ONLINE CONFERENCE PROGRAM ONLINE

9TH INTERNATIONAL CONFERENCE ON COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE

27 – 29 JULY 2021

ONLINE

COMPOSITE IX CONSTRUCTION

RUB steel FG STAHLBAU Institute of Structural Design Prof. Dr.-Ing. Ulrike Kuhlmann uni.lu UNIVERSITÉ DU LUXEMBOURG

9TH INTERNATIONAL CONFERENCE ON COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE

27 – 29 JULY 2021

ONLINE

TABLE OF CONTENT

CONFERENCE SECRETARIAT

Chair of Steel, Lightweight and Composite Structures
Ruhr-Universität Bochum
Universitätsstraße 150
44801 Bochum, Germany

Fon: +49 (0)234 32-22575

Email: ccix@rub.de
Web: https://www.compositeconstructionix.com/

ORGANIZED BY

Ruhr-Universität Bochum | TU Kaiserslautern | Universität Stuttgart | Université du Luxembourg

PREFACE

Composite Construction is a key consideration in the design of buildings and infrastructure. Significant advances in research and development have increased the knowledge of the structural performance of composite structures. Some areas are becoming well understood and implemented in the design practice, codes and standards worldwide, while others like, e.g., application of high-performance materials or dismountable and reusable composite members need further studies; trends that are reflected by the contribution to this conference. To make a full use of these innovations and advances, we need a forum for researchers, practitioners, and engineers to share and discuss their research, practical experience and innovations related to composite constructions in steel and concrete with their peers in an open, international forum.

The highly successful International Conference series on Composite Construction in Steel and Concrete are considered a major forum for the exchange of knowledge among the peers of the global composite construction community. The events started in 1987 in Henniker, New Hampshire, USA followed by Potosi, Missouri, USA in 1992. The conference was once held in Europe, which was the 3rd Composite Construction 1996 in Irsee, Germany. This event was followed by an event in the amazing scenery in Banff, Canada in 2000 as well as in 2004 at the Kruger National Park, South Africa. The 6th event was held 2008 in Devil's Thumb Ranch, Colorado, USA, before visiting Palm Cove, Queensland, Australia in 2013. The latest Composite Construction took place in 2017 in Jackson, Wyoming, USA.

This is the book of proceedings for the 9th International Conference on Composite Construction in Steel and Concrete hosted by the Ruhr-Universität Bochum, Universität Stuttgart, TU Kaiserslautern and University of Luxembourg between the 27th and 29th July 2021. As a result of the global COVID-19 coronavirus pandemic, it is the first Composite Construction Conference to be held completely online.

The 72 papers in this book were selected through a rigorous review process and cover a wide variety of topics, including composite beams, composite columns, composite decks, joints, shear connections, fire behavior, seismic behavior, fatigue and fracture, codification, composite bridges, innovative hybrid structures, numerical investigations and practical applications representing the work of authors from 18 different countries around the world. One of the principles of the conference series is that it should represent a forum where the latest research and case studies are presented. Papers are therefore submitted only a few months before the conference and may be adapted based on the outcome of the discussions during the conference before the final publication, which ensures that only the most current work is presented.

This conference was organized by the members of the Chair of Steel, Lightweight and Composite Structures, Ruhr-Universität Bochum, the Institute of Structural Design, Universität Stuttgart, the Institute of Steel Structures, TU Kaiserslautern as well as the teaching and research area for Structural Engineering and Composite Structures, University of Luxembourg with the help, support and cooperation of the members of the International Scientific Committee, in particular the support of Professors W. Samuel Easterling, Jerome F. Hajjar, Roberto Leon, and Gian Andrea Rassati. We thank all expert reviewers for the time and effort they spent on the task of selecting and reviewing the papers. Our sincere thanks to all authors; the quality of this book is just the corollary of the high standard of their contributions, R&D activity and practical applications. Finally, we would like to acknowledge the effort and support provided by the partners and sponsors of the conference as well as the staff of our universities.

Markus Knobloch, Ulrike Kuhlmann, Wolfgang Kurz, and Markus Schäfer

July 2021

Partner

Ernst & Sohn
A Wiley Brand

gruner

NPS® by Tecnostrutture®
your GREEN BUILDING SYSTEM

Sponsors

HRA

Ingenieurbüro Prof. Dr.-Ing. Ulrike Kuhlmann

Leonhardt, Andrä und Partner
Beratende Ingenieure VBI AG

peikko

EIFFAGE
SEH

Support

Federal Ministry
of Transport and
Digital Infrastructure

I. COMPOSITE CONSTRUCTION CONFERENCE SERIES

The main focus of the conference series is to provide an opportunity for researchers and engineers to share and discuss their research and innovative practical applications related to composite constructions with their peers in an open, international forum. Contributions should include fundamental work that furthers the understanding and application of composite constructions as well as technological developments and case studies.

The conference addresses all subject areas of steel-concrete composite structures such as novel composite systems, composite columns, beams and slabs, composite connections, behavior during development and in the event of fire, as well as the development of new calculation, simulation, dimensioning and structural approaches. At the same time an essential scientific objective is the connection and the perception of global thought and research approaches.

Recent Composite Construction Conferences

- Henniker, New Hampshire, USA (1987)
- Potosi, Missouri, USA (1992)
- Irsee, Germany (1996).
- Banff, Canada (2000)
- Kruger National Park, South Africa (2004)
- Devil's Thumb Ranch, Colorado, USA (2008)
- Palm Cove, Queensland, Australia (2013)
- Jackson, Wyoming, USA (2017)

Kruger Nationalpark, South Africa, 2004


Jackson USA, 2017


Banff, Canada, 2000


Colorado, USA, 2008

II. COMMITTEES

LOCAL ORGANIZING COMMITTEE

Ulrike Kuhlmann	Universität Stuttgart	Germany
Markus Knobloch	Ruhr-Universität Bochum	Germany
Wolfgang Kurz	Technische Universität Kaiserslautern	Germany
Markus Schäfer	Universität Luxembourg	Luxembourg

SCIENTIFIC COMMITTEE

Roland Bärtschi	Bärtschi Ingenieure	Switzerland
Alain Bureau	Centre Technique De La Construction Metallique (CTICM)	France
Adrian Ciutina	Polytechnic University of Timisoara	Romania
Graham Couchman	Steel Construction Institute (SCI)	UK
W. Samuel Easterling	Iowa State University	USA
Jerome Hajjar	Northeastern University	USA
Stephen Hicks	University of Warwick	UK
Markus Knobloch	Ruhr-Universität Bochum	Germany
Venkatsh Kodur	Michigan State University	USA
Ulrike Kuhlmann	University of Stuttgart	Germany
Wolfgang Kurz	Technical University of Kaiserslautern	Germany
Dennis Lam	University of Bradford	UK
Jean-Paul Lebet	École Polytechnique Fédérale de Lausanne	Switzerland
Roberto Leon	Virginia Polytechnic Institute and State University	USA
Matti V. Leskela	University of Oulu	Finland
Richard Liew Jat Yuen	National University of Singapore	Singapore
Renata Obiala	ArcelorMittal Global R&D	Luxembourg
José Oliveira Pedro	Instituto Superior Técnico of Lisbon	Portugal
Gian Andrea Rassati	University of Cincinnati	USA
Manuel L. Romero	Universitat Politècnica de València	Spain
Markus Schäfer	Universität Luxembourg	Luxembourg
Brian Uy	University of Sydney	Australia
Milan Veljkovic	Delft University of Technology	Netherlands
František Wald	Czech Technical University in Prague	Czech Republik
Rebekka Winkler	Ruhr-Universität Bochum	Germany
Ben Young	The Hong Kong Polytechnic University	China

III. CONFERENCE INFORMATION

REGISTRATION

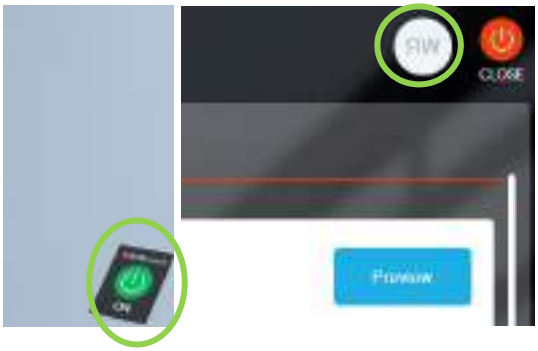
If you have registered for the conference you will receive a personal link by email shortly before the conference, giving you access to the online tool OnAir. (Registration)

TECHNICAL ISSUES

The access is best given through **Google Chrome** or **Microsoft Edge browsers** and a wired internet connection is recommended for optimal transmission.
Enable your microphone and camera to fully take part of the conference.
For technical help please use the **Live Support** or visit the **Welcome Desk**.

PERSONAL SETTINGS

In the 3D view on the ight bottom corner you have the **AIRtouch Button**. By clicking on it, you will see the time schedule and a link to the lobby is given throughout the whole event.
In the top right corner, you see your initials. By clicking on it, you have the option to change your settings. In the 2D view you find the button with your initials in the top right corner.



COME IN CONTACT WITH ALL ATTENDEES

In addition, you can find all attendees, sponsors, speakers and organizers in the **Meeting Hub**, where you can interactively contact all persons via Chat, Call or Message. You can arrange an Appointment, share your contact details or have a discussion in small groups.

QUESTIONS?

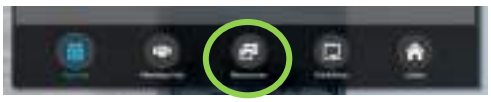
For any questions, please visit our **Welcome Desk**.
We are happy to answer your questions personally.

DISCUSSION AND QUESTIONS DURING THE SESSIONS

We look forward to live discussions about individual presentations. You will have the opportunity to **raise your hand** and be invited to the stage to ask your question live. You can raise your hand using the icon at the bottom right corner.
If the chair invites you to a live question, you will receive a pop-up window inviting you to join the session via the **Green Room**. After setting your camera and microphone, you will be placed on the **Mainstage** to take part in the live discussion.
As we expect the most profitable discussion this way, we favour and prefer this solution. Of course, it is also possible to ask questions via the **Q&A function**. During the sessions, the AIRTouch Button has helpful functions, including the Q&A or taking session notes.

DOWNLOAD PAPER

In the Resource Gallery you can assess all conference versions of the Full Papers. Furthermore, the single Papers are connected to the presentations, and you can download them in the session with a click on the AIRTouch Button.



BREAKS/SOCIAL PROGRAM

We are pleased to offer a social program, which you can join easily via the Conference Platform.

Tue, 27th June	13.00 CEST	Live Music Jazz (Sarah Mesenbrock Quartett)
Wed, 28th June	13.00 CEST	Recent Composite Bridges in Germany - Replacement of the Hanns-Martin-Schleyer Bridge in Esslingen; Leonhardt, Andrä und Partner
	17.30 CEST	Digital Tour World Heritage Zollverein
Thu, 29th June	13.00 CEST	Piano Music (Thomas Klein)
	13.30 CEST	Constructing the High-Moselle-Viaduct; SEH Engineering GmbH

VISIT EXHIBITION

A visit of the 3D **Exhibition Hall** is worthwhile, where the Partners of the CCIX as well as our universities present products, actual research, their labs, ideas and a lot of other impressive and interesting things. In addition, you have the opportunity to get in touch with us directly and the partners of CCIX. Please feel free to drop by.

COFFEE BREAK

During the Breaks we will open a Coffee Bar, where you can Video Chat randomly with other attendees.
You will join a random group of maximum 5 attendees. After 5 minutes, the attendees will be regrouped automatically.
Please feel free to drop by.

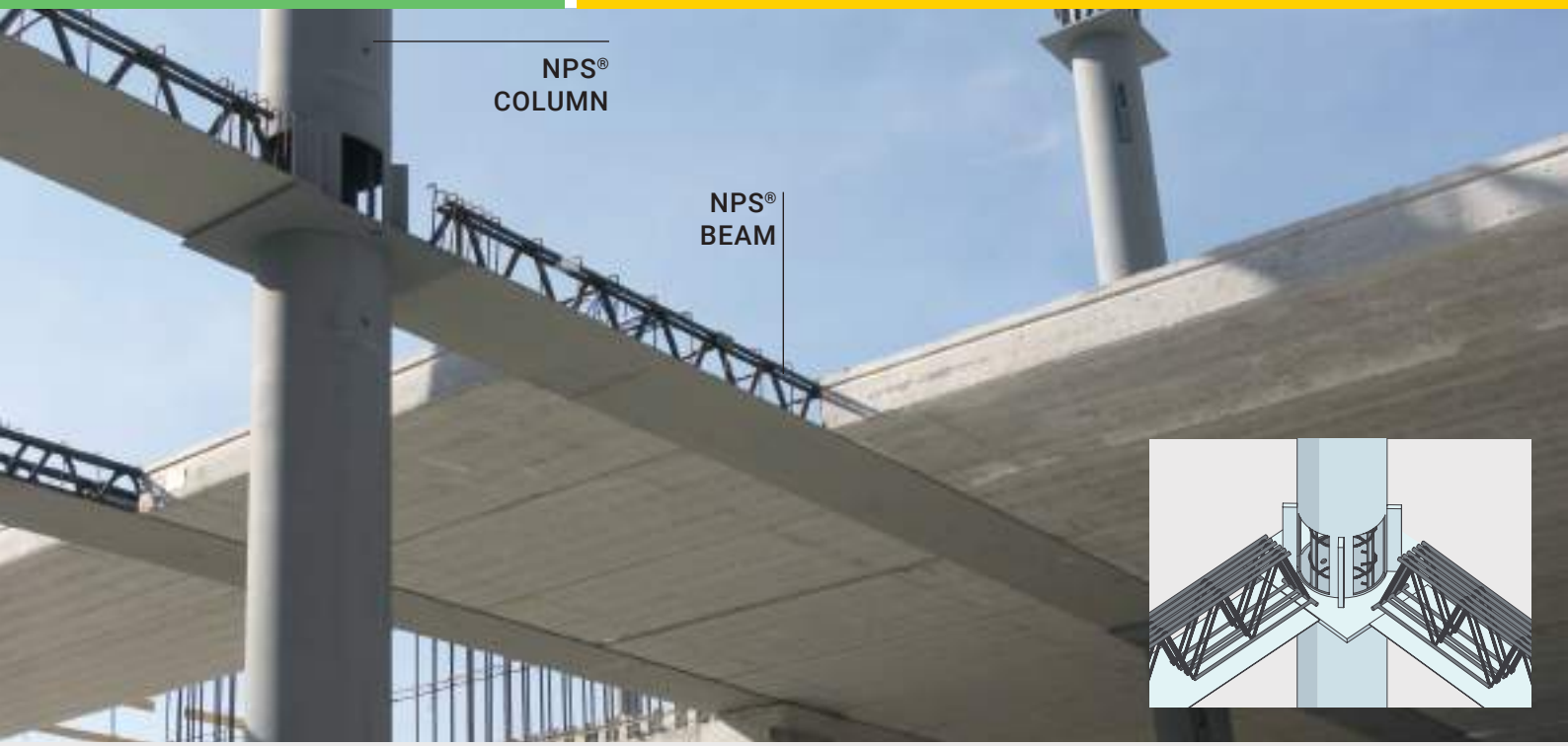
IV. Program at a Glance

EST/**EDT**	AEST	CET/**CEST**	**Tuesday, July 27, 2021**		**Wednesday, July 28, 2021**		**Thursday, July 29, 2021**	
02.45-03.00	16.45-17.00	08.45-09.00	Opening Ceremony					
03.00-03.45	17.00-17.45	09.00-09.45	Keynote 1 Gero Marzahn (Ulrike Kuhlmann)		Keynote 3 Stephen Hicks (Wolfgang Kurz)		Parallel-Sessions	
03.45-03.50	17.45-17.50	09.45-09.50	Coffee Break		Coffee Break		Shear Connections (Roland Bärtschi)	Innovative Structures (Graham Couchman)
03.50-05.05	17.50-19.05	09.50-11.05	Parallel-Sessions		Parallel-Sessions			
			Fire Behaviour 1 (Markus Schäfer)	Seismic Behaviour 1 (Adrian Ciutina)	Composite Columns 2 (Brian Uy)	Composite Beams 1 (Andreas Taras)		
05.05-05.20	19.05-19.20	11.05-11.20	Coffee Break		Coffee Break		Coffee Break	
05.20-07.00	19.20-21.00	11.20-13.00	Parallel-Sessions		Parallel-Sessions		Parallel-Sessions	
			Composite Bridges 1 (Martin Mensinger)	Practical Applications (Richard Liew Jat Yuen)	Joints (František Wald)	Composite Structural Elements (Renata Obiala)	Fire Behaviour 2 (Manuel L. Romero)	Fatigue and Fracture (Milan Veljkovic)
07.00-08.30	21.00-22.30	13.00-14.30	Break and Social Hour - Social Program (45 min.)		Break and Social Hour - Social Program (45 min.)		Break and Social Hour - Social Program 1 (20 min.) and Social Program 2 (45 min.)	
08.30-09.15	22.30-23.15	14.30-15.15	Keynote 2 Roberto Leon (Markus Knobloch)		Keynote 4 Venkatesh Kodur (Markus Schäfer)		Keynote 6 Amit Varma (Jerome Hajjar)	
09.15-09.20	23.15-23.20	15.15-15.20	Coffee Break		Coffee Break		Coffee Break	
09.20-10.35	23.20-00.35	15.20-16.35	Parallel-Sessions		Parallel-Sessions		Parallel-Sessions	
			Composite Columns 1 (Riccardo Zandonini)	Codification (W. Samuel Easterling)	Composite Decks (Christoph Odenbreit)	Seismic Behaviour 3 (Jerome Hajjar)	Fire Behaviour 3 (Venkatesh Kodur)	Composite Beams 2 (Stephen Hicks)
10.35-10.50	00.35-00.50	16.35-16.50	Coffee Break		Coffee Break		Closing Ceremony	
10.50-12.30	00.50-02.30	16.50-18.30	Parallel-Sessions		Keynote 5 Ron Klemencic (Roberto Leon)			
			Composite Bridges 2 (Richard Stroetmann)	Seismic Behaviour 2 (Gian Andrea Rassati)	Coffee Break			
					Digital Tour World Heritage Zollverein			

NPS® by Tecnostrutture®

your GREEN BUILDING SYSTEM

BUILD FAST, SUSTAINABLE AND SAFE



✓ 40% FASTER BUILDING TIME

✓ 20% LESS CO^2 EMISSIONS

YOUR BENEFIT WITH THE NPS® COLUMN-BEAM FRAME

1. Easier project management
2. 40% faster building time compared to traditional systems
3. Compatibility with all types of slabs and facades
4. Easy to transport
5. Simple, safe and precise assembly
6. Simple and controlled concrete casting
7. Contribution to DGNB and LEED certification
8. Integrated fire resistance
9. Adaptable to architectural requirements
10. Technical support from concept to implementation of the project


Also used in the Ferrari 4WD Building

IDEAL FOR

- ✓ Large spans with high loads
- ✓ Slim-floor
- ✓ Tall buildings
- ✓ Projects with tight schedules

The self-supporting NPS® frame offers excellent static performance thanks to the structural efficiency of steel and concrete.
This enables slim-floor with integrated fire resistance and 40% faster construction time. Long spans and slim sections enable flexible layout options and make the building easy to market NPS® frame has at least 20% less environmental impact than traditional solutions (source LCA) The NPS® structure consists of up to 93% recycled steel (source EPD) and contributes to obtain LEED and DGNB points. We support you with full design service from the feasibility-analysis up to the execution of your project.

Tecnostrutture srl

Essen, Germany
Noventa di P, Italy

+49 (0)201 49020176
+39 0421570919

www.tecnostrutture.eu
sales@tecnostruttre.eu

V. LIST OF KEYNOTES

Development of German composite bridge construction	**Marzahn, Gero**	Tuesday, 27th June, 09.00 CEST
Evolution of USA composite codes: changes in chapter I (composite construction) of the AISC 360-22	**Leon, Roberto**	Tuesday, 27th June, 14.30 CEST
European Code developments	**Hicks, Stephen**	Wednesday, 28th June, 09.00 CEST
Enhancing fire resistance of composite structures through advanced analysis	**Kodur, Venkatesh**	Wednesday, 28th June, 14.30 CEST
Evolution of Composite Construction	**Klemencic, Ron**	Wednesday, 28th June, 16.50 CEST
Seismic behavior and assessment of composite structures	**Varma, Amit**	Thursday, 29th June, 14.30 CEST

VI. Sessions, presentations and authors of the Composite Construction Conference IX (speakers marked in bold)

Tuesday, July 27, 2021

08.45-09.00	Opening Ceremony		
09.00-09.45	Keynote 1	Development of German composite bridge construction	**Marzahn, Gero**
09.45-09.50	Coffee Break		
09.50-11.05	Parallel-Sessions		
	Fire Behavior 1	European model of the steel and fibre reinforced concrete circular hollow section column in fire	Tretyakov, Alexey; Tkalenko, Ilia.; Cábová, Kamila.; **Wald, František**
		Thermo-mechanical behavior of innovative concrete-filled steel tube columns with high-performance building materials exposed to fire	**Schurgacz, Przemyslaw**; Knobloch, Markus; Neuenschwander, Martin
		Simplified design method for fire resistance of high strength concrete encased steel columns	**Li, Shan**; Liew, J. Y. Richard
	Seismic Behavior 1	Experiment study on the seismic performance of prefabricated core steel tube reinforced concrete columns	Zhang, Yixin; **Liu, Yang**; Ruan, Jie; Wang, Pinzhi
		Evaluation of the plastic deformation capacity of composite beams through the connection coefficient	**Shimada, Yuko**
		Slim-floor beam to column joints for seismic-resistant structures: Joint performance and case study on MRFs	**Don, Rafaela**; Ciutina, Adrian; Stratan, Aurel; Vulcu, Cristian
11.05-11.20	Coffee Break		
11.20-13.00	Parallel-Sessions		
	Composite Bridges 1	Composite dowels for bridges: Trends and challenges for new european design rules	**Lorenc, Wojciech**; Seidl, Günter
		Development of an orthotropic composite slab system for road bridges	**Stroetmann, Richard**; Karge, Cäcilia; Mansperger, Tobias
		New type of composite arch element using composite dowels: application in railway network arch bridge	**Sęk, Radoslaw**; Pilujski, Bogusław; Sobala, Dariusz; Lorenc, Wojciech
		New type of transition zone for steel-concrete hybrid beams in bridges	**Kozioł, Piotr**; Lorenc, Wojciech; Kożuch, Maciej; Kosecki, Witold; Stempniewicz, Adam
	Practical Applications	Design, calculation and construction work of a prestressed composite construction to support the façade columns of a high-rise building	**Breuninger, Ulrich**; **Landsberger, Jonas**
		Application of rolled sections in composite bridges with span over 50 m	**Kożuch, Maciej**; Lorenc, Wojciech; Bartoszek, Błażej; Stempniewicz, Adam; Windorpski, Henryk; Struczyński, Michał; Sęk, Radosław; Ochojski, Wojciech
		NPS composite beams and columns used for the Odense university hospital	**China, Stefano**; Tegon, Aroldo
		Kunming Tower: Composite Systems in Supertall Design	**Li, Xuemei**; Chhabra, Ashpica; ding, han

13.00-14.30	Break and Social Program		
14.30-15.15	Keynote 2	Evolution of USA composite codes: changes in chapter I (composite construction) of the AISC 360-22	**Leon, Roberto**
15.15-15.20	Coffee Break		
15.20-16.35	Parallel-Sessions		
	Composite Columns 1	Slender column strength of innovative concrete filled steel tube columns with high-performance building materials	**Schurgacz, Przemyslaw**; Knobloch, Markus; Neuenschwander, Martin
		Variable Stiffness Reduction Factor for Stability Design of Steel-Concrete Composite Columns	**Denavit, Mark**
		Studies on load introduction in composite columns with high-performance Materials	Thein, Christina; **Bogdan, Teodora**; Kurz, Wolfgang; Schurgacz, Przemyslaw; Ergun, Ozgun; Knobloch, Markus; Anwaar, Omer M.; Schäfer, Markus
	Codification	Engineering Model for the vertical Shear Capacity of Composite Slabs with additional Reinforcing Steel	**Schmeckebier, Nicole**; Kurz, Wolfgang
		New Eurocode 4 Design Rules for Composite Beams with Precast Concrete Slabs	**Hicks, Stephen**; Braun, Matthias; Markovic, Zlatko; Way, James
		Potentially Unsafe Structural Consequences in the Design of Composite Beams Shear Connectors (A look at some of the Eurocode 4-1-1 design backgrounds)	**Diacu, Ioan**
16.35-16.50	Coffee Break		
16.50-18.30	Parallel-Sessions		
	Composite Bridges 2	Effect of cross-section bracing in steel-concrete composite bridge decks using the generalized beam theory	**Vieira, Luís**; Oliveira Pedro, José; Gonçalves, Rodrigo; Camotim, Dinar
		Integral sheet piling abutments of modular composite bridges for a time efficient construction	**Tibolt, Mike**; Rademacher, Dennis; Hechler, Oliver; Wolters, Kevin; Rittich, Nils; Ivanov, Stoyan
		Use of high-strength steel for slender medium span bridges: Two recent case studies in France	**Zanon, Riccardo**
	Seismic Behavior 2	Experimental investigation of interior and exterior steel-concrete composite NPS beam-column joints	**Calvi, Paolo**; Albright, Ann; Argentoni, Alessio
		RCS moment frames in high seismic zones in the United States	**Fargier-Gabaldon, Luis B.**; Cordova, Paul; Parra-Montesinos, Gustavo; Deierlein, Gregory
		Cyclic Behavior of Composite Connections in Composite Floor Diaphragms	Briggs, Nicholas E.; Coleman, Kyle; Schafer, Benjamin W.; Eatherton, Matthew R.; Easterling, W. Samuel; **Hajjar, Jerome**

Wednesday, July 28, 2021

09.00-09.45	Keynote 3	European Code developments	**Hicks, Stephen**

08.45-09.00	Coffee Break

09.50-11.05	Parallel-Sessions		
	Composite Columns 2	Comparison of geometrical imperfection definitions on encased composite columns	**Ergun, Ozgun**; Schäfer, Markus
		Assessment of general method for composite column design in EN 1994-1-1 and comparison with simplified method	Schäfer, Markus; Zhang, Qingjie; **Zogu, Pellumb**; Bergmann, Marco; Ergun, Ozgun
	Composite Beams 1	Non-linear analysis of composite beams with minimal modelling and calculation effort for strain-limited design	**Hauser, Philipp**; Kurz, Wolfgang
		Deformation capacity and ductility of shear connectors	**Bärtschi, Roland**; Rebelo Garcia, Samuel; Sutter, Pascal
		Probabilistic design of composite girders considering the degradation of the composite joint and the redistribution of forces	**Wolters, Kevin**; Christou, Georgios; Feldmann, Markus

11.05-11.20	Coffee Break

11.20-13.00	Parallel-Sessions		
	Joints	Steel FRC slab in compression in steel-concrete composite frame joints	**Cervenka, Petr**; Dolejs, Jakub
		Studies on steel-to-concrete joints with concentrated loading conditions	**Ziwes, Maximilian**; Ruopp, Jakob; Kuhlmann, Ulrike
		Strengthening of anchor channels on the concrete surface	**Petrasch, Michael**; Hofmann, Jan
		Influence on the load-displacement behaviour of steel-to-concrete connections with post-installed adhesive anchors	**Maci, Nilde**; Hofmann, Jan
	Composite Structural Elements	Innovative numerical approaches for strain limited design of composite beams	**Zhang, Qingjie**; Schäfer, Markus
		Numerical analysis of early age movement in grouted connections	**Henneberg, Joshua**; Schaumann, Peter
		Performance and design of stainless-steel composite structures - beams, columns and joints	Kazemzadeh Azad, Sina; Uy, Brian; Zhou, Yifan; Song, Yuchen; **Wang, Jia**
		Behaviour and design of high-performance steel and steel-concrete composite structures	**Li, Dongxu**; Uy, Brian; Huang, Zhichao; Khan, Mahbub

13.00-14.30	Break and Social Program

14.30-15.15	Keynote 4	Enhancing fire resistance of composite structures through advanced analysis	**Kodur, Venkatesh**

15.15-15.20	Coffee Break

15.20-16.35	Parallel-Sessions		
	Composite Decks	Characterization of the load-slip behaviour of headed stud shear connections in narrow profiled steel sheeting	**Vigneri, Valentino**; Odenbreit, Christoph; Schäfer, Markus; Hicks, Stephen; Lam, Dennis; Hanus, François
		Sagging bending resistance of composite slabs in partial shear connection	**Sokol, Leopold**; Palisson, Anna
	Seismic Behavior 3	Strength of Concrete Filled Steel Deck Composite Diaphragms with Reinforcing Steel	**Avellaneda Ramirez, Raul**; Eatherton, Matthew; Easterling, W. Samuel; Schafer, Benjamin; Hajjar, Jerome
		Full-scale testing of a 2-bay composite moment resisting frame under lateral cyclic loading–design, setup description and preliminary analyses	El Jisr, Hammad; Kempter, Nathan; **Lignos, Dimitrios**

16.35-16.50	Coffee Break

16.50-17.35	Keynote 5	Evolution of Composite Construction	**Klemencic, Ron**

17.35-17.45	Coffee Break

17.45-18.30	Digital Tour World Heritage Zollverein

Thursday, July 29, 2021

09.00-11.05	Parallel-Sessions		
	Shear Connections	Load-bearing behaviour of nailed shear connectors using slender steel profiles	**Schorr, Johannes**; Bottek, Micha; Kuhlmann, Ulrike; Beck, Hermann
		Experimental and numerical investigation of dowel strips for longitudinal and transverse loading	**Karge, Cäcilia**; Stroetmann, Richard
		Development of a consistent design concept for composite dowels	Broschart, Yannick; **Kurz, Wolfgang**; Wolters, Kevin; Christou, Georgios; Feldmann, Markus; Hegger, Josef; Claßen, Martin
		Determination of slip-factor between friction shims and shot-blasted steel surfaces	**Yolacan, Taygun**; Schäfer, Markus
		Longitudinal shear transfer in composite steel truss and composite (CSTC) beams	Vigneri, Valentino; Kroyer, Robert; China, Stefano; Argentoni, Alessio; **Taras, Andreas**
	Innovative Structures	Innovative composite structural systems for modular tall buildings	**Thai, Huu-Tai**
		Integral bridge with VFT-RS technology – step into the future standard highway overpass	**Zanon, Riccardo**; Rademacher, Dennis; Seidl, Günter; Pak, Daniel
		Experimental and numerical investigation of the friction based demountable shear connector	**Fodor, Jovan**; Schäfer, Markus
		Advanced analysis of steel-concrete composite buildings	**Tran, Hau**; Thai, Huu-Tai; Uy, Brian; Ngo, Tuan; Li, Dongxu; Mo, Jun

11.05-11.20	Coffee Break

11.20-13.00	Parallel-Sessions		
	Fire Behavior 2	Advanced numerical fire design of industrial composite slabs with unprotected steel beams – a case study	**Lequime, Pascal**
		Membrane action of reinforced concrete slabs in fire	**Hirashima, Takeo**; Ozaki, Fuminobu; Yoshida, Toru; Kimura, Kei; Suzuki, Junichi
		Numerical analysis of load-bearing fire test for reinforced concrete slabs	**Kimura, Kei**
		DELTABEAM composite slim-floor beams supporting prestressed hollowcore slabs in fire case - Fire tests for assessment of indirect and flexible support	**Beckmann, Oliver**; Cyllok, Michael

11.20-13.00	Parallel-Sessions		
	Fatigue and Fracture	Fatigue analysis of composite beam with bolted shear connectors	Hosseini, Maryam; **Mirza, Olivia**; Mashiri, Fidelis
		Studies of the fatigue stress and strength of large composite bridges with cantilevers and precast concrete elements	**Kraus, Josef**; Geißler, Karsten
		Composite bridges with cracked concrete deck spanning between transverse beams under fatigue shear loading	**Stempniewski, Lena**; Kuhlmann, Ulrike
		Influence of hot dip galvanizing on the fatigue behaviour of t-studs for a grouted joint of integral composite frame bridges	**Oberhaidinger, Florian**; Mensinger, Martin; Stimmelmayr, Lukas

13.00-14.30	Break and Social Program		

14.30-15.15	Keynote 6	Seismic behavior and assessment of composite structures	**Varma, Amit**

15.15-15.20	Coffee Break

15.20-16.35	Parallel-Sessions		
	Fire Behavior 3	A novel strategy for slim-floor fire protection	**Romero, Manuel**; Albero, Vicente; Espinos, Ana; Serra, Enrique; Hospitaler, Antonio; Pons, David
		Concrete cone failure of post installed fasteners during fire	Lakhani, Hitesh; **Hofmann, Jan**
		Practical approaches to the fire safety investigation of steel and composite structures using natural fire methods	**Stamm, Matthias; Drass, Michael**; Schmitt, Ralf; Lorenz, Dirk
	Composite Beams 2	Progressive collapse modeling of a steel structure with composite slab using commercial finite element software	Phillips, Trent; **Rassati, Gian Andrea**; Swanson, James; Baldassino, Nadia; Zandonini, Riccardo
		High-Definition Modelling of Composite Beams	Adhikari, Samiran; **Rassati, Gian Andrea**; Swanson, James; Chicchi, Rachel
		Design of Steel Headed Stud Anchors in Concrete-Filled Steel Composite Deck	Bond, Robert Bailey; Schafer, Benjamin W.; Eatherton, Matthew R.; Easterling, W. Samuel; **Hajjar, Jerome**

16.35-17.05	Closing Ceremony