

International Conference on Transportation and Development 2020

*Highway and
Airfield Pavements*



Selected Papers from the Proceedings of the International
Conference on Transportation and Development 2020
Seattle, Washington | May 26–29, 2020

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TRANSPORTATION
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INTERNATIONAL CONFERENCE ON TRANSPORTATION AND DEVELOPMENT 2020

HIGHWAY AND AIRFIELD PAVEMENTS

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TRANSPORTATION AND DEVELOPMENT 2020

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

EDITED BY
Guohui Zhang, Ph.D., P.E.



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Preface

It is my great pleasure to present to you the proceedings from the ASCE International Conference on Transportation and Development (ICTD 2020), organized by the Transportation and Development Institute (T&DI) of ASCE. ICTD is ASCE's flagship conference in transportation and development. The conference theme, *Showcasing Collaborative, Smart, and Integrated Mobility Solutions*, was set to build up on the theme from our 2018 and 2019 conferences, and spoke to the need for mobility solutions that are smart, integrated, and human-centric. A special feature of this event was the partnership with Washington State Department of Transportation (WSDOT) in order to deliver their Innovations & Partnerships in Transportation Conference as part of the ICTD program. The conference was scheduled to be held from May 26 to 29, 2020, at the brand-new Hyatt Regency in the heart of the beautiful downtown Seattle – the new hub of multimodal transportation and world-changing technologies.

The year 2020 will be forever etched in history due to the COVID-19 global pandemic that brought many parts of the world to a standstill. The human and economic toll from the pandemic was tremendous. Like many other events during that period, and after almost two years of planning and hard work by a large team of staff and volunteers to help deliver a robust program for the conference, ICTD 2020 had to be called off in April 2020 due to the COVID-19 pandemic. While the decision to cancel the event came with a lot of pain, it was the right thing to do in the interest of the health and safety of our members, attendees, and stakeholders. We hope to bring ICTD back to Seattle in the future and showcase all the exceptional transportation and development projects and initiatives that have become the force behind the success of this thriving city.

ASCE ICTD 2020's three-day technical program was designed to feature five plenary sessions with national leaders from ASCE, T&DI, government agencies, and private industry discussing core conference themes. The program also covered deeper technical contents on multiple topics and modes in transportation and development through nine (9) concurrent tracks. In addition to the podium speakers, poster sessions were designed to provide the opportunity for attendees to learn about cutting edge research and speak directly with the authors. The program was also designed to include a variety of special events, such as the Younger Members' offsite social and "3-Minute Pitch Competition," along with an icebreaker reception, a recently-launched student competition final, and T&DI's Annual Awards Luncheon.

In addition to these core elements, the program was designed with the following pre- and post-conference events:

- Workforce Development Needs Roundtable
- Smart City Standards Needs Roundtable
- Cybersecurity for Transportation Professionals Short-Course
- T-Mobile Technical Tour
- SR 99 Tunnel and Seattle Waterfront Redevelopment Technical Tour
- SR 520 Floating Bridge via Bike Tour

- Colman Dock Project, Ferry Ride, and Eagle Harbor Maintenance Facility Tour
- SeaTac Airport Tour
- King County International Airport (KCIA)/Boeing Field (BFI) Tour and the Museum of Flight
- Amazon Fulfillment Center Tour

All these events were carefully designed to enhance the experience of participants and provide the opportunity to earn PDHs. Last but not the least, the program included the opportunity for conference attendees to attend over 15 technical committee meetings of ASCE-T&DI, covering all areas of transportation and development.

ASCE ICTD 2020 conference proceedings have followed the great success of ICTD 2019, ICTD 2018, and ICTD 2016, and attracted significant interest as indicated by the rich technical program. A total of 162 papers were accepted for publication in the proceedings. Each paper went through a rigorous peer review by at least two to three technical experts and a quality assurance process before becoming a publication of ASCE – the world’s largest publisher of Civil Engineering content.

The proceedings for this conference have been organized into six (6) volumes based on topical distribution as follows:

- Volume I: Emerging Technologies & Their Impacts
- Volume II: Transportation Safety
- Volume III: Traffic & Bike/Ped Operations
- Volume IV: Planning & Development
- Volume V: Rail & Public Transport
- Volume VI: Highway & Airfield Pavements

All these accomplishments were due to the incredible efforts of the ICTD 2020 Conference Co-Chairs, Roger Millar and Yinhai Wang, the Conference Steering Committee, and the terrific support from ASCE T&DI staff. I would also like to express my sincere gratitude to all the authors for their contributions. I am also grateful to all paper reviewers for their outstanding volunteer efforts.

Our unique integration of private, government, and academic leaders makes the ASCE ICTD event series an excellent platform for information exchange, experience sharing, and professional networking. ASCE ICTD 2021 is scheduled to be held from June 6 to 9 at the downtown Hilton in Austin, Texas. I am confident that it will be a wonderful and rewarding experience, and I look forward to seeing you there. I sincerely hope that ASCE ICTD becomes a ‘can’t miss’ conference in each year that follows. On behalf of the conference leadership, organizing committee, and the ASCE T&DI family, I wish you all the best!

ASCE ICTD 2020 Proceedings Editor



A handwritten signature in black ink, consisting of stylized, flowing characters.

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