International Symposium on Systematic Approaches to Environmental Sustainability in Transportation

Fairbanks, Alaska, August 2-5, 2015, cem.uaf.edu/cesticc/symposium
# SCHEDULE AT A GLANCE

## August 2\(^{nd}\), Sunday (Wood Center)
- Registration: 10:00 - 5:00 pm, Carol Brown Ballroom
- Workshops 1: 10:00 - 12:00 pm & Workshops 2: 1:15 - 4:15 pm, Conference Rooms C&D
- Ice Breaker Reception: 6:30 - 8:00 pm, Carol Brown Ballroom

## August 3\(^{rd}\), Monday (Wood Center)
- Breakfast: 7:00 – 8:00 am, Dine 49
- Welcome Remarks: 8:00 -8:45 am, Carol Brown Ballroom
- Keynote Speeches: 8:45 – 12:00 pm, Carol Brown Ballroom (with Coffee Break 9:45-10:00 am)
- Lunch: 12:00-1:00 pm, Dine 49
- Lectern Sessions: 1:15 – 3:00 pm, 1-1 in Carol Brown Ballroom, 1-2 in Conference Rooms C&D, and 1-3 in Conference Rooms E&F
- Coffee Break: 3:00 – 3:30 pm
- Poster Session: 3:30 – 5:00 pm, Exhibition Room

## August 4\(^{th}\), Tuesday
- Breakfast: 7:00 – 8:00 am, Wood Center Dine 49
- Keynote Speeches: 8:00 – 10:00 am, Wood Center Carol Brown Ballroom
- Coffee Break: 10:00 – 10:20 am
- Lectern Sessions: 10:20 – 12:00 pm, 2-1 in Wood Center Conference Rooms C&D and 2-2 in Conference Rooms E&F
- Permafrost Tunnel and Trans-Alaska Pipeline System Tour: 1:00 pm-5:00 pm (Lunch: 12:00-1:00 pm, Wood Center Dine 49)
- Geothermal Renewable Energy Tour: 12:00-6:30 pm, Chena Hot Springs Resort (Brown Bag Lunch Pick-up at 12:00 pm)
- Classic Alaska Salmon Dinner: 6:30 – 9:00 pm, Alaska Salmon Bake (2300 Airport Way, Fairbanks, AK 99701)

## August 5\(^{th}\), Wednesday
- Breakfast: 7:00 – 8:00 am, Wood Center Dine 49
- Lectern Sessions: 8:00 – 9:45 am, 3-1 in Wood Center Conference Rooms C&D and 3-2 in Conference Rooms E&F
- Coffee Break: 9:45 – 10:05 am
- Parallel Lectern Sessions: 10:05 – 11:50 am, 4-1 in Wood Center Conference Rooms C&D and 4-2 in Conference Rooms E&F
- Permafrost Tunnel and Trans-Alaska Pipeline System Tour: 1:00 pm-5:00 pm (Lunch: 12:00-1:00 pm, Wood Center Dine 49)
- Geothermal Renewable Energy Tour: 12:00-7:00 pm, Chena Hot Springs Resort (Brown Bag Lunch Pick-up at 12:00 pm)

## August 6\(^{th}\), Thursday
- Post-Symposium Beaver Slide Field Site Trip: Whole Day
Dear Colleagues and Friends:

On behalf of our Co-Chair, Professor Hehua Zhu, and the entire Symposium Organizing Committee, it is my great pleasure to welcome you all to the International Symposium on Systematic Approaches to Environmental Sustainability in Transportation (ISSAEST) at the University of Alaska Fairbanks, the flagship research campus of the University of Alaska System. We at the Center for Environmentally Sustainable Transportation in Cold Climates (CESTiCC), partnering with Tongji University, are honored to have this opportunity to host researchers and engineers from all over the world in Fairbanks, Alaska. Environmental sustainability in transportation is about making responsible decisions that will reduce negative impacts on the environment through the entire life cycle of transportation. We expect this symposium to serve as an international forum to discuss environmental challenges associated with design, construction, and maintenance of multimode transportation systems and a showcase of recent development, practices, and advances to maximize environmental sustainability.

We highly appreciate the great support and help from numerous organizations and individuals that helped make this symposium happen. These include symposium sponsors, the International Advisory Committee and Technical Committee, partners and friends of CESTiCC, American Society of Civil Engineers (ASCE) and Transportation Research Board (TRB) committees, and reviewers of symposium special publications. We thank you for your active participation!

Welcome again to the International Symposium on Systematic Approaches to Environmental Sustainability in Transportation. We hope this symposium will be rewarding and enjoyable for all.

Jenny Liu, Ph.D., P.E., M.ASCE
Chair, Organizing Committee, ISSAEST
Director, CESTiCC
Professor, Department of Civil and Environmental Engineering
University of Alaska Fairbanks
# Committees

## Organizing Committee

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## International Advisory Committee

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## Local Organizing Committee

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1. Emerging Challenges, Best Practices, and Research Needs in Sustainable Winter Road Operations

**Moderator:** Xianming Shi, Ph.D., P.E., Associate Professor, Civil and Environmental Engineering, Washington State University

This workshop will cover topics including: life cycle sustainability of winter road operations, safety/mobility/economic benefits of such operations, emerging challenges in management and technology domains, short-term and long-term risks to motor vehicles and transportation infrastructure, source control vs. reactive strategies to environmental sustainability, training and workforce development, pavement innovations, performance measures, living snow fences, smart snowplows, “green” anti-icing and deicing products, and a look to the future.

Dr. Shi is currently an Associate Professor in Civil and Environmental Engineering at the Washington State University and an assistant director of CESTiCC. Before joining WSU, he was a Research Professor at the Civil Engineering Department, Montana State University and a Program Manager at the Western Transportation Institute. Dr. Shi holds his Ph.D. in Chemistry and a 2nd M.S. in Industrial & Management Engineering.

*If you are unable to make it to the workshop but would like to participate in the workshop please follow the instructions below.*

You can join the workshop from your computer, tablet or smartphone by typing in the following url.
https://global.gotomeeting.com/join/245285293

You can also dial in using your phone: United States : +1 (872) 240-3412, Access Code: 245-285-293

2. Introduction to Life Cycle Assessment (LCA): An Overview

**Moderator:** Liv Haselbach, Ph.D., P.E., Associate Professor, Civil and Environmental Engineering, Washington State University

This workshop provides a snapshot of what is now internationally recognized as the Life Cycle Assessment (LCA) process for cradle to gate/grave/cradle assessment of environmental and resource impacts of a product, process or constructed element. (It does not cover economic or social considerations.) The workshop will be comprised of three consecutive one-hour sessions, each with two 20-minute PowerPoint modules and time for Q&A. The modules will be:

(1) Introduction to Life Cycle Assessment and ISO14040, and What is a Functional Unit?
(2) Environmental Impact Categories Overview Parts I and II
(3) General LCA Tools Overview and Transportation-Related Tools Overview

Dr. Haselbach has authored numerous papers on sustainability related to developmental issues, carbon sequestration and low impact development. Her recent research includes water quantity and quality benefits of permeable pavements, titanium dioxide as an air pollutant treatment for pavements and life cycle assessment (particularly use phase) projects on carbon and energy related to transportation. Dr. Haselbach is very active in the sustainability education arena and has developed courses on sustainability and the LEED rating system at WSU and the University of South Carolina. She is a LEED AP (BD+C). Prior to her academic career she founded an engineering consulting company in the New York – Connecticut area, which specialized in permitting, construction and site development for major US companies, particularly in the retail petroleum industry. Her degrees include a BS in Civil and Environmental Engineering from Cornell, an MS in Chemical Engineering from UC Berkeley, and a PhD in Environmental Engineering from the University of Connecticut.

*If you are unable to make it to the workshop but would like to participate in the workshop please follow the instructions below.*

You can join the workshop from your computer, tablet or smartphone by typing in the following url.
https://global.gotomeeting.com/join/456613693

You can also dial in using your phone: United States : +1 (312) 757-3121, Access Code: 456-613-693
Ice Breaker Reception (6:30 - 8:00 pm, August 2\textsuperscript{nd})

Join us for a relaxed Alaska summer night with awesome food and beverages. Mix and mingle, chat with new attendees, reconnect with old friends, and check out what’s new and exciting in the field.

Welcome Remarks (8:00 - 8:45 am, August 3\textsuperscript{rd})

Jenny Liu, Chair, Symposium Organizing Committee
Patrick Gamble, President, University of Alaska System
William Schnabel, Interim Director, Institute of Northern Engineering
Lydia Mercado and Denise Dunn, Office of the Assistant Secretary for Research and Technology (OST-R), U.S. Department of Transportation
Junming Wang, Science and Technology Counselor, Consulate General of the People’s Republic of China in San Francisco, USA

Keynote Speeches (8:45 - 12 pm on August 3\textsuperscript{rd} and 8:00 - 10:00 am on August 4\textsuperscript{th})

1. Waterborne Transportation in Cold Regions, Jon E. Zufelt, HDR, USA

Abstract: When thinking of ships in ice, most people probably bring to mind the vision of an ice-breaker headed to the North Pole or delivering cargo to McMurdo Station in Antarctica. Most vessel pilots, however, would rather navigate ice-free waters than have to deal with the potential damage to their ships, the extra regulatory requirements for operating in ice conditions, and the increased travel time and O&M costs to their voyage. Cold regions of the world present seasonal (and sometimes year-round) difficulties to navigation. The Port of Anchorage, Alaska in the Upper Cook Inlet of the Gulf of Alaska sees ice conditions for 5 to 6 months each year and while navigation does not stop during the winter, Port operations may be suspended under severe ice conditions. The world’s inland waterways (lakes, rivers and canals) see an equally important level of waterborne transportation commerce. Winter navigation on inland waterways in northern regions is dependent on many factors. River or canal width, depth, and ice conditions will determine the type of vessels and barge loadings that can be operated. Ice concentration and thickness will determine how the locks and dams will be required to operate during harsh winter conditions. Reduced tow width or length, extended times for lockages, gate fanning, and ice lockages may be required during heavy ice conditions. Methods developed in the United States by the U.S. Army Corps of Engineers and other northern countries have proved successful in keeping navigation corridors open during winter.

The Gyeong-In Ara waterway is a new 18-km man-made waterway located in the northern part of South Korea and connects the Han River near Seoul with the West Sea at Incheon. This well planned multi-model system includes the Incheon Terminal, a large turning basin/terminal area separated from the West Sea by twin sliding gate locks. The Gimpo Terminal also includes a large multi-modal distribution complex and is connected to the Han River by a lock with a conventional miter gate. The canal between the two terminals has a trapezoidal shape with a bottom width of 80 m and an operating depth of 6.3 m. While not originally considered in the design, observations during construction in the winter of 2010-2011 and modeling of historic air temperatures indicated that ice formation will occur on the waterway in cold winters. A river ice management plan was developed in order to address any issues that might arise when ice is present. Potential issues include ice congestion and icing formation at the terminals, flow control gates, and lock gates. The degree of ice formation was relatively unknown as it would be affected by many variables, including the water quality of the Han River, the salinity of the West Sea, flow rate through the canal, the large tidal range (10 m) of the West Sea, and the number and frequency of vessel passages during winter. The development of the river ice management plan used an adaptive management approach as there was no operational history for either open water or ice.

Speaker Bio: Dr. Jon Zufelt is a Senior Hydraulic Engineer with HDR in Anchorage, Alaska focusing on the topics of cold regions
hydrology and hydraulics, river engineering, coastal and riverine bank protection, ice engineering, numerical modeling, and hydropower. Some of the projects he is involved with include ice force analysis for the Port of Anchorage, ice processes and modeling for the proposed 460 MW Susitna Watana Hydropower Project, floodplain and scour analysis for several new bridges, and coastal ice processes. Prior to HDR, Jon served 30 years with the Cold Regions Research and Engineering Laboratory (CRREL) where he held positions as research hydraulic engineer, branch chief, technical director for earth sciences and engineering, and civil engineer: first in Hanover, NH and then in 2001 moving to Alaska to manage CRREL’s Anchorage Office.

Dr. Zufelt is an Adjunct Professor at the University of Alaska Anchorage, where he also serves on the College of Engineering Advisory Board as Vice Chair. Jon’s professional activities are concentrated with the American Society of Civil Engineers (ASCE) where he currently serves as the vice chair of the Committee on Technical Advancement, the Editor of the ASCE Journal of Cold Regions Engineering, and a member of the ASCE Convention Advisory Council. He has served as chair of many ASCE Committees including the Technical Council on Cold Regions Engineering. He is a past chair of the United States Permafrost Association and of the Interagency Hydrology Committee of Alaska.

Past recognition of service includes the ASCE Daniel W. Mead Prize for Younger Members in 1988, the CAN-AM Civil Engineering Amity Award in 2005, the 2006 Alaska Engineer of the Year, and the 2015 ASCE Harold R. Peyton Award for Cold Regions Engineering. Jon received his BS in Forest Engineering from SUNY Environmental Science and Forestry, his MS in Civil Engineering from Colorado State University, and his PhD in Civil Engineering from the University of Iowa. He is a registered Professional Engineer in Alaska and New Hampshire and also a Certified Floodplain Manager.

Jon and his wife Penny have two grown children and live in Eagle River, Alaska.

2. Geologic Repository of High-Level Nuclear Waste: Constitutive Modeling and Boundary Value Problems, Feng Zhang, Tongji University, China

Abstract: In this research, geological repository of high-level radioactive waste (HLRW) was investigated in a systematic way. First of all, a unified thermal elastoplastic constitutive model for saturated/unsaturated geomaterials is proposed. The validity of the model is verified with several different element tests for soils and soft rocks. Then, a FEM-based multi-phase scheme named as SOFT, adopting unified field equations for thermo-hydro-mechanical-air (THMA) behavior of geomaterials and using finite element-finite difference scheme (FE-FD) for soil-water-air three-phase coupling problem, is used in the numerical analyses. As an application of the newly proposed numerical method, two engineering problems, one for slope failure in unsaturated model ground and another for in-situ heating test related to geological repository of high-level radioactive waste (HLRW), are simulated. The model tests on slope failure in unsaturated Shirasu ground is simulated in the framework of soil-water-air three-phase coupling under the condition of constant temperature. While an in-situ heating test is simulated in the same framework under the condition of air pressure being constant. Finally, a detailed geological repository of HLRW is analyzed with the proposed THMA scheme.

Speaker Bio: Dr. Feng Zhang is a professor of Nagoya Institute of Technology (NIT, National University Association, Japan) since 2005 and is also a Concurrent Professor of Tongji University since 2006. He got Ph.D. degree from Kyoto University in 1995. He served as the head of Civil Engineering Department of NIT during 2006 to 2008 and the director of Advanced Disaster Prevention Engineering Center of NIT during 2011 to 2014. His main research interests are in constitutive modeling in soil mechanics & rock mechanics, numerical analyses in geotechnical engineering and seismic evaluation of earth structures. He is recipient of the awards including the Best Paper Medal of Soils & Foundations (2002, 2011) and the Best Paper Medal of Japan Society of Civil Engineers (2007).
Abstract: The transportation infrastructure in the US includes over 4,000,000 miles of streets, roads, and highways, as well as more than 600,000 bridges. In order to maintain the condition of its infrastructure, States spent billions of dollars. State economy relies completely on the ability to move goods, fuel, and people freely and inexpensively to every corner of our State. Therefore, efficient operation of the highway network is critical for the viability of the State economy and its growth and productivity. The inadequacy of many of the existing roads and the escalating costs of materials and energy provide a great motivation for exploring new innovative techniques and methods for design, building, and preserving roads that ensure its sustainability. In recent years, many state agencies and the Federal Highway Administration have emphasized the importance of pavement sustainability and recycling. The recent increase in energy prices and the gradual depletion of natural resources have also pressed the need to conserve energy in highway construction activities and to adopt methodologies that would be beneficial to the environment, to the users, and to the industry. Using recycled materials and sustainable methodologies will not only reduce help to overcome the current rapid escalation of the costs for building with new virgin highway materials, but it will also maximize the usage of our existing pavement assets in the rehabilitation strategies. In addition, by incorporating sustainable and recyclable materials and technologies into transportation infrastructure, those structures will have a significant impact on the viability and longevity of our society. The use of sustainable and recycled materials will reduce the amount of materials to be quarried, processed, and transported and protect the environment and its scarce natural resources. In addition, energy consumption and greenhouse gas emission are also reduced as a result of the use of sustainable alternatives. This presentation will review the use of sustainable materials for paving applications, along with their design and performance.

Speaker Bio: Dr. Louay Mohammad is a Professor of Civil and Environmental Engineering and holder of the Irma-Louise Rush Stewart Distinguished Professorship at Louisiana State University, and Director of the Engineering Materials Characterization Research Facility at the Louisiana Transportation Research Center. He is a nationally and internationally recognized expert in the area of pavement materials and sustainable asphalt construction. Dr. Mohammad teaches and conducts research in the area of Highway Construction Materials, Pavement Engineering, Accelerated Pavement Testing, Advanced Materials Characterization and Modeling, and Infrastructure Sustainability.

Dr. Mohammad has served as the PI or Co-PI on more than 58 research projects totaling US $12.4 million including several current NCHRP projects. He has authored/coauthored more than 255 publications in pavement engineering including over 144 refereed papers. Dr. Mohammad has delivered over 145 invited presentations at national and international conferences. He has developed many standard tests and mechanistic models that have impacted pavement materials characterization and performance, and contributed to changes in the State-of Practice of asphalt mixture design through changes in asphalt specifications. Dr. Mohammad is the Past Chair of National Academies TRB Committee AFK40 on Characteristics of Asphalt-Aggregate Combinations to Meet Surface Requirements; member of TRB AFK10 committee on General Issues in Asphalt Technology; TRB committee AFK30 on Characteristics of Nonasphalt Components of Asphalt Paving Mixtures; TRB committee AFK50 on Characteristics of Bituminous Paving Mixtures to Meet Structural Requirement; Chair of ASTM committee on the Analysis of Bituminous mixtures; Bituminous/Flexible pavements Section Editor of ASCE Journal of Materials in Civil Engineering; Associate Editor of Journal of Engineering Research and International Journal of Pavement Research and Technology.

Dr. Mohammad has been recognized with the 2013 Best Paper Award of the 8th International Conference on Road and Airfield Pavement Technology, 2010 Distinguished Research Paper of the Journal of Engineering Research, the 2009, 2012, and 2015 Asphalt Rubber Ambassador Award, and the 2002 Association of Asphalt Paving Technologists Board of Directors Award of Recognition.
4. Transportation Geotechnics: Sustainability Principles, Case Studies and Lessons Learned, Anand J. Puppala, University of Texas at Arlington, USA

Abstract: This keynote presentation provides a comprehensive overview of definition and principles of sustainability and then summarizes various sustainability oriented research projects in which the speaker is involved. Most project studies describe either stabilization aspects of a project or reuse of materials or potential use of alternative energies for potential bridge or pavement deicing operations. Most focus will be made on the use of recycled or reuse materials comprising of reclaimed asphalt pavement (RAP) and recycled crushed concrete aggregates as well as coal combustion products for various applications including as pavement bases and retaining wall backfills.

This section is followed by another section describing various sustainability assessment tools comprising of carbon calculators, life cycle cost assessments and other methods for evaluating the green aspects of a construction project. In conclusion, a brief overview of various sustainability rating systems including green roads, and ASCE Envision will be reviewed and discussed.

Speaker Bio: Dr. Anand Puppala currently serves as Associate Dean - Research in College of Engineering and is a Distinguished Teaching and Scholar Professor in the Civil Engineering department at the University of Texas at Arlington (UTA) in Texas, USA. Dr. Puppala received his BE, MTech and PhD from GITAM, IIT Chennai and Louisiana State University, respectively. Dr. Puppala received many teaching and research awards including 2013 UTA Distinguished Researcher award and 2010 UT System’s Regents Teaching Award. He was the First Engineering Professor from UT Arlington to receive this regents teaching honor in Texas. Dr. Puppala served as President of United States Universities Council on Geotechnical Education and Research (USUCGER) from 2007-2009. He also chaired ASCE’s Geotechnical Institute’s “Engineering Geology and Site Characterization” committee from 2003-2006.

Dr. Puppala is the current Chair of Soil Mechanics section of the TRB. He has been conducting research on sustainable utilization of recycled materials, dams and embankments, stabilization of expansive soils, in situ intrusive methods for site characterization, and pavement material characterization studies. Dr. Puppala has been a recipient of several major research grants totaling well over $11 Million from federal, state and local government agencies. Dr. Puppala’s research is highly regarded by the professional community, as evidenced by his scholarly record of 300+ publications including 165 Journal and Geotechnical Special Publications. He has supervised 20 Doctoral and 52 Masters’ thesis students.

Dr. Puppala is a current editorial member for several journals including ASTM Geotechnical Testing Journal, Elsevier Engineering Geology and ASCE Journal of Geotechnical and Geoenvironmental Engineering and a chief editor of Thomas Telford’s Ground Improvement Journal (UK) and section editor of ASCE Journal of Materials. He also edited several books including seven ASCE’s Geotechnical Special Publications.

5. Airport Pavement Behavior, Performance, and Management System, Chia-Pei Chou, TECRO, USA, and National Taiwan University, Taiwan

Abstract: Just like most of the public infrastructures, airport pavement network requires a huge financial investment and sound engineering management to maintain a satisfactory and safe level of service for its sustainability. The airport pavement network basically consists of multiple runways, taxiways, and large area of apron. A comprehensive airport pavement management system (PMS) includes complete database, periodical performance inspections, reliable traffic and environmental data collection, reasonable maintenance decision criteria, sound maintenance techniques, and continuous research feedback mechanism. The PMS of Taiwan international airport has been developed and a serious of research works focus on runway skid resistance inspection, roughness survey and analysis, strain measurement and stress analysis, and slab movement analysis are integrated and presented. Not like the
International Roughness Index (IRI) has been world widely used for highway network, runway roughness evaluation has been always a challenge to airport maintenance authorities. This presentation covers a comparison of various existing runway roughness indices and introduces a new concept of roughness index which can be tailor-made for each runway based on its profile and aircraft combination. In addition, an automatic grooving measurement equipment was invented for evaluating grooving quality, and it was found that it indeed has significant impacts on the pavement property of skid resistance.

**Speaker Bio:** Dr. Chia-pei Chou received her MS and Ph.D. degrees from the Department of Civil Engineering, University of Texas at Austin. After working one year at the Texas DOT, she joined the Department of Civil Engineering of National Taiwan University in 1989. Since then she has been actively conducting researches in the areas of inspection, evaluation, and management of highway as well as airports pavement facilities, motor vehicle size and weight studies for the past 25 years. She has developed the Pavement Management Systems for the National Freeway Bureau and the Taoyuan International Airport in Taiwan. The CAA specification of runway skid resistance inspection and measurement has been established through her research work. Moreover, the heavy vehicle size and weight regulations of Taiwan have been revised by the Congress Legislators based on her research findings and recommendations.

She has published more than 200 journal and conference papers, and 73 research reports. Dr. Chou was awarded the Outstanding Teaching Awards of NTU four times during last 25 years and has been promoted as the distinguished professor since May 2009. She also received nine Annual Best Paper Awards offered by one international pavement professional society and four major professional engineering societies in Taiwan. In 2008, she was awarded the national outstanding engineering professor by Chinese Engineering Association. Moreover, the heavy vehicle size and weight regulations of Taiwan have been revised by the Congress Legislators based on her research findings and recommendations. In general, she has been actively conducting researches in the areas of inspection, evaluation, and management of highway as well as airports pavement facilities, motor vehicle size and weight studies for the past 25 years.

Researchers at the U.S. Army's Cold Regions Research and Engineering Laboratory (CRREL) Alaska Research Office maintain and manage the Permafrost Tunnel Research Facility and offer support for scientific research projects. The Permafrost Tunnel is situated near the valley floor of Goldstream Creek, 16 miles north of Fairbanks in Fox, Alaska. The Permafrost Tunnel was excavated from 1963–1969 for the study of permafrost, geology, ice science, and the mining and construction techniques specific to permafrost environments. It offers a unique research platform for scientists and engineers who wish to study a frozen environment over 40,000 years old.

The Trans-Alaska Pipeline System (TAPS) includes the trans-Alaska crude-oil pipeline, 12 pump stations, several hundred miles of feeder pipelines, and the Valdez Marine Terminal. TAPS is one of the world's largest pipeline systems. The crude oil pipeline is privately owned by the Alyeska Pipeline Service Company.

**Classic Alaska Salmon Dinner (6:30 – 9:00 pm, August 4th, Alaska Salmon Bake)**

Don't miss this symposium highlight — another opportunity to meet and reconnect with friends and colleagues from around the world, and enjoy delicious Alaska cuisine in one of Fairbank’s most popular tourist’s attractions, Pioneer Park. The historical theme park is filled with museums, shops, food, train rides and so much more. Be sure to spend some extra time in this historic park to learn more about Alaska. Please be prepared to sit indoors and outdoors.
Geothermal Renewable Energy Tour (Afternoons of August 4th and 5th, Chena Hot Springs Resort)

This tour will bring you to Chena Hot Springs, the lowest temperature geothermal resource to be used for commercial power production in the world, to learn more about their energy saving projects. “Chena Hot Springs and the Department of Energy are jointly funding a $1.4 million exploration project designed to locate and characterize the geothermal resource underlying Chena Hot Springs. The goal is to build a model of the deep reservoir using geologic and geophysical exploration techniques coupled with state of the art reservoir engineering. Once the model has been completed, it will be tested by drilling a 4000ft slim hole, sited to intersect the deep geothermal reservoir.” (chenahotspring.com/geothermal-exploration) You will also have an opportunity to enjoy relaxing hot springs, ice museum, and ‘Chena fresh’ greenhouses, etc. Be sure to bring your bathing suit.

Beaver Slide Field Site Trip (8:00 am-10:00 pm, August 6th)

Many roads in Alaska, such as the Dalton Highway, experience degradation caused by frost heave during winter and thaw weakening during subsequent spring. One good example of this damage occurred at Beaver Slide, near mile 110.5 of the Dalton Highway. This trip will take you to the field site of one research project using wicking fabric to mitigate frost heave and thaw weakening on the way up to the arctic circle. You will also enjoy this Article Circle adventure with remarkable 800-mile long Trans Alaska Pipeline, the Arctic Circle Trading Post situated in the rural community of Joy, the rugged Dalton Highway and the mighty Yukon River at much lower group rate than you would find in town.
### Keynote Session 1: 8:45-12:00 pm, Carol Brown Ballroom

- Waterborne Transportation in Cold Regions, **Jon E. Zufelt**, HDR, USA
- Geologic Repository of High-Level Nuclear Waste: Constitutive Modeling and Boundary Value Problems, **Feng Zhang**, Tongji University, China
- Sustainable Development: Material, Design, and Performance, **Louay Mohammed**, Louisiana State University, USA

### Lectern Session 1-1(sponsored by ASCE BMC): Bituminous Materials and Techniques for Paving Application, 1:15 to 3:00 pm, Carol Brown Ballroom

**Session Chairs:** **Louay Mohammed**, Louisiana State University, USA, and **Samer Dessouky**, University of Texas at San Antonio, USA

- Anti-Oxidants Effect on Bitumen Rheology and Mixes Mechanical Performance, **Samer Dessouky**, David Contreras, Jeremy Sanchez, University of Texas at San Antonio, USA; Daewook Park, Kunsan National University, Republic of Korea
- Tack Coat’s Vital Role in Assuring Optimal Flexible Pavement Performance, **David R. Johnson**, Asphalt Institute, USA
- A Case Study of the Asphalt Stabilized Aggregates in Cold and High Altitude Regions, Lei Huang, Aimin Sha, **Feng Ma**, Zhuangzhuang Liu, Xiaolong Zou, Chang’an University, China
- Evaluation of Aggregate Morphological Characteristics and Their Relationship to Mechanical Performances, Linbing Wang, Wenjuan Sun, Yufeng Liu, Virginia Polytechnic Institute and State University, USA; Wenchao Xu, University of Science and Technology Beijing, China
- Linking Field and Lab Performance of Interstate Pavements, Shu Yang, **Andrew Braham**, University of Arkansas, USA; Nazmul Chowdhury, Zahid Hossain, Arkansas State University, USA

### Lectern Session 1-2: Geo-Materials and Soil Stabilization, 1:15 to 3:00 pm, Conference Rooms C&D

**Session Chairs:** **Xiong Zhang**, University of Alaska Fairbanks, USA, and **Caichu Xia**, Tongji University, China

- Nonexistence and Non-decoupling of the Dissipative Potential for Geo-materials, **Yuanxue Liu**, Yu Zhang, Runze Wu, Jiawu Zhou, Yingren Zheng, Logistic Engineering University, China
- Development of an Oedometer Cell with Suction Measurement Ability, **Lin Li**, Xiong Zhang, Chuang Lin, University of Alaska Fairbanks, USA
- Review of Characterization of Geotextile Hydraulic Behavior, **Chuang Lin**, Xiong Zhang, University of Alaska, USA
- Geosynthetic-Stabilized Vegetated Earth Surfaces for Environmental Sustainability in Civil Engineering, **Jie Han**, Jun Guo, the University of Kansas, USA
- Practice of the Geocell Utilized on the Subbase Course in Cold and High Altitude Regions, Aimin Sha, Jiawen Zhou, Liqun Hu, **Zhuangzhuang Liu**, Xiaolong Zou, Chang’an University, China
**Lectern Session 1-3: Management of Stormwater Runoff**, 1:15 to 3:00 pm, Conference Rooms E&F

**Session Chairs:** Laura Fay, Montana State University, USA, and Qiang He, University of Tennessee Knoxville, USA

- Snow and Ice Control Environmental Best Management Practices, **Laura Fay**, Mehdi Honarvar Nazari, Scott Jungwirth, Anburaj Muthumani, Montana State University, USA
- AVL/GPS/MDSS for Improving Winter Operations, Tim Croze, **Justin Droste**, Michigan Department of Transportation, USA
- Green Stormwater Infrastructure Strategies for Airports: Challenges and Opportunities, **Xianming Shi**, Marc Beutel, Washington State University, USA; Thomas Long, Kent State University, USA; Andrew Hellenthal, Brown and Caldwell, USA; Carrie Bristoll-Groll, Stormwater Solutions Engineering, LLC, USA
- Extended Performance of Media Filter Drains: New Media, **Liv Haselbach**, Justin Rath, Maxwell Freimund, Washington State University, USA
- Patterns of Microbial Indicators in Stormwater Runoff from Highways in Tennessee, **Qiang He**, The University of Tennessee, USA

**Poster Session:** 3:30-5:00 pm, Exhibition Room

**Session Chairs:** Xianming Shi, Washington State University, USA, and Dae-Wook Park, Kunsan National University, Republic of Korea

- **(P01)** Analytical Approaches of Long-term Behavior of Shield Tunnel in Soft Deposit due to Groundwater Leakage: A Review, Y. Yuan, H.N. Wu, Y.S. Xu, S.L. Shen, Shanghai Jiao Tong University, China
- **(P02)** Mechanical Properties and Empirical Model of Compacted Silty Clay Subjected to Freeze-thaw Cycles, Feng Zhang, Harbin Institute of Technology, China; Ruxin Jing, Delft University of Technology, Netherlands; Decheng Feng, Bo Lin, Harbin Institute of Technology, China
- **(P03)** The Hazards of Expansive Soils and Its Countermeasures in Transportation Engineering, Hongtao Jiang, Nanjing University, China
- **(P04)** Effect of Conductive Filler Size and Type on Thermal Properties of Asphalt Mixture, Hai Viet Vo, Dae-Wook Park, Woo Jin Seo, Kunsan National University, Republic of Korea; Ji-Sun Im, Korea Research Institute of Chemical Technology, Republic of Korea
- **(P05)** Carbon Sequestration in Old and New Portland Cement Concrete Pavement Interiors, Liv Haselbach, Washington State University, USA; Ashrafal Alam, W-T Structural Engineering, LLC, USA
- **(P06)** Improved User Experience and Scientific Understanding of Anti-icing and Pre-wetting for Winter Roadway Maintenance in North America, **Na Cui**, Montana State University, USA; Xianming Shi, Washington State University, USA
- **(P07)** Review on the Toxicological Effects of Chloride Based Deicers: Impacted Environments and Assessment Methods, **Na Cui**, Laura Fay, Montana State University, USA; Xianming Shi, Washington State University, USA
- **(P08)** Water Quality Implications and Toxicological Effects of Chloride Based Deicers: State of the Knowledge, Mehdi Honarvar Nazari, Washington State University, USA; Laura Fay, Scott Jungwirth, Montana State University, USA; Xianming Shi, Washington State University, USA
- **(P09)** Managing Metallic Corrosion on Winter Maintenance Equipment Assets, Mehdi Honarvar Nazari, Washington State University, USA; Dave Bergner, Monte Vista Associates, LLC., USA; Xianming Shi, Washington State University, USA
- **(P10)** Corrosion of Bare Metals Affected by Exposure to 25% Magnesium Chloride Solution and Tensile Stress: Field and Lab Studies, **Anburaj Muthumani**, Montana State University, USA; Xianming Shi, Washington State University, USA
- **(P11)** Impacts of Specialized Hauling Vehicles on Highway Infrastructure, Economy and Safety: Renewed Perspective, **Anburaj Muthumani**, Montana State University, USA; Xianming Shi, Washington State University, USA
## Keynote Session 2: 8:00-10:00 am, Carol Brown Ballroom

- Transportation Geotechnics: Sustainability Principles, Case Studies and Lessons Learned, **Anand J. Puppala**, University of Texas at Arlington, USA
- Airport Pavement Behavior, Performance, and Management System, **Chia-Pei Chou**, TECRO, USA, and National Taiwan University, Taiwan

## Lectern Session 2-1 (Sponsored by ASCE BMC): Life Cycle Costing and Assessment, Energy Consumption, and Environmental Assessment, 10:20 to 12:00 pm, Conference Rooms C&D

**Session Chairs:** **Liv M. Haselbach**, Washington State University, USA, and **Steve Saboundjian**, Alaska Department of Transportation & Public Facilities, USA

- Assessment of Life Cycle Energy Saving and Carbon Reduction of Using Reclaimed Asphalt Concrete, **Chia-Pei Chou** and Ning Lee, National Taiwan University, Taiwan
- Life Cycle Assessment Synthesis for a Volume of Lubricating Oil in Marine Applications, Q.M. Langfitt and **L.M. Haselbach**, Washington State University, USA
- Life-Cycle Performance Determination of Concrete Bridge Decks with Exposure to Aggressive Environment via a New Risk Rating Method, **Ning Xie**, Montana State University, USA; Xianming Shi, Washington State University, USA
- Environmental and Energy Concerns for Life Cycle Analysis of Transportation Systems, **Waheed Uddin**, Seth Cobb, Tyrus McCarty, Jagdish Sharma, University of Mississippi, USA
- Life-cycle Sustainability Assessment of Highway Winter Maintenance Operations, **Na Cui**, Montana State University, USA; Xianming Shi, Washington State University, USA

## Lectern Session 2-2: Tunneling Engineering and Ground Improvement, 10:20 to 12:00 pm, Conference Rooms E&F

**Session Chairs:** **Hehua Zhu**, Tongji University, China, and **Gang Chen**, University of Alaska Fairbanks, USA

- Structural Performance of Immersed Tunnel Element at Flexible Joint, **Jian Sun**, Xiaoyi Hu, Tongji University, China; Qingfeng Shen, Shanghai Construction Group Co., Ltd., China; Xiaoxuan Zhu, Tongji University, China; Ming Lin, Communications Construction Company, China; Wei Xu, Tongji University, China
- Factors Influencing the Longitudinal Deformation of Metro Tunnel in Soft Deposit: an Overview, Yongxia Wu, Huaina Wu, **Shuilong Shen** and Yeshuang Xu, Shanghai Jiao Tong University, China
- Analysis on 3D Dynamic Pressure Arch Effect around a Mountain Tunnel, **Chengbing Wang** and Hualao Wang, Research Institute of Highway Ministry of Transport, China
- Mechanical Behaviors of Cylindrical Retaining Structures in Ultra-deep Excavation, **Pengfei Xu**, Xiaoyi Hu, Tongji University, China; Meihua Wang, Xiaoqiang Cui, Shanghai Construction Group Co., Ltd., China; Wei Xu, Tongji University, China
- Accuracy and Sensitivity Analysis on the Photogrammetry-Based Deformation Measurement Method, **Lin Li**, Xiong Zhang, University of Alaska Fairbanks, USA
August 5th, Wednesday

Lectern Session 3-1 (Sponsored by ACI Alaska Chapter): Advances and Innovations in Cementitious Materials, 8:00 to 9:45 am, Conference Rooms C&D

Session Chairs: Baoshan Huang, University of Tennessee Knoxville, USA, and Zhiguo Yan, Tongji University, China

- Deicer Impacts on Concrete Bridge Decks: A Comparative Study of Field Cores from Potassium Acetate and Sodium Chloride Environments, Ning Xie, Anburaj Muthumani, Yudong Dang, Montana State University, USA; Xianming Shi, Washington State University, USA
- Evaluation of Cleaning Methods of Pervious Concrete Pavement, Charles Sanford, Mbakisya A. Onyango, Tricia A. Thomas, Frank Jones, Brent Rollins, University of Tennessee at Chattanooga, USA
- Case Study: Application of Mineral Admixtures in Cement Concrete under Sulfate Environment in Northwest China, Qingke Nie, Hebei Research Institute of Construction & Geotechnical Investigation Co. Ltd., China; Changjun Zhou, Harbin Institute of Technology, China; Huawei Li, Hebei Research Institute of Construction & Geotechnical Investigation Co. Ltd., China; Xiang Shu, Baoshan Huang, University of Tennessee Knoxville, USA
- Evaluation of Self-Healing Properties of Mortar containing Microencapsulated Epoxy Resin, Shuai Zhou, Hehua Zhu, Zhiguo Yan, Tongji University, China; Woody Ju, University of California, Los Angeles, USA; Qing Chen, Zeyu Dong, Tongji University, China
- Modified Media Filter Drain Mix with Alternate Aggregate Grading, Maxwell Freimund, Liv Haselbach, Washington State University, USA; Cara Poor, Portland State University, USA; Agathe Thomas, Washington State University, USA

Session 3-2: Railway Engineering and Underground Space, 8:00 to 9:45 am, Conference Rooms E&F

Session Chairs: Jie Han, University of Kansas, USA, and Dongmei Zhang, Tongji University, China

- Numerical Modeling of Moisture Migration in High-speed Railway Subgrade, Hanlin Wang, Renpeng Chen, Lan Luo, Jin Wu, Zhejiang University, China
- Mechanical Behavior of Piled-raft Foundation for High-speed Railway Subjected to Train Loading, Linlin Gu, Nagoya Institute of Technology, Japan; Guanlin Ye, Shanghai Jiaotong University, China; Xiaohua Bao, Shenzhen University, China; Feng Zhang, Nagoya Institute of Technology, Japan
- Development and Application of Remote Monitoring and Analysis System for High Speed Railway Subgrade Structure in Mountainous Areas, Jian Li, Shanxiong Chen, Fei Yu, Wei Guo and V.O. Ojekunle, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan, China
- Frost Heave Induced Pipe Strain of An Experimental Chilled Gas Pipeline, Scott L. Huang, University of Alaska Fairbanks, USA; Kun Yang, China University of Petroleum Beijing, China; Satoshi Akagawa, Cryosphere Engineering Laboratory, Japan; Masami Fukuda, Fukuyama City University, Japan; Shunji Kanie, Hokkaido University, Japan
- Geo-treatments in Constructing A Tunnel in Karst Strata: Lessons Learned from Subway Project in Guangzhou, China, Qing L. Cui, Ye S. Xu, Shui L. Shen, Huai N. Wu, Shanghai Jiao Tong University, China; Zhen Y. Yin, Tongji University, China
### Session 4-1: Constructions and Operations in Cold Climates, 10:05 to 11:50 am, Conference Rooms C&D

**Session Chairs:** Robert A. Perkins, University of Alaska Fairbanks, USA, and Robert McHattie, GZR Engineering, USA

- Crack Surveying Methods to Evaluate Sealing Practice in Alaska, Anthony P Mullin, Sheng Zhao, Jenny Liu, University of Alaska, USA; Robert McHattie, GZR Engineering, USA
- The Current Status of the Roadways Solar Power Technology: A Review, Rajarajan Subramanian, Penn State University, USA
- Study on the Classification and Evaluation Method of the Frost Susceptibility of Rock Mass, Jihui Huang, Caichu Xia, Tongji University, China; Changling Han, First Highway Survey and Design Institute, China; Shiwei Shen, College of Construction Engineering, Jilin University, China
- Sustainable Construction in Remote Cold Regions: Methods and Knowledge Transfer, Robert A. Perkins, University of Alaska Fairbanks, USA; F. Lawrence Bennett, Bennett Engineering, USA
- Field Evaluation of Precut Thermal Cracks in an AC Pavement in Alaska, Jenny Liu, University of Alaska Fairbanks, USA; Robert McHattie, GZR Engineering, USA; Sheng Zhao, Xiong Zhang, University of Alaska Fairbanks, USA

### Session 4-2: Resilient Transportation Engineering, 10:05 to 11:50 am, Conference Rooms E&F

**Session Chairs:** Mbakisya Onyango, University of Tennessee-Chattanooga, USA, and Nathan P. Belz, University of Alaska Fairbanks, USA

- Evaluation of the Biofuel Technology Innovation through Newspaper Articles and Natural Language Processing, Jeff Kessler, Dan Sperling, University of California, Davis, USA
- Small Town and Rural Bicycling and Walking Design Guidance, Rebecca Gleason, Western Transportation Institute at Montana State University, USA; Dana Dickman, Alta Planning & Design, USA
- Safe Routes to School as A Transportation Control Measure: Impacts on the Emission Inventory, Ignatius Fomunung, Joseph Owino, Mbakisya Onyango, University of Tennessee-Chattanooga, USA
- Investigating the Role of Turn Indicator Usage by Exiting Vehicles in Gap Acceptance at Single-Lane Roundabouts, Nathan P. Belz, University of Alaska Fairbanks, USA
- Application of Distributed Fiber Optic Sensing Technology in the Transportation Engineering Monitoring, Bin Shi, Nanjing University, China
Campus Map

Please follow the routes below to Wood Center. During the symposium period, there will be signs on the side of the road directing you to the Wood Center.

1. Thompson Drive or Tanana Loop E → Tanana Loop(first right at roundabout) → Turn right or left into Nenana Parking Lot.
2. University Avenue → Turn left onto Alumni Drive → Continue straight until your reach Nenana Parking Lot → Turn left or right into Nenana Parking Lot.
3. University Avenue which turns into Farmer’s Loop → Turn left into Taku Drive → Turn right into Taku Lot or Ballaine Lot

Parking

After 5 pm on weekdays and all day on weekends, parking is free in all lots on campus (except Handicapped and Reserved spaces). You do not have to purchase a parking permit for Sunday, August 2nd. On weekdays during the day, daily parking permits can be purchased at any Parking Permit Kiosk (as show in the map). The Nenana parking lot offers numerous parking spots with a free shuttle up to the Wood Center. Attendees can park in lots 4B, 4A, 4F, 4D and 4E. Please be sure to visit the parking kiosk in 4F. If you choose to take the shuttle (though it’s a nice walk) to the Wood Center be sure to get off at the roundabout which is right in front of the Wood Center. Another parking option is the Taku/Ballaine parking area. When you enter the parking lot the parking kiosk will be directly to your right. From Taku/Ballaine you will walk up a flight of stairs and continue straight until you reach the Cornerstone Plaza (the flags). Turn right and pass the Rasmuson Library, veer left and you will arrive at the Wood Center.

Weather

The typical summer temperatures in Fairbanks range from 15-25°C (59-77 °F). The Artic Circle is much cooler and temperatures range from 2-20°C (35-68 °F). Please prepare to wear layers. Rain gear is recommended.

Must Do’s on Campus

- **Georgeson Botanical Garden** – Numerous varieties of flowers and vegetables cultivated for Alaska’s climate.
- **University of Alaska Museum of the North** – Discover fascinating stories about Alaska’s people, places, and wildlife.