

## Program

### IABSE Workshop

# Safety, Failures and Robustness of Large Structures

14-15 February 2013

Helsinki, Finland

Photo WSP Group Plc., Mateusz Sosnowski



IABSE  
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## ORGANIZERS

**Finnish Group of IABSE**

**Finnish Association of Civil Engineers RIL**

## ORGANIZING COMMITTEE

**Ms. Helena Soimakallio (chair)**

Finnish Association of Civil Engineers RIL

**Prof., Dr. Aarne Jutila**

Finnish Group of IABSE

**Ms. Anu Karvonen**

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**Dr. Risto Kiviluoma**

Chair of the Finnish Group of IABSE

**Mr. Atte Mikkonen**

Secretary of the Finnish Group of IABSE

**Mr. Ville Raasakka (secretary)**

Finnish Association of Civil Engineers RIL

## INTERNATIONAL SCIENTIFIC COMMITTEE

**Dr. Risto Kiviluoma (chair)**

WSP Finland Ltd

**Prof., Dr. Eugen Brühwiler**

Swiss Federal Institute of Technology (EPFL) Lausanne, Switzerland

**Prof., Dr. Carmen Bucur**

Technical University of Civil Engineering Bucharest, Romania

**Prof., Dr. Joan Ramon Casas**

Technical University of Catalonia, Spain

**Prof., Dr. Airong Chen**

Tongji University, China

**Dr. Christian Cremona**

Sétra, France

**Prof. Thomas Vogel**

ETH Zurich, Switzerland

## INTRODUCTION AND WELCOME

IABSE workshop “Safety, Failures and Robustness of Large Structures” addresses one of the fundamental scope of bridge and structural engineering, i.e., to build safe structures. Structural engineers has long tradition for this by designing structures to resists little extra, to take into account uncertainties in various aspects including design methods, mathematical models, material properties, loads, fire, fatigue, aging of structures and quality of construction. Structural failures, however, occur time to time for varying reasons.

What comes to large structures, their collapses and failures are rare events, but they most often leads to big consequences, worldwide news coverage and public reaction. They are fruitful to the self-learning process of the profession in that respects, that thorough investigations are arranged for revealing the reasons behind. Smaller failures may be big enough to jam the traffic of the city and more detrimental ones may be part of the complex chains resulting in catastrophe-level disasters. While design, construction and maintenance errors may well still occur, an important branch of catastrophic failures appears to be those, which are due to actions not thought in advance. Such actions may, e.g., be man-maid or due to the extreme natural events where the global climatic change may contribute.

Finland is one of the few countries in the World building new nuclear power plant at the times when Fukushima disaster remembered the power of nature and limitations of engineering thinking for ultimate safety. Finland is also a country where nuclear waste disposal system is currently build, deeply in the bedrock, with more than 250'000 years review period in risks assessments.

We believe that safety, failures and robustness of structures are something that benefit from thinking the both old and new ways: learning from the failures that has occurred in the past and borrowing the ideas from other disciplines, like the nuclear industry. From this viewpoint, we would like also to bring new, or at least reinvented, ideas for arranging IABSE workshops. Namely, we have invited speakers among recognized experts outside the IABSE family and discipline, by still providing traditional open call-for-paper sessions for experts to publish their contributions to the theme. Our target is to deliver the creative opportunity for professionals to learn new, and share ideas.

We heartily welcome you to join the workshop in Helsinki!



Dr. Risto Kiviluoma  
Chair of the Finnish Group of IABSE



Ms. Helena Soimakallio  
Managing Director, Finnish Association of Civil Engineers

## PURPOSE OF THE WORKSHOP

The workshop theme is “**Safety, Failures and Robustness of Large Structures**”. Large structures focused in this workshop include tall buildings, bridges, power plants, dams, harbour structures, stadiums, sport halls, public areas, malls and large urban developments, i.e., structures whose failure may cause the most significant consequences in the terms of fatalities, injuries and economic losses. Aside with traditional safety-concept in structural engineering, e.g. loads and resistance, the robustness issues for unforeseen and unexpected actions are addressed. Relevant actions (including loads) include etc.

- fire
- seismicity, tsunamis, waves, wind effects, snow drifting
- floods and landslides
- vehicle collisions
- progressive collapse
- excessive structural vibrations
- fatigue
- leakage, explosions
- man-made hazards
- loads due to construction and renovation.

An attempt will be made to highlight the importance of consequences that a structural failure may initiate directly or indirectly.

The purpose of the workshop is to provide a meeting point and discussion forum to any professional interested in the theme. Keynote speakers are invited as multidisciplinary bases and aim to present the best skills and experience on their field. This gives the participants a possibility to learn new ideas and best practices, as well as learning from the past collapses, failures and catastrophes.

This workshop includes four open call-for-papers sessions, in which experts will publish their scientific contribution to the theme. The abstracts and papers have been reviewed by the International Scientific Committee of the Workshop. Accepted papers will be published in the proceedings.

The workshop includes general closing discussions where the state-of-the art can be reviewed. If urged, the organizers on the behalf of workshop participants, can gather statements or recommendations towards IABSE or openly to national structural engineering associations. These may include recommendation for arranging future events or other modes of collaboration on specific topics.

## SCIENTIFIC PROGRAMME

Scientific program consists on invited key-note lectures and an open call-for paper sessions. Intension is that the presentations serve as starting points of discussions, and all workshop participants are welcomed to bring their own contribution and observations to the topic. Moderators of each session will guide the discussions. At the end of the both workshop days, a separate time slot is reserved for organized panel discussions between the panellist and the audience.

	WED, Feb 13, 2013	THURSDAY, February 14, 2013	FRIDAY, February 15, 2013
9.00		<p><b>OPENING SESSION</b> <b>Auditorium, Chair: Risto Kiviluoma</b></p> <p>Opening words: Risto Kiviluoma, Predrag Popovich and Helena Soimakallio</p> <p>Bridge Damage Caused by the 2011 Great East Japan Earthquake. Kawashima, K.</p> <p>Robustness of Structures, Vogel T.</p>	<p><b>PLENARY SESSION 2</b> <b>Auditorium, Moderator: Thomas Vogel</b></p> <p>Robustness in Tall Buildings: Earth, Wind &amp; Fire. O'Connor, M.</p> <p>Quantifying Redundancy and Robustness of Structures. Casas, J.</p>
10.15		<i>Coffee at 10.15-10.30</i>	
10.30		<p><b>SESSION 1 "Robustness"</b> <b>Auditorium, Moderator: Joan Casas</b></p> <p>Robustness for Large Steel-Concrete Composite Structures, Kuhlmann, U.</p>	<p><b>SESSION 3 "Safety"</b> <b>Auditorium. Moderator: Mark O'Connor</b></p> <p>Fire Safe Steel Structures - Case Studies. Outinen, J.</p>
10.45		Assuring Robustness Of Non-Prescriptive Building Structures In China. Sarkisian, M.	Background of target reliability levels for existing structures. Asp, O.
11.00		Robustness of a typical beam-column concrete structure exposed to fire. Annerel, E.	Load Combination. Poutanen, T.
11.15		Nonlinear modeling for Offshore Robustness. A sensitivity study. Spadaccini, O	System Identification of Multi-story Buildings with A Pair of Seismic Recording, Zhang, R.
11.30		Robustness Of Structures: Role Of Graph Complexity. De Biagi, V.	Tensile membrane Behaviour in Concrete Slabs: Experimental and Numerical Investigation of the Structural Behaviour. Gouverneur, D.G.
11.45		Progressive Collapse Analysis of Composite Framed Buildings with Encased in Concrete Steel Beams. Iliopoulos, A	Improving the Quality of Structural Concrete Design. Boer, D.A.
12.00		Robustness of Steel Building Structures Following a Column Loss, Huvelle, C.	To the question of risk management for failures of cable-stayed and prestressed bridges in Russia. Syrkov, A.
		<i>Lunch at 12.00-13.00</i>	
12.00		<p><b>SESSION 2 "Collapses"</b> <b>Auditorium, Moderator: René Steiger</b></p> <p>Collapse Of The River Verde Viaduct Scaffolding System. Tanner, P.</p>	<p><b>PLENARY SESSION 3</b> <b>Auditorium, Moderator: Kazuhiko Kawashima</b></p> <p>Extending Fatigue Life of Structures Beyond 100 Years using Monitored Data. Brühwiler, E.</p>
13.00		Testing of full scale prestressed concrete beams. Lindberg, R.	
13.15		Failures of dams - Challenges to the Present and the Future. Vogel, A.	
13.30		Ring Rail Line - Protection Structure against Aggressive Fluids. Vuopio, J.A.	Ensuring Safe Structures for a Modern Nuclear Power Plant. Kukkola, T.
13.45		Vehicle Collision into Steel Pedestrian Bridges Salokangas, L.	
14.00	Check-in to the hotel starting at 14.00		
14.15	On-site registration open at 14.00-18.00	<i>Coffee 14.15-14.30</i>	
14.30		<p><b>PLENARY SESSION 1</b> <b>Auditorium, Moderator: Ulrike Kuhlmann</b></p> <p>Avoiding Structural Failures in Construction. Popovich, P.</p>	<p><b>CLOSING SESSION</b> <b>Auditorium. Moderator: Predrag Popovich</b></p> <p>Panel discussion "Robustness"</p> <p>Keynote speakers of the day and the audience</p> <p>Review and closing words, Risto Kiviluoma</p>
15.00		Failures in Large-Span Roof Structures in Switzerland. Steiger, R.	
15.15		Structural Failures from Safety Investigation's Point of View, Valonen, K.	
15.30		<i>Bus transportation to the airport and Helsinki City centre at 15.15</i>	
15.45		<i>Coffee at 16.00-16.15</i>	
16.00		<p><b>DAY 1: CLOSING SESSION</b> <b>Auditorium, Moderator: Risto Kiviluoma</b></p> <p>Panel discussion "Safety and Failures"</p> <p>Keynote speakers of the day and the audience</p>	
16.15-16.45			
18.00	Get-together at Gustavelund at 18.00-20.00		
19.00		Guided walk to the dinner venue at 18:45	
		Dinner at Restaurant Krapihovi at 19.00-22.00	



## INVITED KEY-NOTE PRESENTATIONS

### *Avoiding Structural Failures in Construction*



**Predrag Popovich, USA**  
President of IABSE

Pete Popovic's fields of expertise are the design, assessment and repairs of bridges and buildings. He has in particular expertise in assessment and repair of concrete structures and of fatigue damage in steel bridges, and exterior facades of high-rise buildings. During the first 10 years of practice, he participated in structural design of major steel bridges and rapid transit systems in Chicago, New York and Atlanta, USA. He was engaged in the design of post-tensioned box girder bridges in Kuwait. Over the last 30 years, he has evaluated and designed repairs for over 1500 structures. Major projects included assessment of steel bridges for fatigue damage, investigation of collapses of bridges and buildings, assessment and design of repairs for exterior facades of high-rise buildings up to 60-stories tall, and assessment and repair of over 100 parking structures. Pete act as vice president and senior principal Wiss, Janney, Elstener Associates, Inc., USA.

### *Bridge Damage Caused by the 2011 Great East Japan Earthquake*



**Dr. Kazuhiko Kawashima, Japan**  
Professor, Tokyo Institute of Technology

Prof. Kawashima received his BE, ME and Ph. D in civil engineering from Nagoya University, Japan. After serving for 23 years in the Public Works Research Institute of Japanese Ministry of Construction, he joined the Tokyo Institute of Technology as a Professor of the Department of Civil Engineering in 1995. His research interest is directed to bridge seismic safety including seismic response, ductility capacity of columns and piers, seismic response control, and seismic evaluation and retrofit. He is the receipt of several honors and awards, including the JSCE Tanaka Award, JSCE Yoshida Award and the Minister of Construction's Award for Outstanding Leadership for Technical Development. He authored and co-authored over 400 technical papers on ground motion, structural response, ductility capacity, and passive and semi-active control of bridges. He is a member of the Panel on Wind and Seismic Effects, UJNR, the Science Council of Japan, Japan Association for Earthquake Engineering, Japan Society of Civil Engineers, American Society of Civil Engineers and US Earthquake Engineering Research Institute. He is representative of Japan for International Association for Earthquake Engineering, and currently President, Japan Association for Earthquake Engineering.



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### ***Robustness in Tall Buildings: Earth, Wind & Fire***



**Dr Mark O'Connor**, UK  
Technical Director, WSP

Mark is the head of advanced structural analysis in WSP's UK structures business. His group is responsible for the more specialist aspects of a building's design such as assessment of static and dynamic structural performance of buildings under extreme events such as wind, earthquake, fire and blast. The group also provide early input into the conceptual design of the lateral stability systems of tall buildings. Since joining WSP in 2004, Mark has successfully led analysis inputs into a variety of tall building designs including the Shard at London Bridge - currently Europe's tallest building. These analyses range from aspects of normal static design to nonlinear structural dynamic modelling. The design of buildings to avoid general progressive collapse and to enhance performance against specific extreme events, such as fire and blast, is a particular speciality. Mark also has extensive seismic design experience through his involvement in many overseas projects and the design of UK nuclear facilities. Prior to his present assignment, mark gathered experience over 18 years in applying and calibrating advanced analysis methods against real scale testing of structures and details.

### ***Failures in Large-Span Roof Structures in Switzerland***



**Dr René Steiger**, Switzerland  
Senior Scientist, Swiss Federal Laboratories for Materials Testing and Research (Empa)

René Steiger graduated in civil engineering at the Swiss Federal Institute of Technology (ETH) Zurich in 1986. After receiving his PhD in Technical Sciences from ETH in 1996 he worked as Civil Engineer in an engineering office being responsible for the structural analysis and design of steel, concrete and timber structures as well as for the assessment of existing structures. Since 1999 he has been working as Senior Scientist and Vice Head at the Wood Laboratory of Empa, and since 2012 in Empa's Structural Engineering Research Laboratory. Currently he is managing different research projects, expert's opinions and service contracts in the field of timber engineering. Main research activities he centered on the performance and reliability of timber structures. René has been working in several committees in structural engineering, and authored and co-authored several publications which focused on the assessment of failures and malfunctions of structures, on the general procedure and techniques in assessing timber structures and on the design for robustness.

## ***Extending Fatigue Life of Metallic Structures Beyond 100 Years***



**Dr Eugen Brühwiler**, Switzerland  
Professor, Swiss Federal Institute of Technology (EPFL) Lausanne

Eugen Brühwiler's activities as a Professor of Structural Engineering at the Swiss Federal Institute of Technology (EPFL) in Lausanne, Switzerland, are motivated by the following principle: Methods for the examination of existing structures ("Examineering") must be developed with the ultimate goal to limit construction intervention (and thus the client's expenditure) to a strict minimum. If interventions are necessary then their objective is to improve the structure. His activities as researcher, teacher and consultant include existing civil structures, in particular bridges of high cultural value, fatigue, dynamic and structural behaviour of bridges, as well as Ultra-High Performance Fiber Reinforced Concrete and composite UHPFRC-RC structures for rehabilitation of structures.

## ***Robustness of Structures***



**Thomas Vogel**, Switzerland  
Professor, Swiss Federal Institute of Technology (ETH) Zurich

Thomas Vogel graduated as civil engineer from the Swiss Federal Institute of Technology (ETH) Zurich in 1980. He spent more than ten years in consultancy in different parts of Switzerland, designing structures for commercial and industrial buildings, housing as well as bridges. In 1992 he has been appointed Professor of structural engineering at ETH Zurich. His field of teaching and research covers the evaluation of existing structures and non-destructive testing methods, ductile design with brittle materials like concrete, CFRP and glass, as well as structures designed for and protecting from natural hazards. In IABSE he was member of Working Commission 1 (Structural Performance, Safety and Analysis) and chaired it from 2002 to 2005. Since 2005 he has been member of the Administrative Committee. Together with Franz Knoll, Canada he co-authored the Structural Engineering Document (SED) No. 11 "Design for Robustness", which was issued in 2009 and is currently translated into Chinese.



## ***Quantifying redundancy and robustness of structures***



**Dr. Joan Casas**, Spain  
Professor, Technical University of Catalonia in Barcelona

Joan Casas is professor of bridge engineering at the Technical University of Catalonia in Barcelona. His main fields of expertise are bridge safety and reliability, maintenance and strengthening. Besides his participation in bridge design and construction, Professor Casas has participated in more than 100 consulting and advising works related to bridge safety, maintenance and management and in several European Projects related to safety and robustness of existing bridges and structures. He is author or co-author of 12 books and 8 chapters of books, 83 papers in refereed technical journals and over 200 communications to international scientific meetings. He holds the Bill Curtin Medal 1998, awarded by the Institution of Civil Engineers of United Kingdom to the best paper presented to the Institution describing innovative design in civil engineering and the 2012 IABMAS Senior Prize in recognition of outstanding contributions to the application of advanced bridge inspection, assessment and monitoring techniques.

## ***Structural Failures from Safety Investigation's Point of View***



**Kai Valonen**, Finland  
Chief Safety Investigator, Safety Investigation Authority of Finland

Kai Valonen has worked as an accident investigator since 1998. This work has recently been named safety investigation due to the fact that the work is done solely to improve safety. Kai's organisation, Safety Investigation Authority of Finland, investigates accidents in four modes i.e. aviation, railway, marine and the other accidents. Kai has been in charge of the other accidents since 2006, but has worked as various cases already before that. Many of the cases have been failures of structures, fires, explosions, industrial accidents, serious road accidents and some special individual cases. The first roof collapse Kai was involved in was a failure of a laminated beam in the roof of a swimming hall in 2000. After that there has been involved in 25 investigations concerning damages of structures. Most of the investigations focus on only one single accident, but some others cover several cases. Kai has graduated from Helsinki University of Technology, Finland.

## SOCIAL PROGRAM

Social program of the workshop includes a get-together reception at the venue (on Wednesday evening) and the workshop dinner (on Thursday evening). The dinner takes place at restaurant Krapihovi, which will be reached by guided walk of about 10-15 min or by taxi. From the restaurant, taxi will be arranged back to the venue.

## PARTICIPANTS

The workshop is intended to engineers, architects, researchers, actuarial mathematicians and officials working with large structures. The workshop is also an excellent possibility for young engineers and postgraduate students to get familiar with the theme and the IABSE organisation.

## PUBLICATION

Accepted papers will be published in the proceedings book and in the USB-memory card. The book and the USB-memory will be available at the beginning of the workshop. Extra copies will be available later on for purchase through IABSE.

## REGISTRATION

The on-line registration is open at the Workshop website [www.iabse2013helsinki.org](http://www.iabse2013helsinki.org). Number of seats in the workshop is limited. The speakers are served first and the regular participants in order the registration is made. On-line registration will close February 8, 2013 or at sold out.

The registration fee will include participation to the workshop days (incl. lunch and coffee), get-together reception, dinner and the workshop proceedings. There will be three different fee categories:

- regular participation fee
- discount fee for IABSE and RIL members
- young-engineer fee for participants of 35 years or younger (born 1978 or later).

Early bird fee and author registration for all free categories ends December 31, 2012. After that date everyone will pay the full registration fee.

For any questions please contact the workshop secretariat: [ville.raasakka @ril.fi](mailto:ville.raasakka@ril.fi) or +358 50 366 8687.

## VENUE, ACCOMMODATION AND TRANSPORTATION

Workshop venue is **Gustavelund** (address: Kirkkotie 36, Tuusula), which is located 35 km from Helsinki city centre and close to the Helsinki-Vantaa airport.

The venue has own accommodation facilities with total 84 rooms reserved to the workshop participants. Accommodation needs to be booked separately. In Gustavelund, specially negotiated room rates to workshop participants are:

Single room (standard)	84 eur / night
Double room (standard)	109 eur / night

Room reservations directly from the hotel by December 5, 2012:

**Tel. + 358 9 273 751**  
**E-mail: [reception@gustavelund.fi](mailto:reception@gustavelund.fi)**  
**Booking code: IABSE2013**



Recommended transport from the airport is by taxi, which takes about 15 min. Driving instructions and information of the public transport can be found at [www.gustavelund.fi](http://www.gustavelund.fi).

After the workshop, bus transportation will be arranged to the airport and to the Helsinki city centre. The busses are scheduled to leave on Friday at 15.15. The estimated arrival to the airport is at 15.45 and Helsinki City centre at 16.30.

## IMPORTANT DATES

December 8, 2012	On-line registration ends
February 13, 2013	Get together at the venue
February 14-15, 2013	the Workshop.

## GENERAL INFORMATION

### Language

The official language of the workshop is English. Oral presentation and discussion will be in English only.

### Winter weather in Helsinki region

The month of February is considered winter also in the Southern Finland. If you plan to do outdoor activities, remember to bring a warm jacket, walking shoes, gloves and hat with you. Walking paths might be icy and slippery.

## HELSINKI, FINLAND

The capital, Helsinki, and the neighbouring towns, Espoo and Vantaa, form the fast growing Helsinki metropolitan region, which is now home to almost a million Finns. Helsinki was founded by King Gustav Vasa of Sweden in 1550 and became the capital city of the independent Finland in 1917. Surrounded by the sea and its own exotic archipelago, Helsinki offers visitors an endless number of possibilities.

The workshop is held in Tuusula, about 30 km from Helsinki city centre and 15 min from Helsinki-Vantaa airport. Tuusula is a small town with the population of 36.000. Tuusula has a strong cultural heritage. The first Finnish museum road - Tuusula Rantatie – is located close to the workshop venue. This road hosts the homes of many Finnish artists, such as Pekka Halonen, Juhani Aho, Venny Soldan-Brofeldt, Aleksis Kivi, Eino Leino, Eero Järnefelt and Jean Sibelius.

Finland (Finnish name Suomi) is a republic which became a member of the European Union in 1995. Its population is 5.3 million. Finland is an advanced industrial economy: Metal, engineering and electronics industries account for about 60 % of export revenues and the forest products industry for about 20 %. Finland is situated in northern Europe between the 60th and 70th parallels of latitude. A quarter of its total area lies north of the Arctic Circle. Forest covers about 75 % of Finland, while bodies of water - mainly lakes - cover almost 10 %.



## LOCAL ORGANISERS

The **Finnish Group of IABSE** is more than sixty years old and one of the oldest national groups inside the IABSE organization. The Finnish Group organised the 1988 IABSE Symposium Helsinki, the 2001 Conference in Lahti and the 2008 Conference in Helsinki.

**Finnish Association of Civil Engineers (RIL)** is an organization for civil engineers with Master of Science degrees and university students of civil engineering. RIL supports the development of building, urban planning and environmental technology and acts to preserve solid and durable building and maintenance traditions. RIL also supervises the benefits of its members and promotes their professional skills and welfare. Read more from: [www.ril.fi](http://www.ril.fi).

## ABOUT IABSE

The International Association for Bridge and Structural Engineering (IABSE) was founded in 1929. Today, IABSE has 4000 members in over 100 countries. The mission of IABSE is to promote the exchange of knowledge and to advance the practice of structural engineering worldwide in the service of the profession and society. To accomplish its mission, IABSE organizes conferences and publishes the quarterly journal Structural Engineering International (SEI), as well as reports and other monographs. IABSE also presents annual awards for outstanding achievements in research and practice that advance the profession of structural engineering.

More information about IABSE:

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