

ISAVFT 2015

16th International Symposium on Aerodynamics, Ventilation & Fire in Tunnels

BHR Group
EXPERTS IN FLUID ENGINEERING

Monday 14th September 2015

Registration Reception

16.30 - 18:00 - Collect your delegate pack, meet your peers, and enjoy drinks and canapés kindly sponsored by Zitrón. Visit Seattle representatives will be available for tourist information.



Tuesday 15th September 2015

07:30 Registration with Breakfast

09:00 ISAVFT Welcome from Norman Rhodes, Chairman, ISAVFT 2015

09:05 **Opening Address: Alaskan Way Viaduct Replacement**
Presented by Susan Everett and David Sowers, WSDOT, USA

Plenary Session 1: Seattle

Session Chairperson: Pierre Carlotti, LCPP, France

09:45 **Optimization of mechanical ventilation operations for State Route 99 Tunnel**
Y Liu, S Cassidy, HNTB Corporation; S Everett, WSDOT, USA; [Page 725](#)



10:10 **Final testing of fire detection and fire suppression systems at Mount Baker Ridge and First Hill Tunnels in Seattle**
I Maevski, B Josephson, R Klein, Jacobs Engineering; D Haight, Z Griffith, WSDOT, USA, [Page 745](#)

10:35 **Sizing of extraction ventilation system and air leakage calculations for SR99 tunnel fire scenarios**
Y Liu, S Cassidy, HNTB Corporation, USA; [Page 755](#)

11:00 Exhibitor Presentations

11:10 Refreshment Break



Parallel Session 2A: Road Tunnels - Operation and Management <i>Session Chairperson: Conrad Stacey, Stacey Agnew Pty Ltd, Australia</i>		Parallel Session 2B: Metro and Rail – Control & Design <i>Session Chairperson: Mohammad Tabarra, ARUP, UK</i>	
11:40	Development and implementation of performance metrics for operations and maintenance: Port of Miami tunnel project, a public private partnership - D Dirgins, WSP Parsons Brinckerhoff, D Markt, Q-Free Open Roads, USA; Page 563	11:40	Consequences of a velocity increase of passenger trains for oncoming freight trains – Aerodynamic simulations and measurements for the Gotthard Rail Tunnel - M Flueckiger, P Reinke, S Nyfeler, HBI Haerter Ltd, Switzerland; Page 245
12:05	An owner’s perspective: using practical engineering to retrofit existing roadway tunnels in Seattle with an eye to performance, operability, maintainability, and best value - D Haight, Z Griffith, A Chepel, WSDOT; P Bennett, Sound Transit, USA; Page 579	12:05	Fire localization and ventilation control system of the Gotthard Base Tunnel C Brander, Pöyry Switzerland Ltd, Switzerland; Page 261
12:30	Ventilator jet fan fault detection method using vibration analysis and future challenges - H Fukasawa, K Yamamoto, Central Nippon Expressway Company Ltd, A Kobayashi, M Yokota, Central Nippon Highway Engineering Tokyo Company Ltd, A Iwasaki, Gunma University, Japan; Page 595	12:30	Mont-Royal Tunnel: The challenges of upgrading a century-old rail tunnel for the 21st century I Bowman, B Kumar, C Doucette, Hatch Mott MacDonald Ltd; J-P Pelletier, Agence Métropolitaine de Transport, Canada; Page 271
12:55 Lunch			
14:00 Keynote Address: Aerodynamics – return from investment Presented by Alexander Orellano, Bombardier Transportation GmbH, Germany			
Plenary Session 3: Major Incidents – Design and Response <i>Session Chairperson: Silas Li, WSP Parsons Brinckerhoff, USA</i>			
14:30 The effect of longitudinal ventilation on tenability during egress from passenger trains in tunnels during fire emergencies M Winkler, R Carvel, University of Edinburgh, UK; Page 211			
14:55 The mitigation of explosion effects in confined tunnel environments C Biotto, E Draper, Mott MacDonald, Railways Division; E Meyrick, A Dima, J Hellander, Imperial College London, UK; Page 227			
15:20 Exhibitor Presentations			ARUP AECOM
15:30 Refreshment Break			
Parallel Session 4A: Road and Rail – Flow challenges <i>Session Chairperson: Sean Cassidy, HNTB Corporation, USA</i>		Parallel Session 4B: Metro and Rail - Full-scale Testing <i>Session Chairperson: Akisato Mizuno, Kogakuin University Tokyo, Japan</i>	
16:00	On the prediction of pressure losses in complex flow scenarios using CFD - J Prince, J Peiro, Imperial College London, M Tabarra, J Alexander, ARUP, UK; Page 535	16:00	Verifying the performance of emergency ventilation systems by cold smoke tests - B Ozince, Marmaray BC1 Bosphorus Crossing Project, Turkey; M Tabarra, D Abi-Zadeh, Arup, UK; Page 287
16:25	Smoke confinement velocity and back-layering distance in tunnel fires - F Colella, J Rosen, N Ponchaut, Exponent, Inc. USA; Page 549	16:25	Global tests of the Toulouse Metro (France) - J Veyet, F Duet, Cofely Axima GDF SUEZ, France; Page 299
16:50 Sessions Close			
17:00 - 18:30	Welcome Drinks Reception An excellent opportunity to network with speakers, delegates and exhibitors in an informal setting, kindly sponsored by AECOM		
			 

ISAVFT 2015

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Wednesday 16th September 2015

07:30 Breakfast

09:00 **Keynote Address: Tunnel Fire Safety Systems, Then, Now and Future**

Presented by Gary English, Fire Department, City of Seattle, USA; [Page 127](#)

Plenary Session 5: Fire

Session Chairperson: Gary English, Fire Department, City of Seattle, USA

09:30 **FFFS for flammable liquid fires in road tunnels,**

K Harris, J Harder, WSP | Parsons Brinckerhoff, USA; [Page 67](#)

09:55 **Impact of fixed fire-fighting system on road tunnel structure**

Y Li, D Hahm, I Maevski, Jacobs Engineering, USA; [Page 97](#)

10:20 **Performance of a state-of-the-art low pressure water spray system – results from full scale tunnel fire tests**

M Lakkonen, IFAB (Institute for Applied Fire Safety Research); A Feltmann, D Sprakel, FOGTEC Fire Protection, Germany; [Page 141](#)

10:45 **Exhibitor Presentations**



10:55 **Refreshment Break**

Parallel Session 6A: Road and Rail - Fire

Session Chairperson: Conrad Stacey, Stacey Agnew Pty Ltd, Australia

11:30 **Generic quantification of consequences of road-tunnel fires**

R Brandt, N Riklin, V Butty, S Frey, HBI Haerter; M Schubert, Matrisk GmbH; N Høj, HOJ Consulting GmbH, C Gammeter, B Gogniat, Federal Roads Office (FEDRO), Switzerland; [Page 81](#)

11:55 **Managing tunnel emergency and evacuation in most populous Indian city - A case of Delhi MRTS**

A Gupta, A Singh, R Jain, Delhi Metro Rail Corporation Ltd, India; [Page 113](#)

12:20 **Characterization of electric vehicle fires**

F Colella, N Ponchaut, H Biteau, K Marr, V Somandepalli, Q Horn, R Long, Exponent, Inc. USA; [Page 157](#)

Parallel Session 6B: Metro and Rail - Pressure Transients

Session Chairperson: Marco Bettelini, Amberg Engineering Ltd., Germany

11:30 **Reduction of the pressure gradient in railway tunnels using vented tunnel portals -** *D Heine, G Lauenroth, S Huntgeburth, K Ehrenfried, German Aerospace Center DLR Göttingen, Germany; [Page 483](#)*

11:55 **The behaviour of long entrance hoods for high speed rail tunnels** *A Vardy, University of Dundee; R Sturt, Arup; C Baker, D Soper, University of Birmingham, UK; [Page 449](#)*

12:20 **Dynamic pressure tightness of very high speed train CRH380D** *M Sima, B Schulz, P Gözl, E Thoss, Bombardier Transportation, Germany; [Page 467](#)*

12:45 **Lunch**

Parallel Session 7A: Road Tunnels - Ventilation Control

Session Chairperson: Ian Sweetland, Yyss Ltd, UK

13:45 **A long urban road tunnel that has longitudinal and transversal ventilation systems combined in it** - S Kubota, H Saito, Metropolitan Expressway Company Ltd; Y Mikame, Shutoko Engineering Company Ltd; H Yanagi, Echoplan Company Ltd; A Mizuno, Kogakuin University Tokyo, Japan; [Page 607](#)

14:10 **Ventilation of the E4 Stockholm bypass** - R Brandt, E Engman, S Lucchini, HBI Haerter, Switzerland; L Elertson, C Berg, Swedish Transport Administration; U Malmros, AF Consulting Engineers, Sweden; [Page 631](#)

14:35 **Outline of ventilation control strategy for urban tunnel**
S Kume, K Kanazawa, H Hara, Hanshin Expressway Company Ltd, Japan; [Page 621](#)

15:00 **Ventilation simulation of a large and complex road tunnel: A safe journey - E4 The Stockholm bypass project**
L Elertson, Swedish Transport Administration, Sweden; [Page 645](#)

15:25 **Refreshment Break**

Parallel Session 7B: Metro and Rail – Thermodynamics and cooling

Session Chairperson: Joseph Grella, Amtrak, USA

13:45 **Acceptability of air velocity from a human thermal comfort and safety perspective**
M Legg, M Gilbey, WSP | Parsons Brinckerhoff, UK; [Page 389](#)

14:10 **Interaction between station openings and environmental control systems -**
C Graham, C Gonzalez Mesa, M Gilbey, WSP | Parsons Brinckerhoff, UK; [Page 431](#)

14:35 **Application of heat recovery to long tunnels**
J Thompson, M Gilbey, M Legg, WSP | Parsons Brinckerhoff, UK; [Page 403](#)

15:00 **Diesel locomotive operation with steep grade, high ambient temperature, and long consist**
A Bagis, WSP | Parsons Brinckerhoff; B Dandie, RRT Pty Ltd, Australia; [Page 419](#)

Plenary Session 8: Risk Assessment

Session Chairperson: Eleftheria Aini, VINCI CGP Hellas, Greece

16:00 **Risk assessment of zero-flow ventilation strategy for fires in bidirectional tunnels with longitudinal ventilation**
I Nakahori, T Sakaguchi, Sohatsu Systems Laboratory, Japan; B Kohl, C Forster, ILF Consulting Engineers, Austria; A Vardy, University of Dundee, UK; [Page 501](#)

16:25 **Methodologies for accurate risk modelling in the context of integrated quantitative risk analysis**
C Forster, B Kohl, ILF Consulting Engineers; S Wiesholzer, Austrian Ministry for Transport, Innovation and Technology, Austria; [Page 517](#)

16:50 **Debate sponsored by AECOM: This symposium believes that quantitative risk assessment improves the suitability of tunnel design codes targeted at the safety of humans and infrastructure**
For: Rune Brandt, HBI Haerter, Switzerland and Pierre Carlotti, LCPP, France
Against: Gary English, City of Seattle Frie Dept. and Norman Rhodes, WSP | Parsons Brinckerhoff, USA

17:40 **Sessions Close**

Gala Dinner at Sodo Park

Welcome drinks and canapés precede a splendid three-course meal in this one-of-a-kind venue, kindly sponsored by WSP | Parsons Brinckerhoff. Transport will depart from reception at Hilton Seattle Airport and Conference Center at 19:00, and will return at approx. 22:30.

Additional tickets are available to purchase for guests. Dress code: Business Formal

19:00 - 22:30

Best Paper Award

The winner of the prestigious ISAVFT 2015 best paper award, as voted by the symposium's Technical Advisory Committee and panel of referees, will be announced. The cash prize fund, kindly sponsored by HBI Haerter, will be presented to an author whose paper is deemed to demonstrate outstanding originality, innovation, or otherwise notable features.



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Thursday 17th September 2015

07:30 Breakfast

Parallel Session 9A: Road Tunnels - Ventilation Control

Session Chairperson: *Kate Hunt, WSP | Parsons Brinckerhoff, UK*

09:00 On effective close-loop control of longitudinal ventilation in road tunnels in case of fire

P Altenburger, I Riess, R Brandt, HBI Haerter AG, Switzerland; Page 661

09:25 On transient issues in road-tunnel ventilation design and control

M Bettelini, S Rigert, Amberg Engineering Ltd, Switzerland; Page 677

09:50 Coordinating two-tunnels ventilation control for maintaining air pollution at portals facing each other - I Kon, Nippon Expressway Research Institute

Company Ltd, M Yuhara, AMEC Consultants Co. Ltd, A Mitani, Sohatsu Systems Laboratory Inc., Japan; Page 693

10:15 (In)appropriate control of road tunnel ventilation systems

A Vardy, University of Dundee, UK; Page 703

10:40 Application of air purification system in road tunnel projects

S Lai, WSP | Parsons Brinckerhoff, Hong Kong; W Xie, WSP | Parsons Brinckerhoff, Singapore; Page 717

Parallel Session 9B: Metro and Rail - Simulation, Modelling and Testing

Session Chairperson: *Igor Maevski, Jacobs Engineering, USA*

09:00 Coupling ventilation and egress analyses to design a safer station

Andrew Louie, Silas Li, WSP | Parsons Brinckerhoff, USA; Page 315

09:25 Cross-City-Link Zurich – Proof of proper functionality of the emergency ventilation system in the case of a fire using smoke tests, measurements and CFD simulation

R Yousaf, J Badde, S Wälchli, Pöyry Switzerland Ltd, Switzerland; Page 327

09:50 Computational analysis to assess the performance of on-board high pressure water mist systems for rail cars for improving survivability

I Ong, Hatch Mott MacDonald; T Eng, G Kildare, Los Angeles County Metropolitan Transportation Authority (Metro), USA; Page 343

10:15 The worst fire location in tunnel fires with natural ventilation

Z Yuan, B Lei, H Bi, Southwest Jiaotong University, China; Page 359

10:40 Smoke/thermal control of a transit terminal: An integrated and optimization design process

A Wang, N Rhodes, WSP | Parsons Brinckerhoff, USA; Page 373

11:05 Refreshment Break

Plenary Session 10: Guidelines and Their Application

Session Chairperson: *Davar Abi Zadeh, Arup, UK*

11:35 Minimising the height of a vent stack while still complying with EPA requirements

B Dandie, RRT Pty Ltd; A Bagis, WSP | Parsons Brinckerhoff; C Richardson, Air Noise Environment, Australia; Page 171

12:00 PIARC and fixed fire-fighting systems: A report on working group activity - N Harvey, Hatch Mott MacDonald; N Rhodes, WSP | Parsons Brinckerhoff, USA; L Fielding, London

Bridge Associates Ltd; R Hall, Mott MacDonald, UK, B Dandie, RRT Pty Ltd, Australia; R Brandt, HBI Haerter, Switzerland; H Ingason, SP Fire Research, Sweden; Page 185

12:25 Development of new US standards and guidelines for tunnel ventilation

I Maevski, Y Li, Jacobs Engineering, USA; Page 197

12:50 Exhibitor Presentations

13:00 Lunch

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Plenary Session 11: Assessment and Design

Session Chairperson: Rune Brandt, HBI Haerter AG, Switzerland

- 14:00 Evaluation of the radiative hazard in tunnel fires**
Antoine Mos, CETU (Centre of Expertise on Tunnels), France; [Page 5](#)
- 14:25 Optimization of jet fan deployment and operating conditions in lay-bys and in proximity of tunnel portals**
R Gertl, J Mütterlein, D Stix, ILF Consulting Engineers Austria GmbH, Austria; [Page 21](#)
- 14:50 Review on the configuration of outlet duct for air supply in a tunnel - aiming for safety improvement - S Masukura, R Takagi, Central Nippon Expressway Company Ltd., A Kobayashi, Central Nippon Highway Engineering Tokyo Company Ltd., T Chihara, K Takahashi, FITUT Laboratory Company Ltd., Japan; [Page 37](#)**
- 15:15 Scaled experiments using the helium technique to study the vehicular blockage effect on longitudinal ventilation control in tunnels**
W U Rojas Alva, G Jomaas, A Dederichs, Technical University of Denmark, Denmark; [Page 49](#)
- 15:40 Discussion: Are we as a community doing enough in terms of long term operation and control?**
Panel: Conrad Stacey, Stacey Agnew Pty Ltd, Australia; Ian Sweetland, Yyss Ltd, UK; Joseph Grella, Amtrak, USA; Mohammad Tabarra, ARUP, UK
- 16:20 Sessions Close**

Friday 18th September 2015 - Technical Visits

SOLD OUT! Places are only available for those who have pre-booked.

Sensible clothing, Safety boots and cash for lunch required (unless pre-payment has been made for the walking tour). All other safety equipment will be provided.

Technical Visits - Group 1

ISAVFT Representative: Eleftheria Aini

- 09:15** Coach departs from the Hilton Seattle Airport and Conference Centre
- 10:00 Tour of the I-90 Mount Baker Tunnel**
Hosted by Doug Haight, WSDOT, USA
- 12:15** Coach departs for Pike Place Market
- Explore Pike Place Market at your leisure**
- 14:00** Coach departs from the drop off point
- 14:15 Tour of the Alaskan Way Viaduct**
Hosted by Susan Everett, WSDOT, USA
- 15:30** Coach departs for Hilton Seattle Airport and Conference Centre

Technical Visits - Group 2

ISAVFT Representative: Norman Rhodes

- 10:00** Coach departs from the Hilton Seattle Airport and Conference Centre
- 11:00 Tour of the Alaskan Way Viaduct**
Hosted by Susan Everett, WSDOT, USA
- 12:15** Coach departs for Pike Place Market
- Explore Pike Place Market at your leisure**
- 14:00** Coach departs from the drop off point
- 14:15 Tour of the I-90 Mount Baker Tunnel**
Hosted by Doug Haight, WSDOT, USA
- 16:30** Coach departs for Hilton Seattle Airport and Conference Centre

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