Description of the Braga Municipal Stadium

The Braga Municipal Stadium is a football stadium built in 2003 as the new home for local club SC Braga, and as a 2004 UEFA European Football Championship venue.

Designed by the Portuguese Architect Eduardo Souto de Moura, it is often considered one the most original and beautiful stadiums in the world. The Financial Times, states that:

“There has been nothing in this country to match the architectural delight of Eduardo Souto de Moura’s stadium for Braga in Portugal, a breathtaking arena carved into the side of a rock face on the site of a former quarry.”

Eduardo Souto de Moura has been awarded with the 2011 Pritzker Architecture Prize. Extract of the Citation from the Jury:

“... the scope of his work has expanded: the Braga Municipal Stadium, Portugal, designed in 2000 is muscular, monumental and very much at home within its powerful landscape.”
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 First International Conference on Structures and Architecture (ICSA2010) it was considered convenient to promote a second edition of this event, 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.

ICSA2013 covered all major aspects of structures and architecture, including building envelopes, comprehension of complex forms, computer and experimental methods, concrete and masonry structures, educating architects and structural engineers, emerging technologies, glass structures, innovative architectural and structural design, lightweight and membrane structures, special structures, steel and composite structures, 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.

Structures and Architecture – Concepts, Applications and Challenges, contains the lectures and papers presented at the Second International Conference on Structures and Architecture (ICSA2013) that was organized by the School of Architecture of the University of Minho, Guimarães, Portugal, in July 2013. 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 277 selected contributions from 41 countries.

On behalf of ICSA2013, 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 ICSA2013 a successful event. Finally, we would like to register our sincere thanks to all the sponsors of ICSA2013.
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ECCS – European Convention for Constructional Steelwork

IABMAS – International Association for Bridge Maintenance and Safety

IABSE – International Association for Bridge and Structural Engineering

IASSS – International Association for Shell and Spatial Structures

INTERNATIONAL INSTITUTIONS

ACE – Architects’ Council of Europe / Conseil des Architectes D’Europe

AIA – The American Institute of Architects

ASCE – American Society of Civil Engineers

BIBM – European Federation for Precast Concrete

BTES – Building Technology Educator’s Society

EAAE – European Association for Architectural Education

EFCA – European Federation of Engineering Consultancy Associations

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

ISCARSAH – International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage
NATIONAL INSTITUTIONS

SEI – Structural Engineering Institute / American Society of Civil Engineers

TensiNet

The Institution of Structural Engineers

TheStructuralEngineer.info Website

ANIPB – Associação Nacional dos Industriais de Préfabricação em Betão

APPC – Associação Portuguesa de Projectistas e Consultores

ASCP – Associação Portuguesa para a Segurança e Conservação de Pontes

CMM – Associação Portuguesa de Construção Metálica e Mista

Ordem dos Arquitectos, Secção Regional do Norte

Ordem dos Engenheiros

Sociedad Española de Historia de la Construcción

Sociedad Española de Historia de la Construcción
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University SS. Cyril and Methodius, Macedonia
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University of Coimbra, Portugal  
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Tongji University, China  
Yves Weinand  
EPFL ENAC IIC IBOIS, Switzerland

GENERAL INFORMATION

The ICSA2013 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 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 page 22 of this program.

Onsite registration: Onsite registration fees are:
600.00€ - Authors and participants
300.00€ - Students
250.00€ - 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 24, 9:00 – 9:30  
Place: Main Auditorium

CLOSING CEREMONY

Time: Friday, July 26, 18:40 – 19:00  
Place: Main Auditorium

KEYNOTE LECTURES

Félix Escrig, University of Seville, Spain  
“Emilio Perez Piñero. Inventor of deployability”  
(Wednesday, July 24, Main Auditorium)

Andrea Deplazes, ETH, Zurich, Switzerland  
“Archi-Tectonic”  
(Thursday, July 25, Main Auditorium)

Urich Knaack, Technical University Delft, Delft, The Netherlands  
“A façade roadmap”  
(Thursday, July 25, Main Auditorium)

Mario Chiorino Politecnico di Torino, Torino, Italy  
“Pier Luigi Nervi: Architecture as challenge”  
(Friday, July 26, Main Auditorium)

Randolph Langenbach, Conservationtech Consulting, California, USA  
“The great counterintuitive: Re-evaluating historic and contemporary building construction for earthquake collapse prevention”  
(Friday, July 26, Main Auditorium)
ICSA2013 MINI-SYMPOSIA

WeM 1, WeA 1, WeE 1 & ThM 1:
Mini-Symposium on Modern Renaissance Timber Construction
Prior to the later stages of 19th century timber was unrivalled in many parts of the world as a preferred material for construction of tall, large and exotic buildings, but for a variety of reasons it was relegated to a secondary role during most of the 20th century even in countries where timber is a common commodity. The mini-symposium will address contemporary and emerging issues related which is literally becoming the Modern Rennaissance of Timber Construction as a construction material. The sessions within the mini-symposium will illustrate the growing international network in this domain.

Coordinated by:
Ian Smith, University of New Brunswick, Fredericton, Canada
Jochen Köhler, Swiss Federal Institute of Technology ETH, Switzerland
Sylvain Gagnon, FPInnovations, Canada

ThM 1 & ThE 1:
Mini-Symposium On the “Tectonics” in Architecture: Between Aesthetics and Ethics
Following the successful experience of the mini-symposium already presented at the ICSA2010 in July 2010, the symposium expects to bring together architects, engineers and mathematicians from all over the world, to give an 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, calculus and algorithms in architecture, various approaches to structural complexity. The symposium will also discuss developments concerning the importance of the Vitruvean firmitas, pointing out the risks arising when the structural instances are neglected.

Coordinated by:
Patrizia Trovalusci, University of Rome “La Sapienza”, Rome, Italy
Mario Chiorino, Polytechnic of Turin, Turin, Italy

FrM 1 & FrA 1:
Structural Glass: Crossing borders
Even though Structural Glass currently is often not incorporated in standard structural engineering education programs, the field is developing at high speed and omnipresent in contemporary Architecture. The continuous innovations with Structural Glass are to a large extent driven by Architectural demands, and pushed forward by competent practicing engineers and a vivid research community.

Given their involvement in COST Action TU0905 – “Structural Glass - Novel Design Methods and Next Generation Products” and IABSE WG “Structural Glass”, respectively, the organizers want to bring together a good representation of nowadays projects and research activities which illustrate the growing international network in this domain.

Coordinated by:
Jan Belis, Ghent University LMO, Ghent, Belgium
Geralt Siebert, UniBwM Neubiberg, Germany

ICSA2013 SPECIAL SESSIONS

ThA2
From new tools and methods towards new tasks and ideals: The impact of technology and science in the post-war era
The development of new building tools and methods was an important motor in construction history, especially in the post-WWII era. Apart from their literal effects and immediate use, they also had profound influence on the division of roles and tasks in design and triggered new concepts on architecture and engineering, including a re-consideration of their ideals and societal positions. This session calls for papers exploring the manifold impact of new tools and methods in the world of building in the post-WWII era. It seeks to critically bridge between construction history, the history of technology, architecture history and building practice.

Coordinated by:
Rika Devos, Ghent University, Ghent, Belgium

WeM3
Innovation in timber
In an era of free-form architecture, issues of material properties, innovative solutions and realisation gain increased importance. Through development of technology and refined products, design of timber structures remains a worthy challenge for researchers and practitioners and frequently require new steps of innovation in relation to architectural and environmental performance, structural behaviour, construction methods and realisation during construction. The proposed session addresses factors driving innovation in timber design, innovative solutions and the interaction of architectural and structural aspects in timber research and practice.

Coordinated by:
Andreas Falk, Royal Institute of Technology KTH, Stockholm, Sweden

WeA2
Innovation in reciprocal structures
Reciprocal structures have been studied and used in the past for different needs and purposes, and their presence throughout history is scattered and discontinuous; in the last decades however they gained a constantly growing attention from researchers and practitioners because of the challenges and opportunities that their unique characteristics offer. This session assess the innovation in the design of a typology where the strong interaction between its architectural and engineering aspects stimulated researches concerning the morphology, the form finding methods, the structural and kinematic behavior, as well as the digital crafting and construction methods.

Coordinated by:
Dario Parigi, Aalborg University, Aalborg, Denmark

WeM2
From open structures to the cladding of control: A critical call for current tectonic theories and practices in architecture
Focusing on the cladding of architectural spaces (interior / exterior) this session addresses the current conditions of the built environment where large scale dwellings, hospitals, offices, schools and urban spaces are often experienced as formal structural frameworks rather than inviting spaces for residing. The fundamental potential of architecture is to provide shelter, embrace, surprise and captivate: How to position and provide architecture in the post-WWII era. It seeks to critically bridge between construction history, the history of technology, architecture history and building practice.

Coordinated by:
Anne Beim, Royal Danish Academy of Fine Arts, Denmark

Marie Frier Hvejsel, Aalborg University, Aalborg, Denmark

Anne Beim, Royal Danish Academy of Fine Arts, Denmark
ThM2
Principles in practice for the analysis, conservation and structural restoration of architectural heritage

Focusing The International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage (ISCARSAH) was founded by ICOMOS as a forum for engineers, architects, and conservators involved in the care of building heritage. The Committee has authored the ICOMOS Charter - Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage (ISCARSAH Principles). The symposium explores the Principles as they are put to use in different parts of the world.

Coordinated by:
Gorun Arun, Yildiz Tech. Univ., Vice President ISCARSAH, Turkey
Stephen Kelley, Wiss, Janney, Elstner Assoc., Inc. Pres. ISCARSAH, Chicago, USA

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 laptops will be allowed to connect to the LCD projector for making presentations. 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.

SOCIAL PROGRAM

Welcome Reception
July 23, 20:00 – Ducal Palace of Bragança

The Paço dos Duques de Bragança, built in the 15th century by the then-future duke Dom Afonso, shows elements of architectural styles common in the Great manor houses and palaces of northern Europe. In the mid-20th century, after a period of disuse and abandonment, the palace was renovated and saw new life as a museum displaying items from the 17th and 18th centuries. Among its various collections, we can find pieces that document Portuguese contributions during the Age of Discoveries, while others narrate events in the Conquest of North Africa. Paço dos Duques is placed at a walking distance from the conference venue. A map with information on how to get there is available on page 23.

Gala Dinner
July 25, 20:00 - mitPenha

mitPenha is a contemporary space, located at 607 meters high, on Penha’s hill. It is embedded in the mountain, on a balanced integration with the surrounding ecosystem, enhancing the beauty of nature. MitPenha’s presents a privileged scenery, as it provides a panoramic view of the region, especially of the urban site.

Registration as ‘Student’ does not include the gala dinner. Additional tickets for Gala Dinner for registrants with student fee are available through the registration desk (96.00 €)

Transfer to MitPenha will be available in the main entrance of the University.

ACCOMPANYING PERSON’S PROGRAM

1) Guimarães (half day) - July 24th
Visit to one of the most beautiful and historical cities of Portugal, Guimarães - the Nation’s birthplace. Surrounded by parks and a 15th century Palace, stands the Castle of Guimarães, which will be our first stop. Simple, but yet a remarkable site, a place full of story. It was here that D. Afonso Henriques was born in the 12th century from the Count Henrique and his wife D. Teresa. The future king was baptized in the Romanesque chapel of São Miguel outside the castle gates and close to the Ducal Palace.

Continuing with a visit to the 15th century Palace of the Dukes of Bragança, a massive and imposing building with distinctive turrets and brick chimneys. It was built in 1401 by the first Duke of Bragança and rehabilitated in the last century. The Tour proceeds for a guided tour to the historic centre of Guimarães classified as World Heritage by UNESCO, with its medieval streets layout which is lined with historic buildings everywhere you look. Stop at Largo da Oliveira one of the central points. Free time for a calm stroll.

2) Douro Tour (full day) - July 25th
Meet with Abreu Staff and departure towards the Douro Valley region, worldwide known and famous for the wine production. The first stop will be at Vila Real, a beautiful and ancient city full of manor houses that it’s one of the main characteristics of this city. Panoramic walking tour through the city center. After this walking tour we will continue to “Solar de Mateus”. The Palace, House or Solar de Mateus is one of the most significant works of the Portuguese civil architecture of the Baroque period, probably built by the Italian Architect Nicolau Nasoni. The building it’s surrounded by beautiful gardens, lined with green boxwood and dotted with flower beds. Mateus it’s also known for the production of the wine “Mateus Rose”.

The tour will continue towards the centre of the Douro Valley region, passing through the city’s of Sabrosa and Pinhão. Lunch. After lunch visit “Quinta do Seixo” a wine estate with over one hundred years. Quinta do Seixo also “offers” an outstanding view over the vineyards of this region that was declared by UNESCO as world heritage. Our journey continues with a visit to the city of Régua before the return to Guimarães.

3) Ponte de Lima and Viana do Castelo (full day) - July 26th
Visit to Ponte de Lima a Portuguese village with its medieval architecture and surrounded by a beautiful green area. Ponte de Lima has a beauty and very specific and natural environment. It is situated in the middle of the Ribeira of Lima valley. In the Middle Age it was a fortified village with walls 600 meters long, 10 towers, 2 turrets and 6 entrances. In 1995 Ponte de Lima won the European Grand Prize of Tourism and Environment.

We will then proceed to the town of Viana do Castelo, a XII century town (founded 1258), where the modern town has grown near the river Lima. We can visit the Cathedral and you can’t miss the neo-Byzantine Church of Santa Luzia, located on top of the Santa Luzia hill with a breathtaking view of Viana do Castelo, the river Lima estuary and the sea. The city is a living museum, but it is also the capital of the rich Minho folklore, with an important handicraft industry.

Free time for lunch on the city center. We can also visit the shipyards at Viana do Castelo in activity since 1944, being the major Portuguese Shipbuilder (to be confirmed). Return to Guimarães.

FULL PROGRAMME

Second International Conference on STRUCTURES AND ARCHITECTURE
24-26 July 2013, Guimarães, PORTUGAL

SPEAKERS

Stephen Kelley, Wiss, Janney, Elstner Assoc., Inc. Pres. ISCARSAH, Chicago, USA

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Second International Conference on STRUCTURES AND ARCHITECTURE
24-26 July 2013, Guimarães, PORTUGAL

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<td>Concurrent Technical Sessions, WeM 1 to WeM 6</td>
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<td>WeM 1 – Main Auditorium</td>
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<td>Registration</td>
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<td>9:00 – 10:30</td>
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<td>9:30 – 10:15</td>
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<td>Chair: Paulo J.S. Cruz, Félix Escrig, &amp; Emilio Pérez-Pintos</td>
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<td>15:00 – 19:00</td>
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<td>Welcome Reception</td>
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<td>(Palace of the Dukes of Bragança - Guimarães)</td>
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<td>Wednesday Morning (WeM), July 24, 2013</td>
<td>9:00 – 19:00</td>
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<td>Registration</td>
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<td>9:00 – 9:30</td>
<td>Opening Ceremony</td>
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<td>9:30 – 10:15</td>
<td>Keynote Lecture</td>
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<td>Chair: Clément Mols</td>
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<td>10:15 – 12:15</td>
<td>Concurrent Technical Sessions, WeM 1 to WeM 6</td>
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<td>13:30 – 14:30</td>
<td>Lunch (Restaurant of the University)</td>
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<td>14:30 – 16:30</td>
<td>Concurrent Technical Sessions: WeA 1 to WeA 6</td>
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<td>WeA 2</td>
<td>Special Session</td>
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<td>General Session</td>
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<td>General Session</td>
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<td>WeA 5</td>
<td>General Session</td>
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<tr>
<td>WeA 6</td>
<td>General Session</td>
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</tbody>
</table>

**Wednesday Afternoon (WeA), July 24, 2013**

**Mini-Symposium**

- **Modern renaissance timber construction (2)**
  - Innovation in reciprocal structures: Timber structures (1)
  - The borderline between architecture and structural engineering (2)
  - Computer and experimental methods (2)
  - Innovative architectural and structural design (2)

**Chair:** Sylvain Gagnon

**Seismic design of timber structures with displacement based method**

- The proposal of an ancient technique for modern construction. A stone reciprocal structure
- Contribution to the fire resistance of timber construction using boards
- Architecture and engineering in the new leaning towers
- Multi-objective optimization of concrete shells

**Behaviour of moment connections in timber frameworks**

- Efficient design and fabrication of free-form reciprocal structures
- Low cost construction. State of the art and prospects for using structure wood apartment buildings in Portugal
- Structure as architectural system

**Seismic performance assessment of a timber-log house**

- Static and kinematic formulation of planar reciprocal assemblies
- Embedded information in structural timber
- Closing the gap while celebrating the divide. Tools for A/E collaborative learning
- Performance assessment of mixed CFRP retrofitting solution for RC slabs

**Chair:** Dario Parigi

**Chair:** Paulo Mendonça

**Chair:** Juan Perez Herreras

**Chair:** Kirk Martini

**Chair:** Vitor Martino

**Investigation of seismic performance of multi-storey timber buildings within the frame of the SERIES Project**


**Seismic design of CLT buildings: Definition of a suitable q-factor by numerical and experimental procedures**

- M. Piazza & R. Tomasi, U. Thoenissen, M. Oliveira, J. P. Couto, M. Silva & A. P. Reis

**Chair:** Sylvain Gagnon

**Chair:** Dario Parigi

**Chair:** Paulo Mendonça

**Chair:** Juan Perez Herreras

**Chair:** Kirk Martini

**Chair:** Vitor Martino

**Investigating a new material practice**

- Seismic design of CLT buildings: Definition of a suitable q-factor by numerical and experimental procedures
- Behaviour of moment connections in timber frameworks
- Seismic performance assessment of a timber-log house
<table>
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<th>WeE 2 – Room B1.14</th>
<th>WeE 3 – Room B1.15</th>
<th>WeE 4 – Room B1.16</th>
<th>WeE 5 – Room B1.17</th>
<th>WeE 6 – Room B1.13</th>
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<tbody>
<tr>
<td>Modern renaissance timber construction (3)</td>
<td>General Session</td>
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<tr>
<td>Chair: Jochen Kohler</td>
<td>Chair: Michel Crisinel</td>
<td>Chair: Artur Feio</td>
<td>Chair: Romuald Tarcaewski</td>
<td>Chair: Christian Louther</td>
<td>Chair: Juan Pérez Valcárcel</td>
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</tr>
<tr>
<td>Better than steel? (Part 2): Tall wooden factories and the invention of &quot;slow burning&quot; heavy timber construction</td>
<td>Monitoring the recovery of architectural heritage</td>
<td>Analysis of the elasto-plastic failure behavior of wood under compression</td>
<td>Design of the Brasilia TV tower</td>
<td>Life cycle assessment of Irish residential buildings and typical building envelope analysis</td>
<td>Hybrid structures: A case of a pedestrian bridge</td>
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<tr>
<td>Performance-based design for mid-rise wood constructions in Canada</td>
<td>Comparing the embodied energy of structural systems in parking garages</td>
<td>Optimized generation of non-standard wood structures based on native irregular components</td>
<td>The architecture of the fall. Metamorphosis of structure in the work of Enric Miralles (1988-1997)</td>
<td>Integrated design applied in thermal retrofitting solutions for residential buildings</td>
<td>Origami based, deployable disaster relief shelter</td>
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<tr>
<td>Predicting force flows in timber light-frame building superstructures</td>
<td>Bridge design 2.0: Developments in the field of integrated, sustainable and durable bridge design</td>
<td>Development of prefabricated timber-concrete composite floors</td>
<td>The role of architectural theory in exploiting the potential of iron load-bearing structures</td>
<td>Modified plastic materials for a new generation of architecture</td>
<td>Three-hinged structures in a historical perspective</td>
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<tr>
<td>G. Doudak &amp; J. Smith</td>
<td>J. Smiths</td>
<td>P. Nechansky &amp; P. Kukk</td>
<td>M. Hárta</td>
<td>T. Ries</td>
<td>L. Slivnik</td>
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<tr>
<td>Is cross-laminated timber suitable for building structures to thirty levels?</td>
<td>Earth architecture. Ancient and new methods to improve the durability</td>
<td>Timber framed masonry buildings, an earthquake resistance influenced architecture</td>
<td>Can collaboration within multidisciplinary teamwork be explained using Belbin? A case study</td>
<td>Isostatic lines’ study to optimize steel space grid envelope structures for tall buildings according to their solicitations</td>
<td>“Floating roofs”. The Dorton arena and the development of modern tension roofs</td>
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<tr>
<td>Wind design of timber buildings</td>
<td>Daylight in interiors</td>
<td>The interdisciplinary design studio. Identifying collaboration</td>
<td>Expanded cork as building envelope. Architectonic and technological aspects</td>
<td>Mass-customized architectural design approach. Evaluation and a proposal based on fractal geometry principles</td>
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</tbody>
</table>
### Thursday Morning (ThM), July 25, 2013

#### 8:30 – 19:00

**Registration** (Lobby of the Main Auditorium)

#### 9:00 – 10:30

**Keynote Lectures** (Main Auditorium)  Chair: Luís Simões da Silva

Andrea Deplazes *Architect-Tectonic*

Ulrich Knaack *"A façade roadmap"*

#### 10:30 – 11:00

**Coffee Break** (Lobby of the Main Auditorium)

#### 11:00 – 13:00

**Concurrent Technical Sessions: ThM 1 to ThM 6**

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<tbody>
<tr>
<td><strong>Mini-Symposium</strong></td>
<td><strong>Special Session</strong></td>
<td><strong>General Session</strong></td>
<td><strong>General Session</strong></td>
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<tr>
<td>Modern renaissance timber construction (4)</td>
<td>Principles in practice for the analysis, conservation and structural restoration of architectural heritage</td>
<td>Timber structures (3)</td>
<td>The borderline between architecture and structural engineering (4)</td>
<td>Steel and composite (1)</td>
<td>Innovative architectural and structural design (4)</td>
</tr>
<tr>
<td>Chair: Maurizio Piazza</td>
<td>Chair: Gorun Arun &amp; Stephen Kelley</td>
<td>Chair: Christian Eckhardt</td>
<td>Chair: Miguel C. Fernandez-Cabo</td>
<td>Chair: Martina Elisasova</td>
<td>Chair: Terri Boake</td>
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<tr>
<td><strong>Design concepts and principles for taller multi-storey superstructures incorporating timber frameworks</strong></td>
<td>The ISCARSAH principles in practice</td>
<td>On seismic response of retrofitted wooden house by collapsing process analysis</td>
<td>The interaction of architects &amp; structural engineers for the Hellenic World complex in Athens</td>
<td>Specificity of shaping light gauge steel shells</td>
<td>Deployable stage. Proposal of an application with mobile structures</td>
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<tr>
<td>S. Kelley</td>
<td>I. Takatani &amp; H. Nishikawa</td>
<td>E.S. Kyriazis</td>
<td>J. Abramczyk</td>
<td>N.P. Torres Londoño</td>
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<tr>
<td><strong>Timber beams with end restraints</strong></td>
<td>The building and its structural history (or how the history is the source of endless technical knowledge)</td>
<td>Barriers to the design and use of cross-laminated timber structures in high-rise multi-family housing in the United States</td>
<td>A structural language for a conceptual design collaboration</td>
<td>Numerical analysis of sliding rigid beam-column joints made from encased tubes for high-rise structures</td>
<td>Sustainable processes</td>
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<tr>
<td><strong>Behaviour of dowel-type timber connections under cyclic loading</strong></td>
<td>Master builders’ design skills in diagnosing the failures</td>
<td>A modular timber construction system architecture</td>
<td>Engineers and the role of structures in architecture</td>
<td>Experimental and theoretical analysis of bridges with encased fillers beams</td>
<td>Multi-objective search in the early phase of architectural design</td>
</tr>
<tr>
<td><strong>Design and production of an heavy timber reaction frame for a laboratory test setup</strong></td>
<td>Physical evaluation of the endless column</td>
<td>The roman timber framework, a neglected construction method</td>
<td>On the extension of graphical statistics into the 3rd dimension</td>
<td>Shear connection of composite steel and concrete bridge trusses</td>
<td>Using the laser scanning technology in the rehabilitation of existing buildings</td>
</tr>
<tr>
<td><strong>Glulam structures: some Portuguese case studies</strong></td>
<td>Structural evaluation of Kilitbahir Castle in Canakkale, Turkey</td>
<td>The behavior of toothed-plate connectors under reversed cyclic loading</td>
<td>Configuration design for collective housing building structures -IFD systems configuration</td>
<td>Experimental study on steel-concrete shear walls with steel-encased profiles retrofitted with FRP composites</td>
<td>Computational morphogenesis in architecture. Structure and light as a multi-objective design/optimization problem</td>
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<tr>
<td><strong>Panel discussion: What are the boundaries on what can be constructed from timber?</strong></td>
<td>Dismantling of foundation system for conservation of masonry structures in Angkor, Cambodia</td>
<td>Architectural taming of infrastructures: interaction architect, Structural engineers</td>
<td>The re-use of disassembled steel structures between architectural design and environmental sustainability</td>
<td>Form structure integration</td>
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### Thursday Afternoon (ThA), July 25, 2013

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>13:00 – 14:30</td>
<td>Lunch (Restaurant of the University)</td>
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<tr>
<td>14:30 – 16:30</td>
<td>Concurrent Technical Sessions: ThA 1 to ThA 6</td>
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#### ThA 1 – Main Auditorium

**Mini-Symposium**

- On the “tectonics” in architecture. Between aesthetics and ethics (1)
  - Chair: Patrizia Trovalusci

**Special Session**

- From new tools and methods towards new tasks and ideals. The impact of technology and science in the post-war era
  - Chair: Rika Devos

**Parallel Event**

- Sustainability assessment in early phases of building projects
  - Chair: Luís Bragança

**General Session**

- The borderline between architecture and structural engineering (5)
  - Chair: Russel Gentry

**General Session**

- Steel and composite (2)
  - Chair: Alain Nussbaumer

- The legacy of the modern movement and its adversities in the face of the current development of changeable housing construction solutions
  - Chair: Mircea Georgescu

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#### ThA 2 – Room B1.14

**Mini-Symposium**

- Shells, Innovation system design by Ildefonso Sánchez (1898-1980)
  - P. Cassinello

**Special Session**

- The architecture of absence. Building, landscape and the changing character of technology in the post-war era
  - C. Cabral

**Parallel Event**

- Opening and presentation of the new SB_Steel methodology
  - H. Koukkari

**General Session**

- Infrastructures and environmental impact. The synergy of architectural and structural design
  - M. Pasca

- Great steel structures. The Italian post-war trial
  - M. Zordan & F. Fragnoli

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#### ThA 3 – Room B1.15

**Mini-Symposium**

- The DNA of the avant-gardes
  - L. Enguita

**Special Session**

- New french architectural treatises for a new kind of public architecture
  - E. Monin

**Parallel Event**

- Criteria for sustainable steel-intensive building
  - L. Bragança & J. Andrade

**General Session**

- The disappearance of the structural analysis barrier. The Sydney Opera House from a contemporary perspective
  - J. Rey Rey

- Required performance level of an existing building for over roofing
  - N. Zsolt & M. Cristutiu

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#### ThA 4 – Room B1.16

**Mini-Symposium**

- Conceptual design of a pedestrian bridge by means of topology optimization
  - L. Frattari, J. P. Dagg & G. Leon

**Special Session**

- The development of architectural concrete in Belgium during the 1960s and 1970s
  - S. Van de Voorde

**Parallel Event**

- LCA approach in steel-framed buildings design
  - B. Rossi

**General Session**

- The role of structures in daylighting retrofits for existing buildings
  - M. Sedor, C.T. Griffin & K. Konis

- Innovative conception and design of structural systems for flexible floor spaces
  - C. Odenbreit, O. Hechler & M. Braun

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#### ThA 5 – Room B1.17

**Mini-Symposium**

- The nature of tectonic architecture and structural design
  - A. Carter, P.H. Kirkegaard & R. Tyrrell

**Special Session**

- Working relationships between architects and structural engineers. World War II to the 1970s
  - D. Yeomans

**Parallel Event**

- Thermal performance of steel-framed buildings
  - P.Santos

**General Session**

- Innovative conception and design of structural systems for flexible floor spaces
  - C. Odenbreit, O. Hechler & M. Braun

- “Reticolatus”. An innovative reinforcement for irregular masonry. A numeric model
  - S. Galassi, M. Paradiso, A. Borri & D. Sircopoli

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#### ThA 6 – Room B1.13

**Mini-Symposium**

- Construction and form-finding of a post-formed timber grid-shell
  - F. Portioli, S. Pone, B. D’Amico, R. Landolfo, S. Colabella, B. Parenti, D. Lancia, A. Fiore, M. D’Aniello & C. Cerakli

**Special Session**

- Finnish architect-engineer cooperation on concrete and shell structures in the 1950s and 1960s
  - A. Niskanen

**Parallel Event**

- Sustainable design of steel structures
  - R. Landolfo

**General Session**

- Built environment sustainability. Breaking the boundaries between architects and civil engineers
  - M.A. Szita, T.O. Gheorghiu & D.M. Greca

- Built environment sustainability. Breaking the boundaries between architects and civil engineers
  - M.A. Szita, T.O. Gheorghiu & D.M. Greca

- Double curved aluminum façade
  - K. Najjar

- Fabric formed concrete structures and architectural elements
  - R. Pedreschi

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**General Session**

- Structuring geometry and abstraction of structures in architectural synthesis
  - B. Dzenana, R. Čahtarević & S. Halilovic

- Tree like structures and fractal
  - F. Escrig, J. Sánchez Sánchez & T. Rodriguez León

- Balconies, analysis of constructive technology current state and foresight of new industrial development
  - L. Sierra & J.L. Zamora
Thursday Evening (ThE), July 25, 2013

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<td>16:30 – 17:00</td>
<td>Coffee Break (Lobby of the Main Auditorium)</td>
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<tr>
<td>17:00 – 19:00</td>
<td>Concurrent Technical Sessions: ThE 1 to ThE 6</td>
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### ThE 1 – Main Auditorium

**Mini-Symposium**

- On the “tectonics” in architecture, Between aesthetics and ethics (2)
  - Chair: Mario Chiorino
  - E. Gonzalez & J. Anaya Diaz: Elevated pedestrian ways in Japan. A historical view
  - H. Isohata: Building on planet Mars student project

**General Session**

- The tectonic of architectural solutions (1)
  - Chair: Christoph Odenbreit
  - F. Vieux-Champagne, A. Cairò: Traditional and scientific knowledge for a sustainable vulnerability reduction of rural housing in Haiti
  - J.A. Chica: Role of the LCA in the renovation processes based on two case studies
  - J.A. Chica: Structures for quality and quantity of natural light in architecture

**Technical solutions for rehabilitation of old arch bridges**

- Chair: Vincenzo Riso
- L. Toma, E. Petzek & R. Bâncilă: Combining shape grammars and BIM in the rehabilitation design process of the bourgeois house of Oporto: the research progress
- E. Coimbra & V. Riso: Reconversion process of an old building into a modern commercial centre
- H. Fallon & B. Vandenbulcke: AgW architecture office : Addressing structure in architecture competitions

**Structural solutions for emergency architecture**

- Chair: K. Dong & J. Feldman
- H. Fallon & B. Vandenbulcke: Towards an improved architectural quality in contemporary architecture
- C. Cristensen & P.H. Kirkegaard: Adapting a historic tuss viaduct to modern requirements
- J. Holmawty: Confrontation between building and ground; gravity in the work of João Vilanova Artigas

### ThE 2 – Room B1.14

**Parallel Event**

- Web-based support tool for decision-making and examples of application
  - Chair: Isabel Valente
  - G. O’Reilly & J. Goggin: Efficient solution for large motorways composite bridges
  - E. Petzek, L. Toma & E. Meleş: SPACEPLATES building system
  - A. Romme, I. Sørvin & A. Bagger: Alternative affordable housing through simulated 3d architectural tectonic: V3 Residence, Putrajaya

### ThE 3 – Room B1.15

**General Session**

- The borderline between architecture and structural engineering (6)
  - Chair: Heli Koukkari
  - F. Vieux-Champagne, A. Cairò: Traditional and scientific knowledge for a sustainable vulnerability reduction of rural housing in Haiti
  - F. Vieux-Champagne, A. Cairò: Role of the LCA in the renovation processes based on two case studies
  - E. Petzek, L. Toma & E. Meleş: SPACEPLATES building system

### ThE 4 – Room B1.16

**General Session**

- The borderline between architecture and structural engineering (6)
  - Chair: Mario Rinke
  - M. Uhlhein: Examining the architectural engineer
  - G. O’Reilly & J. Goggin: Efficient solution for large motorways composite bridges
  - E. Petzek, L. Toma & E. Meleş: SPACEPLATES building system

### ThE 5 – Room B1.17

**General Session**

- Steel and composite (3)
  - Chair: Christoph Odenbreit
  - M. Uhlhein: Examining the architectural engineer
  - M. Uhlhein: Traditional and scientific knowledge for a sustainable vulnerability reduction of rural housing in Haiti
  - E. Petzek, L. Toma & E. Meleş: SPACEPLATES building system

### ThE 6 – Room B1.13

**General Session**

- The tectonic of architectural solutions (1)
  - Chair: Vincenzo Riso
  - M. Uhlhein: Examining the architectural engineer
  - E. Petzek, L. Toma & E. Meleş: SPACEPLATES building system
  - A. Romme, I. Sørvin & A. Bagger: Alternative affordable housing through simulated 3d architectural tectonic: V3 Residence, Putrajaya

### ThE 7 – Room B1.18

**General Session**

- The borderline between architecture and structural engineering (6)
  - Chair: Mario Rinke
  - M. Uhlhein: Examining the architectural engineer
  - E. Petzek, L. Toma & E. Meleş: SPACEPLATES building system
  - A. Romme, I. Sørvin & A. Bagger: Alternative affordable housing through simulated 3d architectural tectonic: V3 Residence, Putrajaya
## Friday Morning (FrM), July 26, 2013

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<thead>
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<tr>
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<td>9:00 – 10:30</td>
<td><strong>Keynote Lectures</strong> (Main Auditorium) Chair: Paulo J. S. Cruz</td>
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<td>Mario Chiorino “Pier Luigi Nervi: Architecture as Challenge”</td>
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<td>10:30 – 11:00</td>
<td><strong>Coffee Break</strong> (Lobby of the Main Auditorium)**</td>
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<td>11:00 – 13:00</td>
<td>Concurrent Technical Sessions: FrM 1 to FrM 6</td>
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### Mini-Symposium
- **FrM 1 – Main Auditorium**
  - **Chair:** Jan Belis
  - **General Session:** Structural glass. Crossing borders (1)
  - **General Session:** Concrete and masonry structures (1)

### Concurrent Technical Sessions
- **FrM 2 – Room B1.14**
  - **Chair:** Climent Molins
  - Technology of thin shells in the german baroque
  - Double skin façades made of glass. Aspects of structural design and static analysis
  - B. Siebert

- **FrM 3 – Room B1.15**
  - **Chair:** Humberto R. Camilloni
  - Pier Luigi Nervi in the United States. The height and decline of a master builder
  - The dynamic phrasology of structures. Enabling the design of complex systems
  - T. Boake

- **FrM 4 – Room B1.16**
  - **Chair:** Harry Giles
  - A critical assessment of concrete and masonry structures for reconstruction after seismic events in developing countries
  - Hybrid architecture. Coupling structural understanding and architectural education
  - H. McWilliams & C.T. Griffin

- **FrM 5 – Room B1.17**
  - **Chair:** Juan M. Songel
  - Domenico Parma and Guillermo Gonzalez Zuleta. A story of challenges, innovation and development of concrete architecture in Colombia
  - Cultivating the next generation of architects. Through pattern of structural systems
  - A. Bologna & G. Neri

- **FrM 6 – Room B1.13**
  - **Chair:** Katherine Liapi
  - Double skin façades made of glass. Aspects of structural design and static analysis
  - A critical assessment of concrete and masonry structures for reconstruction after seismic events in developing countries
  - Double skin façades made of glass. Aspects of structural design and static analysis
  - B. Siebert

### Key Notes
- **FrM 1 – Main Auditorium**
  - **Chair:** Paulo J. S. Cruz
  - Mario Chiorino “Pier Luigi Nervi: Architecture as Challenge”
### Friday Afternoon (FrA), July 26, 2013

<table>
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</table>

### FrA 1 – Main Auditorium
- **Mini-Symposium**
  - Structural glass. Crossing borders (2)

### FrA 2 – Room B1.14
- **Chair:** Geralt Siebert
  - Analytic models of adhesively bonded steel-glass beams
    - *M. Netusil, T. Fremr & M. Eliasova*
  - Building integrated photovoltaic. New developments
    - *G. Siebert & B. Siebert*

### FrA 3 – Room B1.15
- **Chair:** Aires Camões
  - Stress corrosion parameters for glass with different edge finishing
    - *M. Vanderbroek, C. Louter, J. Dispersyn, D. Sonck & J. Belis*

### FrA 4 – Room B1.16
- **Chair:** Deborah Oakley
  - Discretization solutions for the construction of free form complex surface structures
    - *A. Berk & H. Giles*

### FrA 5 – Room B1.17
- **Chair:** Marios. Phocas
  - Architectural topology parametrically defined by digital manufacturing
    - *M. Garcia del Valle & J. Anaya Diaz*

### FrA 6 – Room B1.13
- **Chair:** Mario Sassone
  - Structural behaviour of masonry buildings subjected to landslide. Load path method approach
    - *F. Palmisano & A. Elia*

### Concurrent Technical Sessions: FrA 1 to FrA 6

- General Session
  - Concrete and masonry structures (2)
  - The history of the relationship between architects and structural engineers (2)
  - Comprehension of complex forms (2)
  - Educating architects and structural engineers (2)
  - Lightweight and membrane structures (1)
  - Interaction of shape and structural performance. Design of structures methods of structural optimization

- General Session
  - Concrete and masonry structures (2)
  - The history of the relationship between architects and structural engineers (2)
  - Comprehension of complex forms (2)
  - Educational architects and structural engineers (2)
  - Lightweight and membrane structures (1)
  - Interaction of shape and structural performance. Design of structures methods of structural optimization

- General Session
  - Analytic models of adhesively bonded steel-glass beams
    - *M. Netusil, T. Fremr & M. Eliasova*
  - Building integrated photovoltaic. New developments
    - *G. Siebert & B. Siebert*

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    - *M. Garcia del Valle & J. Anaya Diaz*

- General Session
  - Structural behaviour of masonry buildings subjected to landslide. Load path method approach
    - *F. Palmisano & A. Elia*
## Friday Evening (FrE), July 26, 2013

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<td>Aires Camões</td>
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<tr>
<td>Pedro Bandeira</td>
<td>Structural engineering for timber and steel-timber trusses in Italy (1800-1950)</td>
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<td>Conceptual structural design. An important topic in architectural education</td>
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### Short Session

- **Reinforced glass**
  - **Chair:** Paulo Cruz  
  - **P. Carvalho & P. Cruz:** An insight into the new reinforced glass connection technics

- **Agricultural residues applications in contemporary building industry**
  - **H. Dahy & J. Knippers:** Agricultural residues applications in contemporary building industry

### Concurrent Technical Sessions:

- **FrE 1:** Have a look here.
- **FrE 2:** Have a look here.
- **FrE 3:** Have a look here.
- **FrE 4:** Have a look here.
- **FrE 5:** Have a look here.

### Coffee Break (Lobby of the Main Auditorium)

### Concurrent Technical Sessions:

- **FrE 1 – Main Auditorium**
  - **Chair:** Paulo Cruz
  - **An insight into the new reinforced glass connection technics**
    - **P. Carvalho & P. Cruz:** An insight into the new reinforced glass connection technics
  - **Agricultural residues applications in contemporary building industry**
    - **H. Dahy & J. Knippers:** Agricultural residues applications in contemporary building industry

- **FrE 2 – Room B.1.14**
  - **Chair:** Aires Camões
  - **Structural engineering for timber and steel-timber trusses in Italy (1800-1950)**
    - **E. Zamperini:** Structural engineering for timber and steel-timber trusses in Italy (1800-1950)

### General Session

- **Reinforced glass**
  - **Chair:** Paulo Cruz
  - **P. Carvalho & P. Cruz:** An insight into the new reinforced glass connection technics

### Closing Ceremony (Main Auditorium)

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### General Session

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<tr>
<th>Date</th>
<th>Time</th>
<th>Session/Event</th>
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<tbody>
<tr>
<td><strong>Tuesday, July 23, 2013</strong></td>
<td></td>
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<tr>
<td>15:00 – 19:00</td>
<td>Registration</td>
<td>(Lobby of the Main Auditorium)</td>
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<tr>
<td>20:00</td>
<td>Welcome Reception</td>
<td>(Palace of the Dukes of Bragança - Guimarães)</td>
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<tr>
<td>9:00- 9:30</td>
<td>Opening Ceremony</td>
<td>(Main Auditorium)</td>
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<tr>
<td>9:30 – 11:00</td>
<td>Keynote Lectures</td>
<td>(Main Auditorium)</td>
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<tr>
<td>11:30 – 13:30</td>
<td>WeM 1 Mini-symposium</td>
<td>&quot;Modern Renaissance timber construction &quot; (1)</td>
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<tr>
<td></td>
<td>WeM 2 Special Session</td>
<td>From open structures to the cladding of control. A critical call for current</td>
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<tr>
<td></td>
<td></td>
<td>tectonic theories and practices in architecture</td>
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<tr>
<td></td>
<td>WeM 3 Special Session</td>
<td>Innovation in timber</td>
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<tr>
<td></td>
<td>WeM 4 General Session</td>
<td>The borderline between architecture and structural engineering (1)</td>
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<tr>
<td></td>
<td>WeM 5 General Session</td>
<td>Computer and experimental methods (1)</td>
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<tr>
<td></td>
<td>WeM 6 General Session</td>
<td>Innovative Architectural and Structural Design (1)</td>
</tr>
<tr>
<td>14:30 – 16:30</td>
<td>WeA 1 Mini-symposium</td>
<td>&quot;Modern Renaissance timber construction &quot; (2)</td>
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<tr>
<td></td>
<td>WeA 2 Special Session</td>
<td>Innovation in reciprocal structures</td>
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<tr>
<td></td>
<td>WeA 3 General Session</td>
<td>Timber Structures (1)</td>
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<tr>
<td></td>
<td>WeA 4 General Session</td>
<td>The borderline between architecture and structural engineering (2)</td>
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<tr>
<td></td>
<td>WeA 5 General Session</td>
<td>Computer and experimental methods (2)</td>
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<tr>
<td></td>
<td>WeA 6 General Session</td>
<td>Innovative Architectural and Structural Design (2)</td>
</tr>
<tr>
<td>17:00 – 19:00</td>
<td>WeE 1 Mini-symposium</td>
<td>&quot;Modern Renaissance timber construction &quot; (3)</td>
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<tr>
<td></td>
<td>WeE 2 Special Session</td>
<td>Emerging Technologies</td>
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<tr>
<td></td>
<td>WeE 3 General Session</td>
<td>Timber Structures (2)</td>
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<tr>
<td></td>
<td>WeE 4 General Session</td>
<td>The borderline between architecture and structural engineering (3)</td>
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<td></td>
<td>WeE 5 General Session</td>
<td>Building Envelopes</td>
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<td>WeE 6 General Session</td>
<td>Innovative Architectural and Structural Design (3)</td>
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<tr>
<td><strong>Thursday, July 25, 2013</strong></td>
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<tr>
<td>9:00 – 10:30</td>
<td>Keynote Lectures</td>
<td>(Main Auditorium)</td>
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<tr>
<td>11:00 – 13:00</td>
<td>ThM 1 Mini-symposium</td>
<td>&quot;Modern Renaissance timber construction &quot; (4)</td>
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<tr>
<td></td>
<td>ThM 2 Special Session</td>
<td>Principles in practice for the analysis, conservation and structural restoration</td>
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<td>ThM 3 General Session</td>
<td>of architectural heritage</td>
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<td></td>
<td>ThM 4 General Session</td>
<td>The borderline between architecture and structural engineering (4)</td>
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<tr>
<td></td>
<td>ThM 5 General Session</td>
<td>Steel and Composite (1)</td>
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<tr>
<td></td>
<td>ThM 6 General Session</td>
<td>Innovative Architectural and Structural Design (4)</td>
</tr>
<tr>
<td>14:30 – 16:30</td>
<td>ThA 1 Mini-symposium</td>
<td>&quot;Tectonics&quot; in Architecture: Between Aesthetics and Ethics (1)</td>
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<tr>
<td></td>
<td>ThA 2 Special Session</td>
<td>Sustainability assessment in early phases of building projects</td>
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<td></td>
<td>ThA 3 General Session</td>
<td>Timber Structures (3)</td>
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<tr>
<td></td>
<td>ThA 4 General Session</td>
<td>The borderline between architecture and structural engineering (5)</td>
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<tr>
<td></td>
<td>ThA 5 General Session</td>
<td>Steel and Composite (2)</td>
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<td></td>
<td>ThA 6 General Session</td>
<td>Innovative technologies and design</td>
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<tr>
<td>17:00 – 19:00</td>
<td>ThE 1 Mini-symposium</td>
<td>&quot;Tectonics&quot; in Architecture: Between Aesthetics and Ethics (2)</td>
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<td></td>
<td>ThE 2 General Session</td>
<td>Special structures</td>
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<td></td>
<td>ThE 3 General Session</td>
<td>Web-based support tool for decision-making and examples of application</td>
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<td>ThE 4 General Session</td>
<td>The borderline between architecture and structural engineering (6)</td>
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<tr>
<td></td>
<td>ThE 5 General Session</td>
<td>Steel and Composite (3)</td>
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<td>ThE 6 General Session</td>
<td>The tectonic of architectural solutions (1)</td>
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<tr>
<td>20:00</td>
<td>Gala Dinner</td>
<td>(Municipal Stadium - Braga)</td>
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<tr>
<td><strong>Friday, July 26, 2013</strong></td>
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<tr>
<td>9:00 – 10:30</td>
<td>Keynote Lectures</td>
<td>(Main Auditorium)</td>
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<tr>
<td>11:00 – 13:00</td>
<td>FrM 1 Mini-symposium</td>
<td>Structural glass: Crossing borders (1)</td>
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<td>FrM 2 General Session</td>
<td>Concrete and Masonry structures (1)</td>
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<td>FrM 3 General Session</td>
<td>The history of the relationship between architects and structural engineers (1)</td>
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<td>FrM 4 General Session</td>
<td>Comprehension of complex forms (1)</td>
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<td></td>
<td>FrM 5 General Session</td>
<td>Educating architects and structural engineers (1)</td>
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<tr>
<td></td>
<td>FrM 6 General Session</td>
<td>The tectonic of architectural solutions (2)</td>
</tr>
<tr>
<td>14:30 – 16:30</td>
<td>FrA 1 Mini-symposium</td>
<td>Structural glass: Crossing borders (2)</td>
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<td></td>
<td>FrA 2 General Session</td>
<td>Concrete and Masonry structures (2)</td>
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<tr>
<td></td>
<td>FrA 3 General Session</td>
<td>The history of the relationship between architects and structural engineers (2)</td>
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<tr>
<td></td>
<td>FrA 4 General Session</td>
<td>Comprehension of complex forms (2)</td>
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<td></td>
<td>FrA 5 General Session</td>
<td>Educating architects and structural engineers (2)</td>
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<td></td>
<td>FrA 6 General Session</td>
<td>Lightweight and membrane structures (1)</td>
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<tr>
<td>17:00 – 18:40</td>
<td>FrE 1 Mini-symposium</td>
<td>Short Session: Reinforced Glass</td>
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<td></td>
<td>FrE 2 General Session</td>
<td>The use of new materials</td>
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<tr>
<td></td>
<td>FrE 3 General Session</td>
<td>The history of the relationship between architects and structural engineers (3)</td>
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<tr>
<td></td>
<td>FrE 4 General Session</td>
<td>Educating architects and structural engineers (3)</td>
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<tr>
<td>18:40 – 19:00</td>
<td>Closing Ceremony</td>
<td>(Main Auditorium)</td>
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</tbody>
</table>
Conference Venue – Main auditorium, rooms for parallel sessions and exhibition hall

Welcome reception at Paço dos Duques