# 6<sup>th</sup> International Symposium on Highway Geometric Design featuring the 6th Urban Street Symposium























Featuring the 6th Urban Street Symposium

## Smart Highway and Street Design, Ready for the Future

Final program

13-6-2022

### Programme at a glance



	June 26				Jun	e 27						Jun	e 28						Jur	e 29		
	Sunday				Mor	nday						Tue	sday						Wed	resday		
4M			Workshop 5	Workshop 6	Workshop 7	Workshop 8				P	oster sessi	on		d table disc			Session Sa Highway Geometric Design	Session 5l Rural Road Design	Session Se Urban Street Design	Session 5d Traffic Safety	Session Se Design Applications	Session 5f Challenges and Innovation
			Coffee Break							Coffee	Break				Session 6a		Session 6	Session 6d	Session 6e	Session 6f		
			Workshop 5	Workshop 6	Workshop 7	Workshop 8				Session 2a Highway		Session 2c	Session 2d Traffic	Session 2e Design	Session 2f Challenges		Highway Geometric Design		Urban Street Design	Traffic Safety	Design Applications	Challenges and Innovation
	ution	stration							e la	Geometric Design		Street Design	Safety	Applications	and Innovation	t ha			Closing Ple	n ary Sessio	n	
	Reg istration	Fribit Fribit	Lunch						Lunch			xh ibit ha	Lunch									
	Workshop Workshop Workshop 1 2 3 4	æ		O	pening Ple	n ary Sessio			_	Session 3a Highway Geometric Design	Session 3b Rural Road Design	Session 3c Urban Street Design	Session 3d Traffic Safety	Session 3e Design Applications			Technical Tour 1	Technica Tour 2	Technical Tour 3	Technical Tour 4		
	Coffee Break	ı			Coffee	Break						Coffee	Break									
PIM	Workshop Workshop Workshop 1 2 3 4		Session 1a S Highway Geometric Design	Session 1b Rural Road Design	Session 1c Urban Street Design	Session 1d Traffic Safety	Session 1e Design Applications	Session 1f Challenges and Innovation		Session 4a Highway Geometric Design	Session 4b Rural Road Design	Session 4c Urban Street Design	Session 4d Traffic Safety	Session 4e Design Applications	Session 4f Challenges and Innovation							
	Committee Meetings	T		-	-						-	-										
					Welcome	Reception					Boat	Tour and Co	onference	Dinner								





























### Sunday June 26

Workshops: 13:00-16:30

Workshop 1	Room: Grand Ballroom I
Connected and autonomous vehicles and highway design	
Moderators:	
Marco van der Linde (RHDHV)	The Netherlands
David McDonald (Hanson Professional Services Inc.)	United States
Workshop 2	Room: Grand Ballroom II
Innovative intersection and interchange design	
Moderators:	
Jonathan Reid (Arcadis)	United States
René Walhout (Rijkswaterstaat)	The Netherlands
Workshop 3	Room: Grand Ballroom IV
Access management	
Moderators:	
Chris Huffman (Huffman Corridor Consulting, NHI Instructor)	United States
Kristine Connolly (Kittelson & Associates, Inc.)	United States
Basil Psarianos (Technical University of Athens)	Greece
Workshop 4	Room: Grand Ballroom V
AASHTO Highway Safety Manual and PIARC Road Safety Manual	
Moderators:	
John Milton (Washington DOT)	United States

Coffee Break: 14:30 - 15:00

### **Monday June 27**

Workshops: 8:30-12:00

Workshop 5	Room: Grand Ballroom I
Connected and autonomous vehicles and urban street design	
Moderators:	
Maaike Snelder (TNO)	The Netherlands
w 11 c	
Workshop 6	Room: Grand Ballroom II
Cycle facilities	
Moderators:	
Rico Andriesse (Goudappel Coffeng)	The Netherlands
Jeremy Chrzan (Toole Design)	United States
Workshop 7	Room: Grand Ballroom IV
Roadside safety	
Moderators:	
Govert Schermers (SWOV)	The Netherlands
João Cardoso (LNEC)	Portugal
Workshop 8	Room: Grand Ballroom V
Road design and human factors	
Moderators:	
Haneen Farah (Delft University of Technology)	The Netherlands
Sibylle Birth (Intelligenz System Transfer GmbH)	Germany

Coffee Break: 10:00 – 10:30

Lunch: 12:00 – 13:00 (for all attendees)

Plenary opening session: 13:00 – 15:00

Plenary opening session	Room: Heian I+II
Symposium opening (Joris Stroobach, moderator, Arcadis)	The Netherlands
Welcome speech: Douglas Harwood (Chair ISHGD Steering Committee)	United States
Welcome speech: Marcus Brewer (Urban Street Symposium)	United States
Welcome speech: Otto Schepers (Dutch Association Infra Design)	The Netherlands
Welcome speech: Peter Oosterveer (CEO Arcadis, Diamond Partner ISHGD/USS6)	The Netherlands
Welcome and symposium program: Patrick Broeren (Chair Local Organizing Committee)	The Netherlands
Country report The Netherlands (Govert Schermers, SWOV)	The Netherlands
Keynote 1: Michèle Blom (Director General of Rijkswaterstaat, Dutch National Road Authority)	The Netherlands
Keynote 2: Tijs Roelofs (Head of City Innovation Amsterdam)	The Netherlands
Keynote 3: Marco te Brömmelstroet (Professor at University of Amsterdam, Dutch 'Cycle professor')	The Netherlands

Coffee break: 15:00 - 15:30

Session 1: 15:30-17:30<sup>1</sup>

Highway Geometric Design	Room: Heian I+II
1A. Interchanges	Moderator: Alex van Loon
1 Country report Israel: interchange design guidelines in Israel	Shy Bassan
Bassan	
Amy Metom Engineers & Consultants	Israel
2 Evaluation of the Effectiveness of Low-Cost Countermeasures to Reduce Wrong-Way Driving Incidents at Partial Cloverleaf Interchanges	Eric Fitzsimmons
Fitzsimmons, Cunningham IV	
Kansas State University	United States
3 Analysis of Driver's Speed and Lateral Acceleration Behaviour on Ramp Interchanges in India	Sarika Pothukuchi
Pothukuchi, Pawar	
Indian Institute of Technology Hyderabad	India
4 Fourth Bridge over the Panama Canal at the Pacific Side – Freeway and Interchanges Geometric Design	Alejandra Débora Fissore
Castillo, Borrás, Frank, Fissore	
Instituto del Transporte Academia Nacional de Ingeniería Argentina	Argentina
5 A New Application of Displaced Left-Turns at Interchanges	Michael Wahlstedt
Wahlstedt	
Transystems	United States

<sup>&</sup>lt;sup>1</sup> Affiliation and country of corresponding author and name of presenter shown

Rural Road Design	Room: Grand Ballroom IV
1B. Horizontal and Vertical Alignment	Moderator: Douglas Harwood
1 Country report Ghana: new improvements in geometric design practices in Ghana	Magnus L. Quarshie
Lincoln Quarshie	
Delin Consult	Ghana
2 Passing sight distance assessment on rural roads with crest vertical curves	Stergios Mavromatis
Mavromatis, Markos	
National Technical University Of Athens, Greece	Greece
3 Analysis of the effect of horizontal alignment elements on the operating speed in two lanes rural road network of Lithuania	Mindaugas Seporaitis
Seporaitis, Vorobjovas, Vaitkus	
Vilnius Gediminas Technical University	Lithuania
4 The Effect of Plastic Chevron Directional Signs on Oncoming Traffic in Bends to Increase the Traffic Safety	Philipp Riemer
Riemer, Zimmermann	
Institut Für Straßen- Und Eisenbahnwesen (ise) - Karlsruher Institut Für Technologie (kit)	Germany
5 Passing Sight Distance - Regulations Vs Reality	Konstantinos Apostoleris
Apostoleris, Mavromatis, Matragos, Psarianos, Mertzanis, Amiridis	
National Technical University of Athens	Greece

Urban Street Design	Room: Grand Ballroom II
1C: Intersections	Moderator: Marcus Brewer
1 Rural Curved Corner Intersections: Comparing the Safety Performance of Various Geometric Configurations	Timothy Gates
Ingle, Gates	
Michigan State University	United States
2 Planning-level pedestrian and bicycle facility assessment process for alternative and conventional intersections	Zachary Bugg
Warchol, Schroeder, Cunningham, Rodegerdts, Alston, Bugg, Wurtz	
Kittelson And Associates	United States
3 Summary of the FHWA Quadrant Roadway Intersection Guide	Jonathan Reid
Reid Reid	
Arcadis	United States
4 Design and operational criteria of rural intersections	Corinna Auer
Auer	
KIT Karlsruhe, Ise	Germany
5 Assessing Pedestrian and Bicycle Treatments at Complex Continuous Flow Intersections	Nagui Rouphail
Rouphail, Ahmed, Warchol, Cunningham	
NC State University	United States

Traffic Safety	Room: Grand Ballroom V
1D. Road Safety and Human Factors	Moderator: Haneen Farah
1 An exploratory study of driving comfort in geometric road design: What is comfort and how can it be measured?	Kelly Pitera
Pitera, Hofset, Marinelli	
Norwegian University of Science and Technology	Norway
2 Analysis of spatial - temporal fluctuations in behavioural measurements assessing design decision effectiveness of urban road corridor redesign projects	Marco Bassani
Bassani, Catani, Mania, Lolli, Piras	
Politecnico Di Torino	Italy
3 Evaluating passing behaviour and passing related crashes on two-lane rural highways in Michigan	Shakir Mahmud
Mahmud, Gates, Savolainen	
Michigan State University	United States
4 Human Factors in road design: a review of Italian design standards	Andrea Paliotto
Paliotto, Meocci, Branzi	
University Of Florence	Italy
5 Guidelines for The Use of Non-Standard Road Signs – Polish Experiences	Mariusz Kiec
Gaca, Kiec, Kruszewski	
Cracow University Of Technology	Poland

Design Applications	Room: Esperance + Otter
1E. Design Process	Moderator: Patrick Broeren
1 Country report Colombia: policy on highway geometric design in Colombia	Víctor Valencia-Alaix
Posada-Henao, Valencia-Alaix, González-Calderón	
Universidad Nacional de Colombia	Colombia
2 Evaluation of design variants from a traffic safety point of view – A new Handbook for German road planners	Roland Weber
Weber, Irzik, Baier	
University Of Applied Sciences Darmstadt	Germany
3 Development and implementation of a methodology for the economic appraisal of road infrastructure safety schemes	Anastasios Dragomanovits
Yannis, Dragomanovits, Roussou, Nikolaou	
National Technical University Of Athens	Greece
4 Process-oriented quality management as the basis for a functional and material-oriented design of municipal roads	Alexander Buttgereit
Buttgereit	
Jade University of Applied Sciences	Germany
5 Lessons Learned in Roadway Design: A Few Nuggets of Knowledge	David McDonald
McDonald	
Hanson Professional Services Inc.	United States

Challenges and Innovation	Room: Grand Ballroom I
1F. Connected and Automated Vehicles (I)	Moderator: Basil Psarianos
1 Implications automated vehicles for road design	Evert Klem
Klem	
Royal HaskoningDHV	The Netherlands
2 Accommodation of Freeway Merging in Environment of Mixed Vehicle Technologies during Transition to Fully Autonomous Fleet	Afshin Pakzadnia
Pakzadnia	
Carleton university	Canada
3 Image-Based Assessment of Road Network Readiness for Automated Driving	Bahman Madadi
Madadi, van Nes, Snelder, Farah, van Arem	
TU Delft	The Netherlands
4 Impact of Autonomous Vehicles on Urban Structure	Petra Szakonyi
Szakonyi, Frank	
Szechenyi Istvan University	Hungary
5 Finding no-regret design measures for highways in anticipation of the arrival of autonomus vehicles	Jeroen Quee
Quee, de Vries, Mansvelder	
Sweco Nederland Bv	The Netherlands

Welcome reception: 18:00 – 19:30 (location: Foyer Okura)

### Tuesday June 28

Poster session: 9:00 – 10:30 (Grand Ballroom III)

Highway Geometric Design	Room: Grand Ballroom III
Modelling Lateral Acceleration on Ramp Curves of Service Interchanges in India	Sarika Pothukuchi
Pothukuchi, Pawar	
Indian Institute of Technology Hyderabad	India
Parametric investigation of rainwater runoff from road pavement with a constant longitudinal slope	Nikolaos Eliou
Eliou, Lemonakis, Kaliabetsos, Kehagia	
Dept. of Civil Engineering, University of Thessaly	Greece
A Comparison of Daytime and Night-time Operating Speed on Rural Multi-lane Highway Sections in Egypt	Talaat Abdel-Wahed
Abdel-Wahed, El Esawey	NOT PRESENT
Ain Shams University	Egypt
Developing Consistent Horizontal Curve Design Procedure based on Drivers' Speed Choice and Sharpness Perception	Gourab Sil
Sil, Maji, Kumar Maurya, Nama	
Indian Institute of Technology Indore, Simrol	India
Country report China: new concepts, cutting-edge innovations and their impacts on roadway geometric design in China	Ronggui Zhou
Zhou, Meng, Fang, Chen, Hu	NOT PRESENT
Road Safety Research Center	China
Country report Mexico: updates of the design elements of the new highway geometric design manual in Mexico	Emilio Abarca Pérez
Abarca Perez, Casanova Zavala, Sarmiento Castellanos, Mendoza Diaz, Fritz Lopez	NOT PRESENT
Mexican Transportation Institute	Mexico

Rural Road Design	Room: Grand Ballroom III
Superelevation transition assessment on rural roads with reverse consecutive horizontal curves	Stergios Mavromatis
Mavromatis, Matragos, Apostoleris, Vardaki, Yannis	
National Technical University Of Athens	Greece
Is the traditional sight distance at non-signalized intersection safe for human drivers in the era of automated vehicles?	Suyi Mao
Lee, Jiang, Baig, Mao	
Central South University	China
Safety evaluation of turbo roundabout with and without internal traffic separations considering autonomous vehicles operation	Salvatore Trubia
Trubia, Granà, Trubia	
University Kore Of Enna	Italy
How to reduce running-off-road crashes at roundabout: a Louisiana investigation	Ashifur Rahman
Ashifur Rahman, Sun, Moreau	
University Of Louisiana At Lafayette	United States

Urban Street Design	Room: Grand Ballroom III
Safety Evaluation of Median U-Turn Intersections in the United States	Suyi Mao
Al-Omari, Abdel-Aty, Lee, Yue, Abdelrahman, Mao,	
University of Central Florida	United States
In-Service Evaluation and Comparison of Design Alternatives for Railroad Pole Arm Protection	Megat-Johari Nusayba
Cyr, Megat-Johari, Savolainen, Day	
Michigan State University	United States
Pedestrian fatality risk as a function of a tram impact speed	Lukasz Franek
Gaca, Franek	
Krakow Public Transport Authority	Poland
Issues in the Planning and Management of Roundabouts in Cold, Snowy Regions	Kazunori Munehiro
Munehiro, Nakamura, Kuji, Yamaguchi, Sato	
CERI	Japan
Studying the impact of roadway cross-section, on-street parking, and traffic volume on the crash frequency of urban road segments	Muhammad Wisal Khattak
Khattak, Pirdavani, De Winne, Brijs, De Backer	
Ghent University and Hasselt University	Belgium
Developments in U.S. Bicycling Infrastructure and Opportunities for Improvement: An Engineer's Observations from the Seat of a Bicycle	Brooke Struve
Struve	
FHWA	United States
An Investigation for Availability of Bicycle Lanes for Personal Mobility Based on Field Experiments	Sunhoon Kim
Kim, Hwang, Lee, Myeong, Jang	
University Of Seoul	South Korea

Traffic Safety	Room: Grand Ballroom III
Can we help the driver to alleviate his multitasking on European motorways?	Manu Diependaele
Diependaele	
KPMD Consulting	Belgium
How Do Dutch Drivers Perceive Horizontal Curves on Freeway Interchanges and Which Cues Influence their Speed Choice?	Johan Vos
Vos, Farah, Hagenzieker	
Delft University of Technology	The Netherlands
Network-wide Road Design, a Simple Method for Integrating Geometric, Safety and Speed Decisions to achieve a Network Safety Plan	David Bobbermen
Bekavic, Turner, Bobbermen, Fanning	NOT PRESENT
Austroads	Australia
Corridor-level highway access safety evaluation using structural equation modeling	Yingying Xing
Lu, Lu, Xing, Peng	NOT PRESENT
Tongji University	China
A new approach for Geometric Design Consistency Evaluation	Konstantinos Apostoleris
Apostoleris, Milioti, Mertzanis, Stamatiadis, Psarianos, Kepaptzoglou, Amiridis	
National Technical University of Athens	Greece
The effectiveness of a road safety audit-Dutch experiences	Zoran Kenjic
Kenjic	
Ministry of Infrastructure and Water Management	The Netherlands
Novel Pedestrian Signal to Improve Safety and Operations for Pedestrians	Gilbert Chlewicki
Chlewicki	
Advanced Transportation Solutions	United States

Design Applications	Room: Grand Ballroom III
Vertical Design – Visibility Distances vs Construction Costs	Ljerka Buselic
Buselic	
Institut IGH	Croatia
Network Run-off-Road Crash Risk Threshold to Drive Simplified Treatment Decisions	Peter Ellis
Troutbeck, Bobbermen, Ellis, Fanning	NOT PRESENT
Austroads	Australia
Driving Risk Assessment Model of Roads with Small Radius under Ice and Snow Weather Based on Driving Simulator	Yanfeng Liao
Liu, Liao, Guan	NOT PRESENT
Tongji University	China
Analysis of drivers' visual characteristics in expressway tunnels with different radii	Zhou Tingwen
Pan, Zhou, Wang	NOT PRESENT
School of Expressway, Chang'an University	China
Considerations for separating traffic flows on motorways and information for road users	Alex van Loon
van Loon, Walhout	
Rijkswaterstaat	The Netherlands
Performance Evaluation of an Intersection Conflict warning System at an Uncontrolled Intersection for Developing World Traffic	Digvijay Pawar
Yashasvi, Pawar	
IIT Hyderabad	India
Research on the Influence of Sunlight Glare on Drivers	Jianchuan Cheng
Tang, Li, Wang, Zhang, Cheng	NOT PRESENT
Southeast University	China
Clustering Operating Speed Profiles on Horizontal Curves: A Short-term Naturalistic Driving Study	Digvijay Pawar
Malaghan, Pawar	
IIT Hyderabad	India
Oregon Department of Transportation - Target speed	Hermanus Steyn
Steyn	
Kittelson & Associates, Inc.	United States

Challenges and Innovation	Room: Grand Ballroom III
Conditions for road lane markings considering the operation of driving assistance technology	Kazunori Munehiro
Munehiro, Fuse, Kurata, Hatakeyama	
CERI	Japan
Design of dedicated lanes for connected and automated vehicles: literature review and research needs	Solmaz Razmi Rad
Razmi Rad, Farah, Taale, van Arem, Hoogendoorn	
Delft University of Technology	The Netherlands
Truck Operating speed models for two-lane rural roads in plateau	Jiayun Zhu
liayun Zhu	NOT PRESENT
School Of Transportation, Southeast Univ	China
Roadway Design Method and Critical Criteria for Continuous Long and Steep Slope	Donghui Shan
Donghui Shan	NOT PRESENT
Cccc First Highway Consultants Co., Ltd	China
Driver reaction time and stopping sight distance model in plateau area	Jiayun Zhu
Jiayun Zhu	NOT PRESENT
School Of Transportation, Southeast Univ	China
Density of Rest Area Design along the Freeway on Qinghai-Tibet Plateau	Xiaolong Ma
Xiaolong Ma	NOT PRESENT
CCCCC First Highway Consultants Co.ltd.	China
Road Data as Prior Digital Knowledge for Highly Automated Driving	Wolfgang Kuehn
Kuehn	
University Of Applied Sciences Zwickau, Institute Of Transport And Energy	Germany
Sustainable redesign of old urban street infrastructure: an economic evaluation approach	Lidia Żakowska
Żakowska, Venezia	
Politechnika Krakowska	Poland

Round table discussion: 9:00 – 10:30 (Heian I+II)

Round table discussion Low and Middle Income Countries (LMIC's)

Moderator: Fred Wegman (Delft University of Technology, The Netherlands)

Coffee Break: 10:30 - 11:00

### Session 2: 11:00 - 13:00

Highway Geometric Design	Room: Heian I+II
2A. Operational Effects	Moderator: Zachary Bugg
1 Country report Norway: highway geometric design and traffic safety in Norway	Arman Hamidi
Hamidi, Hoff, Foroutan Mirhosseini	
NTNU Trondheim	Norway
2 Truck Platooning on the highway	Daniël Meeusen
Meeusen, van Loon	
Breda University of Applied Sciences	The Netherlands
3 Traffic Performance of Successive Freeway Merge Segments	Alexander Brandenburg
Brandenburg, Sauer, Geistefeldt	
Ruhr University Bochum	Germany
4 Driving behavior on Freeways in The Netherlands with More Than 4 Lanes	Sander Veenstra
Veenstra, van Beinum	
Witteveen+Bos	The Netherlands
5 Revision of french visibility guidelines: Updating of related fundamental parameters and introduction of a performance-based approach to optimize road	Matthieu Holland
Holland	
Cerema	France

	Urban Street Design	Room: Grand Ballroom II
	2C. Pedestrians	Moderator: Liselotte van den Berg
1	Country report Brazil: recent developments in highway and urban street geometric design in Brazil	Felipe Issa Kabbach Jr.
	Kabbach Jr., Suzuki, Camargo Larocca, Dellabianca Araujo, Venâncio Junior, de Souza Campos, Martins Azevedo, de Oliveira	
	Polytechnic School of the University of Sao Paulo	Brazil
2	A Context Sensitive Approach to Pedestrian Crossing Spacing	Jennifer Musselman
	Musselman, Steyn, Learning	
	Kittelson & Associates, Inc.	United States
3	Evaluating pedestrian walking speeds at signalized intersections	Grant Schultz
	Berrett, Schultz, Eggett	
	Brigham Young University	United States
4	Designing Pedestrian Facilities: A Challenging Task at the Intersection of Urban and Transport Planning	Regine Gerike
	Gerike, Jones, Koszowski, Schmotz, Weber, Wittwer,	
	TU Dresden	Germany
5	Shared space as a counterbalance to urban street design	Mariana Batista
	Batista	
	TU Braunschweig	Germany

Traffic Safety	Room: Grand Ballroom V
2D. Roadside Safety	Moderator: Eric Fitzsimmons
1 Country report Ireland: challenges concerning aspects of the road infrastructure management directive and related areas within Ireland	Bryan Kennedy
O'Connor, de Beer, Kennedy	
Transport Infrastructure Ireland	Ireland
2 Evaluation of Strategies to Mitigate Culvert-Involved Crashes	Megat-Johari Nusayba
Megat-Johari , Chawla, Megat-Johari, Savolainen, Day	
Michigan State University	United States
3 Evaluation of Roadside Area Design	Per Strömgren
Strömgren	
Movea AB	Sweden
4 Very high containment vehicle restraint systems, A decision support model for applying very high containment safety barriers	Jeroen Stegeman
Broeren, Stegeman, Koppen, Olsthoorn	
Arcadis	The Netherlands
5 Barrier type choice on Swedish motorways and 2+1-roads	Svante Berg
Strömgren, Bergh	
Movea AB	Sweden

Design Applications	Room: Esperance + Otter
2E. Simulation and Visualization	Moderator: Jeroen Tishauser
1 Analysis of cyclist perception using virtual reality	Ana María Pérez-Zuriaga
Pérez-Zuriaga, Camacho-torregrosa, Paz García, García, Marín-Morales, Guixeres, Alcañiz	
Universitat Politècnica De València	Spain
2 Pavement Grooving Pattern Direction Investigation as a Countermeasure of Hydroplaning	Konstantinos Apostoleris
Apostoleris, Psarianos, Matragos, Mavromatis, Amiridis	
National Technical University of Athens	Greece
3 Methodology for Upgrading Accident-Prone Rural Highways Using Driving Simulation	Wolfgang Kuehn
Kuehn	
University Of Applied Sciences Zwickau, Institute Of Transport And Energy	Germany
4 Simulation-based explanation of crash modification effects: Application to sight distance and left-turn lane offsets.	Gary Davis
Davis	
University of Minnesota	United States
5 Driving simulator for evaluating the effects of road geometric design on driver behavior: a state-of-the-art	Mariane Bobermin
Bobermin, Silva, Ferreira	
Universidade Do Porto	Portugal

Challenges and Innovation	Room: Grand Ballroom I
2F. Traffic safety Evaluation and Prediction	Moderator: James Bradford
1 Design specific safety performance functions and related crash modification factors for the freeway and rural road network	Søren Underlien Jensen
Jensen, Hansen	
Trafitec	Denmark
2 For designing safer urban roads with streetcar traffic	Jean Emmanuel Bakaba
Bakaba	
German Insurance Association	Germany
3 Estimation of crash modification functions using site-level information from before-after evaluations	Meghna Chakraborty
Srinivasan, Chakraborty, Lan	
UNC Highway Safety Research Center	United States
4 Can Vehicle Connectivity Improve Safety at Freeway On-Ramps?	Yasser Hassan
Hassan, Kanteti	
Carleton University	Canada
5 Safety Performance of Ramp Terminals in Urban Areas: Comparison of Ramp Terminals at Single-Point and Tight Diamond Interchanges	Darren Torbic
Torbic, Cook, Porter, Gooch, Kersavage	
MRIGlobal	United States

Lunch: 13:00 - 14:00

### Session 3: 14:00 - 15:30

	Highway Geometric Design	Room: Heian I+II
	3A. Alignment	Moderator: Patrick Broeren
1	Evaluation of driving behaviour in horizontal curves at highway exits using floating car and meteorological data	Liselotte van den Berg
	De Jong, Hermens, Broeren, Groot, Uittenbogerd	
	Arcadis	The Netherlands
2	Performance model of arrestor bed obtained from real-scale tests	Mariana Espinoza
	Espinoza, Altamira	
	Escuela De Ingeniería De Caminos De Montaña	Argentina
3	Frequency and Safety of Small Radii on Secondary Motorways in Greater Stuttgart Area – Recommendations for future Guidelines of Motorways	Juergen Holzwarth
	Holzwarth	
	Rp Stuttgart, State of Baden-Wuerttemberg	Germany
4	Speed Behaviour and Traffic Safety in Connector Roads Second Curves	Johan Vos
	Vos	
	Delft University of Technology	The Netherlands

Rural Road Design	Room: Grand Ballroom IV
3B. 2+1 roads and Passing Lanes	Moderator: Stergios Mavromatis
1 Crash Modification Functions for Passing Relief Lanes on Two-Lane Rural Roads	Bhagwant Persaud
Persaud, Jarari Anarkooli, Almasi, Lyon	
Ryerson University	Canada
2 Investigating the safety effects of median separation layput on 2+1 roads	Mariusz Kiec
Kiec, Cafiso, D'Agostino, Kustra, Szagala	
Cracow University of Technology	Poland
3 Safety analysis of the geometric configurations of 2+1 roads with different simulation techniques	Salvatore Damiano Cafiso
Cafiso, Calvi, D'Agostino, Kiec	
Lund University, Transport & Roads Division (LTH)	Sweden
4 Applications of passing lanes on rural two-lane highways	Marcus Brewer
Brewer	
Texas A&M Transportation Institute	United States

Urban Street Design	Room: Grand Ballroom II
3C. Guidelines and Design Processes for Urban Streets	Moderator: Sarah Binkowski
1 The German Guidelines on Urban Road Design: Approach, Current Practice, and Perspectives	Regine Gerike
Gerike, Schmotz	
TU Dresden	Germany
2 DeepStreet: A deep learning powered urban street network generation module	Zhou Fang
Fang, Yang, Jin	
University Of Cambridge	United Kingdom
3 Oregon Department of Transportation blueprint for urban design - performance-based urban design in the state of Oregon	Hermanus Steyn
Steyn	
Kittelson & Associates, Inc.	United States
4 Directional and landmark road signs, a tool for urban travel	Cecile Normand
Normand, Varin, Gigon	
Cerema	France

Traffic Safety	Room: Grand Ballroom V
3D. Innovative Traffic Safety Evaluation Methodologies	Moderator: Govert Schermers
1 Safer road, Zero Road Deaths and Serious Injuries: an innovative case study	Eric Violette
Violette, Moisan, Subirats, Chauvin	
Cerema	France
2 Safety Performance Evaluation and Comparison Methodology for Different Designs of Intersections	Christopher Cunningham
Lee, Cunningham, Chase, Warchol	
North Carolina State University	United States
3 Why understanding and simulating human factors in driving behaviour is fundamental in next generation road design	Simeon Calvert
Van Lint, Calvert, Schakel	
Delft University of Technology	The Netherlands
4 Analysis of factors influencing road crashes using generalized Poisson model	Muhammad Wisal Khattak
Khattak, De Backer, De Winne, Brijs, Pirdavani	
Ghent University and Hasselt University	Belgium

`	Design Applications	Room: Esperance + Otter
	3E. Network Performance	Moderator: Jonathan Reid
1	Association between Horizontal Curve Geometry and Single Vehicle Crash Occurrence on Rural Secondary Highways	Meghna Chakraborty
	Chakraborty, Kay, Gates	
	Michigan State University	United States
2	The Demand Side of the Equation: Understanding the Resistance to Access Management Application in the Real World	Chris Huffman
	Huffman	
	Huffman Corridor Consulting, Llc	United States
3	Multiple perspectives on improving the robustness of a national highway network	Maaike Snelder
	Snelder, van Loon	
	Tno	The Netherlands
4	Travel time and traffic congestion indicator for the urban area of Rouen Normandy	David Cheinisse
	Cotelle, Cheinisse, Savalle, Doucet	
	Cerema Normandie-Centre	France

Coffee Break: 15:30 - 16:00

### Session 4: 16:00 - 17:30

	Highway Geometric Design	Room: Heian I+II
	4A. Speeds	Moderator: Timothy Gates
1	Modeling Operating Speed Differential for Passenger cars and Heavy Vehicles on Two-Lane Rural Highways Using GPS Data	Digvijay Pawar
	Malaghan, Pawar	
	IIT Hyderabad	India
2	The Safety Analysis of TER based on the Investigation in-depth of accident cases in mountain terrain highway	John Morrall
	Wang, Morrall, Fan, Wei	
	Yunnan Jiaotong College, Kunming	China
3	Passenger Cars Safety Assessment on Interchange Ramps	Konstantinos Apostoleris
	Pasias , Apostoleris, Matragos, Mertzanis, Mavromatis	
	National Technical University Of Athens	Greece
4	Freeway Ramp Speeds Based on SHRP2 Naturalistic Driving Data	Marcus Brewer
	Brewer, Stibbe	
	Texas A&M Transportation Institute	United States

Rural Road Design	Room: Grand Ballroom IV
4B. Connected and Automated Vehicles (II)	Moderator: Patrick Broeren
1 Comparison of fog line detection from in-vehicle camera and a mobile retroreflectometer	Kelly Pitera
Storsaeter, Pitera, McCormack	
Norwegian Public Roads Administration	Norway
2 Minimal Risk Conditions for High-Level Connected and Automated Vehicles	Alfredo Garcia
Garcia, Camacho-Torregrosa, Llopis-Castelló	
Universitat Politecnica de Valencia - HERG	Spain
3 How Autonomous Vehicles May Influence Vertical Curves, At-Grade Railroad Crossings, and Ramp Terminals	David McDonald
McDonald	
Hanson Professional Services Inc.	United States
4 Road Infrastructure Requirements for Improved Performance of Lane Assistance Systems	Nagarjun Reddy
Reddy, Farah, Huang, Dekker, van Arem	
Delft University of Technology	The Netherlands

	Urban Street Design	Room: Grand Ballroom II
	4C. Operational Effects and Performance of Urban Streets	Moderator: Hermanus Steyn
1	Country report Sweden	Per Strömgren
	Strömgren, Bergh, Westman	
	Movea Traffikonsult AB	Sweden
2	Development of Uniform Design Solutions for Inner-City High Capacity Roads	Dominik Schmitt
	Schmitt	
	Federal Highway Research Institute Of Germany	Germany
3	Vehicle Operating Speed on Urban Arterial Roadways with Consideration of the Presence of Bicyclists	Bahar Dadashova
	Fitzpatrick, Das	
	Texas A&M Transportation Institute	United States
4	Intersection Level of Service and Performance Discrepancies	Nagui Rouphail
	Akcelik, Rouphail	
	Sidra Solutions	Australia

Traffic Safety	Room: Grand Ballroom V
4D. Road Safety Audit and Inspection	Moderator: João Cardoso
1 Roadside safety. Assessment of compliance with standards and guidelines through latent Dirichlet allocation applied to road safety inspection reports	João Lourenço Cardoso
Roque, Lourenço Cardoso, Connell, Schermers, Weber	
Laboratório Nacional De Engenharia Civil	Portugal
2 The Application of Crash Modification Factors (CMFs) from the Perspective of Road Safety Inspections within Ireland's Motorway Network.	Alastair de Beer
O'Connor, de Beer, Maguire, Staunton	
Transport Infrastructure Ireland	Ireland
3 New Guidelines for Road Safety Audit in Germany	Kerstin Lemke
Lemke, Irzik	
BASt - Federal Highway Research Institute	Germany
4 Impact analysis of road intrinsic and extrinsic conditions on the safety level: a case study	Giuise Perri
Vaiana, Perri	
Department of Civil Engineering, University Of Calabria	Italy

Design Applications	Room: Esperance + Otter
4E. Innovative Evaluation Methodologies	Moderator: Fred Wegman
1 Country report Italy: smart road and connected automated vehicles legislative framework and experimental applications in Italy	Salvatore Damiano Cafiso
Cafiso, Carrarini, Di Graziano, Pappalardo	
University of Catania	Italy
2 Impact of road and traffic characteristics on driver behaviour and safety using data from smartphones	George Yannis
Kontaxi, Frantzola, Yannis	
National Technical University Of Athens	Greece
3 A Multi-disciplinary Highway Project Design Decision Tool	Ranadeep Basu
Munehiro, Fuse, Kurata, Hatakeyama	
Ramboll India Pvt Ltd	India
4 Investigation of Reaction Times and Deceleration Rates during Near-Crash Events Using Naturalistic Driving Data	Anshu Bamney
Megat-Johari, Cai, Savolainen	
Michigan State University	United States

Challenges and Innovation	Room: Grand Ballroom I
4F. Connected and Automated Vehicles (III)	Moderator: Jeroen Stegeman
1 Geometric design of envelope of managed lanes for autonomous vehicles.	Jana Sarran
Sarran, Hassan	
Carleton University	Canada
2 Smart vehicles on future proof roads: moving towards no-regret measures and standardisation	Marco van der Linde
van der Linde, Boender, Smienk, Selhorst, Smeets, Spaetgens, Van Loon	
Royal HaskoningDHV	The Netherlands
3 An investigation of the effects of autonomous vehicles on intersection sight distance at uncontrolled intersections.	Sean Sarran
Sarran, Hassan	
Carleton University	Canada
4 Assessment of infrastructural operational design domain for lane keeping system equipped vehicles	Ravi Chaudhary
Chaudhary, Farah, Morsink, Alkim, van Arem	
Royal Haskoningdhy	The Netherlands

Conference dinner and boat tour: 17:45 – 23:00 (assemble at the main entrance of the Okura Hotel)

### Wednesday June 29

Session 5: 8:30 - 10:00

Highway Geometric Design	Room: Heian I+II
5A. Innovative Intersections and Interchanges	Moderator: Johan Vos
1 Optimization of Diverging Diamond Interchange (DDI) Geometric Design – A comparison of manual CAD and specialized computerized design approaches	Elisabeth Hofbauer-Spitzer
Chan, Shihundu, Hofbauer-Spitzer	
Transoft Solutions Inc	Canada
2 Diverging Diamond Interchange: Moving Forward Into the Second Decade of Operations	Gilbert Chlewicki
Chlewicki	
Advanced Transportation Solutions	United States
3 Field Evaluation of Northern Virginia's First Diverging Diamond Interchange	Wei Zhang
Zhang, Jordan, Sharp	
USDOT/Federal Highway Administration	United States
4 In-Situ Safety Performance of Arterial Weaves at Innovative Intersections	Stuart Samberg
Samberg	
Rk&k, Llp	United States

<b>Rural Road</b>	Design	Room: Grand Ballroom IV
5B. Roundak	outs	Moderator: Pete Junior
1 Country report	South Africa: geometric improvements to route R573 between Tshwane and Marble Hall	Hein Stander
Stander, Lowe	, Bouwmeester, Malherbe	
Hein Stander I	Professional Services	South Africa
2 An analysis on	impact of geometric elements of multi-lane roundabout on driver behavior	Fotini Kehagia
Kehagia, Anag	nostopoulos	
Aristotle Univ	ersity Of Thessaloniki	Greece
3 Traffic Safety	Evaluation of Swedish Roundabouts	Per Strömgren
Strömgren		
Movea AB		Sweden
4 Operation and	Safety Analysis of Turbo-roundabout and Conventional Intersections on Freight Movements	Evangelos Kaisar
Ardalan, Kaisa	r, Tabassum	
Florida Atlanti	c University	United States

Urban Street Design	Room: Grand Ballroom II
5C. Cycling Facilities (I)	Moderator: Bahar Dadashova
1 Capacity of segregated cycle paths	Hans Godefrooij
Godefrooij, van Gurp	
DTV Consultants	The Netherlands
How does road geometry influence cyclists overtaking on two-lane rural roads?	Griselda López
López, Moll, Pérez-Zuriaga, García	
Universitat Politècnica de València	Spain
3 Effects of Design Parameters on Speed and Lateral Distance Behavior on Highly Frequented Bicycle Facilities in Germany	Alexander Brandenburg
Brandenburg, Geistefeldt	
Ruhr University Bochum	Germany
4 Establishing turning templates for cycles at varying speeds	David Homola
Homola, Ferrini	
Transoft Solutions (Europe) B.V.	The Netherlands

	Traffic Safety	Room: Grand Ballroom V
	5D. Workzones	Moderator:
1	Country report Canada: Canada's evolving geometric design guidance	Geoff Millen
	Millen, Robinson, Morrall	
	WSP Canada Group Ltd.	Canada
2	In-depth analysis of video-recorded traffic accidents on motorways with roadwork	Puk Kristine Andersson
	Andersson, Buch	
	Trafitec	Denmark
3	Assez Project : collect knowledge on workzones context to improve safety	Cheinisse David
	David, Gigon, Perrier, Le Lez, Rosey	
	Cerema	France
	The Importance of Maintaining Proper Visibility of Highway Lane Delineation During Highway Construction	Hector Estrada
	Estrada, King	
	University of the Pacific	United States

Design Applications	Room: Esperance + Otter
5E. Design Tools and Procedures	Moderator: Marjolein van de Nadort
1 Country report Poland: new guidelines for road infrastructure design in Poland	Mariusz Kiec
Gaca, Jamroz, Kiec, Olszewski	
Cracow University of Technology	Poland
2 Proposed Cubic Polynomial Superelevation Attaining Function in Spiral Transition Curves in Highway Geometric Design – Based on PSO Method	Hossein Pourkhani
Kordani, Pourkhani	
Imam Khomeini International University	Islamic Republic of Iran
3 Toward an open data model for road inventories	Santiago Higuera de Frutos
Higuera de Frutos, Castro Malpica	
Technical University Of Madrid	Spain
4 Achieving crash reductions by the application of conflict management in roadway design	Philip Demosthenes
Demosthenes	
Philip B Demosthenes, LLC	United States

	Challenges and Innovation	Room: Grand Ballroom I
	5F. Climate Change and Environment	Moderator: Mark Keppens
1	Country report Iran: highway geometric design guidelines and traffic safety practices in Iran	Mohammed Zia Alavi
	Alavi, Hamidi, Mahpour	
	University of Tehran	Iran
2	Methodology for Planning Multifunctional Infrastructure Corridors as a Basis for Introducing Electromobility	Wolfgang Kuehn
	Kuehn	
	University Of Applied Sciences Zwickau, Institute Of Transport And Energy	Germany
3	Assessing the performance of the Dutch Highway designs for future periods of intense rainfall	Wim Courage
	Courage, Leegwater, Bouman, Paffen, van Muiswinkel, Schevers	
	TNO	The Netherlands
4	Possibilities of CO2 reduction through the use of adaptive street lighting based on the example of a pedestrian/cycling path	Alexander Buttgereit
	Buttgereit	
	Jade University of Applied Sciences	Germany

Coffee Break: 10:00 - 10:30

#### Session 6: 10:30 - 12:00

	Highway Geometric Design	Room: Heian I+II
	6A. Cross Sections	Moderator: Mike Wahlstadt
1	Country report US: Meeting performance priorities in the U.S. through geometric design	Patrick Hasson
	Merritt	
	FHWA	United States
2	Performance Effects of Two- and Three-Lane Highway Geometric Design in Germany	Julia Finkbeiner
	Finkbeiner, Sauer, Hohmann, Geistefeldt	
	Ruhr University Bochum	Germany
3	Part-Time Shoulder Use in the United States: State of Practice	Pete Jenior
	Jenior	
	Kittelson & Associates, Inc	United States
4	Geometric Design of High Capacity Freeways in Germany	Justin Geistefeldt
	Geistefeldt	
	Ruhr University Bochum	Germany

Urban Street Design	Room: Grand Ballroom II
6C. Cycling Facilities (II)	Moderator: Marjolein van de Nadort
1 Oregon Department of Transportation: bicycle facility selection on state highways i	n urban land use contexts Jennifer Musselman
Kingsley, Musselman, Steyn, Gutierrez	
Portland Bureau of Transportation	United States
2 You can't catch a cyclist within a design - a study looking at regional differences wh	en planning and designing bicycle highways Paul Plazier
Plazier	
Sweco	The Netherlands
3 A Specific Program for The Development of Bikeway Network in The San Juan City -	Argentina Aníbal Altamira
Altamira, Espinoza, García, Ruiz	
Escuela de Ingeniería de Caminos de Montaña - Facultad de Ingeniería - Universid	ad Nacional de San Juan Argentina
4 Future proof redesign of the Ring Road around Brussels as leverage for investment	in bicycle highways in the region Jan Persoons
Persoons, Van Hulle, Sandra, Mistiaen, Vercauteren, Awouters	
Mover0	Belgium

Traffic Safety	Room: Grand Ballroom V
6D. Vulnerable Road Users	Moderator: Regine Gerike
1 Safety and usability of mandatory and advisory bicycle lanes	Thomas Richter
Schreiber, Borsellino, Richter	
German Insurers Accident Research (udv)	Germany
2 Effects of infrastructure design, operation and exposure on bicycle accidents at urban street sections	Bettina Schröter
Schröter, Hantschel, Gerike	
TU Dresden IVST	Germany
3 Are the red color shoulders safe for cyclists when overtaken on two-lane rural roads?	Ana Maria Pérez-zuriaga
Pérez-Zuriaga, Moll, López, García	
Universitat Politècnica De València	Spain
4 Safe Roads for All Road Users - Insights from Münster, a Cycle-friendly City	Alexander Buttgereit
Buttgereit, Wegmann, Pott	
Jade University of Applied Sciences	Germany

Design Applications	Room: Esperance + Otter
6E. Operations and Traffic Flow	Moderator: Salvatore Cafiso
1 Country report Hungary: new results in highway geometric design in Hungary	Csaba Koren
Koren, Barna, Borsos, Kerékgyártó, Keresztes, Mocsári, Tomaschek, Vass	
Szechenyi Istvan University	Hungary
2 Passing of long trucks – Impact on traffic safety and traffic flow	Matthias Zimmerman
Zimmermann	
Karlsruhe Institute Of Technology - Institute Of Highway And Railroad Engineering	Germany
3 Car drivers experienced level of service on rural roads and urban streets	Søren Underlien Jensen
Jensen, Pedersen	
Trafitec	Denmark
4 Performance of Lane Support Systems in curvilinear alignments	Giuseppina Pappalardo
Cafiso, Pappalardo	
University of Catania	Italy

Challenges and Innovation	Room: Grand Ballroom I
6F. Reconstruction and Redesign	Moderator: Jeroen Braak
1 Country report India: India's highway development and improvement of guidelines and design practices	Ranadeep Basu
Basu	
Ramboll India	India
2 Double Deck Tunnel Maastricht: an unique and innovative highway project with an integrated approach on sustainable urban development	Alex van Loon
van Loon, Kenjic, Maas	
Rijkswaterstaat	The Netherlands
3 Complex Project 'Eastern Connection' (part of the 'Harbor Route') in Antwerp, Belgium. An integrated approach to the study of alternatives.	Bart Steenwegen
Steenwegen	
Sweco Belgium	Belgium
4 Urban street network upgrade for the new intercity bus terminal in the city of Athens	Anastasios Dragomanovits
Orfanou, Dragomanovits, Mavrogeorgis , Vlahogianni, Yannis	
National Technical University Of Athens	Greece

Plenary closing session: 12:00 - 12:30

Plenary closing session	Room: Heian I+II
Symposium closing (Joris Stroobach, Moderator, Arcadis)	The Netherlands
Best paper award: Patrick Hasson (Committee Member TRB AKD10)	United States
Closing remarks: Douglas Harwood (Chair ISHGD Steering Committee)	United States
Closing remarks: Patrick Broeren (Chair Local Organizing Committee)	The Netherlands

Lunch: 12:30 – 13:30 (for all attendees)

Technical tours: 13:30 – 17:00

Technical Tour 1	Room: Grand Ballroom I
Amsterdam Beltways	
Tour guides:	
Peter Holaar	Rijkswaterstaat
Johan Vos	Rijkswaterstaat
Technical Tour 2	Room: Grand Ballroom II
Greater Amsterdam Regional Tour	
Tour guides:	
Dick Winters	Province North-Holland
Eldar Biro and Suzanne vd Mark	Dura Vermeer
Bas van Viegen	City of Amstelveen
Technical Tour 3	Room: Grand Ballroom IV
Amsterdam City Tour	
Tour guides:	
Kees Vernooij	City of Amsterdam
Heiko Miskotte	City of Amsterdam
Technical Tour 4	Room: Grand Ballroom V
Fast Bicycle Lanes Projects	
Tour guides:	
Alina Prey	Goudappel Coffeng
Harmen Otto Smedes	City of Almere

### **Professional Development Hours Credit Statement for Attendee's Records**

6<sup>th</sup> International Symposium on Highway Geometric Design Featuring the 6<sup>th</sup> Urban Street Symposium

Smart Highway and Street Design, Ready for the Future

Amsterdam – The Netherlands 26-29 June 2022



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#### Sunday, June 26

		Nr.	Name	Hours
13:00 – 16:30	Workshop			

#### Monday, June 27

		Nr.	Name	Hours
8:30 – 12:00	Workshop			
15:30 – 17:30	Session 1			

#### Tuesday, June 28

		Nr.	Name	Hours
9:00 – 10:30	Poster session			
11:00 – 13:00	Session 2			
14:00 – 15:30	Session 3			
16:00 – 17:30	Session 4			

#### Wednesday, June 29

-		Nr.	Name	Hours
8:30 – 10:00	Session 5			
10:30 – 12:00	Session 6	•		



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Featuring the 6<sup>th</sup> Urban Street Symposium

## **Symposium Secretariat**



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