheng Bian, Yunmin Chen, Lili Yan

Long-Term In-situ Measurement of Soil Suction in Railway Foundation Materials
Rick Vandoorne, Petrus Johannes Gräbe, Gerhard Heymann

A tool for estimating the water content of unsaturated railway track formation layers
Iván Campos-Guereta, Andrew Dawson, Nick Thom

Numerical and experimental study of the unsaturated hydraulic behavior of a railroad track profile considering fouled ballast subjected to tropical climate condition
Guilherme Castro, Jose Pires, Rosangela Motta, Robson Costa, Edson Moura, Liedi Bernucci, Luciano Oliveira

Study of the influence of rain water on the railway track
Luisa Carla de Alencar Menezes, Antonio Carlos Rodrigues Guimarães, Carmen Dias Castro

Landslides and Slope Stability—1

Moderator: Dr. Ravi Sundaram, Cengrs Geotechnica Pvt Ltd., India

Landslide at Govindghat—Investigation and Stabilization Measures
Ravi Sundaram, Sanjay Gupta, Minimol Korulla, Rudra Bhudhbhatti, Pankaj Mourya

Geohazard in consequence of ignoring primary stress state and failure to observe the construction process of stabilizing constructions designed
Juraj Ortuta, Viktor Tóth

Runoff water management on karstic terrain and stability of slopes and foundations in Northern Spain
Felipe Collazos Arias, J.C. Mas Bahillo, D. Castro-Fresno, J. Rodriguez- Hernandez, E. Blanco-Fernan-dez, L. Castanon-Jano, D. Garcia-Sanchez, I. Beltran Hernando

Assessment of innovative slope repair techniques
Mike Winter, I M Nettleton, R Seddon, D Leal, J Marsden and J Codd

Inverse Analysis of a Failed Highway Embankment Slope in North Texas
Burak Boluk, Sayantan Chakraborty, Anand J. Puppala, Navid H. Jafari

Case Histories 1: Road Foundations

Moderator: Mr. Fintan Buggy, Roughan and O'Donovan, Ireland

Field behavior of GRS bridge approach under large subsoil settlement: a case study
Chunhai Wang, Huabei Liu

Design and construction of a very high embankment using geosynthetics reinforcement
Mariya Dayana, Budhmal Jain, Satya Kumar Sunkavalli, Reginald Subrama-niam

Observational Method Applied to the Decision Optimizing of Foundation Method in Kujala Interchange on Silty Clay Subsoil
Monica Löfman, Leena Korkiala-Tanttu

Design and Performance of Low Capacity Pavements on Peat Foundation Soils in Ireland
Ciaran Reilly, Fintan Buggy

Geotechnical Investigation of Urban Roads with Composite Pavement Structure Using Destructive and Non-Destructive Testing
Maziar Moaveni, Abbas Butt, Satish Gundapuneni

12:30 PM–2:00 PM

Exhibit Hall and Poster Session

2:00 PM–4:00 PM

Optimized and Recycled Geomaterials—2

Moderator: Prof. Halil Ceylan, Iowa State University

Fit-for-Purpose Road Recycling? Triaxial Evaluation of Bitumen Stabilized RAP and Secondary Materials
Jenkins Kim

Feasibility of using selected and mixed recycled aggregates from Construction and Demolition Waste in unbound pavement layers
Castorina S. Vieira, Paulo Pereira, Maria de Lurdes Lopes

Structural pavement rehabilitation with recycled materials in a circular economy approach
Ana Cristina Freire, E. Correia, Jose Neves, Isabel Martins, A. J. Roque, Isabel Pinto, C. Ferreira, Anabela Martins

The potential of quartzitic rock for use as coarse aggregates in asphaltic concrete
Thomas Arthur, Samuel Ampadu, Simon Gawu

Field scale trial of fibre-reinforced ballast
Geoff Watson, Edgar Ferro, Louis Le Pen, David Milne, Tristan Rees-White, William Powrie

Effects of Using Recycled Aggregates and Large Stones for Base and Subbase Layers on Modulus Properties of Pavements
Haluk Sinan Coban, Bora Cetin, Halil Ceylan, William Likos, Tuncer Edil

Field Evaluation of Using Slag as Aggregates for Otta Seal Surfacing
Bo Yang, Yang Zhang, Halil Ceylan, Sunghwan Kim

Advances in Railroad Ballast Evaluation and Characterization

Moderator: Dr. Ted Sussmann, US DOT Volpe Center

Evaluation of ballast particle degradation under micro-Deval testing using photogrammetry
Andre Paixao, Carlos Afonso, Bruno Delgado, Eduardo Fortunato

Stress-strain analysis of heavy haul rail track with steel slag ballast by laboratory tests and numerical simulations
Bruno Guimarães Delgado, António Viana da Fonseca, and Eduardo Fortunato

Measuring the contact stiffness at the grain scale of fresh and used granite ballast
Geoff Watson, Jacapo Piazza, Madhusudhan BN Murthy, Louis Le Pen

Repeatability of Minimum and Maximum Density Testing on Clean and Fouled Ballast
Mariel Jones, Emily Akey, C. L. Ho, A. J. Rubin

Measuring Railroad Ballast Modulus of Elasticity Using Light Weight Deflectometer
Emily Akey, Mariel Jones, Carlton Ho, Aaron Rubin

Ballast Fouling Identification through Statistical Pattern Recognition Techniques on Ballast Particle Movement
Saharnaz Nazari, Hai Huang, Tong Qiu

Steel slag aggregates characteristics evaluation as railway ballast
Guoqing Jing, Peyman Aela, Qiang Zhou, wenli jia

Advanced Characterization Techniques for Geomaterials—2

Moderator: Prof. Carlton Ho, University of Massachusetts at Amherst

Measuring the performance of railway track through large scale trackside sensor deployments
David Milne, Louis Le Pen, Geoff Watson, William Powrie

Features of a large-scale survey of highways with georadar
Alan frid, Vladimir Frid

Evaluation of Various Spatial Interpolation Techniques for Generating Synthetic CPT Data Profile
Md. Rahman Habibur, Murad Y. Abu-Farsakh

Bender Element Field Sensors for Base Course Stiffness Measurements in Airport Pavements
Mingu Kang, Issam I. A. Qamhia, Erol Tutumluer, Won-Taek Hong, Jesse D. Doyle, Harold T. Carr, Wayne D. Hodo, Ben C. Cox, Jeb S. Tingle

Riprap stockpile size and shape analyses using computer vision
Jiayi Luo, Haohang Huang, Issam Qamhia, John M. Hart, and Erol Tutumluer

Railroad ballast movements pattern recognition by using "SmartRock" '
Kun Zeng, Hai Huang

Development of In-situ Modulus Detector for Transportation Substructure
Yong-Hoon Byun, Dong-Ju Kim

Intelligent Compaction and Construction—1

Moderator: Dr. David White, Ingios Geotechnics, Inc.

Field testing of automatic frequency control for intelligent compaction of embankments
Carl Wersäll, Andreas Persson

Intelligent Construction for Infrastructure—The Framework
George Chang, Guanghui Xu, Antonio Gomes Correia, Soheil Nazarian

Geo-statistical Evaluation of the Intelligent Compaction Performance in a reclaimed base project
Maziar Foroutan, Ahmad Ghazanfari, Hamid Ossareh, and Ehsan Ghazanfari

CCC systems for vibratory and oscillatory rollers in theoretical and experimental comparison
Johannes Pistrol, Mario Hager, Dietmar Adam

Numerical Assessment of Impacts of Vibrating Roller Characteristics on Acceleration Response of Drum Used for Intelligent Compaction
Zhengheng Xu, Hadi Khabbaz, Behzad Fatahi, Jeffrey Lee, Sangharha Bhandari

Evaluating the Influence Soil Plasticity on the Vibratory Roller—Soil Interaction for Intelligent Compaction
Sangharha Bhandari, Behzad Fatahi, Hadi Khabbaz, Jeffrey Lee, Zhengheng Xu, Jinjiang Zhong

Mechanical performance of Tire-Derived Aggregate Permeable Pavements Under Live Traffic Loads
Ramin Raeesi, Amin Soltani, Russell King, Mahdi M. Disfani

4:00 PM–4:30 PM

Coffee Break

4:30 PM–5:30 PM

Special Lectures—Session 2

Moderator: Prof. Soheil Nazarian, University of Texas at El Paso

Track Geomechanics for Future Railways: Use of Artificial Inclusions
Professor Buddhima Indraratna

Mechanistic-Empirical Pavement Design Considerations of Swelling/Shrinkage of Expansive Soils
Professor Claudia Zapata

Thursday, May 27

8:00 AM

IGS Keynote Lecture

Moderator: Prof. Jorge G Zornberg, University of Texas at Austin

Geosynthetic Solutions for Sustainable Transportation Infrastructure Development—Fundamentals and Global Challenges
Professor Chungsik Yoo

9:00 AM

Special Lectures—Session 3

Moderator: Prof. William Powrie, University of Southampton, UK

Geodynamics of Ballastless High-speed Railway
Professor Yunmin Chen

An Overview of Ground Improvement Studies to Better the Performance of Transportation Infrastructure
Professor Anand Puppala

10:00 AM–10:30 AM

Coffee Break

10:30 AM–12:00 PM

Mechanistic Analysis and Design—2

Moderator: Prof. Andreas Loizos, National Technical University of Athens, Greece

Field Monitoring of Flexible and Rigid Pavement Responses in Thailand
Auckpath Sawangsuriya, Apiniti Jotisankasa, Suphawut Malaikrisanachalee

Physical modeling of stress propagation in railway pavement with LWD
Artur Rosa, Maria Marques, Antônio Guimarães, Gleyciane Serra, Marcelino Aurelio Silva

Development of Prediction Models for Mechanistic Parameters of Granular Roads Using Combined Non-Destructive Tests
Sajjad Satvati, Bora Cetin, Jeramy Ashlock

Performance Evaluation of Flexible Pavements with Asphalt-treated Base Courses
Jun Liu, Jenny Liu, Peng Li, Stephan Saboundjian

Evaluation of Flexible Pavement Performance Models in Mississippi: A Neural Network Approach
Patrick Duckworth, Hakan Yasarer, Yacoub Najjar

Stabilization of Subgrade Soils and Aggregates—2

Moderator: Prof. Bernardo Caicedo Hormaza, The University of The Andes, Colombia

A case study on efficacy of cement treated base/subbase
Ashish Gharpure, Prashant Navalakha, Asita Dalvi

A Study on Electrokinetic Dewatering of Saturated Soil
Abhishek Sutar, Veerabhadrappa Rotte

Compaction and CBR Behaviour of Cement Stabilised Sand-Black Cotton Soil Mixtures
Charles Nwaiwu, Benjamin Baba, Obinna Ubani

Construction and monitoring of the short-term strength development of a cement-stabilized lateritic pavement layer under tropical climatic conditions
Samuel Ampadu, Thomas Arthur, Priscilla Ackah, Fred Boadu

Evaluation of Strength and Microstructural Characteristics of Weak Lateritic Soil Stabilized with Calcined Clay and Iron Slag Dust
Adedeji Quadri, Oladapo Abiola, S. O. Odunfa, Jamiu Azeez

Geosynthetics for Mitigating Moisture-related Issues

Moderator: Prof. John McCartney, University of California San Diego

Coupled Analysis on Frost-Heaving Depression Effect of Geosynthetics Drainage Material for Road Pavement
Yasuoka Tomohisa, Tatsuya Ishikawa, Bin Luo, Yuwei Wu, Kimio Maruyama, Chigusa Ueno

Performance evaluation of reinforced expansive soil subgrade with polypropylene fiber and geogrid
Nitin Tiwari, Neelima Satyam

The use of microporous membranes to address mud pumping—UK experience
Philip Sharpe, Andrew Leech

Application of Wicking Geotextile for Pavement Infrastructure on Expansive Soil
Nripojyoti Biswas, Md Ashrafuzzaman Khan, Aritra Banerjee, Anand Puppala, Sayantan Chakraborty

The use of Draintube drainage geocomposites under railways structures
Stephan Fourmont, Mathilde Riot

Problematic Soils and Aggregates

Moderator: Prof. Xiong Zhang, Missouri University of Science and Technology

Frost Heave Protection of Concrete Pavement Subgrades
Chigusa Ueno, Yukihiro Kohata, Maruyama Kimio

Characterization of Expansive Soils in Southwest Brazilian Amazon—Behavior of Subgrade Soils in a Flexible Pavement
Victor Hugo Rodrigues Barbosa, Maria Esther Soares Marques, Antônio Carlos Rodrigues Guimarães, Carmen Dias Castro

Experimental study on soil water retention properties of compacted expansive clay
Debojit Sarker, Jay X. Wang

Rainfall induced deformation on unsaturated collapsible soils
Hamed Moghaddasi, Ashraf Osman, David Toll, Nasser Khalili

Laboratory study on frost heave of ballast
Feng Guo, Yu Qian, Yi Wang, Dimitris C Rizos, Yuefeng Shi

12:00 PM–1:30 PM

Exhibit Hall and Poster Session

1:30 PM–3:00 PM

Mechanistic Analysis and Design—3

Moderator: Dr. Navneet Garg, Federal Aviation Administration

Verification of the structural design parameters for unbound layers of Finnish road structures
Pauli Kolisoja, Antti Kalliainen

A Mechanistic-Based Analysis Procedure for Designing Geosynthetic Reinforcement in Pavement Systems
Peter Becker

Geotechnical characterization of a low volume traffic road
Marina Cabette, Antonio Paula, Manuel Minhoto, Ewerton Fonseca

Class Discriminatory Information for Unbound Granular Layers using Statistical Pattern Recognition Techniques
Reza S. Ashtiani

Finite Element Analysis of Nonlinear Elastic Behavior of Unbound Aggregate Materials under Repeated Loading
Haohang Huang, Jiayi Luo, Issam Qamhia, Erol Tutumluer, Jeb S. Tingle, Carlos R. Gonzalez

Behavior of Ballasted Railway Tracks

Moderator: Prof. Hannes Grabe, University of Pretoria, South Africa

Receptance test performed on a laboratory ballasted track section
Ana Ramos, Alexandre Pinto, Ahmet Esen, Antonio Gomes Correia, Pedro Costa, Rui Calçada, Peter Woodward, Omar Laghrouche

Investigation into the mechanical behavior of track-bed materials with different grain size distributions of coarse grains
Shuai Qi, Yu-jun Cui, Ren-peng Chen

Geotechnical and geophysical railway embankment auscultation
Amine Dhemaied, Robin Heraibi, Marine Dangeard, Ludovic Bodet

Ballasted tracks maintenance modeling using DEM
Jean-Francois Ferellec, Eric Chapteuil, Nicolas Docquier, Olivier Lantsoght

Dynamic Behavior Modeling of Full-Scale High-Speed Ballasted Track using Discrete Element Method
Zhongyi Liu, Bin Feng, Wei Li, Erol Tutumluer, Xuecheng Bian, Youssef M.A. Hashash

Harbor Geotechnics: Characterization, Design, and Case Histories

Moderator: Prof. Askar Zhussupbekov, Eurasian National University, Kazakhstan

Investigation of interaction of piles of LRT and New Cargo Sea Transportation Route Projects with problematical soil ground of Kazakhstan
Askar Zhussupbekov, Victor Kaliakin, Der-Wen Chang, Abdulla Omarov

Assessment of CPT Data on Liquefaction Mitigation with Rammed Aggregate Piers®
Ece Kurt Bal, Lale Oner, I. Kutay Ozaydin, Tuncer Edil

Challenges in Developing Sustainable Infrastructure Case History: Boubyan Clay
Waleed Abdullah, Fahad AlOqaili, Ananth Ramasamy, Srour AlOtaibi, Shaikha AlTheyab

Analysis and design of a special port pavement for heavy steel coils
Nicolas Echeverri Pinto

Particle breakage observed in both transitional and non-transitional carbonate sands
Chenxi Tong, Sheng Zhang, Daichao Sheng

Case Histories 2: Railways

Moderator: Dr. Louis Le Pen, University of Southampton, UK

High Speed Railway Vibrations—An approach to Tackle Dynamic Instability
Saeed Hosseinzadeh, Peter Schouten, Gerhard Schulz

Studying Railway Vibration Projects with a Focus on Environmental Aspects
Agnes Van Uitert, Saeed Hosseinzadeh, Peter Schouten, Otto Heeres

Update and Case Studies of GeotrackTM: A Software for Railway Track and Subgrade Analysis
Yin Gao, Patti Schreiber, Stephen Wilk, Amanda Hanson, Taifeng Li, Dingqing Li

Assessing the risk of critical velocity effects at railway sites using site investigation and advanced laboratory testing
Alice Duley, Madhusudhan Bangalore Narasimha, Louis Le Pen, David Thompson, William Powrie

Repeated-Load Saturated Soil Behavior Linked to Two Derailment Case Studies
Theodore Sussmann

3:00 PM–3:30 PM

Refreshment Break

3:30 PM–5:00 PM

Stabilization of Subgrade Soils and Aggregates—3

Moderator: Prof. Debakanta Mishra, Oklahoma State University

Analytical solution for plane strain consolidation of soft soil stabilised by stone columns
Sam Doan, Behzad Fatahi, Hadi Khabbaz, Haleh Rasekh

Impact of Lime Stabilization on Swelling and Soil Water Retention Behavior of Expansive Subgrade
Asmaa Al-Taie, Mahdi Disfani, Robert Evans, Arul Arulrajah, Ehsan Yaghoubi

Seepage behavior within embankment constructed of mixed soil with steel slag
Katsuyuki Kawai, Kaito Arinishi, Satsuki Kataoka, Koji Nakashima

Fundamental study on combination of Paper sludge ash and Cement for dredged clay soil stabilization
Phan Nguyen Binh, Kimotoshi Hayano, Mochizuki Yoshitoshi

Evaluation of mineral formation in sulfate-bearing soil stabilized with slag cement using XRD
Mengting Chen, Hussein Al-Dakheeli, Jim Puckette, Rifat Bulut

Intelligent Compaction and Construction—2

Moderator: Prof. Soheil Nazarian, University of Texas at El Paso

A Stress-Dependent Approach for Estimation of Drum-Soil Contact Area
Aria Fathi, Cesar Tirado, Sergio Rocha, Mehran Mazari, Soheil Nazarian

Deicing Test of the Externally Heated Geothermal Bridge in Texas
Omid Habibzadeh-Bigdarvish, Teng Li, Gang Lei, Aritra Banerjee, Xinbao Yu, Anand Puppala

An Earthworks Quality Assurance methodology which avoids unreliable correlations
Burt Look

An experimental study on the estimation of field compaction states and stress-strain properties of unbound granular materials from laboratory test results
Sou Ihara, Kairi Magara, Mitsutaka Okada, Hiroyuki Nagai, Shohei Noda, Yoshiaki Kikuchi, Fumio Tatsuoka

Experimental Study on the Effect on Stress Release Holes to Decrease Frost Heaves of Fine Particle Fillers in the North of China
Tianxiao Tang, Yupeng Shen, Xin Liu, Ruifang Zuo

Saturated and Unsaturated Conditions of Geomaterials

Moderator: Prof. Daichao Sheng, University of Technology Sydney, Australia

Use of steel slags in earthworks—Hydraulic properties of steel slags and granulometrically modified steel slags under saturated and unsaturated conditions
Elissavet Barka, Emanuel Birle

Effect of Relative Density on the Drained Seismic Compression of Unsaturated Backfills
Wenyong Rong, John McCartney

Development of a Linear Equilibrium Suction Model Based on TMI and Climatic Regions for Oklahoma
Amir Hossein Javid, Hussein Al-Dakheeli, Rifat Bulut

Hydro-Mechanical Behavior of Unsaturated Unbound Pavement Materials under Repeated and Static Loading
Ehsan Yaghoubi, Mahdi Disfani, Arul Arulrajah, Jayantha Kodikara, Asmaa Al-Taie

Effect of Traffic Load on Permeability of Remolded Kaolin
Jian Zhou, Linghui Luo, Hao Hu, Jie Xu, Yicheng Jiang

Landslides and Slope Stability—2

Moderator: Prof. Hasan Ozer, Arizona State University

A long-term record of water content and pore water pressure in a vegetated clay highway cut slope
Joel Smethurst, Aingaa Sellaiya, Anthony Blake, William Powrie

Initiation of 2014 Oso Landslide Using 3D Slope Stability Analyses: Effect of Infiltration
Pourya Kargar Ghomsheh, Abdolreza Osouli

Investigating the effect of direction of grass roots on shear strength of soil and stability of embankment slope
Jakob Schallberger, Lalita Oka

Challenges associated with construction of highways on steep side slopes covered with colluvium –from Hunter Expressway Project Australia
Sudarshan Aryal, Robert Kingsland

Predicting the stability of riverbank slope reinforced with columns under various river water conditions
Cong Chi Dang, Liet Chi Dang, Hadi Khabbaz

5:00 PM–5:45 PM

Closing Ceremony

Moderator: Erol Tutumluer, 4th ICTG Chairman, University of Illinois at Urbana-Champaign

Presentation of the 5th ICTG Venue

Keynote and Special Lecture Speakers

ISSMGE 3rd Proctor Lecture

Railway Track Substructure: Recent Research and Future Directions

PROF. WILLIAM POWRIE, FRENG

Professor of Geotechnical Engineering
University of Southampton

William Powrie is Professor of Geotechnical Engineering at the University of Southampton, having served as Dean of the Faculty of Engineering and the Environment from 2010–2018. His main technical areas of expertise are in geotechnical aspects of transport infrastructure, and sustainable waste and resource management. He was elected Fellow of the Royal Academy of Engineering in recognition of his work in these areas in 2009.

William's work on geotechnical aspects of transport infrastructure encompasses groundwater control, in-ground construction to reduce environmental impacts in urban and other sensitive areas, understanding and mitigating vegetation and climate change effects, and fundamental soil behaviour.

Major projects on which he has worked include the A55 Conwy Crossing, the Jubilee Line extension stations at Canary Wharf and Canada Water, and HS1. He is currently working with HS2 on geotechnical and earthworks aspects. He is co-author of Construction Industry Research and Information (CIRIA) reports C750 Groundwater control—design and practice, 2nd edition (2016) and C760 Guidance on embedded retaining wall design (2017). Both of these incorporate results of his research in these areas.

He was Principal Investigator for Rail Research UK (2003-2010), a Universities-based centre for Rail Systems Research, and now leads an EPSRC Programme Grant, Track to the Future, aiming to provide the science needed to underpin a radical overhaul in techniques for railway track design, construction and maintenance. He is Convenor of the UK Collaboratorium for Research on Infrastructure and Cities (UKCRIC) and leads the UK Rail Research and Innovation Network Centre of Excellence in Infrastructure.

He is a former Associate Editor of the Canadian Geotechnical Journal, a former Honorary Editor of the Institution of Civil Engineers journal Geotechnical Engineering and has been Geotechnical Consultant to groundwater specialists WJ Group since 1987.

William's work in waste and resource management focuses on landfill engineering, and on the development of a sound scientific basis for policy and practice. He led a major EPSRC-funded programme of fundamental research, Science and Strategies for the Management of Residual Wastes, with the aim of enabling and encouraging landfill operation to accelerate biodegradation and stabilization of the waste. He was a co-author of the Institute of Wastes Management report on the Role and operation of the flushing bioreactor.

He worked on the design and engineering risk assessment of the low level radioactive waste repositories at Drigg; and was founding Honorary Editor of the ICE journal Waste and Resource Management; a member of the Scientific Committee of the International Waste Working Group; and chair of the Technologies Advisory Committee for Defra's £30M programme of research and demonstrator projects for new technologies for the treatment of biodegradable waste. He is the author of the widely respected textbook, Soil mechanics: concepts and applications.

ASCE Monismith Lecture

Flexible Pavement Analysis & Design: Charting a Course Forward

PROF. ATHANASSIOS T. PAPAGIANNAKIS, PH.D., P.E., F. ASCE

Dept. of Civil and Enviro. Engineering
University of Texas at San Antonio

Dr. Papagiannakis is a Professor of Civil Engineering with an academic career spanning over 30 years at Washington State University and at the University of Texas at San Antonio, where he served as the Dept. Chair between 2006 and 2015. His expertise is in pavement engineering, specializing in structural pavement analysis, asphaltic material characterization and traffic loading. He has contributed over 200 journal and conference publications in this area. In addition, he has co-authored the textbook

Pavement Design and Materials published by Wiley and Sons in 2008, which is in its fourth printing. He has served as the lead in many national studies funded by NCHRP, FHWA and ASCE, as well as a multitude of studies funded by the Washington State DOT and the Texas DOT with a total budget of over $11m. He recently concluded a Texas DOT funded study dealing with the calibration of the Texas M-E and the AASHTOWare ME pavement design methods using Texas data.

He has won several research awards, including ASCE's Most Innovative Green Engineering Award (2016), ASCE' Next Generation Transportation Award (2017) and the Geo-Institute's Monismith Award (2019). Dr. Papagiannakis is the founder and the past chair of the Pavements Committee of the Geo-Institute that focusses on pavement geotechnics. This committee has evolved into the premium venue for pavement mechanics and has a very keen international membership. Since its inception on 1996, it has sponsored numerous sessions in National and International conferences and has generated a multitude of Geotechnical Special Publications and conference proceedings. Dr. Papagiannakis has co-chaired several international conferences, including 3DFEM 2005 (Delft), ICTI 2014 (Pisa), ICONFBPM 2019 (Thessaloniki), and AM3P 2020 (San Antonio).

Dr. Papagiannakis is an active member of the GI, T&DI, ISSMGE, ISAP, TRB and serves as an Associate Editor for ASCE's Transportation Engineering/Pavements Journal. He holds a PhD degree from the University of Waterloo, he is a Fellow of the ASCE and a registered Professional Engineer in Texas and Ontario.

IGS Keynote Lecture

Geosynthetic Solutions for Sustainable Transportation Infrastructure Development—Fundamentals and Global Challenge

PROF. CHUNGSIK YOO

Sungkyunkwan University, Korea

Professor Chungsik Yoo is currently Professor of Civil, Architectural Engineering and Landscape Architecture at Sungkyunkwan University (SKKU) in Korea. He is the President of International Geosynthetics Society (IGS). Professor Yoo is active in international tunneling community and has served as an Executive Council member and Animateur of Working Group 2 of ITA. Professor Yoo obtained his MSc and Ph.D. degrees in Civil Engineering from the Pennsylvania State University in 1989 and 1993, respectively. After briefly working at Mueser Rutledge Consulting Engineers in USA as a Geotechnical Engineer, he returned to Korea and joined SKKU as Assistant Professor in 1994. Since then, Professor Yoo is continuing to serve as a professor at SKKU and has served as Chair Professor of School of Civil and Architectural Engineering from 2014 to 2016 and as Vice Dean of College of Engineering from 2017 to 2018. Professor Yoo has co-authored over 400 technical papers, including SCI journal papers and conference papers, in geotechnical engineering and tunneling based on laboratory testing, numerical modeling, and field testing. He was a recipient of 2010 IGS Award from the International Geosynthetic Society (IGS). Professor Yoo also received many awards from the Korean Civil Engineering Society, Korean Geotechnical Society, Korean Tunnelling and Underground Space Association, and Korean Geosynthetics Society including the Best Scientific and Engineering Paper Award from the Korean Federation of Science and Technology Societies in 2014. Currently, he is a Co-Editor in Chief of Geotextiles and Geomembranes and an Associate Editor of Tunnelling and Underground Space Technology, Soils and Foundations. He is also an Editorial Board Member of Geosynthetics International and Computers and Geotechnics.

Special Keynote Lecture

Geodynamics of Ballastless High-speed Railway

PROF. YUNMIN CHEN
Chair Professor of Civil Engineering
Zhejiang University, China

Dr. Yunmin Chen, born in 1962, is a Chair Professor of Civil Engineering at Zhejiang University. He was educated at Zhejiang University (1979-1989) with a BSc (Building Structural Engineering, 1983), MSc (Structural Engineering, 1986) and PhD (Geotechnical Engineering, 1989). From 1993-1995, he was a visiting scholar at IFCO Foundation Expertise in Netherlands. In 2015, he was elected as the Academician of the Chinese Academy of Sciences in recognition of his contribution in the field of geotechnical engineering. Currently, he serves as the Chief Scientist of a National Large Research Infrastructure project—Centrifugal Hypergravity and Interdisciplinary Experiment Facility (CHIEF), and the principal investigator of a Basic Science Center Program—Multiphase Evolution in Hypergravity—supported by the National Natural Science Foundation of China. He is Co-Editor-in-Chief of the highly regarded International Journal Transportation GEOTECHNICS, and presently serves on the Editorial Board of 6 other international esteemed journals. He was the founder of the conference series on Environmental Vibration and Transportation Geodynamics. He has published more than 300 refereed journal papers and been recognized by many awards, including three Second Prizes of The State Scientific and Technological Progress Award, the Outstanding Journal Paper Award by ASCE in 2015, and the Mao Yisheng Science and Technology Award in 2017. One of his experimental facilities named Innovative High-Speed Rail Tester (ZJU-iHSRT) was awarded as one of Top Ten Scientific and Technological Progress of Chinese Universities in 2017.

Special Keynote Lecture

Characterization of Geo-Materials for Airport Pavements—Current State of the Art & Future Outlook

DR. NAVNEET GARG
Program Manager
National Airport Pavement & Materials Research Center (NAPMRC)
FAA William J. Hughes Technical Center

Dr. Navneet Garg is a Program Manager in Airport Technology R&D Branch at the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey, and manages projects on Full-Scale Accelerated Pavement Testing, Field Instrumentation and Testing, and Pavement Materials. He earned his Ph.D. from the University of Illinois at Urbana-Champaign in 1997 and his M.S. from the Illinois Institute of Technology, Chicago, in 1993, both in civil engineering. He has been actively involved in airport pavement research at the FAA's National Airport Pavement Test Facility since 1998, and has authored several FAA technical reports, and research papers for various journals and conference proceedings. He has taught in airport pavement design and evaluation workshops for ICAO, Asphalt Institute, Airport Consultants Council, and has been a member of several master's and doctoral degree students thesis committees. He is the winner of "2018 T&DI Airfield Pavements Practitioner of the Year" award given by American Society of Civil Engineers (ASCE), and "2004 Engineer of the Year" award given by the Southern New Jersey Professional Societies (American Institute of Aeronautics & Astronautics AIAA, Institute of Electrical & Electronics Engineers IEEE, and IEEE Computer Society). He is the current Vice-Chair of ASCE Airfield Pavement Committee, past Chairman of Heavy Vehicle Simulator International Alliance, and the Associate Editor of International Journal of Pavement Engineering (IJPE). He is a member of TRB Committees on General and Emerging Pavement Design (AFD30), Geotechnical Instrumentation & Modelling (AFS20), Aggregates (AFP70).

Special Keynote Lecture

Track Geomechanics for Future Railways: Use of Artificial Inclusions

PROF. BUDDHIMA INDRARATNA

Distinguished Professor of Civil Engineering and Director of Transport Research Centre, University of Technology (UTS), Sydney (from August 2020)

Distinguished Professor of Civil Engineering, and Research Director, Centre for Geomechanics & Railway Engineering

University of Wollongong, NSW, Australia; Executive Director, Australian Government's National Training Centre for Advanced Technologies in Rail Infrastructure (ITTC-Rail)

Prof Buddhima Indraratna is a Civil Engineering graduate from Imperial College, London. Since his PhD from the University of Alberta in 1987, his significant contributions to geotechnical and railway engineering have been acknowledged through numerous national and international awards, including the 1st Ralph Proctor Lecture and 4th Louis Menard Lecture of the International Society of Soil Mechanics and Geotechnical Engineering. In 2009, he delivered the prestigious E.H. Davis Memorial Lecture of the Australian Geomechanics Society for his contributions to theory and practice of geotechnical engineering.

For his pioneering contributions to ground improvement and transport infrastructure, he was honoured with the Business and Higher Education award by the Australian Government in 2009, Engineers Australia Transport Medal in 2011, and the combined Engineers Australia-New Zealand Railway Society's Outstanding Individual Award in 2015. Over the past 2 decades, he has also received prestigious international awards, including Thomas Telford Award by the Institution of Civil Engineers UK, Robert Quigley Award by the Canadian Geotechnical Society, and the 2017 Medal of Excellence for life-time contributions, the highest accolade by the International Association of Computer Methods and Advances in Geomechanics.

Prof Indraratna currently leads numerous projects funded by the Australian Research Council at an annual research income of $2 million/year, and he has been a consultant to various geotechnical and rail organisations worldwide. He has more than 800 publications, over 350 Journal articles, 11 books and over 60 invited Keynote papers, and has successfully supervised over 60 PhD graduates and 30 Postdoctoral Fellows. He has been a national and international consultant in numerous major projects worldwide, and to name a few, ground improvement at 2nd Bangkok International Airport, Port of Brisbane and Wollongong harbour reclamations work, Pacific Highway north of Sydney, Melbourne to Brisbane Railway, and post-tsunami reconstruction in Sri Lanka.

Professor Indraratna is a Fellow of several professional bodies including the most prestigious Australian Academy of Technology and Engineering, as well as being a Fellow of the Institution of Engineers, Australia, Fellow of American Society of Civil Engineers (FASCE), and a Fellow of the Geological Society of UK.

Special Keynote Lecture

An Overview of Ground Improvement Studies to Better the Performance of Transportation Infrastructure

PROF. ANAND J. PUPPALA, PH.D., P.E., D.GE, F. ASCE

A.P. Wiley and Florence Chair of Zachry Civil and Environmental Engineering

Associate Director of Center for Infrastructure Renewal (CIR)

Texas A&M University College Station, Texas

Dr. Anand Puppala currently serves as A. P. Wiley and Florence Chair of Zachry Civil and Environmental Engineering at Texas A&M University and is also an Associate Director of Center for Infrastructure Renewal (CIR). He served as a Distinguished Scholar Professor in the Civil Engineering department and served as Associate Dean—Research in College of Engineering at the University of Texas at Arlington (UTA) in Texas, USA. He has over 25 years of experience in teaching, research, continuing education and administration in public Universities in Texas. Dr Puppala has been conducting research on stabilization of expansive soils, sustainable utilization and stabilization of recycled materials for low to high volume roads, in situ intrusive methods for site characterization, infrastructure resilience and pavement material characterization studies.

Dr. Puppala has been a recipient of several major research grants from federal, state and local government agencies. Dr. Puppala is the director of NSF's Industry University Co-operative Research Center (IUCRC) on Composites in Civil Infrastructure (CICI) at UTA.

Dr. Puppala is the current Chair of Soil Mechanics section (AFS00) of the Transportation Research Board (TRB) and is a member of Design and Construction group of TRB. He chaired American Society of Civil Engineers (ASCE)'s Geotechnical Institute's (GI) "Engineering Geology and Site Characterization" committee and TRB committee on 'Soil and Rock Instrumentation'. He has extensively published with well over 400 publications and participates with many esteemed organizations including TRB to develop and deliver workshops, conference sessions, webinars and technical programs to local, state and industry as well as academic personnel. He received many awards and distinctions including recent 2020 Ralph Peck Award from ASCE-GI.

Special Keynote Lecture

Mechanistic-Empirical Pavement Design Considerations of Swelling/ Shrinkage of Expansive Soils

PROF. CLAUDIA E. ZAPATA
Associate Professor
School of Sustainable Engineering and the Built Environment
Deputy Director, NSF Engineering Research Center for Bio-mediated and Bio-inspired Geotechnics
Arizona State University

Claudia Zapata is an Associate Professor in the School of Sustainable Engineering and Built Environment and the Deputy Director for the NSF Center for Bio-mediated and Bio-inspired Geotechnics. She has authored more than 70 technical publications on research related to unsaturated soil behavior, characterization of problematic soil properties, thermo-hydro-mechanical behavior of soils due to static and repeated loading, empirical modeling of fluid flow and volume change of soils applied to pavement structures and residential foundation systems, and environmental effects on soil behavior. She is the past Chair of the Transportation Research Board committee on the Behavior of Unsaturated Geomaterials and active member of several TRB and ASCE committees, including TRB Committee on Seasonal Climatic Effects on Transportation Infrastructure (AFP50) since 2010; ASCE Geo-Institute Unsaturated Soils Committee since 2008; TRB Engineering Behavior of Unsaturated Soils Committee (AFP60) since 2007; TRB Latin-American Transportation Research and Practice Subcommittee (2006-2010); and the ASCE Arizona Geotechnical Division subcommittee since 2006. Dr. Zapata's career highlights include her active participation in the development of the newest Mechanistic-Empirical Pavement Design Guide; the development of models to incorporate environmental effects and problematic soils behavior into current pavement design practice; and the development of a database of soil properties for more than 35000 unsaturated soils for the continental United States, Hawaii and Puerto Rico.

Dr. Zapata's career highlights include her active participation in the development of the newest Mechanistic-Empirical Pavement Design Guide; the development of models to incorporate environmental effects and problematic soils behavior into current pavement design practice; and the development of a database of soil properties for more than 35000 unsaturated soils for the continental United States, Hawaii and Puerto Rico. In 2019 she was selected to receive the Ira Fulton School of Engineering Top 5% Teaching Award for her "outstanding contributions to the education of our students". As Deputy Director of CBBG, she has made important contributions to broadening the participation of k-12 and under-represented populations in the field, and has overviewed more than 30 public events and three summer programs in the past year. On this role, she has striven to broadening the participation of k-12 and under-represented populations in the field, effort that awarded her the nominations to the Faculty Women Association (FWA) 2019 Outstanding Faculty Mentor Award and to the ASU Excellence in Diversity and Inclusion Award in 2015.

Special Keynote Lecture

Properties Governing the Design of Geosynthetic-stabilized Roadway Bases

PROF. JORGE G. ZORNBERG, PH.D., P.E., F.ASCE
Priddy Centennial Professor in Engineering
The University of Texas at Austin

Prof. Zornberg has over 30 years' experience in practice and research in geotechnical and geosynthetics engineering. As an engineering consultant, he has been involved in the design of civil, transportation, mining and waste containment infrastructure. He has served as expert witness in numerous litigation and forensic cases. As a researcher, he focuses on transportation geotechnics, geosynthetics, unsaturated soils, expansive clays and environmental geotechnics. From 2010 to 2014, Prof. Zornberg served as president of the International Geosynthetics Society (IGS). He currently chairs the Geosynthetics Technical Committee of the Geo-Institute of ASCE. He has authored over 450 technical publications, edited a number of proceedings and book chapters, and been awarded three patents. Prof. Zornberg has been invited to deliver keynote lectures in numerous events around the world. He has also received many prestigious awards, including the Mercer Lecture, ASCE's Croes Medal, IGS' Award, ASCE's Collingwood Prize, and IGS' Young Member Award, as well as the Presidential Early Career Award for Scientists and Engineers (PECASE) awarded by the President of the United

Preconference Events

Schedule for the 3rd YTGE Meeting—4th ICTG, May 24, 2021

All times given are U.S. Central Time (UTC –5)

08:00–08:10	Opening of the 3rd YTGE Meeting—Dr. Yu Qian, University of South Carolina		
08:10–08:30	Session 1	Welcome Speech	Prof. Antonio Gomes Correia, Univ. of Minho, Portugal
08:30–08:50	Session 1	(Invited Presentation) A study of particle migration in ballast bed under long-term train load using image analysis and "Smart Rock"	Chuang Zhao*, Qiusheng Gu, Xuecheng Bian
08:50–09:10	Session 1	Influence of pile side grouting reinforcement on the compressive bearing capacity of existing piles	Xinran Li*, Quanmei Gong, Yao Shan, Xiaofan Nie
09:10–09:30	Session 1	Steel slag aggregates characteristics evaluation as railway ballast	Guoqing Jing, Peyman Aela*, Qiang Zhou, Wenli Jia
09:30–09:40	Discussion		
09:40–10:00	Coffee Break		
10:00–10:20	Session 2	(Invited Presentation) Vibratory compaction characteristics and microstructure evolution of unbound railway embankment materials studies from smart sensing and X-ray CT technologies	Wenjun Hua*, Yu Jiang, Yuanjie Xiao
10:20–10:40	Session 2	Long-term settlement of ballastless high-speed railway track under the conditions of ground water level variations	Hongming Liu*, Xuecheng Bian, Lili Yan, Yunmin Chen
10:40–11:00	Session 2	Effect of degraded subgrade stiffness on rail geometry and train vibrations in high-speed railways	Hongguang Jiang*, Shun Liu*, Yinxin Li, Haoran Chi, Jizhe Zhang, Ming Liang
11:00–11:20	Session 2	Characterizing the effect of fines content on small strain shear modulus of unsaturated sandy soils	S. Mohsen Haeri, Mohammadreza Jebeli*, Ali Khosravi
11:20–11:30	Discussion		
11:30–13:00	Lunch Break		
13:00–13:20	Session 3	(Invited Presentation) Field investigation of inverted pavements in Tennessee	Xi Jiang*, Jay Gabrielson, Hani Titi, Baoshan Huang
13:20–13:40	Session 3	A study on suction properties, subgrade modulus and compressibility of marine soil subgrade for flexible pavement	Ram Wanare*, Pritam Sinha, Dr. Kannan Iyer
13:40–14:00	Session 3	Shrinkage curve of treated sulfate-bearing soils with GGBS	Hussein Al-Dakheeli*, Amir Hossein Javid, Mengting Chen, Rifat Bulut
14:00–14:20	Session 3	A back-analysis technique for condition assessment of ballasted railway tracks	Shadi Fathi*, Moura Mehravar
14:20–14:30	Discussion		
14:30–15:00	Refreshment Break		
15:00–15:20	Session 4	(Invited Presentation) Railroad ballast movements pattern recognition by using Smart Rock	Kun Zeng*, Hai Huang
15:20–15:40	Session 4	Behavior of polymer-reinforced granular mixtures for railway sub-ballasts	Eivy Alvarez*, Xiaobin Chen, Francisco Grajales-Saavedra
15:40–16:00	Session 4	Performance of jointed S&C bearers	Ali Shahbaz Khan*, Edgar Ferro, Louis Le Pen, William Powrie
16:00–16:20	Session 4	R-Value and resilient modulus prediction models based on soil index properties for Colorado soils	Cara Fragomeni*, Reza Hedayat
16:20–16:30	Discussion		
16:30–17:00	Closure		

*= Presenter

Short Course on Geosynthetics in Transportation Geotechnics

Instructors: Jorge G. Zornberg, Erol Tutumluer, and Jie Han

Description

Geosynthetics provide sustainable alternatives for enhanced performance, durability and cost-effectiveness of road pavements, railways and airfields. This short course provides an integrated view of the multiple applications of geosynthetics in these three transportation modes. This includes the mechanisms involved in the different applications, the identification of relevant properties, the available design methodologies, and case histories involving the use of geosynthetics in pavements, railways and airfields. An outline of the main topics to be covered is as follows:

- Welcome. Objectives of the Short Course
- Geosynthetics: Types and Functions
- Overview of GS in pavements, railways and airfields
- Mitigation of reflective cracking in structural asphalt overlays
- Stabilization of unbound aggregate layers
- Stabilization of unbound aggregate layers
- Reduction of layer intermixing
- Reduction of moisture in structural layers
- Stabilization of soft subgrades
- Mitigation of shrink/swell distress
- Path forward. Closure

This is a full-day (8 hours) short course, organized on behalf of the North American Chapter of the International Geosynthetics Society (IGS-NA). Course attendees will complete the short course with a working knowledge on the characteristics of different geosynthetics and their use to solve specific problems in the structural design of pavements, railways and airfields.

Instructors

Dr. Jorge G. Zornberg is Professor in Geotechnical Engineering at The University of Texas at Austin. He has over 30 years' experience in practice and research in geotechnical and geosynthetics engineering. As an engineering consultant, he has been involved in the design of civil, transportation, mining and waste containment infrastructure. He has also served as expert witness in numerous litigation cases and forensic investigations. As a researcher, his focus has been on soil reinforcement interaction, geosynthetics, earth retaining structures, roadways, urban and mining waste containment, unsaturated soils, and numerical and physical (centrifuge) modeling of geotechnical systems. From 2010 to 2014, Prof. Zornberg served as president of the International Geosynthetics Society (IGS). He has also served in leadership roles with the ASCE Geo-Institute, currently chairing the Geosynthetics Technical Committee. He has authored over 400 technical publications, edited a number of proceedings and book chapters, and been awarded three patents. Prof. Zornberg has been invited to deliver keynote lectures in numerous events around the world. He has also received many prestigious awards, including the Mercer Lecture, ASCE's Croes Medal, IGS' Award, ASCE's Collingwood Prize, and IGS' Young Member Award, as well as the Presidential Early Career Award for Scientists and Engineers (PECASE) awarded by the President of the US.

Dr. Erol Tutumluer is Abel Bliss Professor of Engineering specializing in Transportation Geotechnics at The University of Illinois at Urbana-Champaign (UIUC). He has been active in geosynthetics engineering research, education, and practice for over 20 years. He has research interests and expertise in characterization of pavement and railroad track geomaterials, i.e., subgrade soils and base/ballast unbound aggregates, soil/aggregate stabilization and geosynthetics. Dr. Tutumluer has served as an investigator on over 100 research projects and graduated 21 PhD and 44 MS students, and authored/co-authored over 350 peer reviewed publications from his research projects. Dr. Tutumluer currently serves as a Council Member and

Publication Committee Chair of the International Geosynthetics Society. Dr. Tutumluer is the Editor-in-Chief of the Transportation Geotechnics Elsevier journal and the Chair of the ISSMGE Technical Committee 202 on Transportation Geotechnics. Dr. Tutumluer is an active affiliate of the Transportation Research Board (TRB) and serves as the Chair of TRB's AKG00 Geological and Geotechnical Engineering Section. He served as the Chair of TRB's AFP70 Aggregates Committee in 2011-2016 and he is a member of the AKG80 Geosynthetics Committee. Dr. Tutumluer has received prestigious awards for his research achievements such as the ASCE's James Laurie Prize and Carl L. Monismith Lecture award and the TRB's Fred Burgraff award for Excellence in Transportation Research. Dr. Tutumluer received several paper awards including TRB's Geology and Geotechnical Engineering Section Best Paper Awards in 2009, 2012, 2016, 2019.

Dr. Jie Han, F. ASCE, is the Glenn L. Parker Professor of Geotechnical Engineering in the Civil, Environmental, and Architectural Engineering Department at the University of Kansas. He has gained extensive teaching, research, and industry experiences in geosynthetics, ground improvement, pile foundations, buried structures, and roadways. Prof. Han is the sole author of the book entitled "Principles and Practice of Ground Improvement" and has published more than 400 peer-reviewed journal and conference papers. Prof. Han is a member of Board Governors of the ASCE Geo-Institute, a council member of the International Geosynthetics Society, and the chair of the TRB Transportation Earthworks Committee. He serves as an associate editor for the ASCE Journal of Geotechnical & Geoenvironmental Engineering and the ASCE Journal of Materials in Civil Engineering, and a handling editor for Transportation Research Record. Prof. Han has been invited to give the 3rd Robert M. Koerner Award Lecture in 2021, the State of the Practice Lecture at the 21st Annual George F. Sowers Symposium in Atlanta, Georgia in 2018, and the 18th UK IGS Lecture in London in 2018. He has received numerous awards from the profession including but not limited to two US Transportation Research Board Best Paper Awards in 2008 and 2017, the 2011 Shamsher Prakash Prize for Excellence in Practice of Geotechnical Engineering, the 2014 the International Geosynthetics Society Award, the 2017 ASCE Martin S. Kapp Foundation Engineering Award, and the 2018 ASCE Kansas City Section Engineer of Year Award.

Workshop on Rail Track Substructure State of the Art Challenges

WORKSHOP ORGANIZERS

Dr. Ted Sussmann, US DOT Volpe Center

Dr. Dingqing Li, Transportation Technology Center, Inc.

OBJECTIVE: Discussion of track substructure topics such as geohazards and transportation geodynamics and other state of the art issues. Special emphasis is placed on emerging failure mechanics and modeling, advanced inspection technology, and maintenance options.

MONDAY, MAY 24, 2021

All times are US Central Time

8:00–8:35	Track, Loading, and Substructure State of the Art Issues | **T. R. Sussmann**
8:35–9:05	Track Substructure Requirements Supporting the Fourth Industrial Revolution (RR4.0) | **H. Grabe**
9:05–9:45	Influence of Track Foundation on the Performance of Ballast and Concrete Slab Tracks | **A. Ramos and A. Gomes Correia**
9:45–10:00	Break
10:00–10:35	Defining and Managing Geohazards | **M. Hendry**
10:35–11:05	Track Modeling and Mechanistic Analysis and Future Applications | **D. Li**
11:05–11:40	Track Geodynamic Performance, Analysis, and Modeling | **X. Bian**
11:40–12:30	Lunch

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12:30–3:00	**Track Support and Substructure Roundtable** Discussion of track support and substructure issues in a 10–minute introductory presentation followed by a flexible 1.5 hr interactive panel discussion. 1. Probabilistic Ballast Life Forecasting & Applications | **C. Ho & M. Forde** 2. Optimizing Ballasted Track Maintenance Operations using Discrete Element Modeling | **Jean Francois Ferellec** 3. British Ballast and Subgrade Advancements | **L. LePen** 4. Track Maintenance and Inspection Advances | **A. Eriksen** 5. Drainage Effects on Track Substructure Performance | **S. Wilk** 6. Inspection, Detection, and Remediation of Track Substructure | **J. P. Hyslip**
3:00–3:15	Break
3:15–3:45	Track Substructure Design Methodology and Requirements | **S. M. Chrismer**
3:45–4:20	Overview of Heavy Haul Experience with Ballast & Program Summary | Top Ten List | **M. Ruel**
4:20–4:30	Closing Remarks and Presentations | **T. R. Sussmann & D. Li**

Workshop on Intelligent Compaction Technologies in Earthworks

The primary tool currently used for quality management of earthwork and unbound aggregates is a nuclear density gauge (NDG) to ensure appropriate density and moisture content. Significant research effort has been devoted to understanding and implementing stiffness-based quality control using the intelligent compaction (IC) concept, along with spot tests using modulus-based devices. When implemented properly, IC technology can provide QC over 100% of compacted geomaterials for assets such as roadways, railbeds, airfields, and other transportation infrastructure (major shortcoming of the spot testing) to assure the uniformity of the compaction process. This will lead to better performing transportation assets and lower maintenance costs. Even though the application of the IC technology in construction QC can be straight forward, several research efforts are on the way to address the gaps that prevent the IC technology from being used for the eventual construction acceptance of the geomaterials.

PROGRAM

Monday, May 24, 2021

This workshop starts at 8:00 AM U.S. Central Time (UTC –5)

1. Introduction (Nazarian) 15 minutes
2. Fundamentals of Good Earthwork (Gomes Correia) (30 minutes)

Break (10 minutes)

3. State of Practice
   a. in US (Chang) (35 minutes)
   b. in EU (Kloubert) (35 minutes)

Break (10 minutes)

4. State of the Art
   a. in US (Nazarian) (35 minutes)
   b. in EU (Sangiorgi) (35 minutes)
5. QA and Discussions (15 minutes)

Prof. Soheil Nazarian, Ph.D., P.E., DGE

Director of Center for Transportation Infrastructure Systems
The University of Texas at El Paso
500 West University Ave, El Paso, TX 79968
Phone: +1 915-747-6911
Email: **nazarian@utep.edu**

Dr. Nazarian is the McIntosh Murchison Chair Professor of Civil Engineering at The University of Texas at El Paso (UTEP) where he has served as the Director of the Center for Transportation Infrastructure Systems and the Campus Director of the newly-established Engineering Research Center entitled "Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE)" funded by the National Science Foundation.

Dr. Nazarian has more than 40 years of experience in the areas of design, evaluation, and nondestructive testing of geotechnical and transportation infrastructure and lifeline. He has been one of the pioneers in the development and improvement of the nondestructive testing methods in infrastructure assessment, and he has significantly contributed to the body of knowledge in construction, quality management, and mechanistic characterization of earthwork using innovative technologies. He currently chairs the Geotechnical Instrumentation and Modeling Committee of the Transportation Research Board and is on the Executive Board of the International Society of Intelligent Construction.

Dr. George K. Chang, P.E.

Director of Research
The Transtec Group
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Email: **GKchang@TheTranstecGroup.com**

Dr. George Chang is an expert on pavement smoothness and intelligent compaction/construction technologies. Dr. Chang has founded the International Intelligent Construction Technologies Group (IICTG) in 2016, which is changed to the International Society for Intelligent Construction (ISIC) in 2019. His research, teaching, specification development, and software tools (such as ProVAL and Veta) have helped make significant technological advancements in the above

fields. Dr. Chang has been the principal investigator for numerous projects that enhancing pavement materials/ structures, pavement surface characteristics, etc. Recognized for his energetic, lively teaching style, Dr. Chang delivers smoothness and intelligent compaction/construction-related workshops worldwide.

Dr. Chang has been the chairman for ISIC, Road Profile Users' Group (RPUG), TRB AFD90/AFP50 Pavement Surface Properties and Vehicle Interaction committee, etc. Dr. Chang received many awards, including Kummer Lecture Award, Meyer-Horne Award, and ASTM Billiard-Stubstad Award from the ASTM; NOVA award from Construction Innovation Forum, Founders' Award from RPUG; Certificate of Appreciation from TRB; and Emeritus Member of TRB AFD90/AFP50 Committee. His research work has been featured in over 50 professional publications and 100+ reports.

Prof. António Gomes Correia, PhD

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António Gomes Correia is professor and researcher at the Institute for Sustainability and Innovation in Structural Engineering (ISISE) of University of Minho and vice president of the International Society for Intelligent Construction (ISIC), former International Intelligent Construction Technologies Group (IICTG) from 2016. He received the diploma in Civil Engineering from the Technical University of Lisbon - IST in 1977, the degree of Doctor-Engineer Degree by "Ecole Nationale des Ponts et Chaussées"- Paris in 1985, the PhD degree in Civil Engineering by the Technical University of Lisbon—IST in 1987, and later in 1998 the title of "Habilitation" in Civil Engineering.

His activities involve research, teaching and consulting in the general field of geotechnical engineering for 42 years. António's work has embraced transportation geotechnics, pavement, rail track, compaction, soil improvement, foundations, design, management, and more recently application of data mining, machine learning and artificial intelligence in transportation related problems. He has over 400 technical papers published on these subjects being 159 indexed in SCOPUS (February 2021). The research activities

Prof. Gomes Correia was from 1998 to 2001, Chairman of the ISSMGE - European Technical Committee - ETC 11 - Geotechnical aspects in design and construction of pavements and rail track and from 2001 Chairman of the International Technical Committee - TC 3—Geotechnics for pavements of the ISSMGE, renamed from 2009 as TC 202—Transportation Geotechnics. He is from 2013 member of the executive committee. He delivered the 2nd Proctor Lecture, TC202 honor lecture of ISSMGE, at the 19th ICSMGE, Seoul, 2017.

He has been a member of the organizing/technical committee for many well-established international conferences. He has founded the conference series on Transportation Geotechnics and organized the 3rd ICTG in Guimarães in 2016. Associated with the 3rd ICTG he launched the First meeting/Forum of Young Transportation Geotechnics Engineers. He has also been one of founding editors for the international journal "Transportation Geotechnics" (from 2014), as well as of "Transportation Engineering" (from 2020), both published by Elsevier. He is also editor of the Journal "Geotecnia" (SPG (Portugal), ABMS (Brazil), SEMSIG (Spain)).

Prof. Ing. Cesare Sangiorgi

Alma Mater Studiorum—University of Bologna
Department of Civil, Chemical, Environmental and Materials Engineering (DICAM)
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He is a Civil Engineer in Transportation since year 2000, today he is Associate Professor at the Department of Civil, Chemical, Environmental and Materials Engineering of the University of Bologna, in Bologna. He works in the Transportation Infrastructures section of the Department and addresses research themes related to the pavement materials and innovative construction technologies. The use of recycled materials and low impact solutions are of primary importance in Dr. Sangiorgi's research and the collaboration with renowned research institutes are the basis for the research activities and the involvement

of students at any level (PhD and MSc), as well as for the participation in various international research groups and associations, such as RILEM, APSE and iSMARTi.

In the area of pavement materials, the link with the Nottingham Transportation Engineering Centre is active since year 2001 after he spent part of his PhD at the former NCPE working on interlayer bonding. Then new links were established with other important research centers such as the TU Delft in The Netherlands, the Pavement Research Center (PRC) in Berkeley (today in Davis) (University of California, USA), the Centre for Pavement and Transportation Technology (CPATT) in Waterloo (University of Waterloo, Canada), the Centre of Subjects Allied to Built Environment Research (SABER) at Ulster University (UK), the C-MADE, Centre for Materials and Building Technology, in Beira Interior (Portugal), the Department of Mechanical, Aerospace and Civil Engineering of the London Brunel University, the Institute of Transportation of TU Wien and, more recently, the Research Institutes of Sweden (RISE), in Stockholm, Sweden.

Dr. Sangiorgi is a Marie Curie Fellow since 2015 as partner of the MSCA-RISE project REMINE on the "Reuse of mining waste into innovative geopolymeric-based structural panels, precast, ready mixes and insitu applications". Moreover, Dr. Sangiorgi is Coordinator of the H2020 MSCA-ITN-ETN project SAFERUP! on Sustainable, Accessible, Safe, Resilient and Smart Urban Pavements that had its official Kick-off in March 2018 and will end in February 2022.

Dr. Sangiorgi is and has been Chief Investigator of several research projects in the private and public sectors dealing mainly with paving recycling materials and innovative construction solutions. He has lead researches for an overall amount of grants reaching over 5 million Euros in the last 10 years. Among the funding companies/institutions can be found: ENI SpA, Ecopneus, Scpa, Marini Spa and Iterchimica srl.

Dr. Sangiorgi has been invited to present the activities and researches of his research group at more than 50 national and international events such as Symposiums, Conferences, Workshops, Seminars and Summer Schools. He acted as Chairman and Keynote lecturer at international events in and out of Europe. He is reviewer for more than 50 scientific journals and acted as reviewer for many national and international Conferences and Congresses, among them the Transport Research Arena.

Dipl.-Ing. Hans Kloubert

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Hans Kloubert, Head of Application Technology at BOMAG, is a Civil Engineer and received his diploma in Civil Engineering from RWTH Aachen University, Germany in 1985. Before joining BOMAG he served as a project engineer on a wide range of pavement and geotechnical projects.

For 30 years Hans has been BOMAG's application expert in soil and asphalt compaction, compaction quality control and soil stabilization. He has been involved in numerous compaction trials, the development of compaction concepts and the application of Continuous Compaction Control& Intelligent Compaction on international highway, railway and airport projects. Hans is also involved in BOMAG`s ongoing development of new technologies in the field of compaction technology, roller integrated compaction measurement and recently digitalization. His publications on compaction, soil stabilization and mix-in-place recycling testify to his extensive global experience. Hans has been invited to many national and international workshops, seminars and conferences to present his experience on the application of modern compaction technology and Continuous Compaction Control.

Since 1995 Hans has been a member of German working committee of German regulations for Earthworks, Quality Control in Earthworks and Asphalt Technology. In 2010 he was appointed German delegate for CEN / TC 396 - the European standardization for quality control and CCC in earthworks - where he made a significant contribution to the conception of the European specification of Continuous Compaction Control (CCC).

Workshop on Sustainability & Climatic Effects in Mechanistic based Designs of Road Infrastructure Systems

Moderators: Halil Ceylan, Chair, ASCE Geo-Institute Pavements Committee

Hasan Ozer, Chair, ASCE T&DI Highway Pavements Committee

WORKSHOP PROGRAM

Monday, May 24, 2021

This workshop starts at 9:00 AM U.S. Central Time (UTC –5)

Introductory comments by the moderators about the workshop (~15 minutes)

- We aim to allocate one full hour for each presentation/topic, 35–40 mins for the presentation followed by 20–25 minutes for the discussion. Our goal is to discuss each topic in detail so that the audience has the opportunity to ask plenty of questions and learn more about the topics covered during the workshop.
- The workshop is scheduled to start at 9 am CDT and we will wrap it up by 4:30 pm CDT (including a 15 min break after the 3rd presentation)
- Presentations will be delivered via live/synchronous Zoom meeting connection

Presenter 1

Dr. Claudia Zapata, Arizona State University, ***czapata@asu.edu***

Dr. Xiong (Bill) Yu, P.E., Case Western Reserve University, **xxy21@case.edu**

Multiscale Multiphysics Processes in Frozen Soils: Incorporating Frost Actions into Pavement Design

Frost heave and thaw weakening leads to change of pavement IRI and compromise pavement performance. This presentation will firstly introduce the theoretical framework that aims to understand the multi-physics processes in frozen soils and its influence on the pavement. The coupling phenomena is described with continuous finite element model as well as a random finite element model that allows holistic simulation of frozen soil behaviors, including the effects of phase transition and the consequent internal stress and volume changes. The performance of the model is firstly validated with laboratory experiments. The model is implemented to simulate the effects of frost action on pavement. The coupled thermal-mechanical actions including the mechanical responses of subgrade soils subjected to freezing temperature and its effects on the pavement structure are analyzed. The results show that the frost action and expansion of ice lenses change the interaction modes between pavement layers, and that the detrimental effects of frost heave on the pavement structure can be mitigated by increasing the thickness of base layer, use of thermal insulation layer or improve drainage in the subgrade layer.

For implementation in the pavement design and performance prediction, a simplified model is formulated to estimate the frost depth and frost heave. The results are evaluated and calibrated with data from instrumented sites. The calibrated model identifies the critical factors on frost heave and thaw weakening as well as the change in pavement IRI due to seasonal freezing-thawing processes. It will allow to predict the effects of climate on the long-term pavement performance.

Presenter 2

Dr. Raul Velasquez, P.E., Geomechanics Research Engineer, Minnesota Department of Transportation, ***raul.velasquez@state.mn.us***

Climatic Effects on Performance of Recycled Bases in MnROAD

This presentation summarizes on-going geotechnical research at MnROAD related to environmental impacts on the performance of recycled aggregate bases (including RCA and RAP). Emphasis is placed on the effect of drastic temperature changes on the response of recycled pavement foundation. Furthermore, the importance of the relative shallow groundwater condition present at research facility is discussed.

Presenter 3

Andrew Dawson, Chair, TRB AKM80 Aggregates Technical Committee, ***andrew.nottingham@aol.com***

Climate Change and Its Impact on Transportation Pavements/Tracks and Their Foundations

Break (15 minutes)

Presenter 4

Dr. Guangming Wang, P.E., State Pavement Performance Engineer, FDOT State Material Office
Florida Department of Transportation, ***Guangming.Wang@dot.state.fl.us***

FWD-Based Decision Matrix for Flood Inundated Roadways: Florida Case Study

Abstract:

Flooding can not only cause significant damage to roadway assets but also pose a safety threat to the road users. Thereby, flooded pavements are closed to traffic to restrict further deterioration of pavements and to ensure safety of the traveling public. However, when the flood waters recede, the pavements are structurally vulnerable and may lead to structural and functional failures if traffic is allowed immediately onto the roadway. Therefore, a well-informed and sound methodology is required to determine the structural adequacy of the pavement to carry vehicular traffic post flooding. For this purpose, Florida Department of Transportation (FDOT) initiated a study that resulted in a practical and easily understood decision matrix based on Falling Weight Deflectometer (FWD) data for opening roadways to traffic after flood events. The decision matrix considers pavement performance parameters such as subgrade modulus, truck traffic, and the present flood condition to determine whether the roadway is safe to be re-opened to traffic. In this presentation, a brief overview of the decision matrix methodology along with a case study where the tool was successfully employed is presented.

Dr. Wang is a Florida registered professional engineer with more than 10 years of experience in pavement engineering. He graduated from the University of Florida with Ph.D. degree in Civil Engineering in 2009. After graduation, he joined Quality Engineering Solutions and had been working as a pavement/geotechnical engineer and project manager for more than 5 years before he joined FDOT in 2015. His areas of expertise include pavement non-destructive testing, pavement design and analysis, pavement marking management (PMM) and pavement modeling.

Dr. Wang currently works as State Pavement Performance Engineer and manages several statewide programs including FWD, GPR, PMM, high friction surface treatment (HFST) and green colored pavement markings (GCPM).

Presenter 5

Brian Moore, Secondary Roads Research Engineer, Iowa County Engineers Association Service Bureau (ICEASB, ***brian.moore@iceasb.org***

Challenges Faced with Unpaved and Local Road Infrastructure Systems in Iowa

Iowa is the United States leader in corn, soybean, and pork production. The network of over 72,000 miles of granular unpaved roads is the backbone of Iowa's agricultural and manufacturing economy that help feed the world. Local road owners spend millions of dollars annually on the maintenance of this system. The presentation will highlight the challenges faced by local road owners and research solutions put into practice to help maintain the network.

Presenter 6

Bora Cetin, Associate Professor, Michigan State University, ***cetinbor@msu.edu***

Long-Term Seasonal Assessment of Pavement Base Aggregates Using Recycled and Natural Materials

In this presentation long term performance of seven pavement test sections built with various base materials, including recycled Portland cement concrete (RPCC), reclaimed asphalt pavement (RAP), commonly used natural aggregates that are classified as MnDOT (Minnesota Department of Transportation) Class 3 through Class 6, and blended aggregates with recycled and natural materials along with aggregate base section stabilized with 14% fly ash. Each test site was monitored for 7-10 years via conducting falling weight deflectometer (FWD), international roughness index (IRI), rutting tests. Results of FWD, IRI, and rutting tests will be presented and discussed.

Panel Discussion (60 minutes)

Discussion questions

We will share a list of discussion questions with the panelists ahead of the workshop. Please e-mail us any questions that you have in mind to be discussed during the workshop and panel session

Each presenter will be asked at least one question during the panel discussion

Workshop on Airfield Pavement Design and Rehabilitation

PROGRAM

Monday, May 24, 2021

All times given are U.S. Central Time (UTC–5)

8:00–8:15	Introductions and Workshop Overview (TINGLE)
8:15–8:30	General Concepts in Airfield Pavement Design and Rehabilitation (GONZALEZ)
8:30–8:45	FAA Airfield Pavement Design Software FAARFIELD (GARG)
8:45–9:45	FAA Flexible Pavement Design (GARG)
9:45–10:00	Break
10:00–11:00	FAA Rigid Pavement Design (BRILL)
11:00–11:45	FAA Rehabilitation Strategies (BRILL)
11:45–12:00	ACR/PCR Concept (BRILL)
12:00–13:00	Lunch
13:005–14:00	DOD Flexible Pavement Design (GONZALEZ)
14:005–14:10	Break
14:10–15:30	DOD Rigid Pavement Design (STACHE)
15:305–16:15	DOD Rehabilitation Strategies (GONZALEZ)
16:155–16:30	Closing Remarks QA and Discussions (15 minutes)

Dr. David Brill, Ph.D., P.E.

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Dr. David R. Brill is Program Manager for Airport Pavement Technology in the FAA Airport Technology R&D Branch, located at the William J. Hughes Technical Center, Atlantic City International Airport, NJ. Since joining the FAA in 1999, Dr. Brill has worked on developing and implementing advanced airport pavement design procedures, including the FAARFIELD program, and most recently, the ACR-PCR method. He is the author of numerous technical papers and reports on airport pavement technology, on subjects including full-scale testing of airport pavement structures and the application of 3D finite element modeling methods to airport pavement design. Dr. Brill is a graduate in civil and urban engineering of the University of Pennsylvania and holds a doctorate in civil engineering from Rutgers University. He is a licensed professional engineer in the states of New Jersey and Pennsylvania. Dr. Brill is a member of the ASCE Airfield Pavement Committee and the TRB standing committee on Aircraft / Airport Compatibility (AV070).

Dr. Navneet Garg, Ph.D.

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Dr. Navneet Garg is a Program Manager in Airport Technology R&D Branch at the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey, and manages projects on Field Instrumentation and Testing, Full-Scale Accelerated Pavement Testing, and Pavement Materials. He earned his Ph.D. from the University of Illinois at Urbana-Champaign in 1997, M.S. from the Illinois Institute of Technology, Chicago in 1993, B.E. from National Institute of Technology Suratkal, India in 1990, all in Civil Engineering. He has been actively involved in airport pavement research at the FAA's National Airport Pavement Test Facility since 1998, and has authored several FAA technical reports, and research papers for various journals and conference proceedings. He has taught in airport pavement design and evaluation workshops for International Civil Aviation Organization, Asphalt Institute, Airport Consultants Council, and other international organizations. He is the current Chair of ASCE Airfield Pavement Committee, on Board of Directors of International Society for Asphalt Pavements (ISAP), Vice Chair of ISAP's Technical Committee on Pavement Field Evaluation, and member of the TRB Committees on Geotechnical Instrumentation & Modelling (AKG60), and Aggregates (AKM80). He is an Associate Editor of International Journal of Pavement Engineering.

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Mr. Jeb S. Tingle is a Senior Scientific Technical Manager and Program Manager in the Geotechnical and Structures Laboratory at the U.S. Army Engineer Research and Development Center in Vicksburg, Mississippi. Mr. Tingle routinely leads large multi-disciplinary teams to solve complex engineering problems. Mr. Tingle has 25 years of experience focused upon transportation research and development with an emphasis on full-scale pavement construction and testing. His individual areas of expertise include soil stabilization, aggregate roads, pavement design, pavement construction, and pavement evaluation. Mr. Tingle is the primary author or co-author of more than 150 technical papers and ERDC/WES reports that encompass such topics as soil mechanics; geosynthetics; soil stabilization; pavement evaluation, pavement design, dust abatement, and airfield damage repair. Mr. Tingle is a past Chair of ASCE's Airfield Pavement Committee and a current member of TRB's Committee on Mechanics and Drainage of Saturated and Unsaturated Geomaterials (AKG40). Mr. Tingle received his Bachelor's and Master's Degrees in Civil Engineering from Mississippi State University, and he is a licensed Professional Engineer in the state of Mississippi.

Dr. Jeremiah M. Stache, Ph.D., P.E.
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Dr. Jeremiah Stache is a Research Civil Engineer in the Airfields and Pavement Branch at the U.S. Army Engineer Research and Development Center in Vicksburg, MS. He received a B.S. in Civil Engineering from the U.S. Military Academy in West Point, NY; M.S. in Civil Engineering from the University of Tennessee in Knoxville, TN; M.S. in Geological Engineering from Missouri University of Science and Technology in Rolla, MO; and a Ph.D. in Civil Engineering from Mississippi State University in Starkville, MS. He is a registered Professional Engineer in the state of Tennessee. His research interests include computational geomechanics using the finite element method, layered elastic and visco-elastic analysis of conventional and contingency pavement structures, and numerical modeling of dynamic aircraft response. Dr. Stache is a member of the ASCE Unsaturated Soils Committee and an associate member of the ASCE Airfield Pavement Committee.

Dr. Carlos R. Gonzalez, Ph.D., P.E.
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Dr. Carlos R. Gonzalez is a Research Civil Engineer in the Airfields and Pavement Branch at the U.S. Army Engineer Research and Development Center in Vicksburg, MS. He earned his Ph.D. from the University of Illinois at Urbana-Champaign in 2015, M.E. from the University of Puerto Rico, Mayaguez in 1989, and a B.S. from the University of Puerto Rico, Mayaguez in 1983. His primary areas of research include pavement analytical and numerical methods, development of pavement performance criteria, assessment of aircraft runway roughness, and development and integration of pavement analysis, data integration, pavement design, and evaluation into U.S. Department of Defense (DOD) Pavement-Transportation Computer Assisted Engineering software (PCASE). He has served as technical instructor for multiple PCASE Workshops conducted around the world. He serves as one of DOD's subject matter experts in an information exchange on pavement design and evaluation. Dr. Gonzalez is also a registered Professional Engineer in the state of Mississippi.

Poster Presentations

Mechanistic-empirical design (road, railways, airfields and harbor facilities)

Dynamic response of a beam on a layered half-space with a poroelastic interlayer subjected to moving loads
Yicheng Li, Xiaolei Zhang, Shijin Feng

Influence of braking on the pavement shakedown limits
Yuchen Dai, Jiangu Qian, Feifei Lei

FreeHyTE: a hybrid-Trefftz finite element platform for poroelastodynamic problems
Natalia Climent, Ionut Moldovan, António Gomes Correia

R-Value and Resilient Modulus Prediction Models Based on Soil Index Properties for Colorado Soils
Cara Fragomeni, Ahmadreza Hedayat

Performance Evaluation of Jointed Concrete Pavements on Mississippi Highways via Artificial Neural Network
William Andrews, Hakan Yasarer, Yacoub Najjar

Optimized geomaterial use, reuse and recycling in road embankments and structural layers

Introduction of Stone Matrix Asphalt for National Highways in Japan's Cold, Snowy Regions
Shunsuke Tanaka, Kimio Maruyama, Shuichi Kameyama

The Analysis of Road Performance, Mechanism and Environmental Benefits of SMC Normal Temperature Modifier
Haoyuan Luo, Yanjun Qiu, Ting Su

Discrete Element Simulation of the Internal Structure of Asphalt Mixtures with High Contents of Tire Rubber
Xiaodong Zhou, Siyu Chen, Dongzhao Jin, Zhanping You

Effective Subgrade Remediation by materials improved with blast furnace type B cement
Atsuko Sato, Osamu Hatakeyma, Naoyuki Kuji

Particle Breakage of a Crushed Sandstone-Mudstone particle Mixture
Zhenfeng Qiu, Shaobo Yang, Junjie Wang, Ting Cao

Alternate Materials for the construction of Landfills and Embankments
Yeluri Meghana, E. C. Nirmala Peter, Srinivas Allena

Sustainability in transportation geotechnics

Reuse of waste HDPE bottle derived geocells for stabilization of hilly roadway slopes
Punit Bhanwar, Sunil Ahirwar, Trudeep Dave

Polymer reinforced RAP and WMM mix as base course of flexible pavement
Jnanendra Nath Mandal, Dulal Chandra Saha

Rail track substructures, including transition zones, and transportation geodynamics

Performance of jointed S&C bearers
Ali Shahbaz Khan, Edgar Ferro, Louis Le Pen, William Powrie

Dynamic response of subgrade in a bridge transition along the Qinshen high-speed rail
Tengfei Wang, Qiang Luo, Liang Zhang, Jun Yao

Experimental study on deformation characteristics of subgrade soil under intermittent train load
Rusong Nie, Yafeng Li, Huihao Mei, Junli Dong

Effect of degraded subgrade stiffness on rail geometry and train vibrations in high-speed railways
Hongguang Jiang, Shun Liu, Yinxin Li, Haoran Chi, Jizhe Zhang, Ming Liang, Zhanyong Yao

Interface Test Study on Asphalt Concrete Full Section Waterproof Sealing Structure of Subgrade of High Speed Railway
Yang-sheng Ye, De-gou Cai, Hong-ye YAN, Jian-ping YAO, Liang-wei Lou, Feng Chen, Yue-Feng Shi, Tai-Feng Li, Song Lv

The Settlement Characteristics of Ballast Bed Based on Variable Boundary Ballast Box
Liang Gao, Hao Yin, Yang Xu, Shunwei Shi, Hang Cai, Xiangning Wang

A study on the evolution of ballast particle surface damage
Akash Gupta, Madhusudhan BN Murthy, Antonis Zervos, John Harkness

Stabilization and reinforcement of geomaterials and its implications in pavement and rail track design

Comparative Evaluation of Lime and Biopolymer Amended Expansive Soil
Landlin Guunasekaran, B. Sharmila, S. Bhuvaneshwari

Evaluation of penetration index of untreated and treated soil using dynamic cone penetrometer
PVSN Pavan Kumar

Shrinkage Curve of Treated Sulfate-Bearing Soils with GGBS
Hussein Al-Dakheeli, Amir Hossein Javid, Mengting Chen, Rifat Bulut

CBR characteristics of kaolin-simulated clay type subgrade stabilised with cement, lime, poly-fiber and ionic compounds mix
Chee-Ming Chan, Abdul Rashid Ahmad Nasri, Poi-Cheong Tan, Danny Ng

Geosynthetics in transportation applications

Effects of geogrid encasement on behavior of stone column-improved soft clay
Meixiang Gu, Jie Cui, Yang Wu, Jie Yuan, Yadong Li

Finite Element Analyses of Geocell Reinforced Tracks over Clayey Subgrade
Lalima Banerjee, Sowmiya Chawla, Sujit Dash

Bearing capacity test with small model soil box model on reinforcement of base course using geotextile
Kenichi Sato, Takuro Fujikawa, Chikashi Koga, Takumi Kitamura

Effect of Natural Reinforcement Aperture Shape on Bearing Capacity of Reinforced Soil
Sunil Ahirwar, J. N. Mandal

Subsurface sensing for transportation infrastructure

Disturbance deformation of ground induced by a large-area piling: A field test
Limin Wei, Shuanglong Li, Qun He, Meng Du, Hong Zhou

Characterizing the Effect of Fines Content on the Small Strain Shear Modulus of Sand-Silt Mixtures during Hy-draulic Hysteresis
Mohammadreza Jebeli, S. Mohsen Haeri, and Ali Khosravi

A back-analysis technique for condition assessment of ballasted railway tracks
Shadi Fathi, Moura Mehravar

Tunnels

Influence of shield slurry property on filter cake quality in sand stratum
Weitao Ye, Longlong Fu, Shunhua Zhou

Dynamic response and long-term settlement of four overlapping tunnels subject to train load
Xiangliang Zhou, Quanmei Gong, Zhiyao Tian, Yao Shan

Research on Calculating Quantity of Utility Tunnel with Revit Secondary Development
Qi Zhang, Qian Su, Yan Yan

The effect of excavation unloading on the deformation of existing underlying shield tunnel
Min-yun Hu, Jing-tian Yang, Li-dong Pan, Kong-shu Peng, and Yu-ke Lu

Climatic effects on geomaterial behavior related to mechanics of unsaturated transportation foundations

Moisture Influence on the Shakedown Limit of a Tropical Soil
Gleyciane Almeida Serra, Antonio Carlos Rodrigues Guimaraes, Maria Esther Soares Marques, Carmen Dias Castro, Artur Cortes da Rosa

Long-term performance of ballastless high-speed railway track under the conditions of ground water level variations
Hongming Liu, Xuecheng Bian, Lili Yan, Yunmin Chen

Climate Change Impacts on Flexible Pavement Performance
Shahjalal Chowdhury, Mojtaba Sadegh, Debakanta Mishra

Slope stability and risk management

Earth pressure, a load or a resistance: Formulation of the 'What You Design Is What You Get' model for stability design of propped cantilever walls
Chi-Kuen Stanley Yuen

Maintenance Planning Framework for Rock Slope Management
Roman Denysiuk, Joaquim Tinoco, José Matos, Tiago Miranda, António Gomes Correia

Harbor geotechnics

A study on suction properties, subgrade modulus and compressibility of marine soil subgrade for flexible pavements
Ram Wanare, Pritam Sinha, Kannan K. R. Iyer

Case histories

Evaluating the Performance Benefits for Low Volume Roadways Constructed with Geosynthetic Wicking Fabrics: A Case Study in Northern New England
Mohamed Elshaer, Christopher Decarlo

Retaining walls

Numerical and experimental analysis of internal stability of back to back mechanically stabilized earth walls supporting the rail embankment system
Shilpa S Vadavadagi, Sowmiya Chawla

Deep foundations

Analysis and Reconstruction of rock joint surface based on DCT algorithm
Lianheng Zhao, Dongliang Huang, Shuaihao Zhang, Xiang Wang, Yingbin Zhang, Shi Zuo

Influence of Pile Side Grouting Reinforcement on the Compressive Load Bearing Capacity of Existing Piles
Xinran LI, Quanmei Gong, Yao Shan, Xiaofan Nie

Attenuation characteristics of plane waves by metabarriers with negative parameters
Jiahua Zhou, Xingbo Pu, Zhifei Shi

Shearing Behavior of Jointed Rocks under Monotonic & Cyclic Loading with Varying Gouge Materials
Nirali Hasilkar, Lalit S. Thakur, Nikunj Amin

Model research on the deformation behavior of geogrid supported by rigid-flexible piles under cyclic loading
Kaifu Liu, Yonghao Cai, Yi Hu, Dazhi Wu, Zhenying Zhang

4th ICTG Exhibitors

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EXHIBITORS

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