### Conference Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday, June 29, 2009</th>
<th>Tuesday, June 30, 2009</th>
<th>Wednesday, July 1, 2009</th>
<th>Thursday, July 2, 2009</th>
<th>Friday, July 3, 2009</th>
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<tr>
<td>7:30 AM</td>
<td>Registration Opens &amp; Continental Breakfast 7:30 AM–6:00 PM</td>
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<td>9:00 AM</td>
<td>Pre-conference Workshops* 8:00 AM–12:00 PM</td>
<td>Opening Session and Keynote Speakers 8:30 AM–12:00 PM</td>
<td>Technical Track 3 8:00–9:45 AM</td>
<td>Technical Track 7 8:00–9:45 AM</td>
<td>Technical Track 3 8:00–9:45 AM</td>
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<tr>
<td>10:00 AM</td>
<td>Break • 9:45–10:00 AM</td>
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<td>Technical Track 4 10:15 AM–12:00 PM</td>
<td>Technical Track 8 10:15 AM–12:00 PM</td>
<td>Buses Depart 10:30 AM</td>
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<td>11:00 AM</td>
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<td>Lunch 12:00–1:00 PM</td>
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<td>1:00 PM</td>
<td>Pre-conference Workshops 1:00–5:00 PM</td>
<td>Technical Track 1** 1:30–3:15 PM</td>
<td>Technical Track 5 1:30–3:15 PM</td>
<td>Technical Track 9 1:30–3:15 PM</td>
<td>Technical Track 1** 1:30–3:15 PM</td>
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<td>2:00 PM</td>
<td>Technical Track 2 3:45–5:30 PM</td>
<td>Technical Track 6 3:45–5:30 PM</td>
<td>Technical Track 10 3:45–5:30 PM</td>
<td>Technical Track 1** 1:30–3:15 PM</td>
<td>Optional Downtown Chicago Visit 1:00–9:45 PM</td>
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<td>3:00 PM</td>
<td>Break 3:15–3:45 PM</td>
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<td>4:00 PM</td>
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<td>Break 5:00–5:30 PM</td>
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<td>Closing Session 5:30–6:15 PM</td>
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<td>7:00 PM</td>
<td>Welcome Reception Alice Campbell Alumni Center 6:00–8:00 PM</td>
<td>Technical Visit Advanced Transportation Research and Engineering Laboratory (ATREL) and Reception Barbeque 6:30–8:00 PM</td>
<td>Conference Banquet at I Hotel and Conference Center 6:30–8:00 PM</td>
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* Workshops run concurrently
** Each Technical Session consists of four parallel tracks with up to four papers per session. Speakers are scheduled for 20 minutes with 5 minutes for questions.
Welcome Message

On behalf of the Organizing and Scientific committees, we would like to welcome you to the Eighth International Conference on the Bearing Capacity of Roads, Railways, and Airfields (BCR2A’09). This international conference is coming to the United States for the second time, the first being the successful 1994 conference held in Minnesota. Illinois, being at the crossroads of the U.S. transportation network, is a logical location for this conference, and the University of Illinois at Urbana-Champaign (U of I) is in a unique position to host it, with its highly ranked Civil and Environmental Engineering Department, its prominent transportation centers and programs, and a long-standing reputation of cutting-edge research on transportation infrastructure. The submitted papers were rigorously peer reviewed, and only 147 papers from 27 countries will be presented in the conference, with 156 papers included in the conference proceedings.

This conference is the eighth in the series that began in Trondheim, Norway in 1982 and occurs at four-year intervals under the title “Bearing Capacity of Roads and Airfields—BCRA.” In the sixth BCRA Conference in Lisbon, Portugal, a third component, railways, was added in the scope as a vital element of transportation infrastructure worldwide. But the acronym, BCRA, still remained. For the first time, this eighth conference uses the acronym BCR2A to emphasize the infrastructure problems that all three transportation modes have in dealing with the challenges of bearing capacity.

The Eighth International BCR2A’09 Conference aims to promote efficient design, construction, and maintenance of the transportation infrastructure. Bearing capacity issues are steadily changing because of ever-increasing traffic volumes and vehicle weights, which require stronger and more durable pavements, railroad track structures, and superstructures. New materials and methods are being developed and new aspects of design and material utilization are brought into focus, requiring a smooth transition when implementing mechanistic concepts in designing pavements and railroad track structures. The BCR2A’09 conference will provide such a forum for new concepts and innovative solutions.

There will be sessions in the conference on subgrade soils, granular materials, asphalt mixtures, in situ measurement techniques and developments, modeling and methods of functional testing, backcalculation analyses of deflection measurements, new and/or innovative techniques in compaction and construction, structural evaluation and performance prediction, structural design systems for new construction and rehabilitation, bearing capacity designs for challenging conditions and load effects and for climatic conditions, reinforcement of structural layers, utilization of recycled materials, railroad track structures, full-scale testing, and case histories of roads, railways, and airfields.

Due to the large number of papers, the conference papers are presented in four parallel tracks. During the BCR2A’09 event, four half-day preconference workshops have also been organized, on climatic effects on pavement infrastructure, pavement interlayer systems, railroad track design including asphalt trackbeds, and designs for new and rehabilitated airport pavements. In addition, four events are taking place in conjunction with the conference: a mid-year meeting of the ASCE’s Airfield Pavements Committee, a display of exhibits during the conference, a technical visit to the U of I Advanced Transportation Research and Engineering Laboratory (ATREL), and a special Thursday session on Chicago’s O’Hare Airport Modernization Program. On Friday, there is an optional visit to downtown Chicago.

We would like to acknowledge the Scientific and Organizing committees for their continuing input and suggestions throughout the conference planning, the many individuals who helped review the papers, and Sinem Ertunga Tutumluer, who helped with formatting of the manuscripts. The guidance and continuing input from the members of the International Advisory Committee were essential in planning this conference, and highly appreciated. Many thanks go to the students; faculty members Chris Barkan, Bill Buttlar, Riley Edwards, Dave Lange, Jeff Roesler, and Marshall Thompson; and staff members Leslie Elble, Carol Czajkowski, and Kim Hagemann at the University of Illinois at Urbana-Champaign, who helped in this effort. Finally, special thanks go to Elaine Wolff from the Conferences and Institutes division of the Office of Continuing Education, the keynote speakers, workshop coordinators, and the session chairs for all their efforts in making this conference a success.
**CONFERENCE CHAIRS**

Erol Tutumluer, Chair  
Imad L. Al-Qadi, Co-chair

**INTERNATIONAL ADVISORY COMMITTEE**

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Norwegian Public Roads Administration, Norway  
Erol Tutumluer, Co-chair  
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David D. Davis, Association of American Railroads, USA  
Guy Doré, Laval University, Canada  
Magdy El-Sibaie, Federal Railroad Administration, USA  
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Ralph Fischer, Deutsche Bahn AG - DB Systemtechnik, Germany  
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Rita Moura Fortes, Mackenzie Presbyterian University, Brazil  
Antonio Gomes Correia, University of Minho/DEC, Portugal  
Øyvind Hallquist, Aivinor A/S, Norway  
Ivar Horvli, ViaNova, Norway  
Takei inoue, Research Institute, Nippon Hodo, Japan  
Geoff Jameson, ARRB Transport Research Ltd., Australia  
Hans Jørgen Ertmann Larsen, Danish Road Directorate, Denmark  
Andreas Loizos, National Technical University of Athens, Greece  
Rafael Alvarez Loranca, Jefe de Area de Gestion de Infraestructuras Geocica, Spain  
Jens Melsom, Norwegian National Rail Administration, Norway  
Helge Mork, Norwegian University of Science and Technology, Norway  
Jean Michel Piau, Laboratoire Central des Ponts et Chaussées, France  
Cheryl A. Richter, Federal Highway Administration, USA  
Tom Scarpas, Delft University of Technology, The Netherlands  
Ramesh Sinha, Highways Agency, UK  
Dariusz Sybilski, Road and Bridge Research Institute, Poland  
Xinglong Wang, Heilongjiang Institute of Highway and Transport Research, P.R. China

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University of Illinois at Urbana-Champaign  
Imad L. Al-Qadi, Co-chair and Highway Area Coordinator  
Director of Illinois Center for Transportation (ICT), University of Illinois at Urbana-Champaign  
Christopher P.L. Barkan, Railroad Area Coordinator  
Director of Association of American Railroads (AAR) Affiliated Research Laboratory, University of Illinois at Urbana-Champaign  
David A. Lange, Airfield Area Coordinator  
Director of Center of Excellence for Airport Technology (CEAT), University of Illinois at Urbana-Champaign  
William G. Buttlar, University of Illinois at Urbana-Champaign  
Riley Edwards, University of Illinois at Urbana-Champaign  
David L. Lippert, Illinois Department of Transportation

**ORGANIZING COMMITTEE (Cont.)**

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Marshall R. Thompson, University of Illinois at Urbana-Champaign  
Richard Thuma, Crawford, Murphy & Tilly, Inc.  
Elaine Wolff, University of Illinois at Urbana-Champaign

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Imad L. Al-Qadi, Co-chair  
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David Brill, Federal Aviation Administration, USA  
Neeraj Buch, Michigan State University, USA  
William G. Buttlar, University of Illinois, USA  
Samuel H. Carpenter, University of Illinois, USA  
Halil Ceylan, Iowa State University, USA  
Ghassan Chehab, Penn State University, USA  
David Davis, Association of American Railroads, USA  
Andrew Dawson, University of Nottingham, UK  
Herve Di Benedetto, ENTE, France  
Tuncer Edil, University of Wisconsin - Madison, USA  
Paul Fleming, University of Loughborough, UK  
Antonio Gomes Correia, University of Minho, Portugal  
Edward Guo, SRA International, Inc., USA  
Øyvind Hallquist, Aivinor, Norway  
Ivar Horvli, ViaNova, Norway  
James Hyslip, Hygroy Engineering, USA  
Buddhima Indraratana, University of Wollongong, Australia  
Tatsuya Ishikawa, Hokkaido University, Japan  
Geoff Jameson, Australian Road Research Board, Australia  
David A. Lange, University of Illinois, USA  
Hans Jørgen Ertmann Larsen, Danish Road Directorate, Denmark  
Dingqing Li, Association of American Railroads, USA  
David L. Lippert, Illinois Department of Transportation, USA  
Andreas Loizos, National Technical University of Athens, Greece  
Byron Lord, Federal Highway Administration, USA  
Robert Lytton, Texas A&M University, USA  
Eyad Masad, Texas A&M University, USA  
Jens Melsom, Norwegian National Rail Administration, Norway  
Andre Molenaar, Delft University of Technology, The Netherlands  
Helge Mork, Norwegian University of Science and Technology, Norway  
Soheil Nazarian, University of Texas at El Paso, USA  
Anand Puppala, University of Texas at Arlington, USA  
Jeffery R. Roesler, University of Illinois, USA  
Jerry Rose, University of Kentucky, USA  
Charles Schwartz, University of Maryland, USA  
Mark B. Snyder, Mark B. Snyder Engineering, USA  
Shiraz Tayabji, Fugro Consultants, Inc., USA  
Marshall R. Thompson, University of Illinois, USA  
Richard Thuma, Crawford, Murphy & Tilly, Inc., USA  
Per Ullidtz, Dynatest, Denmark  
David White, Iowa State University, USA
General Information

REGISTRATION AND INFORMATION DESK
The conference registration and information desk will be located outside the Illinois Ballroom in the I Hotel and Conference Center. On Monday, the desk will open at 7:30 AM and remain open until 6:30 PM. The desk will open at 7:30 AM on Tuesday, Wednesday, and Thursday. It will stay open until 6:00 PM. The staff of the registration and information desk can be reached at 217-714-9479.

INTERNET ACCESS
Free Internet access is available throughout the conference center. Login information is available at the conference registration desk.

CONTINENTAL BREAKFASTS, BREAKS, AND LUNCHES
All breakfasts, breaks, and lunches will be held in the Exhibit Hall located in the Illinois Ballroom of the Conference Center. Continental breakfast will be served from 7:30 to 8:00 AM on Tuesday and 7:30 to 8:00 AM on Wednesday and Thursday. Refreshments and coffee will be available from 9:45 to 10:15 AM and 3:15 to 3:45 PM each day. A lunch buffet will be available from 12:00 to 1:30 PM each day.

SOCIAL EVENTS
Welcome Reception
Monday, June 29
Alice Campbell Alumni Center
The Welcome Reception is the perfect venue to meet with colleagues. Drink tickets are included in all registration packets. Buses will be ready for boarding at 5:30 PM at the Conference Center at the St. Mary’s Road (north) entrance of the building. The drive to the Alumni Center is approximately 10 minutes. The last bus will leave the Alumni Center at 8:00 PM.

Barbecue
Tuesday, June 30
ATREL, Rantoul
Buses will be ready for boarding at 6:00 PM at the Conference Center at the St. Mary’s Road (north) entrance of the building. The drive to ATREL is approximately 40 minutes. The last bus will leave ATREL at 8:30 PM.

Conference Banquet
Wednesday, July 1
The conference banquet takes place Wednesday night at the I Hotel.

Optional Chicago Visit
Friday, July 3
The conference tour bus will transport participants from Champaign-Urbana to downtown Chicago for a day of sightseeing, shopping, and entertainment. Participants will visit Chicago’s Magnificent Mile and its many museums and restaurants, and enjoy the city’s Independence Day celebrations, including “Taste of Chicago,” outdoor concerts, and fireworks in Grant Park!
**Monday, June 29, 2009**

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<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
<th>Coordinated by</th>
<th>Description</th>
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<tr>
<td>7:30 AM–6:30 PM</td>
<td><strong>Registration Opens</strong></td>
<td>Illinois Ballroom Lobby</td>
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| 8:00 AM–12:00 PM | **Pre-conference Workshops**                                         |                           |                                     | **Climatic Effects on Pavement Infrastructure**  
Lincoln Room  
Coordinated by Andrew Dawson, University of Nottingham, UK, and Claudia Zapata, Arizona State University, USA  
There will be a brief review of overall climatic influences that are imposed upon pavements, their variation, and typical and relevant values for design and performance. The emphasis, thereafter, will be given to the water condition in the unbound base, sub-base and subgrade layers of pavements and how that condition is likely to affect the pavement’s performance. Ways to incorporate that understanding into pavement design and assessment will be discussed. Some coverage of the likely effects of climate change on pavement performance will also be presented. Information will be drawn from full-scale test and monitored pavement sections. Participants will be provided with some idealized scenarios and asked to apply their prior knowledge and information obtained in the workshop to assess likely effects and remediation/ modification strategies. |
|               | **FAARFIELD: Designs for New and Rehabilitated Airport Pavements**    | Alma Mater Room           | David R. Brill, Federal Aviation Administration, USA | The FAA recently introduced a new software package for airport pavement thickness design called FAARFIELD (for FAA Rigid and Flexible Iterative Elastic Layered Design). This workshop will explore in depth the concepts used in FAARFIELD-based design, such as traffic models, structural models, and failure models. This will be done through hands-on demonstrations of the latest FAARFIELD software package, with new and overlay pavement design examples. |
| 12:00–1:00 PM | **Lunch for Workshop participants**                                  | Chancellor Ballroom       |                                     |                                                                                                                                                                                                                                                                                                                                             |
| 1:00–5:00 PM  | **Pre-conference Workshops**                                         |                           |                                     | **Pavement Interlayer Systems**  
Lincoln Room  
Coordinated by Imad Al-Qadi, University of Illinois at Urbana-Champaign, USA  
The mechanism of the various interlayer systems used in bound and unbound layers will be discussed. In the first part of the workshop, topics related to the optimal use of stabilization and/or reinforcement interlayer systems for unbound materials will be discussed. This includes the use of various types of geogrids, geotextiles, and tri-planar. In the second part of the workshop, interlayer system application in bound materials to control reflective cracking will be discussed. What causes reflective cracking, and traditional and new techniques to control this, will be presented. Reflective cracking initiation and propagation mechanisms, as well as the difference between the need for reinforcement and/or strain energy absorber layers, will be discussed. |
|               | **Railroad Track Design Including Asphalt Trackbeds**                | Alma Mater Room           | Jerry Rose, University of Kentucky, USA | The workshop will provide an overview of the procedures currently utilized for the structural design of railway tracks, initially concentrating on the more traditional or empirical methods. A tutorial will be provided covering the more recent mechanistic, such as finite element, methods. Emphasis will be placed on analyzing the track structure as a series of interactive layers. Attention will be given to mechanistic analysis and design procedures that have outputs—analyzing the stresses and strains at the various layer interfaces and the methodology for predicting the performance and estimating the life of tracks for various designs and loading conditions. Various innovative designs and configurations will be featured for both ballasted and ballastless trackbeds that are structurally configured specifically to provide extended life and superior performance for modern high-speed and heavy tonnage rail lines. |
| 4:30 PM       | **Airfield Pavement Committee Meeting**                              | Knowledge Room            |                                     |                                                                                                                                                                                                                                                                                                                                             |
| 6:00–8:00 PM  | **Welcome Reception**                                                | Alice Campbell Alumni Center |                                     | Buses will be ready for boarding at 5:30 PM at the Conference Center at the St. Mary’s Road (north) entrance of the building. The drive to the Alumni Center is approximately 10 minutes. The last bus will leave the Alumni Center at 8:00 PM. |
### 7:30 AM

**Registration and Continental Breakfast Opens**  
Illinois Ballroom Lobby

### 8:30–9:45 AM

**Opening Remarks** by Erol Tutumluer and Imad Al-Qadi  
Chancellor Ballroom

**Welcome to the University**  
Chancellor Ballroom

**Welcome to Central Illinois** by David Lippert, Bureau Chief, Materials and Physical Research, Illinois Department of Transportation, USA

**KEYNOTE PRESENTATION ON ROADS**  
Chancellor Ballroom

**Recent and landmark improvements in performance characterization of unbound aggregate bases and subbases and sublayers comprising chemically stabilized materials (CSMs)**  
Professor Dallas N. Little holds the E.B. Sneed Endowed Chair in Transportation Engineering in the Zachry Department of Civil Engineering of the Look College of Engineering at Texas A&M University. He is also senior research fellow at the Texas Transportation Institute (TTI). Currently, he is the principal investigator for Texas A&M University's contribution to the Asphalt Research Consortium (ARC), a five-year major research effort funded through the Federal Highway Administration to provide fundamental research in asphalt technology that will directly improve the ability to predict and affect the performance of the nation's asphalt pavement infrastructure.

Professor Little is also associate director of the International Center for Aggregates Research (ICAR), operated jointly by Texas A&M University and the University of Texas at Austin and funded by an endowment from the aggregates industry. He has served as a materials engineering and pavement design consultant on major new construction and rehabilitation projects, including the Denver (Colorado) International Airport, the Qatar-Bahrain Causeway, numerous airport projects for Houston Airport Systems, and numerous projects in Iraq and Afghanistan for Kellogg Brown & Root (KBR). He was recently recognized by KBR for his "extraordinary efforts" in support of KBR's CENTCOM IDIQ projects at Balad Air Force Base in Iraq, for which KBR received the CENTCOM award for "Best Construction Contractor Excellence Award." He received the Trinity-Wootan Career Achievement Award from TTI in 1999 and the Zachry Excellence in Research Award from Texas A&M in 2009. He is a fellow of the American Society of Civil Engineers.

**Break and Exibits**  
Illinois Ballroom

### 9:45–10:00 AM

**KEYNOTE PRESENTATION ON RAILWAYS**  
Chancellor Ballroom

**The performance of rail track incorporating the effects of ballast breakage, confining pressure, and geosynthetic reinforcement**  
Professor Buddhima Indraratna is a graduate in Civil Engineering from Imperial College of Science and Technology, London, UK, and completed his PhD in Geotechnical Engineering at the University of Alberta, Canada, in 1987. In 1991, he joined the University of Wollongong, Australia, where he is a professor of Civil Engineering, head of the Geotechnical Engineering Research Centre, and head of the School of Civil, Mining and Environmental Engineering. Professor Indraratna is also a research leader of Rail Track Geotechnics under the Corporative Research Centre for Railway Innovation, funded by the Australian Government. Apart from rail geomechanics, his other main research interests include soft clay engineering, ground improvement, and environmental geomechanics. He has won various awards, to name a few: Swedish Geotechnical Society award for ground improvement in 1999, Robert Quigley Honorary Mention Award from the Canadian Geotechnical Society, and 2008 Outstanding Contributions Regional Award by the International Association of Computer Methods and Advances in Geomechanics. He is an active member of several technical committees of ISSMGE (International Society for Soil Mechanics and Geotechnical Engineering), and a Fellow of ASCE, Institute of Engineers Australia, and the Geological Society of UK.

### 10:00 AM–12:00 PM

**KEYNOTE PRESENTATION ON AIRFIELDS**  
Chancellor Ballroom

**Airport pavement design for the 21st century**  
Dr. Agrawal is the manager of the FAA's Airport Technology Research and Development Branch at the William J. Hughes Technical Center located near Atlantic City, New Jersey. In this capacity, he is responsible for formulating, directing, managing, and conducting research in the following areas: airport pavement and runway surface technology, airport visual guidance, runway incursions, wildlife hazards at or near airports, airport planning and design technology, and post-crash aircraft rescue and firefighting. Dr. Agrawal has been with the FAA for 30 years. He earned his master's degree from the University of Iowa and his doctorate from the Pennsylvania State University.
## Tuesday, June 30, 2009

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| 12:00–1:30 PM | Lunch at Exhibit Hall  
Illinois Ballroom                                                        |
| 1:30–3:15 PM | **Technical Track 1**  
**Concurrent Session 1A:** Subgrade Soils  
Alma Mater Room  
Session Chair:  
Hani Titi, University of Wisconsin at Milwaukee, USA  
- Precision triaxial equipment for the evaluation of the elastic behavior of soils  
  N. Araújo and A. Gomes Correia, University of Minho, Portugal  
- A comparative subgrade evaluation using CBR, vane shear, light weight deflectometer, and resilient modulus tests  
  N. Garg and A. Larkin, William J. Hughes Technical Center, Atlantic City International Airport, USA  
  H. Brar, SRA International Inc., USA  
- The effect of moisture hysteresis on resilient modulus of subgrade soils  
  C. Khoury and N. Khoury, University of Oklahoma, USA  
- Dynamic properties of a full weathering granite subgrade and other pavement materials studied by model tests  
  J. Zou, Hunan Communications Polytechnic University, P.R. China  
  Z. Li, Hunan Communications Research Institute, P.R. China  
  X. Cao, Southwest Jiaotong University, P.R. China  
**Concurrent Session 1B:** Granular Materials  
Technology Room  
Session Chair:  
Andrew Dawson, University of Nottingham, UK  
- Pavement base unbound granular materials gradation optimization  
  J.P. Bilodeau, G. Doré, and P. Pierre, Université Laval, Canada  
- Effect of grading and moisture on the deformation properties of unbound granular aggregates  
  L.U. Mathisen, Kolo Veidekke AS, Norway  
- IDOT test loop: evaluating the field performance of various dense graded aggregates  
  G. Heckel, Illinois Department of Transportation, USA  
- Characterizing aggregate permanent deformation behavior based on types and amounts of fines  
  D. Mishra, E. Tutumluer, and J. Kern, University of Illinois at Urbana-Champaign, USA  
  A.A. Butt, Engineering Research International, Inc., USA  
**Concurrent Session 1C:** Asphalt Mixtures  
Lincoln Room  
Session Chair:  
William G. Buttlar, University of Illinois at Urbana-Champaign, USA  
- Contribution of asphalt mix components to permanent deformation resistance  
  P.M. Muraya, A.A.A. Molenaar, and M.F.C. van de Ven, Delft University of Technology, The Netherlands  
- Fatigue resistance of hot mix asphalt at low temperatures—is there a way to reduce the test efforts?  
  K. Mollenhauer and M. Wistuba, Braunschweig Institute of Technology, Germany  
- Discrete element analysis of aggregate variability, blending, and fracture in asphalt mixture  
  E. Masad, Texas A&M University at Qatar, Qatar  
  E. Mahmoud, Texas A&M University, USA  
  S. Nazarian, University of Texas at El Paso, USA  
- Long-term study on asphalt mixture segregation in Connecticut: preliminary results on use of MTV  
  D.J. Nener-Plante and A. Zofka, University of Connecticut, USA  
**Concurrent Session 1D:** Railroad Track Structures I  
Quad Room  
Session Chair:  
Jørn Melson, Norwegian National Rail Administration, Norway  
- Pressure measurements and structural performance of hot mixed asphalt railway trackbeds  
  L.S. Bryson and J.G. Rose, University of Kentucky, USA  
- Effects of incorporating a bituminous subballast layer on the deformation of railway trackbeds  
  T. Ferra, P.F. Teixeira, and R. Cardoso, IST, Technical University of Lisbon, Portugal  
- An innovative slab track test-line in China  
  J. Ren and R. Xiang, Southwest Jiaotong University of China, P.R. China  
  B. Lechner, Munich University of Technology, Germany  
- Comparison of in situ performance-based test methods to evaluate moduli of railway embankments  
  A. Gomes Correia and J. Martins, University of Minho, Portugal  
  L. Caldeira, National Laboratory of Civil Engineering, LNEC, Portugal  
  E. Maranhão das Neves, IST, Technical University of Lisbon, Lisbon, Portugal  
  J. Delgado, National Railway Network, REFER, Lisbon, Portugal |
### 3:15–3:45 PM

**Break and Exhibits**

Illinois Ballroom

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### 3:45–5:30 PM

**Concurrent Session 2A: Subgrade Stabilization**

**Alma Mater Room**

**Session Chair:**
David Arellano, The University of Memphis, USA

- **Improving subgrade strength and pavement performance by chemical treating subgrade soils**
  N. Bandara and M.J. Grazioli, Michigan Department of Transportation, USA

- **A performance study of different curing materials applied to soil-Portland cement base course cure**
  R.M. Fortes and J.V. Merighi, Mackenzie Presbyterian University, Brazil

- **Sustainable reconstruction of highways with in situ reclamation of materials stabilized for heavier loads**
  T.B. Edil, University of Wisconsin at Madison, USA
  H. Wen, Washington State University, USA

- **The use of geofiber and synthetic fluid for stabilizing marginal soils**
  K. Hazirbaba, University of Alaska Fairbanks, USA
  B. Connor, Alaska University Transportation Center, USA

---

**Concurrent Session 2B: Resilient Behavior of Granular Materials**

**Technology Room**

**Session Chair:**
Navneet Garg, Federal Aviation Administration, USA

- **Resilient modulus of hydraulically bound road base materials with high volume waste dust**
  H. Al Nageim and P. Visuliis, Liverpool John Moores University, Liverpool, UK

- **Characterizing natural and recycled granular materials for (sub)base layers of roads by cyclic triaxial testing**
  C. Grégoire, B. Detty, and J. Detty, Belgian Road Research Centre, Belgium
  A. Gomes Correia, University of Minho, Portugal

- **Resilient modulus of unbound base material containing extra waste Stancombe limestone dust**
  B. Saghafi and H. Al Nageim, Liverpool John Moores University, UK

- **Resilient characteristics of bottom ash**
  H.H. Tit, A.R. Coenen, and M.B. Elias, University of Wisconsin at Milwaukee, USA

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**Concurrent Session 2C: Asphalt Mixture Evaluation**

**Lincoln Room**

**Session Chair:**
Zhanping You, Michigan Technological University, USA

- **Use of polymer modified binders to reduce rutting in Nordic asphalt pavements**
  B.O. Lerfald, SINTEF Building and infrastructure, Norway
  J. Aurstad and N.S. Uthus, Norwegian Public Roads Administration, Norway

- **Development of wear-resistant pavements using polymer modified binders**
  R.G. Saba, L.J. Baklekk, and J. Aknes, Norwegian Public Roads Administration, Norway
  B.O. Lerfald, SINTEF Building and Infrastructure, Norway

- **Laboratory evaluation of warm mix asphalt using Sasobit®**
  S.W. Goh, Y. Liu, and Z. You, Michigan Technological University, USA

- **Laboratory characterization of half-warm mix asphalts with high recycling rate by means of the factorial experiment design approach**
  F. Olard, E. Beduneau, D. Bonneau, S. Dupriet, and N. Seignez, EIFFAGE Travaux Publics, France

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**Concurrent Session 2D: Railroad Track Structures II**

**Quad Room**

**Session Chair:**
Jerry G. Rose, University of Kentucky, USA

- **Evaluation of roadbed stiffness on bearing capacity of railroad ballast with discontinuous analysis**
  T. Ishikawa and T. Kamei, Hokkaido University, Japan
  Y. Ohrishy, Kyoto University, Kyoto, Japan

- **Actions on railway track panel and ballast—behavior of the Hellenic limestone ballast**
  K. Giannakos, University of Thessaly, Greece
  A. Loizos, National Technical University of Athens, Greece

- **Ballast evaluation and hot mix asphalt performance**
  H.M. Lees, BNSF Railway, USA

- **Comparison of coal dust fouled railroad ballast behavior—granite versus limestone**
  W. Dombrow, H. Huang, and E. Tutumluer, University of Illinois at Urbana-Champaign, USA

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**6:30–8:30 PM**

**Technical Visit**

Advanced Transportation Research and Engineering Laboratory (ATREL) & Barbeque Reception

Rantoul, IL

Buses will be ready for boarding at 6:00 PM at the Conference Center at the St. Mary’s Road (north) entrance of the building. The drive to ATREL is approximately 40 minutes. The last bus will leave ATREL at 8:30 PM.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Chairs and Speakers</th>
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<tr>
<td>7:30 AM</td>
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<td><strong>Registration and Continental Breakfast Opens</strong></td>
<td>Illinois Ballroom Lobby</td>
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<tr>
<td>8:00–9:45 AM</td>
<td>Session 3A</td>
<td><strong>Subgrade modification—practitioner’s experience</strong></td>
<td>T. McCleary, Illinois Department of Transportation, USA</td>
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<td></td>
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<td><strong>“Baku Bayil Yard Site” soil improvement geotechnical works</strong></td>
<td>E. Guler, Bogazici University, Istanbul, Turkey, A. Gure, Tekfen Engineering, Istanbul, Turkey, E. Cetin, ELC Group, Istanbul, Turkey</td>
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<td></td>
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<td><strong>Design methodology based on strength and its application to full weathering granite used in highway subgrade</strong></td>
<td>Z. Li and C. Dong, Hunan Communications Research Institute, P.R. China</td>
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<td></td>
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<td><strong>Taxiway embankment over soft ground using staged construction</strong></td>
<td>R. Wells, X. Barrett, and T. Wells, Trigon Engineering Consultants, Inc., USA</td>
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<td></td>
<td>Session 3B</td>
<td><strong>Analytical evaluation of unbound granular layers in regard to permanent deformation</strong></td>
<td>L.A.T. Brite and A.R. Dawson, Nottingham Transportation Engineering Centre, UK, P.J. Kolisoja, Tampere University of Technology, Finland</td>
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<td><strong>Influence of the macroscopic cohesion on the 3D FE modeling of a flexible pavement rut depth</strong></td>
<td>F. Allou and C. Petit, University of Limoges, France, C. Chazallon, INSA, France, P. Hornych, Laboratoire Central des Ponts et Chaussées, France</td>
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<td></td>
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<td><strong>Use of 3-dimensional discrete element model to examine aggregate layer particle movement due to load wander</strong></td>
<td>P.R. Donovan, E. Turumlu, and H. Huang, University of Illinois at Urbana-Champaign, USA</td>
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<td><strong>Processed Portuguese steel slag—a new geomaterial</strong></td>
<td>A. Gomes Correia and S.M. Reis Ferreira, University of Minho, Portugal, A. Cavalheiro, Portuguese Steel Company, Portugal</td>
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<td></td>
<td>Session 3C</td>
<td><strong>Evaluation of different predictive dynamic modulus models of asphalt mixtures used in Argentina</strong></td>
<td>F.O. Martínez and S.M. Angelone, University of Rosario, Argentina, A. Abu Abdo, F. Bayomy, R. Nielsen, T. Weaver, and S.J. Jung, University of Idaho, USA, M.J. Sant, Idaho Transportation Department, USA, S. Adhikari and Z. You, Michigan Technological University, USA</td>
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<td><strong>Prediction of the dynamic modulus of Superpave mixes</strong></td>
<td>A. Abu Abdo, F. Bayomy, R. Nielsen, T. Weaver, and S.J. Jung, University of Idaho, USA, M.J. Sant, Idaho Transportation Department, USA</td>
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<td><strong>Dynamic modulus prediction of asphalt concrete using three tensile tests</strong></td>
<td>S. Adhikari and Z. You, Michigan Technological University, USA, M. Wistuba, K. Mollenhauer, and K. Metzker, Braunschweig Institute of Technology, Germany</td>
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<td><strong>Assessing low-temperature properties of asphalt materials by means of static testing techniques</strong></td>
<td>M. Wistuba, K. Mollenhauer, and K. Metzker, Braunschweig Institute of Technology, Germany</td>
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<td><strong>Influence of the stiffness-damping coupling of the foundation in the performance of a high-speed train track</strong></td>
<td>J. Cunha and A. Gomes Correia, University of Minho, Portugal, A.M. Paixão, E.C. Fortunato, and M.L. Antunes, National Laboratory of Civil Engineering, LNEC, Portugal</td>
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<td><strong>Emerging trends for high-speed rail track superstructures—ballastless track as an alternative to the ballasted track</strong></td>
<td>A.M. Paixão, E.C. Fortunato, and M.L. Antunes, National Laboratory of Civil Engineering, LNEC, Portugal</td>
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<td><strong>Dynamic responses and cyclic settlement of railway substructure</strong></td>
<td>X. Bian, Zhejiang University, P.R. China, A.M. Paixão, E.C. Fortunato, and M.L. Antunes, National Laboratory of Civil Engineering, LNEC, Portugal</td>
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**Break and Exhibits:**
Illinois Ballroom
### Technical Track 4

#### Concurrent Session 4A:
**Subgrade Continuous Compaction Control**  
Alma Mater Room  
**Session Chair:**  
David White, Iowa State University, USA

<table>
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<tr>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>Alternatives to heavy test rolling for cohesive subgrade assessment</td>
<td>D.J. White, P.K.R. Vennapusa, H.H. Gieselman, and L. Johanson, Iowa State University, USA</td>
</tr>
<tr>
<td>Appraisal of density-based field compaction control test validity</td>
<td>J. Sadekarim and S. Seyyedi, University of Tabriz, Iran</td>
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<tr>
<td>Continuous compaction control: preliminary data from a Delaware case study</td>
<td>F.S. Tehrani and C.L. Meehan, University of Delaware, USA</td>
</tr>
<tr>
<td>Geostatistical analysis of roller-integrated continuous compaction control data</td>
<td>N. Facas, M. Mooney, and R. Furrer, Colorado School of Mines, USA</td>
</tr>
</tbody>
</table>

#### Concurrent Session 4B:
**Recycled Concrete as Unbound Materials**  
Technology Room  
**Session Chair:**  
Haifang Wen, Washington State University, Washington, USA

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<thead>
<tr>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>Unbound crushed concrete in high volume roads—evaluation of field behavior and structural performance</td>
<td>J. Austad, J.E. Dahlhaug, and G. Berntsen, Norwegian Public Roads Administration, Norway</td>
</tr>
<tr>
<td>Structural evaluation of rubblized concrete pavements in Iowa</td>
<td>H. Ceylan, K. Gopalakrishnan, and S. Kim, Iowa State University, USA</td>
</tr>
<tr>
<td>Study on fully and highly efficient recycling of waste concrete</td>
<td>L. Lu, Y. He, and S. Hu, Wuhan University of Technology, P.R. China</td>
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<tr>
<td>Idaho Airport saves time and money with full-depth reclamation</td>
<td>G.E. Halsted, Portland Cement Association, USA</td>
</tr>
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</table>

#### Concurrent Session 4C:
**Performance Evaluations of Asphalt Mixtures**  
Lincoln Room  
**Session Chair:**  
Eyal Levenberg, Technion University, Israel

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<tr>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>Research and applications of new pavement structure based on large stone porous asphalt mixture</td>
<td>B. Yufeng and W. Songgeng, Shandong Bureau of Highway Administration, PR. China, G. Huber, Heritage Research Group, USA</td>
</tr>
<tr>
<td>Aging of stone mastic asphalt and evaluation of cracking resistance</td>
<td>S. Büchler, K. Mollenhauer, M. Wistuba, and P. Renken, Braunschweig Institute of Technology, Germany</td>
</tr>
<tr>
<td>Permanent deformation evaluation of Idaho Superpave mixes using gyratory stability</td>
<td>F. Bayomy, A.A. Abdo, University of Idaho, USA, M.J. Santi, Idaho Transportation Department, USA</td>
</tr>
<tr>
<td>Multidirectional behavior of bituminous mixture</td>
<td>P. Clec'h, C. Sauzéat, and H. Di Benedetto, Université de Lyon, ENTPE, France</td>
</tr>
</tbody>
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#### Concurrent Session 4D:
**Railroad Track Structures IV**  
Quad Room  
**Session Chair:**  
Paulo F. Teixeira, Technical University of Lisbon, Portugal

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Railway bridge transition case study</td>
<td>J.P. Hyslip, D. Li, and C.R. McDaniel, HyGround Engineering, USA</td>
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<tr>
<td>Reducing track faults using polymer geocomposite technology</td>
<td>P.K. Woodward and G. Medero, Henko-Watt University, UK</td>
</tr>
<tr>
<td>Discrete element model of ballast aggregates based on imaging</td>
<td>H. Huang, E. Tutumluer, T.M.A. Hashash, and J. Ghaboussi, University of Illinois at Urbana-Champaign, USA</td>
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</tbody>
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**Lunch at Exhibit Hall**  
Illinois Ballroom
## Wednesday, July 1, 2009

### Technical Track 5

| Concurrent Session 5A: Compaction and Construction of Geomaterials | Long-term in situ measurements of concrete culverts with high fills  
J. Vaslestad, G.Y. Yesuf, and T.H. Johansen, Norwegian Public Roads Administration, Norway |
| --- | --- |
| Alma Mater Room | Application of gray theory in settlement forecast of rock-fill highway embankment  
X. Wang, Pennsylvania State University, USA, and Centre South University, PR. China  
W. Qin, Centre South University, PR. China  
M.C. Wang, Pennsylvania State University, USA |
| Session Chair: Antonio Gomes Correia, University of Minho, Portugal | Data mining applied to compaction of geomaterials  
R. Marques, A. Gomes Correia, and P. Cortez, University of Minho, Portugal |
| 1:30–3:15 pM | Study of dry sludge stabilization from water treatment plant (WTP) in Taiaçupeba to use as compacted soil in earthwork ditches  
| Concurrent Session 5B: Climatic Conditions Affecting Pavements | Seasonal coefficients for the pavement roads in Polish climate conditions  
M. Graczyk, IBDiM Road and Bridge Research Institute, Poland |
| Technology Room | Effect of a changed climate on gravel roads  
P.D. Aursand, Norwegian Public Road Administration, Norway  
I. Horivi, ViaNova Plan and Traffic AS, Norway |
| Session Chair: James Signore, University of California Pavement Research Center, USA | Water impact on the structural behavior of a pavement structure  
S. Erlingsson, The Swedish National Road and Transport Research Institute, Sweden, and University of Iceland, Iceland |
| 1:30–3:15 pM | Mitigating unbound roadway rutting caused by groundwater movement  
V. Diyaljee, GAEA Engineering Ltd, Canada |
| Concurrent Session 5C: Construction and Performances of Asphalt Mixtures | Construction and field performance of hot mix asphalt with moderate and high RAP contents  
R. West, N. Tran, A. Kvasnak, B. Powell, and P. Turner, National Center for Asphalt Technology, USA |
| Lincoln Room | Viability of the use of construction and demolition debris in hot mix asphalt  
I. Pérez and M. Toledano, Universidad de Cádiz, Spain |
| Session Chair: Andreas Loizos, National Technical University of Athens, Greece | Design of pavements containing foamed bitumen recycled layers  
M. Losa, R. Bacci, A. Terroso Axerio, and P. Leandro, University of Pisa, Italy |
| Concurrent Session 5D: Bearing Capacity Designs of Airfield Pavements | Use of bitumen emulsion in urban paving  
C.R. de Carvalho Filho and L.D. da Silva Pontes Filho, Universidade Federal de Pernambuco, Brazil  
P.P. Cavalcante, da JBR Engenharia Ltda, Brazil  
C. de Medeiros Brito Cavalcante and J.A. Gonçalves de Macêdo, Universidade Federal de Campina Grande, Brazil |
| Quad Room | Full-scale aircraft tire pressure tests  
C. Fabas, Airbus SAS, France  
J. Balay, Laboratoire Central des Ponts et Chaussées, France  
P. Lerat, Civil Aviation Technical Center, France  
A. Mazars, Laboratoire Régional des Ponts et Chaussées, LRP Toulouse, France |
| Session Chair: David Bill, Federal Aviation Administration, USA | A robust approach for the evaluation of airport pavement bearing capacity  
Y.H. Lee and H.W. Ker, Tamkang University, Taiwan  
Y.B. Liu and J.D. Lin, National Central University, Taiwan |
| 3:15–3:45 pM | Estimating bearing capacity for opportune landing sites  
R. Affleck, L. Barm, S. Shoop, and C. Ryerson, ERDC, Cold Regions Research and Engineering Laboratory, USA |
| Concurrent Session 5E: Full-scale aircraft tire pressure tests | Evaluation of runway bearing capacity: in situ measurements and laboratory tests  
A. Graziani, F. Cardone, E. Santagata, and S. Barbat, Università Politecnica delle Marche, Italy |
<p>| Illinois Ballroom | Break and Exhibits |</p>
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<thead>
<tr>
<th>Session</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Concurrent Session 6A:</td>
<td>In situ Measurement Techniques and Developments</td>
<td>Alma Mater Room&lt;br&gt;Session Chair: Leif Bakløkk, Norwegian Public Roads Administration, Norway&lt;br&gt;Development of the UK highways agency traffic speed deflectometer&lt;br&gt;B. Ferne, P. Langdale, and N. Round, Transport Research Laboratory, UK&lt;br&gt;R. Fairclough, Highways Agency, UK&lt;br&gt;Three years of high speed deflectograph measurements of the Danish state road network&lt;br&gt;S. Baltzer, Danish Road Institute, Denmark&lt;br&gt;Deflection measurement: the need of a continuous and full view approach&lt;br&gt;J.M. Simonin and L.-M. Cottineau, Laboratoire Central des Ponts et Chaussées, France&lt;br&gt;V. Muzet, C. Henikels, and Y. Guillard, Laboratoire Régional des Ponts et Chaussées, France&lt;br&gt;3D visualization model of road surface&lt;br&gt;X. Li, S. Ma, and X. Hou, Harbin Institute of Technology, P.R. China</td>
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<td>Concurrent Session 6B:</td>
<td>Temperature Changes Affecting Pavements</td>
<td>Technology Room&lt;br&gt;Session Chair: Rosa Affleck, US Army Corps of Engineers CRREL, USA&lt;br&gt;Thermal stresses of asphalt pavement with temperature-dependent modulus of elasticity&lt;br&gt;Y. Zhong and L. Geng, Dalian University of Technology, P.R. China&lt;br&gt;Use of ground penetrating radar for detection of salt concentration on Norwegian winter roads&lt;br&gt;A. Lalague and I. Hoff, SINTEF, Norway&lt;br&gt;E. Eide, 3d-Radar AS, Norway&lt;br&gt;A. Svendsen, Norwegian Public Roads Administration, Norway&lt;br&gt;Seal courses for a soft asphalt pavement with semi-rigid base in cold regions&lt;br&gt;X. Wang, X. Zhang, and Y. Tan, Harbin Institute of Technology, P.R. CHINA&lt;br&gt;Thermal stress analysis in ultra-thin whitetopping pavement&lt;br&gt;J.R. Roesler and D. Wang, University of Illinois at Urbana-Champaign, USA</td>
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<tr>
<td>Concurrent Session 6C:</td>
<td>Applications of Recycled Materials: Asphalt</td>
<td>Lincoln Room&lt;br&gt;Session Chair: Massimo Losa, University of Pisa, Italy&lt;br&gt;Bearing capacity assessment of recycled asphalt pavements&lt;br&gt;V. Papavasiliou and A. Loizos, National Technical University of Athens, Greece&lt;br&gt;The influence of virgin aggregate content on the strength and modulus of cold, in-place, reclaimed asphalt pavement&lt;br&gt;H. Wang and P. Hao, Chang'an University, P.R. China&lt;br&gt;K. Zhang, Wirtgen Group, P.R. China&lt;br&gt;Hot mix asphalt produced from marble waste&lt;br&gt;C. Gürer, H. Akbulut, and A. Yildiz, Afyon Kocatepe University, Turkey&lt;br&gt;Expansive characteristics of RAP materials for use as aggregates in the pavement substructure layers&lt;br&gt;D. Denez, E. Tutumluer, and J.S. Popovics, University of Illinois at Urbana-Champaign, USA</td>
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<tr>
<td>Concurrent Session 6D:</td>
<td>Construction and Testing of Concrete Pavements</td>
<td>Quad Room&lt;br&gt;Session Chair: Maria de Lurdes Antunes, LNEC, Portugal&lt;br&gt;Fiber-reinforced concrete pavement design and material requirements&lt;br&gt;A. Bordelon and J. Roesler, University of Illinois at Urbana-Champaign, USA&lt;br&gt;Analysis of in-pavement sensor data for CC2 new rigid test items at the FAA National Airport Pavement Test Facility&lt;br&gt;D.R. Brill, Federal Aviation Administration, USA&lt;br&gt;E.H. Guo, SRA International Corporation, USA&lt;br&gt;Comparison of precast and cast-in-place concrete pavements responses under heavy vehicle simulator loads&lt;br&gt;E. Kohler, Dynatest Consulting Inc., USA&lt;br&gt;J. Harvey, University of California Pavement Research Center, USA&lt;br&gt;L. du Plessis, CSIR-Built Environment, South Africa&lt;br&gt;L. Motumah, California Department of Transportation, USA&lt;br&gt;Field testing of concrete pavements at Chicago O’Hare International Airport&lt;br&gt;Y. S. Liu and D. Lange, University of Illinois at Urbana-Champaign, USA</td>
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| Conference Banquet | | Illinois Ballroom<br>6:30–8:00 PM<br>Conference Program 11
## Thursday, July 2, 2009

### Registration and Continental Breakfast Opens
**Illinois Ballroom Lobby**

### 7:30 AM

#### Concurrent Session 7A: Roadway Assessment Techniques I
**Alma Mater Room**

**Session Chair:** Susanne Baltzer, Danish Road Institute, Denmark

**Structural roadway assessment with frequency response function**
- J.-M. Simonin and D. Lièvre, Laboratoire Central des Ponts et Chaussées, France
- J.-C. Dargenton, Centre d’Etude et de Construction de Prototype, France

**A method for benefiting pavement quality assurance measures related to roughness condition surveys**
- C. Plati and A. Loizos, National Technical University of Athens, Greece

**Development and testing of low noise pavements in Norway**
- J. Aksnes and R.G. Saba, Norwegian Public Roads Administration, Norway
- T. Berge, SINTEF ICT, Norway

**Roughness progression models by regression and artificial neural network techniques**
- E. Taddesse and H. Mork, Norwegian University of Science and Technology, Norway

### 8:00–9:45 AM

#### Concurrent Session 7B: Nondestructive Structural Evaluation I
**Technology Room**

**Session Chair:** Michael Mooney, Colorado School of Mines, USA

**The use of impact-stiffness modulus outputs from FWD measurements to determine PCN in Israel**
- M. Livneh, Technion-Israel Institute of Technology, Israel

**Temperature correction of falling weight deflectometer measurements**
- E. Straube and D. Jansen, University of Duisburg-Essen, Germany

**Lightweight deflectometers for quality assurance in road construction**
- P.R. Fleming and M.W. Frost, Loughborough University, England
- J.P. Lambert, Scott Wilson Pavement Engineering, England

**Going beyond elastic response while evaluating falling weight deflectometer data**
- C.A. Lenngren, Swedish Road Administration Consulting Services, Sweden

#### Concurrent Session 7C: Reinforcement of Structural Layers
**Lincoln Room**

**Session Chair:** John McCartney, University of Colorado at Boulder, USA

**Performance of flexible pavements reinforced with steel fabric**
- S.F. Said, H. Carlsson, and H. Hakim, VTI, Swedish National Road and Transport Research Institute, Sweden

**Evaluation of geogrid displacement on subbase reinforcement using specially designed pullout test**
- M.V. Akpinar and T. Sert, Karadeniz Technical University, Turkey

**In situ strain measurement during dynamic shear loading of an unbound geogrid reinforced pavement section**
- B.R. Cox, B. Curry, C.M. Wood, and C. Young, University of Arkansas, USA
- J.S. McCartney, University of Colorado at Boulder, USA

**Experimental study on bearing capacity of geocell-reinforced bases**
- S.K. Polkarev, I. Han, R.L. Parsons, and Yu Qian, University of Kansas, USA
- D. Leschinsky, University of Delaware, USA
- I. Halahmi, PRS Mediterranean Ltd., Israel

#### Concurrent Session 7D: Modeling of Materials and Pavement Systems I
**Quad Room**

**Session Chair:** Ivar Horvili, ViaNova, Norway

**PFC2D simulation research on vibrating compaction test of soil and rock aggregate mixture**
- X. Jia, Chinese Academy of Sciences and Chongqing Communications Research & Design Institute, P.R. China
- M. Chai and Z. Yan, Chongqing Communications Research & Design Institute, P.R. China
- Y. Zheng, Department of Architecture & Civil Engineering EU, P.R. China

**Finite element analyses of pavement materials at or near failure: a constant bulk modulus approach**
- C. Gonzalez and S. Jersey, U.S. Army Engineer Research and Development Center, USA

**Axi-symmetric analyses of vertically inhomogeneous elastic multilayered systems**
- J.W. Maina, CSIR Built Environment, South Africa
- Y. Ozawa and K. Matsui, Tokyo Denki University, Japan

**Effects of bearing capacity and load transfer efficiency of jointed concrete pavements on reflective cracking in hot-mix asphalt overlays**
- J. Baek and L.L. Al-Qadi, University of Illinois at Urbana-Champaign, USA

### 9:45–10:15 AM

#### Break and Exhibits
**Illinois Ballroom**
| Concurrent Session 8A: Roadway Assessment Techniques II | Structural assessment of the English strategic road network—latest developments  
B. Ferne, Transport Research Laboratory, UK  
R. Sinhal and R. Fairclough, Highways Agency, UK  
Nature resources and functional road design criteria  
C.A. Lennhagren, Swedish Road Administration, Sweden  
R. Fredriksson, Vägverket Produktion, Sweden  
Dynamic response of rigid pavements under moving traffic loads with variable velocities  
Y. Zhong and L. Geng, Dalian University of Technology, P.R. China  
Pavement contribution to truck rolling resistance  
C.A. Lennhagren, Swedish Road Administration, Sweden |
|---|---|
| Concurrent Session 8B: Nondestructive Structural Evaluation II | Practical use of light-weight deflectometer for pavement design  
S. Baltzer and C. Hejlesen, Danish Road Institute, Denmark  
H.C. Korsgaard and P.E. Jakobsen, Grontmij | Carl Bro A/S, Denmark  
Analysis of FWD data and characterization of airfield pavement materials in New Mexico  
M.U. Ahmed, R. Bishn, and R.A. Tarefder, The University of New Mexico, USA  
Evaluation of asphalt road pavement rehabilitation using steel mesh reinforcement  
J.M.C. Neves IST-CESUR, Portugal  
A.R.D. Alves, EP S.A., Castelo Branco, Portugal  
The use of surfacing service life as a parameter in pavement strengthening design  
G. Refsdal, R. Johansen, and G. Berntsen, Norwegian Public Roads Administration, Norway |
| Concurrent Session 8C: Mechanistic-Empirical Design Applications | Comparison of design thickness between the 1993 AASHTO Guide and MEPDG for full depth reclamation pavement  
Y. X and Y.E. Namnug, Indiana Department of Transportation, USA  
Influence of unbound materials on flexible pavement performance: a comparison of the AASHTO and MEPDG methods  
C.W. Schwartz, University of Maryland, USA  
Verification of mechanistic-empirical pavement design guide for the state of New Jersey  
N. Siraj, Y.A. Mehta, and K.M. Murel, Rowan University, USA  
R.W. Sauber, New Jersey Department of Transportation, USA  
Mechanistic evaluation of second generation preservation overlays  
D.A. Moran and S. Sadasivam, Quality Engineering Solutions, Inc., USA  
S.M. Stoffels, G. Chehab, and T. Kumar, Pennsylvania State University, USA |
| Concurrent Session 8D: Modeling of Materials and Pavement Systems II | Rigid pavement reinforcement: modeling of structural behavior  
F. Domingos and M. Antunes, National Laboratory of Civil Engineering, LNEC, Portugal  
J. Neves, IST, Technical University of Lisbon, Portugal  
Joint modeling for JPCP: successes and pending problems  
E. Guo, SRA International Corporation, USA  
FEM analysis of the bearing plate deflection tests on rubblized concrete pavement  
Y. Liu, Arhuia Transportation Infrastructure Construction Quality Control Station, P.R. China  
Y. Sheng, Chang’ an University, P.R. China  
L. Wang, Virginia Tech, USA  
Design of pavement rehabilitation to reduce the reflective cracking in pavements with cement stabilized bases  
E. Padilla, COSIC Consultants, Mexico |

<table>
<thead>
<tr>
<th>Lunch at Exhibit Hall</th>
<th>Illinois Ballroom</th>
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<th>10:15 AM–12:00 PM</th>
<th>12:00–1:30 PM</th>
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</table>

Thursday, July 2, 2009
### Technical Track 9

#### Concurrent Session 9A: Backcalculation Analyses of Deflection Measurements

**Alma Mater Room**  
**Session Chair:** Halil Ceylan, Iowa State University, USA  

**Backcalculation of the stiffnesses of cement treated base courses using artificial intelligence**  
M. Miradi, A.A.A. Molenaar, and M.F.C. van de Ven, Delft University of Technology, The Netherlands  
S. Molenaar, EDP Consultants Inc., USA

**CalBack: new backcalculation software for Caltrans mechanistic-empirical design**  
Q. Lu and J.M. Signore, University of California Pavement Research Center, USA  
P. Ullidtz, Dynatest International A/S, Denmark  
I. Basheer and K. Ghuzlan, California Department of Transportation, USA

**SOFTSYS for backcalculation of full-depth asphalt pavement layer moduli**  
Q. Pelcan, E. Tutumluer, and J. Ghaboussi, University of Illinois at Urbana-Champaign, USA

**Deterministic-empirical backcalculation of LWD deflection basins**  
R.N. Stubstad, Applied Research Associates, Inc., USA  
H.C. Korsgaard, K. Olsen, and J.P. Pedersen, Grontmij–Carl Bro A/S Pavement Consultants, Denmark

#### Concurrent Session 9B: Nondestructive Structural Evaluation III

**Technology Room**  
**Session Chair:** Katherine Petros, Federal Highway Administration, USA

**Models to estimate k subgrade reaction modulus values based on deflection basin parameters**  
C.Y. Suzuki, University of São Paulo, Brazil  
C.R.G. Santos, S. Ferri, F.M. Lopes, R.T.G. Cruz, and A.M. Azevedo, Planservi Engenharia Ltda., Brazil

**Using falling weight deflectometer data for new construction interactive design**  
C.A. Lenngren, Swedish Road Administration Consulting Services, Sweden

**Automated pavement thickness evaluation for FWD backcalculation**  
K.R. Maser, L.A. McGrath, and B.C. Miller, Infrasense, Inc., USA  
H. Ceylan, Iowa State University, USA  
G. Sanati, Foundation Mechanics, Inc., USA

**Lessons learned during regular monitoring of in situ pavement bearing capacity conditions**  
P. Paige-Green, CSIR Built Environment, Pretoria, South Africa

#### Concurrent Session 9C: Modeling Interlayers and Overlay Systems

**Lincoln Room**  
**Session Chair:** Brian Ferne, Transport Research Laboratory, UK

**Evaluation of effectiveness of FWD use for assessment of pavement interlayer bond**  
D. Sybilski, T. Mechowski, and P. Harasim, Road & Bridge Research Institute, Warsaw, Poland

**A case study: quantification and modeling of asphalt overlay delamination on an airport pavement**  
E. Horak and J.W. Maina, Built Environment, CSIR from University of Pretoria, South Africa  
S.E. Emery, University of the Witwatersrand and Kubu International (Pty) Ltd., South Africa

**Mechanistic modeling of potential interlayer slip at base sub-base level**  
E. Horak and J.W. Maina, Built Environment, CSIR from University of Pretoria, South Africa  
S.E. Emery, University of the Witwatersrand and Kubu International (Pty) Ltd., South Africa  
B. Walker, Bing Walker and Associates Consultants Pty Ltd., South Africa

**Unbonded concrete overlay movements in response to gear loads**  
D.A. Morian, S. Sadasivam, and J. Reiter, Quality Engineering Solutions, USA  
S.M. Stoffels and L. Yeh, Pennsylvania State University, USA  
A. Ioannides, University of Cincinnati, USA

### 3:15–3:45 PM

#### Break and Exhibits

**Illinois Ballroom**
Thursday, July 2, 2009

**Technical Track 10**

**Concurrent Session 10A:**
*Technical Track 10*

**Bearing Capacity Designs for Challenging Conditions and Load Effects**
Alma Mater Room

**Session Chair:** Helge Mork, Norwegian University of Science and Technology (NTNU), Norway

**Load bearing analysis of EPS-block geofoam embankments**
D. Arellano, The University of Memphis, USA
T.D. Stark, University of Illinois at Urbana-Champaign, USA

**Shear strength properties of naturally occurring bituminous sands**
J. Arochie-Boateng and E. Tutumluer, University of Illinois at Urbana-Champaign, USA

**The discussion on the "b" value of the axle load conversion in China**
X. Wang, Research Institute of Highway Ministry of Communications, P.R. China
L. Zhang, Beijing Municipal Road Management, P.R. China

**A review of the influence of chalk on pavement performance in the southeast of England, United Kingdom**
M. Zohrabi, Mott MacDonald Ltd., UK

**Concurrent Session 10B:**
*Technical Track 10*

**Full-Scale and Structural Testing for Bearing Capacity**
Lincoln Room

**Session Chair:** Sigurður Erlingsson, VTI, Sweden

**Validation of NCAT structural test track experiment using INDOT APT facility**
E. Levenberg, North Central Superpave Center, Purdue University, USA

**Using the viscoelasticity and continuum damage theories to quantify the effects of loading speed in accelerated pavement testing results**
K.M. Theisen, D.R. Victorino, W.P. Nunez, and J.A.P. Ceratti, Federal University of Rio Grande do Sul, Brazil

**The premature failure of slab pavements on heavily trafficked industrial sites**
C. Van Geem and O. De Myttenaere, Belgian Road Research Centre (BRRC), Belgium

**Soil characterization for Orion contingency land landings**
E. Heymsfield, University of Arkansas, USA

**Concurrent Session 10C:**
*Technical Track 10*

**Chicago’s O’Hare International Airport Modernization**
Technology Room

**Session Chair:** David Lange, CEAT, University of Illinois at Urbana-Champaign, USA

**A virtual tour of the O’Hare Modernization Program (OMP)**
R. Anderson, OMP, USA

**Characterizing subgrade soils and establishing treatment needs for runway 9L-27R**
M.R. Thompson, University of Illinois at Urbana-Champaign, USA

**Concrete pavement and materials research supporting OMP projects**
J.R. Roeder, University of Illinois at Urbana-Champaign, USA

**Closing Session**
Chancellor Ballroom

5:30–6:15 PM

Friday, July 3, 2009

**Optional Downtown Chicago Visit**
The conference tour bus will transport participants from Champaign-Urbana to Downtown Chicago for a day of sightseeing, shopping, and entertainment. Participants will visit Chicago’s Magnificent Mile and its many museums and restaurants, and enjoy the city’s Independence Day celebrations, including "Taste of Chicago,” outdoor concerts, and fireworks in Grant Park!


[http://www.tasteofchicago.us](http://www.tasteofchicago.us)

**Schedule**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>10:30 AM</td>
<td>Depart Champaign-Urbana (boxed lunch included on the bus)</td>
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<tr>
<td>1:00 PM</td>
<td>Arrive Downtown Chicago; tour city on bus</td>
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<td>1:30 PM</td>
<td>Drop-off in Downtown Chicago</td>
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<td>Taste of Chicago in Grant Park</td>
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<tr>
<td>2:30 PM</td>
<td>Drop-off at O’Hare International Airport &amp; bus returns to Downtown</td>
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<tr>
<td>7:30 PM</td>
<td>85th Army Band in Grant Park</td>
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<tr>
<td>9:00 PM</td>
<td>Fireworks in Grant Park</td>
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<tr>
<td>9:45 PM</td>
<td>Bus departs Downtown Chicago</td>
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<tr>
<td>11:45 PM</td>
<td>Bus arrives in Champaign-Urbana</td>
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</tbody>
</table>
Exhibitors

The Exhibit Hall features a variety of vendors showcasing products and services related to the conference. It is located in the Illinois Ballroom of the I Hotel Conference Center. The hall is open from 9:45 AM to 4:00 PM on Tuesday, Wednesday, and Thursday. All breaks and lunches are also held in the Exhibit Hall. Continental breakfasts are available in the Illinois Ballroom Lobby.

<table>
<thead>
<tr>
<th>Exhibitor</th>
<th>Contact Information</th>
<th>Description</th>
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<tbody>
<tr>
<td>3D-Radar</td>
<td>PO Box 341, Homer, NY 13077</td>
<td>3D-Radar will share information about its innovative, ground-penetrating radar solutions, which employ a multi-antenna step frequency approach. The result is that road, railbed, and bridge deck GPR surveys can be conducted accurately in less time, enhancing public safety and convenience.</td>
</tr>
<tr>
<td>All About Pavements, Inc.</td>
<td>1705 Lakeshore Drive, Mahomet, IL 61853</td>
<td>All About Pavements, Inc. (API) is a full service pavement engineering firm dedicated to technical excellence and customer service. It is also a minority- and veteran-owned business enterprise. In addition, API is also registered as a Local Disadvantaged Business Enterprise (LDBE) with the Metropolitan Washington Airports Authority (MWAA). The company offers a full suite of pavement management and engineering services and handles major pavement engineering, research, management, construction, repair, and maintenance projects. It maintains three offices, conveniently located, to efficiently conduct project work. The corporate headquarters and Midwest office is located in Mahomet, Illinois, near Chicago. The East Coast office is located in Ashburn, Virginia, near the Washington-Dulles International Airport, and the South East office is located in Mexico Beach, Florida, near Tallahassee.</td>
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<tr>
<td>Dynatest</td>
<td>165 South Chestnut Street, Ventura, CA 93001</td>
<td>Dynatest offers pavement engineering equipment and consulting services. It started in 1976 in Denmark with a group of people who combined science, technology, and business into the development and manufacturing of highly specialized equipment and a methodology for pavement engineering. Dynatest has evolved into a small yet multinational group with a parent company and subsidiaries in Denmark, USA, and the United Kingdom; it also operates with joint-venture companies in Brazil, Chile, China, Malaysia, Mexico, and South Africa. There are offices in the USA in California, Florida, Michigan, Texas, and a satellite office in Chicago.</td>
</tr>
<tr>
<td>Engineering &amp; Research Int’l, Inc.</td>
<td>1401 Regency Drive East, Savoy, IL 61874</td>
<td>Engineering and Research Int’l, Inc. (ERI) is a civil engineering firm specializing in various aspects of pavement technology: management, design and rehabilitation, and testing. It also specializes in geotechnical engineering, construction inspection, materials testing, Geographic Information Systems (GIS), as well as research and education in these areas. The company is the exclusive sales, service, and manufacturing representative of KUAB Falling Weight Deflectometers (FWD) for North American countries, including the United States, and selected overseas countries. It offers a complete range of pavement and geotechnical engineering related services for both airports and highways.</td>
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<td>Exhibitors</td>
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<td><strong>Greenwood Engineering A/S</strong></td>
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<td>Denmark</td>
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<td>Contact: Jorgen Krarup</td>
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<td>Phone: 454-014-6373</td>
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<td>Fax: 453-636-0001</td>
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<tr>
<td>Contact E-mail: <a href="mailto:jk@greenwood.dk">jk@greenwood.dk</a></td>
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<td>Web Site: <a href="http://www.greenwood.dk">www.greenwood.dk</a></td>
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<td>Greenwood Engineering A/S is the developer and supplier of the most advanced equipment for pavement and railroad condition monitoring. The Traffic Speed Deflectometer (TSD) measures pavement deflections at traffic speed. Multi-functional Profilers have been delivered worldwide. LaserProf is a suitcase version of the inertial profiler, with one or two lasers measuring at same accuracy as large equipment. LineScan is a high-resolution pavement surface imaging system utilizing latest LED technology—the raw image is processed in real-time. MiniProf is a series of high-precision profiling systems for rails and wheels. To ensure efficient system integrations, equipment and software are designed and developed in-house.</td>
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<td>**Grontmij</td>
<td>Carl Bro A/S, Pavement Consultants**</td>
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<td>Kolding DK-6000</td>
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<td>Contact: Klavs Olsen</td>
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<td>Phone: 45-8228-1482</td>
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<td>Fax: 45-8228-1401</td>
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<td>Contact E-mail: <a href="mailto:KLO@grontmij-carlbro.dk">KLO@grontmij-carlbro.dk</a></td>
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<tr>
<td>Web Site: <a href="http://www.pavement-consultants.com">www.pavement-consultants.com</a></td>
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<td>Pavement Consultants is a highly specialized division within the Grontmij Group. Having more than 50 years of experience in highway and airport pavement construction and three decades in strategic highway and airport maintenance, we are an international leader within pavement technology and management. Grontmij</td>
<td>Carl Bro is the first company to develop a Super Heavy Falling Weight Deflectometer (SHWD), which meets the higher load impact from the new, super-heavy aircraft. The SHWD is capable of subjecting a pavement to a load of more than 300 kN, which can simulate the wheel load of a Boeing 777 or Airbus 380, for example. Today Grontmij</td>
<td>Carl Bro's falling weight deflectometers are used in more than 70 countries worldwide. Our company has developed one of the world's most applied pavement and asset management systems, RoSy, which is today used by more than 450 users throughout the world. As the licensed distributor of ARRB Group Ltd's technology products, Grontmij</td>
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<td><strong>Hayward Baker</strong></td>
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<tr>
<td>1530 South Second Street</td>
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<tr>
<td>St. Louis, MO 63104</td>
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<td>Contact: Jeff Hill</td>
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<td>Phone: 314-802-2920</td>
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<td>Contact E-mail: <a href="mailto:jrhill@haywardbaker.com">jrhill@haywardbaker.com</a></td>
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<td>Web Site: <a href="http://www.haywardbaker.com">www.haywardbaker.com</a></td>
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<td>Hayward Baker Inc., North America’s leader in specialty geotechnical construction, is committed to providing the most economical and technically correct solution for each geotechnical challenge. Whether your site requires foundation support and rehabilitation, settlement control, structural support, site improvement, soil and slope stabilization, underpinning, excavation shoring, earth retention, seismic stabilization or groundwater control, we are ready and eager to assist you.</td>
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<td><strong>Humboldt Mfg. Co.</strong></td>
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<td>3801 North 25th Avenue</td>
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<td>Schiller Park, IL 60176</td>
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<tr>
<td>Contact: Ed Hall</td>
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<tr>
<td>Phone: 800-544-7220</td>
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<td>Fax: 708-456-0137</td>
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<tr>
<td>Contact E-mail: <a href="mailto:edhall@humboldtmfg.com">edhall@humboldtmfg.com</a></td>
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<td>Web Site: <a href="http://www.humboldtmfg.com">www.humboldtmfg.com</a></td>
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<td>Humboldt Manufacturing Company makes and supplies materials testing equipment for soils, concrete, and asphalt (for both lab and field). Field-testing tools include compaction testing equipment to measure density and stiffness. Laboratory equipment includes geotechnical equipment for permeability, consolidation, direct shear, and triaxial testing.</td>
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Exhibitors

IL-ACPA
PO Box 9530
Springfield, IL 62791-9530
Contact: Randell C. Riley, P.E.
Phone: 217-793-4933
Contact E-mail: pccman@ilacpa.com
Web Site: www.ilacpa.com

The Illinois Chapter, Inc. of the American Concrete Pavement Association is the principal professional organization representing companies in Illinois interested in promoting better, longer-lasting concrete pavements. It does this through active participation in technology transfer programs, educational activities, and applied research at the agency and university levels. Its membership consists of concrete paving contractors, ready-mix concrete producers, manufacturers of portland cement, and others involved in supplying materials and services to the concrete paving industry. Find us on the Web at www.ilacpa.com.

Illinois Asphalt Pavement Association
241 North 5th Street
Springfield, IL 62701
Contact: Marvin Taylor
Phone: 217-523-2208
Fax: 217-544-0086
Contact E-mail: mltraylor@aol.com
Web Site: www.il-asphalt.org

The Illinois Asphalt Pavement Association is a not-for-profit trade association composed of Hot Mix Asphalt producers (and affiliated companies) serving the Illinois market.

Illinois Center for Transportation
1611 Titan Drive
Rantoul, IL 61866
Contact: Leslie Myrick
Phone: 217-893-0705 x225
Fax: 217-893-0601
Contact E-mail: lsweet@illinois.edu
Web Site: www.ict.illinois.edu

The Illinois Center for Transportation (ICT) is a premier transportation research center that builds on the experience of renowned experts in transportation and related fields at the University of Illinois, the Illinois Department of Transportation (IDOT), and other universities in Illinois and across the country by providing the appropriate tools and support required for objective research. The ICT is headquartered at the Advanced Transportation Research and Engineering Laboratory (ATREL), one of the top transportation research facilities in the nation located on 47 acres of the former Chanute Air Force Base in Rantoul, Illinois. The ICT currently manages more than 100 projects and continues to provide national and international leadership on a variety of transportation topics, including pavements, bridges, safety, and traffic operations and control.

Opsens
2014 Cyrille-Duquet Street, Suite 125
Quebec City, QC G1N 4N6
Canada
Contact: Charles Leduc
Phone: 418-956-0078
Fax: 418-682-9939
Contact E-mail: charles.leduc@opsens.com
Web Site: www.opsens.com

Opsens, a leading manufacturer of fiber optic sensors, introduces the latest advancement in fiber optic sensor technology. Through several novel sensor designs, Opsens is able to provide high accuracy, high stability, and high resolution sensing solutions to meet the most demanding needs of the civil engineering industry. Designed to perform in harsh environments, Opsens’ fiber optic solution is ideal for monitoring pavement structure performance. It combines precise signal conditioner, fiber optic deflectometer, and strain sensors designed for accurate measurement of pavement response under a moving load and providing reliable data to engineers in charge of improving structure lifetime. Fiber optic sensor assemblies are perfectly suited for road structure monitoring and are well adapted for measurements of horizontal strains and vertical deflection in existing pavements.

University of Illinois Technical Assistance Center
901 West University Avenue, Suite 101
Urbana, IL 61801
Contact: Scott McDonald
Phone: 800-895-9345
Contact E-mail: Techctr@illinois.edu
Web Site: www.tac.illinois.edu

The University of Illinois Technical Assistance Center provides distribution, support, and training services for a group of Sustainment Management Systems software developed by the U.S. Army Corps of Engineers. These infrastructure asset management programs provide organizations a platform to perform objective assessments of their assets, create long-range work plans, and optimize their budgetary process.