## Transportation Research Record: Journal of the Transportation Research Board

Volume 2673, Issue 3

ISBN: 978-1-5108-8709-1

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Published by Sage Publications USA

Copyright© (2019) by Transportation Research Board of the National Academies All rights reserved.

ISBN (Print) 978-1-5108-8709-1

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact sagepub.com/journals-permissions

## Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400 Fax: 845-758-2633 Email: curran@proceedings.com Web: www.proceedings.com



## Contents

## Emerging Technologies, Data, and Information

Macroscopic Safety Requirements for Highly Automated Driving Philipp Junietz, Udo Steininger, and Hermann Winner	I
Different Stories from Different Approaches in Evaluating Property Value Uplift: Evidence from the Gold Coast Light Rail System in Australia Barbara T. H. Yen, Corinne Mulley, and Heather Shearer	П
Minimum Sampling Size of Floating Cars for Urban Link Travel Time Distribution Estimation Meiping Yun and Wenwen Qin	24
Technology Assessment to Improve Operations Counts at Non-Towered Airports Chuyang Yang, John H. Mott, Brandon Hardin, Steven Zehr, and Darcy M. Bullock	44
Trip-Chain-Based Travel-Mode-Shares-Driven Framework using Cellular Signaling Data and Web-Based Mapping Service Data Xiaoxuan Chen, Xia Wan, Qing Li, Fan Ding, Charlie McCarthy, Yang Cheng, and Bin Ran	51
Speed Estimation using Smartphone Accelerometer Data Ilyas Ustun and Mecit Cetin	65
Bicycle and Pedestrian Count Programs: Scan of Current U.S. Practice Peter B. Ohlms, Lance E. Dougald, and Hannah E. MacKnight	74
Decision Tree Approach to Predicting Vehicle Stopping from GPS Tracks in a National Park Scenic Corridor Antonio Fuentes, Kevin Heaslip, Abigail M. Sisneros-Kidd, Ashley D'Antonio, and Kaveh Bakhsh Kelarestaghi	86
Environment, Planning, and Climate Change	
An Analysis of Success Plans and Performance Measures for Rural Transit Systems in North Carolina Kai Monast and Charlie Stanfield	97
Sensitivity of Life-Cycle Assessment Outcomes to Parameter Uncertainty: Implications for Material Procurement Decision-Making Chaitanya G. Bhat and Amlan Mukherjee	106
Performance Analysis of Piezoelectric Energy Harvesting in Pavement: Laboratory Testing and Field Simulation Abbas F. Jasim, Hao Wang, Greg Yesner, Ahmad Safari, and Pat Szary	115
Impact of Heavy-Duty Diesel Truck Activity on Fuel Consumption and Its Implication for the Reduction of Greenhouse Gas Emissions Sonya Collier, Chris Ruehl, Seungju Yoon, Kanok Boriboonsomsin, Thomas D. Durbin, George Scora, Kent Johnson, and Jorn Herner	125

Multimodal Trip Generation from Land Use Developments: International Synthesis and Future Directions Chris De Gruyter	136
Air Quality and Health Impacts of Freight Modal Shifts: Review and Assessment Tara Ramani, Rohit Jaikumar, Haneen Khreis, Mathieu Rouleau, and Nick Charman	153
Analysis of the Incentive for Slow Steaming in Chinese Sulfur Emission Control Areas Lixian Fan and Liyan Huang	165
Assessing the Impact of High-Speed Rail on Domestic Aviation CO <sub>2</sub> Emissions in China Bojun Wang, Aidan O'Sullivan, and Andreas W. Schäfer	176
Induced Travel Demand Modeling for High-Speed Intercity Transportation Dapeng Zhang, Sara Luchian, Joshua Raycroft, and Darryle Ulama	189
Freight	
Multiple Equipment Integrated Scheduling and Storage Space Allocation in Rail–Water Intermodal Container Terminals Considering Energy Efficiency Yijia Yang, Xiaoning Zhu, and Ali Haghani	199
Comparative Assessment of Industrial Classification Systems for Modeling Freight Production and Freight Trip Production Agnivesh Pani and Prasanta K. Sahu	210
Optimizing Canada–U.S. Border Crossing Investments for Export Competitiveness Hamed Shahrokhi Shahraki and Chris Bachmann	225
Safety Evaluation of Freight Intermodal Connectors in Tennessee State Deo Chimba, Emmanuel Masindoki, Xiaoming Li, and Casey Langford	237
Infrastructure	
Investigation of Design Speed Characteristics on Freeway Ramps using SHRP2 Naturalistic Driving Data Marcus A. Brewer and Jayson Stibbe	247
Evaluation of Chemically Stabilized Quarry Byproduct Applications in Base and Subbase Layers through Accelerated Pavement Testing Issam I. A. Qamhia, Erol Tutumluer, Hasan Ozer, Heather Shoup, Sheila Beshears, and James Trepanier	259
Applicability of 3-D Scanning Technology for Section Loss Assessment in Corroded Steel Beams Alexandra Hain, Arash E. Zaghi, Armin Kamali, Robert P. Zaffetti, Bradley Overturf, and Flavia E. Pereira	271
Field Performance of Foaming Warm Mix Asphalt Pavement Shenghua Wu, Weiguang Zhang, Shihui Shen, and Balasingam Muhunthan	281
Evaluation of Vehicle Braking Performance on Wet Pavement Surface using an Integrated Tire-Vehicle Modeling Approach Xiuyu Liu, Qingqing Cao, Hao Wang, Jiaying Chen, and Xiaoming Huang	295
Relating Pavement Condition Index and Present Serviceability Rating for Asphalt-Surfaced Pavements James Bryce, Richard Boadi, and Jonathan Groeger	308
Structural Analysis for APT Sections Based on Deflection Parameters Edgar Camacho-Garita, Robinson Puello-Bolaño, Piero Laurent-Matamoros, José P. Aguiar-Moya, and Luis Loria-Salazar	313

The Use of Laboratory-Measured and Strain-Gauge Backcalculated Asphalt Stiffness for Rutting Performance Prediction	323
Erdem Coleri and John T. Harvey	
Developing Performance Prediction Models for Pavement Management Systems in Local Governments in Absence of Age Data Nima Kargah-Ostadi, Yuxiao (Mina) Zhou, and Tahmidur Rahman	334
Effective Strategies for Improving Camber Predictions in Precast, Prestressed Concrete Bridge Girders David M. Mante, Robert W. Barnes, Levent Isbiliroglu, Andric Hofrichter, and Anton K. Schindler	342
Factors Affecting the Tracking Performance of Tack Coat Materials Quan Lv and Hussain U. Bahia	355
Laboratory and Field Aging Effect on Bitumen Chemistry and Rheology in Porous Asphalt Mixture Ruxin Jing, Aikaterini Varveri, Xueyan Liu, Athanasios Scarpas, and Sandra Erkens	365
Non-Destructive Evaluation of Crack Initiation and Propagation in Continuously Reinforced Concrete Pavemen Lucio Salles de Salles, Lev Khazanovich, and José Tadeu Balbo	ts 375
Risk and Reliability Analysis of Geometric Design Criteria: A Critical Synthesis Anusha Musunuru, Richard J. Porter, Tarek Sayed, and Martin Fyfe	386
Evaluation of Unbound Aggregate Base Layers using Moisture Monitoring Data Eyoab Zegeye Teshale, Dai Shongtao, and Lubinda F. Walubita	399
Remotely Sensed Freeze-Thaw from the Soil Moisture Active Passive Instrument to Inform the Timing of Seasonal Load Restrictions in Alaska Simon Kraatz, Heather J. Miller, and Jennifer M. Jacobs	410
The Influence of Time after Crushing for Cold In-Place Recycling on Compaction and Raveling Erica Yeung and Andrew Braham	419
An Alternative Experimental Method for Measuring the Low Temperature Rheological Properties of Asphalt Binder by Using 4mm Parallel Plates on Dynamic Shear Rheometer Di Wang, Augusto Cannone Falchetto, Alexander Alisov, Johannes Schrader, Chiara Riccardi, and Michael P. Wistuba	427
Applicability of Modified University of Illinois at Urbana–Champaign Model for Unbound Aggregate Material with Different Water Content Tianshu Lin, Tatsuya Ishikawa, and Bin Luo	439
Development of a Hot Mix Asphalt Location Cost Index for the Alabama Department of Transportation Keren Xu, Jorge Rueda-Benavides, and Karthik Chowdary Pakalapati	450
Evaluation of Moisture Damage under Crack-Sealed Asphalt Pavements in Louisiana Momen R. Mousa, Mostafa A. Elseifi, Zhongjie Zhang, and Kevin Gaspard	460
Experimental Investigation on Fatigue and Low Temperature Properties of Asphalt Mixtures Designed with Reclaimed Asphalt Pavement and Taconite Aggregate Ki Hoon Moon, Augusto Cannone Falchetto, Di Wang, and Yun Su Kim	472
Performance Evaluation of an Innovative High-Friction Surface Treatment Xiaoyu W. Chen, Michele A. Lanotte, M. Emin Kutay, and Larry Galehouse	485
A Numerical Study on Installation Effects and Long-Term Shaft Resistance of Pre-Bored Piles in Cohesive Soils Lin Li, Shengli Chen, and Zhongjie Zhang	494

Expansion Level of Steel Slag Aggregate Effects on Both Material Properties and Asphalt Mixture Performance Jamilla Emi Sudo Lutif Teixeira, Aecio Guilherme Schumacher, Patrício Moreira Pires, Verônica Teixeira Franco Castelo Branco, and Henrique Barbosa Martins	506
Safety Evaluation of Geometric Design Criteria: Horizontal Curve Radius and Side Friction Demand on Rural, Two-Lane Highways Scott Himes, Richard J. Porter, Ian Hamilton, and Eric Donnell	516
A Balanced Mix Design Method for Selecting the Optimum Binder Content of Cold In-Place Recycling Asphalt Mixtures Ahmed Saidi, Ayman Ali, Wade Lein, and Yusuf Mehta	526
Evaluation of Crumb Rubber Modification on Specification Compliance of Asphalt Mixtures Samuel Cooper, III, Saman Salari, and David Mata	540
Kinetic Viscoelasticity of Crosslinking Epoxy Asphalt Panos Apostolidis, Xueyan Liu, Martin van de Ven, Sandra Erkens, and Tom Scarpas	551
Out-of-Flatness Effect on Flexural Strength of Steel Bridge Girders Mahdi Asadnia and W. M. Kim Roddis	561
Network Operations and Congestion	
Frequency and Vehicle Capacity Determination using a Dynamic Transit Assignment Model Oded Cats and Stefan Glück	574
Introducing the Super DDI as a Promising Alternative Service Interchange Amirarsalan Mehrara Molan, Joseph E. Hummer, and Khaled Ksaibati	586
Estimating Traffic Volume for Local Streets with Imbalanced Data Peng Chen, Songhua Hu, Qing Shen, Hangfei Lin, and Chi Xie	598
Robust Stop-Skipping at the Tactical Planning Stage with Evolutionary Optimization Konstantinos Gkiotsalitis	611
Assigning Bus Delay and Predicting Travel Times using Automated Vehicle Location Data Christy Coghlan, Sina Dabiri, Brian Mayer, Mitch Wagner, Eric Williamson, Michael Eichler, and Naren Ramakrishnan	624
Path-Based Approaches to Robust Network Design Problems Considering Boundedly Rational Network Users Longsheng Sun, Mark H. Karwan, and Changhyun Kwon	637
Implementation of Bus Priority with Queue Jump Lane and Pre-Signal at Urban Intersections with Mixed Traffic Operations: Lessons Learned? Kinjal Bhattacharyya, Bhargab Maitra, and Manfred Boltze	646
People	
Competency Assessment for State Highway Agency Project Managers Sarah Rezk, Gary C. Whited, Michael Ibrahim, and Awad S. Hanna	658
Response to White Light Emitting Diode Aviation Signal Lights Varying in Correlated Color Temperature John D. Bullough and Yi-wei Liu	667
Investigating the Mode Switching Behavior from Different Non-Car Modes to Car: The Role of Life Course Events and Policy Opportunities Weibo Li and Maria Kamargianni	676

Peak-Car Phenomenon Revisited for Urban Areas: Microdata Analysis of Household Travel Surveys from Five European Capital Cities	686
Rico Wittwer, Regine Gerike, and Stefan Hubrich	
Use of Ride-Hailing Services among Older Adults in the United States Suman Kumar Mitra, Youngeun Bae, and Stephen G. Ritchie	700
Practical Framework for Benchmarking and Impact Evaluation of Public Transportation Infrastructure: Case of Belo Horizonte, Brazil Rounag Basu and Bianca Bianchi Alves	711
Temporal Transferability of Vehicle Ownership Models in the Developing World: Case Study of Dhaka, Bangladesh Anyiko Flavia and Charisma Choudhury	722
The Politics of Prioritizing Transit on City Streets Rosalie Singerman Ray	733