

# 11th International Conference on Bridge Maintenance, Safety and Management

## IABMAS 2022

Barcelona, Spain  
July 11 - 15, 2022

## PROGRAMME



**11<sup>th</sup> International Conference on  
Bridge Maintenance, Safety and Management**

**BARCELONA IABMAS 2022**



**11<sup>th</sup> International Conference on  
Bridge Maintenance, Safety and Management**

**BARCELONA IABMAS 2022**

# **PROGRAMME**

**Barcelona, Spain  
July 11 - 15, 2022**

A publication of:

**International Centre for Numerical  
Methods in Engineering (CIMNE)**  
Barcelona, Spain



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Spain

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## **CHAIRS WELCOME**

Welcome to the 11th International Conference of IABMAS in the city of Barcelona.

The First (IABMAS'02), Second (IABMAS'04), Third (IABMAS'06), Fourth (IABMAS'08), Fifth (IABMAS'10), Sixth (IABMAS'12), Seventh (IABMAS'14), Eighth (IABMAS'16), Ninth (IABMAS'18) and Tenth (IABMAS'20) International Conferences on Bridge Maintenance, Safety and Management were held in Barcelona, Spain, July 14–17, 2002, Kyoto, Japan, October 18–22, 2004, Porto, Portugal, July 16–19, 2006, Seoul, Korea, July 13–17, 2008, Philadelphia, USA, July 11–15, 2010, Stresa, Lake Maggiore, Italy, July 8–12, 2012, Shanghai, China, July 7–11, 2014, Foz do Iguacu, Brazil, June 26–30, 2016, and Melbourne, Australia, July 9–13, 2018 and on-line from Sapporo, Hokkaido, Japan, April 11–15, 2021 respectively.

In this edition, the venue is located in the city where the first conference of the series was organized twenty years ago, Barcelona, and the format will be again face-to-face. IABMAS 2022 is organized on behalf of the International Association for Bridge Maintenance and Safety under the auspices of Technical University of Catalonia, Barcelona Tech, Spain (<https://www.upc.edu/>) and Construction Engineering -ConstruTech- research group (<https://construtech.upc.edu/en>) with the organizational support of the Spanish group of IABMAS.

The interest of the international bridge community in the fields covered by IABMAS has been confirmed by the large response to the IABMAS 2022 call for papers. The Conference Secretariat received 616 abstracts, 540 of which were selected for final publication as full papers and presentation at the Conference within mini-symposia, special sessions, and general sessions. Finally, 350 presentations will be orally delivered during the 3 days of technical sessions.

In this program you will find useful information regarding the technical activities and social events during the days of the conference.

We wish to all participants an enjoyable stay in Barcelona and we are extremely happy that the conference will make possible to see our colleagues and friends face to face again and to recover the advantages of a presential event.

On behalf of IABMAS and the conference organizing committee, we warmly welcome you to BARCELONA IABMAS 2022.

Joan-R. Casas, Dan Frangopol and Jose Turmo  
Chairs, BARCELONA IABMAS 2022  
July 2022





## ACKNOWLEDGEMENTS

### *Host organizations*



UNIVERSITAT POLITÈCNICA  
DE CATALUNYA  
BARCELONATECH

**Technical University of Catalonia,  
BarcelonaTech**



UNIVERSITAT POLITÈCNICA DE CATALUNYA  
BARCELONATECH  
**CONSTRUTECH**

**Construtech: Research Group on  
Construction Engineering**

### *Organizing Associations*



**IABMAS, International Association  
for Bridge Maintenance and Safety**



**Spanish group of IABMAS**

**Supporting Organizations**



Generalitat de Catalunya  
Departament d'Empresa i Coneixement  
Secretaria d'Universitats i Recerca

**Secretaria d'Universitats i Recerca  
del Departament d'Empresa i  
Coneixement de la Generalitat de  
Catalunya**



**ATLSS Engineering Research  
Center, Lehigh University,  
Bethlehem, PA, USA**



**IALCCE, International Association  
for Life-Cycle Civil Engineering**



**RCEAS, P.C. Rossin College of  
Engineering and Applied Science,  
Lehigh University, Bethlehem, PA,  
USA**



**Transportation Research Board**



**ACHE**



**IABMAS Australia Group**



**IABMAS Brazil Group**



**IABMAS Chile Group**



**IABMAS China Group**



**IABMAS Italy Group**



**IABMAS Japan Group**



**IABMAS Korea Group**



**IABMAS Portugal Group (ASCP)**



**IABMAS Sri Lanka Group**



**IABMAS Turkey Group**



**IABMAS USA Group**

***Sponsors***



## ORGANIZERS AND COMMITTEES

### CONFERENCE CHAIRS

<b>Joan-Ramon Casas</b>	<i>Technical University of Catalunya, UPC – Barcelona Tech, Spain</i>
<b>Dan M. Frangopol</b>	<i>Lehigh University, Bethlehem, USA</i>
<b>José Turmo</b>	<i>Technical University of Catalunya, UPC – Barcelona Tech, Spain</i>

### INTERNATIONAL SCIENTIFIC COMMITTEE

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Joan-Ramon Casas	<i>Technical University of Catalunya, UPC – Barcelona Tech, Spain</i>
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Manuel Valdés	<i>Barcelona City Hall</i>



## T.Y. LIN LECTURE

### **Zheng Chen**

School of Civil Engineering and Architecture, Guangxi University,  
Nanning, Guangxi, China

*Recent Development of Long-Span Arch Bridges in China*

## KEYNOTE LECTURES

### **Sreenivas Alampalli**

Stantec, USA

*Bridge Inspection, Evaluation, and Management in the United States*

### **Nurdan Apaydin**

Istanbul University Cerrahpasa, Ministry of Transportation and  
Infrastructure, Turkey

*The New World Record Breaking Bridge-1915Çanakkale*

### **Javier Diaz-Rozo**

Aingura IIoT, Spain

*AI and IIoT Convergence Towards Automated Bridge Inspection*

### **Kiyohiro Imai**

PIARC Road Bridge Committee, Honshu Shikoku Bridge Expressway  
Company Ltd., Kobe, Japan

*Safety and life extension of road bridges by considering design,  
damage assessment and  
rehabilitation*

### **Eva Lantsoght**

Delft University of Technology, The Netherlands

Universidad San Francisco de Quito, Ecuador

*Assessment of Existing Concrete Bridges By Load Testing*

**Pier Giorgio Malerba**

School of Civil, Environmental and Land Management Engineering,  
Politecnico di Milano, Italy

*About Recent Bridge Failures*

**Lahs Fuhr Pedersen**

Sund & Baelt A/S, Denmark

*Sustainable Bridge Maintenance through Life Time Extension and Optimization*

**Juan Sobrino**

C.E.O., Pedelta, Canada

*Less and Better. Good Design Practices For Sustainable Bridges*

**Man-Chung Tang**

T.Y.Lin International (China)

*Twinning of the Egongyan Bridge*

## MINISYMPOSIA

### **MS01 - Life-Cycle Redundancy, Robustness and Resilience of Bridges and Infrastructure Networks under Multiple Hazard**

Organizers: Fabio Biondini, Dan M. Frangopol

### **MS02 - Risk, Vulnerability and Resilience Assessment of Highway Systems to Extreme Events**

Organizers: André Teófilo Beck, Gustavo Henrique Siqueira, Luiz Carlos Marcos Vieira Jr.

### **MS03 - Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment**

Organizers: Mitsuyoshi Akiyama, Dan M. Frangopol, Hiroshi Matsuzaki

### **MS04 - Novel Techniques Regarding the Assessment and Monitoring of Bridges**

Organizers: Alfred Strauss, Dan M. Frangopol

### **MS05 - Assessment of Existing Infrastructure Assisted by Field Data**

Organizers: Eva Lantsoght, Yuguang Yang, Sreenivas Alampalli

### **MS06 - Strengthening of Existing Bridges**

Organizers: Altanzagas Ochirdorj, Tsas-Orgilmaa Makhbal

### **MS07 - Design of Bridge Components Considering the Impact of Micromovements of Flexible Structures**

Organizer: Simon Hoffmann

### **MS08 - Footbridges: Advances in Vibration Serviceability Assessment**

Organizers: Colin Caprani, Federica Tubino

### **MS09 - Rehabilitation and Service Life Extension of Historic Railways Bridges**

Organizers: Pier Giorgio Malerba, Franco Bontempi, Emanuele Lizzori, Marcello Vaccarezza, Daniele Corti, G. Ascari

**MS10 - Emerging Digital Technologies Toward Resilient and Sustainable Bridges**

Organizers: Stergios Aristoteles Mitoulis, Maria Pregnolato, Sotirios A Argyroudis, Maria Pina Limongelli

**MS11 - Bridge Loading – Measurement and Modelling**

Organizers: Colin Caprani, Andrzej Nowak, Eugene O'Brien, Xin Ruan

**MS12 - Realization of Intelligent Bridge With Smart Monitoring System**

Organizers: Ayaho Miyamoto, Akito Yabe, Ludovic Fulop, Timo Tirkkonen

**MS13 - Advances in Bridge Monitoring Strategies: Novel Technologies and Information Fusion**

Organizers: Chul-Woo Kim, Yi Zhang, Mehrisadat Makki Alamdari, Patrick J. McGetrick

**MS14 - The Submerged Floating Tunnel, a Smart Infrastructure for Waterway Crossing**

Organizers: Yiqiang Xiang, H.K. Lee, Beatrice Faggiano, Raffaele Landolfo, Luca Martinelli

**MS15 - Innovative Solution of Classic Problems in Bridge Design, Construction and Maintenance with Artificial Intelligence**

Organizers: Airong Chen, Xin Ruan

## **SPECIAL SESSIONS**

### **SS01 - Bridge Weigh-in-Motion: technology developments and applications for maintenance**

Organizer: Daniel Cantero

### **SS02 - Small and medium span bridges and culverts: analysis, evaluation, durability, and rehabilitation**

Organizers: Damian Beben, Halil Sezen, Jan Vaslestad, Tomasz Maleska

### **SS03 - Life-Cycle Performance Safety, Reliability, and Risk of Bridges and Infrastructure Systems under Climate Change**

Organizers: Fabio Biondini, Zoubir Lounis, Michel Ghosn

### **SS04 - Vibration-based monitoring and damage identification for bridges**

Organizers: Maria Pina Limongelli, Necati Catbas

### **SS05 - Design, Construction and Evaluation of Steel/FRP & Concrete Composite Bridge Structures**

Organizers: Haohui Xin, Xiaoqing Xu, Rong Liu, Jun He

### **SS06 - Bridge Precast and Assembly for Urban Regeneration**

Organizers: Liang Zhou, Zhiqiang Wang, Haili Jiang

### **SS07 - Intelligent monitoring and maintenance of bridges**

Organizers: Amir Alani, Mojtaba Mahmoodian, Alireza Khaloo, Sujeeva Setunge, Kevin Zhang

### **SS08 - Recent Advances in Bridge Design and Construction**

Organizers: Upul Attanayake, Haluk Aktan, Benjamin A. Graybeal, Matthew J. Chynoweth, Michael LaViolette



**SS09 - Steel Bridge Rehabilitation**

Organizer: Masahiro Sakano

**SS10 - Data-driven asset management – The Scandinavian Way**

Organizers: Jens Sandager Jensen, Lars Fuhr Pedersen, Poul Linneberg

**SS11 - Data-driven asset management**

Organizers: Jens Sandager Jensen, Lars Fuhr Pedersen, Poul Linneberg

**SS12 - BRIDGE|50 Research Project: Experimental Testing on a 50-Year-Old PC Bridge**

Organizers: Fabio Biondini, Francesco Tondolo, Sergio Manto, Carlo Beltrami

**SS13 - Risk-Based Prioritization and Monitoring of Bridges for Road Infrastructure Management in Lombardy Region, Italy**

Organizers: Fabio Biondini, Maria Pina Limongelli, Carmelo Gentile, Marco Belloli

**SS14 - Approaches to Bridge Management / Bridge Management Systems in Response to Today's Challenges**

Organizers: Reed M. Ellis, Paul Thompson, Rade Hajdin

## **GENERAL SESSIONS**

**General Session 1: Long-Span Bridges**

**General Session 2: Inspection and Monitoring**

**General Session 3: Evaluation and Assessment**

**General Session 4: Service Life and Maintenance**

**General Session 5: Repair and Strengthening**

## **PRACTICAL INFORMATION**

### **Presentations**

The Conference will provide computers for presentations.

The presenters should bring the presentation in a USB and upload it in the room's computer before the session starts.

The use of personal computers will not be allowed.

### **Registration and Check in**

All attendees are required to check in at the registration desk of the Conference Venue.

A registration desk will also be available at the entrance of Institut d'Estudis Catalans (Carrer del Carme, 47, 08001 Barcelona), on Monday July 11<sup>th</sup> from 16h00 up to the start of the Welcome Cocktail at 20h30.

During the conference, participants are responsible to wear name badges at all times while in the conference area. Access will not be allowed to the coffee breaks and technical session areas if a name badge is not visible.

### **Conference Venue**

The Conference Venue is located at:

**Vèrtex Building at Universitat Politècnica de Catalunya**  
Plaça d'Eusebi Güell, 6, Barcelona

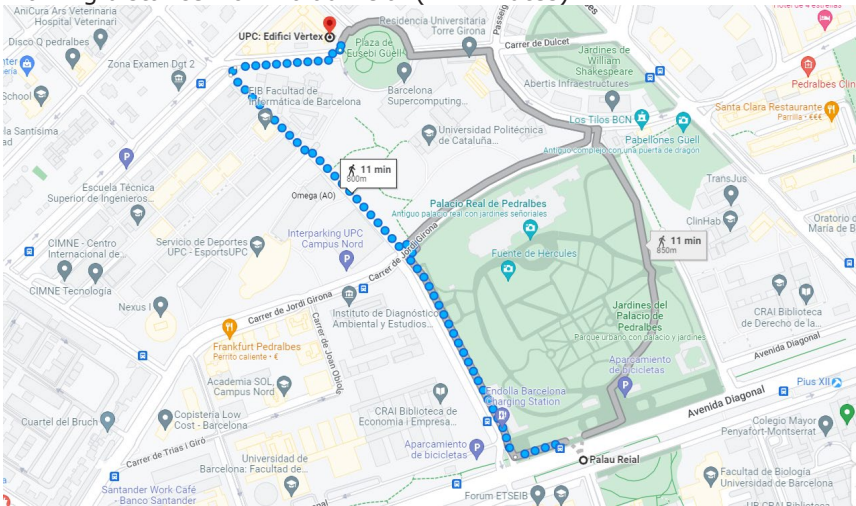


## How to get to the Conference Venue:

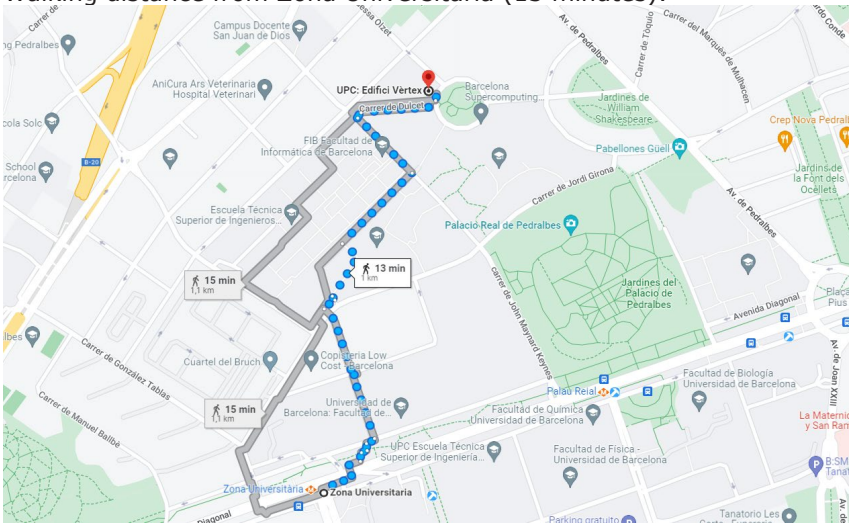
### From Barcelona downtown:

The nearest metro stations to get to the conference venue are “Palau Reial” or “Zona Universitaria”, both in Line 3 (green line).

### Walking distance from Palau Reial (11 minutes):



### Walking distance from Zona Universitaria (13 minutes):



## From the Barcelona El Prat Airport:

### By Metro:

The fastest way to get to the Conference Venue from the airport by public transportation is to take Line 9 from T1 or T2 in Barcelona El Prat Aiport.

Last stop of Line 9 is "Zona Universitaria".

### By train:

Renfe Line 2 suburban train

From Airport to Estació de Sants.

<http://www.renfe.com/viajeros/cercanias/barcelona/>

In Estació de Sants you can take Line 3 to get to "Zona Universitaria".

### By Taxi:

#### Free Now APP

<https://www.free-now.com/es/>

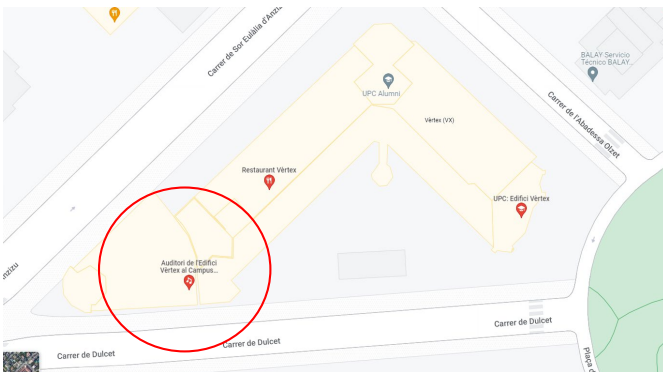
Telephones Barcelona Taxis:

+34 932 250 000

+34 933 033 033

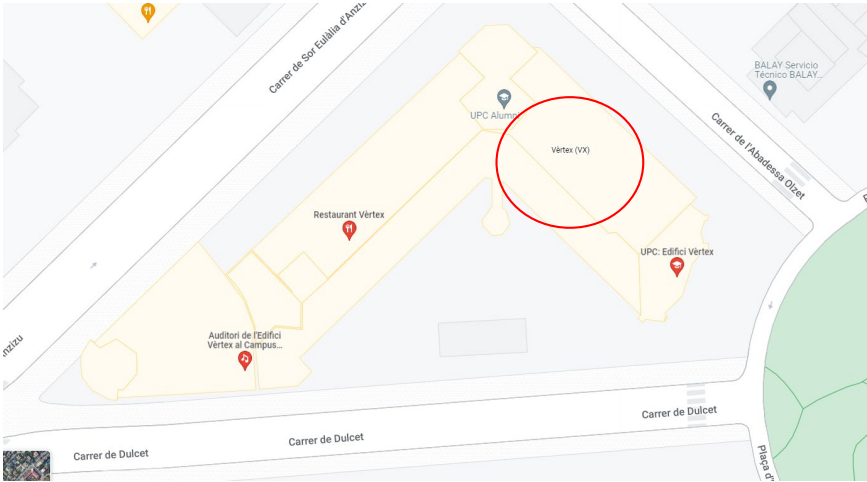
## Rooms location at the Conference Venue

### Auditorium:



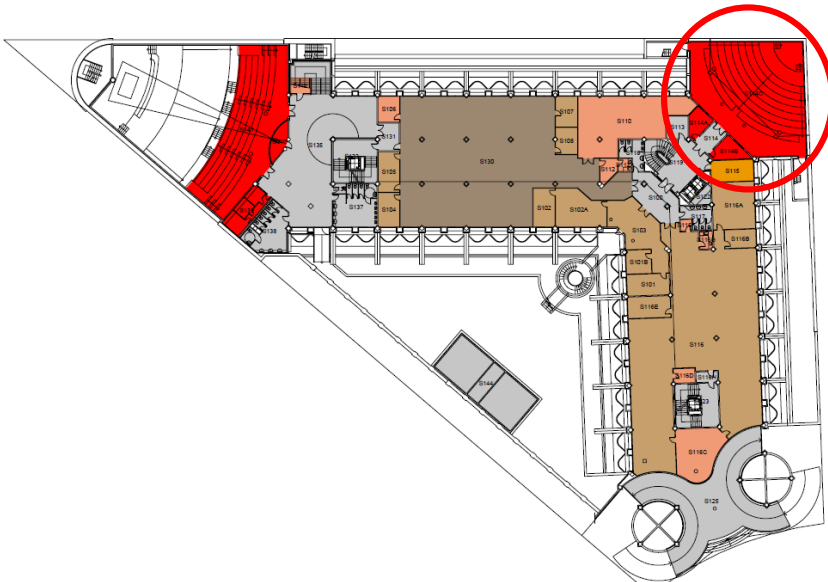
The Conference Secretariat **registration desk** will be located at the ground level of the Vèrtex Auditorium Building.

**Vèrtex VX Building (Other rooms):**



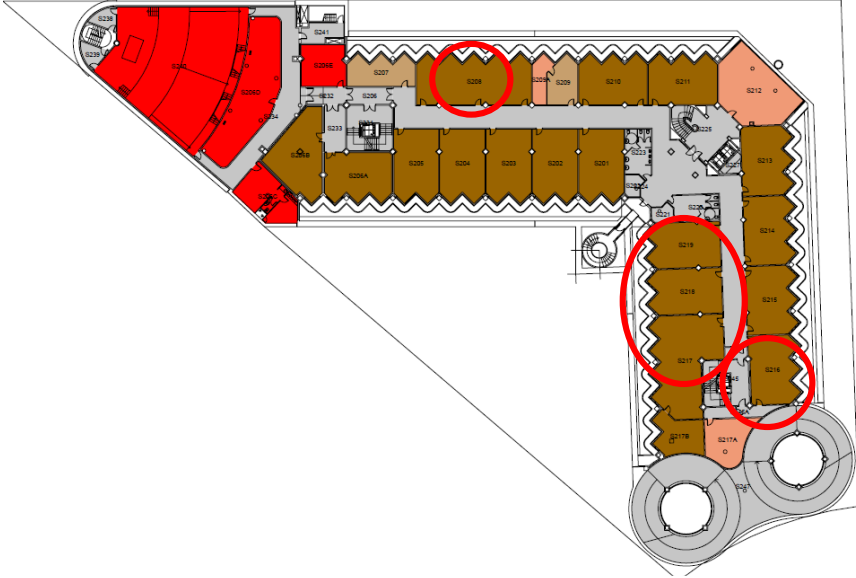
**VÈRTEX VX BUILDING – LEVEL -1**

Sala d'Actes



## VÈRTEX VX BUILDING – LEVEL -2

ROOMS VS208, VS216, VS217, VS218, VS219



### Secretariat Desk Timetable:

Tuesday July 12: 07h30 to 18h30  
Wednesday July 13: 8h00 to 18h00  
Thursday July 14: 9h00 to 16h30

### Internet Access

Wireless Internet access will be available.  
Login name: IABMAS2022  
Password: IABMASbcn22\*

### Social Programme

The Conference Social Programme includes the Welcome Cocktail and the Gala Dinner.

The **Welcome Cocktail** will be held on Monday July 11 2022, 20h30, at **Institut d'Estudis Catalans**, Carrer del Carme, 47, 08001 Barcelona.

Nearest metro station to Institut d'Estudis Catalans is "**Liceu**" (**Line 3**).

The **Gala Dinner** will be held on Wednesday July 13, 21h, in **El Xalet de Montjuïc** Restaurant located in Montjuïc mountain, Avinguda de Miramar, 31, 08038 Barcelona.

You can go to Xalet de Montjuïc by taxi or public transportations.

The easiest way to arrive to Xalet de Montjuïc by public transportation, is to take **metro line 2 or 3** and take the cable car (funicular) from the metro stop **"Paral·lel"**.

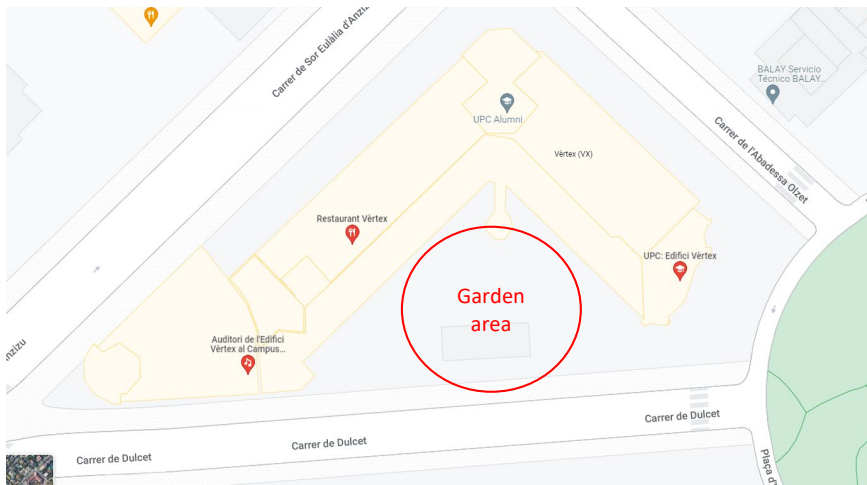
After the gala dinner, a bus service will be provided to return to Barcelona (three stops will be made: Plaça Espanya, Plaça Francesc Macià, Plaça Catalunya).

**Coffee breaks** during Barcelona IABMAS2022 will take place at the Conference Venue, in the garden of the Vèrtex Building at Universitat Politècnica de Catalunya, located at Plaça d'Eusebi Güell, 6, 08034 Barcelona.

Tuesday July 12th – morning and afternoon coffee break

Wednesday July 13th – morning and afternoon coffee break

Thursday July 14th – morning coffee break

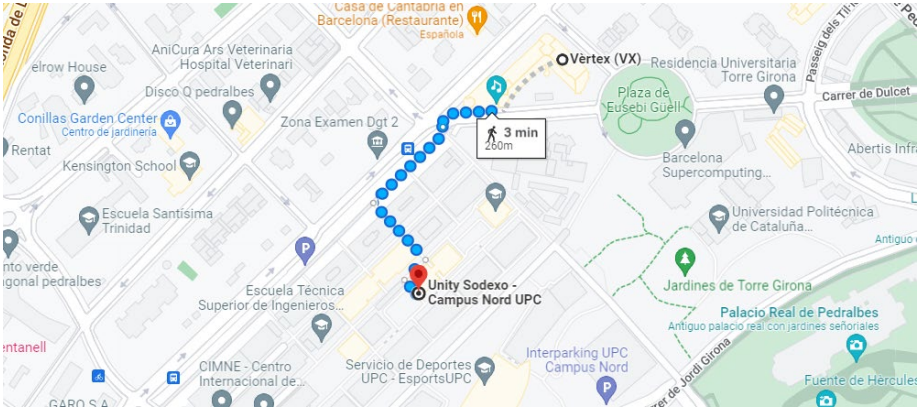


To access the garden area where coffee breaks will be served, you have to go to level -1 of the Vèrtex Auditorium Building or take the outside stairs in front of the Vèrtex VX Building.

Seated **lunches** from Tuesday July 12th to Thursday July 14th will be served in Unity Restaurant at Universitat Politècnica de Catalunya, near the Conference Venue (Unity Sodexo - Campus Nord UPC, Carrer de Jordi Girona, 1-3 PI Telecom-Edifici, B4, 08034 Barcelona).



Walking distance from Vèrtex Building to Unity Restaurant (3 minutes):



**Emergency Calls:**

Emergency: 112  
Ambulance: 061  
Fire Emergency: 080  
Police: 092

**CONFERENCE SECRETARIAT CONGRESS BUREAU**

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**TECHNICAL PROGRAMME OVERVIEW**

MONDAY JULY 11, 2022

16h00 – 20h30 REGISTRATION  
20h30

WELCOME COCKTAIL

TUESDAY JULY 12, 2022

REGISTRATION

07h30

AUDITORIUM

08h30 – 9h00

9h00 – 9h30

TY Lin Lecture:

*Recent Development of Long-Span Arch Bridges in China, Zheng Chen*

Keynote Lecture I:

*Sustainable Bridge Maintenance through Life Time Extension and Optimization, Lars Fuhr Pedersen*

*The New World Record Breaking Bridge-1915Çanakkale, Nurdan Apaydin*

COFFEE BREAK (Garden Vortex Building)

10h30 – 11h00

Technical sessions

Auditorium

Sala d'Actes

VS208

VS216

VS2017

VS2018

VS2019

11h00–12h30

MS3 Part I Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment

MS14 Part I The Submerged Floating Tunnel, a smart infrastructure for waterway crossing

MS1 Life-Cycle Redundancy, Robustness and Resilience of Bridges and Infrastructure Networks under Multiple Hazards

MS2 Part I Risk, Vulnerability and Resilience Assessment of Highway Systems to Extreme Events

SS4 Vibration-Based Monitoring and Damage Identification for Bridges

GS3 Part I Evaluation and Assessment

12h30–14h00

MS3 Part II Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment

MS14 Part II The Submerged Floating Tunnel, a smart infrastructure for waterway crossing

MS12 Realization of Intelligent Bridge with Smart Monitoring System

MS2 Part II Risk, Vulnerability and Resilience Assessment of Highway Systems to Extreme Events

SS6 Bridge Precast and Assembly for Urban Regeneration

GS3 Part II Evaluation and Assessment

14h00–15h00

LUNCH BREAK (Unity Restaurant)

15h00–16h30

MS3 Part III Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment

MS14 Part III The Submerged Floating Tunnel, a smart infrastructure for waterway crossing

MS9 Part I Rehabilitation and Service Life Extension of Historic Railways Bridges

SS7 Part I Intelligent monitoring and maintenance of bridges

SS8 Recent Advances in Bridge Design and Construction

GS3 Part III Evaluation and Assessment

16h30–17h00

COFFEE BREAK (Garden Vortex Building)

17h00–18h30

MS5 Part I Assessment of existing infrastructure assisted by field data

MS7 Design of bridge components considering the impact of micromovements of flexible structures

MS9 Part II Rehabilitation and Service Life Extension of Historic Railways Bridges

SS7 Part II Intelligent monitoring and maintenance of bridges

SS12 BRIDGE150 Research Project: Experimental Testing on a 50-Year-Old PC Bridge

GS4 Part I Service Life and Maintenance

WEDNESDAY JULY 13, 2022

AUDITORIUM

8h30 – 10h00

Keynote Lecture II:

*AI and IoT Convergence Towards Automated Bridge Inspection, Javier Diaz*

*Safety and life extension of road bridges by considering design, damage assessment and rehabilitation, Kiyohiro Imai*

*Twinning of the Egongyan Bridge, Man-Chung Tang*

COFFEE BREAK (Garden Vèrteix Building)

10h00 – 10h30

Technical sessions	Auditorium	Sala d'Actes	VS208	VS216	VS2017	VS2018	VS2019
10h30 – 12h00	MS5 Part II Assessment of existing infrastructure assisted by field data	SS2 Part I Small and medium span bridges and culverts: analysis, evaluation, durability, and rehabilitation	MS6 Strengthening of existing bridges	SS13 Part I Risk-Based Prioritization and Monitoring of Bridges for Road Infrastructure Management in Lombardy Region, Italy	MS11 Part I Bridge Loading – Measurement and Modelling	GS2 Part I Inspection and Monitoring	GS4 II Service Life and Maintenance
12h00 – 13h30	MS5 Part III Assessment of existing infrastructure assisted by field data	SS2 Part II Small and medium span bridges and culverts: analysis, evaluation, durability, and rehabilitation	GS1 Long-Span Bridges	SS13 Part II Risk-Based Prioritization and Monitoring of Bridges for Road Infrastructure Management in Lombardy Region, Italy	MS11 Bridge Loading – Measurement and Modelling	GS2 Part II Inspection and Monitoring	GS4 III Service Life and Maintenance

13h30 – 14h30

LUNCH BREAK (Unity Restaurant)

14h30 – 16h00	MS4 Part I Novel techniques regarding the assessment and monitoring of bridges	SS5 Part I Design, Construction and Evaluation of Steel/FRP & Concrete Composite Bridge Structures	MS8 Part I Footbridges: Advances in Vibration Serviceability Assessment	SS14 Part I Approaches to Bridge Management / Bridge Management Systems in Response to Today's Challenges	MS15 Part I Innovative Solution of Classic Problems in Bridge Design, Construction and Maintenance with Artificial Intelligence	GS3 Part IV Evaluation and Assessment	GS4 IV Service Life and Maintenance
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16h00 – 16h30

COFFEE BREAK (Garden Vèrteix Building)

16h30 – 18h00	MS4 Part II Novel techniques regarding the assessment and monitoring of bridges	SS5 Part II Design, Construction and Evaluation of Steel/FRP & Concrete Composite Bridge Structures	MS8 Part II Design, Construction and Evaluation of Steel/FRP & Concrete Composite Bridge Structures	SS14 Part II Approaches to Bridge Management / Bridge Management Systems in Response to Today's Challenges	MS15 Part II Innovative Solution of Classic Problems in Bridge Design, Construction and Maintenance with Artificial Intelligence	GS3 Part V Evaluation and Assessment	GS5 Part I Repair and Strengthening
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18h00 – 19h00 General Assembly

21h00

GALA DINNER AT XALET DE MONTJUÏC RESTAURANT

THURSDAY JULY 14, 2022

AUDITORIUM

9h30 – 11h00

*Keynote Lecture III:*

*Assessment of existing concrete bridges by load testing, Eva Lantsoght  
Less and Better. Good Design Practices for Sustainable Bridges, Juan Sobrino*

*Bridge Inspection, Evaluation, and Management in the United States, Sreenivas Alampalli*

11h00 – 11h30

COFFEE BREAK (Garden Vèrtex Building)

Technical sessions	Auditorium	Sala d'Actes	VS208	VS216	VS2017	VS2018	VS2019
11h30 – 13h00	MS4 Part III Novel techniques regarding the assessment and monitoring of bridges	MS13 Part I Advances in Bridge Monitoring Strategies: Novel Technologies and Information Fusion	MS10 Part I Emerging digital technologies toward resilient and sustainable bridges	-	SS1 Bridge Weigh-in-Motion: technology developments and applications for maintenance	GS3 VI Evaluation and Assessment	GS5 Part II Repair and Strengthening

13h00 – 14h00

LUNCH BREAK (Unity Restaurant)

14h00 – 14h30

*Keynote Lecture IV:*

*About recent bridge failures, Pier Giorgio Malerba*

14h00 – 16h00	MS4 Part IV Novel techniques regarding the assessment and monitoring of bridges	MS13 Part II Advances in Bridge Monitoring Strategies: Novel Technologies and Information Fusion	MS10 Part II Emerging digital technologies toward resilient and sustainable bridges	-	SS3 Life-Cycle Performance Safety, Reliability, and Risk of Bridges and Infrastructure Systems under Climate Change	GS3 VII Evaluation and Assessment	GS5 Part III Repair and Strengthening
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16h00 – 16h30

CLOSING CEREMONY

## FULL TECHNICAL PROGRAMME

Tuesday, July 12

08:30 - 09:00

**Opening Session**

09:00 - 09:30

**TY Lin Lecture**

TuMP

Room: Auditorium

Chair: Dan Frangopol

Co-Chair: Dan Frangopol

**Recent development of long-span arch bridges in China**

*Z. Chen*

09:30 - 10:30

**Keynote Lectures I**

TuMP

Room: Auditorium

Chair: Jens Sandager Jensen

Co-Chair: Joan Casas

**Sustainable Bridge Maintenance through Life Time Extension and Optimization**

*L.F. Pedersen*

**The New World Record Breaking Bridge-1915Çanakkale**

*N. Apaydin*

10:30 - 11:00

**Coffee break**

11:00 - 12:30

**TECHNICAL SESSIONS**

**MS3 Part I - Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment**

organized by Mitsuyoshi Akiyama, Dan Frangopol and Hiroshi Matsuzaki

TuM1

Room: Auditorium

Chair: Upul Attanayake

**Causal Evaluation of Fascia Beam Deterioration in a Fleet of PC I-Beam Bridges**

*A.R.M. Amunugama and U.B. Attanayake*

**Deep reinforcement learning-based life-cycle management of deteriorating transportation systems**

*M. Saifullah, C.P. Andriotis, K.G. Papakonstantinou and S.M. Stoffels*

**Assessing bridge conditions using visual inspection following a risk-based methodology**

*N. Bertola and E. Brühwiler*

**Reconstruction of 3D model and performance analysis of high strength steel wire with rust pit**

*T.Z. Cheng, Y. Pan, Y.Q. Dong and D.L. Wang*

**Automatic Tiny Crack Inspection on Bridge Surfaces using Attention-based Encoder-decoder Architecture**

*L.D. Deng, H.C. Chu and W.W. Wang*

**Development of Self-maintenance Model for small bridges performed by local residents**

*W.A. Asano and I.I. Iwaki*

**MS14 Part I - The Submerged Floating Tunnel, a smart infrastructure for waterway crossing organized by Yiqiang Xiang, H.K Lee, Beatrice Faggiano and Raffaele Landolfo and Luca Martinelli**

TuM2  
Room: Sala Actes  
Chair: Beatrice Faggiano

**Construction simulation of submerged floating tunnel**

*B.M. Jin*

**Tuned mass damper application for submerged floating tunnel under wave and seismic excitations**

*C. Jin, S.J. Kim and M.H. Kim*

**Convolutional neural network-based damage detection of the tethers of submerged floating tunnels using structural response data under various incident waves**

*S. Min, K. Jeong, Y. Noh, S. Kim and D. Won*

**Assessment of total hydrodynamic pressure distribution on the Submerged Floating Tunnels**

*S.J. Kim, C. Jin and M.H. Kim*

**Simultaneous displacement and cable force estimation for submerged floating tunnel based on strain and acceleration measurements**

*Z. Ma, J. Choi and H. Sohn*

**A semi-analytical model for the design and optimization of SFTs under seismic loading**

*F. Foti, L. Martinelli and F. Perotti*

**Recent advancements on binary or ternary binders for chloride resistance**

*S. Kim, H.N. Yoon, J. Seo, J.-H. Bae and H.K. Lee*

**MS1 - Life-Cycle Redundancy, Robustness and Resilience of Bridges and Infrastructure Networks under Multiple Hazards organized by Fabio Biondini and Dan Frangopol**

TuM3  
Room: Room VS208  
Chair: Fabio Biondini  
Co-Chair: Michel Ghosn

**Failure times of deteriorating RC bridges under uncertainty.**

*L. Capacci, F. Biondini and D.M. Frangopol*

**Structural redundancy and robustness analysis of highway bridge superstructures**

*G.F. Fiorillo and M.G. Ghosn*

**Redundancy Evaluation of Twin Steel Box Girder Bridges**

*M.A. Abedin, A.B.M Mehrabi, A.A Azizinamini, M.G. Ghosn, A.S.N Nowak and A.R.B Babu*

**Reliability assessment of railway bridges under high-speed traffic by considering the track quality and the system randomness**

*P. Yuan, Y. Dong and D. Frangopol*

**Eulerian-Lagrangian Simulation of Wave Impact on Coastal Bridges**

*A. Majlesi, R. Nasouri, D. Amory, A. Montoya, A. Du, A. Matamoros and A. Shahriar*

**Robustness evaluation on galloping stability of bridge local structure**

*J.L. Li, X.Q. Qiao and H.L. Li*

**MS2 - Risk, Vulnerability and Resilience Assessment of Highway Systems to Extreme Events**  
organized by Andre Beck, Gustavo H. Siqueira and Luiz Vieira

TuM4  
Room: Room VS217  
Chair: Matias Valenzuela  
Co-Chair: Daniel Herrera

**Probabilistic connectivity assessment of bridge networks under seismic hazard considering the spatial correlation of ground motion-induced damage**

*K.A. Aoki, M.A. Akiyama, Y.F. Fuse, H.I. Ishibashi and D.M. Frangopol*

**Impact analysis of asphalt pavement against PC bar protrusion using Applied Element Method**

*A.D. Bongor, A. Hosoda, H. Salem and T. Fukaya*

**Framework for Determining the Dominant Hazard of Bridges under Flood and Seismic Hazards**

*P.F. Firdaus, M.A. Akiyama, H.M. Matsuzaki, D.F. Frangopol and H.I. Ishibashi*

**Probabilistic demand hazard assessment of RC bridges under seismic loading**

*D. Herrera and D. Tolentino*

**State of art of GRDR methodology. Cases of study applied in Chile**

*P. Moraga, M.A. Valenzuela, H. Pinto, L. Jorquera, A. Peña-Fritz, M. Marquez and F. Alvarez*

**Resonances of highway bridges induced by autonomous truck platooning**

*T.Y. Ling, W. He, H.B. Wu and L. Deng*

**SS4 - Vibration-Based Monitoring and Damage Identification For Bridges**  
organized by Maria Pina Limongelli and Necati Catbas

TuM5  
Room: Room VS218  
Chair: Maria Pina Limongelli  
Co-Chair: Necati Catbas

**Investigation and Comparative Evaluation of a Prestressed Concrete Highway Bridge**

*A. AlGadi, F. Luleci, M. Debees, C.Z. Dong and F.N. Catbas*

**An indirect approach for long term monitoring of bridge health**

*R. Corbally and A. Malekjafarian*

**A Displacement Measurement Method Based on Special Image Signs**

*J.C. Liu, Y. Pan, D.L. Wang, Y.P. Ji and Z.T. Zhou*

**The role of curvatures in damage identification**

*F. Vestroni, A. Pau and J. Ciambella*

**Subspace identification of bridge frequencies using a traversing vehicle**

*N. Jin, E. G. Dimitrakopoulos and L. S. Katafygiotis*



**General Session 3 (Part I) - Evaluation and Assessment**

TuM6  
 Room: Room VS219  
 Chair: Riyadh Hindi  
 Co-Chair: Matias Valenzuela

**A mechanistic approach to infer the load capacity of highway bridges with insufficient as-built data**

*J. S. Spinel Peñuela, J. C. Reyes Ortiz, J. E. Acosta Salinas, N. Garcia Carvajalino, C. F. Duran Guzman, G. K. Arias Carrillo, J. F. Correal Daza and E. E. Muñoz Díaz*

**Study on temperature distribution of steel bridge under solar radiation**

*R. Sun, Y. Suzuki, Y. Kitane and K. Sugiura*

**Derivation of seismic vulnerability functions for conventional highway bridges in Colombia**

*J. C. Reyes Ortiz, J. S. Spinel Peñuela, J. F. Correal Daza and C. M. Vallejo Paladines*

**Steel-concrete composite bridge optimization through threshold accepting**

*D. Martínez-Muñoz, J.V. Martí and V. Yepes*

**Frictional load transfer of high strength bolted connection in post-slip behavior focused on bolt preload**

*T. Takai*

**Non-Destructive Evaluation of Grout Unfilled PC Duct Including Water Staying Condition**

*Y. Ishida and K. Suzuki*

**Identification of moving truck load on T-girder bridge using wavelet threshold de-noising method**

*J. Wu, M. Yang, Z.X. Dong, Y. C. Bian and C.Y. Kong*

**SS9 - Steel Bridge Rehabilitation organized by Masahiro Sakano**

TuM7  
 Room: Room VS216  
 Chair: Masahiro Sakano

**Research on the fatigue crack detection by strain measurement under unloading condition**

*T. Ishikawa, N. Matsumoto and N. Ueda*

**Thermal effect on shear fatigue of headed stud connectors in steel-concrete composite girder bridges**

*C.-S. Wang, G.-S. Wu and Y.-Z. Wang*

**The fatigue enhancement of a multispan steel box girder viaduct in the UK due to the cyclic distortional effects**

*K. Antonou, J.M. Bonnett and R.A. Percy*

**Required length of CFRP and energy release rate for CFRP jointed steel tubes under pure bending conditions**

*M. Mizutani and T. Ishikawa*

**Fatigue Durability of Vertical Stiffener to Deck Connection.**

*A. Tanabe, H. Konishi, T. Kano, K. Numa and M. Sakano*

**Numerical simulation of UHPFRC reinforcement for distortion-induced fatigue details in steel girder bridges**

*C.-S. Wang, C.S. and Y.-Z. Wang*

**Analytical Evaluation of Fatigue resistance of Vertical Stiffener to Deck Connection details in Orthotropic Steel Decks**

*A. Tanabe, K. Numa and M. Sakano*

**One-sided Repair of Steel Girder End Having Corroded Bearing Stiffeners with High-Strength Bolted Doubler Plate**

*H. Moriyama, Yu Lang, G. Hayashi and T. Yamaguchi*

12:30 - 14:00

**TECHNICAL SESSIONS**

**MS3 Part II - Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment**  
 organized by Mitsuyoshi Akiyama, Dan Frangopol and Hiroshi Matsuzaki

TuA1  
 Room: Auditorium  
 Chair: Bruno Briseghella

**FE approach to assess the combined effect of ASR and steel corrosion on bridge structures**  
*R.V. Gorga, B. Martín-Pérez, L.F.M. Sanchez and M. Noël*

**Fatigue tests on cutout in rib-to-floor beam connections of steel bridges.**  
*R. Hao, W. Lin and N. Taniguchi*

**Numerical simulation method for shrinkage of concrete material**  
*Y Li, X Ruan and Y.L. Yi*

**Multiphysics modelling and structural analysis of RC bridge columns exposed to chlorides under cyclic loading**  
*A. Pelle, B. Briseghella, A.V. Bergami, G. Fiorentino, G.F. Giaccu, D. Lavorato, G. Quaranta, A. Rasulo and C. Nuti*

**New algorithm of Acoustic Emission Tomography that considers change of emission times of AE events during identification of elastic wave velocity distribution**  
*Y. Kobayashi, K. Nakamura and K. Oda*

**MS14 Part II - The Submerged Floating Tunnel, a smart infrastructure for waterway crossing**  
 organized by Yiqiang Xiang, H.K Lee, Beatrice Faggiano and Raffaele Landolfo and Luca Martinelli

TuA2  
 Room: Sala Actes  
 Chair: Luca Martinelli

**Submerged Floating Tunnels: recent research activity at Politecnico di Milano**  
*F. Foti, L. Martinelli, M.G. Mulas and F. Perotti*

**Experimental study on corrosion behavior of steel in submerged floating tunnels(SFT)**  
*J.C. Park and H.J. Jung*

**Semi-analytical Method of Analyzing Vertical Vibration Response of Submerged Floating Tunnel Under Moving Load**  
*Y.Q. Xiang, C.Q. Gao and Y.S. Yang*

**Industry-University-Research Cooperation in China Accelerates the Research and Development of Intelligent SFT**  
*Y.Q. Xiang, K. S. Wu , Y.S. Yang, L.L. Jin and K. Chen*

**Overview of experimental tests on SFT small scale specimen**  
*G. Iovane, E. Begovic, E. Bilotta, B. Faggiano, R. Landolfo and F. M. Mazzolani*

**The coupled dynamic response of a prototype SFT to high speed trains.**  
*M.G. Mulas, L. Martinelli and S. Zambon*

**MS12 - Realization Of Intelligent Bridge With Smart Monitoring System**  
organized by Ayaho Miyamoto, Akito Yabe, Ludovic Fülöp and Timo Tirkkonen

TuA3  
Room: Room VS208  
Chair: Ayaho Miyamoto  
Co-Chair: Ludovic Fülöp

**Bridge frequency identification using vibration responses from sensors on a passing vehicle**  
*Y. Lan, W. Lin and Y. Zhang*

**smartBRIDGE Hamburg: a digital twin to optimise infrastructure maintenance**  
*M.W. Wenner, M.M.W. Meyer-Westphal, M.H. Herbrand and C.U. Ullerich*

**A study on the intelligent bridge with an advanced monitoring system**  
*A.M. Miyamoto and A.Y. Yabe*

**Feasibility study on the intelligent bridge combined with smart monitoring techniques**  
*A.M. Miyamoto, P.H. Hradil and I.H. Hakola*

**Full review of low-cost electronics implemented in Structural Health Monitoring Applications for Bridges**

*M. Komary, S. Komarizadehasl, N. Tošić, G. Ramos, J. Turmo and V. Torralba*

**Smart monitoring system for stress-laminated timber bridges**  
*P.H. Hradil, S. Fortino, K. Koski, J. Mäkinen and L. Fülöp*

**Utilization of dynamic interaction analysis between a bridge and vehicles for the intelligent bridge**  
*A.Y. Akito*

**SS6 - Bridge Precast and Assembly for Urban Regeneration**  
organized by Zhiqiang Wang

TuA5  
Room: Room VS218  
Chair: Juan José Jorquera-Lucerga

**Application of Ultra-High Performance Concrete in Bridge Strengthening**  
*X. Li, L. Zhou, Y. Lu, J. Peng and L. Cheng*

**Research on Key Technologies for Precast Concrete Bridge Piers and Bent Caps**  
*Z. Yin, L. Zhou, X. Li, J. Peng, X. Yan and Y. Wu*

**Investigation and verification on seismic performances of precast bridge piers with new type of pedestal connections**  
*J. Zhang, Z. Wu and Z. Wang*

**Theoretic analysis of precast bridge pier subjected to shear failure via direct shear test**  
*H.Q. Qu, C.W. Wu, H.L. Lv, X.Y. Yan and Z.W. Wang*

**General Session 3 (Part II) - Evaluation and Assessment**

TuA6  
Room: Room VS219  
Chair: Tomasz Kaminski

**Ground-Based Interferometer radars for load tests of long-span arch bridges. Case study: Almonte and El Tajo Viaducts, Extremadura, Spain.**

*A. Rodríguez, J.V. Fuente, R. Fabregad, J.A. Álvarez, R. Chacón and C. Ramonell*

**Preliminary comparison of scour estimation methods**

*G. Gavriel, P.J. Vardanega and M Pregnolato*

**Bridge Pier Column Multi-hazard Response – Fire, Impact and Blast**

*Q.A. Alomari and D.G. Linzell*

**Analytical investigation of the shear-carrying mechanism of reinforced concrete beams under axial compression**

*H.N. Nagai and T.K. Kanazawa*

**Assessment of Impact Resistance Performance of a Cable-Stayed Bridge subjected to Light Aircraft Impact**

*K. Choi, J. Lee, C.H. Chung and J. Yoon*

**An Analytical Study on Local Buckling Strength of Box Stub-Columns made of SBHS500 Under Axial Compression**

*R.Y. Yamazaki, N.T. Takeshima, S.O. Okada, Y.K. Kitane, M.M. Matsumura and K.O. Ono*

**14:00 - 15:00**

**Lunch break**

**15:00 - 16:30**

**TECHNICAL SESSIONS**

**MS3 Part III - Life-Cycle Performance Assessment of Existing Bridges in an Aggressive Environment organized by Mitsuyoshi Akiyama, Dan Frangopol and Hiroshi Matsuzaki**

TuE1  
Room: Auditorium  
Chair: Giuseppe Quaranta

**Physics-based Modelling of Construction Defects in Concrete Decks**

*M.S. Salmeron, N.M.C. Criner, X.Z. Zhang, S.J.D. Dyke, J.R. Ramirez, B.W. Wogen and A.R. Rearick*

**Study on the Fatigue Resistance of Precast Road Bridge Deck with The Newly Developed Joint under Ponding Water**

*Z. He, T. Maeshima, M. Hosotani and I. Iwaki*

**Effects of two corrosion acceleration methods on spatial steel corrosion and structural performance of RC beams**

*S. Iim, J. Xin, M. Akiyama, D.M. Frangopol, Z. Xu, A. Li and S. Miyazato*

**A Novel Risk-Based Inspection and Strength Evaluation of Suspension Bridge Main Cable Systems**

*M.S. Shen, R.B. Betti and G.D. Deodatis*

**Performance of retrofitted bridges by seismic isolation considering aging of isolators**

*H. Matsuzaki*

**MS14 Part III - The Submerged Floating Tunnel, a smart infrastructure for waterway crossing organized by Yiqiang Xiang, H.K Lee, Beatrice Faggiano and Raffaele Landolfo and Luca Martinelli** TuE2  
 Room: Sala Actes  
 Chair: Beatrice Faggiano  
 Co-Chair: Luca Martinelli

**Analysis of dynamic response of shore connection segment of submerged floating tunnel.**  
*S.J. Kang, J. Kim, J. Park and G.C. Cho*

**Saipem's Submerged Floating Tunnel Concept – An Industry and University Cooperation to Drive Innovation in Civil Infrastructures**  
*G. Chiesa, B. Faggiano, R. Landolfo, L. Martinelli, F.M. Mazzolani, F. Perotti and M.G. Mulas*

**Dynamic Transient Analysis of a Submerged Floating Tunnel By Collision Impact**  
*M. Kim, S. Lee and J.-W. Hong*

**MS9 Part I - Rehabilitation And Service Life Extension Of Historic Railways Bridges** TuE3  
 Room: Room VS208  
 Chair: Francesco Petrini  
 Co-Chair: Gianluca Ascari  
**organized by Pier Giorgio Malerba, Franco Bontempi, Emanuele Lizzori and Marcello Vaccarezza and Daniele Corti and Gianluca Ascari**

**Management and Extension of Service Life of a Railway Bridge**  
*F. Bontempi, F. Petrini, M. Mazzacane, M. Ronchi, M. Monno and R. Priscopo*

**Monitoring the San Michele Railway Bridge after the refurbishing works**  
*G. Ascari, M. Di Mercione, A. Terraneo and A. Dalle Fratte*

**Seismic retrofit of a simply supported truss girder in Seto-Ohashi Bridges**  
*T. Kaneda, K. Imai and M. Nishitani*

**The San Michele Bridge in Paderno d'Adda through 130 years of service**  
*M. Di Mercione and E. Lizzori*

**San Michele Railway Bridge (Paderno, Italy). A critical issue: demolition or refurbishment?**  
*L. Cavacchioli and G. Spirolazzi*

**Carbonation resistance of bridge concrete with graphene oxide modified epoxy resin top-coats**  
*T. Gao, G. Li, Y. Ding, Y. Zhang and C. Fan*

**SS7 Part I - Intelligent monitoring and maintenance of bridges** TuE4  
 Room: Room VS217  
 Chair: Michael Chajes  
 Co-Chair: Tomasz Howiacki  
**organized by Amir Alani, Mojtaba Mahmoodian, Alireza Khaloo and Sujeeva Setunge and Kevin Zhang**

**The monitoring, refurbishment and remediation of existing bridge bearings**  
*K. Antoniou and R.A. Percy*

**Distributed fibre optic sensing for safety monitoring of concrete, steel and composite bridges**  
*R. Sierko, Ł. Bednarski and T. Howiacki*

**Prestressed Bridges - Eventually not a Problem**  
*B.H. Hillemeier, S.K. Knapp and T.L. Luther*

**Sensor Data Alignment for Multi-View Bridge Monitoring**  
*V.T. Hong, T. Doan and A. Takasu*

**Assessment of water absorption in concrete member by electrical resistance tomography**  
*K. Kawai and T. Nishida*

**Crack detection inside concrete based on specific resistivity monitoring**  
*T.N. Takahiro and K.K. Keiyu*

**SS8 - Recent Advances in Bridge Design and Construction**  
 organized by Upul Attanayake

TuE5  
 Room: Room VS218  
 Chair: Upul Attanayake  
 Co-Chair: Arjuna Ranasinghe

**Instrumentation and Monitoring Plan for the 2nd Avenue Network Arch Bridge with Posttensioned Tie Girders**

*A.R.M. Amunugama, U.B. Attanayake, H. Aktan, M. La Violette and M. Chynoweth*

**Creep and Shrinkage Estimation for Low-Heat Concrete Mix Used in the 2nd Avenue Network Arch Bridge**

*K. Basnayake, U.B. Attanayake, M. LaViolette and M. Chynoweth*

**Innovative Construction Method of Two Bridges in Hong Kong**

*Y.H Chong, A.A Sun, E. Ho and N. Hussain*

**Research status and latest development of buckling restrained bracing**

*C. Li, H. Li and W. Li*

**Size effect of a low-cost sliding isolation system with a flat-inclined spherical shape**

*M.Y. Yajima, M.A. Akiyama, M.B. Brito, H.K. Kashiya, R.H. Honda, N.I. Ishigaki and H.T. Takahashi*

**General Session 3 (Part III) - Evaluation and Assessment**

TuE6  
 Room: Room VS219  
 Chair: Tomasz Kaminski

**Numerical Study on UHPC-RC Deck within Hogging Moment Region**

*R. Zhou, H. Ma, X. Shi, X. Li and J.A. Lozano-Galant*

**Dynamic Performance of Twin-I Composite Girder Bridges Subjected to Random Traffic Excitation**

*J.Y. Zhou, Z.Y. Tan, Z.N. Zhou and H.Y. Ma*

**A risk-based evaluation of a prestressed concrete bridge**

*S.J. Sarmiento, R.S. Díaz, I. Björnsson, S. Thöns, J. Gonzalez-Libreros and G. Sas*

**SS10 - Data-driven asset management – The Scandinavian Way**  
 organized by Jens Sandager Jensen, Lars Fuhr Pedersen and Poul Linneberg

TuE7  
 Room: Room VS216  
 Chair: Jens Sandager Jensen  
 Co-Chair: Poul Linneberg

**Data-driven Asset Management of bridges and structures on the state roads of Denmark**

*M.E. Ebbesen*

**Condition Based Monitoring and Digital Twins: Damage Detection on a Norwegian Bridge**

*A. Hagen, T. Andersen, M. Reiso and K. Sletten*

**Unmanned Aerial Vehicle (UAV) supported bridge inspections**

*P. Linneberg, F.M. Jensen, E.D. Hartwich and P. Holt*

**Bridge Safety and Accessibility Improvements on the Storebælt bridges including a Model for Wind induced Vehicle Overturning**

*L.F. Pedersen*

**Data-driven asset management-projects by the Swedish Transport Administration**

*O. Aronsson and H. Pétursson*

16:30 - 17:00  
Coffee break

17:00 - 18:30  
TECHNICAL SESSIONS

**MS5 Part I - Assessment of existing infrastructure assisted by field data**  
organized by Eva Lantsoght, Yuguang Yang and Sreenivas Alampalli

TuN1  
Room: Auditorium  
Chair: Eva Lantsoght  
Co-Chair: Sreenivas Alampalli

**Reliability assessment of existing reinforced concrete bridges and viaducts through proof load testing**

*R. de Vries, E.O.L. Lantsoght, R.D.J. Steenbergen and S.A.A. Fennis*

**Humber Bridge hanger replacements and testing, UK**

*C. Hendy, D. Bishop, C. Mundell and A. Arundell*

**Modal Testing of a Riveted Metallic Bridge under Different End Conditions**

*S. Biswal, B. Imam, Y. Wang, M.K. Chryssanthopoulos and N. Aleksieva*

**Monitoring of a Suspension Bridge**

*L.L. Lai*

**Results from a Decade of Periodically Conducted Load Tests on a Cable-Stayed Bridge**

*C. Aloupis, T. Shenton and M. Chajes*

**MS7 - Design of bridge components considering the impact of micromovements of flexible structures**  
organized by Simon Hoffmann

TuN2  
Room: Sala Actes  
Chair: Simon Hoffmann  
Co-Chair: Esther Real

**Solutions for eliminating fretting fatigue due to micromovement in friction saddles**

*H. Fan and B. Manshadi*

**EADs as a new level of expansion joint assessment**

*S. Hoffmann and N. Meng*

**Long-term movement behaviour of bridge bearings and joints from SHM**

*A. Chrysovergis, T. Richli and N. Meng*

**Fracture-critical bridge components subject to fatigue loading**

*S.B. Mendes, R. Abbasi, N. Abraham and L. Cao*

**Wind-induced vibration of lamp posts on a long bridge over open water and its vibration reduction analysis**

*H.Q. Li, D.L. Wang and Y. Pan*

<p><b>MS9 Part II - Rehabilitation And Service Life Extension Of Historic Railways Bridges</b>  <b>organized by Pier Giorgio Malerba, Franco Bontempi, Emanuele Lizzori and Marcello Vaccarezza and Daniele Corti and Gianluca Ascari</b></p>	<p>TuN3                  Room: Room VS208                  Chair: Konstantinos Gkoumas                  Co-Chair: Gianluca Ascari</p>
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**Assessment of a centenary iron bridge of the Domodossola-Locarno railway line**

*D. Corti, A. Menghini, E. Conti and P.G. Malerba*

**The San Michele Bridge in Paderno d'Adda (Italy): retrofitting design criteria**

*M. Vaccarezza, P.G. Malerba, L. Crespo and P. Galli*

**San Michele Railway Bridge (Paderno, Italy). The retrofitting works: a demanding task.**

*M.F. Carera, P. Pancini and M. Di Mercione*

<p><b>SS7 Part II - Intelligent monitoring and maintenance of bridges organized by Amir Alani, Mojtaba Mahmoodian, Alireza Khaloo and Sujeeva Setunge and Kevin Zhang</b></p>	<p>TuN4                  Room: Room VS218                  Chair: Michael Chajes                  Co-Chair: Tomasz Howiacki</p>
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**Establishing threshold values for use in structural health monitoring**

*J. Chen, M. Chajes and T. Shenton*

**A novel ropeway-based system for bridge apparent scanning**

*Y. Pan, X.L. Zhuang, D.L. Wang and H Tian*

**Using Few Accelerometer for Improving the Resolution and Accuracy of Low- Cost Accelerometers**

*S. KomarizadehAsl, M. Komary, F. Lozano, V. Torralba, J.A. Lozano-Galant and J. Turmo*

**Developing and validation of an Inclinometer sensor based on fusion of a magnetometer, an accelerometer and a gyroscope sensor for SHM applications**

*M. Komary, S. Komarizadehasl, G. Ramos and V. Torralba*

**Measurement of 3C component displacement of full-scale structures using an unmanned aerial system (UAS)**

*B.J. Perry and Y. Guo*

<p><b>SS12 - BRIDGE 50 Research Project: Experimental Testing on a 50-Year-Old PC Bridge</b>  <b>organized by Fabio Biondini, Francesco Tondolo, Sergio Manto and Carlo Beltrami</b></p>	<p>TuN5                  Room: Room VS218                  Chair: Fabio Biondini                  Co-Chair: Francesco Tondolo</p>
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**Experimental Program and Recent Outcomes of the BRIDGE|50 Research Project: Residual Structural Performance of a 50-year-old PC Bridge**

*F. Biondini, F. Tondolo, S. Manto, C. Beltrami, M. Chiara, B. Salza, M. Tizzani, B. Chiaia, A. Lencioni, L. Panseri and L. Quaranta*

**Full-scale testing and analysis of 50-year old prestressed concrete bridge girders**

*F. Tondolo, D. Sabia, B. Chiaia, A. Quattrone, P. Savino, F. Biondini, G. Rosati and M. Anghileri*

**Experimental evaluation of the effect of controlled damages on the dynamic response of PC bridge beams**

*D. Sabia, A. Quattrone, F. Tondolo and P. Savino*

**Formulation and Experimental Validation of Nonlinear Finite Element Analysis of PC Bridge Deck Beams**

*M. Anghileri and F. Biondini*

**BIM as a tool for experimental tests on bridge beams**

*D. Rodriguez, F. Tondolo, A. Osello and C. Trincianti*

**Corrosion assessment of 50-year-old PC deck beams M. Carsana**

*M. Carsana, F. Biondini, E. Redaelli and D.O. Valoti*



**General Session 4 (Part I) - Service Life and Maintenance**

TuN6  
Room: Room VS219  
Chair: Rolando Chacón  
Co-Chair: Eftychia Apostolidi

**State-of-the-art review on the structural behaviour of stainless steel reinforced concrete elements**

*H. Moodley, S. Afshan, S. Blainey and J. Preston*

**Approximated performance curve for steel bridges under joint state of probability of collapse, following the Weibull reliability model of cumulative damage.**

*F.A. Nunez-Moreno, L.F. Lozano-Acosta, J.F. Correal-Daza and F. Ramirez-Rodriguez*

**Prefabricated Elements and Foundation Options for Rural Bridges**

*U. Attanayake*

**Cost-effective life cycle treatment plans: A case study for Wisconsin decks**

*B. Bektas and A.J. Albughdadi*

**Maintenance plan and durability design for the new Samuel De Champlain Bridge.**

*M. Nader, C. Choi, N. Vo and A. Sanjines*

**Catamaran spherical bearings**

*P. Günther and A. Lanzoni*

**SS11 - Data-driven asset management organized by Jens Sandager Jensen, Lars Fuhr Pedersen and Poul Linneberg**

TuN7  
Room: Room VS216  
Chair: Jens Sandager Jensen  
Co-Chair: Poul Linneberg

**Quality confirmation of two typical acceleration data based on Benford's law**

*Z.W. Li, Y. Pan and D.L. Wang*

**Improved Structural Health Monitoring of Great Belt Bridge hangers and deck using Digital Image Correlation**

*J. Winkler, F. Bormlund and M. Havelykke*

**Developing risk-based and multi-objective optimization approach to railway bridge management in Finland**

*J. Wuorenjuuri*

## Wednesday, July 13

**08:30 - 10:00**  
**Keynote Lectures II**

WeMP  
Room: Auditorium  
Chair: Jose Turmo  
Co-Chair: Fabio Biondini

**AI and IIoT Convergence Towards Automated Bridge Inspection**

*J. Diaz*

**Safety and life extension of road bridges by considering design, damage assessment and rehabilitation**

*K. Imai*

**Twinning of the Egongyan Bridge**

*X. Chen, Y. Qi and M.C. Tang*

**10:00 - 10:30**  
**Coffee break**

**10:30 - 12:00**  
**TECHNICAL SESSIONS**

**MS5 Part II - Assessment of existing infrastructure assisted by field data**  
**organized by Eva Lantsoght and Yuguang Yang**

WeM1  
Room: Auditorium  
Chair: Eva Lantsoght  
Co-Chair: Yuguang Yang

**Bridge deck fatigue: A case for proactive preventive bridge management**

*P.S. McCarten*

**Research experience obtained from dynamic load testing of railway bridges at a high speed line**

*P. Olaszek, A. Matysek, J. Skawiński and W. Szaniec*

**Research on temperature gradient of concrete hollow column along the horizontal thickness direction**

*W.Q.P Peng, W.L.L Lu and F.L.L Li*

**Comparison of results of different approaches to load rating bridges and culverts with missing information**

*S. Rupp, J. Tatar, D. Wagner and H.W. Shenton*

**Comparative study of bridge structural condition assessment methodologies**

*C.A.F. Souza, J.M.F. Carvalho, D.S. Oliveira, A.C.P. Martins, F.G. Bellon, R.C. Verly, G.S. Santos, M.C.S. Alvarenga, K.M.L Cesar and J.C.L. Ribeiro*

**Estimation of the bridge damping decrement for in-situ recorded signal with unusual features**

*K. Tomaszkiwicz and T. Owerko*

**SS2 Part I - Small and medium span bridges and culverts: analysis, evaluation, durability, and rehabilitation organized by Damian Beben, Halil Sezen, Jan Vaslestad and Tomasz Maleska** WeM2  
Room: Sala Actes  
Chair: Damian Beben  
Co-Chair: Halil Sezen

**Proposal of a Continuous PC T-girder for Integral Abutment Bridges**

*J.Q. Xue, H. Shao, S. Ma, B. Briseghella and F.Y. Huang*

**Field Load Testing and Analysis of a New FRP Composite Tub Girder Bridge with a Concrete Deck**

*W.G. Davids and A.P. Schanck*

**Bridge design and rehabilitation using new sandwich plate system (SPS)**

*R.V. Gorga, N. Little, R. Maier and S. Gettler*

**Diagnostic Load Testing and Assessment of a Deteriorated Culvert**

*T. DuBose, S. Safari, H. Shenton, J. Tatar, M. Chajes, J. Karam, J. Hastings and M. Head*

**Exterior Protection of Precast Reinforced Concrete Culvert Structures**

*B. Kasapoglu, H. Sezen and K. White*

**Rehabilitation and Repair Methods for Culvert Structures**

*H. Sezen*

**MS6 - Strengthening of existing bridges organized by Altanzagas Ochirdorj and Tsas-Orgilmaa Makhbal** WeM3  
Room: Room VS208  
Chair: Altanzagas Ochirdorj  
Co-Chair: Tsas-Orgilmaa Makhbal

**Retrofitting of prestressed concrete decks by arch steel trusses for different degradation levels**

*R. Cucuzza, M. Rosso, M. Domaneschi and G. Marano*

**Strengthening two damaged bridges in the motorway M-410 in Madrid**

*C. Jurado*

**Current status and maintenance system of bridges in Mongolia**

*T.-O. Makhbal, K. Sambuu, B. Rentsen, S. Namsrajav, B. Terbish, U. Altangerel, E. Davaanyam and A. Chogsom*

**The diagnosis of old railway steel bridge over the Kharaa river**

*A. Ochirdorj, T.-O. Makhbal, D. Yagaanbuyant and M. Duinkherjav*

**Traffic barriers replacement and deck surface reparation of Las Lamas viaduct in León (Spain)**

*J. Rodado and F. Otero*

**Replacement of the deck and rehabilitation of the viaduct at the link between M-40 and M-607 in Madrid (Spain)**

*J. Rodado and F. Otero*

**MS11 Part I - Bridge Loading – Measurement and Modelling**  
organized by Colin Caprani, Andrzej Nowak, Eugene OBrien and  
Xin Ruan

WeM4  
Room: Room VS217  
Chair: Colin Caprani  
Co-Chair: Xuejing Wang

**Impact of truck platooning on bridges' braking forces**

*M. Breveglieri, M. Sjaarda, A. Nussbaumer and G. Feltrin*

**Experimental validation of a moving force identification method for applications in railway  
bridge dynamics**

*A. Firus, R. Kemmler, G. Lombaert, J. Schneider and H. Berthold*

**Ballast coupling on simply-supported railway bridges with twin decks**

*M.D. Martínez, J.C. Sánchez, E. Moliner, P. Galvin and A. Romero*

**Correlation analysis of bridge traffic load level and socio-economic development: A case study  
on Sutong Bridge**

*Y. Wei, X. Ruan, L.P. Feng and X.J. Wang*

**General Session 2 (Part I) - Inspection and Monitoring**

WeM5  
Room: Room VS218  
Chair: Ignacio Pulido  
Sanchez  
Co-Chair: Juan Avendaño

**The monitoring system of the first metal 3D printed bridge: design, installation, management  
and initial findings**

*R. Kromanis and G. Buchanan*

**N80-S1 River Slaney bridge monitoring and fatigue assessment**

*A. Barrias, J. Martínez-García and P. Moore*

**Ratio-based features for bridge damage detection based on displacement influence line and  
curvature influence line**

*A. Döring, M. Vogelbacher, O. Schneider, J. Müller, S. Hinz and J. Matthes*

**Simulation of stress wave propagation and cracking in RC beams for damage detection using  
local vibration testing**

*R. Hashimoto, H. Naito, S. Ichimaru and J.E. Bolander*

**Experiences in the inspection of large number of bridges with new Italian Guidelines for  
inspection and management of existing bridges**

*P.F. Franchetti, S.V. Vernizzi, I.Z. Zattoni and M.F. Frizzarin*

**General Session 4 (Part II) - Service Life and Maintenance**

WeM6  
Room: Room VS219  
Chair: Ho-Kyung Kim  
Co-Chair: Jung Sik Kong

**Use of Seismic Isolation Bearings in High Speed Rail Bridges as Exemplified by California High Speed Rail SR 43 Network Tied Arch Bridge**

*A.P. Ranasinghe, H. Al-khateeb and J. Conklin*

**Probabilistic Corrosion Fatigue Life Evaluation of Steel Plates Using Random Field Simulation**

*L.S. An, Y.C. Park and H.K. Kim*

**Performance Degradation Model of Bridges using Recurrent Neural Network**

*Y. Choi, Y. Choi and J. Kong*

**Prediction model for condition rating of the bridge using various deep-learning methods**

*Y. Choi, Y. Choi and J.S. Kong*

**Reduction of maintenance operations by applying the Direct Algorithm in the design of cable-stayed bridges**

*J. Farré Checa, J.A. Lozano-Galant and J. Turmo*

**Tools for Constructability for Improving Bridge Durability**

*H. Aktan, U. Attanayake and E. Aktan*

**SS13 - Risk-Based Prioritization and Monitoring of Bridges for Road Infrastructure Management in Lombardy Region, Italy organized by Fabio Biondini, Maria Pina Limongelli, Carmelo Gentile and Marco Belloli**

WeM7  
Room: Room VS216  
Chair: Fabio Biondini  
Co-Chair: Maria Pina Limongelli

**Bridge Vulnerability and Hazard Assessment for Risk-Based Infrastructure Management**

*F. Biondini, F. Ballio, M. di Prisco, S. Bianchi, M. D'Angelo, G. Zani, L. Capacci, M. Anghileri, A. Scalbi and K. Flores Ferreira*

**Development of a functional priority index for assessing the impact of a bridge closure**

*M. Arena, G. Azzone, P. Secchi, A. Torti, V.M. Urbano and S. Vantini*

**The Structural Monitoring guidelines for the management of bridges in the Lombardia region in Italy**

*M.P. Limongelli, C. Gentile, F. Biondini, M. di Prisco, F. Ballio, M. Belloli, F. Resta, P. Vigo and A. Colombo*

**Structural Health Monitoring of a RC Bridge in Como, Italy**

*S. Bianchi, L. Capacci, M. Anghileri, F. Biondini, G. Rosati, C. Somaschini, G. Cazzulani and L. Benedetti*

**Structural Health Monitoring and Geometric Survey Informed by Laser Scanner and UAV Mapping of an Existing Tall RC Viaduct**

*L. Capacci, S. Bianchi, M. Anghileri, F. Biondini, G. Rosati, L. Pinto, F. Ioli, C. Somaschini, G. Cazzulani and L. Benedetti*

**GNSS-based Structural Monitoring of the Isola Dovarese Bridge, Italy**

*S. Bianchi, F. Biondini, M. Anghileri, L. Capacci, G. Rosati, G. Cazzulani and S. Caldera*

**StradeNet: A Regional Road Information System**

*S. Bianchi, G. Zani, A. Scalbi, K. Flores Ferreira, M. D'Angelo, M. Anghileri, L. Capacci, F. Biondini, M. di Prisco, F. Ballio, P. Borlenghi, G. Zonno, C. Gentile, L. Benedetti, M. Belloli, A. Colombo, P. Vigo, C. Sportel, V. Lanza and S. Barassi*

12:00 - 13:30

**TECHNICAL SESSIONS**

<b>MS5 Part III - Assessment of existing infrastructure assisted by field data</b> organized by Eva Lantsoght, Yuguang Yang and Sreenivas Alamaplli	WeA1 Room: Auditorium Chair: Eva Lantsoght Co-Chair: Gabriel Sas
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**Potential Hazards at the New York City Bridges, 1982 - 2006**

*B. Yanev*

**Monitoring of Repaired Concrete Floor in the Maastunnel Using Smart Aggregates**

*H. Cheng, F. Zhang, Y. Yang and C.B.M. Blom*

**Assessment of shear strength of existing prestressed concrete bridge beams: full-scale tests and numerical simulations**

*A. Lupoi, A. Ficociello and M. Malavisi*

**Cost-effective measurement equipment and data analysis tool for structural health monitoring. Case Study: Metro railway bridge**

*P.L. Sierra, R.A. Chacón and X. Martinez*

**Development of a Bridge Load Test Procedure for Low Temperature Conditions**

*J. Gonzalez-Libreros, C. Wang, A.M. Agredo, S.J. Sarmiento, Y. Tu, C. Daescu and G. Sas*

**Fatigue Reliability Assessment of an In-service Steel Bridge Based on BWIM and Strain Data**

*S.H. Lee, Y.C. Park, L.S. An and H.K. Kim*

<b>SS2 Part II - Small and medium span bridges and culverts: analysis, evaluation, durability, and rehabilitation</b> organized by Damian Beben, Halil Sezen, Jan Vaslestad and Tomasz Maleska	WeA2 Room: Sala Actes Chair: Halil Sezen Co-Chair: Damian Beben
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**Corrugated steel plate tunnel behaviour under strong seismic excitation**

*T. Maleska and D. Beben*

**Long-term behavior of instrumented RC culvert with high soil cover using EPS for load reduction**

*T. Maleska, J. Nowacka, D. Beben and J.V. Vaslestad*

**Ten Years of Advanced Culvert Research: A Retrospective**

*D. Becerril García, N.A. Hoult and I.D. Moore*

**Stiffness variations of railway tracks over rigid concrete and flexible steel culverts**

*D.S.S. Sukuvara, A.L. Lau, S.N. Nordal and J.V. Vaslestad*

**General Session 1 - Long-Span Bridges**

WeA3  
Room: Room VS208  
Chair: Ignacio Pulido Sanchez  
Co-Chair: Gonzalo Ramos

**Wind-resistant design of long-span cable-stayed bridges focusing on nonlinear aerostatic stability: A parametric study**

*M. Cid Montoya, S. Hernández, F. Nieto, J.Á. Jurado and A. Kareem*

**Doubling the set of hangers of tied-arch bridges to support eccentric load distributions**

*J.J. Jorquera-Lucerga and J.M. García-Guerrero*

**Fire Protection of Suspension Bridge Cables**

*J. Laigaard, H. Narasimhan and J. Mouritsen*

**Analysis and design of a concrete network tied arch bridge for California high speed rail project**

*A.P. Ranasinghe, M. Loizias, H. Al-Khateeb and S. Greenburg*

**Effectiveness of buckling restrained damper for improving seismic performance of steel arch bridge**

*P. Sosorburam, E. Namkhainyambuu and E. Yamaguchi*

**Reliability consideration for vortex-induced oscillation and buffeting of long-span bridge**

*S.C. Yang, S.K. Li and S. Gong*

**Analysis on whole-span deck replacement plan for large-span network arch bridge**

*H.Y. Fu, Q.T. Su, L. Cheng and F.P. Chang*

**MS11 Part II - Bridge Loading – Measurement and Modelling organized by Colin Caprani, Andrzej Nowak, Eugene OBrien and Xin Ruan**

WeA4  
Room: Room VS217  
Chair: Colin Caprani  
Co-Chair: Xuejing Wang

**Analysis on the specification applicability of long-span bridge based on traffic effect**

*X.Y. Zhao, X. Ruan, L.Z. Wu and Z.R. Jin*

**New Procedure for Bridge Analysis of Heavy Vehicles transit (NTEO)**

*A. Lupoi, F. Alessio and A. Basconi*

**Smart Bridge Bearings and Expansion Joints as a Combined WIM and SHM System**

*D. Rill, C. Butz and M. Tahedl*

**General Session 2 (Part II) - Inspection and Monitoring**

WeA5  
Room: Room VS218  
Chair: David Martínez-Muñoz  
Co-Chair: Antonio Barrias

**Effect of air-entraining agent and freeze-thaw cycles on concrete microstructure using computed tomography scanning**

*A. Mena, M.A. Vicente, J. Mínguez and D.C. González*

**Using sub-size Charpy V-Notch tests to evaluate thin structural components**

*T.D. Yount, W.N. Collins, D. Yu, C.R. Bennett and J. Li*

**Image based inspection of concrete cracks using UAV photography**

*J.A. Avendaño, J.L. Leander and R.K. Karoumi*

**Bridge Scouring Inspection and Mitigation in Indonesia**

*R.P. Pratama, R. Irawan and E. Kurniawati*

**Field Monitoring of Ambient Vibration Response of a Self-Anchored Suspension Bridge**

*M.R. Hernandez-Garcia, M. Wahbeh, G. Thomas and S.F. Masri*

**Damage detection of steel truss bridge based on stacked auto-encoder**

*C. Wang, J. Gonzalez, G. Sas, L. Elfgren, S. Lu and Y. Tu*

**General Session 4 (Part III) - Service Life and Maintenance/  
Proactive maintenance approaches and decision-making in  
future European standardisation**

WeA6  
Room: Room VS219  
Chair: Paola Darò  
Co-Chair: Alfred Strauss

**Condition assessment of reinforced concrete structures: state of the art knowledge and case studies in the TG3.3 fib Bulletin**

*M.P. Limongelli and E. Chatzi*

**Performance Prediction & Modelling including Advanced Methods for Existing Concrete Structures in the Framework of the fib TG 3.3 Bulletin**

*E. Apostolidi, A. Strauss, F. Sattler and H. Sousa*

**Contributions to IM-SAFE project based on the experience gained about numerical model updating of in-service bridges using multidisciplinary research**

*O. Bouzas, B. Barros, B. Conde, M. Cabaleiro, A. Sánchez-Rodríguez and B. Riveiro*

**Bridges continuous dense monitoring network: a framework to support the infrastructures assessment and management process**

*I. Alovisi, A. Cigada, D. La Mazza and M. Longo*

**Enhanced Bridge Maintenance Using In-Situ CVM Sensors for Automated Damage Detection**

*D.P. Roach*

**Evaluation of Long-Term Durability Performance of the Exfoliation Prevention Method Using Basalt Net in Actual Structure**

*M.T Tsuda, S.U Ueda, T.A Aoki and K.T Torii*

**13:30 - 14:30**

**Lunch break**

**14:30 - 16:00**

**TECHNICAL SESSIONS**

**MS4 Part I - Novel techniques regarding the assessment and monitoring of bridges  
organized by Alfred Strauss and Dan Frangopol**

WeE1  
Room: Auditorium  
Chair: Alfred Strauss  
Co-Chair: Eleni Chatzi

**Cost-benefit evaluation of a monitoring system for structural identification of existing bridges**

*N. Bertola, I. Bayane and E. Brühwiler*

**Structural Inspection and Rehabilitation of Steel Floorbeam to Column Connections**

*J. Tupper and P. Bocchini*

**Damage assessment of bridges based on static and dynamic flexibility changes**

*K. Dakhili, T. Kebig, M. Schäfer, M. Bender, A. Zürbes and S Maas*

**Data mining corrosion and failure in cable stays**

*J. Laigaard Jensen, I. Farreras Alcover, S. Joye and L. Laguerre*

**Easy and Low-cost Bridge Warning System for Damage Detection at Girder End**

*H. Mawatari, K. Matsuyama, T. Sonoda, K. Nakatsui and J. Tsujii*

**Investigation on Load Capacity Evaluation of Existing Bridge based on Deflection**

*Y.K. Kinoshita, Y.U. Umekawa and H.S. Suganuma*



**SS5 Part I - Design, Construction and Evaluation of Steel/FRP & Concrete Composite Bridge Structures**  
organized by Haohui Xin, Xiaoqing Xu, Rong Liu and Jun He

WeE2  
Room: Sala Actes  
Chair: Bruno Briseghella  
Co-Chair: Gonzalo Ramos

**Influence of Slenderness Ratios on Mechanical Performance of Axially Loaded CFST Columns with Circumferential Debonding Gap**

*J.Q. Xue, J.G. Sun, B. Briseghella, B.C. Chen and J.G. Wei*

**Structural performance and on-site monitoring of steel-concrete composite bridge with link slab**

*H. Su, Q.T. Su, J.R. Casas, M.X. Xi and Y.F. Ji*

**Serviceability oriented fatigue assessment of orthotropic steel bridge decks with penetrating cracks**

*B. Wang, Y. Ma, D. Wang and A. Chen*

**Stress analysis on cable anchorage zone of long-span self-anchored suspension bridge**

*W.P.H Wu, W.C Wu and S.Q.T Su*

**Local stress analysis and force transmission mechanism of steel bridge tower**

*W.Y Wu, Z.M.G Zeng and S.Q.T Su*

**Finite element simulation study on continuous structure of steel-concrete composite simple-supported beam bridge**

*F. Wang, C. Wu and Q. Su*

**MS8 Part I - Footbridges: Advances in Vibration Serviceability Assessment**  
organized by Colin Caprani and Federica Tubino

WeE3  
Room: Room VS208  
Chair: Colin Caprani  
Co-Chair: Federica Tubino

**Dynamic characterization and vibration serviceability assessment of a historic suspension footbridge**

*E. Bayat and F. Tubino*

**The UNIOVI footbridge**

*M. García-Diéguez and J.L. Zapico-Valle*

**Energy harvesting from pedestrian-induced vibrations in footbridges with piezoelectric devices: a feasibility study**

*J.F. Jiménez-Alonso, G. Castillo López, F. García Sanchez and A. Sáez*

**Considerations about dynamic calculation of a footbridge**

*C. Jurado*

**Experimental validation of crowd-induced loading on footbridges**

*F. Tubino and K. Van Nimmen*

**MS15 Part I - Innovative Solution of Classic Problems in Bridge Design, Construction and Maintenance with Artificial Intelligence organized by Airong Chen and Xin Ruan**

WeE4  
Room: Room VS217  
Chair: Xuejing Wang  
Co-Chair: Necati Catbas

**Human-AI Collaboration in Bridge Monitoring and Inspection Using Mixed Reality**

*M. Zakaria, E. Karaaslan and F. N. Catbas*

**Evaluation of Factors Affecting Long-term Creep of Concrete Using Machine Learning Regression Models**

*H. Daou, W. Raphael and F. Geara*

**Use of a Machine Learning Algorithm to Calibrate the Eurocode 2 Creep Model: Application of Classification and Regression Tree**

*H. Daou, W. Raphael and R. Faddoul*

**Damage evaluation of concrete beams using forced vibration testing and machine learning**

*Y. Fujisaku, H. Naito and K. Inaba*

**Finite element analysis of piles and information for installation monitoring**

*O. Adegbulugbe and S. Jung*

**Construction of crack image dataset using active learning**

*J.P. Shu, J. Li and Z.F. Jin*

**General Session 3 (Part IV) - Evaluation and Assessment**

WeE5  
Room: Room VS218  
Chair: Túlio Bittencourt  
Co-Chair: Javier Fernando Jiménez Alonso

**Evaluation of deterioration modeling of corroded reinforced concrete railway bridges under uncertainty**

*I. Ames, L.S. Moreira, A.T. Beck, H. Carvalho, T.N. Bittencourt and M.M. Futai*

**Advanced numerical analysis of fatigue-critical details of existing metallic railway bridges**

*C.S. Horas, A.M.P. Jesus and R.A.B. Calçada*

**Numerical evaluation of a VBI bridge-damage detection approach in railway bridges using a machine learning algorithm**

*E.F. Souza, T.N. Bittencourt, D.R. Ribeiro, H. Carvalho and T.D. Silva*

**Evolution of the optimal solution for single and twin-box bridge decks subject to gravitational loads and several aeroelastic phenomena**

*M. Cid Montoya, S. Hernández and A. Kareem*

**Modelling an existing steel railway bridge for residual service life assessment**

*P.L. Todesco, A. Rønning, G.T. Frøseth and M. Domaneschi*

**Modelling bonding failure effects in deteriorated concrete elements of bridges.**

*M. Bartolozzi, J.R. Casas and M. Domaneschi*

**General Session 4 (Part IV) - Service Life and Maintenance**

WeE6  
Room: Room VS219  
Chair: Eiki Yamaguchi  
Co-Chair: Carol Choi

**Digital Innovation in Bridge Management – Overview of the Project GOA.BI**

*T. Mendonça, V. Brito, S. Costa, J. Matos and M. Coelho*

**Adapting a Bridge Management System to Port Structures**

*T. Mendonça, V. Brito and S. Costa*

**Study of demolition strategies and preliminary plan for the case of the Kalix bridge**

*C. Daescu, H. Lundin, S.J. Sarmiento, J. Gonzalez-Libreros, L. Elfgrén and G. Sas*

**An overview of strategic bridge life cycle modelling on the British railway**

*G. Calvert, M. Hamer and L. Neves*

**Evaluating the impact of using Fiber Reinforced Concrete on service life of bridges: A case study**

*M. Domingo, G. Ramos and A.C. Aparicio*

**Present and future applications of BIM for Bridge Maintenance**

*F. Lozano, A. Sanseverino, S. Komarizadehasl, J.A. Lozano-Galant, V. Torralba and J. Turmo*

**Application of BIM and GIS models for the degradation analysis and management of Port Infrastructure**

*J.C. Matos, J. Gil and E. Teixeira*

**SS14 Part I - Approaches to Bridge Management / Bridge Management Systems in Response to Today's Challenges organized by Reed Ellis, Paul Thompson and Rade Hajdin**

WeE7  
Room: Room VS216  
Chair: Reed Ellis  
Co-Chair: Paul Thompson

**Risk-Based Bridge Management Implementation in the Yukon, Canada**

*R.M. Ellis and K. Power*

**Preliminary probabilistic analysis of bridge management data in the province of Ontario**

*P.D. Babajamu, A.M. Abdelmaksoud and G.P. Balomenos*

**Retrospective Analysis of Predictive Models in Bridge Management Software used in the Province of PEI, Canada.**

*D.J. Evans and R.M. Ellis*

**Development of a novel bridge management system for Colombia**

*J.F. Correal, E. Muñoz, J.C. Reyes, A. Vargas, F. Ramirez, F. Nuñez, A.M. Medaglia, L.A. Guzman, E. Prada and J.E. Echeverry*

**Decision making model for bridge management – Application to Colombian bridge infrastructure**

*E. Prada, N. Robayo, A.F. Calvo, R. Fernandez, J.F. Correal, A.M. Medaglia, J.E. Echeverry and S. Gonzalez*

**Cost-effective lifetime management of deteriorating bridges considering correlated maintenances**

*B.X. Ge, A.R. Chen and H.C. Chang*

16:00 - 16:30  
Coffe break

16:30 - 18:00  
TECHNICAL SESSIONS

**MS4 Part II - Novel techniques regarding the assessment and monitoring of bridges**  
organized by Alfred Strauss and Dan Frangopol

WeN1  
Room: Auditorium  
Chair: Alfred Strauss  
Co-Chair: Paolo Bocchini

**Monitoring of displacements in bridges and singular structures using computer vision. Example of application in the Cathedral of Saint Mary (Burgos, Spain)**

*A. Mena, M.A. Vicente, J. Mínguez and D.C. González*

**Application of a novel safety format technique on concrete bridges**

*F. Sattler, A. Strauss, L. Novák and D. Novák*

**Review on Deep Learning in Structural Health Monitoring**

*M. Rosso, R. Cucuzza, A. Aloisio, G. Cirrincione and G. Marano*

**Stress component measurement sensor using thermoelastic stress analysis**

*A.S. Sato, K.S. Sugjura, Y.K. Kitane and Y.G. Goi*

**Application of multipurpose measuring system on various bridges – pros and cons**

*M.V. Venglar, K.L. Lamperová and D.B. Beutelhauser*

**Monitoring the superstructure of cable-stayed bridges applying Geotechnological tools. Case study: Bridge “Solidaridad” in Guerrero state, México.**

*H. Ortiz-Pineda, R. Vázquez-Jiménez, S. Sánchez-Tizapa and G. Moyao-Callejas*

**SS5 Part II - Design, Construction and Evaluation of Steel/FRP & Concrete Composite Bridge Structures**  
organized by Haohui Xin, Xiaoqing Xu, Rong Liu and Jun He

WeN2  
Room: Sala Actes  
Chair: Bruno Briseghella  
Co-Chair: Upul Attanayake

**Multi-scale evaluation of ultimate capacity of high-performance materials used in bridge engineering**

*H. Xin, J. Li, Q. Gao, Y. Liu and M. Veljkovic*

**Numerical Analysis of Mechanical Properties and Damage Mechanism of GFRP-Concrete Composite Beam**

*J. Xing, Z. Chen and Q. Luo*

**Use of Fiber Reinforced Concrete in compression slabs of beam-and-slab decks for new bridge constructions**

*M. Domingo, G. Ramos and A.C. Aparicio*

**Experimental Design of SFRC Link Slab in Steel-Concrete Composite Bridge**

*L. Xiao, Q.T. Su and F.Y. Wang*

**MS8 Part II - Footbridges: Advances in Vibration Serviceability Assessment**  
 organized by Colin Caprani and Federica Tubino

WeN3  
 Room: Room VS208  
 Chair: Federica Tubino  
 Co-Chair: Colin Caprani

**Human-induced loading due to bidirectional pedestrian traffic**

*F. Tubino and F. Venuti*

**Dynamic running actions on footbridges: a pilot study on human-structure interaction**

*J. Lottefier, P. Van den Broeck and K. Van Nimmen*

**Integrated measurement concept for identification of human-structure-interaction of flexible structures for natural gait**

*M.J. Fritzsche, H. Berthold, S. Lorenzen, A. Firus, J. Schneider, M. Stasica, G. Zhao and A. Seyfarth*

**MS15 Part II - Innovative Solution of Classic Problems in Bridge Design, Construction and Maintenance with Artificial Intelligence**  
 organized by Airong Chen and Xin Ruan

WeN4  
 Room: Room VS217  
 Chair: Xuejing Wang  
 Co-Chair: Fernando Moreu

**Intelligent parameter identification of hydration heat and field cracking classification analysis: a case study of concrete bent cap**

*L.C. Xu, X. Ruan, Y. Li and Z.R. Wang*

**Stress-based topology optimization method using deep learning**

*C. Xiang, A. Chen, D. Wang and R. Ma*

**Increasing the use of Human-Machine Interfaces with Augmented Reality for Inspectors**

*E. Wyckoff, A. Khorasani, K. Malek and F. Moreu*

**Smart and Connected Communities informed against Floods with Low-cost Sensors (LEWIS 5)**

*J. Murillo and F. Moreu*

**Automated Structural Damage Mapping on 3D Digital Bridge Model**

*H. Bae, Y.K. An and Y. Cho*

**General Session 3 (Part V) - Evaluation and Assessment**

WeN5  
 Room: Room VS218  
 Chair: Juan José Jorquera-Lucerga  
 Co-Chair: Marco Domaneschi

**Modal and Pushover Analysis of Concrete Bridges with Shallow Footing Subjected to Seismic and Scour Loading**

*S. Biazar, S. Kameshwar and G.P. Balomenos*

**Phase field model for reinforcement corrosion induced concrete cover cracking**

*X. Fang, Z. Pan, J. Zhang and A. Chen*

**Analytical study on the minimum patch plate arrangement for the corroded steel girder ends**

*T.F. Fujimaru, M.T. Tamai, M.O. Okumura and K.N. Nozaka*

**Evaluation of ASR resistance of geopolymers using industrial by-products for application to bridges**

*H. Goda, K. Shinkai, K. Harada and M. Hibino*

**ASR resistance of concrete member using blast furnace slag based on gel fluorescence method**

*H. Goda, K. Okubo, Y. Sagawa and M. Hibino*

**Improvement Work for Elongation of Service Life of Dojima Ohashi Bridge**

*S. Fujisawa, S. Nagahashi, M. Yamauchi and T. Yamaguchi*

**General Session 5 (Part I) - Repair and Strengthening**

WeN6  
Room: Room VS219  
Chair: Riad Al-Mahaidi  
Co-Chair: Raffaele Cucuzza

**FRP Repair Alternatives for Deteriorated Culverts**

*M. Ehsani*

**Some Cases of Pathologies in Prestressed Concrete Bridges in Spain. Diagnosis, Analysis, and Decision Making**

*I. Pulido , F. Millanes , B. González and A. Hernández*

**Use of Composite Structures for the Reinforcement of Pathologies in Concrete Bridges**

*I. Pulido, F. Millanes, E. Bordó and S. Salas*

**Behaviour of FRP Strengthened RC planks anchored with Hybrid anchors**

*B. Al-Atta, R. Kalfat and R. Al-Mahaidi*

**Genetic Programming in the Prediction of Concrete Cover Separation in RC Beams Strengthened with FRP**

*K.A. Al-Ghreyr, R.A. Al-Mahaidi, R.K. Kalfat and N.O. Oukaili*

**Resistance to salt-corrosion of concrete with externally bonded FRP sheets in marine environment**

*D.Y. Liu, Y.M. Tu, Y. Zhang, C. Wang, J. Gonzalez-Libreros, G. Sas and L. Elfgrén*

**SS14 Part II - Approaches to Bridge Management / Bridge Management Systems in Response to Today's Challenges organized by Reed Ellis, Paul Thompson and Rade Hajdin**

WeN7  
Room: Room VS216  
Chair: Reed Ellis  
Co-Chair: Rade Hajdin

**StruPlan: Open-Source Long-Range Renewal Planning for Transportation Structures**

*P.D. Thompson*

**Indicators and modules for a life cycle management**

*S.S. Staub and R.H. Holst*

**18:00 - 19:00**

**General Assembly**

## Thursday, July 14

**09:30 - 11:00**  
**Keynote Lectures III**

ThMP  
Room: Auditorium  
Chair: Ho-Kyung Kim  
Co-Chair: Túlio Bittencourt

**Assessment of existing concrete bridges by load testing**  
*E.O.L. Lantsoght*

**Less And Better. Good Design Practices For Sustainable Bridges**  
*J. Sobrino*

**Bridge Inspection, Evaluation, and Management in the United States**  
*S. Alampalli*

**11:00 - 11:30**  
**Coffe break**

**11:30 - 13:00**  
**TECHNICAL SESSIONS**

**MS4 Part III - Novel techniques regarding the assessment and monitoring of bridges**  
organized by Alfred Strauss and Dan Frangopol

ThM1  
Room: Auditorium  
Chair: Alfred Strauss  
Co-Chair: Poul Linneberg

**Hyperspectral imaging analyses of concrete structures with emphasis on bridges**  
*A. Strauss, F. Sattler, M. Granzner and D. Frangopol*

**Compressive load estimation method based on plate vibration measurement**  
*S. Watanabe, Y. Yiran, Y. Goi, K. Takase, N. Okubo, Y. Kitane and K. Sugiura*

**Deterioration-Based Probabilistic Assessment of Design Resistance of Railway Bridge**  
*M. Šomodíková, O. Slowik, D. Lehký and J. Doležel*

**Application of Proper Orthogonal Decomposition to bridge damage detection - field investigations**  
*S. Ardani, S. Eftekhar Azam, E. Akintunde and D.G. Linzell*

**Deep learning based indirect monitoring to identify bridge natural frequencies using sensors on a passing train**  
*S.R. Lorenzen, H. Berthold, M. Rupp, L. Schmeiser, E. Apostolidi, J. Schneider, J. Brötzmann, C.D. Thiele and U. Ruppel*

**Data fusion and machine learning for bridge damage detection**  
*H. Wang, G. Barone and A. Smith*

**MS13 Part I - Advances in Bridge Monitoring Strategies: Novel Technologies and Information Fusion**  
organized by Chul-Woo Kim, Yi Zhang, Mehrisadat Makki Alamdari and Patrick McGetrick

ThM2  
Room: Sala Actes  
Chair: Chul-Woo Kim

**Image registration for bridge defect growth tracking**

*J. Bush, J. Bennetts, J. Ninic, S. Denton, G. Thermou and P. Hill*

**Point cloud registration for bridge defect tracking in as-built models**

*J. Bush, J. Bennetts, J. Ninic, S. Denton, G. Thermou and P. Hill*

**Deep learning monitoring of the Z24 benchmark bridge**

*V. Giglioni, I. Venanzi, V. Poggioni, A. Milani and F. Ubertini*

**Bridge damage detection utilizing dynamic force obtained from moving vehicle acceleration**

*S. Hasegawa, C.-W. Kim, K.-C. Chang and N. Toshi*

**Bridge frequency identification from multiple moving-vehicle dynamics using cross-spectrum method.**

*X. Lu, L. Sun, C.W. Kim, K.C. Chang and Z. Han*

**Bridge Indirect Monitoring Using Uniform Manifold Approximation and Projection (UMAP)**

*M. Makki Alamdari, P. Cheema, K.C. Chang, C.W. Kim and M Sugiyama*

**MS10 Part I - Emerging digital technologies toward resilient and sustainable bridges**  
organized by Stergios Aristoteles Mitoulis, Maria Pregnotato, Sotirios Argyroudis and Maria Pina Limongelli

ThM3  
Room: Room VS208  
Chair: Stergios Aristoteles Mitoulis  
Co-Chair: Maria Pina Limongelli

**Using Interpretable Machine Learning for Data-Driven Decision Support for Infrastructure Operation & Maintenance**

*E.N. Chatzi, I. Abdallah, K. Tatsis, S. Osmani and I. Robles*

**New and emerging digital technologies for bridge inspection and monitoring: a perspective from European Research**

*K. Gkoumas and F.L. Marques dos Santos*

**UAV-enabled flood damage assessment and recovery monitoring of bridges following Medicane Ianos**

*M. Loli, J. Manousakis, S. Mitoulis and D. Zekkos*

**A survey of emerging technologies for the future of routine visual inspection of bridge structures**

*D.T. Nepomuceno, P.J. Vardanega, T. Tryfonas, M. Pregnotato, G.T. Webb and J. Bennetts*

**Scour monitoring for railway assets (UK)**

*M. Pregnotato, G. Gavriel, D. Thompson, M. Anderson, I. Fox and K. Giles*

**Information supported resilience management of bridges**

*Z.I. Turksezer, M.P. Limongelli and M.H. Faber*



**SS1 - Bridge Weigh-in-Motion: technology developments and applications for maintenance organized by Daniel Cantero**

ThM4  
Room: Room VS217  
Chair: Daniel Cantero

**Moving point load approximation for BWIM**

*D. Cantero*

**Using B-WIM system-generated performance indicators to support model updating of a multi-span viaduct**

*D. Hekic, A. Anzlin, M. Kreslin, J. Kalin and A. Znidaric*

**Axle-load-estimation based on strain of transverse stiffener and characteristics of traffic loads due to heavy trucks**

*E. Yamaguchi and Y. Furusato*

**Application of a modular bridge weigh-in-motion system on an orthotropic bridge deck**

*J.D. Rodenburg, S.H.J. van Es, J.H. Paulissen, M.P. de Bakker and S.T. Hengeveld*

**Using Bridge Weigh-in-Motion Concepts for the Structural Health Monitoring of Bridges**

*S. Wang, D.P. McCrum and E.J. OBrien*

**Uncertainty Quantification of axle weight estimated by Bayesian Bridge Weigh-In-Motion**

*K. Maruyama, I. Yoshida, H. Sekiya and S. Mustafa*

**General Session 3 (Part VI) - Evaluation and Assessment**

ThM5  
Room: Room VS218  
Chair: Robby Caspeele  
Co-Chair: Rolands Kromanis

**Hydrological and seismic fragility curves in common highway bridges**

*J.G. Cruz-Vargas, M.C. Gómez Soberón, D. De León-Escobedo and C. Rojas-Serna*

**Fatigue evaluation for root cracks in U-rib to deck welded joints of orthotropic steel decks**

*M.H. Hattori, K.T. Tateishi, T.H. Hanji and M.S. Shimizu*

**Field Evaluation of Pipe-Tie System in Limiting the Girder Rotation during Bridge Deck Construction**

*L.H. Hui, F.H. Hraib, M.V. Vicente and R.H. Hindi*

**Influence of model error on Bayesian updating of the corrosion degree of a skewed reinforced concrete girder bridge**

*E. Vereecken, W. Botte, G. Lombaert and R. Caspeele*

**Investigation towards adaptation of a pipeline structure to function as a bridge**

*T. Kaminski, J. Bien, M. Kliński and A. Mróz*

**Fatigue strength enhancement of welded joints in existing steel bridges using high-frequency mechanical impact treatment**

*T. Hanji, K.T. Tateishi, S. Kano and M. Shimizu*

**General Session 5 (Part II) - Repair and Strengthening**

ThM6  
Room: Room VS219  
Chair: Matias Valenzuela  
Co-Chair: Carlos Jurado

**New Solutions for Repair of Submerged Piles and Bulkheads**

*Mo Ehsani*

**Cabrianes Bridge Widening across the “Llobregat” River (Barcelona, Spain)**

*Benjam Domínguez and Begoña Martín*

**Ratcheting behaviour of austenitic and lean duplex stainless steel in fatigue tests**

*E. Horisawa, K. Sugiura, Y. Kitane and Y. Goi*

**Implementation of GRDR methodology on the Quillota Bridge, Chile. A heritage review analysis**

*M.A. Valenzuela, A. Peña-Fritz, A. Paz, H. Pinto, L. Jorquera and P. Moraga*

**Latest developments in replacing external post-tensioning tendons**

*E. Vonk, A. Bonetto and A. Schwarz*

**Experimental Study on Construction Technology of Viaduct Regeneration in Downtown Districts**

*X. Zhou, X. Yan and L. Zhou*

**Major repair of La Bauma Viaduct**

*B. Bellavista*

**13:00 - 14:00**

**Lunch break**

**14:00 - 14:30**

**Keynote Lectures IV**

ThAP  
Room: Auditorium  
Chair: Jose Turmo  
Co-Chair: Michel Ghosn

**About recent bridge failures**

*P.G. Malerba*

**14:30 - 16:00**

**TECHNICAL SESSIONS**

**MS4 Part IV - Novel techniques regarding the assessment and monitoring of bridges organized by Alfred Strauss and Dan Frangopol**

ThE1  
Room: Auditorium  
Chair: Alfred Strauss  
Co-Chair: Túlio Bittencourt

**Efficiency and effectiveness evaluation of post-tensioned prestressed bridge girders by concrete relaxation tests.**

*A. Lupoi and F. Alessio*

**The Use of Artificial Intelligence for Assessing an Overpass affected by Alkali-Silica Reaction (ASR).**

*A. Bezerra, C. Trottier, L.F.M. Sanchez and B. Fournier*

**Bridge Deck Characterization for Condition Assessment**

*I. N Al Shaini, J. Carson and A. Trias-Blanco*

**Data Based Approach for Predicting Future Values of Bridge components' Condition Ratings**

*S.K. Kameshwar and M. Mia*

<p><b>MS13 Part II - Advances in Bridge Monitoring Strategies: Novel Technologies and Information Fusion</b>  <b>organized by Chul-Woo Kim, Yi Zhang, Mehrisadat Makki Alamdari and Patrick McGetrick</b></p>	<p>ThE2                  Room: Sala Actes                  Chair: Chul-Woo Kim                  Co-Chair: Daigo Kawabe</p>
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**Review and Development of Post Tensioned Bridge Inspection Technologies**

*C. Mundell and C.R. Hendy*

**SHM deployments for two bridge structures: assessing potential value**

*D.T. Nepomuceno, P.J. Vardanega, T. Tryfonas, M. Pregnotato, G.T. Webb, J. Bennetts, A. Foster, L. Augustine and M. Holland*

**Feasibility study on distributed fiber optic vibration sensing for bridge health monitoring**

*M. Petladwala, T. Hino and C.W. Kim*

**Data-driven bridge damage detection using multiple passing vehicles responses**

*M.Z. Sarwar and D. Cantero*

**Research Data Management of Structural Health Monitoring Projects and Subsequent Applications of Artificial Intelligence Methods**

*P. Simon, R. Herrmann, R. Schneider, F. Hille, M. Baeßler and R. El-Athman*

**Bayesian damage detection on full-scale pole structure with anchor bolt tension loosening**

*D. Kawabe, C. W. Kim and Y. Goi*

**Structural monitoring of PC bridges under construction based on the measurable data**

*S. Morichika, H. Sekiya, K. Nakashima, I. Yoshida, H. Iwaki and T. Toshinami*

<p><b>MS10 Part II - Emerging digital technologies toward resilient and sustainable bridges</b>  <b>organized by Stergios Aristoteles Mitoulis, Maria Pregnotato, Sotirios Argyroudis and Maria Pina Limongelli</b></p>	<p>ThE3                  Room: Room VS208                  Chair: Maria Pina Limongelli                  Co-Chair: Maria Pregnotato</p>
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**On the digital twinning of routine load tests in railway bridges. Case Study: High Speed Railway Network, Extremadura, Spain**

*R. Chacón, H. Posada, C. Ramonell, P. Sierra, A. Rodriguez, I. Koulalis, R. Tomar, S. Wagmeister, S. Freitag and M. Teodorovic*

**Low-Cost Accurate Acceleration Acquisition Sensor**

*S. KomarizadehAsl, M. Komary, F. Lozano, V. Torralba, J.A. Lozano-Galant and J. Turmo*

**From Point Clouds to Capacity Assessment of Corroded Steel Bridges**

*G. Tzortzinis, C. Ai, S.F. Brena and S. Gerasimidis*

**A review of the Digital Twin in the AEC sector in the context of application.**

*J. Brötzmann, C.-D. Thiele, U. Rüppel, S.R. Lorenzen, H. Berthold and J. Schneider*

**SS3 - Life-Cycle Performance Safety, Reliability, and Risk of Bridges and Infrastructure Systems under Climate Change**  
organized by Fabio Biondini, Zoubir Lounis and Michel Ghosn

ThE4  
Room: Room VS217  
Chair: Michel Ghosn  
Co-Chair: Zoubir Lounis

**Risk-based Design and Safety Assessment of Structures in a Changing Climate**

*M. Ghosn and B. R. Ellingwood*

**On an early warning model based on extensive sets for the operational safety of ISTB**

*T. Li, Y. Huang, H. Yang and J. Xiang*

**Reliability-Based Design of Structures under Non-Stationary Climate Conditions**

*M. Pandey and Z. Lounis*

**Network- and bridge- level management under uncertainties associated with climate change**

*M. Sasidharan, A.K. Parlikad and J. Schooling*

**Risk-based scour assessment of bridges: Italian VS French guidelines**

*P.F. Giordano, Z.I. Turksezer and M.P. Limongelli*

**Reliability-Based Calibration of Wind Load for Canadian Highway Bridge Design Code by Considering Climate Change Effects**

*H.P. Hong, D. Kennedy, Z. Lounis, D. Gagnon and D. Evans*

**General Session 3 (Part VII) - Evaluation and Assessment**

ThE5  
Room: Room VS218  
Chair: Jose Antonio Lozano-Galant  
Co-Chair: Carlos Jurado

**Analysis of a ship collision accident to a protective island by CEL approach**

*G.H. Lee*

**Research on Sunshine Temperature Field Distribution of Concrete Hollow Column**

*F. Li, W. Lu and W. Peng*

**Large-scale OT-slab tests: Laboratory measurements and evaluation**

*C.O.C. Christensen, P.S.H. Halding, J.W.S. Schmidt and P.G. Goltermann*

**Neutral Axis Position as a Means for Identifying Damage in Cable-Stayed Bridges**

*C. Aloupis, M.J. Chajes and H.W. Shenton*

**Fragility analysis of skew bridges involving frictional deck-abutment pounding under earthquakes**

*Z. Shi, N. Jin, Q. Yue, D. Jin and W. Chen*

**General Session 5 (Part III) - Repair and Strengthening**

ThE6  
Room: Room VS219  
Chair: Javier Pascual Ramos  
Co-Chair: Alessandro Greco

**Field Implementations of a Novel UHPC Beam End Repair on Steel Girder Bridges in Connecticut, USA**

*A.H. Hain and A.E.Z Esmaili Zaghi*

**The use of cement grout for corrosion protection of external tendons**

*G. Ramírez and R. Annan*

**Evaluation of interfacial debonding of Fibre-Reinforced Polymer Using Variable Angle Peel Test**

*I.F Fowai, M.N Noël , B.M Martin-Perez and L.S Sanchez*

**Study on strengthening effect of a steel I girder with web-patch plates focusing on the bolt pitch and patch plate length**

*K. Ishida, T. Yamaguchi, T. Matsumoto and G. Hayashi*

**Structural monitoring during structural repair of cable-stayed bridges. Experience of Arena Bridge**

*F. Collazos-Arias, D. Garcia-Sanchez and A. Gaute-Alonso*

**The effectiveness of viscous dampers in the seismic retrofitting project of an italian cantilever bridge**

*A. Lupoi and A. Greco*

**16:00 - 16:30**

**Closing Ceremony**

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