



# International Conference on Transportation and Development 2018

Airfield and Highway Pavements



Papers from Sessions of the  
International Conference  
on Transportation and  
Development 2018

Pittsburgh, Pennsylvania

July 15–18, 2018



ASCE

Edited by Yin Hai Wang, Ph.D.

Michael T. McNerney, Ph.D., P.E.

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TRANSPORTATION  
& DEVELOPMENT  
INSTITUTE

# INTERNATIONAL CONFERENCE ON TRANSPORTATION AND DEVELOPMENT 2018

## *AIRFIELD AND HIGHWAY PAVEMENTS*

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SELECTED PAPERS FROM THE INTERNATIONAL CONFERENCE ON  
TRANSPORTATION AND DEVELOPMENT 2018

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SPONSORED BY  
The Transportation & Development Institute  
of the American Society of Civil Engineers

EDITED BY  
Yinhai Wang, Ph.D.  
Michael T. McNerney, Ph.D., P.E.



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# Preface

It is our great pleasure to welcome you to the ASCE International Conference on Transportation and Development (ICTD 2018)! Organized by Transportation and Development Institute (T&DI), ICTD is ASCE's flagship conference in transportation and development. The conference theme, *Emerging Technologies: Impacts on Transportation and Development*, represents our vision and goal for future endeavors in transportation and development research, education, and practice. ASCE ICTD 2018 awaits your active participation and contribution at the beautiful and scenic Wyndham Grand Pittsburgh Downtown Hotel from July 15 through 18, 2018.

Pittsburgh is historically known as "the Steel City." Now, about 1,600 technology firms, including Google, Apple, Bosch, Facebook, Uber, Nokia, Autodesk, and IBM, have landed in Pittsburgh, making it an important technology hub and one of the eleven most livable cities in the World. Being the host city of ASCE ICTD 2018, Pittsburgh offers many unique real-world examples for transportation and development professionals to feel, think, and learn.

ASCE ICTD 2018's technical program is featured with four plenary sessions:

- Opening Plenary Session: Keynote Speeches from Federal, State, and Local Government Leaders.
- Private Sector CEO Forum: Impacts of Connected & Autonomous Vehicles on Transportation & Development - Perspectives of Leaders from the Private Sector
- State DOT CEO Forum: Impacts of Connected & Autonomous Vehicles on Transportation & Development - Perspectives of Leaders from the Public Sector.
- The Advent of CAVs - A Global Perspective: Current Status of Deployment and Future of Connected and Autonomous Vehicles Around the World.

The program covers deeper technical content on multiple modes and topics in transportation and development in eight (8) concurrent tracks. It also includes a variety of special events such as the T&DI Board of Directors' Town Hall Meeting, Younger Members' "The Best Advice I Ever Received" session, icebreaker reception, and an Awards Banquet. The conference is preceded with four (4) associated workshops:

- Mobility as a Service Workshop
- University Transportation Center Technology Transfer Workshop
- NSF Civil Infrastructure Systems Workshop
- ASCE Ethics Workshop.

All these workshops are carefully designed to enhance fruitful experience of participants. Last but not the least, conference attendees get the opportunity to attend over 15 technical committee meetings of ASCE as preconference event, covering all areas of transportation and development. In addition, partnering with Transportation Research Board (TRB), two TRB committees have chosen to host their mid-year meeting at ICTD 2018, giving conference attendees additional exposure to technical discussions and content.



It is exciting to announce that ASCE ICTD 2018 attracted huge interests as indicated by the record high quality contributions and the rich technical program. A total of 146 papers were accepted for publication in the proceedings. These published papers went through a rigorous review and quality assurance process in the process of becoming a publication of ASCE – the world’s largest publisher of Civil Engineering content. The proceedings for this conference have been organized in four (4) different volumes based on the topical distribution as follows:

- Volume I: Connected & Autonomous Vehicles and Transportation Safety
- Volume II: Traffic & Freight Operations and Rail & Public Transit
- Volume III: Airfield & Highway Pavements
- Volume IV: Planning, Sustainability, and Infrastructure Systems

All these accomplishments are due to the excellent team efforts of our Conference Steering Committee, and the terrific support from ASCE-T&DI staff. We would like to express our sincere gratitude to all the authors and conference participants for their solid contributions. We are also grateful to all paper reviewers for their outstanding volunteer efforts. Finally, our special thanks goes to the entire Conference Steering Committee, Local Organizing Committee, T&DI technical committee volunteers, ASCE-T&DI staff members, sponsors, exhibitors, invited speakers, and session chairs for their hard work and great efforts to help lead ASCE ICTD 2018 on track to a great success!

ASCE ICTD has been an excellent platform for information exchange, experience sharing, and professional networking since it was launched in 2011. We hope ASCE ICTD 2018 to be another wonderful and rewarding experience in your memory. Wish you a very pleasant stay in Pittsburgh!

ASCE ICTD 2018 Co-Chairs & Proceedings Editors



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