IALCCE2018

Sixth International Symposium on Life-Cycle Civil Engineering

Final Program

October 28-31, 2018
Ghent, Belgium

GHENT UNIVERSITY

SUNDAY, OCTOBER 28 - MONDAY, OCTOBER 29, 2018

Sunday, October 28, 2018										
17:00–20:00	**Registration** (conference venue, 1st floor)									
18:00–20:00	**Welcome Reception** (conference venue, 1st floor)									
Monday, October 29, 2018										
08:30–09:30	**Opening Ceremony** (auditorium)									
09:30–10:00	**Keynote Lecture** (auditorium) M.P. Sarkisian									
10:00–10:30	Coffee Break									
	'Jan Van Eyck' room	**'Hubert Van Eyck' room**	**'Van Der Goes' room**	**'Baekeland 1' room**		**'Baekeland 2' room**	**'Baekeland 3' room**	**'Bauwens' room**	**'Ghislain 1' room**	**'Ghislain 2' room**
10:30–12:00	MoM-1 MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: frameworks and approaches	MoM-2 SS-6: TRUSS ITN - Reducing uncertainty in structural safety	MoM-3 MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings	MoM-4 MS-14: Monitoring of structures for informed-decision making		MoM-5 SS-12: Repair and self-repair of concrete	MoM-6 SS-14: Advanced NDT for visualization and quantification of concrete deterioration and repair effects	MoM-7 MS-3: Probabilistic assessment of existing structures	MoM-8 MS-6: Performance of concrete during Life-Cycle	MoM-9 GS-4: Nonlinear analysis & structural optimization
12:00–13:00	Lunch									
13:00–13:30	**Keynote Lecture** (auditorium) D. Straub									
13:30–14:00	**Keynote Lecture** (auditorium) A.H.-S. Ang									
14:00–14:30	Coffee Break									
	'Jan Van Eyck' room	**'Hubert Van Eyck' room**	**'Van Der Goes' room**	**'Baekeland 1' room**		**'Baekeland 2' room**	**'Baekeland 3' room**	**'Bauwens' room**	**'Ghislain 1' room**	**'Ghislain 2' room**
14:30–16:00	MoA-1 MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: applications of techniques	MoA-2 SS-6: TRUSS ITN - Reducing uncertainty in structural safety	MoA-3 MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings	MoA-4 SS-10: Value of Structural Health Monitoring information for the Life-Cycle management of civil structures		MoA-5 SS-12: Repair and self-repair of concrete	MoA-6 SS-14: Advanced NDT for visualization and quantification of concrete deterioration and repair effects	MoA-7 MS-3: Probabilistic assessment of existing structures	MoA-8 MS-6: Performance of concrete during Life-Cycle	MoA-9 MS-1: Load testing of new and existing structures
16:00–16:30	Coffee Break									
16:30–18:00	MoE-1 MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: rationalization of intangibles	MoE-2 SS-6: TRUSS ITN - Reducing uncertainty in structural safety	MoE-3 MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings	MoE-4 SS-10: Value of Structural Health Monitoring information for the Life-Cycle management of civil structures		MoE-5 MS-9: Multi-hazard resilience assessment in a Life-Cycle context	MoE-6 SS-2: Climate adaptation engineering	MoE-7 MS-3: Probabilistic assessment of existing structures	MoE-8 MS-6: Performance of concrete during Life-Cycle	MoE-9 MS-1: Load testing of new and existing structures
18:00–19:00	**General Assembly** (room 'Jan Van Eyck')									

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16:00–16:30	Coffee Break
16:30–18:00	MoE-5 MS-9: Multi-hazard resilience assessment in a Life-Cycle context / MoE-6 SS-2: Climate adaptation engineering / MoE-7 MS-3: Probabilistic assessment of existing structures / MoE-8 MS-6: Performance of concrete during Life-Cycle / MoE-9 MS-1: Load testing of new and existing structures
18:00–19:00	**General Assembly** (room 'Jan Van Eyck')

TUESDAY, OCTOBER 30 - WEDNESDAY, OCTOBER 31, 2018

Tuesday, October 30, 2018						Tuesday, October 30, 2018				
08:30–09:00	**Keynote Lecture** (auditorium) C. Gehlen					**Keynote Lecture** (auditorium) C. Gehlen				
09:00–09:30	**Keynote Lecture** (auditorium) A. Chen					**Keynote Lecture** (auditorium) A. Chen				
09:30–10:00	Coffee Break					Coffee Break				
	'Jan Van Eyck' room	**'Hubert Van Eyck' room**	**'Van Der Goes' room**	**'Baekeland 1' room**		**'Baekeland 2' room**	**'Baekeland 3' room**	**'Bauwens' room**	**'Ghislain 1' room**	**'Ghislain 2' room**
10:00–12:00	TuM-1 SS-1: Structural Health Monitoring and decision making for infrastructure in multi-hazard environment"	TuM-2 SS-4: Modeling time-dependent behavior and deterioration of concrete	TuM-3 SS-3: Quality control procedures on the Life-Cycle management of existing bridges	TuM-4 MS-4: Risk and reliability acceptance criteria		TuM-5 MS-17: Life-Cycle management as focus area within asset management	TuM-6 SS-13: Life-Cycle of slope and river bank protection system considering soil bioengineering as well as conventional structures	TuM-7 MS-15: Probability-based service life design of reinforced concrete structures exposed to reinforcement corrosion	TuM-8 GS-7: Bridge engineering	TuM-9 GS-1: Probability theory & applied structural reliability methods
12:00–13:00	Lunch					Lunch				
13:00–14:30	TuA-1 MS-13: Advances in Structural Health Monitoring for real-world applications	TuA-2 SS-4: Modeling time-dependent behavior and deterioration of concrete	TuA-3 MS-2: Vibration-based Structural Health Monitoring, damage identification and residual lifetime estimation	TuA-4 GS-5: Earthquake engineering		TuA-5 MS-17: Life-Cycle management as focus area within asset management	TuA-6 MS-18: Serviceability of underground structures	TuA-7 MS-11: Life-Cycle performance of structure and infrastructure under uncertainty	TuA-8 GS-6: Traffic load modelling	TuA-9 GS-8: Life-cycle assessment
14:30–15:00	Coffee Break					Coffee Break				
15:00–16:30	TuE-1 MS-13: Advances in Structural Health Monitoring for real-world applications	TuE-2 GS-2: Durability	TuE-3 MS-2: Vibration-based Structural Health Monitoring, damage identification and residual lifetime estimation	TuE-4 GS-5: Earthquake engineering		TuE-5 MS-17: Life-Cycle management as focus area within asset management	TuE-6 MS-18: Serviceability of underground structures	TuE-7 MS-11: Life-Cycle performance of structure and infrastructure under uncertainty	TuE-8 SS-17: INFRASTAR - Fatigue reliability analysis of wind turbine and bridge structures SS-9: Novel materials and systems for Life-Cycle Structural Health Monitoring	TuE-9 GS-8: Life-cycle assessment
18:00–19:30	**Gala Ceremony** (UGent Aula, Voldersstraat 9, 9000 Ghent)					**Gala Ceremony** (UGent Aula, Voldersstraat 9, 9000 Ghent)				
	Fazlur R. Khan Lecture (UGent Aula, Voldersstraat 9, 9000 Ghent) M.C. Tang					**Fazlur R. Khan Lecture** (UGent Aula, Voldersstraat 9, 9000 Ghent) M.C. Tang				
20:00–23:00	**Symposium Banquet** (Oude Vismijn, Rekelingestraat 5, 9000 Ghent)					**Symposium Banquet** (Oude Vismijn, Rekelingestraat 5, 9000 Ghent)				
Wednesday, October 31, 2018						**Wednesday, October 31, 2018**				
08:30–09:00	**Keynote Lecture** (auditorium) C.-Q. Li					**Keynote Lecture** (auditorium) C.-Q. Li				
09:00–09:30	**Keynote Lecture** (auditorium) J.D. Sørensen					**Keynote Lecture** (auditorium) J.D. Sørensen				
09:30–10:00	Coffee Break					Coffee Break				
	'Jan Van Eyck' room	**'Hubert Van Eyck' room**	**'Van Der Goes' room**	**'Baekeland 1' room**		**'Baekeland 2' room**	**'Baekeland 3' room**	**'Bauwens' room**	**'Ghislain 1' room**	**'Ghislain 2' room**
10:00–12:00	WeM-1 MS-5: Early BIM for Life-Cycle performance	WeM-2 MS-10: Next generation asset management of civil infrastructure systems	WeM-3 MS-12: Life-Cycle redundancy, robustness and resilience indicators for aging structural systems under multiple hazards	WeM-4 SS-11: Design for robustness of steel and steel-concrete composite structures		WeM-5 MS-16: Life-Cycle maintenance and management for urban infrastructures with big data	WeM-6 GS-9: Assessment of existing structures	WeM-7 MS-19: Circular economy to improve sustainability of infrastructure		WeM-8 SS-18: The impact of BIM and web technologies in the life-cycle of our built environment
12:00–13:00	Lunch					Lunch				
13:00–13:30	**Keynote Lecture** (auditorium) P. Gardoni					**Keynote Lecture** P. Gardoni				
	'Jan Van Eyck' room	**'Hubert Van Eyck' room**	**'Van Der Goes' room**	**'Baekeland 1' room**		**'Baekeland 2' room**	**'Baekeland 3' room**	**'Bauwens' room**	**'Ghislain 1' room**	**'Ghislain 2' room**
13:30–15:00	WeA-1 MS-5: Early BIM for Life-Cycle performance	WeA-2 GS-3: Concrete structures	WeA-3 SS-15: PROGRESS - Provisions for Greater Reuse of Steel Structures	WeA-4 SS-16: Life-Cycle asset management for railway-structures (LeCIE)		WeA-5 SS-7: Application of probabilistic methods in fire safety engineering	WeA-6 SS-8: Bespoke models for marine structural management	WeA-7 GS-8: Life-cycle assessment		
15:00–16:00	**Closing Ceremony** (auditorium)					**Closing Ceremony** (auditorium)				

WELCOME TO IALCCE2018

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Chair IALCCE2018

LUC TAERWE
Ghent, Belgium
Co-Chair IALCCE2018

DAN M. FRANGOPOL
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During the past two decades there is a growing awareness of the importance of a life-cycle perspective in civil engineering and challenges exist to tackle the contemporary needs, for example related to the long-term prediction of material behaviour and structural response, the assessment of existing structures, inspection and maintenance strategies and life-cycle optimization, among others.

Considering these needs, the objective of the International Association for Life-Cycle Civil Engineering (IALCCE), founded in 2006, is to promote international cooperation in this field of expertise. Its activities encompass all aspects of life-cycle assessment, design, maintenance, rehabilitation, and monitoring of civil engineering systems. To this intent, the Association organizes biennial Symposia, bringing together the top experts in this field and providing a unique international platform for the advance of research and practice. These events have been held worldwide since 2008, with previous symposia at Lake Como (Italy) (IALCCE2008), Taipei (Taiwan) (IALCCE2010), Vienna (Austria) (IALCCE2012), Tokyo (Japan) (IALCCE2014) and Delft (The Netherlands) (IALCCE2016).

The sixth International Symposium on Life-Cycle Civil Engineering, IALCCE2018, is held in Ghent (Belgium) from October 28 to 31, 2018, under the auspices of Ghent University and in particular the Department of Structural Engineering. The more particular IALCCE2018 objective is summarized in its theme "Towards an Integrated Vision for Life-Cycle Civil Engineering", in which a focus is put on new interdisciplinary developments that enable bringing life-cycle assessment in civil engineering to a higher level. During this symposium a particular focus is put on the cross-fertilization between different sub-areas of expertise and the development of an overall vision for life-cycle analyses.

The papers presented at IALCCE2018 are included in the proceedings, which consist of a book of extended abstracts and a USB device containing the Fazlur R. Khan lecture, 8 keynote lectures and 390 technical papers from all over the world.

Being held at Ghent, with its rich history and superbly preserved building patrimony which is sometimes referred to as the Manhattan of the Middle Ages, the Chairs trust to providing you a unique setting to reflect on the challenges in life-cycle civil engineering and hope that this may yield new fruitful ideas and stimulate new initiatives for the future.

We wish you a very inspiring Symposium !

October 2018

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SYMPOSIUM ORGANISATION

ORGANIZING ASSOCIATION

IALCCE
International Association
for Life-Cycle Civil Engineering
www.ialcce.org

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www.ugent.be

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RILEM
International Union of
Laboratories and Experts
in Construction Materials,
Systems and Structures

IABSE
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for Bridge and Structural
Engineering

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GENERAL INFORMATION

SYMPOSIUM INFORMATION

DATE
October 28-31, 2018

VENUE
ICC International Convention Center Ghent
Van Rysselberghedreef 2 bus 1 – Citadelpark, B – 9000 Ghent, Belgium

OFFICIAL LANGUAGE
English (no translators or translation facilities are provided)

REGISTRATION DESK
The registration desk is located on the 1st floor of the conference venue and is open during the hours indicated below.

Sunday, October 28	17:00-20:00
Monday, October 29	08:00-19:00
Tuesday, October 30	08:00-17:00
Wednesday, October 31	08:00-12:00

ON-SITE REGISTRATION
All attendees and accompanying persons must have registered in order to get access to the symposium. If you have not made registration in advance via the symposium website, please complete registration on site. Payment can be made by cash or by credit card. On-site registration fees are as follows:

IALCCE Member	€ 870
Non-IALCCE Member	€ 960
PhD student	€ 550
Dinner (upon availability)	€ 150
Accompanying person	€ 400

Registration fee for IALCCE members/ Non-IALCCE members includes:
- Participation in the symposium
- Proceedings
- Welcome Reception
- Symposium banquet
- Lunches
- Coffee breaks

Registration fee for PhD students includes:
- Participation in the symposium
- Proceedings
- Welcome reception
- Lunches
- Coffee breaks

Registration fee for accompanying persons includes:
- Welcome reception
- Symposium banquet
- Lunches
- Coffee breaks
- City tour

SYMPOSIUM NAME TAG
Upon registration, you will receive a conference kit with your name tag and other symposium related information. Please wear your name tag at all times, during the symposium and at social events.

INTERNET SERVICE
You can use your own personal computer for free internet access by wireless network at symposium venues. No technical support is provided, nor responsibility for your PC's security.
SSID: IALCCE2018 (no password required)

LUNCH AND COFFEE BREAKS
Lunch and coffee breaks will take place in the foyer "Minneplein" on the 1st floor of the venue.

	Coffee break	Lunch	Coffee break	Coffee break
Monday, October 29	10:00-10:30	12:00-13:00	14:00-14:30	16:00-16:30
Tuesday, October 30	09:30-10:00	12:00-13:00	14:30-15:00	
Wednesday, October 31	09:30-10:00	12:00-13:00		

GUIDELINES FOR SPEAKERS AND CHAIRS

Guidelines for Speakers and Chairs are available on
the Symposium website **www.IALCCE2018.org/#/speakerguidelines**
Please make sure to check out these guidelines before your session!

GENERAL ASSEMBLY

The General Assembly of IALCCE will be held on Monday, October 29 from 18:00-19:00 in the "Jan Van Eyck" room on the 1st floor of the venue.

A SERIOUS GAME

During the Symposium, the Serious Game "Flood barrier in control?!", developed by Rijkswaterstaat – TNO – Delta Pi (The Netherlands), is available to be played by the conference visitors. During this game-based workshop visitors are experiencing hands-on the multi-disciplinary and multi-objective challenges involved in managing and maintaining storm surge barriers. Location: foyer 2nd floor. **Time: Tuesday, October 30** 13:00-14:30 and 15:00-16:30. People interested in participating are invited to register for the game at the registration desk on Monday or Tuesday morning.

GALA CEREMONY AND FAZLUR R. KHAN PLENARY LECTURE

Before the Symposium Banquet, a gala ceremony is organized at the Aula of Ghent University (Voldersstraat 9, 9000 Ghent) on Tuesday 30 October from 18:00 until 19:30. During this event, the Fazlur R. Khan Plenary Lecture will take place, as well as the awards ceremony.

CLOSING CEREMONY

The Closing Ceremony is scheduled on Wednesday, October 31 from 15:00-16:00 in the Auditorium (1st floor).

NON-SMOKING POLICY

Smoking is prohibited inside the venue.

RESTRICTION

Videotaping or audio recording of any sessions during this symposium is prohibited.

	Sunday 28 October	Monday 29 October	Tuesday 30 October	Wednesday 31 October
8:00 - 8:30		Registration	Registration	Registration
8:30 - 9:00		Opening Ceremony	Keynote Lectures	Keynote Lectures
9:00 - 9:30				
9:30 - 10:00		Keynote Lecture	Coffee Break	Coffee Break
10:00 - 10:30		Coffee Break	TuM Sessions	WeM Sessions
10:30 - 11:00		MoM Sessions		
11:00 - 11:30				
11:30 - 12:00				
12:00 - 13:00		Lunch	Lunch	Lunch
13:00 - 13:30		Keynote Lectures	TuA Sessions	Keynote Lecture
13:30 - 14:00				WeA Sessions
14:00 - 14:30		Coffee Break		
14:30 - 15:00		MoA Sessions	Coffee Break	
15:00 - 15:30			TuE Sessions	Closing Ceremony
15:30 - 16:00				
16:00 - 16:30		Coffee Break		
16:30 - 17:00		MoE Sessions		
17:00 - 17:30	Registration			
17:30 - 18:00				
18:00 - 18:30	Welcome Reception	General assembly	Gala Ceremony & Fazlur R. Khan Lecture	
18:30 - 19:00				
19:00 - 19:30				
19:30 - 20:00				
20:00 - 20:30			Symposium Banquet	
20:30 - 21:00				
21:00 - 21:30				
21:30 - 22:00				
22:00 - 22:30				
22:30 - 23:00				

DETAILED SYMPOSIUM PROGRAM

MONDAY, OCTOBER 29, 2018

Keynote Lecture

9:30 | 10:00		New architecture created from high performance structures **M.P. Sarkisian**

Concurrent Technical Sessions

		Session Title	Organizer(s)
10:30 | 12:00	MoM-1	MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: frameworks and approaches	F. den Heijer, J. Wessels, H. Yokota & M. Hoffmann
	MoM-2	SS-6: TRUSS ITN - Reducing uncertainty in structural safety	A. González
	MoM-3	MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings	R. Frischknecht, H. Birgisdottir, T. Lützkendorf & A. Passer
	MoM-4	MS-14: Monitoring of structures for informed-decision making	A. Strauss & D.M. Frangopol
	MoM-5	SS-12: Repair and self-repair of concrete	N. De Belie, K. Van Tittelboom, D. Snoeck & E. Gruyaert
	MoM-6	SS-14: Advanced NDT for visualization and quantification of concrete deterioration and repair effects	T. Shiotani, E. Verstrynge, D.G. Aggelis & P. Pahlavan
	MoM-7	MS-3: Probabilistic assessment of existing structures	M. Sýkora, M. Holicky, R. Caspeele, D. Diamantidis & R.D.J.M. Steenbergen
	MoM-8	MS-6: Performance of concrete during Life-Cycle	J. Li, X. Gao & X. Ren
	MoM-9	GS-4: Nonlinear analysis & structural optimization	

Keynote Lectures

13:00 | 14:00		Reliability assessment of deteriorating structures: Challenges and (some) solutions **D. Straub**
		Optimal reliability-based aseismic design of high-rise buildings **A.H.-S. Ang**

Concurrent Technical Sessions

		Session Title	Organizer(s)
14:30 | 16:00	MoA-1	MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: applications of techniques	F. den Heijer, J. Wessels, H. Yokota & M. Hoffmann
	MoA-2	SS-6: TRUSS ITN - Reducing uncertainty in structural safety	A. González
	MoA-3	MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings	R. Frischknecht, H. Birgisdottir, T. Lützkendorf & A. Passer
	MoA-4	SS-10: Value of Structural Health Monitoring information for the Life-Cycle management of civil structures	S. Thöns, G. Lombaert & M.P. Limongelli
	MoA-5	SS-12: Repair and self-repair of concrete	N. De Belie, K. Van Tittelboom, D. Snoeck & E. Gruyaert
	MoA-6	SS-14: Advanced NDT for visualization and quantification of concrete deterioration and repair effects	T. Shiotani, E. Verstrynge, D.G. Aggelis & P. Pahlavan
	MoA-7	MS-3: Probabilistic assessment of existing structures	M. Sýkora, M. Holicky, R. Caspeele, D. Diamantidis & R.D.J.M. Steenbergen
	MoA-8	MS-6: Performance of concrete during Life-Cycle	J. Li, X. Gao & X. Ren
	MoA-9	MS-1: Load testing of new and existing structures	A. de Boer, D.A. Hordijk, E.O.L. Lantsoght & Y. Yang
16:30 | 18:00	MoE-1	MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: rationalization of intangibles	F. den Heijer, J. Wessels, H. Yokota & M. Hoffmann
	MoE-2	SS-6: TRUSS ITN - Reducing uncertainty in structural safety	A. González
	MoE-3	MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings	R. Frischknecht, H. Birgisdottir, T. Lützkendorf & A. Passer
	MoE-4	SS-10: Value of Structural Health Monitoring information for the Life-Cycle management of civil structures	S. Thöns, G. Lombaert & M.P. Limongelli
	MoE-5	MS-9: Multi-hazard resilience assessment in a Life-Cycle context	J. Ghosh & J.E. Padgett
	MoE-6	SS-2: Climate adaptation engineering	E. Bastidas-Arteaga, M.G. Stewart & Y. Li
	MoE-7	MS-3: Probabilistic assessment of existing structures	M. Sýkora, M. Holicky, R. Caspeele, D. Diamantidis & R.D.J.M. Steenbergen
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	MoM-1 'Jan Van Eyck' room	MoM-2 'Hubert Van Eyck' room	MoM-3 'Van Der Goes' room	MoM-4 'Baekeland 1' room
	MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: frameworks and approaches Chairs F. den Heijer & J. Wessels	**SS-6: TRUSS ITN – Reducing uncertainty in structural safety** Chairs J.R. Casas & C. McNally	**MS-8:IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings** Chairs T. Lützkendorf	**MS-14: Monitoring of structures for informed-decision making** Chairs A. Strauss & D.Y. Yang
10:30	Introduction	Mechanical characterisation of braided BFRP rebars for internal concrete reinforcement **S. Antonopoulou, C. McNally & G. Byrne**	Assessing life cycle related environmental impacts caused by buildings (IEA EBC Annex 72) **R. Frischknecht**	RAMS evaluation for the steel-truss arch high-speed railway bridge based on SHM system **Y.L. Ding, H.W. Zhao & A.Q. Li**
10:45	Asset management maturity for flood protection infrastructure: a baseline across the North Sea region **B. Gersonius, R. Ashley, F. den Heijer, W.J. Klerk, P. Sayers & J. Rijke**	Use of post-installed screws in the compressive strength assessment of in-situ concrete **M.S.N.A. Sourav, S. Al-Sabah & C. McNally**	Principles for the development and use of benchmarks for life-cycle related environmental impacts of buildings **T. Lützkendorf & M. Balouktsi**	Crowd load prediction on pedestrian bridges using fiber bragg grating sensors **K. Hassoun, J. Karaki, S. Mustapha, A. Kassir, Z. Dawy & H. Abi-Rached**
11:00	Asset management of water and sewer networks, and levees: recent approaches and current considerations **C. Curt, R. Tourment, Y. Le Gat & C. Werey**	Impact of input variables on the seismic response of free-standing spent fuel racks **A. Gonzalez Merino, L. Costas de la Peña & A. González**	LCA benchmarks for decision-makers adapted to the early design stages of new buildings **A. Hollberg, P. Vogel & G. Habert**	Levels of assessment for chloride model parameters of existing concrete structures **A. Strauss, C. Matzenberger, K. Bergmeister, M. Somodikova & T. Zimmermann**
11:15	Working towards one and the same objective: how serious gaming makes storm surge barriers more reliable **M. Schelland, J.N. Huibregtse, M. Walraven & E.C.J. Bouwman**	Surrogate infill criteria for operational fatigue reliability analysis **R. Teixeira, A. O'Connor & M. Nogal**	Lessons learned from establishing an environmental benchmark for buildings in Switzerland **L. Tschümperlin & R. Frischknecht**	
11:30	A framework for assessing information quality in asset management of flood defences **W.J. Klerk, R. Pot, J.M. van der Hammen & K. Wojciechowska**	Probabilistic decision basis and objectives for inspection planning and optimization **G. Zou, K. Banisoleiman & A. González**	Belgian approach to mainstream LCA in the construction sector **D. Trigaux, K. Allacker, F. De Troyer, W. Debacker, W.C. Lam, L. Delem, L. Wastiels, R. Servaes & E. Rossi**	
11:45	Discussion	Characterization of hoisting operations on the dynamic response of the lifting boom of a ship unloader **G. Milana, K. Banisoleiman & A. González**	Life cycle assessment benchmarks for Danish office buildings **F.N. Rasmussen & H. Birgisdóttir**	

	MoM-5 'Baekeland 2' room	MoM-6 'Baekeland 3' room	MoM-7 'Bauwens' room	MoM-8 'Ghislain 1' room	MoM-9 'Ghislain 2' room
	SS-12: Repair and self-repair of concrete Chairs K. Van Tittelboom & N. De Belie	**SS-14: Advanced NDT for visualization and quantification of concrete deterioration and repair effects** Chairs T. Shiotani & E. Verstrynge	**MS-3: Probabilistic assessment of existing structures** Chairs D. Zwicky & A. Slobbe	**MS-6: Performance of concrete during Life-Cycle** Chairs J. Li & X. Gao	**GS-4: Nonlinear analysis & structural optimization** Chairs B. Belletti & W. De Corte
10:30	Optimizing nutrient content of microbial self-healing concrete **Y.C. Erşan & Y. Akin**	Case study on determination of remaining bearing capacity of cantilevered balconies of high rise buildings **B. Craeye, W. Gijbels, L. De Winter, M. Maes, T. Soetens & D. Vanermen**	Reducing semi-probabilistic methods to acceptable structural safety deficits in deterministic assessments of existing concrete structures **D. Zwicky**	Remaining life prediction of aged bridges under salt and carbonation damages by concrete core tests **A. Miyamoto**	Optimized design and life cycle cost analysis of a duplex welded girder bridge **B. Karabulut, B. Rossi, G. Lombaert & D. Debruyne**
10:45	Microencapsulated spores and growth media for self-healing mortars **K. Paine, I. Horne, L. Tan, T. Sharma, A. Heath, R. Cooper, J. Virgoe, D. Palmer & A. Kerr**	Localization and characterization of damage modes in reinforced concrete by means of acoustic emission monitoring during accelerated corrosion and pull-out testing **C. Van Steen, E. Verstrynge & M. Wevers**	The added value of full-probabilistic nonlinear finite element analysis for the assessment of reinforced concrete structural members **Á. Rózsás, A. Slobbe, D.L. Allaix, W.M.G. Courage, A. Bigaj van Vliet & H.G. Burggraaf**	Service life prediction of concrete under freeze-thaw deicing salt attack with intermittent dry periods **C. Thiel, C. Gehlen & F. Foestl**	Decision criteria for life cycle based optimisation in early planning phases of buildings **C. Dotzler, P. Schneider-Marin, C. Röger & W. Lang**
11:00	Use of fibre-reinforced self-healing cementitious materials with superabsorbent polymers to absorb impact energy **D. Snoeck, T. De Schryver, P. Criel & N. De Belie**	Study of the applicability of the polarization resistance method in analysis and experimental measurement of electric conductivity **C. Okuma, S. Okazaki & H. Yoshida**	Reliability assessment of infrastructure in Germany: Approaching a holistic concept **A. Panenka, F. Nyobeu, H. Schmidt-Bäumler, J. Sorgatz, R. Rabe & M. Reinhardt**	Effect of choice of functional units on comparative life cycle assessment of concrete mix designs **D. Kanraj, C.J. Churchill & D.K. Panesar**	Nonlinear reliability analysis of RC columns designed according to Chinese codes **D.-G. Lu, J.-S. Wang & Z.-M. Chang**
11:15	Life cycle assessment of self-healing engineered cementitious composite (SH-ECC) used for the rehabilitation of bridges **P. Van den Heede, N. De Belie, F. Pittau, G. Habert & A. Mignon**	Damage mechanisms analysis of reinforced concrete beams in bending using non-destructive testing **S. Pirskawetz, G. Hüsken, K.-P. Gründer & D. Kadoke**	Probabilistic aspects relating to assessment of existing structures **M. Holicky**	Evaluation of crack width in reinforced concrete beams subjected to variable load **T. Arangjelovski, G. Markovski & D. Nakov**	Risk analysis for the impact on traffic sign bridges **T. Braml, M. Keuser & S. Petry**
11:30	Self-healing concrete vs. conventional waterproofing systems in underground structures : a cradle to gate LCA comparison with reference to a case study **S. Rigamonti, E. Cuenca, A. Arrigoni, G. Dotelli & L. Ferrara**	Ultrasound pulse velocity to measure repair efficiency of concrete containing a self-healing vascular network **E. Tsangouri, J. Lelon, P. Minnebo, D.G. Aggelis & D. Van Hemeltijck**		Steel corrosion in ASR deteriorated concrete affected by de-icing salts **Y. Kubo, S.H. Ho, S. Kikuchi & Y. Ishikawa**	Dependency of punching shear resistance and membrane action on boundary conditions of reinforced concrete continuous slabs **B. Belletti, S. Ravasini, F. Vecchi & A. Muttoni**
11:45				Analysis of the influencing factors for shear capacity of reinforced concrete beam-column joints **X. Gao, D. Xiang, Y. He & J. Li**	Kriging-based heuristic optimization of a continuous concrete box-girder pedestrian bridge **V. Penadés Plà, T. García-Segura, V. Yepes & J.V. Martí**

	MoA-1 'Jan Van Eyck' room	MoA-2 'Hubert Van Eyck' room	MoA-3 'Van Der Goes' room	MoA-4 'Baekeland 1' room
	MS-7: Life-Cycle engineering for hydraulic structures, levees, and other water related infrastructure: infrastructure: applications of techniques Chairs H. Yokota & F. den Heijer	**SS-6: TRUSS ITN – Reducing uncertainty in structural safety** Chairs A. Gonzalez & L. Neves	**MS-8: IEA EBC Annex 72: Assessing Life-Cycle related environmental impacts caused by buildings** Chairs A. Passer	**SS-10: Value of Structural Health Monitoring information for the Life-Cycle management of civil structures** Chairs S. Thöns and G. Lombaert
14:30	Fundamental study on effective utilization of caisson in breakwater **E. Kato, Y. Kawabata, K. Uno & H. Yokota**	Monitoring crack movement on a masonry type abutment using optical camera system – A case study **F. Huseynov, E. O'Brien, J. Brownjohn, K. Faulkner, Y. Xu & D. Hester**	The coupling of BIM and LCA – Challenges identified through case study implementation **M. Röck, A. Passer, D. Ramon & K. Allacker**	Cost-based optimization of the performance of a damage detection system **A.C. Neves, J. Leander, R. Karoumi & I. González**
14:45	Efficient investments in the waterway Danube with vessel traffic analysis and fairway optimization **M. Hoffmann, A. Haberl, C. Konzel, T. Hartl, S. Simon & M. Simoner**	Outlier detection of point clouds generating from low-cost UAVs for bridge inspection **S. Chen, L.C. Truong-Hong, E. O'Keeffe, D.F. Laefer & E. Mangina**	Using BIM-based methods to obtain life-cycle environmental benchmarks for buildings **A. García-Martínez, J.C. Gómez de Cósar & M. Ruiz Alfonsea**	The integration of bridge life cycle cost analysis and the value of structural health monitoring information **G. Du & J. Qin**
15:00	Risk based inspection of flood defence dams: an application to grass revetments **W.J. Klerk, K.L. Roscoe, A. Tijssen, R.P. Nicolai, J. Sap & F. Schins**	Using step-by-step Bayesian updating to better estimate the reinforcement loss due to corrosion in reinforced concrete structures **F. Schoefs, B. Heitner, T. Yalamas, G. Causse & E.J. OBrien**	Modular methodology for building life cycle assessment for a building stock model **Zs. Szalay & B. Kiss**	The value of monitoring on the service life prediction of a critical steel bridge **J. Leander & R. Karoumi**
15:15	Comparative analysis of the reliability levels in hydraulic structures using partial safety factors and full probabilistic methods **A. Tahir & C. Kunz**	Structural health monitoring of bridges: a Bayesian network approach **M. Vagnoli, R. Remenyte-Prescott & J. Andrews**	Potential for interconnection of tools for cost estimation and life cycle assessment of partial carbon footprint in the building sector in Czechia **A. Lupíšek, M. Nehasilová, J. Železná, P. Hájek, B. Pospíšilová & M. Hanák**	Structural monitoring and inspection modeling for structural system updating **A. Agusta & S. Thöns**
15:30	A maintenance management plan for port mooring facilities based on cost-benefit analysis – A case study **Y. Kawabata, E. Kato, Y. Tanaka & H. Yokota**	Noninvasive empirical methods of damage identification of bridge structures using vibration data **J.J. Moughty & J.R. Casas**	Building life cycle assessment tools developed in France **B. Peuportier & P. Schalbart**	Metamodeling strategies for value of information computation **M.S. Khan, S. Ghosh, J. Ghosh & C. Caprani**
15:45	Discussion	Bridge condition evaluation using LDVs installed on a vehicle **A.D. Martínez Otero, A. Malekjafarian & E.J. O'Brien**	Analyzing the life cycle environmental impacts in the Chinese building design process **W. Yang, Q.Y. Li, L. Yang, J. Ren & X.Q. Yang**	The value of visual inspections for emergency management of bridges under seismic hazard **M.P. Limongelli, S. Miraglia & A. Fathi**

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14:30	Efficiency of manual and autonomous healing to mitigate chloride ingress in cracked concrete **K. Van Tittelboom, B. Van Belleghem, R. Callens, P. Van den Heede & N. De Belie**	A comparative study of Acoustic Emission tomography and Digital Image Correlation measurement on a reinforced concrete beam **Y. Yang, F. Zhang, D.A. Hordijk, K. Hashimoto & T. Shiotani**	Hidden safety in equilibrium verification of a steel bridge based on wind tunnel testing **J. Žitný, P. Ryjáček, J. Marková & M Sýkora**	Study on physical property and curability of concrete with high content of blast furnace slag **K. Eguchi, Y. Kato & D.N. Katpady**	Critical proof load for proof load testing of concrete bridges based on scripted FEM analysis **X. Chen, Y. Yang, P. Evangeliou & H. van der Ham**
14:45	Establishment of spraying repair technology for concrete structures using drone **T. Iyoda, K. Nimura & T. Hasegawa**	Analysis of fatigue behaviour of single steel fibre pull-out in a concrete matrix with micro-CT and acoustic emission **M. De Smedt, C. Van Steen, K. De Wilder, L. Vandewalle & E. Verstrynge**	Analysis for repair effect in each layer of expressway pavements **S. Araki, T. Kazato, K. Kaito, K. Kobayashi & A. Tanaka**	Influence of ASR expansion on concrete deterioration observed with neutron imaging of water **Y. Yoshimura, M. Mizuta, H. Sunaga, Y. Otake, Y. Kubo & N. Hayashizaki**	Proposed stop criteria for proof load testing of concrete bridges and verification **E.O.L. Lantsoght, C. van der Veen & D.A. Hordijk**
15:00	Polymer Flexible Joint as a structural repair method reducing stress concentrations in cracked concrete structures **Ł. Zdanowicz, M. Tekieli, B. Zając & A. Kwiecień**	Non-destructive inspection method for bending strength estimation of polymer concrete **C. Saito, M. Okutsu, M. Nakagawa, S. Yanagi & H. Takahashi**	Advancements in bridge specific assessment live loads for long span structures **N. Benham, C. Mundell & C.R. Hendy**	Long-term performance of cementitious materials used in nuclear waste disposal – A case study at SCK-CEN **Q.T. Phung, S. Seetharam, J. Perko, N. Maes, D. Jacques, S. Liu, E. Valcke, T. Seeman, G. Hoder, L. Lemmens, A. Varzina & R.A. Patel**	Nonlinear finite element analysis of beam experiments for stop criteria **J.E. Paredes & E.O.L. Lantsoght**
15:15	Structural column retrofitting of school building using Ferrocement Composites in Vigan, Ilocos Sur, Philippines **J.M.C. Ongpeng, V. Pilien, A. Del Rosario, A.M. Dizon, K.B. Aviso & R.R. Tan**	Combining X-Ray imaging and acoustic emission to measure damage progression in ultra-high-performance-concrete **R. Kravchuk, D. Loshkov & E.N. Landis**	Probabilistic assessment of durability of hydroelectric power plants **J. Marková, K. Jung & M. Sýkora**	Investigating the effect of surplus filler of asphalt plant on setting time and compressive strength of cement mortar **M. Kioumarsi & H. Vafaeinejad**	Load testing on a high railway bridge to determine the longitudinal stiffness of the substructure **M. Wenner, F. Wedel, T. Meier & S. Marx**
15:30	An optimum strategy for FRP-strengthening of corrosion-affected reinforced concrete columns **H. Baji, C.-Q. Li, F. Chen & W. Yang**			Effect of initial curing temperature on mechanical strength of concrete **M. Kioumarsi & H. Vafaeinejad**	Bridge diagnostic load testing in Ecuador – case studies **J. Bonifaz, S. Zaruma, A. Robalino & T.A. Sánchez**
15:45	The role of silicate salts in self-healing properties of cement pastes **M. Stefanidou, V. Kotrotsiou & F. Kesikidou**			A sustainable approach to the design of reinforced concrete beams **A.P. Fantilli, F. Tondolo, B. Chiaia & G. Habert**	Determination and assessment of the behavior of a semi-integral railway viaduct **M. Käding, M. Wenner, H. Liao & S. Marx**

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16:30	Sustainable and future-proof port infrastructure J.G. de Gijt, E.J. Broos, C. Bosschieter, P. Taneja & H.E. Pacejka	On the bonding performance of distributed optical fiber sensors (DOFS) in structural concrete A. Barrias, J.R. Casas & S. Villalba	Effects of LCA impact categories and methodology on the interpretation of a building's environmental performance L. Delem, L. Wastiels & K. Allacker	A Bayesian network based approach for integration of condition-based maintenance in strategic offshore wind farm O&M simulation models J.S. Nielsen, J.D. Sørensen, I.B. Sperstad & T.M. Welte
16:45	Robustness as a decision criterion for construction and evaluation of ship lock chambers C. Kunz	A machine learning approach for the estimation of fuel consumption related to road pavement rolling resistance for large fleets of trucks F. Perrotta, T. Parry, L.C. Neves & M. Mesgarpour	Review of existing service lives' values for building elements and their sensitivity on building LCA results and LCC results S. Lasvaux, M. Giorgi, D. Favre, A. Hollberg, V. John & G. Habert	Structural integrity management with unmanned aerial vehicles: state- of-the-art review and outlook M. Kapoor, E. Katsanos, S. Thöns, L. Nalpantidis & J. Winkler
17:00	Improvement of the planning process of flood protection assets by using experiences with operation and maintenance - Hamburg case study P. Fröhle, N. Manojlovic, S. Shaikh, P. Jordan, M. Schaper, J.-C. Schmidt & M. Roth	Fuzzy-random approach to debris model for riverbed scour depth investigation at bridge piers L. Sgambi, N. Basso & E. Garavaglia	Improving the reliability and specificity of an input-output-based hybrid (IOH) method for computing embodied energy of a building M.K. Dixit & V. Venkatraj	The effects of deterioration models on the value of damage detection information L. Long, S. Thöns & M. Döhler
17:15	Peer reviews as an asset management tool B. Lassing, P. Van Poorten, M. Walraven, S. van Herk, B. Vonk & R. Windsor		Development of a simplified methodology for creating embodied energy database of construction materials and processes in India S. Palaniappan & V. Bindu Inti	
17:30	Expert interviews in long-term damage analysis for bottom and bank revetments along German inland waterways J. Sorgatz, J. Kayser & H. Schüttrumpf		Environmental impacts of future electricity production in Hungary with reflect on building operational energy use B. Kiss, Zs. Szalay & E. Kácsor	
17:45	Discussion		Life cycle assessment of alternative masonry to concrete blocks J. Dahmen, J. Kim & C.M. Ouellet-Plamondon	

	MoE-5 'Baekeland 2' room	MoE-6 'Baekeland 3' room	MoE-7 'Bauwens' room	MoE-8 'Ghislain 1' room	MoE-9 'Ghislain 2' room
	MS-9: Multi-hazard resilience assessment in a Life-Cycle context Chairs J. Ghosh & J.E. Padgett	**SS-2: Climate adaptation engineering** Chairs E. Bastidas-Arteaga & M. Kušter Marić	**MS-3: Probabilistic assessment of existing structures** Chairs M. Blomfors & D. Müller	**MS-6: Performance of concrete during Life-Cycle** Chairs A. Hollberg & T. Iyoda	**MS-1: Load testing of new and existing structures** Chairs E.O.L. Lantsoght & Y. Yang
16:30	A discussion on the need for flexibility in infrastructure development S. Torres & M. Sánchez-Silva	Modeling the climate change effects on storm surge with metamodels A. Contento, H. Xu, P. Gardoni & S. Guerrier	Reliability analysis of corroded reinforced concrete beam with regards to anchorage failure M. Blomfors, D. Honfi, O. Larsson Ivanov, K. Zandi & K. Lundgren	Performance evaluation on chlorine ion immobilizing ability of concrete using calcium aluminate aggregate and additive Y. Nakanishi, S. Ito & T. Iyoda	Development of a stop criterion for load tests based on the critical shear displacement theory K. Benitez, E.O.L. Lantsoght & Y. Yang
16:45	Modeling the resilience of aging concrete bridge columns subjected to corrosion & extreme climate events H. Almansour, A. Mohammed & Z. Lounis	Impact of climate change on optimal wood pole asset management A.M. Salman, Y. Li & E. Bastidas-Arteaga	Historic roof structures: life-cycle assessment and selective maintenance strategies E. Garavaglia, N. Basso & L. Sgambi	Effect of chloride and corrosion of reinforcing steel on heat transfer of reinforced concrete P. Sancharoen, D. Im, P. Julnipitawong & S. Tangtermsirikul	Verification of flexural stop criteria for proof load tests on concrete bridges based on beam experiments A. Rodriguez Burneo & E.O.L. Lantsoght
17:00	Uncertainty analysis and impact on seismic life-cycle cost assessment of highway bridge structures S. Shekhar & J. Ghosh	Climate change impact on safety and performance of existing and future bridges A. Nasr, O. Larsson Ivanov, I. Björnsson, J. Johansson, D. Honfi & E. Kjellström	Development of an optimisation-based and practice orientated assessment scheme for the evaluation of existing timber structures M. Loebjinski, H. Pasternak, J. Köhler & W. Rug	Estimation of compressive strength at early age using electric conductivity L.L. Chacha Costa, T. Shibuya & T. Iyoda	Load testing and rating of the KY 220 road bridge A. Peiris, J. Hudson & I. Harik
17:15	Life-cycle based resilience assessment of bridges under seismic hazard B. Sharanbaswa & S. Banerjee	A tool to evaluate effectiveness of climate change adaptation measures for houses subjected to coastal flood risks A. Creach, M. Gonzva, E. Bastidas-Arteaga, S. Pardo & D. Mercier	Reliability assessment of large hydraulic structures with spatially variable measurements S. Geyer, I. Papaioannou, D. Straub & C. Kunz	Investigating the effect of improving the low grade recycled aggregate by carbonation A.A. Abdulkadeeer, N. Matsuda & T. Iyoda	Strength evaluation of pre-stressed concrete bridges by load testing E.S. Hernandez & J.J. Myers
17:30	Stochastic modeling of post-repair performance and integration into bridge life-cycle assessment N. Vishnu & J.E. Padgett	Evaluating the effect of climate change on thermal actions on structures P. Croce, P. Formichi, F. Landi & F. Marsili	Uncertainties in the assessment of existing masonry structures D. Müller & C.-A. Graubner	Cement-based geotechnical elements exposed to chemical attack – provisions for durability in standards F. Wagemann, F. Schmidt-Döhl & A. Rahimi	Static load deflection experiment on a beam for damage detection using the Deformation Area Difference Method D. Erdenebat, D. Waldmann & F.N. Teferle
17:45				Shrinkage characteristics of ground granulated blast furnace slag high content cement H. Mizuno & T. Iyoda	Follow-up assessment on an old concrete road bridge based on operational dynamic bridge behaviour – analysis of structural integrity and determination of loading capacity R. Veit-Egerer, J. Bursa & J. Synek

TUESDAY, OCTOBER 30, 2018

Keynote Lectures

08:30 | 09:30		Compliance testing for probabilistic durability design purposes **C. Gehlen**
		Data standardization for life-cycle performance evaluation of a suspension bridge with multi-pylons **A. Chen**

Concurrent Technical Sessions

		Session Title	Organizer(s)
10:00 | 12:00	TuM-1	SS-1: Structural Health Monitoring and decision making for infrastructures in multi-hazard environment	S. Thöns, G. Lombaert & M.P. Limongelli
	TuM-2	SS-4: Modeling time-dependent behavior and deterioration of concrete	R. Wan-Wendner, M. Alnagger, G. Di Luzio & G. Cusatis
	TuM-3	SS-3: Quality control procedures on the Life-Cycle management of existing bridges	J.C. Matos & J.R. Casas
	TuM-4	MS-4: Risk and reliability acceptance criteria	D. Diamantidis, M. Faber, K. Fischer, M. Holicky, M. Sýkora, J. Köhler & T. Vrouwenvelder
	TuM-5	MS-17: Life-Cycle management as focus area within asset management	J. Bakker, H. Roebers, M. Hertogh & J.F.M. Wessels
	TuM-6	SS-13: Life-Cycle of slope and river bank protection system considering soil bioengineering as well as conventional structures	G. Kalny, H.P. Rauch & A. Strauss
	TuM-7	MS-15: Probability-based service life design of reinforced concrete structures exposed to reinforcement corrosion	G. De Schutter & S. Keßler
	TuM-8	GS-7: Bridge engineering	
	TuM-9	GS-1: Probability theory & applied structural reliability methods	
13:00 | 14:30	TuA-1	MS-13: Advances in Structural Health Monitoring for real-world applications	C.W. Kim, P.J. McGetrick, A. Cunha & T. Kitahara
	TuA-2	SS-4: Modeling time-dependent behavior and deterioration of concrete	R. Wan-Wendner, M. Alnagger, G. Di Luzio & G. Cusatis
	TuA-3	MS-2: Vibration-based Structural Health Monitoring, damage identification and residual lifetime estimation	E.P.B. Reynders, G. Lombaert, E. Chatzi & C. Papadimitriou
	TuA-4	GS-5: Earthquake engineering	
	TuA-5	MS-17: Life-Cycle management as focus area within asset management	J. Bakker, H. Roebers, M. Hertogh & J.F.M. Wessels
	TuA-6	MS-18: Serviceability of underground structures	Y. Yuan, E. Bilotta, H. Yu & Q. Ai
	TuA-7	MS-11: Life-Cycle performance of structure and infrastructure under uncertainty	M. Akiyama & D.M. Frangopol
	TuA-8	GS-6: Traffic load modelling	
	TuA-9	GS-8: Life-cycle assessment	
15:00 | 16:30	TuE-1	MS-13: Advances in Structural Health Monitoring for real-world applications	C.W. Kim, P.J. McGetrick, A. Cunha & T. Kitahara
	TuE-2	GS-2: Durability	
	TuE-3	MS-2: Vibration-based Structural Health Monitoring, damage identification and residual lifetime estimation	E.P.B. Reynders, G. Lombaert, E. Chatzi & C. Papadimitriou
	TuE-4	GS-5: Earthquake engineering	
	TuE-5	MS-17: Life-Cycle management as focus area within asset management	J. Bakker, H. Roebers, M. Hertogh & J.F.M. Wessels
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	TuE-7	MS-11: Life-Cycle performance of structure and infrastructure under uncertainty	M. Akiyama & D.M. Frangopol
	TuE-8	SS-17: INFRASTAR - Fatigue reliability analysis of wind turbine and bridge structures	E. Brühwiler, E. Niederleithinger & J.D. Sørensen
	TuE-9	GS-8: Life-cycle assessment	

Gala Ceremony and Fazlur R. Khan Lecture

18:00		Durability of bridges **M.C. Tang**

	TuM-1 'Jan Van Eyck' room	TuM-2 'Hubert Van Eyck' room	TuM-3 'Van Der Goes' room	TuM-4 'Baekeland 1' room
	SS-1: Structural Health Monitoring and decision making for infrastructures in multi-hazard environment Chairs M.P. Limongelli & P. Gardoni	**SS-4: Modeling time-dependent behavior and deterioration of concrete** Chair R. Wan-Wendner	**SS-3: Quality control procedures on the Life-Cycle management of existing bridges** Chairs J.C. Matos & J.R. Casas	**MS-4: Risk and reliability acceptance criteria** Chairs J. Köhler & R. Hingorani
10:00	Stochastic differential equations for modeling deterioration of engineering systems and calibration based on Structural Health Monitoring data **L. Iannacone & P. Gardoni**	Size and shape effect in shrinkage based on chemo-mechanical simulations **L. Czernuschka, I. Boumakis, J. Vorel & R. Wan-Wendner**	COST Action TU1406 and main results on bridge lifecycle management **J.C. Matos & J.R. Casas**	Obsolescence rate: framework, analysis and influence on risk acceptance criteria **D. Diamantidis, M. Sýkora & E. Bertacca**
10:15	Information requirements for effective management of an ageing transport network **J.H. Paulissen, S.H.J. van Es, W.H.A. Peelen & H.E. Klatter**	Three types of errors in the international norms for the design of concrete and reinforced concrete **R.S. Sanjarovskiy, T.N. Ter-Emmanuilyan & M.M. Manchenko**	Performance based design and assessment - levels of indicators **A. Strauss, L. Mold, K. Bergmeister, A. Mandic, J.C. Matos & J.R. Casas**	Reliability targets for semi-probabilistic design standards **J. Köhler**
10:30	ROC-based performance analysis and interpretation of image-based damage diagnostic tools for underwater inspections **M. O'Byrne, V. Pakrashi, F. Schoefs & B. Ghosh**	Deflections of reinforced concrete beams made with recycled and waste materials under sustained load: experiment and fib Model Code 2010 predictions **N. Tošić, S. Marinković, I. Ignjatović & A. de la Fuente**	The Indicator Readiness Level for the classification of Research Performance Indicators for road bridges **M.P. Limongelli, A. Orcesi & A. Vidovic**	Structural reliability analysis of wind turbines for wind and seismic hazards in Mexico **A. López López, L.E. Pérez Rocha, C.J. Muñoz Black, M.A. Fernández Torres & L.E. Pech Lugo**
10:45	Real-time monitoring as a non-structural risk mitigation strategy for river bridges **F. Ballio, G. Crotti & A. Cigada**	An investigation into influential factors affecting the time to concrete cover cracking in reinforced concrete structures **F. Chen, H. Baji & C.-Q. Li**	Effects of multivariate data reduction of condition assessment of bridge networks on the Value of Information **L. Quirk, C.M. Hanley, J.C. Matos & V. Pakrashi**	Risk analysis of chemical industrial complex using parallel CUDA algorithms **M. Jeremiah & M. Torbol**
11:00	Fiber optic sensing in an integrated Structural Health Monitoring system **R. Blin & D. Inaudi**	Development of fatigue life prediction for RC Slabs under traveling wheel-type loading **K. Takeda & Y. Sato**	Regular bridge inspection data improvement using non-destructive testing **M. Kusar, N. Galvão & S. Sein**	Acceptance criteria for structural design or assessment in accidental situations due to gas explosions **R. Hingorani, P. Tanner & C. Zanuy**
11:15	Structural and climate performance indicators in service life prediction of concrete bridges in multi-hazard environment **M. Kušter Marić, A. Mandić Ivanković & J. Ožbolt**	Early damage detection of fastening systems in concrete under dynamic loading - model details and health monitoring framework **M. Höpfner & P. Spyridis**	First results from a benchmarking of Quality Control Frameworks **A. Kedar & S. Sein**	Safety requirements for the design of ancillary construction equipment **P. Tanner, R. Hingorani & J. Soriano**
11:30		Study on the time variant alteration of chloride profiles for prediction purpose **F. Binder, S.L. Burtscher & A. Limbeck**	Standardizing the quality control of existing bridges **V. Pakrashi & H. Wenzel**	Target reliability indices for existing quay walls derived on the basis of the LQI-criterion **A.A. Roubos, D.L. Allaix, R.D.J.M. Steenbergen, K. Fischer & S.N. Jonkman**
11:45			The case study of Chile, how quality control could improve better lifecycle management of bridges **M.A. Valenzuela**	

	TuM-5 'Baekeland 2' room	TuM-6 'Baekeland 3' room	TuM-7 'Bauwens' room	TuM-8 'Ghislain 1' room	TuM-9 'Ghislain 2' room
	MS-17: Life-Cycle management as focus area within asset management Chairs J. Bakker & H. Roebers	**SS-13: Life-Cycle of slope and river bank protection system considering soil bio-engineering as well as conventional structures** Chairs H.P. Rauch & M. v. d. Thannen	**MS-15: Probability-based service life design of reinforced concrete structures exposed to reinforcement corrosion** Chairs S. Keßler & G. De Schutter	**GS-7: Bridge engineering** Chairs H. De Backer & X. Ruan	**GS-1: Probability theory & applied structural reliability methods** Chairs C. Viljoen & J.D. Sørensen
10:00	Quantifying the impact of variability in railway bridge asset management **P.C. Yianni, L.C. Neves, D. Rama, J.D. Andrews, N. Tedstone & R. Dean**	Degradation processes of wooden logs in soil bioengineering structures **G. Kalny, K. Rados, B. Berntatz, B. Winkler & H.P. Rauch**	Evaluation of the chloride migration and carbonation coefficients of Belgian ready mixed and precast concrete for a performance-based design **P. Minne, E. Gruyaert, L. De Winter, B. Craeye, R. Caspeele & G. De Schutter**	Steel bridge structural retrofit: innovative and light-weight solutions **A. Pipinato, R. Pavan, P. Collin, R. Hallmark, S. Ivanov, R. Geier & M. van der Burg**	Vulnerability of critical slopes by using continuous Bayesian networks **D. De León, D. Delgado, E. Solorio & L. Esteva**
10:15	Quantifying the Performance Age of Highway Bridges **Y. Xie, D. Schraven, J. Bakker & M. Hertogh**	Development of a concept for a holistic LCA model for soil bioengineering structures **M. von der Thannen, S. Hoerbinger, H.P. Rauch, R. Paratscha, R. Smutny, A. Strauss & T. Lamplazer**	Probabilistic evaluation of service-life of RC structures subjected to carbonation **R.A. Couto & S.M.C. Diniz**	Assessment procedures for existing bridges: towards a new era of codes and standards **R. Pavan & E. Siviero**	A fast and efficient approach to solution of structure system reliability **N. Xiao, Y. Chen & F.Y. Lu**
10:30	A simplified approach to address uncertainty in life cycle costing (LCC) analysis **Y. Sun & D.G. Carmichael**	Soil bioengineering: requirements, materials, applications **H.P. Rauch, M. von der Thannen & C. Weissteiner**	Durability design of concrete structures regarding chloride-induced corrosion by means of nomograms **A. Rahimi**	Stress concentration factor in concrete-filled steel tubular K-joints under balenced axial loading **I.A. Musa & F.R. Mashiri**	Failure probability of a designed nonlinear structure taking into account the uncertainty of Fourier phase **R. Huang, T. Sato, C. Wan, A. Ahamed & L. Zhao**
10:45	Life cycle approach for sustainable pavement options for infrastructure projects **B. Czarnecki**	Service life planning for Austrian river bank protection structures **R. Paratscha, A. Strauss, R. Smutny, M. von der Thannen, H.P. Rauch & T. Lampalzer**	Sensitivity analysis of a service life model linked to chloride induced corrosion focusing the critical chloride content **G. Kapteina**	Influence of fly-ash mixture to give to life cycle cost and constructability of composite girder bridge **K. Kubota, H. Ito, H. Kuriyama & T. Izumiya**	Iterative point estimate method for probability moments of function **W. Fan, H. Guo, J. Wei, Z. Li & P. Deng**
11:00	Comparison of truck fuel consumption measurements with results of existing models and implications for road pavement LCA **F. Perrotta, T. Parry, L.C. Neves, T. Buckland, E. Benbow & H. Viner**	Specialisation for the Ecoengineering sector in the Mediterranean environment ECOMED **P. Sangalli, G. Tardío & G. Zaimes**	The importance of the size effect in corrosion of steel in concrete for probabilistic service life modeling **U.M. Angst**	Assessment of Barton High Level Bridge approach span superstructures **D.M. Day**	An assessment of the inherent reliability of SANS 10162-2 for cold-formed steel columns using the Direct Strength Method **M.A. West-Russell, C. Viljoen & E. van der Klashorst**
11:15	Technical management risks for transport infrastructures along whole life cycle: identification and analysis **D. Garcia-Sanchez, J. Aurtenetxe, M. Zalbide, R. Socorro, A. Pérez-Hernando & D. Inaudi**	Development and challenges of soil bioengineering applications to vegetated riprap **P. Raymond, S. Tron & I. Larocque**	Evaluation of half-cell potential measurement and its impact on the condition assessment **S. Keßler**	Life cycle performance of HSS bridges **M. Seyoum Lemma, C. Rigueiro, L. Simões da Silva, H. Gervásio & J.O. Pedro**	Failure probability estimation in high dimensional spaces **K. Breitung**
11:30	Expert-driven and data-driven risk-centred maintenance decision-making approaches for railway transport assets **F. Dinmohammadi**	The limits of mechanical resistance in bioengineering for riverbank protection **A. Evette, D. Jaymond, A. Recking, G. Piton, H.P. Rauch & P.-A. Frossard**	Serviceability and residual working life assessment of existing bridges **J. Marková & V. Navarova**	Refurbishment of Swanswell Viaduct **C.G. West**	Reliability based design of temporary structures **E. Vereecken, W. Botte & R. Caspeele**
11:45	Mechanisms for managing changes in construction projects **H. C. Demirel, L. Volker, W. Leendertse & M. Hertogh**			Resilience and economical sustainability of a FRP reinforced concrete bridge in Florida: LCC analysis at the design stage **T. Cadenazzi, M. Rossini, S. Nolan, G. Dotelli, A. Arrigoni & A. Nanni**	Reliability-based analysis of tensile surface structures designed using partial factors **E. De Smedt, M. Mollaert, L. Pyl & R. Caspeele**

	TuA-1 'Jan Van Eyck' room	TuA-2 'Hubert Van Eyck' room	TuA-3 'Van Der Goes' room	TuA-4 'Baekeland 1' room
	MS-13: Advances in Structural Health Monitoring for real-world applications Chairs A. Cunha & T. Kitahara	**SS-4: Modeling time-dependent behavior and deterioration of concrete** Chair R. Wan-Wendner	**MS-2: Vibration-based Structural Health Monitoring, damage identification and residual lifetime estimation** Chairs E. Chatzi & E. Reynders	**GS-5: Earthquake engineering** Chairs R. Honda
13:00	Identification of damaged regions in dynamically loaded dams **M. Alalade, T. Lahmer & F. Wuttke**	A rapid numerical simulation method of chloride ingress in concrete material **Y. Li, X. Ruan & Z.R. Jin**	Robust computation of the observability of large linear systems with unknown parameters **X. Shi, M.N. Chatzis & M.S. Williams**	A simple estimation method of the probability distribution of residual displacement and maximum bending moment for pile supported wharf by earthquake **T. Nagao & P. Lu**
13:15	Installation and results from the first 18 months of operation of the dynamic monitoring system of Baixo Sabor arch dam **S. Pereira, F. Magalhães, A. Cunha, J. Gomes & J.V. Lemos**	Concrete cover cracking under chloride-induced time-varying non-uniform steel corrosion **J. Zhang, P. Wang & Z. Guan**	Towards the use of UHPFRC in railway bridges: the rehabilitation of Buna Bridge **H. Martín-Sanz, K. Tatsis, E. Chatzi, E. Brühwiler, I. Stipanovic, A. Mandic, D. Damjanovic & A. Sanja**	Machine learning implementation for a rapid earthquake early warning system **F. Sihombing & M. Torbol**
13:30	Monitoring of corrosive environment focusing on dew condensation in steel bridges **Z. Rasoli, K. Nagata & T. Kitahara**	Analysis of coupled exposures considering the rapid chloride migration test and the accelerated carbonation test **M. Vogel, S. Schmiedel & H.S. Müller**	Online tracking of inputs, states and parameters of structural dynamic systems **F. Karlsson, K. Maes & G. Lombaert**	Experimental investigation of seismic behaviour of corroded RC bridge piers **X. Ge, N.A. Alexander & M.M. Kashani**
13:45	Optimising circumferential piezoelectric transducer arrays of pipelines through linear superposition analysis **X. Niu, H.P. Chen & H.R. Marques**	Modelling of corrosion induced cracking in reinforced concrete **I. Lau, G. Fu, C.-Q. Li & S. De Silva**	State estimation of geometrically non-linear systems using reduced-order models **K. Tatsis, L. Wu, P. Tiso & E. Chatzi**	Seismic isolation design for Chaijiaxia Yellow River Bridge with steel triangular plate damper **L. Zhou, J. Peng, Y. Wu & Z. Yin**
14:00	Particle Swarm Optimization for damage identification in beam-like structures **A. Barontini, M.-G. Masciotta, L.F. Ramos, P.B. Lourenço & P. Amado-Mendes**	Optimization of service life design of concrete infrastructures in corrosive environments under a changing climate **Z. Lounis**	Modal strain-based damage identification on a prestressed concrete beam **D. Anastasopoulos, G. De Roeck & E.P.B. Reynders**	Assessing economic risk for businesses subject to seismic events **L. Hofer, M.A. Zanini, F. Faleschini & C. Pellegrino**
14:15	Experimental investigation on crack detection using imbedded smart aggregate **C. Du, Y. Yang & D.A. Hordijk**	Simulation of crack propagation owing to deformed bar corrosion **S. Okazaki, C. Okuma, H. Yoshida & Mao Kurumatani**		

	TuA-5 'Baekeland 2' room	TuA-6 'Baekeland 3' room	TuA-7 'Bauwens' room	TuA-8 'Ghislain 1' room	TuA-9 'Ghislain 2' room
	MS-17: Life-Cycle management as focus area within asset management Chairs M. Hertogh & J.F.M. Wessels	**MS-18: Serviceability of underground structures** Chairs C.Q. Li & Q. Ai	**MS-11: Life-Cycle performance of structure and infrastructure under uncertainty** Chairs M. Akiyama & D.M. Frangopol	**GS-6: Traffic load modelling** Chairs J. Köhler & D.L. Allaix	**GS-8: Life-cycle assessment** Chairs K. Van Tittelboom
13:00	A many-objective optimization model for sustainable pavement management considering several sustainability metrics through a multi-dimensionality reduction approach **J. Santos, V. Cerezo, G. Flintsch & A. Ferreira**	The effect of hydrogen embrittlement on durability of buried steel pipes **M. Wasim, M. Mahnoodian, D. Robert & C.-Q. Li**	Hazard analysis for bridge scour evaluation at watershed level considering climate change impact **D.Y. Yang & D.M. Frangopol**	Development and validation of a full probabilistic model for traffic load of bridges based on Weigh-In-Motion (WIM) data **J. Kim & J. Song**	ProLCA – treatment of uncertainty in infrastructure LCA **O. Larsson Ivanov, D. Honfi, F. Santandrea & H. Stripple**
13:15	Computational framework for a railway bridge maintenance strategies affected by gradual deterioration **J. Fernandes, J.C. Matos, D.V. Oliveira & A.A. Henriques**	Rapid detecting equipment for structural defects of metro tunnel **K. Wang & X. Yao**	Sensitivity analysis of time dependent reliability of RC members in general climate environment **D.-G. Lu, W.-H. Zhang & W. Wang**	The effect of traffic load model assumptions on the reliability of road bridges **M. Teichgräber, M. Novák, J. Köhler & D. Straub**	LCA of civil engineering infrastructures in composite materials. ACCIONA Construction's expertise **M.M. Pintor-Escobar, E. Guedella-Bustamante & C. Paulotto**
13:30	Evaluation and application of AHP, MAUT and ELECTRE III for infrastructure management **Z. Allah Bukhsh, I. Stipanovic, A. Hartmann & G. Klanker**	A state-oriented maintenance strategy of tunnel structure **Q. Ai, Y. Yuan & X. Jiang**	Seismic fragility of corroding RC bridge substructures in marine environment **F. Cui & M. Ghosn**	Extended extrapolation methods for robust estimates of extreme traffic load effects on bridges **M. Nowak, D. Straub & O. Fischer**	Method and assessment decisions in the evaluation of the LCA-results of timber construction components **S. Ebert & S. Ott**
13:45	Assessing approximation errors caused by truncation of cash flows in public infrastructure net present value calculations **R. Treiture, L. van der Meer, J. Bakker, M. Van den Boomen, R. Schoenmaker & R. Wolfert**	Changes in rheology of printable concrete during pumping process **Y. Yuan, Y. Tao & X. Wang**	Time-dependent structural reliability analysis of shield tunnels in coastal regions **Z. He, M. Akiyama, C. He & D.M. Frangopol**		Comparative evaluation of the ecological properties of timber construction components of the dataholz.de platform **S. Ott & S. Ebert**
14:00	A survey of health monitoring techniques for the Dutch transportation infrastructure **J.F.M. Wessels, P.J. van der Mark, K.E. Bektas, J. Bakker & M. van der Voort**	Settlement control, monitoring and analysis of utility tunnel on soft soil foundation **J. Huang, H. Wang & J. Wang**	Non linear structural analyses of prestressed concrete girders: tools and safety formats **B. Belletti, F. Vecchi, M.P. Cosma & A. Strauss**		The impact of structural system composition on reduced embodied carbon **M. Sarkisian, D. Shook, C. Horiuchi & N. Wang**
14:15	Considerations on the use of data to better predict long term replacement and renovation activities in transport infrastructure **J.F.M. Wessels, H. van Meerveld, J. Bakker & K.E. Bektas**		Digitalization is the road to collaboration **W. Jaspers, L.S. van Duffelen & J.-J. de Jong**		Benchmarking embodied carbon in structural materials **C. De Wolf & D. Davies**

	TuE-1 'Jan Van Eyck' room	TuE-2 'Hubert Van Eyck' room	TuE-3 'Van Der Goes' room	TuE-4 'Baekeland 1' room
	MS-13: Advances in Structural Health Monitoring for real-world applications Chairs C.W. Kim & P.J. McGetrick	**GS-2: Durability** Chairs S. Keßler & Ph. Van den Heede	**MS-2: Vibration-based Structural Health Monitoring, damage identification and residual lifetime estimation** Chairs E. Chatzi & G. Lombaert	**GS-5: Earthquake engineering** Chairs B. Belletti
15:00	Development of a remote monitoring system with wireless power-saving sensors for analyzing bridge conditions **E. Sasaki, P. Tuttipongsawat, N. Sinsamutpadung, H. Nishida & K. Takase**	The resistance to salt penetration of the high-strength fly-ash concrete used to make composite girder bridges **H. Ito, K. Kubota, H. Kuriyama & T. Izumiya**	Damage detection of steel bridge by numerical simulations and measurements **B.T. Svendsen, G.T. Frøseth & A. Rønnquist**	Electricity supply reliability modelling for public sector facilities in view of seismic disaster risk **G. Shoji & I. Matsushima**
15:15	Investigation of Bayesian damage detection method for long-term bridge health monitoring **Y. Goi & C.W. Kim**	Influence of re-application of surface penetrant on progression of carbonation of concrete with surface penetrant **Y. Sakoi, M. Aba & Y. Tsukinaga**	Parametric identification and damage assessment of real buildings **G.S. Wang, Y.R. Li & F.K. Huang**	Non-gaussian stochastic features hidden in earthquake motion phase **T. Sato**
15:30	A trial vibration measuring for evaluating performance of small bridge with small FWD system **H. Onishi, K. Ouchi, N. Kimura & D. Yaegashi**	Formulation of the conditions of the destruction of the passivation film of steel bar by chloride ion in high pH environment **N. Hashimoto & Y. Kato**	Deep Neural Network for structural damage detection in bridges **D. Darsono & M. Torbol**	Implications of performance-based seismic design of nonstructural building components on life cycle cost of buildings **G. Karaki**
15:45	Structural health monitoring of a steel girder bridge utilizing reconstructed sparse-like system matrix **T. Mimasu, C.W. Kim & Y. Goi**	Simulating low-frequency and long-term fatigue loading for life-cycle structures **F. Li & J. Zhao**	Vibration-based damage indicators for corrosion detection in tubular structures **O.E. Esu, Y. Wang & M.K. Chryssanthopoulos**	Reliability of base-isolated structures with sliding hydromagnetic bearings considering stochastic ground motions **L.C. Ding, R. Van Coile, R. Caspeele, Y.B. Peng & J.B. Chen**
16:00	Damage identification of bridge structures using the Hilbert-Huang Transform **J.J. Moughty & J.R. Casas**	Study on the spatial distribution of the chloride ion supply in the superstructure of an open-type wharf **Y. Tanaka, Y. Kawabata & E. Kato**	Pre-image reconstruction for compensation of environmental effects in Structural Health Monitoring by kernel PCA **C. Rainieri & E. Reynders**	
16:15	Experimental studies on the feasibility of drive-by bridge inspection method using an appropriate vehicle model **S. Nakajima, C.W. Kim, K.C. Chang & S. Hasegawa**			

	TuE-5 'Baekeland 2' room	TuE-6 'Baekeland 3' room	TuE-7 'Bauwens' room	TuE-8 'Ghislain 1' room	TuE-9 'Ghislain 2' room
	MS-17: Life-Cycle management as focus area within asset management Chairs J. Bakker & H. Roebers	**MS-18: Serviceability of underground structures** Chairs Y. Yuan & E. Bilotta	**MS-11: Life-Cycle performance of structure and infrastructure under uncertainty** Chairs M. Akiyama & D.Y. Yang	**SS-17: INFRASTAR – Fatigue reliability analysis of wind turbine and bridge structures** **SS-9: Novel materials and systems for Life-Cycle Structural Health Monitoring** Chairs J.D. Sørensen	**GS-8: Life-cycle assessment** Chairs D. Snoeck
15:00	Life cycle cost analysis for short span bridges in Indiana **S.L. Leiva & M.D. Bowman**	Dynamic soil normal stresses on side wall of a subway station **Z.M. Zhang, Y. Yuan, E. Bilotta, H.T. Yu & H.L. Zhao**	Sensitivity analysis of fatigue lifetime predictions of pre-stressed concrete bridges using Sobol'-indices **D. Sanio, M.A. Ahrens & P. Mark**	Fatigue reliability analysis of Cret De l'Anneau Viaduct: a case study **A. Mankar, S. Rastayesh & J.D. Sørensen**	Sustainable model-based lifecycle cost analysis of real estate developments **M. Moesl & A. Tautschnig**
15:15	Lifecycle management and replacement strategies: two of a kind? **M. Zandvoort, M.J. van der Vlist, R. Haitsma & E. Oosterveld**	Shaking table model tests on tunnels at different depths **X. Zhao, R.H. Li, M. Zhao & L.J. Tao**	A comparative study on fatigue assessment of orthotropic steel decks based on long-term WIM data **B. Wang, A. Chen & H. De Backer**	"Pocket-Monitoring" for the fatigue safety verification of a RC bridge deck slab **I. Bayane & E. Brühwiler**	EFIResources: A novel approach for resource efficiency in construction **H. Gervasio & S. Dimova**
15:30	A holistic approach to Life Cycle Management at Rijkswaterstaat **J. Bakker & H. Roebers**	Two-dimensional finite element analysis of the seismic performance in complex underground structure **X.S. Cai, Z. Ye & Y. Yuan**	Reliability analysis for geotechnical structures using iterative particle filter **T. Shuku & I. Yoshida**	Fatigue safety verification of a steel railway bridge using short term monitoring data **B. Sawicki, E. Brühwiler & M. Nesterova**	Sustainability rating of lightweight expanded clay aggregates using energy inputs and carbon dioxide emissions in life-cycle analysis **F.M. Tehrani, R. Farshidpour, M. Pouramini, M. Mousavi & A. Namadmalian Esfahani**
15:45	Lessons learned from data analytics, applied to the track maintenance of the Dutch high speed line **R. Schalk, A. Zoeteman & A. Núñez**	Shaking table test on shaft ingate of shield tunnel **J. Zhang, X. Tu , X. Zhang, F. Li & Y. Yuan**	Optimal inspection planning based on Value of Information for airport runway **Y. Tasaki & I. Yoshida**	Innovative soft-material sensor, wireless network and assessment software for bridge life-cycle assessment **K. Loupos et al.**	Standardisation of condition assessment methodologies for structures **J. Engelen, R. Kuijper, D. Bezemer & L. Leenders**
16:00	Asset information management using linked data for the life-cycle of roads **B. Luiten, M. Böhms, D. Alsem & A. O'Keeffe**		A sampling-based approach to identifying optimal inspection and repair strategies for offshore jacket structures **R. Schneider, A. Rogge, S. Thöns, E. Bismut & D. Straub**	The potential of energy harvesting for monitoring corroding metal pipes **F. Okosun & V. Pakrashi**	Life cycle assessment of asphalt mixtures healed by induction heating **E. Lizasoain-Arteaga, I. Indacoechea-Vega & D. Castro-Fresno**
16:15	Discussion		Numerical durability simulation of reinforced concrete structures under consideration of polymorphic uncertain data **K. Kremer, P. Edler, S. Freitag, M. Hofmann & G. Meschke**		Service life prediction of pitched roofs clad with ceramic tiles **R. Ramos, A. Silva, J. de Brito & P.L. Gaspar**

WEDNESDAY, OCTOBER 31, 2018

Keynote Lectures

8:30 | 9:30		Corrosion and its effects on deterioration and remaining safe life of civil infrastructure **C.-Q. Li**
		Optimal planning of operation and maintenance for offshore wind turbines **J.D. Sørensen**

Concurrent Technical Sessions

		Session Title	Organizer(s)
10:00 | 12:00	WeM-1	MS-5: Early BIM for Life-Cycle performance	P. Schneider & P. Geyer
	WeM-2	MS-10: Next generation asset management of civil infrastructure systems	A. Michel, H. Stang, M.R. Geiker & M.D. Lepech
	WeM-3	MS-12: Life-Cycle redundancy, robustness and resilience indicators for aging structural systems under multiple hazards	F. Biondini & D.M. Frangopol
	WeM-4	SS-11: Design for robustness of steel and steel-concrete composite structures	J.-F. Demonceau & J.-P. Jaspart
	WeM-5	MS-16: Life-Cycle maintenance and management for urban infrastructures with big data	A. Chen, Y. Yuan & X. Ruan
	WeM-6	GS-9: Assessment of existing structures	
	WeM-7	MS-19: Circular economy to improve sustainability of infrastructure	S. de Vos-Effting & R. Hofman
	WeM-8	SS-18: The impact of BIM and web technologies in the life-cycle of our built environment	P. Pauwels, K. McGlinn & V. Malvar

Keynote Lectures

13:00 | 13:30		Promoting societal well-being by designing sustainable and resilient infrastructure: engineering tools and broader interdisciplinary considerations **P. Gardoni**

Concurrent Technical Sessions

		Session Title	Organizer(s)
13:30 | 15:00	WeA-1	MS-5: Early BIM for Life-Cycle performance	P. Schneider & P. Geyer
	WeA-2	GS-3: Concrete structures	
	WeA-3	SS-15: PROGRESS - Provisions for Greater Reuse of Steel Structures	P. Kamrath & P. Hradil
	WeA-4	SS-16: Life-Cycle asset management for railway-structures (LeCIE)	T. Petraschek, A. Hüngsberg, N. Friedl, U. Staindl, G. Lener & A. Strauss
	WeA-5	SS-7: Application of probabilistic methods in fire safety engineering	D. Rush, L. Bisby & R. Van Coile
	WeA-6	SS-8: Bespoke models for marine structural management	M. Collette
	WeA-7	GS-8: Life-cycle assessment	

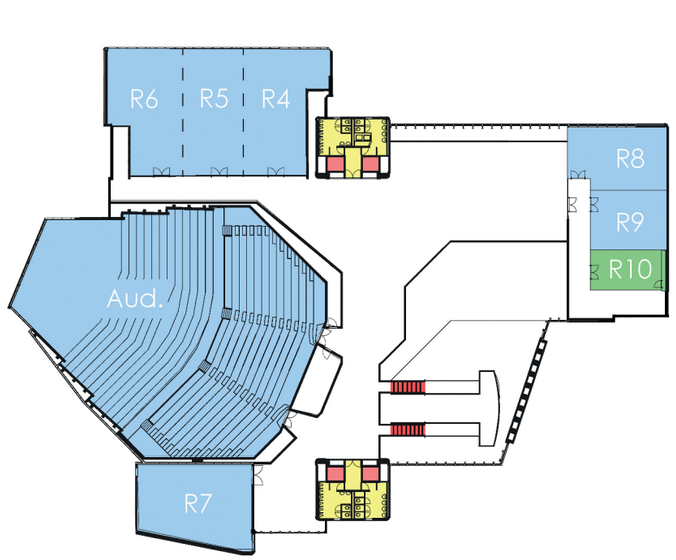
	WeM-1 'Jan Van Eyck' room	WeM-2 'Hubert Van Eyck' room	WeM-3 'Van Der Goes' room	WeM-4 'Baekeland 1' room
	MS-5: Early BIM for Life-Cycle performance Chairs P. Geyer & P. Schneider	**MS-10: Next generation asset management of civil infrastructure systems** Chairs M. Geiker & A. Michel	**MS-12: Life-Cycle redundancy, robustness and resilience indicators for aging structural systems under multiple hazards** Chairs F. Biondini & D.Y. Yang	**SS-11: Design for robustness of steel and steel-concrete composite structures** Chair J.-F. Demonceau
10:00	Design-integrated environmental performance feedback based on early-BIM **A. Hollberg, I. Agustí-Juan, T. Lichtenheld & N. Klüber**	Comparison of optimization approaches for pavement maintenance and rehabilitation policies on road section and network level **V. Donev & M. Hoffmann**	Influence of seismic hazard on RC buildings' resilience based on ANN **G. Bunea, F. Leon & G.M. Atanasiu**	Robustness of steel structures subjected to a column loss scenario **J.-F. Demonceau, M. D'Antimo & J.-P. Jaspart**
10:15	Early-design integration of environmental criteria for digital fabrication **I. Agustí-Juan, A. Hollberg & G. Habert**	Coupled mass transport, chemical, and mechanical modelling in cementitious materials: a dual-lattice approach **A. Michel, V.M. Meson, H. Stang, M.R. Geiker & M. Lepech**	Evaluation of road network performance considering capacity degradation on numerous links **H. Nakajima & R. Honda**	Investigation of the column loss scenario of one composite steel and concrete frame **G. Roverso, N. Baldassino & R. Zandonini**
10:30	A multi-LOD model representing fuzziness and uncertainty of building information models in different design stages **J. Abualdenien & A. Borrmann**	Measuring critical chloride contents in structures and the influence on service life modeling **C. Boschmann Käthler, U.M. Angst & B. Elsener**	Probabilistic life-cycle resilience assessment of aging bridges and road networks under seismic and environmental hazards **L. Capacci & F. Biondini**	Design of steel and composite structures for robustness **N. Hoffmann, U. Kuhlmann & G. Skarmoutsos**
10:45	The energy grey zone - uncertainty in embedded energy and greenhouse gas emissions assessment of buildings in early design phases **H. Harter, P. Schneider-Marin & W. Lang**	A framework for modeling corrosion-related degradation in reinforced concrete **Z. Zhang, U.M. Angst & A. Michel**	Innovative methodology of assessing the residual structural safety margin of reinforced concrete structures - application to cooling towers **N.C. Tran, C. Toulemonde, F. Beaudouin & C. Meuwisse**	Behaviour of an innovative joint solution under impulsive loading **M. D'Antimo, J.-F. Demonceau & J.-P. Jaspart**
11:00	Information exchange scenarios between machine learning energy prediction model and BIM at early stage of design **M.M. Singh, S. Singaravel & P. Geyer**	Design and maintenance of concrete structures requires both engineering and sustainability limit states **M.R. Geiker, A. Michel, H. Stang, H. Vikan & M.D. Lepech**	Life-cycle seismic performance prediction of deteriorating RC structures using artificial neural networks **S. Bianchi & F. Biondini**	Influence analysis of group studs stiffness in accelerated construction steel-concrete composite small box girder bridges **Y. Xiang & S. Guo**
11:15	Intelligent substitution models for structural design in early BIM stages **D. Steiner & M. Schnellenbach-Held**	Long-term planning with complex and dynamic infrastructure systems **M. Havelaar, W. Jaspers, A.R.M. Wolfert, G.A. van Nederveen & W.L. Auping**	Modelling of physical systems for resilience assessment **G. Tsionis, A. Caverzan, E. Krausmann, G. Giannopoulos, L. Galbusera & N. Kourti**	Development of a design-oriented structural robustness index for progressive collapse **C. Praxedes Silva Neto & X.-X. Yuan**
11:30		Scheduling of waterways maintenance interventions applying queueing theory **F. Marsili, J. Bödefeld, H. Daduna & P. Croce**	Robustness analysis of 3D base-isolated systems **P. Castaldo, D. Gino & G. Mancini**	Performance metrics for seismic-resilient steel braced frame buildings **O. Serban & L. Tirca**
11:45			Probabilistic resilience assessment of infrastructure - a review **C. de Paor, L. Connolly & A. O'Connor**	Post-failure torsion capacity and robustness of encased tubular arch spring connections **Ph. Van Bogaert, K. Schotte & H. De Backer**

	WeM-5 'Baekeland 2' room	WeM-6 'Baekeland 3' room	WeM-7 'Bauwens' room	WeM-8 'Ghislain 2' room
	MS-16: Life-Cycle maintenance and management for urban infrastructures with big data Chairs Y. Yuan & X. Ruan	**GS-9: Assessment of existing structures** Chairs M. Sykora & W. Botte	**MS-19: Circular economy to improve sustainability of infrastructure** Chairs S. d. Vos-Effting & R. Hofman	**SS-18: The impact of BIM and web technologies in the life-cycle of our built environment** Chairs P. Pauwels
10:00	Performance comparison for pipe failure prediction using artificial neural networks **S. Kerwin, B. García de Soto & B.T. Adey**	Condition assessment based on results of qualitative risk analyses **A. Panenka & F. Nyobeu**	Are recycled and low temperature asphalt mixtures more sustainable? **M. Hauck, E. Keijzer, H. van Meerveld, B. Jansen, S. de Vos-Effting & R. Hofman**	Modelling risk paths for BIM adoption in Singapore **X. Zhao**
10:15	Long-term mechanical reliability evaluation of the main cable of a suspension Bridge **D. Wang, Y. Zhang, A. Chen, L. Li & H. Tian**	Development and operation of non-destructive inspection device for stay cables **H. Sakai**	Relevance of the information content in module D on circular economy of building material **K. Krause & A. Hafner**	Investigation of the lifetime extension of bridges, using three-dimensional CIM data **T. Yamamoto, K. Konuma, T. Yaguchi, H. Furuta, H. Tsuruta & N. Ueda**
10:30	Empirical Bayes-based Markov chain deterioration modelling for municipal sewer systems **P. Lin, X.X. Yuan & R. Rashedi**	Point-based POMDP risk based inspection of offshore wind substructures **P.G. Morato, Q.A. Mai, P. Rigo & J.S. Nielsen**	PAPERCHAIN Project: Establishment of New Circular Economy Models between pulp and paper industry and construction industry to create sustainable infrastructures **M.S. Martín-Castellote, J.J. Cepriá-Pamplona, M.M. Pintor Escobar & E. Guedella-Bustamante**	A generic model for the digitalization of structural damage **A. Hamdan & R.J. Scherer**
10:45	Incremental launching construction of Chajiaxia Yellow River Bridge with data feedback **L. Zhou, J. Peng, Y. Wu & Z. Yin**	Acoustic emission based fracture analysis in masonry under cyclic loading **N. Shetty, E. Verstrynge, M. Wevers, G. Livitsanos, D. Aggelis & D. Van Hemelrijck**	Introducing the circular economy in road construction **W.L. Leendertse, M.E.M. Schäffner & S. Kerkhofs**	Using semantic technologies to improve FM asset information management processes **J.W.B. Kibe**
11:00	Bayesian formula based dynamic information updating of bridge traffic flow response probability model **X.J. Wang, X. Ruan & K.P. Zhou**	A comparative study on load response of long-span bridges derived by the macro and micro scale methods **Z.R. Jin, X. Ruan & Y. Li**	SUP&R DST: SUstainable Pavement & Railways Decision Support Tool **J. Santos, S. Bressi, V. Cerezo & D. Lo Presti**	CEO & CAMO Ontologies: a circulation medium for materials in the construction industry **E.M. Sauter, R.L.G. Lemmens & P. Pauwels**
11:15	Experimental study on the mechanical property evolution of main cable steel wires of suspension bridges under corrosion state **R. Ma, C. Cui, A. Chen, L. Li & H. Tian**	Reschedule or not? Use of benefit-cost indicator for railway track inspection **M.H. Osman & S. Kaewunruen**		
11:30	A risk management system of Hainan interchange merge area in maintenance zone: risk analysis, identification, assessment and countermeasure **B. Liu, H. Yan & W. Zhao**	Instrumentation, truck, track and bridge on operation railway **R. Montoya, L. Fernando Martha, J. Fernando Rodriguez, A. Merheb, A. Sisdelli & F. Masini**		
11:45	Buckling analysis of a long span steel cable-stayed bridge **Y. Wei, Y.T. He, X. Ruan & L. Ding**	Adaptive direct policy search for inspection and maintenance planning in structural systems **E. Bismut & D. Straub**		

	WeA-1 'Jan Van Eyck' room	WeA-2 'Hubert Van Eyck' room	WeA-3 'Van Der Goes' room	WeA-4 'Baekeland 1' room
	MS-5: Early BIM for Life-Cycle performance Chairs P. Schneider & P. Geyer	**GS-3: Concrete structures** Chairs K. Bergmeister & L. Taerwe	**SS-15: PROGRESS - Provisions for Greater Reuse of Steel Structures** Chairs P. Kamrath & P. Hradil	**SS-16: Life-Cycle asset management for railway-structures (LeCIE)** Chairs G. Lener & A. Strauss
13:30	Seamless integration of simulation and analysis in early design phases **A. Zahedi & F. Petzold**	Application of 2D micro-scale image analysis on concrete surface for evaluating concrete durability under various environments **T. Chlayon, M. Iwanami & N. Chijiwa**	Environmental- and life cycle cost impact of reused steel structures : a case study **S. Vares, P. Hradil, S. Pulakka, V. Ungureanu & M. Sansom**	Life cycle assessment for civil engineering structures of railway bridges made of steel **G. Lener & J. Schmid**
13:45	Efficient management of design options for early BIM **H. Mattern & M. König**	Robustness of flat slabs against progressive collapse due to column loss **T. Molkens**	Assessment of reusability of components from single-storey steel buildings **P. Hradil, L. Fülöp & V. Ungureanu**	Approach on network-wide sustainable asset management focused on national funding **R. Liskounig**
14:00	The early BIM adoption for a Contracting Authority: standard and methods in the ANAS approach **A. Osello, N. Rapetti & F. Semeraro**	Prestressed concrete roof girders: Part I – Deterministic and stochastic model **A. Strauss, B. Krug, O. Slowik & D. Novák**	Calculating the climate impact of demolition **P. Kamrath**	Decision-making framework and optimized remediation for railway concrete bridges deteriorated by carbonation and chloride attack **A. Vidovic, I. Zambon, A. Strauss & D.M. Frangopol**
14:15	How to make decision-makers aware of sustainable construction? **H. Kreiner, M. Scherz & A. Passer**	Prestressed concrete roof girders: Part II – Surrogate modeling and sensitivity analysis **D. Lehký, D. Novák, L. Novák & M. Šomodíková**	Deconstruction, recycling and reuse of lightweight metal constructions **P. Kamrath, M. Kuhnhenne, D. Pyschny & K. Janczyk**	Short-, mid- and longterm LCM prognosis of heavy maintenance and replacement demand for bridge structures at 3 selected railway routes analysing different maintenance strategies **R. Veit-Egerer, G.J. Rajasingam, T. Petraschek, L. Rossbacher, N. Friedl & U. Staindl**
14:30		Prestressed concrete roof girders: Part III – Semi-probabilistic design **D. Novák, L. Novak, O. Slowik & A. Strauss**	Modelling and experimental testing of interlocking steel connection behaviour **P. Matis, T. Martin, P.J. McGetrick & D. Robinson**	Execution time estimation of recovery actions for a disrupted railway track inspection schedule **M.H. Osman & S. Kaewunruen**
14:45		Basalt fiber for strengthening compressed structural elements in concrete and reinforced concrete: finite element modeling **T. Zhelyazov**		Structural assessment and rehabilitation of old stone railway bridges **P.G. Malerba & D. Corti**

	WeA-5 'Baekeland 2' room	WeA-6 'Baekeland 3' room	WeA-7 'Bauwens' room
	SS-7: Application of probabilistic methods in fire safety engineering Chairs R. Van Coile	**SS-8: Bespoke models for marine structural management** Chairs M. Collette	**GS-8: Life-cycle assessment** Chairs W. De Corte
13:30	Effects of modelling on failure probabilities in structural fire design **M. Shrivastava, A.K. Abu, R.P. Dhakal & P.J. Moss**	Integrated computational materials engineering (ICME) techniques to enable a material-informed digital twin prototype for marine structures **C.R. Fisher, K. Nahshon, M.F. Sinfield & D. Kihl**	Energy consumption evaluation of a passive house through numerical simulations and monitoring data **C. Tanasa, V. Stoian, D. Stoian & D. Dan**
13:45	Numerical analysis on the fire behavior of a steel truss structure **L.M. Lu, G.L. Yuan, Q.J. Shu & Q.T. Li**	Adapting life-cycle management of ship structures under fatigue considering uncertain operation conditions **Y. Liu & D.M. Frangopol**	A review of retrofit strategies for Large Panel System buildings **E. Romano, O. Iuorio, N. Nikitas & P. Negro**
14:00	The application of an LQI reliability based methodology to determine the fire resistance requirements for two Mumbai residential towers **D. Hopkin, S. Lay & A. Henderson**	Probabilistic service life management of fatigue sensitive ship hull structures considering various sea loads **S. Kim & D.M. Frangopol**	Investigation, assessment and suggestion to the existing traditional house of low-income family in Cambodia based on principles of passive house design **A. Vann & G.Q. He**
14:15	Target safety levels for insulated steel beams exposed to fire, based on Lifetime Cost Optimisation **R. Van Coile & D.J. Hopkin**	Ship motion and fatigue damage estimation via a digital twin **M. Schirmann, M. Collette & J. Gose**	Interchange of economic data throughout the life cycle of building facilities in public procurement environments **F. Salvado, N. Almeida & Á. Vale e Azevedo**
14:30			Smart grid integration towards sustainable retrofitting of large prefabricated concrete panels collective housing built in the 1970s **D.M. Muntean & V. Ungureanu**
14:45			

SYMPOSIUM ROOMS



- Registration desk
- Slide Center
- Session room
- WC/Restroom
- Elevator
- Escalator

R1: Jan Van Eyck
R2: Hubert Van Eyck
R3: Van Der Goes
R4: Baekeland 1
R5: Baekeland 2
R6: Baekeland 3
R7: Bauwens
R8: Ghislain 1
R9: Ghislain 2
R10: Ghislain 3 - Slide Center

SOCIAL PROGRAM

Reception and Lunch service will be offered to all registered symposium delegates and accompanying persons. Banquet is open to symposium delegates and registered accompanying persons. The banquet is not included in the PhD student rate. There is however the possibility to purchase a separate dinner ticket (upon availability). In case you do not have a dinner ticket, please inquire at the registration desk.

WELCOME RECEPTION

Symposium venue, 1st floor, foyer "Minneplein"

Sunday, October 28 18:00-20:00

The reception will be held at the foyer "Minneplein" on Sunday, October 28 from 18:00 until 20:00. All participants to the Symposium are invited to attend.

Please make use of this opportunity to also register and obtain your conference bag (avoiding queues on Monday)!

SYMPOSIUM BANQUET

Banquet room, Oude Vismijn, Rekelingestraat 5, 9000 Ghent

Tuesday, October 30 20:00-23:00

The Symposium Banquet will be held at the Event Center "Oude Vismijn" (Rekelingestraat 5, 9000 Ghent). The attendance to the Banquet is not included in the student registration fee, unless having purchased a dinner ticket (upon availability). Participants will be able to enjoy a very nice atmosphere with live entertainment. Before the Symposium Banquet, the Gala Ceremony (with the Fazlur R. Khan Plenary Lecture and the Awards Ceremony) will take place at the Aula of Ghent University (see pg.16). Please follow the directions of the crew to move from the Gala Ceremony to the venue for the Symposium Banquet.

TOURS

Before, during and after the Symposium, several sightseeing tours are offered. Please visit the Symposium website for more detailed information. **www.ialcce2018.org/#/sightseeingtours**

The tours are organized conditional on a minimal amount of participants. Therefore, we invite participants to share their interest and/or make reservations well before the start of the Symposium. For tours which are guaranteed by a sufficient number of pre-registered participants, and upon availability, participants will be able to make some last-minute registration on Monday 29 October at the registration desk.

AUTHOR INDEX

NOTES

IALCCE2018

Sixth International Symposium on Life-Cycle Civil Engineering

October 28-31, 2018 - Ghent, Belgium

GHENT UNIVERSITY