

ICSA 2016

27-29 July 2016
Guimarães, PORTUGAL

3rd International Conference
on **Structures and Architecture**

www.icsa2016.com

Conference Chair:
Prof. Paulo Cruz



University of Minho
School of Architecture

WELCOME TO ICSA2016

Although Architecture and Structural Engineering have both had their own historical development, their interaction has led to many fascinating and delightful structures. However, there is still the need to stimulate the inventive and creative design of architectural structures and to persuade architects and structural engineers to further collaborate in this process.

Following the success of the previous conferences held in Guimarães in 2010 and 2013 it was considered convenient to promote a third edition of this event, dedicated to the memory of Félix Escrig and aiming to promote the synergy of both disciplines and to bring together all of the very best work that has been done in the field of structures and architecture.

Structures and Architecture – Beyond their Limits, contains the lectures and papers presented at the Third International Conference on Structures and Architecture (ICSA2016) that was organized by the School of Architecture of the University of Minho, Guimarães, Portugal, in July 2016. It consists of a book of abstracts and a CD-ROM containing the full texts of the lectures presented at the conference, including the 4 keynote lectures, and 180 selected contributions from 34 countries.

ICSA2016 aimed to promote the synergy of both disciplines. The contributions on creative and scientific aspects in the conception and construction of structures, on advanced technologies and on complex architectural and structural applications represent a fine blend of scientific, technical and practical novelties in both fields.

ICSA2016 covered all major aspects of structures and architecture, including building envelopes / facades, comprehension of complex forms, computer and experimental methods, concrete and masonry structures, educating architects and structural engineers, emerging technologies, glass structures, ice structures, innovative architectural and structural design, lightweight and membrane structures, special structures, steel and composite structures, structural design challenges, tall buildings, the borderline between architecture and structural engineering, the history of the relationship between architects and structural engineers, the tectonic of architectural solutions, the use of new materials and timber structures, among others.

The interest of the international community in all these subjects has been confirmed by the high response to the call of papers. In fact, more than five hundred abstracts were received at the Conference Secretariat. About sixty percent of them were selected for final publication as full-papers and presentation at the Conference within three plenary sessions and 34 technical sessions.

This set of book and CD-ROM is intended for a global readership of researchers and practitioners, including architects, structural and construction engineers, builders and building consultants, constructors, material suppliers and product manufacturers, and other professionals involved in the design and realization of architectural, structural and infrastructural projects.

On behalf of ICSA2016, the chair of the Conference would like to take this opportunity to express his sincere thanks to the authors, organizers of mini-symposia and special sessions, and participants for their contributions, to the members of the International Scientific Committee for their dedicated work, and for the time and effort they have dedicated to make of ICSA2016 a successful event. Finally, we would like to register our sincere thanks to all the sponsors of ICSA2016.

Guimarães, July 2016

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IABSE – International Association for Bridge and Structural Engineering



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

INTERNATIONAL INSTITUTIONS



ASCE – American Society of Civil Engineers



BIBM – European Federation for Precast Concrete



BTES – Building Technology Educator's Society



EFCA – European Federation of Engineering Consultancy Associations



EU-GLASS-LABS – European Federation of Structural Glass Laboratories



IASSS – International Association
for Shell and Spatial Structures



International Society
for the Philosophy of Architecture



StructuralEngineer.info
Website



TensiNet

NATIONAL INSTITUTIONS



ASCP – Associação Portuguesa
para a Segurança e Conservação de Pontes



CMM – Associação Portuguesa
de Construção Metálica e Mista



Laboratório de Construção
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Laboratório de Paisagens,
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Ordem dos Arquitectos,
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ORDEM
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Ordem dos Engenheiros



Instituto
Design
Guimarães

Instituto do Design de Guimarães

CONFERENCE ORGANIZATION

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School of Architecture, University of Minho, Guimarães, Portugal

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GENERAL INFORMATION

The ICSA2016 will be held at the Convention Centre of the Campus of Azurém of the University of Minho in Guimarães, Portugal.

The city of Guimarães is like no other city in Portugal. Its past is so intimately intertwined with the History of Portugal that it is commonly and proudly referred to as the Cradle of the Nation.

The Historic Centre of Guimarães has remained basically unchanged since the 15th century and was declared a World Heritage Site in 2001 by UNESCO, due to its Middle Age historical monuments. Guimarães was chosen by the Portuguese government to be the European Capital of Culture in 2012.

PROCEEDINGS

The book of abstracts and a CD-ROM will be distributed with registration's materials at the Conference.

SCHEDULE

An overview of the schedule is provided on the back cover of this program.

Onsite registration: Onsite registration fees are:

600€ – Authors and participants

300€ – Students

250€ – Accompanying Persons

The registration fees includes: Conference attendance, the Book of Abstracts and the CD-ROM Proceedings, coffee-breaks, banquet (except for students) and welcome reception.

OPENING CEREMONY

Time: Wednesday, July 27, 9:00 – 9:30

Place: Main Auditorium

CLOSING CEREMONY

Time: Friday, July 29, 17:00 – 17:30

Place: Main Auditorium

KEYNOTE LECTURES

Terri Boake, School of Architecture, University of Waterloo, Canada

“Innovation in architectural steel” (July 27)

Enzo Siviero, IUAV, University of Venice, Italy

“Bridges and viaducts between engineering and architecture” (July 28)

James O' Callaghan, Eckersley O' callaghan, London, United Kingdom

“Glass Challenges – Past, Present and Future” (July 28)

Frederic Veer, TUDelft, Delft, The Netherlands

“Materials science, bridging the gap between architecture, architectural engineering and structural engineering” (July 29)

Mark West

University of Manitoba, Canada

Mark S. Anderson

University of California, Berkeley, United States of America

Martina Eliasova

Czech Technical University, Czech Republic

Maurizio Piazza

University of Trento, Italy

Maziar Asefi

Ryerson & Tabriz University, Canada

Michal Netusil

Czech Technical University, Czech Republic

Miguel C.Fernandez-Cabo

Universidad Politecnica de Madrid, Spain

Miquel Peiro

bordas+peiro, France

Mircea Georgescu

The Politehnica University of Timisoara, Romania

Nijse Rob

TU Delft, Netherlands

Ognen Marina

University SS. Cyril and Methodius, Macedonia

Olga Popovic-Larsen

The Royal Danish Academy of Fine Arts

School of Architecture, Denmark

Patrizia Trovalusci

Sapienza University of Rome, Italy

Paulo Carvalho

University of Minho, Portugal

Paulo Cruz

University of Minho, Portugal

Paulo Mendonça

University of Minho, Portugal

Poul H. Kirkegaard

Aalborg University, Denmark

Rajagopla Sundaram

Sundaram Architects Pvt. Ltd., India

Regin Schwaen

North Dakota State University, United States of America

Romuald Tarczewski

Wroclaw University of Technology, Poland

Rossella Corrao

University of Palermo, Italy

Rui Póvoas

University of Porto, Portugal

Siu Lai Chan

Hong Kong Polytechnic University, Hong Kong

Terri Boake

University of Waterloo, Canada

Ulrich Knaack

TU Delft, Netherlands

Vilquin Thomas

Université Libre de Bruxelles, Belgium

Vincenzo Riso

University of Minho, Portugal

Vitor Murtinho

University of Coimbra, Portugal

Yukio Tamura

Tokyo Polytechnic University, Japan

ICSA2016 MINI-SYMPOSIA

WeE, ThM2 & ThA2 **Mini-Symposium on New wood- and bio-based construction as enabler of contemporary architecture**

Globally renewable resources are gaining market in response to the changing needs and continued growth of our built environment. In sustainability perspective wood- and bio-based materials and products imply a potential alternative in many applications and so-called engineered wood products (EWP) show versatile properties and potential efficiency, which can support the needed societal development. New bio-based materials and products also enable new structural and architectural design solutions, which are in focus of this mini-symposium. How can the renewable bio-based resources be utilised in construction and what effect can innovation and development in this field have on structural and architectural design and functionality?

Coordinated by: **Andreas Falk**, Royal Institute of Technology KTH, Stockholm, Sweden; **Ian Smith**, University of New Brunswick, Fredericton, Canada.

FrM2 & FrA2 **Mini-Symposium on Everyday Tectonics? Critical call for current tectonic theories and practices in everyday architecture**

Everyday architecture may be considered as mundane or as 'a-tectonic', whereas through tectonic reflections are often considered as part of more advanced and high-end architecture that holds iconic status. This mini-symposium critically addresses such understandings and intends to question how everyday architecture can be qualified by means of general tectonic considerations.

Questions that are raised: How to position and release this potential within the economical and technical conditions that govern everyday architecture? Which technological innovations can be developed as part of a tectonic approach to everyday architecture? And what is the role of the architect and engineer in this matter?

Coordinated by: **Anne Beim**, Royal Danish Academy of Fine Arts, Denmark; **Marie Frier Hvejsel**, Aalborg University, Department of Architecture, Aalborg, Denmark.

ICSA2016 SPECIAL SESSIONS

WeM2 **Special Session on Performance Aided/Assisted Design (PAD) – Embracing complexity in architectural design. Computational tools and methodologies**

Creativity plays a fundamental role in architectural design: Performance Aided Design (PAD) indicates an evolving paradigm in architectural design, in which computational tools are increasingly used to expand the opportunities for creative work when the problems are too complex to be solved purely on designer intuition.

This session investigates the role of computational tools in triggering a synthesis of aesthetics and technical performance, towards a "poetic performance", a design approach that aims at including rather than excluding the complexity implicit in the design process, and that uses the complexity as source of inspiration for developing unique and innovative solutions.

Coordinated by: **Dario Parigi**, Aalborg University, Department of Civil Engineering, Aalborg, Denmark.

WeA2 **Special Session on The authority of the structure – Reflecting the process of architectural structural design**

The deeply effective and comprehensive conception of a building structure does not arise for the architecture but along with it. Formal and functional requirements and the need for a robust force flow lead to an exploration of structural possibilities in order to propose a final form serving as both a strong structural framework and a constituting component of architectural space. How can the authoritative necessity of the building structure be developed to serve a specific and strong building character? Rather than showing the finished building this session explores the evolution – the unique process of negotiating forms – as architectural structural design.

Coordinated by: **Mario Rinke**, ETH Zurich, Department of Architecture, Zurich, Switzerland.

WeA3 **On the Tectonics in Architecture between Aesthetics and Ethics**

Following the successful experiences of two earlier editions, within ICSA (2010, 2013), the TAAE symposium expects to bring together architects, engineers and mathematicians from all over the world, to give a heterogeneous look on the aspects of the art of building, focusing the attention on the relations among mechanics, mathematics, structural and architectural design. Although not limited to these topics, the content of sessions will emphasise the following themes: theoretical issues concerning tectonics in architecture, calculus and algorithms in architecture, different approaches to 'complexity'. The symposium will also discuss developments concerning the importance of the Vitruvean firmatas, pointing out the risks arising when the structural instances are neglected.

Coordinated by: **Patrizia Trovalusci**, Sapienza University of Rome, Rome, Italy; **Enzo Siviero**, University IUAV of Venice, Venice, Italy.

WeE3 **Special Session on Teaching Architecture in full scale – wood**

Education of architects is often synonymous with focus on digital design and scale modelling. In some institutions there is an emerging practice of incorporating full scale building as an educational tool. By developing their own architectural design and then constructing in full scale the students will, in the process of developing architectural concepts, achieve an increased insight in the inherent properties of materials, structures, workmanship, production and erection of structures, as well as collaboration and communication.

In this session the latest experiences gained in using full scale building as an educational tool will be discussed. Approaches with different aims and results will be presented, and the advantages will be discussed and illustrated with cases. This approach to pedagogic practice and research provides valuable insight into learning and the design process.

Coordinated by: **Jan Siem**, Norwegian University of Science and Technology, Norway; **Olga Popovic Larsen**, Royal Danish Academy of Fine Arts, Denmark

ThM3 **Special Session on Teaching Architecture in full scale – regional materials**

Education of architects is often synonymous with focus on digital design and scale modelling in the studio. In some institutions there is an emerging practice of incorporating full scale building as an educational tool. By developing their own architectural design and then constructing in full scale the students will, in the process of developing architectural concepts, achieve an increased insight in the inherent properties of materials, structures, workmanship, production and erection of structures, as well as collaboration and communication.

In this session the most recent experiences gained in using full scale building as an educational tool will be discussed. The studies will discuss the learning from 10 years of Erasmus IP workshop in 7 European countries within the overall theme "Tectonic in building culture" and relate the experiences to the teaching practice of the universities today. Studies with different aims and results will be presented, and the advantages will be discussed and illustrated with cases. This approach to pedagogic practice and research provides valuable insight into learning and the design process.

Coordinated by: **Finn Hakonsen**, Norwegian University of Science and Technology, Norway; **Urs Meister**, Universitat Liechtenstein, Institute of Architecture and Planning, Liechtenstein

ThA3 **Special Session on Beyond Disciplines: Building Transdisciplinary Teams**

Transdisciplinarity focuses on the areas between and beyond defined disciplines allowing the emergence of new and broader perspectives to understand complex issues. As architects, engineers and other members of the design team mine the data in complex projects, we see the development of new efficiencies, new materials and new ways of working. The space between disciplines supports innovation. This creates a new system of working that allows unexpected solutions.

In what ways do transdisciplinary experiences help us move beyond discipline boundaries to solve complex real world problems. This session asks; Do transdisciplinary teams enhance projects? By working in a transdisciplinary world, can architects and engineers amplify solutions to complex problems?

Coordinated by: **James Doerfler**, Philadelphia University, College of Architecture and the Built Environment, Philadelphia, USA; **Kevin Dong**, California Polytechnic State University, College of Architecture and Environmental Design, San Luis Obispo, USA

ThE3 Special Session on Reinforced Ice Structures: in the footsteps of Da Vinci and Candela

Based on project experience over the last years, reinforced ice has proven to be a strong and suitable building material for temporary structures in a cold environment. Unlike traditional igloo structures, no stacked blocks are used. Instead, relatively thin shells are created by spraying subsequent thin layers of water mixed with wood-based fibres on inflatable formwork which is removed afterwards. This session is dedicated to full-scale experiments with this type of structures, built recently in Finland by joint international teams of university students and staff. The main focus is on the challenging projects conducted in early 2016, in particular the large reinforced ice structures inspired by Leonardo Da Vinci's bridge and Félix Candela's hyper shells.

During the conference, the session will be organised in parallel with a special photo exhibition about the Structural Ice Project.

Coordinated by: **Jan Belis**, Ghent University, Department of Structural Engineering, Ghent, Belgium; **Arno Pronk**, Eindhoven University of Technology, Department of the Built Environment, Eindhoven, The Netherlands

PRESENTATION GUIDELINES

The presentations should take 15 minutes plus 5 minutes for audience questions. This schedule will be strictly enforced.

Each paper session will be attended by a chairman, responsible for monitoring the time and enlightening the author, through a signal, once there are 5 minutes left to the end of the presentation.

Personal Computer (MS Windows) with Power Point will be available at each Session room. No personal computers will be allowed to connect to the LCD projector for making presentations.

Please make sure to bring your presentation not only on USB-stick but also on CD-ROM (floppy disks cannot be used!).

Authors are requested to provide their presentation files at the Conference Desk. Please make sure no Asian fonts are used or, if those fonts are necessary, all fonts are embedded in the Power Point file.

The key to a good presentation is organization and clarity. While preparing the presentation, think wisely on what you would like – and reasonably expect – the audience to learn in the time allotted. Put down the main ideas so you will have a backup in case you lose track of the ideas. All speakers are kindly requested to strictly observe the allotted presentation time.

SOCIAL PROGRAM

The social program includes the welcome reception and gala dinner for the participants (registration as 'Student' does not include the gala dinner). The registration as accompanying person also includes the participation in several tours. Registration in one or more tours can also be made by persons not registered as accompanying person.

Welcome Reception

The welcome reception will take place at the Design Institute of Guimarães - former "Fábrica de Curtumes da Ramada" (Tanning Factory of Ramada) in the 26th of July, at 19h00.

With roots in the middle ages, the tanning industry occupied, in other times, a specific zone, located at the gates of Guimarães, called "Couros". Given the historical significance and heritage of this area and

constituting an essential element of this region, the factory was classified as a building of public interest in 1977.

The Design Institute of Guimarães is a new city equipment, which came into being following the renovation of the neighbourhood of Couros in the aim of Guimarães 2012 European Capital of Culture. Its an institution dedicated to design research, to the incorporation of design product development, to specialized training and to the promotion and dissemination of industrial products combined with design.

The Gala Dinner

The dinner will be held on July 28 2016 at Pousada Mosteiro de Guimarães. Situated in a 12th century Augustin Convent, the Pousada overlooks Guimarães. An imposing lounge with smooth stone arches having once been the barns and chambers of the monastery. The delicacies that can be savoured are traditional of the region's cuisine, offering a personalised service characterised by its professionalism with the ability of giving their customers an unforgettable experience.

ACCOMPANYING PERSON'S PROGRAM

1) Santiago de Compostela (Full day visit) – 27th July

Departure from Guimarães to visit Santiago de Compostela.

Santiago de Compostela, the capital city of Galicia, Spain, and one of the most important places in Catholicism because it is reputed to be the place where St. James, one of the twelve Apostles of Christ, is buried. This is the final destination on the Way of Saint James pilgrimage route and its old quarter has the UNESCO World Heritage designation.

We will start with a walking tour towards Praza do Obradoiro, the heart of the city, and it's named after the workshop of the stone masons that was established during the construction of the Cathedral. This is the arrival point of thousands of pilgrims every day and kilometer 0 of the Way of St. James is located just in the center of this square.

The surrounding buildings are examples of different architectural styles, but the most outstanding is the Cathedral, that we will have the opportunity to visit. The tomb of Santiago ("Saint James") is located under the Cathedral, and there's the possibility to visit its tomb and even hug the sculpture that represents the saint. On regular occasions the church shows its Botafumeiro, a huge solid silver incense burner which is swung from the ceiling of the church by a team of energetic men (tiraboleiros) hauling on ropes. After this visit, free time for a good walk around the streets and squares of the historic center. Here we will find a series of narrow streets, squares and granite buildings with centuries of history. Stop for lunch (not included). Afterwards having lunch we will have the opportunity of a panoramic city tour and return journey will follow to Guimarães.

Price per person, for a minimum of 20 participants: 90,00€

2) Visiting Douro (Full day visit) – 28th July

Departure from Guimarães to visit Douro Region.

Douro Region is a world wide known Douro Valley with its famous vineyards. First stop will be at the town of Amarante, blessed in terms of beautiful landscapes, framed by the mountains of Marão. Leaving to the town of Régua, where we are going to have a wine tasting, visit to "Quinta da Pacheca", a wine estate with over one hundred years. The vineyards of "Quinta da Pacheca" are in the very heart of the Douro region. Continue to Lamego, an attractive town with Renaissance and baroque mansions overlooked by two hills. On one of the hills are the ruins of a 12th century castle, on the other is the monumental baroque Sanctuary of Nossa Senhora dos Remédios. A marvelous granite staircase decorated with tiles, allegorical fountains, small chapels, and statues leads to a baroque church with views over the town. At the end of our Tour we will go North of Lamego to the is Miradouro da Boa Vista, a belvedere with a magnificent view of the spectacular World Heritage Douro Valley as a local saying goes, "God created the Earth and man the Douro". Return to Guimarães.

Price per person, for a minimum of 20 participants: 98,00€

3) Visiting Aveiro (Full day visit) – 29th July

Departure from Guimarães to visit Aveiro.

Aveiro, an interesting town crossed by canals and known as the Portuguese Venice.

Cultural and Ethnographic Tour to Aveiro, crossed by canals grandly embroidered with art nouveau house and spanned by humpbacked bridges. Cruise on a moliceiro boat – one of the brightly colored gondola-style boats that bob around the canals a nice opportunity to admire Aveiro's sights from the water during your 1-hour. Continuing passing through the Cultural Center, Santa Joana Church, the Cathedral and the University, one of the best Universities in Portugal. Lunch near the Barra and Costa Nova beach. Opportunity to take photographs of the typical houses painted with several colors. Return to Guimarães.

Price per person, for a minimum of 20 participants: 90,00€

ASSOCIATED EVENTS

TO DRAW IS TO BUILD

During ICSA2016 a large mural will emerge on the walls of the School of Architecture of the University of Minho. Depicting architectural meanderings and imaginary structures, Mister Mourao will create an architectural capriccio using only a black pen and his characteristic detail focused style.

Mister Mourao - aka Vasco Mourao (mistermourao.com), an ex-architect turned into an artist with a tendency for obsessive drawing.

He collaborates with various publications such as The New Yorker, The Washington Post, Wired, Domus, Established & Sons and private clients.

Organization: **Paulo Cruz**, Chairman ICSA2016, Full Professor, School of Architecture, University of Minho. Acknowledgments: **Vasco Mourão**, **Maria Manuel Oliveira** and **Natacha Moutinho**. Sponsors: **Lab2PT – Landscape, Heritage and Territory Laboratory** and **EAUM – School of Architecture, University of Minho**

IMAGINARY STRUCTURES – STUDENT DRAWING COMPETITION AND EXHIBITION

ICSA2016 promoted a student drawing competition focused on the depiction of built landscape - based in architectural meanderings, city landscapes or structures. It was free and open to undergraduate and graduate students of Architecture, Art, Design and Engineering.

During ICSA2016 the printed artworks will be exhibited at the School of Architecture of the University of Minho, with full credits to the authors.

The selection and prizes were decided by: **Vasco Mourão**, Architect and Illustrator; **Paulo Cruz**, Chairman ICSA2016, Full Professor, School of Architecture, University of Minho; **Pedro Bandeira**, Associate Professor, School of Architecture, University of Minho; and **Natacha Moutinho**, Assistant Professor, School of Architecture, University of Minho. Organization: **Paulo Cruz**, Chairman ICSA2016, Full Professor, School of Architecture, University of Minho. Acknowledgments: **Vasco Mourão**, **Pedro Bandeira**, **Natacha Moutinho**, **Rute Carlos** and **Henrique Pizarro**. Sponsors: **Lab2PT – Landscape, Heritage and Territory Laboratory** and **EAUM – School of Architecture, University of Minho**.

PARAMETRICAL RECIPROCAL STRUCTURES - WORKSHOP OF DESIGN AND FABRICATION

One of the central challenges that needs to be maintained throughout new structural and constructional design pedagogy is how to impart knowledge about structural and constructive concepts in a manner that enhances the capacity to understand and apply them in design.

Promoted under the auspices of ICSA2016 this workshop had its genesis in proposals developed by students of the course of Special Structures of the Master in Architecture of the School of Architecture of the University of Minho (EAUM). The solutions designed by the students focused on the design of a reciprocal structure to be built at the Design Institute of Guimarães (former Tanning Factory of Ramada). The one which proposed a structural hexagonal grid was selected.

The workshop involved EAUM students and staff to implement constructive solutions, in the manufacturing of all components and in the assembling of the structure: approximately 300 bars will be produced and more than 500 bolted connections will be used.

The initiative aimed to explore architectural and structural design concepts, embracing the research of: methods and processes of designing thinking; simulation and processing tools; and manufacturing concepts and materials.

The computational model Reciprocalizer, developed by Prof. Dario Parigi from the University of Aalborg, was used for the morphological design exploration. This model allows: generating three-dimensional reciprocal grids, characterized by a high degree of freedom; and formal experimentation: defining the geometric pattern of the mesh; adapting to the context and designing the building components.

The proposed combination of creative aspects in the conception and construction of structures, advanced technologies and complex architectural and structural applications represented a valuable learning experience of collaborative work.

Organization: **Paulo Cruz**, Chairman ICSA2016, Full Professor, School of Architecture, University of Minho; and **Bruno Figueiredo**, Assistant Professor, School of Architecture, University of Minho. Acknowledgments: **Dario Parigi**, **Henrique Pizarro**, **Ivo Barbosa**, **João Ribeiro** and **Samuel Ribeiro**. Sponsors: **IDEGUI – Design Institute of Guimarães**; **LCT – Laboratory of Construction and Technology**; **Lab2PT – Landscape, Heritage and Territory Laboratory** and **Municipality of Guimarães**.

ICE STRUCTURES EXHIBITION

This photographic exhibition presents the construction of full-scale pykrete and cellulose-ice composite structures in Juuka - Finland during the winters of 2014, 2015 and 2016.

The photos highlight the main phases of the construction of four astonishing structures (Pykrete Dome - 2014, Sagrada Familia in Ice - 2015, Leonardos's Bridge in Ice - 2016, Candela Pavilion in Ice - 2016).

During ICSA2016 the printed artworks will be exhibited at the Design Institute of Guimarães.

Organization: **Arno Pronk**, Assistant Professor, Eindhoven University of Technology, Eindhoven, Netherlands; **Jan Belis**, Prof. dr. ir.-arch., Department of Structural engineering, Ghent University, Ghent, Belgium & Eindhoven University of Technology, Eindhoven, Netherlands; and **Paulo Cruz**, Chairman ICSA2016, Full Professor, School of Architecture, University of Minho. Photos Credits: Pykrete Dome 2014: **Joep Rutgers**, **Bart van Overbeeke**; Sagrada Familia in Ice 2015: **Bart van Overbeeke**; Bridge in Ice 2016: **SintLucas-Thomas Meijerman**; Candela Pavilion in Ice 2016: **Bram Ronsse**; **Coen Dalenoord**; **Jan Belis**; **Paulo Cruz** and **Thomas Meijerman**. Acknowledgments: **Pedro Bandeira**, **Rute Carlos**, **João Ribeiro** and **Samuel Ribeiro**. Sponsors: **IDEGUI – Design Institute of Guimarães**; **Lab2PT – Landscape, Heritage and Territory Laboratory**; **Eindhoven University of Technology**; and **Ghent University**

Tuesday, July 26, 2016

14:00 – 18:00 **Registration** Lobby of the Main Auditorium

19:00 **Welcome Reception**

Wednesday Morning (WeM), July 27, 2016

08:00 – 19:00 **Registration** Lobby of the Main Auditorium

09:00 – 09:30 **Opening Ceremony** Main Auditorium

09:30 – 10:15 **Keynote Lecture** Main Auditorium Chairman: Deborah Oakley
Terri Boake "Innovation in Architectural Steel"

10:15 – 10:45 **Coffee Break** Lobby of the Main Auditorium

10:45 – 12:45 **Concurrent Technical Sessions** WeM 1 to WeM 4

WeM 1 – Main Auditorium	WeM 2 – Room B1.14	WeM 3 – Room B1.15	WeM 4 – Room B1.16
General Session Building Envelopes (1)	Special Session Performance Aided Assisted Design	General Session Glass Structures	General Session Timber structures
Chairman: Katherine Liapi	Chairman: Dario Parigi	Chairman: Alain Nussbaumer	Chairman: Charlotte Bundgaard
New equipment for new technology: Fixing systems for thin, textile reinforced concrete façades <i>M. Roik</i>	Building timber gridshells with air: Numerical simulations and technique challenges <i>A. Liuti, A. Pugnale & B. D'Amico</i>	The behaviour of fire resistant glass under fire <i>K. Machalická, M. Charvátová, M. Eliášová & P. Kuklík</i>	Contrasting approaches to load-bearing timber structures <i>A. Gianoli & R. Furrer</i>
Mashrabiya reinvented: Double façades, persian gulf style <i>T. Boake</i>	Specialised algorithms for different project stages in a post-formed timber gridshell design <i>S. Pone, G. Mirra, E. Pignatelli, D. Lancia & S. Colabella</i>	Durability of linear adhesive cold-formed steel-glass connections <i>B. Van Lancker, W. De Corte & J. Belis</i>	Mass timber high-rise design, cost and schedule research: Competitive advantages of wood over concrete <i>A. Jacobs, M. Timmers, J. Sundnes & A. Baker</i>
Reconstruction of roof decks of large roofs as a result of a synergy between technical and architectural solutions <i>V. Tichomirov, K. Landl & D. Bečkovský</i>	Computation tools for the design of a deployable dome structure <i>D. Lee, O. Larsen & S. Kim</i>	System safety of statically indeterminate glass beams after failure <i>K. Martens, R. Caspeele & J. Belis</i>	Structural performance of multi-storey cross-laminated timber (CLT) buildings <i>I. Lukacs & A. Björnfor</i>
Façade modernisation for retrofitting existing buildings to achieve nearly- zero energy buildings <i>S. Zuhair, M. Hajdukiewicz, M. Keane & J. Goggins</i>	Transformable bending-active structures: Manipulating elastic deformation in kinetic and rapidly assembled structures <i>S. Brancart, L. De Laet & N. De Temmerman</i>	Developing the bundled glass column <i>F. Oikonomopoulou, F. Veer, T. Bristogianni & R. Nijse</i>	The conceptual design of hybrid structures – Theoretical and experimental research of external prestressed timber beams <i>S. Miljanovic & M. Zlatar</i>
Structural laminated bamboo passive house <i>M. Taylor</i>	Generative material simulation: Contemporary trends in parametric structural design <i>J. Ripple</i>	A scientifically valid approach for determining the design strength and safety factor for heat strengthened glass <i>F. Veer</i>	Hybrid wood-based structural systems for multi-storey buildings <i>C. Loss, M. Piazza & R. Zandonini</i>
Application of simple surface climate models for modelling mould growth on wooden façades <i>T. Thiis, I. Burud, D. Kraniotis & L. Gobakken</i>	Advances in design and fabrication of free-form reciprocal structures <i>D. Parigi</i>	Lateral and torsional stability of hybrid steel-glass beams <i>I. Pravdová & M. Eliášová</i>	

Wednesday Afternoon (WeA), July 27, 2016

12:45 – 14:00 **Lunch** Restaurant of the University

14:00 – 16:00 **Concurrent Technical Sessions** WeA 1 to WeA 4

WeA 1 – Main Auditorium	WeA 2 – Room B1.14	WeA 3 – Room B1.15	WeA 4 – Room B1.16
General Session Building Envelopes (2)	Special Session The authority of the structure	Special Session On the tectonics in architecture	General Session Educating architects and structural engineers (1)
Chairman: Martina Eliasová	Chairman: Mario Rinke	Chairman: Patrizia Trovalusci	Chairman: Regin Schwaen
An oak composite thermal dynamic envelope <i>I. Foged & A. Pasold</i>	The art of structure <i>J. Schwartz</i>	Heinz Hossdorf: The innovation of “mixed rims” in the thin concrete shells of modern architecture <i>P. Cassinello</i>	A comparative study of the physical model as a tool for structural education <i>L. Luyten, T. Vilquin, I. Vrouwe & E. Verstrynge</i>
External musculature: The façade in the works of Ignacio Álvarez Castela <i>P. Cueto</i>	National technical library Prague – Building as a technical textbook <i>O. Hofmeister</i>	The “question of the technique”: From the designing idea to the realized form <i>R. Panei, P. Trovalusci & A. Tinelli</i>	Blending structural application into architectural design studios <i>M. Callahan, S. Shadravan & C. Leinneweber</i>
Understanding the complexities of building physics and human behaviour in achieving a nearly zero energy building <i>P. Moran, M. Hajdukiewicz & J. Goggins</i>	How to re-open the black box in the structural design of complex geometries <i>K. Verbeeck, L. Loos, L. De Laet & L. Muller</i>	Structural design and aesthetics of infrastructures in natural and artificial environments <i>M. Pasca</i>	Effective assignments and haptic teaching methods in architectural structure <i>R. Schwaen & R. Art</i>
Bionic patterns in architectural structures <i>N. Nawari & T. Chichugova</i>	Trended structures – On the authority of the load-bearing structure <i>N. Graber & C. Steiger</i>	Foldable geometries for architectural applications: Tectonics and material expression <i>K. Liapi, A. Ioannidi & E. Spyridonos</i>	Architect in residence: Pursuing integrated design within engineering <i>T. Nees</i>
Thermal behaviour of reinforced concrete and brick masonry structures. A case study <i>M. Molina-Huelva, A. Barrios-Padura & P. Fernández-Ans</i>	Homage – Source of inspiration <i>M. Schlaich</i>	Revisiting the form finding techniques of Sergio Musmeci: The bridge over the Basento river <i>P. Magrone, G. Tomasello, S. Adriaenssens, S. Gabriele & V. Varano</i>	A structuralist view of prefabrication <i>A. Correia, L. Simões da Silva & V. Murtinho</i>
		A two-stage approach for the design of grid shells <i>E. Grande, M. Imbimbo & V. Tomei</i>	
		Three-dimensional lower-bound analysis of masonry structures <i>P. Foti, A. Fraddosio, N. Lepore & M. Piccioni</i>	

Wednesday Evening (WeE), July 27, 2016

16:00 – 16:30 **Coffee Break** Lobby of the Main Auditorium

16:30 – 18:30 **Concurrent Technical Sessions** WeE 1 to WeE 4

WeE 1 – Main Auditorium	WeE 2 – Room B1.14	WeE 3 – Room B1.15	WeE 4 – Room B1.16
General Session Innovative architectural and structural design (1)	Mini-symposium New wood and bio-based construction (1)	Special Session Teaching Architecture in full scale – wood	General Session Educating architects and structural engineers (2)
Chairman: J. M. Morales Sanchez	Chairman: Ian Smith and Andreas Falk	Chairman: Jan Siem	Chairman: Ana Luísa Rodrigues
Optimization methodology for cross-section size in moment-resisting frame design <i>J. Xu, X. Lu & B. Spencer</i>	Opening of the session, introduction to the theme <i>I. Smith & A. Falk</i>	Models in 1:1 – A powerful education and research tool for bridging the gap between architects and engineers <i>O. Popovic-Larsen</i>	Advanced structural understanding: Load path and structural function revised <i>L. Luyten</i>
Pedestrian bridge as public art: Detailing in exposed steel <i>T. Boake</i>	Overview on the structural performance of timber structures under the effects of blast loading – Research and design considerations <i>D. Lacroix, C. Viau, D. Côté, M. Poulin, A. Lopez & G. Doudak</i>	From best practices to tactical design <i>P. Tidwell</i>	Bridge Design; Education and research in the field of integral, innovative, sustainable bridge design at TU Delft <i>J. Smits</i>
Integrated complex shell structures made up of effectively transformed flat folded sheets <i>J. Abramczyk</i>	Wall elements made of timber and wood-cement compounds – Building-physical properties and structural performance <i>D. Zwicky & N. Macchi</i>	Phases of intensive design and build workshops in architectural education <i>P. Aalto & S. Rintala</i>	Behavior of building structures: Study through models of relevant architecture <i>E. Fenollosa, I. Cabrera, A. Almerich & V. LLopis</i>
Bending-active structures: A parametric analysis on decoding structural behavior and capacity <i>K. Alexandrou & M. Phocas</i>	Slab elements made of timber and wood-cement compounds – Structural and other performances <i>M. Eymard & D. Zwicky</i>	Learn-by-making and its role in architectural education – Examples from Sweden and Australia <i>D. Bylund</i>	In search of the lunar catenary: Teaching form-active design with lower mathematics <i>E. Jannasch</i>
Innovative structural system consisting of CFT columns and precast concrete beams <i>A. El Debs, L. Bezerra & M. El Debs</i>	Function and design of innovative bio-based products for the building sector <i>A. Falk & M. Wälinder</i>	Full scale in four months – Objectives, methods and results <i>J. Siem, B. Braaten & A. Gilberg</i>	Drawing in the engineering design process: Learning from the first 150 years of modern engineering <i>E. Brito, R. Póvoas & P. Providência</i>
			Structural engineering in architectural studies at CTU Prague <i>M. Vavruskova & M. Pospisil</i>

Thursday Morning (ThM), July 28, 2016

08:30 – 19:00	Registration Lobby of the Main Auditorium		
09:00 – 10:30	Keynote Lectures Main Auditorium Chairman: Paulo Cruz and A. Adão da Fonseca James O'Callaghan "Glass Challenges – Past, Present, and Future" Enzo Siviero "Bridges and viaducts between Engineering and Architecture"		
10:30 – 11:00	Coffee Break Lobby of the Main Auditorium		
11:00 – 13:15	Concurrent Technical Sessions ThM 1 to ThM 4		
ThM 1 – Main Auditorium	ThM 2 – Room B1.14	ThM 3 – Room B1.15	ThM 4 – Room B1.16
General Session Innovative architectural and structural design (2)	Mini-symposium New wood and bio-based construction (2)	Special Session Teaching Architecture in full scale – regional materials	General Session Educating architects and structural engineers (3)
Chairman: Terri Boake	Chairman: Ian Smith and Andreas Falk	Chairman: Finn Hakonsen	Chairman: Humberto Camilloni
Is there a future for fabric-formed concrete structures? <i>R. Schmitz</i>	Beech LVL – High strength material for engineered timber structures <i>H. Blass, M. Enders-Comberg & M. Frese</i>	Material, structure, tectonics: The power of full scale in the education of architects <i>U. Meister & C. Rist-Stadelmann</i>	The relationship between structure, architecture, and cost of building based on conceptual design of cable-stayed footbridge <i>S. Skibicki</i>
Sarajevo University library architectural and structural concept <i>A. Pašić, M. Hrasnica & F. Biberkić</i>	Experimental campaign of mechanical CLT connections subjected to a combination of shear and tension forces <i>L. Pozza, M. Massari, M. Savoia & B. Ferracuti</i>	Constructing things for constructing other things <i>T. Berlemont</i>	The teaching of structural engineering – A practical approach <i>L. Houck & T. Aurlien</i>
Early-stage integration of architectural and structural performance in a parametric multi-objective design tool <i>N. Brown, J. Ochsendorf, C. Mueller & J. de Oliveira</i>	Experimental analysis of a new connection system for CLT structures <i>A. Polastri, R. Brandner & D. Casagrande</i>	An inclusive aesthetic approach to full scale building <i>N. Haarsaker & G. Brenk</i>	Design and build studios in architectural education <i>S. Sandness</i>
The New MAAT in Lisbon. Using old methods to design contemporary architectural solutions <i>E. Brito & R. Furtado</i>	Numerical analyses of high – and medium – Rise CLT buildings braced with cores and additional shear walls <i>A. Polastri, L. Pozza, C. Loss & I. Smith</i>	Learning at the scale of "real life". New pedagogical ideas for teaching architecture <i>M. Spaan</i>	Inverse investigations: Material definitions of structure and space <i>M. Donofrio</i>
Structural system concept for twisted buildings <i>M. Piekarski</i>	Timber prefab façades – Low Environmental impact solutions for the retrofit of buildings <i>G. Callegari, A. Spinelli, L. Bianco & V. Serra</i>	Building culture written into the landscape – How to read spatial tradition <i>J. Borucka</i>	STEM principles implementation in building technology education at Texas universities <i>S. Toker-Beeson & R. Azari</i>
Integrating engineering and architecture <i>S. Smith</i>		Listening to the material. An intuitive approach to the knowledge of construction materials <i>R. Farré</i>	Crossing boundaries: Blurring the lines between engineers and architects <i>K. Dong & T. Fowler</i>
		Didactic concepts within teaching architecture in one to one scale – Two cases <i>F. Hakonsen, M. Waagaard, A. Gilberg & J. Siem</i>	

Thursday Afternoon (ThA), July 28, 2016

13:00 – 14:00 **Lunch** Restaurant of the University

14:00 – 16:10 **Concurrent Technical Sessions** ThA 1 to ThA 4

ThA 1 – Main Auditorium	ThA 2 – Room B1.14	ThA 3 – Room B1.15	ThA 4 – Room B1.16
General Session Innovative architectural and structural design (3)	Mini-symposium New wood and bio-based construction (3)	Special Session Beyond Disciplines: Building Transdisciplinary Teams	General Session Educating architects and structural engineers (4)
Chairman: Vitor Murtinho	Chairman: Ian Smith and Andreas Falk	Chairman: James Doerfler	Chairman: Robert Dermody
An eco-friendly approach for enhancing rural archaeological heritage in Romania <i>S. Bica, M. Tămășan & C. Mărăcineanu</i>	Bio-based structural building components grown into near net shape <i>F. Moser, M. Trautz, A.L. Beger, M. Löwer, J. Feldhusen, J. Prell, J. Reimer, A. Wormit, B. Usadel, C. Kämpfer, T.B. Seiler & H. Hollert</i>	Shared parameters: Interfaces of collaborative exchange <i>J. Ripple</i>	Tectonics in the study abroad design studio <i>S. Milovanovic-Bertram</i>
Externally post-tensioned structures: Validation through physical models <i>L. Todisco & C. Mueller</i>	Pourable wood-cement compounds – Properties, potential and challenges of a new structural material <i>N. Macchi & D. Zwicky</i>	AECO: Web based collaborative digital design <i>M. Naugle</i>	A survey of structures education in North American schools of architecture <i>R. Dermody, D. Oakley & M. Uihlein</i>
Topology optimization of photovoltaic panels as a factor in shaping structural system and architectural form <i>R. Tarczewski & M. Świąciak</i>	Can CLT construction help copenhagen become world's first carbon neutral city? <i>D. Horsewill & T. Nielsen</i>	Interdisciplinary synergy <i>R. Roesling & B. Nuttall</i>	Forces frozen: Hands-on exploration of structural ice shells <i>C. Fivet & C. Mueller</i>
'COCOON' a bamboo building with integration of digital design and low-tech construction <i>L. Hansen & S. Kim</i>	Energy and seismic performance of timber buildings in Mediterranean region <i>A. Polastri, G. H. Poh'siè, I. Paradisi & J. Ratajczak</i>	Blurring boundaries through interdisciplinary engagement <i>M. Mistur</i>	Sketching as thinking: Structural concepts and design <i>M. Dunn</i>
Studies in 3D Topologies: Structural morphologies and grid shell structures <i>I. Lochner</i>	A new dissipative connection for CLT buildings <i>L. Marchi, D. Trutalli, R. Scotta, L. Pozza & A. Ceccotti</i>		A freehand method for analyzing certain spatial porticoes almost accurately <i>A. Lacort</i>

Thursday Evening (ThE), July 28, 2016

16:10 – 16:40 **Coffee Break** Lobby of the Main Auditorium

16:40 – 19:00 **Concurrent Technical Sessions** ThE 1 to ThE 4

ThE 1 – Main Auditorium	ThE 2 – Room B1.14	ThE 3 – Room B1.15	ThE 4 – Room B1.16
General Session Tall Buildings and structural design challenges	General Session The history of the relationship between architects and structural engineers	Special Session Reinforced Ice Structures: in the footsteps of Da Vinci and Candela	General Session Concrete and masonry structures
Chairman: Manos Kyriazis	Chairman: Olga Popovic-Larsen	Chairman: Jan Belis	Chairman: To be announced
Wind tunnel tests around bluff-bodies of circular base to optimize space grid envelope structures for high-rise steel buildings <i>R. Señis</i>	A study on the conservation of operating historical bridges – Recent experiences in Japan <i>H. Isohata</i>	Historical development of structural ice <i>A. Pronk, N. Vasiliev, J. Belis</i>	Influence of the wall shape on the collapse of arch-wall systems <i>D. Aita, R. Barsotti & S. Bennati</i>
Façade integrated structural damping systems for tall buildings <i>K. Moon</i>	Technological changes and architecture: The case of APCER magazine, Portugal 1935-45 <i>J. Delgado & P. Pinto</i>	Compressive strength of ice and cellulose-ice composite <i>P.J.S. Cruz & J. Belis</i>	The structure of the external lift at the Port of Ribadeo. Galicia. Spain <i>J. Valcárcel</i>
An engineer reads. Interpreting the Citylife Tower RdD1 structural design process through an essay of Italo Calvino <i>E. Brito & R. Furtado</i>	Claiming ground: The first structural engineering license in the United States <i>M. Uihlein</i>	Technical installations to enable the construction of the “Juuka in ice” project 2016 <i>J. van den Elzen</i>	Form and structure in the Cathedral of Cuzco <i>H. Rodríguez-Camilloni</i>
Comparative evaluation of diagrid and braced tube structures for tall buildings <i>K. Moon</i>	Structural documentation of the Palace of Congress in Brasilia <i>J. Sánchez & E. da Silva</i>	Design of Da Vinci’s bridge in ice <i>A. Pronk, R. Blok, M. Van Brunschot, A. Van Lier, F. Van de Mortel, K. Williams, M. Arntz, L. Hermens, R. Koekkoek & T. Van den Nieuwenhof</i>	Assessment of masonry buildings subjected to landslide by strut-and-tie models <i>F. Palmisano & A. Elia</i>
Bearing structure of a multi layered stone façade in cantilever of a 5 story residence in Athens <i>M. Kyriazis</i>	Collaboration between architects and structural engineers: A history of major successes and major failures <i>J. Rey-Rey</i>	Reinforced ice structures: In the footsteps of Candela <i>J. Belis, B. Ronsse, K. Martens, B. Van Lancker, P.J.S. Cruz & G. Deruyter</i>	Beyond the funicular: Exploiting untapped potentials in masonry construction <i>E. Jannasch</i>
A yoga analogy in structural behaviour: Understanding versus computation <i>J. Bernabeu & A. Bernabeu</i>	Building modelling in historical perspective <i>R. Tarczewski</i>	On-site geometrical measurements of an experimental ice composite shell through TLS and photogrammetry <i>G. Deruyter, K. Fransen, H. Glas & J. Belis</i>	Graphical methods for the design of masonry arches: The case of Luis Moya Blanco’s Nuestra Señora de la Araucana in Madrid, 1972 <i>L. Todisco, C. Fivet & S. Rojo</i>
Micro-mega – Nature inspired structural patterns for tall buildings: Modeling, analysis, design <i>G. Montuori, G. Perrella, M. Fraldi & E. Mele</i>		Three-dimensional lower-bound analysis of masonry structures <i>P. Foti, A. Fraddosio, N. Lepore & M. Piccioni</i>	

Friday Morning (FrM), July 29, 2016

09:00 – 17:00	Registration Lobby of the Main Auditorium
09:30 – 10:15	Keynote Lectures Main Auditorium Chairman: Paulo Carvalho Frederic Veer “Materials science, bridging the gap between architecture, architectural engineering and structural engineering”
10:15 – 10:45	Coffee Break Lobby of the Main Auditorium
10:45 – 12:30	Concurrent Technical Sessions FrM 1 to FrM 4

FrM 1 – Main Auditorium	FrM 2 – Room B1.14	FrM 3 – Room B1.15	FrM 4 – Room B1.16
General Session The borderline between architecture and structural engineering (1)	Mini-symposium Everyday Tectonics (1)	General Session The tectonic of architectural solutions (1)	General Session Steel, Concrete and masonry structures
Chairman: Maria Sanvitto	Chairman: Anne Beim	Chairman: Rui Póvoas	Chairman: Juan Perez Valcarcel
When structure and architecture are interdependent <i>M. Sanvitto</i>	Everyday tectonics? – Clarification of concepts <i>A. Beim & M. Hvejsel</i>	Carlo Scarpa and the search for gravity <i>A. Schultz</i>	New roles of the structure in the refurbishment of the architectural heritage: The MediaLab-Prado project <i>J. Rey & P. Vegas</i>
New orders, in search of a new point-block diagram for Hong Kong <i>O. Ottevaere</i>	A didactic of tectonics <i>N. Cowee</i>	Tectonic thinking on housing of modern architecture: Mies van der Rohe vs Alison and Peter Smithson <i>A. Rodrigues & P. Baía</i>	Prefabricated planar elements for reinforced brick shells <i>A. Pick, S. Schäfer & J. Reising</i>
Structure as power: The case of the Matosinhos Market, Portugal, 1936-1953 <i>J. Delgado & P. Pinto</i>	Constructing and construing environmental sensations <i>I. Foged</i>	Re-Envisioning the Knot: The Neil Astle House <i>B. Wrightsman</i>	Safety assessment of masonry structures based on modern methods and technologies <i>C.S. Dragomir, M. C. Calin, S. Purdoi, A. Virsta & R. Manea</i>
Architectural vs. structural constraints in urban multi-hazard safety assessment <i>E. Georgescu, C. Gociman, I. Craifaleanu, T. Florescu, M. Georgescu & C. Moscu</i>	Auxiliary architectures – The everyday potential of supplementary textile architectures <i>M. Hensel & D. Hensel</i>	From Seia to Guimarães. Fernando Távora’s tectonic shift in the Sacor fuel stations <i>E. Fernandes</i>	In the Arabian Gulf maintenance is the key to sustainability <i>M. Samarai</i>
Railway stations – The borderline between architecture and structure <i>E. Kido</i>	Subtle or Significant. Tectonic Transformations of Everyday Architecture <i>C. Bundgaard</i>	Tectonics and landscape: The structure of ground and atmosphere <i>M. Laboy</i>	Sustainable construction through Eco-efficient ultra-high performance concrete <i>I. Ferdosian & A. Camões</i>

Friday Afternoon (FrA), July 29, 2016

12:30 – 14:00 **Lunch**

14:00 – 15:20 **Concurrent Technical Sessions** FrA 1 to FrA 4

FrA 1 – Main Auditorium	FrA 2 – Room B1.14	FrA 3 – Room B1.15	FrA 4 – Room B1.16
General Session The borderline between architecture and structural engineering (2)	Mini-symposium Everyday Tectonics (2)	General Session The tectonic of architectural solutions (2)	General Session Lightweight and membrane structures
Chairman: Jan Belis	Chairman: Marie Frier Hvejsel	Chairman: Eduardo Fernandes	Chairman: Paulo Mendonça
The physical model in the structural studies of Robert Le Ricolais: “apparatus” or “hierogram” <i>M. Vrontissi</i>	The tectonics of recycling <i>U. Madsen</i>	Tectonic approaches in the design of concrete architecture in postwar Italy <i>L. Ingold & M. Rinke</i>	A simplified and robust material model for fabrics used in membrane structures <i>J. Pargana & V. Leitão</i>
Holistic integration versus separation and fragmentation in the architecture <i>D. Bijedic, R. Cahtarevic & S. Halilovic</i>	Investigations on cultural ecology of industrial timber construction – Through tectonic understanding of new wood materials <i>K. Sundahl</i>	Appropriate building physics in relation to the tectonic of architectural quality <i>C. Kristensen</i>	The new Warner Stand at Lord's Cricket Ground: Innovative fabric roof structures <i>S. Smith, A. Lerpiniere, W. Whitby, M. Trousdell & R. Zara</i>
Formal and structural multiplicity in early truss design <i>M. Rinke</i>	Tensegrity systems – Transferring tectonics from the extraordinary to the everyday <i>M. Hensel, G. Bover, J. Hoer, S. da Cunha & S. Sørensen</i>	Recovering a broader understanding of tectonics. The case for the architectural potentials of sheet metal <i>J. Holst & O. Jackson</i>	Lightweight modular membrane structures for various applications <i>S. Gellin & R. Tarczewski</i>
New formal expectations. The dynamic alternative between the evident and the disturbing <i>F. Suárez</i>	The ecology of urban tectonics – Studied in everyday building culture of Hans Christian Hansen <i>A. Beim & M. Hvejsel</i>	Le Corbusier's Maison Dom-ino and John Habraken's supports: Differences and similarities <i>H. Ferreira, L. Simões da Silva & V. Murtinho</i>	A case study for the use of structural textile cables in building <i>M. Brocato & R. Zarcone</i>

Friday Evening (FrE), July 29, 2016

15:20 – 17:00 **Concurrent Technical Sessions** FrE 1 to FrE 2

FrE 1 – Main Auditorium	FrE 2 – Room B1.14
General Session Futuristic and emerging technologies	General Session Computer and experimental methods
Chairman: Emanuel Jannasch	Chairman: Bruno Figueiredo
Rotoreliefs, definitively unfinished: From constructivism experiences to his legacy in progress, 1915-1998 <i>C. García</i>	Designing a slender footbridge based on a passive control algorithm <i>J.F. Jiménez-Alonso, A.M. Hernández Diaz & A. Sáez</i>
Sun, sea, sand and architectural structures <i>R. Rahman & M. Daud</i>	Free form surfaces construction with precast pieces and minimum formwork <i>P. Vegas & A. Bernabeu</i>
Systematic case study on energy efficiency of existing Irish buildings using BIM in order to achieve nearly zero energy standards <i>T. Ganguly, M. Hajdukiewicz, M. Keane & J. Goggins</i>	Genetically enhanced parametric design in the exploration of architectural solutions <i>P. von Buelow</i>
Lightweight steel intensive solutions for over-roofing of existing residential buildings <i>V. Ungureanu, A. Floricel & M. Georgescu</i>	Dynamic analysis of a modern cable-stayed footbridge <i>J. Dulinska & I. Murzyn</i>
	Optimization of stadium roof structure using force density method <i>M. Uroš, P. Gidak & D. Lazarevic</i>

17:00 – 17:30 **Closing Ceremony** Main Auditorium

AUTHOR INDEX

Author, Session Sessions are listed as **Day Time – Room**

Day: Wednesday, Thursday or Friday **Time:** Morning, Afternoon or Evening **Room:** 1 (main Auditorium), 2 (B1.14), 3 (B.15), 4 (B.16)

A

Aalto, P. WeE 3
Abramczyk, J. WeE 1
Adriaenssens, J. WeA3
Aita, D. ThE 4
Alexandrou, K. WeE 1
Almerich, A. WeE 4
Arlt, R. WeA 4
Arntz, M. WeA 3
Aurlien, T. ThM 4
Azari, R. ThM 4

B

Baía, P. FrM 3
Baker, A. WeM 4
Barrios-Padura, A. WeA 1
Barsotti, R. ThE 4
Bečkovský, D. WeM 1
Beger, A. ThA 2
Beim, A. FrM 2, FrA 2
Belis, J. WeM 3, ThE 3, FrA1
Bennati, S. ThE 4
Berlemont, T. ThM 3
Bernabeu, A. ThE1, FrE2
Bernabeu, J. ThE 1
Bezerra, L. WeE 1,
Biberkić, F. ThM 1
Bica, S. ThA 1
Bijedic, D. FrA 1
Björnfot, A. WeM 4
Blass, H. ThM 2
Blok, R. ThE3
Boake, T. KN-WeM, WeM1, WeE1
Borucka, J. ThM 3
Bover, G. FrA 2
Braaten, B. WeE 3
Brancart, S. WeM 2
Brandner, R. ThM 2
Brenk, G. ThM 3
Bristogianni, T. WeM 3
Brito, E. WeE 4, ThM 1, ThE 1
Brocato, M. FrA 4
Brown, N. ThM 1
Bundgaard, C. FrM 2
Bunud, I. WeM 1
Bylund, D. WeE 3

C

Cabrera, I. WeE 4
Cahtarevic, R. FrA 1
Calin, M.-C. FrM 4
Callahan, M. WeA 4
Camões, A. FrM 4
Casagrande, D. ThM 2
Caspeele, R. WeM 3
Cassinello, P. WeA 3
Ceccotti, A. ThA 2
Charvátová, M. WeM 3
Chichugova, T. WeA 1
Colabella, S. WeM 2
Correia, A. WeA 4
Côté, D. WeE 2
Cowee, N. FrM 2
Craifaleanu, I. FrM 1
Cruz, P.J.S. ThE3
Cueto, P. WeA 1

D

D'Amico, B. WeM 2
da Cunha, S. FrA 2
da Silva, E. ThE 2
Daud, M. FrE 1
De Corte, W. WeM 3
De Laet, L. WeM 2, WeA 2
de Oliveira, J. ThM 1
De Temmerman, N. WeM 2
Delgado, J. ThE 2, FrM 1
Dermody, R. ThA 4
Deruyter, G. ThE3
Dong, K. ThM 4
Donofrio, M. ThM 4
Doudak, G. WeE 2
Dragomir, C.-S. FrM 4
Dulinska, J. FrE 2
Dunn, M. ThA 4

E

El Debs, M. WeE 1
El Debs, A. WeE 1
Elia, A. ThE 4
Eliášová, M. WeM 3
Enders-Comberg, M. ThM 2
Eymard, M. WeE 2

F

Falk, A. WeE 2, ThM 2, ThA 2
Farré, R. ThM 3
Feldhusen, J. ThA 2
Fenollosa, E. WeE 4
Ferdosian, I. FrM 4
Fernandes, E. FrM 3
Fernández-Ans, P. WeA 1
Ferracuti, B. ThM 2
Ferreira, H. FrA 3
Fivet, C. ThA 4, ThE 4
Florescu, T. FrM 1
Florice, A. FrE 1
Foged, I. WeA 1, FrM 2
Foti, P. WeA 3
Fowler, T. ThM 4
Fraddosio, A. WeA 3
Fraldi, M. ThE 1
Fransen, K. ThE3
Frese, M. ThM 2
Furrer, R. WeM 4
Furtado, R. ThM 1, ThE 1

G

Gabriele, S. WeA 3
Ganguly, T. FrE 1
García, C. FrE 1
Gellin, S. FrA 4
Georgescu, M. FrM 1, FrE 1
Georgescu, E. FrM 1
Gianoli, A. WeM 4
Gidak, P. FrE 2
Gilberg, A. WeE 3, ThM 3
Glas, H. ThE3
Gobakken, L. WeM 1
Gociman, C. FrM 1
Goggins, J. WeM 1, WeA 1, FrE 1
Graber, N. WeA 2
Grande, E. WeA 3

H

Haarsaker, N. ThM 3
Hajdukiewicz, M. WeM1, WeA1, FrE1
Hakonsen, F. ThM 3
Halilovic, S. FrA 1
Hansen, L. ThA 1
Hensel, D. FrM 2
Hensel, M. FrM 2, FrA 2
Hermens, L. WeA 3
Hernandez-Diaz, A. FrE2
Hoen, J. FrA 2
Hofmeister, O. WeA 2
Hollert, H. ThA 2
Holst, J. FrA 3
Horsewill, D. ThA 2
Houck, L. ThM 4
Hrasnica, M. ThM 1
Hvejsel, M. FrA 2, FrM 2

I

Imbimbo, M. WeA 3
Ingold, L. FrA 3
Ioannidi, A. WeA 3
Isohata, H. ThE 2

J

Jackson, O. FrA 3
Jacobs, A. WeM 4
Jannasch, E. WeE 4, ThE 4
Jimenez-Alonso, J. FrE 2

K

Kämpfer, C. ThA 2
Keane, M. WeM 1, FrE 1
Kido, E. FrM 1
Kim, S. WeM 2, ThA 1
Koekkoek, R. WeA 3
Kraniotis, D. WeM 1
Kristensen, C. FrA 3
Kuklik, P. WeM 3
Kyriazis, M. ThE 1

L

Laboy, M. FrM 3
Lacort, A. ThA 4
Lacroix, D. WeE 2
Lancia, D. WeM 2
Landl, K. WeM 1
Larsen, O. WeM 2
Lazarevic, D. FrE 2
Lee, D. WeM 2
Leineweber, C. WeA 4
Leitão, V. FrA 4
Lepore, N. WeA3
Lerpiniere, A. FrA 4
Liapi, K. WeA3
Liuti, A. WeM 2
Llopis, V. WeE 4
Lochner, I. ThA 1
Loos, L. WeA 2
Lopez, A. WeE 2
Loss, C. WeM 4, ThM 2
Löwer, M. ThA 2
Lu, X. WeE 1
Lukacs, I. WeM 4
Luyten, L. WeA 4, WeE 4

M

Macchi, N. WeE 2, ThA 2
Machalická, K. WeM 3
Madsen, U. FrA 2
Magrone, P. WeA3
Manea, R. FrM 4
Mărăcineanu, C. ThA 1
Marchi, L. ThA 2
Martens, K. WeM 3, ThE 3
Massari, M. ThM 2
Meister, U. ThM 3
Mele, E. ThE 1
Miljanović, S. WeM 4
Milovanovic-Bertram, S. ThA 4
Mirra, G. WeM 2
Mistur, M. ThA 3
Molina-Huelva, M. WeA 1
Montuori, G. ThE 1
Moon, K. ThE 1
Moran, P. WeA 1
Moscu, C. FrM 1
Moser, F. ThA 2
Mueller, C. ThM 1, ThA 1, ThA 4
Muller, L. WeA 2
Murtinho, V. WeA 4, FrA 3
Murzyn, I. FrE 2

N

Naugle, M. ThA 3
Nawari, N. WeA 1
Nees, T. WeA 4
Nielsen, T. ThA 2
Nijse, R. WeM 3
Nuttall, B. ThA 3

O

Oakley, D. ThA 4
O'Callaghan, J. KN-ThM
Ochsendorf, J. ThM 1
Oikonomopoulou, F. WeM 3
Ottevaere, O. FrM 1

P

Palmisano, F. ThE 4
Panei, R. WeA3
Paradisi, I. ThA 2
Pargana, J. FrA 4
Parigi, D. WeM 2
Pasca, M. WeA3
Pašić, A. ThM 1
Pasold, A. WeA 1
Perrella, G. ThE 1
Phocas, M. WeE 1
Piazza, M. WeM 4
Piccioni, M. WeA3
Pick, A. FrM 4
Piekarski, M. ThM 1
Pignatelli, E. WeM 2
Pinto, P. ThE 2, FrM 1
Poh'siè, G. ThA 2
Polastri, A. ThM 2, ThA 2
Pone, S. WeM 2
Popovic-Larsen, O. WeE 3
Pospisil, M. WeE 4
Poulin, M. WeE 2
Póvoas, R. WeE 4
Pozza, L. ThM 2, ThA 2
Pravdová, I. WeM 3
Prell, J. ThA 2
Pronk, A. ThE3
Providência, P. WeE 4
Pugnale, A. WeM 2
Purdoi, S. FrM 4

R

Rahman, R. FrE 1
Ratajczak, J. ThA 2
Reimer, J. ThA 2
Reising, J. FrM 4
Rey-Rey, J. ThE 2, FrM 4
Rinke, M. WeA 2, FrA 1, FrA 3
Rintala, S. WeE 3
Ripple, J. WeM 2, ThA 3
Rist-Stadelmann, C. ThM 3
Rodrigues, A. FrM 3
Rodríguez-Camilloni, H. ThE 4
Roesling, R. ThA 3
Roik, M. WeM 1
Rojo, S. ThE 4
Ronsse, B. ThE3

S

Sáez, A. FrE 2
Samarai, M. FrM 4
Sánchez, J. ThE 2
Sandness, S. ThM 4
Sanvitto, M. FrM 1
Savoia, M. ThM 2
Schäfer, S. FrM 4
Schlaich, M. WeA 2
Schmitz, R. ThM 1
Schultz, A. FrM 3
Schwaen, R. WeA 4
Schwartz, J. WeA 2
Scotta, R. ThA 2
Seiler, T.-B. ThA 2
Señis, R. ThE 1
Shadravan, S. WeA 4
Siem, J. WeE 3, ThM 3
Simões da Silva, L. WeA 4, FrA 3
Siviero, E. KN ThM
Skibicki, S. ThM 4
Smith, I. WeE 2, ThM 2
Smith, S. FrA 4, ThM 1
Smits, J. WeE 4
Sørensen, S. FrA 2
Spaan, M. ThM 3
Spencer, B. WeE 1
Spyridonos, E. WeA 3
Steiger, C. WeA 2
Suárez, F. FrA 1
Sundahl, K. FrA 2
Sundnes, J. WeM 4
Święciak, M. ThA 1

T

Tămășan, M. ThA 1
Tarczewski, R. ThA 1, ThE 2, FrA 4
Taylor, M. WeM 1
Thiis, T. WeM 1
Tichomirov, V. WeM 1
Tidwell, P. WeE 3
Timmers, M. WeM 4
Tinelli, A. WeA3
Todisco, L. ThA 1, ThE 4
Toker-Beeson, S. ThM 4
Tomasello, G. WeA3
Tomei, V. WeA3
Trautz, M. ThA 2
Trousdel, M. FrA 4
Trovalusci, P. WeA3
Trutalli, D. ThA 2

U

Uihlein, M. ThA 4, ThE 2
Ungureanu, V. FrE 1
Uroš, M. FrE 2
Usadel, B. ThA 2

V

Valcárcel, J. ThE 4
Van Brunschot, M. ThE3
Van de Mortel, F. ThE3
Van den Elzen, J. ThE3
Van den Nieuwenhof, T. ThE3
Van Lancker, B. WeM 3
Van Lier, A. ThE3
Varano, V. WeA3
Vasiliev, N. ThE3
Vavruskova, M. WeE 4
Veer, F. WeM3, KN FrM
Vegas, P. FrM4; FrE 2
Verbeeck, K. WeA 2
Verstrynge, E. WeA 4
Viau, C. WeE 2
Vilquin, T. WeA 4
Virsta, A. FrM 4
von Buelow, P. FrE 2
Vrontissi, M. FrA 1
Vrouwe, I. WeA 4

W

Waagaard, M. ThM 3
Wålander, M. WeE 2
Whitby, W. FrA 4
Williams, K. ThE3
Wormit, A. ThA 2
Wrightsmann, B. FrM 3

X

Xu, J. WeE 1

Z

Zandonini, R. WeM 4
Zara, R. FrA 4
Zarcone, R. FrA 4
Zlatar, M. WeM 4
Zuhaib, S. WeM 1
Zwicky, D. WeE 2, ThA 2

SUMMARY PROGRAM

Wednesday , July 27, 2016

09:30 – 10:15 **Keynote Lectures** Main Auditorium

WeM 1 – Main Auditorium	WeM 2 – Room B1.14	WeM 3 – Room B1.15	WeM 4 – Room B1.16
General Session Building Envelopes (1)	Special Session Performance Aided Assisted Design	General Session Glass Structures	General Session Timber structures
WeA 1 – Main Auditorium	WeA 2 – Room B1.14	WeA 3 – Room B1.15	WeA 4 – Room B1.16
General Session Building Envelopes (2)	Special Session The authority of the structure	Special Session On the tectonics in architecture	General Session Educating architects and structural engineers (1)
WeE 1 – Main Auditorium	WeE 2 – Room B1.14	WeE 3 – Room B1.15	WeE 4 – Room B1.16
General Session Innovative architectural and structural design (1)	Mini-symposium New wood and bio-based construction (1)	Special Session Teaching Architecture in full scale – wood	General Session Educating architects and structural engineers (2)

Thursday July 28, 2016

09:00 – 10:30 **Keynote Lectures** Main Auditorium

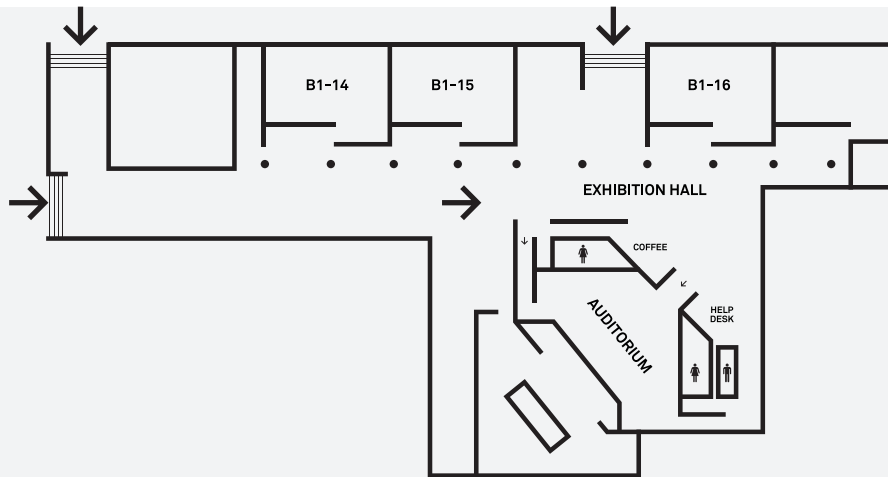
ThM 1 – Main Auditorium	ThM 2 – Room B1.14	ThM 3 – Room B1.15	ThM 4 – Room B1.16
General Session Innovative architectural and structural design (2)	Mini-symposium New wood and bio-based construction (2)	Special Session Teaching Architecture in full scale – regional materials	General Session Educating architects and structural engineers (3)
ThA 1 – Main Auditorium	ThA 2 – Room B1.14	ThA 3 – Room B1.15	ThA 4 – Room B1.16
General Session Innovative architectural and structural design (3)	Mini-symposium New wood and bio-based construction (3)	Special Session Beyond Disciplines: Building Transdisciplinary Teams	General Session Educating architects and structural engineers (4)
ThE 1 – Main Auditorium	ThE 2 – Room B1.14	ThE 3 – Room B1.15	ThE 4 – Room B1.16
General Session Tall Buildings and structural design challenges	General Session The history of the relationship between architects and structural engineers	Special Session Reinforced Ice Structures: in the footsteps of Da Vinci and Candela	General Session Concrete and masonry structures

Friday July 29, 2016

09:30 – 10:15 **Keynote Lectures** Main Auditorium

FrM 1 – Main Auditorium	FrM 2 – Room B1.14	FrM 3 – Room B1.15	FrM 4 – Room B1.16
General Session The borderline between architecture and structural engineering (1)	Mini-symposium Everyday Tectonics (1)	General Session The tectonic of architectural solutions (1)	General Session Steel, Concrete and masonry structures
FrA 1 – Main Auditorium	FrA 2 – Room B1.14	FrA 3 – Room B1.15	FrA 4 – Room B1.16
General Session The borderline between architecture and structural engineering (2)	Mini-symposium Everyday Tectonics (2)	General Session The tectonic of architectural solutions (2)	General Session Lightweight and membrane structures
FrE 1 – Main Auditorium	FrE 2 – Room B1.14		
General Session Futuristic and emerging technologies	General Session Computer and experimental methods		

CONFERENCE VENUE



GUIMARÃES CITY MAP





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