# TABLE OF CONTENTS

## CONFERENCE OUTLINE

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>About WCTE</td>
</tr>
<tr>
<td>6</td>
<td>Program at a Glance</td>
</tr>
<tr>
<td>8</td>
<td>On-Site Information</td>
</tr>
</tbody>
</table>

## BEYOND SCIENCE

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Social &amp; Accompanying Persons' Program</td>
</tr>
<tr>
<td>14</td>
<td>Technical Excursions</td>
</tr>
<tr>
<td>17</td>
<td>Living in Vienna</td>
</tr>
<tr>
<td>18</td>
<td>Expositions</td>
</tr>
<tr>
<td>19</td>
<td>Blue Award</td>
</tr>
<tr>
<td>20</td>
<td>Exhibition</td>
</tr>
</tbody>
</table>

## SCIENTIFIC PROGRAM

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Information for Presenters &amp; Chairs</td>
</tr>
<tr>
<td>26</td>
<td>Overview</td>
</tr>
<tr>
<td>27</td>
<td>Plenary &amp; Semi-Plenary Lectures</td>
</tr>
</tbody>
</table>

### CONTENT OF MINI-SYMPOSIA, GENERAL & POSTER SESSIONS

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Wood Products &amp; Components</td>
</tr>
<tr>
<td>34</td>
<td>Computer-based Methods</td>
</tr>
<tr>
<td>36</td>
<td>Timber Architecture</td>
</tr>
<tr>
<td>38</td>
<td>Timber Engineering</td>
</tr>
<tr>
<td>42</td>
<td>Implementation</td>
</tr>
</tbody>
</table>

## TIME TABLE

<table>
<thead>
<tr>
<th>Page</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Monday, August 22</td>
</tr>
<tr>
<td>54</td>
<td>Tuesday, August 23</td>
</tr>
<tr>
<td>64</td>
<td>Wednesday, August 24</td>
</tr>
<tr>
<td>74</td>
<td>Thursday, August 25</td>
</tr>
<tr>
<td>78</td>
<td>Friday, August 26</td>
</tr>
</tbody>
</table>

## ABSTRACTS

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>Wood Products &amp; Components</td>
</tr>
<tr>
<td>125</td>
<td>Computer-based Methods</td>
</tr>
<tr>
<td>142</td>
<td>Timber Architecture</td>
</tr>
<tr>
<td>159</td>
<td>Timber Engineering</td>
</tr>
<tr>
<td>208</td>
<td>Implementation</td>
</tr>
</tbody>
</table>

## INDEX OF AUTHORS

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>228</td>
<td>Index of Authors</td>
</tr>
</tbody>
</table>

## PARTNERS

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>235</td>
<td>Partners</td>
</tr>
</tbody>
</table>

## ANNOUNCEMENT OF WCTE 2018

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>257</td>
<td>Announcement of WCTE 2018</td>
</tr>
</tbody>
</table>

## ROOM MAPS

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>258</td>
<td>Room Maps</td>
</tr>
</tbody>
</table>

For further information and interactive conference calendar please visit: [http://wcte2016.conf.tuwien.ac.at/](http://wcte2016.conf.tuwien.ac.at/)
The conference series known as the World Conference on Timber Engineering (WCTE) is the world’s premier forum for dissemination of the latest developments, technologies and innovations in wood or timber design, engineering and construction.

The scope covers research, education and practice topics from all over the globe. The conference has attracted wide international representation and attendance.

The name WCTE exists since 1998 when the world’s timber engineering society decided to coordinate the former world events and to introduce a biennial rhythm with consecutive conferences in Europe, America, Asia & Pacific:

- 1998 WCTE Montreux, Switzerland
- 2000 WCTE Whistler, Canada
- 2002 WCTE Shah Alam, Malaysia
- 2004 WCTE Lahti, Finland
- 2006 WCTE Portland, USA
- 2008 WCTE Miyazaki, Japan
- 2010 WCTE Trentino, Italy
- 2012 WCTE Auckland, New Zealand
- 2014 WCTE Quebec City, Canada
- 2016 WCTE Vienna, Austria
- 2018 WCTE Seoul, South Korea

The National Advisory Board:

**Representatives of Scientific Community**
- **Thomas Bader**, Vienna University of Technology
- **Ernst Beneder**, Vienna University of Technology
- **Manfred Brandstätter**, Holzforschung Austria
- **Heinz J. Ferk**, Graz University of Technology
- **Michael Flach**, University of Innsbruck
- **Josef Füssl**, Vienna University of Technology
- **Thomas Hasler**, Vienna University of Technology
- **Alexander Petutschnigg**, Salzburg University of Applied Sciences
- **Gerhard Schickhofer**, Graz University of Technology
- **Alfred Teischinger**, University of Natural Resources and Life Sciences
- **Rupert Wimmer**, University of Natural Resources and Life Sciences

**Representatives of Industry**
- **Michael Bauer**, Austrian Assoc. of Glulam Industry, Graf-Holztechnik
- **Helmut Hödl**, Rubner Holzbau
- **Herbert Jöbstl**, Stora Enso
- **Peter Lang**, Rotho Blaas GmbH
- **Dieter Lechner**, Association of Austrian Wood Industries
- **Raimund Mauritz**, Doka
- **Michael Offner**, proHolz, KLH Massivholz
- **Gerald Schweighofer**, Schweighofer Group
- **Reinhold Steinmaurer**, Austrian Association of Master Carpenters
- **Mario Wagner**, KLH Massivholz
- **Erich Weisselbaum**, AT Assoc.Prefabricated Building Manufacturers
- **Erich Wiesner**, Association of Austrian Wood Industries, WIEHAG

**Representatives of Public / Govermn. Institutions**
- **Martin Greimel**, Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management
- **Brigitte Jilka**, Urban Planning, Develp. & Construction, City of Vienna
- **Gerald Mannsberger**, Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management
- **Rainer Mikulits**, Austrian Institute of Construction Engineering
- **Barbara Neubauer**, Federal Monuments Office
- **Christian Smoliner**, AT Federal Ministry of Science, Research & Economy
- **Hans-Peter Weiss**, Bundesimmobiliengesellschaft

**Representatives of Planning / Architecture**
- **Helmut Dietrich**, Unterrichtlicher Architekten
- **Hermann Kaufmann**, Hermann Kaufmann Architects
- **Werner Nussmüller**, Nussmüller Architects
- **Georg Pendl**, Federal Chamber Architects & Chartered Eng. Consultants
- **Richard Woschitz**, RWT plus ZT GmbH
European Focus on Timber Construction
Since 40% of the EU total energy consumption is caused by the building sector, energy and resource efficiency is a major concern of European climate policy. Wood as a sustainable material has an excellent chance to be the alternative material in the future. The significant increase of the required raw material timber could be easily guaranteed by the European forests (30% of the annual growth is actually not harvested). This provides a great challenge for planners, industry, craftsmen, and researchers.

A Program to Foster Interdisciplinarity
The different scientific backgrounds of the involved Faculties of Architecture & Planning and Civil Engineering of Vienna University of Technology generates synergies in combining engineering, material science, computer-based modeling, and architecture.

Mini-symposia to Share Specific Knowledge
The selection of the oral presentations followed on the one hand the traditional way of abstract proposals, their reviewing, and clustering into general sessions by the National and International Advisory Board. New for the WCTE conference series is the format of so-called mini-symposia. Distinguished scientists acted as organizers of the individual mini-symposia, invited speakers and reviewed the respective contributions. Larger mini-symposia were invited to nominate Extended Lectures in the program.

Conference Tracks & Program
The conference program will be organized along five conference tracks which represent the four knowledge platforms, supplemented by a platform for best practice examples to combine all topics. The presentations showing latest research results are distributed along the five conference tracks as follows: one third each are related to “MAT: Wood Products & Components” and “ENG: Timber Engineering”. The remaining third is evenly spread among “COM: Computer-based Methods”, “ARC: Timber Architecture”, and “IMP: Implementation”. The scientific program of WCTE 2016 comprises about 750 presentations – 350 out of them in the on specific topics organized mini-symposia, more than 200 in general sessions related to conference topics and 190 additional poster presentations.

Exhibition of Industrial Products
The exhibition in the historic Arcade Court of the University of Vienna, gathered more than 35 exhibitors and shows a broad overview on the state-of-the-art of European timber construction. The organization was handled by the “forum-holzbau”.

Expositions to Intensify Exchange
Complementing the traditional form of oral and poster presentations, the WCTE 2016 organizers tried to create a large platform for personal exchange through an additional exposition of ideas.

The Blue Award, an international student competition for sustainable architecture, had been initiated by Architect Francoise Helene Jourda, Professor at Vienna University of Technology, Department of Spatial and Sustainable Design, several years ago. After her sudden passing away in 2015, it has now been organized by her successor Prof. Ernst Beneder. In 2016, this biennial event takes place for the 4th time. An international jury under the direction of Architect Kazuyo Sejima nominated outstanding projects, which will be presented and honoured during the conference.
## PROGRAM AT A GLANCE

### AUGUST 21
**Sunday**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00</td>
<td>Registration</td>
</tr>
</tbody>
</table>
| 09:00 | Opening Ceremony  
**Festive Hall, Hofburg** |
| 09:40 | **Plenary Lecture**  
**Ingo Burgert** |
| 10:10 | **Plenary Lecture**  
**Erik Serrano** |
| 10:40 | **Plenary Lecture**  
**Hermann Kaufmann** |
| 12:30 | Lunch Break |

### AUGUST 22
**Monday**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Coffee Break</td>
</tr>
</tbody>
</table>
| 09:00 | **Parallel Sessions**  
**8:30 - 10:00** |
| 10:30 | **Parallel Sessions**  
**10:30 - 12:00** |
| 13:30 | **Parallel Sessions**  
**13:30 - 15:00** |
| 15:10 | **Poster Sessions**  
**15:10 - 16:00** |
| 17:00 | **Company Presentations**  
**Extended Lectures**  
**17:00 - 18:30** |
| 19:00 | Welcome Cocktail  
**University of Vienna** |

### AUGUST 23
**Tuesday**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Coffee Break</td>
</tr>
</tbody>
</table>
| 09:00 | **Parallel Sessions**  
**8:30 - 10:00** |
| 10:30 | **Parallel Sessions**  
**10:30 - 12:00** |
| 13:30 | **Parallel Sessions**  
**13:30 - 15:00** |
| 15:10 | **Poster Sessions**  
**15:10 - 16:00** |
| 17:00 | **Company Presentations**  
**Extended Lectures**  
**17:00 - 18:30** |
| 17:00 | **Semi-Plenary Lectures**  
**17:00 - 18:30** |

#### Talks

- **MS1-01**  
  **MAT**  
  **PS1-01**  
  **PS1-02**  

- **MS1-02**  
  **MAT**  
  **PS1-03**  
  **PS1-04**  

- **MS1-03**  
  **MAT**  
  **PS1-05**  
  **PS1-06**

- **MS2-01**  
  **COM**  
  **PS2-01**  
  **PS2-02**  

- **MS2-02**  
  **COM**  
  **PS2-03**  
  **PS2-04**  

- **MS3-01**  
  **ARC**  
  **PS3-01**  
  **PS3-02**  

- **MS3-02**  
  **ARC**  
  **PS3-03**  
  **PS3-04**  

- **MS3-03**  
  **ENG**  
  **PS3-05**  
  **PS3-06**  

- **MS3-04**  
  **ENG**  
  **PS3-07**  
  **PS3-08**  

- **MS4-01**  
  **ENG**  
  **PS4-01**  
  **PS4-02**  

- **MS4-02**  
  **ENG**  
  **PS4-03**  
  **PS4-04**  

- **MS4-03**  
  **ENG**  
  **PS4-05**  
  **PS4-06**  

- **MS4-04**  
  **ENG**  
  **PS4-07**  
  **PS4-08**  

- **MS4-05**  
  **ENG**  
  **PS4-09**  
  **PS4-10**  

- **MS4-06**  
  **ENG**  
  **PS4-11**  
  **PS4-12**  

- **MS4-07**  
  **ENG**  
  **PS4-13**  
  **PS4-14**  

- **MS4-08**  
  **ENG**  
  **PS4-15**  
  **PS4-16**  

- **MS4-09**  
  **ENG**  
  **PS4-17**  
  **PS4-18**  

- **MS4-10**  
  **ENG**  
  **PS4-19**  
  **PS4-20**  

- **MS5-01**  
  **IMP**  
  **PS5-01**  
  **PS5-02**  

- **MS5-02**  
  **IMP**  
  **PS5-03**  
  **PS5-04**  

### Authors

- **Kaori Fujita**  
  **IMP**  

### Keynote Speakers

- **Ki-Cheol Baek**  
  **Alfred Teischinger**

- **Stefan Winter**  
  **Jan-Willem van de Kuilen**

- **Kaori Fujita**  
  **Jouni Hakkarainen**
**AUGUST 24**
Wednesday

**Parallel Sessions**
8:30 - 10:00

**Poster Sessions**
15:10 - 16:00

**Company Presentations**
16:30 - 16:50

**Semi-Plenary Lectures**
17:00 - 18:30

<table>
<thead>
<tr>
<th><strong>Lecture</strong></th>
<th><strong>Speaker</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric N. Landis</td>
<td>Alfred W. Kammerhofer</td>
</tr>
<tr>
<td>Anders Olsson</td>
<td>Maurizio Piazza</td>
</tr>
<tr>
<td>Andy Buchanan</td>
<td>Gary C. Williams</td>
</tr>
</tbody>
</table>

**Conference Banquet & Blue Award Ceremony**
City Hall Vienna

20:00

---

**AUGUST 25**
Thursday

**Parallel Sessions**
8:30 - 10:00

**Plenary Lecture**
Gerald Epp
12:10 - 12:40

**Technical Tour**
"Timber in Vienna"

**Group 1:**
- Erdberger bridge
- Rinterzelt – waste treatment plant
- Residential buildings Wagramerstraße
- Student residence and residential buildings "Aspern Seestadt"

**Group 2:**
- Residential buildings Mühlweg
- Residential buildings Spöttlgasse
- Rinterzelt – waste treatment plant
- Student residence and residential buildings "Aspern Seestadt"

---

**AUGUST 26**
Friday

**Technical Tour**
"Along the Danube"
8:00 - 11:00

- Group 1: Stora Enso Timber
- Rubner Holzbau
- Dürnstein Medieval Town
- Acoustic Centre - Holzforschung Austria
- G3 Shopping Resort Gerasdorf

- Group 2: Rubner Holzbau
- Stora Enso Timber
- Dürnstein Medieval Town
- Institute of Wood Technology and Renewable Materials
- G3 Shopping Resort Gerasdorf

**Technical Tour**
"Graz"
8:00 - 11:00

**2-day Technical Tour**
"Graz & Carinthia"
7:30 - 20:30 (Sat)

**Day 1**
- Kulmer Bau
- Stora Enso Timber
- Velox

**Day 2**
- Observation tower Pyramidenkogel
- Construction technology centre TU Graz Timber Research
- Centre of Reininghaus South
- Communal flats Hummelkasernen
- Nursing home Peter Rosegger
- Headquarters - Mayr-Melnhof Holz Holding
Conference Venue
Scientific events will take place in the Main Building of the University of Vienna (Universitätsring 1, 1010 Vienna) which is located in the center of the city. The Registration Desk and the Exhibition Area will be located around the „Arcade Court“ (Arkadenhof).
The conference venue can be easily reached by public transport (metro line U2, tram lines 1, 2, D, 37, 38, 40, 41, 42, 43, and 44) and from Vienna International Airport, which provides direct flights to over 170 destinations worldwide.
The Opening Ceremony and the Plenary Lectures on Monday will take place in the Festive Hall of the Hofburg, the residence of the Emperors of Austria from 1804 to 1918.

Certificates of Participation
All participants will receive a certificate of participation with their conference material at the registration desk.

Cloakroom
In nearly all lecture rooms are coat hooks available. In case you want to lock your hand bag or jacket, please use the "Lockers" on the lower level (see map page 258).

Coffee Breaks & Lunches
Coffee, tea, soft drinks, and biscuits as well as the lunch will be served in the Arcade Court next to the Exhibition Area. In addition, you will find various water dispensers in the conference venue.

Conference App
The Conference4me smartphone app provides you with the most comfortable tool for planning your participation at WCTE 2016. Browse the complete program, the list of exhibitors, and room maps directly from your phone or tablet and create your very own agenda on the fly. The app is available for Android, iOS, Windows Phone.
To download the mobile app, please visit http://conference4me.eu/download or type ‘conference4me’ in Google Play, iTunes App Store, Windows Phone Store or Amazon Appstore. More information can be found here http://conference4me.eu/download

Conference Staff
The Mondial Congress & Events team members are present at the registration counter. Technical staff and conference hostesses are present in all lecture rooms. Do not hesitate to approach them with queries – they will gladly assist you.

Exhibition
Opening hours:
Monday, August 22 ................................. 12:00 - 20:00
Tuesday, August 23 ................................ 08:00 - 19:00
Wednesday, August 24 ................................ 08:00 - 19:00
Thursday, August 25 .............................. 08:00 - 14:00

Internet Access
The University of Vienna provides free and personalized wireless internet access for the WCTE 2016 participants. A username and password will be handed over at the registration desk.

Latest Changes to the Program
Latest changes to the program will be communicated at the registration desk or through the Conference App.

Lost & Found
Participants can collect their lost items or leave found items at the registration desk.

Luggage Storage
A luggage storage will be provided on the departure days at the lower level (see map page 258).
Opening hours:
Wednesday, August 24 .......................... 11:30 - 19:00
Thursday, August 25 .............................. 08:30 - 13:30

Medical Service
The emergency medical service is located outside the Main Building of the University of Vienna. In case of an emergency, please contact the conference staff.

Parking
There are no car parks available at the University of Vienna. In the city center of Vienna, parking charges apply. If you arrive by car,
Photocopying and Printing
There is a copier and printer available in the “Business Center”, located on the first floor of the Main Building of the University. Operating hours of the Business Center are Monday to Thursday 08:00 - 15:00.

Preview Center
A Preview Center, located on the first floor of the Main Building, is available for all speakers who wish to pre-check their presentation on one of the conference notebooks. In addition, the Preview Center can be used for checking e-mails on the notebooks provided and for printing, e.g., the boarding passes.

It is not possible to upload presentations there. Presenters are requested to check-in their presentation on their CD-ROM or USB stick directly with the technical staff in the lecture room well in advance of their lecture in order to allow smooth changes between the individual lectures.

Opening hours:
Sunday, August 21 ............................................................. 16:00 - 19:00
Monday, August 22 ............................................................ 12:00 - 17:00
Tuesday, August 23 .............................................................. 08:00 - 17:00
Wednesday, August 24 ..................................................... 08:00 - 17:00
Thursday, August 25 ............................................................ 08:00 - 12:00

Registration Information
For registration and collection of conference materials, please visit the registration area at the main entrance of the Main Building. Registration Tel.: +43 676 880 845 704

Opening hours:
Sunday, August 21 ............................................................. 16:00 - 19:30
(preferred registration time)
Monday, August 22 ............................................................ 08:00 - 19:00
Tuesday, August 23 .............................................................. 07:30 - 18:00
Wednesday, August 24 ..................................................... 08:00 - 18:30
Thursday, August 25 ............................................................ 08:00 - 12:15

Registration counters:
• Pre-Registrations: Please note that all registration documents have been prepared for pre-registered participants and sorted by last name. Therefore, when approaching the appropriate registration counter make sure to clearly state your last name (family name) under which you have registered. Please have your confirmation letter and ID close at hand.
• On-Site Registration / Open Payments: For participants registering and paying their registration fees on-site or with an outstanding payment.
• Social Program & Guided Tours: For questions related to the official social program and bookings of Sightseeing Tours or/and Technical Guided Tours. Extra tickets for these events/tours can be purchased here. Tickets are subject to availability!

Payment
All payments need to be made in Cash in EUR (€) or by debit/credit card. VISA, MASTERCARD, MAESTRO, DINERS and AMEX will be accepted. Unfortunately, we cannot accept traveller cheques, other credit cards, eurocheques, or any other currencies. Please note that there is no currency exchange possibility at the conference venue. An ATM can be used in the lower level (see map page 258) or in the surrounding area of the conference venue.

Smoking
Due to the non-smoking policy in public buildings, smoking is prohibited in the conference venue. There are some smoking areas in the Arcade Court of the Main Building.

Social Events & Guided Tours
Information about social events as well as the vouchers for the purchased tickets can be obtained from the “Social Program & Guided Tours” counter. Please make sure to bring the voucher along to the event.

Transportation in Vienna:

Travel to the Conference Venue
• From ‘Westbahnhof’ train station: U3 direction to ‘Simmering’, get off at ’Volkstheater’, then change to U2 direction to ‘Aspernstraße’ and get off at ‘Schottentor’
• From ‘Hauptbahnhof’ train station: U1 direction to ‘Leopoldau’, get off at ‘Karlsplatz’, then change to U2 direction to ‘Aspernstraße’ and get off at ‘Schottentor’
• From Vienna International Airport (Schwechat): A Vienna Airport Lines/Postbus bus (line 1185) goes from Vienna International Airport straight to ‘Morzinplatz’, close to tram station 1 ‘Salztorbrücke’ (duration of the journey approximately 38 minutes). Take the tram line 1 direction to ’Stefan-Fadinger-Platz’ and exit the tram at ‘Schottentor’. The university is to your right handside.

Public Transportation
The Viennese public transport network provides modern and efficient accessibility within the city limits, making it easy for delegates to explore Vienna by bus, tram or metro. On weekends metro operates at least every 15 minutes through the night from Friday morning to Sunday evening.

The University of Vienna is located in the immediate vicinity of the underground station Schottentor of line U2 and the tram stations of lines 1, 2, 37, 38, 40, 41, 42, 43, and D.
SOCIAL PROGRAM

Meet and Greet | Sunday, August 21
The Meet and Greet will take place on Sunday, August 21, 17:00 - 20:00 in the Arcade Court of the University of Vienna.

Opening Ceremony | Monday, August 22
The Opening Ceremony will take place on Monday, August 22, 09:00 - 11:00 in the Festive Hall of the Hofburg.

Welcome Cocktail | Monday, August 22
The Welcome Cocktail will be offered on Monday, August 22, starting at 19:00 in the Arcade Court of the University of Vienna.

OPTIONAL GUIDED TOURS

From Monday, August 22 to Thursday, August 25, full and half day guided tours for accompanying persons are offered. Tickets that have been booked in advance will be handed out together with the conference material at the registration desk. For any questions, please visit the “Social Program & Guided Tour” counter.

City Tour including Schönbrunn

Date: August 22, 2016
Start & End: University of Vienna
Minimum number of participants: 12 persons
Price: € 75 per person (incl. private guide, bus, entry and guided tour in Schönbrunn Palace)

Time: 14:00 – 17:30
Duration: 3.5 hours

Culinary Walking Tour Vienna

Date: Wednesday, August 24, 2016
Start & End: University of Vienna
Minimum number of participants: 10 persons
Price: € 64 per person (incl. private guide, cheese tasting at Pöhl am Naschmarkt, coffee “Melange” and “Apfelstrudel” at Café Landtmann)

Time: 10:30 – 13:30
Duration: 3 hours

Bike the City - A Tour through Vienna

Date: Wednesday, August 24, 2016
Start & End: University of Vienna
Minimum number of participants: 10 persons
Price: € 55 per person (incl. private guide, bike, bike lock, helmet)

Time: 14:00 – 17:00
Duration: 3 hours

Conference Banquet | Wednesday, August 24
The Conference Banquet hosted by the Mayor of the City of Vienna, will take place at the picturesque City Hall on Wednesday, August 24, starting at 20:00. Entrance at 19:45.

Date: August 23, 2016
Start & End: University of Vienna
Minimum number of participants: 20 persons
Price: € 128 per person (incl. bus, guide, entrance fee St. Martin’s Cathedral, boat trip and lunch with drink)

Time: 9:00 – depends on group/traffic
Duration: 8 hours
The two technical excursions in Vienna run in parallel, with a common meeting point in Seestadt Aspern at the end of the tour.

**Technical Excursion “Timber in Vienna – Group 1”**

This excursion provides an overview of Vienna’s wide spectrum of wood and wood-based constructions, from engineering-based timber structures like the “Erdberger Steg” - a pedestrian bridge, via innovative examples of sustainable and social residential buildings in the north of the city, to the visit of Seestadt Aspern, Vienna’s Urban Lakeside and one of Europe’s largest urban development projects. The trip will partially be accompanied by the architects and civil engineers responsible for the design of the visited buildings.

The trip will close with a presentation in Seestadt Aspern in “Flederhaus” - a modern and temporary architectural art object, including an exhibition and presentation of the development area of Seestadt Aspern and its high-rise building “HoHo”, the first 24-story timber structure worldwide. The last part of the tour will hereby offer a good opportunity to meet, talk, and have a snack, thankfully provided by “Flederhaus”, in an inspirational environment.

A visit of Rinterzelt, one of the largest tent-shaped timber roof constructions worldwide, built in 1980, is planned – its final realization depends on the access permission because of the possible ongoing renovation works.

**Technical Excursion “Timber in Vienna – Group 2”**

This excursion provides an overview of Vienna’s wide spectrum of wood and wood-based constructions with an emphasis on innovative examples of sustainable and social residential buildings in the northern districts of the city, a part of Vienna, which is increasingly taking center stage in urban and architectural developments and has become an important possibility to face prospective scarcer living space.

The trip will partially be accompanied by the architects and civil engineers responsible for the design of the visited buildings. It closes with a presentation in Seestadt Aspern in “Flederhaus” - a modern and temporary architectural art object, including an exhibition and presentation of the development area of Seestadt Aspern and its high-rise building “HoHo”, the first 24-story timber structure worldwide. The last part of the tour will hereby offer a good opportunity to meet, talk, and have a snack, thankfully provided by “Flederhaus”, in an inspirational environment.

A visit of Rinterzelt, one of the largest tent-shaped timber roof constructions worldwide, built in 1980, is planned – its final realization depends on the access permission because of the possible ongoing renovation works.

Please visit the WCTE Homepage [http://wcte2016.conf.tuwien.ac.at/scientific-programme/technical-excursions/](http://wcte2016.conf.tuwien.ac.at/scientific-programme/technical-excursions/) for the detailed tour descriptions.
Along the Danube

The two technical excursions along the Danube run parallel, with a common meeting point in Gerasdorf at the end of the tour.

**Technical Excursion “Along the Danube - Group 1”**

provides the opportunity to explore some of Austria’s most important wood construction companies, such as the Rubner Holzbau (production site for timber products, structural roof, and wall elements) and Stora Enso (sawmill and CLT production center). Guided tours will give insights into the company’s manufacturing and working processes and will be complemented by a joint lunch, thankfully provided by Stora Enso.

Traveling to regions westward of Vienna will enable you to visit timber construction companies, timber buildings, and a historical city center. It will give you an interesting glimpse at the beautiful and varied landscape of the state of Niederösterreich – Lower Austria, characterized by pastures, wine areas, forests, and river valleys.

During the afternoon, the group will be able to explore the historical city of Dürnstein, which is followed by a visit of Austria’s most important timber research unit the “Akustik Center Austria” –, established by Holzforschung Austria. It provides a wide spectrum of acoustic examinations of wood and wood-based constructions. The tour will end by stopping at an outstanding timber construction, the sprawling curved roof structure of the G3 Shopping Resort Gerasdorf.

**Technical Excursion “Along the Danube - Group 2”**

provides the opportunity to explore some of Austria’s and Europe’s most important wood construction companies, such as the Rubner Holzbau (production site for timber products, structural roof, and wall elements) and Stora Enso (sawmill and CLT production center). Guided tours will give insights into the company’s manufacturing and working processes and will be complemented by a joint lunch, thankfully provided by Stora Enso.

Traveling to regions westward of Vienna will enable you to visit timber construction companies, timber buildings, and a historical city center. It will give you an interesting glimpse at the beautiful and varied landscape of the state of Niederösterreich – Lower Austria, characterized by pastures, wine areas, forests, and river valleys.

During the afternoon, the group will be able to explore the historical city of Dürnstein, which is followed by a visit of the research center “Institute of Wood Technology and Renewable Materials”, a part of BOKU Vienna, University of Natural Resources and Life Sciences and guided by Prof. Teischinger – Head of Department of Material Sciences and Process Engineering. The tour will end by stopping at an outstanding timber construction, the sprawling curved roof structure of the G3 Shopping Resort Gerasdorf.
Graz

The one-day tour to the south of Austria not only leads into the scenically and especially culturally attractive state of the Steiermark – Styria and its state capital Graz, but above all to some interesting examples of distinguished modern timber architecture, research centers, and production sites for wood-based building systems.

We will visit multi-story residential buildings in solid timber and timber-hybrid constructions, partially under construction, a STRABAG office block built of preassembled timber frame elements, but also the production site of Kulmer Bau, a company specialized in prefabricated houses, Kiels teg (one of the most recent and innovative building elements in timber and plywood) and wall and structural glulam timber elements. Thankfully, lunch will be provided by Kulmer Bau.

Graz and Carinthia

In case you want to explore the further-off parts of Austria’s south, then the two-day tour will be just right, similar to the one-day tour, but taking you not only to the Styria but also to Carinthia, characterized by high mountains and the Klagenfurter Basin, extended lake sceneries, and wide valleys. The trip focuses on production sites for wood-based building systems, just as on structurally and architecturally interesting examples of modern timber constructions.

On the first day, the tour will lead to the production site of Kulmer Bau, a company specialized in prefabricated houses, Kielsteg (one of the most recent and innovative building elements in timber and plywood) and wall and structural glulam timber elements, as well as to Stora Enso sawmill and CLT production center and Velox production site for wood-based building and insulation boards. Thankfully, lunch will be provided by Stora Enso. After spending a night in the bustling and welcoming city of Villach, it is planned to visit the Pyramidenkogel, an outstanding accomplishment of timber engineering and the world’s tallest observation tower built of wood, providing also the best lookout available. Lunch will be taken at the Pyramidenkogel, followed by the visit of the “Bautechnikzentrum” in Graz, part of the Technical University of Graz - guided by Prof. Schickhofer – head of Institute of Timber Engineering and Wood Technology, and later to a residential neighborhood of Graz, visiting multi-story residential buildings in solid timber and timber-hybrid constructions, partially under construction.

A visit of the Headquarters of Mayr-Melnhof Holz, famous for its prominent architectural timber structure, is planned – depending on available time and possible visit of prefabricated building modules, developed at the Bautechnikzentrum Graz instead.
Bank and Exchange
Banking hours in general are Monday to Friday, 09:00 - 17:00/18:00. Some in the Inner City are open on Saturday, 10:00 - 13:00. ATMs are located outside most banks, cash can be withdrawn there 24/7. National and foreign Maestro cards (cash cards) as well as Mastercard, AMEX, Visa and Diners are accepted. Money can be changed at the airport, at banks, exchange bureaus and larger hotels. The banks that are located closest to the WCTE 2016 venue can be found across the street from the main entrance to the Main Building:

- Bank Austria, Schottengasse 6-8 (open: Mon-Fri 09:00-18:00)
- Raiffeisenlandesbank Niederösterreich-Wien, Schottengasse 2 (open: Mon-Wed, Fri 09:00-15:00; Thu 09:00-17:30), or
- DenizBank AG, Schottengasse 10 (open: Mon-Fri 08:00-17:30)

Coffee Houses – Restaurants – Bars
Around the world Vienna is famous for its cuisine. You know that you have had an authentic ‘Vienna experience’ when you have tasted ‘Tafelspitz’ (boiled tender beef in a broth), ‘Wiener Schnitzel’, or ‘Schweinsbraten’ (roast pork). For dessert we can recommend the famous chocolate cake ‘Sacher Torte’, a typical ‘Apfelstrudel’, or one of the countless pastries and pralines.

Though the Viennese café tradition goes back a long way it remains an integral part of daily life up to this day: Despite the age of said tradition – or perhaps because of it – coffee houses are more alive and diverse than ever before.

Vienna being a great place for gourmets, it goes without saying that sweet delicacies can be found everywhere, including luxury pralines from Altmann & Kühne, the above-mentioned legendary Sacher Torte or Aida’s Caprese gateau, which all contribute to a memorable trip to Vienna and can serve as great souvenirs.

Currency / Weather / Time Zone
The official currency in Austria is EURO (€). Temperatures in Vienna in August usually range between 18 - 24°C by day, nights might be cool.

Vienna is in the Central European Time Zone, one hour ahead of Greenwich Mean Time (GMT).

Electricity
The main voltage in Austria is 230 V. Please do not forget to bring a travel adapter for the Austrian socket outlet. (230 V, 50 Hz)

Pharmacy
The nearest pharmacy is located on Universitätsstraße 10 (open: Mon-Fri 8:00-18:00, Sat 8:00-12:00). The same opening times apply to most pharmacies in Vienna. A 24-hour pharmacy standby service is available throughout the city. Details of the nearest open pharmacy are posted at every pharmacy. For telephone information call +43 1 1455.

Shops
Typical shopping hours are Monday to Friday 9:00 - 18:00 and Saturday 10:00 - 13:00 (17:00). Apart from some tobacconists and small supermarkets at petrol stations and at the main railway stations, shops are closed on Sundays.

Luxury shops with an elegant clientele can be found in the pedestrian zone of the Graben and of Kärntnerstraße (underground lines U1 and U3 / station Stephansplatz). Street entertainers and outdoor cafés contribute to the special atmosphere of this area. A well known shopping area is Mariahilferstraße (underground line U3 / station Neubaugasse).

Tipping
Service is usually included in the prices in bars and restaurants. Tips are always welcome and usually 5-10% of the total amount.

Tourist Info
The nearest Tourist Info Point is located in the city center at Albertinaplatz (corner of Maysedergasse), and is open daily from 9:00 to 19:00. You can also look up the Vienna Tourism website: http://www.wien.info/en. Sightseeing tours can be booked at the “Social Program & Guided Tour” counter.

Useful Telephone Numbers
- Ambulance: 144
- Fire Brigade: 122
- Police: 133
- International Emergency Phone: 112
- Taxi: (+43 1) 31300, (+43 1) 40100 or (+43 1) 60160
THE LIGHTNESS OF BEING – LA LÉGÈRETÉ DE L´ÊTRE
Contemporary wood and timber buildings in France
Twenty years of “pilgrimages” to Austria have inspired thousands of French experts. Nowadays wood and timber construction in France has developed its own dynamism, and current wood and timber architecture comprises a wide range of projects beyond the scope of private residential buildings. Used on its own or in conjunction with stone, steel, concrete and clay, no matter whether for social housing or schools, wine cellars or circus tents – wood is a material employed in increasingly creative applications.
Above all the great variety of tree species as well as the rediscovery of broadleaf trees, which predominate in France, for interior fittings, but also for façades and load-bearing frameworks open up new structural and aesthetic approaches for French wood and timber architecture.
“LA LÉGÈRETÉ DE L´ÊTRE” presents 25 buildings that were awarded the French Timber Construction Prize and embody a certain “esprit français”. Each of these projects is underpinned by strong ecological awareness and bears witness to the diversity and originality of contemporary wood and timber architecture in France.
The exhibition is a co-operation of überholz – master course for wood and timber architecture at Kunstuniversität Linz with France Bois Régions (federation of regional inter-professional associations of the wood and timber industry).
Curator: Dominique Gauzin-Müller
Scenographer: Veronika Müller, überholz
Graphics: David Zacher, arch2media

Building with Timber - Paths into the future
Based on selected distinguished national and international projects, the exhibition represents the state-of-the-art in sustainable and modern timber architecture.

Professor Hermann Kaufmann in cooperation with Professor Winfried Nerdinger, both of Technical University of Munich, curated the exposition which had been shown in 2011 in Munich and 2012 in Vienna. In October 2016 the actualized exhibition including 16 new projects will be shown in Berlin.

Large sized models of all projects, accompanied by plans, excerpts, and photographs help to understand the architectural and structural characteristics of the surprising buildings. For the WCTE 2016, 12 representative projects among the recently realized buildings had been selected in the categories "Urban Living", "Production and distribution facilities", large size buildings "Big and High" and "New Aesthetics".

The Berlin exhibition is organized in cooperation with the DAZ – Deutsches Architektur Zentrum (Center of German Architecture) in Berlin and sponsored by the Deutsche Bundesstiftung Umwelt (German Federal Environment Foundation) and other public and private institutions.
The fourth Edition of the BLUE AWARD
This year for the 4th time, in cooperation with the Society of Architecture and Spatial Design, the Department of Spatial and Sustainable Design at the Vienna University of Technology has been organizing the Blue Award: a biennial, anonymous, international and single-phase competition for students. The competition awards projects addressing the topic of sustainability, considering the ecological aspects of future buildings and cities as well as the wider meaning of sustainability taking account of the cultural and social tasks at hand. The international competition for students of architecture, urbanism and regional planning, and also – in 2016 in its 4th edition – of civil engineering, is intended to reinforce the topic of sustainability in education and to promote young planners who examine social, cultural and ecological sustainability within the framework of university design projects.

Aim
Considering its economic, cultural and social dimensions in architecture, regional planning, urbanism and in construction, sustainable developments should be accorded the same importance as technical and functional issues.

Cooperation with WCTE 2016
The results of the 4th edition of the Blue Award will be awarded and exhibited within the framework of WCTE 2016. Through the cooperation with WCTE 2016, this time the Blue Award was also announced in the university disciplines of civil engineering, building technology and in particular in timber construction. Thus projects could be submitted in the categories of urban development and regional planning, architecture, building in existing structures and building construction. Special consideration was given to teams, i.e. projects that have been developed in cooperation with the disciplines of architecture and civil engineering.

Jury
- Kazuyo Sejima (architect, SANAA (JP), Pritzker Price Winner / president of the jury)
- Arch. Cuno Brullmann (architecture)
- Arch. Much Untertürfaller (architecture)
- Former President UIA Albert Dubler (architecture)
- Prof. Wolfgang Winter (architecture, civil engineering, timber construction)
- Mag. Marina Hämmerle (urbanism)
- Moderation: Dr. Robert Korab

Judging Panel
On May 31, 2016, the judging panel took place at the Vienna University of Technology. The jury members decided upon 15 nominations for first prizes, honorable mentions and special prizes for timber construction in each category.

Exposition
During the WCTE 2016 conference, the winning projects as well as related information on the Blue Award will be exhibited.

Award Ceremony
The winning projects of the Blue Award 2016 will be awarded and presented as part of the WCTE 2016 conference. On this special occasion, a special prize for timber technology for the use of timber in the context of sustainability will be awarded. The award ceremony will take place during the conference banquet in the City Hall.

For more information visit www.blueaward.at
The world-famous inner court of the imperial university building with covered arcades will be a unique location to expose timber-related industrial products and to bring together professionals of different areas.

The exhibition is handled by “forum-holzbau”, an international group of universities annually realizing Europe’s most important meeting in the field of timber construction, including a professional exhibition.

Organization of Exhibition & Sponsoring:

Hugo Karre
timbertrend e.U. | forum-holzbau

Auenweg 2 | A-9813 Möllbrücke
hugo.karre@forum-holz.com
Phone: (+43 660) 144 20 20, Fax: (+43 4769) 233 69
Content of Mini-Symposia, General & Poster Sessions

30 MAT Wood Products & Components
34 COM Computer-based Methods
36 ARC Timber Architecture
38 ENG Timber Engineering
42 IMP Implementation

Timetable

47 Monday, August 22
54 Tuesday, August 23
64 Wednesday, August 24
74 Thursday, August 25
78 Friday, August 26

Abstracts

80 MAT Wood Products & Components
125 COM Computer-based Methods
142 ARC Timber Architecture
159 ENG Timber Engineering
208 IMP Implementation

228 Index of Authors
### Information for Chairpersons:
- Please check the time and lecture room of the session you are chairing in the daily program and on the info boards as there might have been changes.
- All lecturers of your session are requested to approach you in the lecture room at least 10 minutes before the start of the session. This allows you to identify lecturers who have not arrived yet.
- Technical staff wearing green T-shirts are assigned to each lecture room for help with technical equipment. They are responsible for the technical equipment in the lecture room and are ready to help you in any other aspect.
- You are kindly asked to switch between presentations by simply announcing the name of the next presenter and the title of the presentation. Due to the tight schedule, there will not be sufficient time for introducing individual lecturers in a more detailed manner.
- Please do your best to strictly limit the duration of each presentation and discussion to the allotted time.
- If a lecturer is missing, please stick to the original program, i.e., extend the discussion time of the preceding presentation or allow a break for the duration of the missing lecture(s). This enables participants to move inbetween sessions and to listen to chosen individual lectures according to the announced sequence.

### Information for Speakers:
- Please check the time and lecture room of your presentation in the daily program and on the info boards as there might have been changes.
- Technical staff wearing green T-shirts are assigned to each lecture room for help with technical equipment.
- Each lecture room is equipped with a notebook (Windows 7, Microsoft Office 2016, Acrobat Reader) and a video projector. You are asked to upload your presentation on the notebook as soon as possible, but at the very latest in the break before the session.
- You may pre-check your presentation in the Preview Center located on the first floor of the Main Building.
- Please be present at least 10 minutes prior to the start of your session and let the chairperson know you are there.
- Please make sure to stay in your session from the beginning on in order to ensure smooth changes between the individual presentations.
- The time allotted for the presentations is
  - 18 min. (incl. discussion) for presentations in mini-symposia and general sessions
  - 3 mins. for poster presentations
  - 27 min. (incl. discussion) for Extended Lectures in mini-symposia
  - 30 min. for Plenary and Semi-Plenary Lectures
- The chairpersons are requested to stop presentations after the allotted time has passed.

---

### Publication Codes
Publication codes have been assigned to all contributions. This way they are easy to find both in the program and in the list of abstracts. These codes indicate first on whether a contribution is presented within a mini-symposium, a general session, or a poster session. Then, the affiliated conference track is mentioned, followed by the session and possibly the subsession number.

**Exemplary publication code:**

MS4-01A: 1

**Sessions Code:**

GHG
MS4 01A

**Publication Codes:**

- **MS**: Mini-symposium
- **GS**: General Session
- **PS**: Poster Session

**Number of contribution in session:**

**Session number (Subsession number):**

- 1: MAT - Wood Products & Components
- 2: COM - Computer-based Methods
- 3: ARC - Timber Architecture
- 4: ENG - Timber Engineering
- 5: IMP - Implementation
Presentation Durations:
- Plenary and Semi-Plenary Lectures: 30 mins.
- Oral Presentation in Mini-symposia and General Sessions: 18 mins. incl. discussion
- Extended Lectures in Mini-symposia and General Sessions: 27 mins. incl. discussion
- Poster Presentation: 3 mins. brief oral presentation in addition to the poster display

Poster Mounting Periods
As we are not able to have all posters displayed during the entire conference, please consider the following mounting periods:
- Mounting of Poster: during lunch break of the day of your poster presentation
- Dismantling of Poster: at the latest during the morning coffee break at the day after your poster presentation

Please note, that all posters not dismantled during the morning coffee break, will be removed and thrown away by our staff.
## Topics and Organizers of Mini-symposia, General and Poster Sessions

<table>
<thead>
<tr>
<th>MAT</th>
<th>WOOD PRODUCTS &amp; COMPONENTS</th>
<th>ORGANIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1-01</td>
<td>Innovative wood construction and materials at the ETH house of natural resources</td>
<td>I. Burgert, A. Franji</td>
</tr>
<tr>
<td>MS1-03</td>
<td>Joints in timber structures – Characterization and structural design</td>
<td>E. Serrano, M. Dorn, T. K. Bader</td>
</tr>
<tr>
<td>MS1-04</td>
<td>Modified wood as building material for sustainable constructions</td>
<td>A. Petutschnigg, A. Kutnar</td>
</tr>
<tr>
<td>MS1-05</td>
<td>Current progress in adhesive bonding of solid wood</td>
<td>H. W. G. van Herwijnen, J. Konnerth</td>
</tr>
<tr>
<td>MS1-06</td>
<td>Multi-functional performance of cement-bound wood products</td>
<td>D. Zwicky, N. Macchi</td>
</tr>
<tr>
<td>MS1-07</td>
<td>Hardwood in structural engineering</td>
<td>S. Franke, B. Franke, A. Müller, R. Steiger, G. Fink</td>
</tr>
<tr>
<td>MS1-08</td>
<td>Timber connections by the under-40s</td>
<td>P. Quenneville</td>
</tr>
<tr>
<td>MS1-09</td>
<td>Aspects on the forest resource wood and the conversion process to building materials</td>
<td>W. Sekot, A. Tetschner</td>
</tr>
<tr>
<td>MS1-10</td>
<td>The next generation – veneer based building products</td>
<td>M. Grabner, R. Brandner, G. Schickhofer</td>
</tr>
<tr>
<td>MS1-11</td>
<td>Properties and characteristics of traditional timber connections in Northeast Asia</td>
<td>M. Park</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COM</th>
<th>COMPUTER-BASED METHODS</th>
<th>ORGANIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS2-01</td>
<td>Computational modeling of joints in timber structures</td>
<td>T. K. Bader, M. Dorn, E. Serrano</td>
</tr>
<tr>
<td>MS2-02</td>
<td>Computational mechanics of wood &amp; wood-based products</td>
<td>J. Füssel, A. Olsson, M. Kaislak, J. Eberhardsteiner</td>
</tr>
<tr>
<td>MS2-03</td>
<td>Practice-oriented structural design of timber-concrete composite slab elements</td>
<td>D. Zwicky, C. Malaga</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARC</th>
<th>TIMBER ARCHITECTURE</th>
<th>ORGANIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS3-01</td>
<td>Integrated design of sustainable architectures with wood for the future</td>
<td>N. Ando, Y. Goto</td>
</tr>
<tr>
<td>MS3-02</td>
<td>Reinforcement of timber elements in existing structures</td>
<td>J. M. Branco, P. Dietsch</td>
</tr>
<tr>
<td>MS3-03</td>
<td>Wooden facade</td>
<td>M. Kari</td>
</tr>
<tr>
<td>MS3-04</td>
<td>Acoustics in wooden building</td>
<td>D. Bard</td>
</tr>
<tr>
<td>MS3-05</td>
<td>From the Atacama desert to „Tierra del Fuego“: Recent developments in the Chilean timber industry</td>
<td>J. J. Ugarte (pp. UC’s Timber Innovation Center)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENG</th>
<th>TIMBER ENGINEERING</th>
<th>ORGANIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS4-01</td>
<td>Seismic design and behaviour of innovative timber systems</td>
<td>M. Fragiacomo, J. van de Lindt, H. Isoda</td>
</tr>
<tr>
<td>MS4-02</td>
<td>Tall buildings - Dynamic performance from measurements of completed structures</td>
<td>R. Harris, W. Chang</td>
</tr>
<tr>
<td>MS4-03</td>
<td>Design of tall woodland buildings for lateral loads</td>
<td>A. Buchanan</td>
</tr>
<tr>
<td>MS4-04</td>
<td>Eurocode 5 - a halftime summary of the review process</td>
<td>S. Winter</td>
</tr>
<tr>
<td>MS4-05</td>
<td>System level structural design of hybrid structures</td>
<td>I. Smith</td>
</tr>
<tr>
<td>MS4-06</td>
<td>Glued-in rods - Application and design rules</td>
<td>V. Rajčić</td>
</tr>
<tr>
<td>MS4-07</td>
<td>Seismic performance and standardization of CLT building structures</td>
<td>N. Kawai, H. Isoda</td>
</tr>
<tr>
<td>MS4-08</td>
<td>Fire safety of structures made of timber &amp; other bio-based products - COST Action FP1404</td>
<td>J. Schmid, M. Fragiacomo, S. Craft, K. Kagiya</td>
</tr>
<tr>
<td>MS4-09</td>
<td>Seismic behavior of timber construction</td>
<td>A. Ceccotti</td>
</tr>
<tr>
<td>MS4-10</td>
<td>Mixed, composite &amp; hybrid structures</td>
<td>K. Crews</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMP</th>
<th>IMPLEMENTATION</th>
<th>ORGANIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS5-02</td>
<td>Execution of timber buildings</td>
<td>T. Toratti</td>
</tr>
<tr>
<td>MS5-03</td>
<td>Sustainable modular building systems in wood</td>
<td>M. Fuchs</td>
</tr>
<tr>
<td>MS5-04</td>
<td>Teaching timber design in interdisciplinary settings</td>
<td>T. Tannert, P. Dietzsch, R. Harris</td>
</tr>
<tr>
<td>MS5-05</td>
<td>Developments in wood engineering education</td>
<td>P. L. Clouston, M. Gershfeld, M. Kaislak</td>
</tr>
<tr>
<td>MS5-06</td>
<td>Tall buildings - case studies</td>
<td>M. Piazza, R. Tomasi</td>
</tr>
<tr>
<td>MS5-07</td>
<td>Human perception and health in wooden buildings</td>
<td>Y. Cronhjort, M. Hughes</td>
</tr>
</tbody>
</table>

### Topics

- Manufacturing
- IT-based architectural design and computer-aided modeling of materials
- Modeling of structures
- Structural performance
- Strengthening and durability
- Wooden facade

- Mixed, composite and hybrid structures
- Fire safety of structures made of timber & other bio-based products - COST Action FP1404
- Seismic design and behaviour of innovative timber systems
- Seismic performance and standardization of CLT building structures

- Design practice
- Evaluation and comparison

- Properties and characteristics of traditional timber connections in Northeast Asia
- Next generation – veneer based building products
- Aspects on the forest resource wood and the conversion process to building materials
- Properties and characteristics of traditional timber connections in Northeast Asia
- Next generation – veneer based building products
- Aspects on the forest resource wood and the conversion process to building materials
High performance wood materials - progress, challenges and visions  
**Ingo Burgert**, ETH Zurich, Switzerland  
Mon | 09:40 - 10:10 | Hofburg

Rational modelling and design in timber engineering applications using fracture mechanics  
**Erik Serrano**, Lund University, Sweden  
Mon | 10:10 - 10:40 | Hofburg

Building systems - constraints or chances for architects?  
**Hermann Kaufmann**, Architect, AT, TU München, GER  
Mon | 10:40 - 11:10 | Hofburg

Timber awakening in America  
**Gerald Epp**, Structure Craft, Canada  
Thu | 12:10 - 12:40 | AudiMax

Opportunities and limits of timber in construction  
**Alfred Teischinger**, BOKU Vienna, Austria  
Tue | 17:00 - 17:30 | Festive Hall

Wood properties from roundwood to timber engineering  
**Jan-Willem van de Kuilen**, TU München, Germany  
Tue | 17:30 - 18:00 | Festive Hall

Development of engineered wood products - the industry perspective  
**Jouni Hakkarainen**, Metsä Group, Finland  
Tue | 18:00 - 18:30 | Festive Hall

Determination of sawn timber properties using laser scanning – development potentials and industrial applications  
**Anders Olsson**, Linnaeus University, Sweden  
Wed | 17:30 - 18:00 | AudiMax

The contribution of wood to climate/energy challenges - resource policy and wood action plan using the example of Switzerland  
**Alfred W. Kammerhofer**, FOEN, Switzerland  
Wed | 17:00 - 17:30 | Festive Hall

The challenges for designers of tall timber buildings  
**Andy Buchanan**, University of Canterbury, NZ  
Wed | 18:00 - 18:30 | AudiMax

The recovery of wood culture and urban tectonic in Korea  
**Ki-Cheol Bae**, University of Ulsan, Korea  
Wed | 17:00 - 17:30 | AudiMax

From Europe with love  
**Gary C. Williams**, Timber Systems, Canada  
Wed | 18:00 - 18:30 | Festive Hall
CONTENT OF MINI-SYMPOSIA, GENERAL & POSTER SESSIONS

30 MAT Wood Products & Components
34 COM Computer-based Methods
36 ARC Timber Architecture
38 ENG Timber Engineering
42 IMP Implementation
The minisymposium is related to a pilot building, named ETH House of Natural Resources, which has been designed at ETH Zurich, to be used as an office building and additionally will serve as a showcase building of sustainable and reliable timber construction and innovative wood materials. The underlying concept will be introduced to the Timber Engineering Community by addressing multiple innovation aspects, such as the use of beech for structural elements, the implementation of permanent sensor networks as well as in-situ tests at different construction stages. In terms of wood materials, research activities on UV protective and water repellent coatings and autonomously deforming wood elements for wood facades are presented. The activities are supported by Climate KIC in the framework of the Building Technologies Accelerator Flagship program.

**Innovative wood construction and materials at the ETH house of natural resources**

*I. Burgert, A. Frangi*  

Papers presented in this mini-symposium are dedicated to the mechanical behavior of dowel-type connections, including dowels, bolts, nails and screws as well as threaded and glued-in steel rods. Even novel design ideas for joints will be presented. Experimental investigations of characteristics of joints are discussed from the single fasteners up to moment-resisting joints in timber structures, including stiffness, load-bearing capacity, load distribution as well as their cyclic behavior. The experimental quantification of load-deformation characteristics of joints is essential in the design of timber structures, both for direct application to empirical design formulae and for verification of numerical or analytical models.

**Joints in timber structures – Characterization and structural design**

*E. Serrano, M. Dorn, T. K. Bader*  

The symposium is dealing is organized in four subsequent sessions which are focussing on general views on massive wood products for sustainable constructions, modified wood products and their use for sustainable constructions, wood composites, new biobased materials and the ecological aspects of biobased materials for sustainable constructions. The first session will lead to the different Topics and will give an brief overview. The second session is focussing on modified wood products and their properties. The third session will give an view on constructions, and biobased building materials and their properties. In the fourth session the modelling of biobased materials and their evaluation is in the focus.

**Modified wood as building material for sustainable constructions**

*A. Petutschnigg, A. Kutnar*  

Adhesive bonding is the key to advanced wood constructions. A thorough understanding of binding is needed to develop innovative engineered timber products. The mini-symposium reviews the current state of the art on fundamentals of adhesion between wood and (pre-)polymers and therefore spans a bridge towards topics of direct relevance for current and novel applications, e.g. bonding of different wood species, in particular hardwoods and modified wood; progress in the understanding of the peculiarities of polyurethane adhesives; advanced formaldehyde based resins, bio-based adhesives; or long-term performance of adhesive systems under mechanical and environmental stress.

**Current progress in adhesive bonding of solid wood**

*H. W. G. van Herwijnen, J. Konnerth*  

The session starts with a presentation on newly developed pourable wood-cement compounds, exposing which mechanical, building physical, economic and ecological performances they may provide. This subject is followed by presentations on specific mechanical issues of connection techniques in timber-concrete composite structures - being essential, as it is well known, in timber construction - on the one hand, for the long-term behavior of adhesive connections in timber-concrete composite elements and, on the other, a new and innovative curing procedure for glued-in rods as connection means. The session is finished by presentations on the ecological, economic and structural performances of complete, multi-functional, multi-material structural elements, principally based on timber and wood-cement compounds.
The mini-symposium provides the possibility to discuss and to present recent research results as well as open questions regarding the use of hardwood. The focus is on structural application of hardwoods, available products, quality control within production, grading of the raw material, design and successful implementation in structures. This includes contributions on material properties and structural behaviour of members, connections as well as structural systems.

**MS1-07: Mon 17:55 - 18:55 | Festive Hall**
**MS1-07A: Mon 13:30 - 15:00 | HS41**
**MS1-07B: Tue 08:30 - 10:00 | HS41**

**Timber connections by the under-40’s**

P. Quenneville

The first session of the mini-symposium aims at having a peak at what the next generation of timber connection investigators are researching. The topics vary from state-of-the-art screws to carpenter joints and research issues for connections. The second session of the mini-symposium aims at having a peak at what the next generation of timber connection investigators are researching. The topics vary from state-of-the-art screws to carpenter joints and research issues for connections.

**MS1-08A: Wed 08:30 - 10:00 | HS50**
**MS1-08B: Wed 10:30 - 12:00 | HS50**

**Aspects on the forest resource wood and the conversion process to building materials**

W. Sekot, A. Teischinger

The material wood is derived from forest sources such as semi-natural mixed forests, even-aged monocropping forest stands and plantagon forestry comprising a wide range of different wood species. This variety in raw material sources concerning wood species and raw material properties combined with natural hazards, logging and harvesting characteristics of the forest owners are big challenges on roundwood allocation and the conversion process of the raw material into a homogeneous and reliable building material with tailored and engineered material properties in the best possible way.

**MS1-09A: Mon 13:30 - 15:00 | HS48**
**MS1-09B: Tue 08:30 - 10:00 | HS48**

**The next generation – veneer based building products**

M. Grabner, R. Brandner, G. Schickhofer

This mini-symposium emphasises on development, production and design of veneer-based building products. Key factors influencing their performance and economic application in the building sector are addressed. The contributions comprise evaluation of test methods and process-related factors influencing the bonding and self-bonding behaviour of rotary-cut veneers. Approaches for predicting the capacity and reliability of veneer-based products recovered from early to mid-rotation plantations are presented. Various methods for the production of light-weight load-bearing elements are discussed with special focus on form press profiles, e.g. channel/top-hat sections for floor or wall panels. The necessity for new or adapted joint solutions for heavy duty veneer-based products is outlined; in this context the joint design of glued-in rods and their application for tension and bending joints in beams and trusses is illustrated.

**MS1-10: Wed 13:30 - 15:00 | HS50**

**Properties and characteristics of traditional timber connections in Northeast Asia**

M. Park

Traditional timber connections in Northeast Asian Countries are different from modern timber connections with metal connectors. Traditional timber connections transfer dead and live load of timber construction effectively through complex load path between structural members of timber construction without metal connectors. Fortunately there are numerous examples of historical timber buildings with traditional timber connections main maintained perfectly for hundreds of thousands of years. The details of the connections are complicated shape but successfully resist vertical and horizontal load of timber construction. Due to the complicated details of connections, manufacturing the traditional connections requires highly skilled labor and working hours. The mini-symposia will introduce innovative solutions for various types of traditional timber connections in the Northeast Asia and provide fruitful discussion on traditional timber connections including improvement of quality and manufacturing cost reduction of the connections for modernized timber connections for future.

**MS1-10: Mon 13:30 - 15:00 | HS34**
**Structural performance of materials**

These sessions provide the possibility to discuss and to present recent research results as well as open questions regarding structural application of various timber materials. The focus is on structural behavior, structural application and design. This includes contributions on material properties, experimental and numerical investigations on moisture diffusion in timber structures, mechanical properties of glued-laminated (glulam) and cross-laminated timber (CLT) members, adhesive bonds, influence of bending stress on the dynamic properties as well as further development.

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS1-01A</td>
<td>Mon</td>
<td>13:30 - 15:00</td>
<td>H547</td>
</tr>
<tr>
<td>GS1-01B</td>
<td>Tue</td>
<td>13:30 - 15:00</td>
<td>H541</td>
</tr>
<tr>
<td>GS1-01C</td>
<td>Wed</td>
<td>08:30 - 10:00</td>
<td>H541</td>
</tr>
<tr>
<td>GS1-01D</td>
<td>Wed</td>
<td>10:30 - 12:00</td>
<td>H541</td>
</tr>
<tr>
<td>GS1-01E</td>
<td>Wed</td>
<td>13:30 - 15:00</td>
<td>H541</td>
</tr>
</tbody>
</table>

**High performance wood products**

This session provides the possibility to discuss and to present recent research results as well as open questions regarding structural application of laminated veneer lumber (LVL) products. The focus is on structural behavior and application as well as design. This includes experimental investigations on performance of laminated veneer lumber (LVL) products and further development.

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS1-02</td>
<td>Tue</td>
<td>13:30 - 15:00</td>
<td>H548</td>
</tr>
</tbody>
</table>

**New products and connections**

These sessions are dedicated to the novel high performance of timber and hybrid products and the mechanical behavior of novel connections in engineered wood products. The focus is on structural application, quality control within production, design and successful implementation. This includes contributions on material properties and structural behavior of members and connections, experimental quantification of structural characteristics as well as structural systems.

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS1-03A</td>
<td>Wed</td>
<td>10:30 - 12:00</td>
<td>H548</td>
</tr>
<tr>
<td>GS1-03B</td>
<td>Thu</td>
<td>08:30 - 10:00</td>
<td>H548</td>
</tr>
</tbody>
</table>

**Industrialization of the wood chain**

This session gives an insight into the latest achievements in the area of industrialization of the wood chain and resource optimized productions, including studies on development of recycled materials from wood waste of wood.

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS1-04</td>
<td>Tue</td>
<td>10:30 - 12:00</td>
<td>H541</td>
</tr>
</tbody>
</table>
Strength / grading

The papers presented in this session deal with mechanical properties of timber. The focus is on structural application, design and experimental study. This includes contributions on experimental quantification of structural characteristics.

PS1-01: Mon | 15:10 - 16:00 | HS41

Connections

The session provides the possibility to discuss and to present recent research results as well as open questions regarding structural application of various connections. The focus is on structural behavior, structural application and design. This includes experimental and numerical investigations on wood connections and further development.

PS1-02: Mon | 15:10 - 16:00 | HS50

Joints

This session gives an insight into the latest achievements in the area of timber connection systems, including studies on development of timber joint system by high ductility wood frame structure.

PS1-03: Tue | 15:10 - 16:00 | HS41

Moisture / durability

The session provides the possibility to discuss and to present recent research results as well as open questions regarding structural application of various timber materials. The focus is on structural behavior, structural application and design. This includes experimental and numerical investigations on moisture diffusion and durability in timber structures.

PS1-04: Tue | 15:10 - 16:00 | HS50

Cross Laminated Timber (CLT) / Laminated Veneer Lumber (LVL)

The session provides the possibility to discuss and to present recent research results as well as open questions regarding structural application of cross laminated timber (CLT) and laminated veneer lumber (LVL) products. The focus is on structural behavior and application as well as design. This includes experimental investigations on performance of CLT and LVL products and further development.

PS1-05: Tue | 15:10 - 16:00 | HS47

Structural elements

The session is dedicated to the performance of timber structural elements. The focus is on structural application, quality control within production, design and successful implementation. This includes contributions on material properties and structural behavior of members, experimental quantification of structural characteristics as well as structural systems.

PS1-06: Wed | 15:10 - 16:00 | HS41

Wood modification

The session provides the possibility to discuss and to present recent research results as well as open questions regarding wood modification. The focus is on structural behavior and application as well as design. This includes experimental investigations on mechanical properties and extended long-term behavior as well as further development.

PS1-07: Wed | 15:10 - 16:00 | HS50

Cross Laminated Timber (CLT)

The session provides the possibility to discuss and to present recent research results as well as open questions regarding structural application of various timber materials. The focus is on structural behavior, structural application and design. This includes experimental and numerical investigations on cross laminated timber (CLT) and hybrids.

PS1-08: Wed | 15:10 - 16:00 | HS47
**Computational modeling of joints in timber structures**
*T.K. Bader, M. Dorn, E. Serrano*

Computational approaches presented in this mini-symposium encompass numerical and analytical methods for the analysis of single fasteners, connection systems, dowel groups and the stress analysis of the timber matrix in joints. Presented papers describe the nonlinear behavior of joints, including ductile and brittle failure modes, as well as the behavior under cyclic loading. Further presentations will discuss combined experimental-numerical approaches and data fitting methods. Models are important for the understanding of the relationship between the mechanical behavior of joints and properties of their components as well as in relation to the global behavior of timber structures.

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS2-01A</td>
<td>Wed, 13:30-15:00</td>
<td>BIG2</td>
</tr>
<tr>
<td>MS2-01B</td>
<td>Thu, 08:30-10:00</td>
<td>BIG2</td>
</tr>
<tr>
<td>MS2-01C</td>
<td>Thu, 10:30-12:00</td>
<td>BIG2</td>
</tr>
</tbody>
</table>

---

**Computational mechanics of wood and wood-based products**
*J. Füssl, A. Olsson, M. Kaliske, J. Eberhardsteiner*

This minisymposium is considered to be a forum for scientists and engineers working in the field of computational wood mechanics and wood technology. The contributions refer to recent developments and advances on analytical, numerical, and related experimental aspects of the mechanical and physical behaviour of wood and wood-based products. Also contributions dealing with developments in the fields of wood processing and innovative wood composites can be found. Main focus is laid on topics like the numerical analysis of wood, wood-based products, and timber structures taking into account failure mechanisms of wood, its stochastic nature, as well as moisture-induced deformations or moisture transport, respectively. Furthermore, macroscopic constitutive modelling, large deformations, wood drying and processing, and wood/glass and wood/steel composites are of special interest.

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS2-02A</td>
<td>Mon, 13:30-15:00</td>
<td>BIG1</td>
</tr>
<tr>
<td>MS2-02B</td>
<td>Tue, 08:30-10:00</td>
<td>BIG1</td>
</tr>
<tr>
<td>MS2-02C</td>
<td>Tue, 10:30-12:00</td>
<td>BIG1</td>
</tr>
</tbody>
</table>

---

**Practice-oriented structural design of timber-concrete composite slab elements**
*D. Zwicky, C. Malaga*

The first presentation shows results on the development of a composite system made of timber-steel hybrid beams and concrete floors, concentrating on first design concepts and planned tests. This is followed by an immediately linked issue: transversal load sharing in timber-concrete composite floors, numerically and experimentally validated, conducting a multi-parametrical study (i.e. span, joist spacing, beam geometry, load position). The concept of connecting beam-like timber sections to concrete slabs is challenged in the third presentation, where panel-type engineered wood products are combined with a concrete topping, analyzed in a comprehensive experimental program. The session is terminated with presentations on particular issues of numerical modelling of a nail laminated timber-concrete composite floor system as an alternative to the commonly used profiled steel-concrete deck, as well as a presentation on the numerical modelling of the long-term behavior of adhesive-bonded timber-concrete composite slabs, based on three-dimensional material models accounting for hygrothermal and time-dependent behavior, being validated against experimental data.

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS2-03A</td>
<td>Mon, 13:30-15:00</td>
<td>BIG2</td>
</tr>
</tbody>
</table>
Modeling of structures

The papers presented in these sessions deal with non-linear load bearing behavior and structural performance of timber structures including experimental and numerical study; numerical simulation of reinforced timber structures and structural performance of shear walls including experimental study. The focus is on structural application, design and experimental study on traditional timber frames. This includes contributions on structural behavior of connections, experimental quantification of structural characteristics. They discuss combined experimental-numerical approaches and data fitting methods as well as seismic performance and evaluate damping capacity in wood-frame shear wall buildings.

<table>
<thead>
<tr>
<th>Session</th>
<th>Day</th>
<th>Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS2-01A</td>
<td>Tue</td>
<td>08:30 - 10:00</td>
<td>BIG2</td>
</tr>
<tr>
<td>GS2-01B</td>
<td>Tue</td>
<td>10:30 - 12:00</td>
<td>BIG2</td>
</tr>
<tr>
<td>GS2-01C</td>
<td>Tue</td>
<td>13:30 - 15:00</td>
<td>BIG2</td>
</tr>
</tbody>
</table>

Modeling of materials

Computational approaches presented in this sub track describe the methods for the calculation of the physical and mechanical properties and structural performance of timber including experimental and numerical study.

<table>
<thead>
<tr>
<th>Session</th>
<th>Day</th>
<th>Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS2-02A</td>
<td>Thu</td>
<td>08:30 - 10:00</td>
<td>BIG1</td>
</tr>
<tr>
<td>GS2-02B</td>
<td>Thu</td>
<td>10:30 - 12:00</td>
<td>BIG1</td>
</tr>
</tbody>
</table>

IT-based architectural design & computer-aided manufacturing

This session gives an insight into application of computer-aided manufacturing (CAM) and computer-aided design (CAD) for wooden building elements, e.g. robotic production of individualized wood joints as well as additive manufacturing of wooden elements. The use of computer to assist in all operations of a manufacturing plant, including planning is presented in detail.

<table>
<thead>
<tr>
<th>Session</th>
<th>Day</th>
<th>Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS2-03</td>
<td>Wed</td>
<td>08:30 - 10:00</td>
<td>BIG2</td>
</tr>
</tbody>
</table>

Modeling

The papers presented in this session deal with numerical simulation of timber structures. The focus is on structural application, design and experimental study on timber structures. This includes contributions on structural behavior of connections, experimental quantification of structural characteristics.

<table>
<thead>
<tr>
<th>Session</th>
<th>Day</th>
<th>Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS2-01</td>
<td>Mon</td>
<td>15:10 - 16:00</td>
<td>BIG1</td>
</tr>
</tbody>
</table>
We have seen the great development of the timber industry in the past decades ranging from materials to construction systems. The increasing number of multi-storey timber constructions is a good example. However, the focus of the development has been mostly on the structural performance of the materials/systems in order to ensure the structural safety. For the further development of the timber industry, it is crucial to enhance the holistic sustainability of timber constructions considering environmental, economic and social aspects. The performances to be better engineered and integrated in the design process would be durability, indoor comfort, energy efficiency and lifecycle environmental impact. The mini-symposium will focus on the demands of the integrated design of timber constructions in the future. Innovative design concepts as well as methodologies are presented and discussed.

**Integrated design of sustainable architectures with wood for the future**

*N. Ando, Y. Goto*

We have seen the great development of the timber industry in the past decades ranging from materials to construction systems. The increasing number of multi-storey timber constructions is a good example. However, the focus of the development has been mostly on the structural performance of the materials/systems in order to ensure the structural safety. For the further development of the timber industry, it is crucial to enhance the holistic sustainability of timber constructions considering environmental, economic and social aspects. The performances to be better engineered and integrated in the design process would be durability, indoor comfort, energy efficiency and lifecycle environmental impact. The mini-symposium will focus on the demands of the integrated design of timber constructions in the future. Innovative design concepts as well as methodologies are presented and discussed.

**Reinforcement of timber elements in existing structures**

*J. M. Branco, P. Dietsch*

Within the building sector there is a growing need for the upgrading of buildings for safety, economic, environmental, historical and social reasons. Structural upgrading oftentimes includes reinforcement which may become necessary from motivations such as change of use, changes of load, changes in regulatory specifications, interventions to increase seismic resistance, deterioration due to poor maintenance, or exceptional damaging incidents. This Mini-Symposium is focusing on latest research that aims at advancing methods to reinforce existing but also new timber structures. Within the first session we are focusing on the strengthening of traditional timber buildings with a focus on timber joints and timber walls. The second session is focused on structural elements from engineered wood and novel techniques to strengthen these for bending, shear and tensile stresses perpendicular to the grain.

**Wooden façade**

*M. Kairi*

Construction of the wooden façade using structural pre-manufactured elements is a combination of many challenging steps. Before the final decision of the solution the interactive cooperation is needed between professionals of architecture, wood technology and civil engineering.

**Acoustics in wooden building**

*D. Bard*

Acoustics concerns both sound and vibration, and for wooden constructions there are some important features that differ from those in concrete and other heavy constructions. The weight of a construction is an important parameter for the airborne sound insulation properties, especially for the lower frequency range, 20–200 Hz. This means that wood constructions may have poor sound insulation at the lower frequencies. Impact sound from people walking is the most common sound insulation problem for lightweight floors, especially at low frequencies. Flanking transmission is another main problem for lightweight constructions.

**From the Atacama desert to "Tierra del Fuego": recent developments in the Chilean timber industry**

*J. J. Ugarte (on behalf of UC's Timber Innovation Center)*

Chile’s unique geography presents an attractive field to explore the response of wood and building typologies to extreme climate conditions in a territory prone to seismic activity and natural hazards, with vast forest resources which includes the pinus radiata specie along with extensive reserves of native wood. Such conditions have already served as natural laboratory for scientific and industrial initiatives to study the response of timber buildings to seismic activity, envelope response to climatic zones and new prefabrication systems to produce timber housing units, among others. These initiatives have been supported by the joint efforts of the Government sector, the Chilean Timber University Network and Timber Local Companies as well as building companies, thus opening new knowledge areas and new fields for practical applications. In parallel, local designers had made of wood a predominant building material for unique pieces of contemporary architecture which have achieved international recognition.
**Intervention on building stock**

Papers presented in these sessions deal with historic structural timber elements, connections and novel techniques to strengthen these in several countries.

GS3-01: Wed | 08:30 - 10:00 | HS16

**Building physics and building skins**

The session provides the possibility to discuss recent research results and to present timber construction projects as well as open questions regarding building physics. The focus is on thermal insulation and moisture proofing, structural application and design.

GS3-02: Tue | 10:30 - 12:00 | HS16

**Design practice**

This session gives an insight into design process of timber constructions. The use of databases to assist in all operations, including construction process and planning is presented.

GS3-03: Tue | 13:30 - 15:00 | HS16

**Evaluation and comparison**

The sessions provide the possibility to present current timber construction projects as well as discuss open questions regarding quantitative criteria, ecology and cost comparison. The focus is on life cycle assessment, environmental performance of timber constructions, design and structural application.

GS3-04A: Tue | 13:30 - 15:00 | HS21

GS3-04B: Wed | 13:30 - 15:00 | HS21

**Historic / repair**

Papers presented in this session deal with historic structural timber elements and connections as well as novel techniques to strengthen these in several countries.

PS3-01: Mon | 15:10 - 16:00 | HS21

**Building physics / skin**

The session provides the possibility to discuss recent research results and to present innovative timber façade elements as well as open questions regarding building physics. The focus is on thermal insulation and moisture proofing, structural application and design.

PS3-02: Tue | 15:10 - 16:00 | HS21
Seismic design and behaviour of innovative timber systems
M. Fragiacomo, J. von de Lindt, H. Isoda

Timber is a lightweight material and, as such, performs particularly well in moderate to intense earthquakes. However wood itself is not ductile and may have brittle failure modes such as splitting if not addressed properly within the seismic design procedure. Extensive research has been completed and numerous projects are underway worldwide on the seismic behavior of timber structures and buildings. An effort has been made to implement this new knowledge in codes of practice such as the Eurocode and the Canadian Standard. Many countries have differing design philosophies and rules governing the number of stories, the approach used for overstrength, etc. This mini-symposium will highlight the results of research projects from Italy, the United States, Germany, Japan, Canada, New Zealand, Slovenia, France, and Portugal. This includes experimental testing and numerical modelling of connections, subassemblies and full-scale building tests; some light-frame will be presented but the majority of the focus will be on heavier timber technologies such as cross-laminated, glue-laminated, log-house and hybrid construction; and the use of innovative techniques such as tuned mass dampers, energy dissipators, post-tensioning and passive base isolation in timber buildings. The development of design methods including capacity based design will be also the subject of the Symposium.

Tall buildings - Dynamic performance from measurements of completed structures
R. Harris, W.-S. Chang

As more tall timber buildings are constructed, it is essential to make records of their performance and feed this back into design predictions. This session includes papers that present some of the first measurements of the dynamic response of buildings under wind load, which will inform the methods and parameters for future tall building design.

Design of tall wood buildings for lateral loads
A. Buchanan

This mini-symposium will present papers which describe the lateral load design of real buildings, i.e. only those buildings which are already completed, or being constructed, or being designed. It covers lateral load design for both wind and earthquakes. These buildings all have a timber lateral load resisting system (not concrete shear cores or steel towers).

Eurocode 5 - a halftime summary of the review process
S. Winter

The symposium provides an introduction to the review process of Eurocode 5, the actual structure of the work and the committee and the targets of the revision progress. In addition a short excursus is given about "Ease-of-Use" and legitimate National Determined Parameters (NDP). The complete mini-symposia will provide colleagues from abroad and Europeans not familiar with standardisation with a clear overview of structures, targets and processes and should be a starting point for further coordination and cooperation with engineers and code writers all over the world. More detailed information is given about reinforcement, Timber-concrete-composites, design of fasteners and the dependency of material-design and execution in standardisation.

System level structural design of hybrid structures
I. Smith

Today it is no longer acceptable to employ simple elemental level design practices for timber buildings. Justification for this assertion lies in such an approach being a major impediment to restoring timber to the status it lost to steel as the structural engineering material of choice in the late 19th century. Key to transforming modern use of timber lies in marrying the dependency of material-design and execution in standardisation.
Glued-in rods – Application and design rules
V. Rajčić

Session will present variety of topic related to glued in rod type of connection which has been adopted as an effective way to connect timber elements from both load bearing capacity/stiffness and aesthetic point of view. This connection is also widely accepted as a method for reinforcement of the new and existing timber structures. Steel rods as well as basalt FRP rods will be discussed as a single rod connection as well as a multiple rods - group connection. Several possibilities of application will be presented: transfer of tension force but also for transfer moment in post beam connections in box section frames. Session will give discussion on differences in load bearing capacity using different test methods. Some solution will be presented in case of high load bearing capacity/stiffness needs.

Cross laminated timber (CLT) is now used worldwide including seismic regions as one of the wood-based building materials suitable not only for low rise buildings but also middle to high rise buildings. Many research projects have been providing findings on seismic performance of CLT structure, by experimental and numerical studies on joints, wall systems and structures, in several countries. Besides, the effort has been paid to the market of Cross-laminated timber panels (CLT) - the greater the taller timber buildings become – especially after the introduction of bio-based building products. The implementation of FSE and PBD for timber and bio-based building products requires cooperation between (i) structural engineers, (ii) material scientists, and (iii) fire safety engineers, amongst others including architects and regulators. This mini-symposium will focus on seismic performance and standardization of CLT building structures.

Timber and bio-based building products have been used extensively in construction in the past. In the last 100 years, however, combustibility has been a key reason why products made from wood were not permitted e.g. in many multi-storey building applications. When Performance Based Design (PBD) for fire safety was introduced, many building regulations opened the market for products which demonstrably meet the required performance objectives. Based on extensive international collaboration, research institutes and industries provided results, techniques and calculation models on how fire safety can be achieved for many fields of application. Large differences in the local regulations among countries still exist, and the use of combustible building products remains limited in countries where only prescriptive rules are used (e.g. bio-based insulations is allowed up to a building height of 18 m or more in Spain, whereas it is limited to 7 m in Germany).

Fire Safety Engineering (FSE) is a possible tool to achieve satisfactory fire safety levels for specific building solutions and any building material. The implementation of FSE and PBD for timber and bio-based building products requires cooperation between (i) structural engineers, (ii) material scientists, and (iii) fire safety engineers, amongst others including architects and regulators. This mini-symposium will provide insights into the latest achievements in the area of fire safety of bio-based construction materials and systems, including calculation methods, experimental testing at different scales, and best practice in Europe, Asia, America, and Australasia. Materials like cross-laminated timber (CLT) panels, active and passive fire safety tools, as well as possibilities and limitations of material treatments will be discussed.

The taller timber buildings become – especially after the introduction in to the market of Cross-laminated timber panels (CLT) - the greater is the importance of a better knowledge on how much some structural solutions can influence the whole behavior of a building shaken by a big quake. This is the case of in-plane actual deformability of floors vs infinite rigidity of floors in diaphragm behavior in high-rise buildings and the case of how much the height of a CLT building can or cannot influence the actual value of the seismic action reduction factor for a better design of CLT tall buildings.

The focus of these sessions is the presentation of recently completed research, including examples of new applications for timber composite / timber hybrid floor and beam systems, with an emphasis on characterising structural behaviour and development of design methods that will enable the research outcomes to be applied in new building and bridge structures.
**Codes and international engineering**

The session gives an overview of practical construction details and the latest design methods around the world. Moreover, the results of new research projects with reference to standards for cross laminated timber (CLT) in USA and Europe are presented in detail.

**Fire engineering**

The session provides an insight into the area of fire engineering of timber constructions in multi-story buildings, including experimental full-scale fire testing and calculation methods. Furthermore, the sub track provides the possibility to discuss and to present recent research results around the world as well as open questions regarding fire engineering of timber constructions, including fire resistance characteristics of glued laminated and cross-laminated timber.

**Structural design and engineering**

The papers presented in these sessions with structural design of timber constructions. The focus is on structural application, design and experimental studies. This includes contributions on experimental quantification of structural characteristics, damping characteristics and seismic performance of different timber systems and historical timber structures, dynamic characteristics of glulam and cross-laminated timber (CLT) beams and floors, experimental quantification of lateral resistance of novel connection systems, latest developments in timber bridge constructions and long-term monitoring of timber bridges.

**Mixed composite and hybrid structures**

The sessions deal with structural design of timber constructions in multi-story buildings. The focus is on design, structural application and experimental study on wood-based composite constructions particularly timber-glass-, timber-concrete- and timber-steel composite constructions. This includes contributions on experimental quantification of long-term behavior, experimental quantification of connections and seismic capacity of hybrid timber structures.
**Structures / codes**

The session deals with structural design of timber constructions in multi-story buildings and bridges. It gives an overview of practical construction details and the latest design methods around the world. Moreover, the results of new research projects are presented in detail.

PS4-01: Mon | 15:10 - 16:00 | BG2

**Mixed**

The focus of this session is on design, structural application and experimental study on wood-based composite constructions. This includes contributions on experimental study on dynamic and long-term behavior of wood-based hybrid constructions.

PS4-02: Mon | 15:10 - 16:00 | HS47

**Fire - basics**

The session provides an insight into the area of fire engineering of timber constructions in multi-story buildings, including experimental full-scale fire testing and calculation methods.

PS4-03: Tue | 15:10 - 16:00 | BG1

**Seismic**

This session presents the results of experimental study on the seismic behavior of wood-based hybrid constructions aimed to investigate the seismic performance of different timber systems.

PS4-04: Tue | 15:10 - 16:00 | BG2

**Fire - applications**

The session provides the possibility to discuss and to present recent research results around the world as well as open questions regarding fire engineering of timber constructions, including fire resistance characteristics of glued laminated and cross-laminated timber.

PS4-05: Wed | 15:10 - 16:00 | BG1

**Structures**

The papers presented in this session deal with structural design of timber constructions in multi-story buildings. The focus is on experimental study, design and structural application on various connections. This includes contributions on experimental quantification of novel connection systems.

PS4-06: Wed | 15:10 - 16:00 | BG2
The execution of structures may be defined as a holistic process during which a building is realized, starting from the client needs and definition of the design requirements, all the way to the construction methods and setting of requirements for the works in the construction site. Several countries have recently developed (or are developing) execution rules and guidelines for timber construction. It is a prerequisite for the established design procedures that certain execution rules are followed, most commonly these may be related to assembly tolerances, moisture control on site for wood products and assembly plan for construction safety with building elements. This session covers the wide variety of methods for the execution of timber buildings worldwide. Both methods of execution and standards for the execution rules of timber buildings are dealt with.

**Execution of timber buildings**  
*T. Toratti*

The execution of structures may be defined as a holistic process during which a building is realized, starting from the client needs and definition of the design requirements, all the way to the construction methods and setting of requirements for the works in the construction site. Several countries have recently developed (or are developing) execution rules and guidelines for timber construction. It is a prerequisite for the established design procedures that certain execution rules are followed, most commonly these may be related to assembly tolerances, moisture control on site for wood products and assembly plan for construction safety with building elements. This session covers the wide variety of methods for the execution of timber buildings worldwide. Both methods of execution and standards for the execution rules of timber buildings are dealt with.

**Sustainable modular building systems in wood**  
*M. Flach*

The requirements of future constructions will focus on cost efficiency, sustainability, rapidity and flexibility. Modular constructions in wood contribute an appropriate answer in ambitious refurbishment programs of existing buildings in the European smart cities initiative as well as for sustainable urban densification. Modular systems in wood offer high quality and sustainable constructions, therefore they are prefabricated with CNC technology to be mounted and assembled precisely in a very short time. The first part of the mini-symposium focuses on prefabrication technology of façade elements for thermal refurbishment, multi-story - and extension buildings in sustainable urban development. The second part of the modular system symposium deals with adequate technologies in combination with innovative components and connector systems. There is a growing demand for habitation in fast expanding cities, for substitute buildings in case of refurbishment of old buildings, for centers for victims of natural catastrophes as in seismic areas and recently for political and climate change refugees. Modular building systems have developed from the well-known barracks in wood to industrial approaches of Konrad Wachsmann, from transportable container modules of Kaufmann to integrated fabricated components for large multi-story buildings. They are produced in workshops to be prefabricated in combination with computer controlled joinery machines, energy efficient and high precision components. One of the key points is the assembling process, multi-material and multi-functional components and the choice between a 2D or 3D assembling and transportation mode.

**Teaching timber design in interdisciplinary settings**  
*T. Tannert, P. Dietsch, R. Harris*

Educating Architects and Engineers of the future about the opportunities and challenges when building with timber is an essential requirement for the continued success of timber structures. Therefore, timber design should be embedded in the mainstream curricula for Architectural and Engineering undergraduate students. The mini-symposium provides a platform to disseminate knowledge about modern “student-centred” teaching approaches that stimulate in-class participation and learning. The mini-symposium will cover topics from teaching timber design in Engineering and Architectural Faculties with an emphasis on interdisciplinary courses, design-build projects, and competitions. In the presentations, we will first travel down the North American West coast from Prince George over Vancouver to Corvallis and discuss the Integrated Wood Engineering program at UNBC, Team-based learning approaches at UBC and cross-Faculty learning at OSU before turning to Central Europe to discuss educational approaches and curricula including interdisciplinary projects at TUM/ Munich and the University Innsbruck.

**Developments in wood engineering education**  
*P. L. Clouston, M. Gershfeld, M. Kam-Biron*

A growing recognition of the sustainability of wood, together with innovations in product technology, construction methods, design, processing, 3D CAD modeling and even building code developments has led to a world-wide renaissance in wood construction, especially for multi-family/ mid-rise building types. These modern engineered wood structures require specialized expertise, not only in structural analysis but also in architectural design, product fabrication and building construction. Several wood engineering education initiatives are underway to help facilitate the design, specification and use of wood in the US. For example, the Wood Products Council (WPC), a cooperative venture of the major wood associations in North America in partnership with research organizations and government agencies, launched what is known as the WoodWorks initiative. This initiative supports the use of wood in non-residential building applications and provides one-stop access to the widest possible range of information on the use of wood in non-residential structures to design professionals. In July of 2008, WoodWorks announced an educational partnership with California State Polytechnic University Pomona and provided a seed investment grant to develop online educational content for undergraduate, graduate, and continuing education programs nationwide under Wood Education Institute (WEI) program.
Tall buildings – case studies
M. Piazza, R. Tomasi

This mini-symposium intends to collect papers regarding case studies of tall timber buildings already fabricated, under construction or under design process, highlighting also the problems and the constructive solutions adopted for the design and execution. The mini-symposium will emphasize what are the real problems which may be encountered when a tall building is erected. In this sense, the experience gained during the construction is of fundamental importance and it is crucial that this information valuable for the development of tall timber buildings can be shared and discussed. The list of presenters includes, primarily, the designers of some existing timber tall buildings, so that it is possible for attendants to perceive the main issues regarding those buildings, not only the ones involving structural design.

Human perception and health in wooden buildings
Y. Cronhjort, M. Hughes

We spend 90% of our lives inside buildings, and with improved energy efficiency the importance of interior air quality increases. Temperature and moisture are central characteristics of interior spaces. Wood’s propensity to interact with moisture can be put to good effect in helping to mediate the interior environments of buildings. Associated with adsorption there is a release of heat which can raise the surface temperature of wood; conversely heat is required during desorption. These processes give rise to the concept of hygrothermal mass, which may have the potential to improve the energy efficiency of buildings. In addition to economically and ecologically sound living spaces, future social sustainability requires accessibility and comfort in our living and care environments, so as to support human wellbeing. Wood is perceived as a natural, pleasant, breathing, and timeless material that feels warm. These characteristics can help improve human comfort in the space.
Teaching and dissemination

Several timber engineering education initiatives are worldwide ongoing to help facilitate the use of timber and design it. This session presents an overview of recent timber engineering education initiatives as a pedagogical framework for teaching sustainable design predominantly to architecture students.

GSS-02:  Wed | 10:30 - 12:00 | HS21

Best practice examples

This session presents particularly successful examples of how important new challenges may be successfully resolved. It gives an insight into the process of modern timber design and engineering. The use of computer-assisted planning is presented.

GSS-03:  Mon | 17:55 - 18:50 | HS7
GSS-03A:  Tue | 13:30 - 15:00 | HS34
GSS-03B:  Wed | 13:30 - 15:00 | HS34

Case studies and visions

The presented buildings in this session deal with timber construction details and methods in multi-story buildings. The focus is on design and implementation. This includes contributions on best practice case studies.

GSS-04:  Thu | 10:30 - 12:00 | HS34

Market / realization

The session provides the possibility to present current timber construction projects as well as discuss open questions regarding cost comparison and ecology. The focus is on design and structural application.

PS5-01:  Mon | 15:10 - 16:00 | HS7

Buildings / examples

The presented buildings in this session deal with timber construction details and methods in multi-story buildings and bridges. The focus is on design and implementation.

PS5-02:  Tue | 15:10 - 16:00 | HS7

Teaching / research

Several timber engineering education initiatives are worldwide ongoing to help facilitate the use of timber and design it. This session presents an overview of recent timber engineering education initiatives as a pedagogical framework for teaching sustainable design predominantly to architecture students.

PS5-03:  Wed | 15:10 - 16:00 | HS21
TIMETABLE

47  Monday, August 22
54  Tuesday, August 23
64  Wednesday, August 24
74  Thursday, August 25
78  Friday, August 26
### OPENING & PLENARY LECTURES | 0900 - 1110

#### OPENING CEREMONY

**Johannes Brahms – Hungarian Dances** (Orchestra of Vienna University of Technology)

**Welcome addresses**

- **Prof. Wolfgang Winter** (Chairman WCTE 2016)
- **Dr. Erich Wiesner** (Chair Austrian Federation of Woodworking Industries & Vice-Chair of Cei-Bois)
- **Prof. Sabine Seidler** (Rector, Vienna University of Technology)
- **Prof. Regina Hitzenberger** (Vice-Rector for Infrastructure, University of Vienna)

**Wolfgang A. Mozart – Divertimento in F, K 138**

**Johann Strauss – Thunder and Lightning Polka**

#### PLENARY LECTURES - SESSION A

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:40</td>
<td>High performance wood materials – progress, challenges and visions</td>
<td>I. Burgert, V. Merk, M. Chanana</td>
<td>ETH Zurich, Switzerland</td>
</tr>
<tr>
<td>10:10</td>
<td>Rational modelling and design in timber engineering applications using fracture mechanics</td>
<td>E. Serrano</td>
<td>Lund University, Sweden</td>
</tr>
<tr>
<td>10:40</td>
<td>Building systems - constraints or chances for architects?</td>
<td>H. Kaufmann</td>
<td>TU München, Germany</td>
</tr>
</tbody>
</table>

**High performance wood materials** are essentially required to grow in step with the rapid development in the wood construction sector. The expectations on the reliability and long-term properties of wood are already high, but will rise further with the increasing construction of wooden multi-storey houses in an urban environment. Intensive research activities are needed in the field of wood modification to develop hybrid materials and wood composites which lead to an improvement of wood properties in fields of existing limitations, but may also result in multifunctional wood materials with yet uncommon performance profiles and new application potentials. In this paper, concepts for fundamental research activities are exemplarily reported and current challenges are addressed. These are based on the vision of developing and implementing wood materials that are capable to fulfill present and future requirements of timber engineering and thereby facilitate the transition towards a sustainable society.

### Return to University of Vienna

**Lunch**

TIME TABLE | Opening & Plenary Lectures | 47
null
## Time Table | Monday, August 22

### Parallel Sessions | 1330 - 1500

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:30</td>
<td>Acoustics in wooden building</td>
</tr>
<tr>
<td>13:30</td>
<td>System level structural design of hybrid structures</td>
</tr>
<tr>
<td>13:30</td>
<td>Fire safety of structures made of timber and other bio-based products</td>
</tr>
<tr>
<td>13:30</td>
<td>Seismic behavior of timber construction</td>
</tr>
<tr>
<td>13:30</td>
<td>The standardisation chain in Europe: material - design - execution</td>
</tr>
<tr>
<td>13:30</td>
<td>CLT buildings laterally braced with core and perimeter walls</td>
</tr>
<tr>
<td>13:48</td>
<td>Design and behaviour of a timber-steel core wall multi-storey hybrid building under seismic action</td>
</tr>
<tr>
<td>14:06</td>
<td>Assessment of disproportionate collapse for multi-storey cross-laminated timber buildings</td>
</tr>
<tr>
<td>14:24</td>
<td>Reliability based design of timber structures - system focussed application</td>
</tr>
<tr>
<td>15:00</td>
<td>Break</td>
</tr>
</tbody>
</table>

---

**ARC**

- **ARC**
- **ENG**
- **ENG**
- **ARC**

A. Buchegger, H. Feri, M. Schanz
A. Speranza, L. Barboresi, F. Morandi
J. Negreira, A. Sjöström, D. Bard
O. Floðén, K. Persson, G. Sandberg

B. Arcas, Delphine Bard
A. Ioannis Sjöström, Delphine Bard
J. Negreira, A. Sjöström, D. Bard
A. Sjöström, Delphine Bard

### M.S. 04A

- 13:30 **M.S. 04A**: 1. Effects of wave transformation in junctions of cross-laminated timber systems for CLT panels
- 13:48 **M.S. 05A**: 1. Experimental analysis of flanking transmission of different connection systems for CLT panels
- 14:06 **M.S. 05A**: 1. Modelling guidelines for simulating low frequency vibroacoustic performance in wooden T-Junctions
- 14:24 **M.S. 05A**: 1. Low frequency force to sound pressure transfer function measurements using a modified tapping machine on a light weight wooden joist floor
- 14:42 **M.S. 05A**: 1. Numerical methods for predicting vibrations in multi-storey wood buildings

---

**ENG**

- **ENG**
- **ENG**
- **ENG**

A. Polastri, C. Loss, L. Pozza, I. Smith
C. Goertz, C. Dickof, D. Rostkoff, S. Tesfamariam
H. Mpidi Bita, N. Currie, T. Tannert

B. Arcas, Delphine Bard
A. Ioannis Sjöström, Delphine Bard
J. Negreira, A. Sjöström, D. Bard
A. Sjöström, Delphine Bard

### M.S. 05A

- 13:30 **M.S. 05A**: 1. How environmental variables are related to shoot and foliage development and wood ring formation: an integrated analysis for functional-structural modeling purposes
- 13:48 **M.S. 05A**: 1. Towards timber mid-rise buildings in Chile: structural design challenge and regulations
- 14:06 **M.S. 05A**: 1. Experimental evaluation of the vibration serviceability of timber floor systems in Chilean social housing
- 14:24 **M.S. 05A**: 1. Project shelter and settlement

---

**ENG**

- **ENG**
- **ENG**
- **ENG**

L. Osborne, J. Su, C. Dagenais
A. Bartlett, F. Wiesner, R. Hadden, B. Lane, A. C. Lawrence, P. Palma, A. Frangi
J. Schmid, A. Santomosa, D. Brandon, U. Wickström, A. Frangi

B. Arcas, Delphine Bard
A. Ioannis Sjöström, Delphine Bard
J. Negreira, A. Sjöström, D. Bard
A. Sjöström, Delphine Bard

### M.S. 05A

- 13:30 **M.S. 05A**: 1. Seismic design method for HanOk considering joint lateral rigidity using BIM
- 13:48 **M.S. 05A**: 1. Experimental study on the seismic behaviour of traditional Chuan-Dou style wood frame
- 14:06 **M.S. 05A**: 1. Earthquake response analysis of traditional timber gate of Hagi-shi-onganji temple based on 3D analytical model
- 14:24 **M.S. 05A**: 1. Development and application of seismic reinforcement design method for traditional wooden houses in heavy-snow regions by taking advantage of structural features
- 14:42 **M.S. 05A**: 1. Seismic reinforcement for traditional timber gate utilizing external stairs
### POSTER SESSIONS | 1510 - 1600

**Time Table | Monday, August 22**

#### ARC

<table>
<thead>
<tr>
<th>PS3</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Historic / repair</strong></td>
<td></td>
</tr>
<tr>
<td>PS3:01:1</td>
<td>J. Cho, B. Lee, J. Yoon</td>
</tr>
<tr>
<td>PS3:01:2</td>
<td>H. Sato, M. Koshihara, T. Miyake, I. Kawajiri</td>
</tr>
<tr>
<td>PS3:01:3</td>
<td>S-C. Kim, J. Choi, H. Yang</td>
</tr>
<tr>
<td>PS3:01:4</td>
<td>F. Scharmacher, K-U. Schöber, N. Almstedt, M. Böttges</td>
</tr>
</tbody>
</table>

#### MAT

<table>
<thead>
<tr>
<th>PS1</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strength / grading</strong></td>
<td></td>
</tr>
<tr>
<td>PS1:01:1</td>
<td>E. Correlé-Môdel, M. Vîches-Casals, P. Langbour, M-F. Theyenon, J. Gérard, D. Guigou</td>
</tr>
<tr>
<td>PS1:01:2</td>
<td>D. F. Llana, G. Iglesias-Gonzalez, E. Hermosa, V. Maynou, F. Arriga</td>
</tr>
<tr>
<td>PS1:01:3</td>
<td>S. Iseue, C. F. Pambou Niengui, R. Moutou Piti, S. Ekomy-Anjo</td>
</tr>
<tr>
<td>PS1:01:4</td>
<td>T. Takeeda, Y. Hosoo, T. Hashizume</td>
</tr>
<tr>
<td>PS1:01:5</td>
<td>Y. Kuboijima, S. Sonoda, H. Kato</td>
</tr>
</tbody>
</table>

#### COM

<table>
<thead>
<tr>
<th>PS2</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connections</strong></td>
<td></td>
</tr>
<tr>
<td>PS2:01:2</td>
<td>G. Y. Jeong, S. S. Lee</td>
</tr>
<tr>
<td>PS2:01:3</td>
<td>C. Zhang, W.-S. Chang, R. Harris</td>
</tr>
<tr>
<td>PS2:01:4</td>
<td>H. Castaneda, S. Bjarnadottir</td>
</tr>
<tr>
<td>PS2:01:5</td>
<td>K. Kobayashi, K. Hayashi, M. Yasumura</td>
</tr>
</tbody>
</table>

**THOMAS BOGENSPERGER**

**HS41**

**Pablo Guindos**

**HS50**

**Sigrurður Ormarsson**

**BIG1**

**RICHARD HARRIS**

**HS21**
### Structures / codes

**PS4 01**

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS4-01: 1 J. R. Loferski, J. B. Showalter, J. Bouldin</td>
<td>Development and implementation of a prescriptive guide for the construction of residential decks in the USA</td>
</tr>
<tr>
<td>PS4-01: 2 D. D. Boyadzhieva, K. Fijita</td>
<td>On the design of timber elements according to building codes of Europe, Russia and Japan</td>
</tr>
<tr>
<td>PS4-01: 3 J. P. Englund, B. Iskra</td>
<td>Australian building code change - 8 storey timber residential and office buildings</td>
</tr>
<tr>
<td>PS4-01: 4 S. Takeshishi, K. Ohda, H. Takahashi, Y. Sakamak, N. Michiba, K. Kagawa, Y. Ohashi</td>
<td>Study on the relationship between damage and residual strength of wooden house built according to Japanese old standard</td>
</tr>
<tr>
<td>PS4-01: 5 H. Honda, S. Aroki</td>
<td>Applied method and estimation of durable years for modern timber bridges</td>
</tr>
</tbody>
</table>

### Mixed

**PS4 02**

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS4-02: 1 K. Kohara, M. Inada, K. Hoshia, M. Tabata, M. Fukumoto, K. Komoto, M. Takimoto</td>
<td>A study on portal frame structure with combined column for timber building</td>
</tr>
<tr>
<td>PS4-02: 2 T.-C. Hsu, F.-C. Chang, M.-T. Tsai, T.-D.-H. Le</td>
<td>Study on performance of timber-steel composite beams with different shape of steel component</td>
</tr>
<tr>
<td>PS4-02: 3 R. Franko, B. Ber, M. Premrov</td>
<td>Experimental and numerical investigations of timber-glass shear walls</td>
</tr>
<tr>
<td>PS4-02: 4 M. Držičnik, M. Premrov, A. Strukel</td>
<td>Advantages and disadvantages of timber glass composite beams</td>
</tr>
<tr>
<td>PS4-02: 5 N. Keipour, H. Vallpour, M. Bradford</td>
<td>Steel-timber versus steel-concrete composite floors: a numerical study</td>
</tr>
</tbody>
</table>

### Market / realization

**PS5 01**

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS5-01: 1 C. Calil Neto, R. Fujii, A. Takata</td>
<td>Glued laminated timber in Brazil: past - present and future</td>
</tr>
<tr>
<td>PS5-01: 3 M. Kuittinen</td>
<td>Low-carbon refugee shelters from wood - case studies, possibilities and global impacts</td>
</tr>
<tr>
<td>PS5-01: 5 S. Bjarmadottir, Y. Li, M. G. Stewart, G. Reynisson</td>
<td>Economic viability of adaptation for timber distribution poles considering climate change</td>
</tr>
</tbody>
</table>

### Poster Discussion & Coffee Break

16:00 - 17:00
## Time Table | Monday, August 22

### COMPANY & EXTENDED LECTURES | 16:30 - 17:55

<table>
<thead>
<tr>
<th>Time</th>
<th>Sponsor</th>
<th>Location</th>
<th>Speaker</th>
<th>Title</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:30</td>
<td>Collano</td>
<td>Audimax</td>
<td>Hugo Karre</td>
<td>The influence of diaphragm stiffness on the dynamic behaviour of multi-storey timber buildings (Extended Lecture)</td>
<td></td>
</tr>
<tr>
<td>16:35</td>
<td>FunderMax</td>
<td>RUBNER Holzbau</td>
<td>Georg Binder</td>
<td>From the Atacama desert to &quot;Tierra del Fuego&quot;: recent developments in the Chilean timber industry (Extended Lecture)</td>
<td></td>
</tr>
<tr>
<td>16:40</td>
<td>MADEexpo</td>
<td></td>
<td></td>
<td>Interdisciplinary approaches to developing wood modification processes for sustainable building and beyond – InnoRenew CoE (Extended Lecture)</td>
<td></td>
</tr>
<tr>
<td>16:45</td>
<td>SPAX</td>
<td></td>
<td></td>
<td>Seismic behavior of timber construction</td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>Fermacell</td>
<td>Festive Hall</td>
<td></td>
<td>Fire safety of structures made of timber and other bio-based products - COST Action</td>
<td></td>
</tr>
<tr>
<td>16:35</td>
<td>Isocell</td>
<td></td>
<td></td>
<td>Fire safety engineering - opportunities and challenges for timber buildings (Extended Lecture)</td>
<td></td>
</tr>
<tr>
<td>16:40</td>
<td>Rubner Holzbau</td>
<td></td>
<td></td>
<td>Comparison of life risks due to fire in mid- and high-rise, combustible and non-combustible office buildings (Extended Lecture)</td>
<td></td>
</tr>
<tr>
<td>16:45</td>
<td>TiComTec</td>
<td></td>
<td></td>
<td>Performance-based design as a tool to evaluate behavior factors for multi-storey timber buildings (Extended Lecture)</td>
<td></td>
</tr>
</tbody>
</table>

### EXTENDED LECTURES

<table>
<thead>
<tr>
<th>MAT</th>
<th>Joints in timber structures - Characterization and structural design</th>
<th>Roberto Crocetti</th>
<th>Festive Hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>K. A. Malo, H. Stamatakopoulos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:28</td>
<td>R. Brandner</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAT</th>
<th>Modified wood as building material for sustainable constructions</th>
<th>Alexander Petutschnigg</th>
<th>HS21</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>M. D. Burnard, M. J. Schwarzkopf, A. Kutnar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:28</td>
<td>G. Kain, B. Lienbacher, M. C. Barbu, P. Plank, K. Richter, A. Petutschnigg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENG</th>
<th>From the Atacama desert to &quot;Tierra del Fuego&quot;: recent developments in the Chilean timber industry</th>
<th>Cecilia Poblete</th>
<th>H57</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>J. J. Ugarte</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENG</th>
<th>Fire safety of structures made of timber and other bio-based products - COST Action</th>
<th>Joachim Schmidt</th>
<th>Audimax</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>B. Östman, D. Brandon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:28</td>
<td>X. Zhang, J. Mehaffey, G. Hadjisophocoeus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COM</th>
<th>Computational mechanics of wood and wood-based products</th>
<th>Josef Eberhardtsteiner</th>
<th>BIG1</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>S. Fortina, P. Hradil, A. Genoese, A. Genoese, A. Poussette, P.-A. Fjellström</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:28</td>
<td>M. Hu, A. Briggett, A. Olsson, M. Johannson, J. Occarsson, H. Stall</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENG</th>
<th>Seismic behavior of timber construction</th>
<th>Ario Ceccotti</th>
<th>BIG2</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>D. Moroder, F. Sarti, T. Smith, S. Pamparin, A. Buchanan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:28</td>
<td>J. Hummel, W. Seim</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Time Table | Monday, August 22

### EXTENDED LECTURES | 1755 - 1850

<table>
<thead>
<tr>
<th>Time</th>
<th>MAT</th>
<th>ENG</th>
<th>COM</th>
<th>IMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:55</td>
<td>Current progress in adhesive bonding of solid wood</td>
<td>Seismic design and behaviour of innovative timber systems</td>
<td>Computational modeling of joints in timber structures</td>
<td>Best practice examples</td>
</tr>
<tr>
<td>17:55</td>
<td>Hendrikus W. G. van Herwijnen</td>
<td>Massimo Fragiacomo</td>
<td>Thomas K. Bader</td>
<td>Alireza Fadai</td>
</tr>
<tr>
<td>MS1</td>
<td>MS4</td>
<td>MS2</td>
<td>MS5</td>
<td>G55</td>
</tr>
<tr>
<td>MS1:05:1</td>
<td>Influence of microstructure on adhesive penetration and bond performance (Extended Lecture)</td>
<td>Research outline of seismic standard development for CLT construction in Japan (Extended Lecture)</td>
<td>Numerical simulations of timber connections with angle brackets subjected to external loading (Extended Lecture)</td>
<td>Carbon, construction and COP 21 – guideline for engineers to position wood in the post-COP 21 era to address global climate change (Extended Lecture)</td>
</tr>
<tr>
<td>MS1:05:2</td>
<td>From the lab to commercial reality with bio-based adhesives for wood (Extended Lecture)</td>
<td>The new version of Chapter 8 of Eurocode 8 (Extended Lecture)</td>
<td>Matrix failure of multi-dowel type connections – engineering modelling and parameter study (Extended Lecture)</td>
<td>Debut &quot;Timber City&quot; to the world - KES® system × fire-proof technology “COOL WOOD®” (Extended Lecture)</td>
</tr>
</tbody>
</table>

### Welcome Cocktail | Arcade Court

**19:30**
### Time Table | Tuesday, August 23

#### PARALLEL SESSIONS | 0830 - 1000

**MAT** Joints in timber structures - Characterization and structural design  
Michael Dorn  
HS50  
08:30  
M. Cepelka, K. A. Malo  
Experimental study of end grain effects in timber joints under uniaxial compression load  
08:48  
C. Winkler, U. Schwarz  
Characterization of adhesively bonded wood structures by electrical modification of the bonding system  
09:06  
M. Trautz, C. Koj, H. Lichtmann  
Load bearing behaviour of self-tapping screws in laser-drilled guideholes  
09:24  
C. Signst, P. Zock  
New connections suitable for robotic assembly of complex timber structures  
09:42  
J. Kunecky, H. Hasniková, M. Kloiber, P. Fojman  
Half lap scarf joint with inclined faces and wooden dowels: research and designs

**MAT** Aspects on the forest resource wood and the conversion process to building materials  
Alfred Teischinger  
HS48  
08:30  
R. Maderebner, M. Roch, A. Teischinger, M. Bacher  
Influences of the growing area on the visual, physical and mechanical parameters based on the example of wood from alpine regions  
08:48  
U. Müller, O. Vöy, A. Martinez Conde, S. Fybot, T. Krenke, J. Komerath, A. Teischinger  
Converting wood into timber and particles - new approaches  
09:06  
S. Kühle, A. Teischinger, M. Gronalt  
Structure analysis of a production network by means of quality function development and value stream mapping  
09:24  
BIOECONOMY CLUSTER: resource efficient creation of value from beech wood to bio-based building materials

**MAT** Modified wood as building material for sustainable constructions  
Andreja Kutnar  
HS47  
08:30  
P. Tukiainen, M. Hughes  
The fracture properties of thermally modified spruce  
08:48  
R. Herrera Díaz, A. Arrese, J. Lobidi, R. Llano-Ponte  
Dynamic evolution of physical-mechanical properties of heat-treated wood exposed to weathering conditions  
09:06  
B. Lesar, M. Humar, D. Kričšnik, N. Thaler, M. Žtiljevič  
Performance of façade elements made of five different thermally modified wood species on model house in Ljubljana  
09:24  
A. Ugošek, B. Šubič, G. Rep, M. Humar, B. Lesar, N. Thaler, C. Brischke, D. Jones, J. I. Lazano  
Performance of windows and facade elements made of thermally modified Norway-spruce (Picea abies) in different climatic conditions  
09:42  
R. M. Rowell  
Acetylated wood: a stable and durable structural building material

**COM** Computational mechanics of wood and wood-based products  
Markus Lukacovic  
BIG1  
08:30  
D. Konopka, M. Kitase  
Hygro-mechanical FE-analysis of wooden structures: implementation and application of reliable moisture transport models  
08:48  
P. Hardil, S. Fortino, L. Salokangas, A. Musci, G. Metelli  
Effect of moisture induced stresses on the mechanical performance of glued laminated timber (glulam) beams  
09:06  
S. Ormarsson, J. Vesaby, B. Källner, I. Fichev  
Numerical analysis of failure modes and force distribution in a pitched roof structure of wood  
09:24  
H. Petersson, B. Källner, S. Ormarsson  
Strength grading of structural timber based on buckling analysis and scanning techniques  
09:42  
Stability of a wood column composite section with creep determined by a three parameters model

**MAT** Hardwood in structural engineering  
Gerhard Fink  
HS41  
08:30  
P. Schlotzauer, F. Wilhelms, C. Lux, S. Bollmus  
Machine grain angle determination on spruce, beech and oak lumber for construction use  
08:48  
M. Togni, A. Cavalli, D. Cibecchini, G. Goli  
First strength grading, physical and mechanical tests on Turkey oak beams for structural use  
09:06  
V.-D. Tran, M. Oudjene, P.-J. Méausoone  
Performance of oak timber in glued structural elements and joints  
09:24  
G. Rovershont, N. Camper, P. de Vries, J.-W. van de Kuiilen  
Determination of the shear strength of tropical hardwood timber  
09:42  
A. J. Lara-Bocanegra, A. Majano-Majano, J. Crespo, M. Guaita  
Finger-joint performance in engineered laminated products made of Eucalyptus globulus

**COM** Modeling of structures  
Eric Lukacovic  
BIG2  
08:30  
S. Ablarth, J. Van den Bulcke, E. Botter, J. Van Acker, D. Garaz, W. Van Paepgen  
Simulating the behaviour of historical valuable timber structures: a case study on wooden use  
08:48  
D. Rammer, J. Wacker, T. Hosteng, S. Dählerberg, Y. Deng  
Field testing and structural analysis of a butt-arch covered bridges in Pennsylvania  
09:06  
E. Sorin, F. Lanata, C. Bouadou  
Behaviour of timber structures under variable environment through long-term monitoring  
09:24  
N. Laborid, J. Huidal Mork, S. Hillersøy Dyvik, M. Nilsen, A. Ramnquist, B. Manum  
Experimental and numerical study of the structural performance of a timber gridshell  
09:42  
M. Oppel, M. Jøhres, K. Rautenstrauch  
Non-linear load bearing behavior of girder-supported timber shells

---

**Notes:**
- **Time Table:** 0830 - 1000
- **Location:** WCTE 2016 World Conference on Timber Engineering, August 22-25, 2016 | Vienna, Austria
- **Authors:** Various authors listed for each presentation.
- **Sessions:** PARALLEL SESSIONS | 0830 - 1000
- **Themes:** Joints in timber structures, Modified wood, Hardwood in structural engineering, Computational mechanics, Modeling of structures.

---

**World Conference on Timber Engineering**

August 22-25, 2016 | Vienna, Austria
## Parallel Sessions | Tuesday, August 23

### Time Table | 0830 - 1000

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Wooden facade: A. M. Kailla, E. Jansson, L. Rautkari</td>
</tr>
<tr>
<td></td>
<td>- Cladding boards in wooden facades: selection of wood species, cutting</td>
</tr>
<tr>
<td></td>
<td>- direction, thickness</td>
</tr>
<tr>
<td>08:48</td>
<td>Acoustics in wooden building: H. Reichelt, U. Gerharter, S. Wiederin, R.</td>
</tr>
<tr>
<td></td>
<td>- Maderetbner</td>
</tr>
<tr>
<td>09:06</td>
<td>System level structural design of hybrid structures: J. Nair</td>
</tr>
<tr>
<td></td>
<td>- Mechanical properties of cross-laminated timber accounting for non-</td>
</tr>
<tr>
<td></td>
<td>- bonded edges and additional cracks</td>
</tr>
<tr>
<td>09:24</td>
<td>Seismic performance and standardization of CLT building structures:</td>
</tr>
<tr>
<td></td>
<td>- M. Shahnewaz, T. Tannert, M. S. Akam, M. Popovski</td>
</tr>
<tr>
<td></td>
<td>- In-plane stiffness of CLT panels with and without openings</td>
</tr>
<tr>
<td></td>
<td>- C. Málaga-Chuquitaype, J. Skinner, A. Dowdall, J. Kernohan</td>
</tr>
</tbody>
</table>

### Timber Structures

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Fire safety of structures made of timber and other bio-based products</td>
</tr>
<tr>
<td></td>
<td>- M. Tiso, A. Just</td>
</tr>
<tr>
<td>08:48</td>
<td>Seismic behavior of timber construction: R. Steiger, G. Feltrin, F.</td>
</tr>
<tr>
<td></td>
<td>- Weber, S. Nerbano, M. Motavalli</td>
</tr>
<tr>
<td>09:06</td>
<td>System level structural design of hybrid structures: J. Nair</td>
</tr>
<tr>
<td></td>
<td>- Mechanical properties of cross-laminated timber accounting for non-</td>
</tr>
<tr>
<td></td>
<td>- bonded edges and additional cracks</td>
</tr>
<tr>
<td>09:24</td>
<td>Seismic performance and standardization of CLT building structures:</td>
</tr>
<tr>
<td></td>
<td>- M. Shahnewaz, T. Tannert, M. S. Akam, M. Popovski</td>
</tr>
<tr>
<td></td>
<td>- In-plane stiffness of CLT panels with and without openings</td>
</tr>
<tr>
<td></td>
<td>- C. Málaga-Chuquitaype, J. Skinner, A. Dowdall, J. Kernohan</td>
</tr>
</tbody>
</table>

### Coffee Break

10:20 - 10:30
**Time Table | Tuesday, August 23**

**PARALLEL SESSIONS | 1030 - 1200**

### MAT
**Innovative wood construction and materials at the ETH house of natural resources**
**Andrea Frangi**

- **10:30**
  - J. Ogrizec, F. Wanninger, A. Frangi
  - Post-tensioned timber frames at the ETH house of natural resources

- **10:48**
  - L. Boccadora, S. Zweidler, A. Frangi
  - Timber-concrete composite slabs made of beech laminated veneer lumber

- **11:06**
  - C. Leyder, A. Frangi, E. Chatri
  - Modal vibration testing of an innovative timber structure

- **11:24**
  - H. Guo, B. Michels, I. Burgert
  - An almost transparent inorganic coating for protection of wooden facades against weathering

- **11:42**
  - C. Vailati, I. Burgert, M. Roggeberg
  - Wooden blayers for innovative climate adaptive shading and tracking systems

### COM
**Computational mechanics of wood and wood-based products**
**Anders Olsson**

- **10:30**
  - G. Kandler, M. Lukacevic, J. Füssl
  - From the knot morphology of individual timber boards to the mechanical properties of glued laminated timber

- **10:48**
  - M. Li, J. Füssl, M. Lukacevic, J. Eberhardtseiner, C. M. Martin
  - A numerical limit analysis approach for predicting strength of clearwood

- **11:06**
  - M. Lukacevic, J. Füssl, J. Eberhardtseiner
  - A numerical approach to describe failure of wood - from the wood cell level up to wood-based products

- **11:24**
  - J. Füssl, M. Li, M. Lukacevic, J. Eberhardtseiner, C. M. Martin
  - Three different methods to predict the strength behaviour of clear wood - a performance comparison and basis for a combined approach

- **11:42**
  - A. Briggert, M. Hu, A. Olsson, J. Össonsson
  - Evaluation of three dimensional fibre orientation in Norway spruce using a laboratory laser scanner

### MAT
**Joints in timber structures - Characterization and structural design**
**Thomas K. Bader**

- **10:30**
  - S. Novis, J. Jacks, P. Quenneville
  - Predicting the resistance and displacement of timber bolted connections

- **10:48**
  - A. Misoned, M. Ballerini, J.-W. van de Kuilen
  - Steel-to-steel joints of beech-LVL with very high strength steel dowels

- **11:06**
  - M. Wang, X. Song, X. Gu, Y. Wu
  - Mechanical behavior of bolted glulam beam-to-column connections with slotted-in steel plates under pure bending

- **11:24**
  - A. Lokev, K. Kleijmonová
  - Comments to round timber bolted joints

- **11:42**
  - L.-M. Ottenhaus, M. Li, T. Smith, P. Quenneville
  - Ductility and overstrength of dowelled LVL and CLT connections under cyclic loading

### COM
**Modeling of structures**
**John Naim**

- **10:30**
  - J. R. Jayamon, F. Charmey, F. X. Fores, P. Line
  - Influence of wall load-displacement shape on seismic performance of wood-frame shear wall structures

- **10:48**
  - T. Vogt, W. Seim
  - Evaluation of damping in wood-frame shear wall buildings

- **11:06**
  - E. Ussher, J. Weckendorf, I. Smith
  - Vibration response modelling of cross laminated timber slabs

- **11:24**
  - S. Facchini, J. Hartig, P. Holzer
  - Experimental and numerical investigations on a moulded wooden tube made of beech exposed to lateral vehicle impact

### ARC
**Wooden facade**
**Matti Kairi**

- **10:30**
  - B. Forsthuber, M. Ecker, G. Grull
  - Prediction of colour development of coated wood surfaces during weathering and maintenance

- **10:48**
  - L. R. Gobakken, O. Høibø, G. Vestøl, T. Thiis, L. Burud
  - Weathered wood in building façades – influencing factors and aesthetic aspects

- **11:06**
  - K. Gradei, N. Labonnote, B. Time, J. Köhler
  - A proposed probabilistic-based design methodology for predicting mould occurrence in timber façades

- **11:24**
  - E. Gasparri, G. Giunta, E. Mazzucchelli, A. Lucchini
  - Prefabricated CLT facade systems for fast-track construction and quality assurance

### MAT
**Modulated wood as building material for sustainable constructions**
**Ankit Sinha**

- **10:30**
  - P. v. d. Lugt, F. Bongers, J. Vogtlander
  - Environmental impact of constructions made of acetylated wood

- **10:48**
  - L. Blomqvist, A. Frangi, J. Johansson
  - Temporary buildings in reusable lightweight material design

- **11:06**
  - G. Berger, M. C. Barbù, H. Hubler, J. Berger, G. Schwarzmüller
  - Applying biomimicry in lightweight wood panel development

- **11:24**
  - Panel of strand lumber composite of sugarcane bagasse and plywood

- **11:42**
  - E. M. Tudor, M. C. Barbù, A. Petutschnigg, R. Réh
  - Thin wear layers of tree bark as a substitute for cork in flooring tiles

### ARC
**Building physics and building skins**
**Waldo Bustamante**

- **10:30**
  - S. Pei, A. Khavari, P. C. Tabares-Velasco, S. Zhao
  - Comparative energy consumption study on tall cross laminated timber building for U.S. climates

- **10:48**
  - Timber buildings with enhanced energy and seismic performance for the Mediterranean region

- **11:06**
  - J. Wang, E. Karsh, G. Finch, M. Cheng
  - Field measurement of vertical movement and roof moisture performance of the wood innovation and design centre

- **11:24**
  - J. Bächtiger, R. Musser, J. Bednor, M. Teibinger
  - Influence of an unvented air cavity at the cold side of the insulation in sun exposed wooden flat roofs

- **11:42**
  - S. Günther, A. Ringhofer, G. Schickhofer
  - External thermal insulation composite systems in solid timber construction
## TIME TABLE | Parallel Sessions | 1030 - 1200

### Seismic performance and standardization of CLT building structures
Noahito Kawai

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>MS4-07B: N. Kawai, T. Miyake, M. Yasumura, H. Isoda, M. Koshihara, S. Nakajima, Y. Araki, T. Nakagawa, M. Sato</td>
</tr>
<tr>
<td></td>
<td>Full scale shake table tests on five story and three story CLT building structures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:48</td>
<td>MS4-07B: M. Sato, N. Kawai, T. Miyake, M. Yasumura, H. Isoda, M. Koshihara, S. Nakajima, Y. Araki, T. Nakagawa</td>
</tr>
<tr>
<td></td>
<td>Structural design of five-story and three-story specimen of the shaking table test</td>
</tr>
</tbody>
</table>

### Fire safety of structures made of timber and other bio-based products - COST Action
Birgit A-L Östman

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>MS4-08C: X. Li, C. McGregor, A. Medina, X. Sun, D. Barber, G. Hadjisophocleous</td>
</tr>
<tr>
<td></td>
<td>Real-scale fire tests on timber constructions</td>
</tr>
<tr>
<td>10:48</td>
<td>MS4-08C: D. Barber, R. Crielaard, X. Li</td>
</tr>
<tr>
<td></td>
<td>The key modes of fire spread in wood-framed apartment buildings – a Canadian perspective</td>
</tr>
<tr>
<td>11:06</td>
<td>MS4-08C: K. Calder, P. Senez</td>
</tr>
<tr>
<td></td>
<td>Development of wood-based fireproof buildings in Japan</td>
</tr>
<tr>
<td>11:24</td>
<td>MS4-08C: Y. Hasemi, N. Itagaki, T. Yamaguchi</td>
</tr>
<tr>
<td></td>
<td>Fire performance of mass-timber encapsulation methods and the effect of encapsulation on char rate of cross-laminated timber</td>
</tr>
</tbody>
</table>

### Seismic behavior of timber construction
Andy Buchanan

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>MS4-09C: P. Dechent, G. C. Giuliano, J. D. Dolan, R. Silva, J. Crempien, J. Motamadi, G. Acuña</td>
</tr>
<tr>
<td></td>
<td>Development of a simplified design seismic-resistant method for timber multi story buildings</td>
</tr>
<tr>
<td>10:48</td>
<td>MS4-09C: C. Bedon, G. Rinaldin, M. Fragiacomo, S. Noè</td>
</tr>
<tr>
<td></td>
<td>Finite element assessment of the seismic performance of three dimensional Blockhaus buildings</td>
</tr>
<tr>
<td>11:06</td>
<td>MS4-09C: G. Tamagnone, G. Rinaldin, M. Fragiacomo</td>
</tr>
<tr>
<td></td>
<td>A simplified non-linear procedure for seismic design of CLT wall systems</td>
</tr>
<tr>
<td>11:24</td>
<td>MS4-09C: D. A. Talledo, L. Pozza, A. Saetta, M. Savoia</td>
</tr>
<tr>
<td></td>
<td>Coupled shear-tension numerical model for modeling of CLT connections</td>
</tr>
</tbody>
</table>

### Mixed, composite & hybrid structures
Keith Crews

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>MS4-10A: S. Monteiro, A. Dias, S. Lopes</td>
</tr>
<tr>
<td></td>
<td>New guidelines for design of timber-concrete systems for point and line loads (Extended Lecture)</td>
</tr>
<tr>
<td>10:57</td>
<td>MS4-10A: L. Hu, S. Guerrier-Audair, Y. H. Chui, R. Ramzi, S. Gagnon, M. Mohammad, C. Ni, M. Poposki</td>
</tr>
<tr>
<td></td>
<td>Design method for controlling vibrations of wood-concrete composite floors systems (Extended Lecture)</td>
</tr>
<tr>
<td>11:24</td>
<td>MS4-10A: C. Ui Chulidin, K. Sikora, A. M. Harte</td>
</tr>
<tr>
<td></td>
<td>Influence of connection systems on serviceability response of CLT timber flooring</td>
</tr>
<tr>
<td>11:42</td>
<td>MS4-10A: P. Kuklik, A. Kukliková, A. Gregorová</td>
</tr>
<tr>
<td></td>
<td>Timber-concrete composite structures with mechanical connection systems</td>
</tr>
</tbody>
</table>

### Tall buildings - case studies
Roberto Tomasi

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>MS5-06B: E. Poirier, M. Moudgil, A. Fallahi, S. Staub-French, T. Tannert</td>
</tr>
<tr>
<td></td>
<td>Design and construction of a 53-meter-tall timber building at the University of British Columbia</td>
</tr>
<tr>
<td>10:48</td>
<td>MS5-06B: T. Harley, G. White, A. Dowdall, J. Bawcombe, A. McRobie, R. Steinke</td>
</tr>
<tr>
<td></td>
<td>Dalston Lane - the world's tallest CLT building</td>
</tr>
<tr>
<td>11:06</td>
<td>MS5-06B: M. Mohammad, R. Jones, E. Karacabeyli</td>
</tr>
<tr>
<td></td>
<td>New heights in building with wood: Canada's tall wood buildings demonstration initiative</td>
</tr>
<tr>
<td>11:24</td>
<td>MS5-06B: D. Vassallo, M. Follesa, M. Fragiacomo</td>
</tr>
<tr>
<td></td>
<td>Seismic design of a six-storey CLT building in Florence, Italy</td>
</tr>
<tr>
<td>11:42</td>
<td>MS5-06B: A. Polastri, I. Giorgio, S. Pacchioli, M. Piazza</td>
</tr>
<tr>
<td></td>
<td>Structural analysis of CLT multi-storey buildings assembled with the innovative X-RAD connection system: case-study of a tall-building</td>
</tr>
</tbody>
</table>

### Lunch Break

1200 - 1300
**Time Table | Tuesday, August 23**

**PARALLEL SESSIONS | 1330 - 1500**

### MAT

**Joints in timber structures - Characterization and structural design**

Erik Serrano

- **13:30**
  - H. Danielsen, R. Crocci, P. J. Gustafsson, S. Serrano
  - Brittle failure modes in nailed steel plate connections

**Modified wood as building material for sustainable constructions**

Marius Catalin Barbu

- **13:30**
  - R. Moutou Pitti, S. E. Hamdi, F. Dubois, E. Fournely, M. K. Kuzman
  - Thermo-hydro fracture and viscoelastic behavior of timber based materials: numerical analysis

### COM

**Computational mechanics of wood and wood-based products**

Anders Olsson

- **13:30**
  - G. Balduzzi, G. Hochreiner, J. Füssl, F. Aurichio
  - Performance evaluation of new straightforward formulas for the serviceability analysis of cambered timber beams

**Modeling of structures**

Josef Eberhardtsteiner

- **13:30**
  - T. Claus, W. Seim
  - Multiple tenon - numerical studies on local reinforcement and geometrical optimization

### ARC

**From the Atacama desert to “Tierra del Fuego”: recent developments in the Chilean timber industry**

Juan José Ugarte

- **13:30**
  - W. Bustamante, J. J. Ugorde, F. Encinas, P. Martinez, S. Vera
  - Envelope design in timber housing: technological innovation to promote the use of radiata pine in Chile

**Design practice**

Khaled Saleh Pascha

- **13:30**
  - Z. Tolszczuk-Leclerc, S. Bernier-Lavigne, A. Solenikovich, A. Polvin
  - Design process of a free-form structure using CLT panels - analysis of an architectural large scale structure
**PARALLEL SESSIONS | 1330 - 1500**

**59**

**Time Table | Tuesday, August 23**

**PARALLEL SESSIONS | 1330 - 1500**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
</table>
| 13:30 | Mixed, composite & hybrid structures by Keith Cress (GS4-10B: 1)  
M. Augustin, S. E. Zimmer, T. Bogensperger, T. Sleik  
A contribution to the design of ribbed plates |
| 13:48 | Mixed, composite & hybrid structures by Ting-Ming Young (GS4-10B: 2)  
C. Beaton, M. Fragiacomo  
FE modelling of notched connections for timber-concrete composite structures |
| 14:06 | Mixed, composite & hybrid structures by Keith Cress (GS4-10B: 3)  
M. Kastner, K. Routenstrauch  
Efficient shear transfer in timber-concrete-composite bridges by means of grouting with polymer mortar |
| 14:24 | Mixed, composite & hybrid structures by Ting-Ming Young (GS4-10B: 4)  
M. Khelifa, D. Thi  
Numerical analysis of damage evolution of 3D timber-steel hybrid beams in bending |
| 14:42 | Mixed, composite & hybrid structures by Ting-Ming Young (GS4-10B: 5)  
B. Šubic, G. Fajdiga, J. Lopatnič  
Bending of wooden based hybrid beams: experimental analysis |

**TIME TABLE | Parallel Sessions**

**59**

**Tall buildings - Dynamic performance from measurements of completed structures by Richard Harris (MS4-02)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
</table>
| 13:30 | Tall buildings - Dynamic performance from measurements of completed structures by Richard Harris (MS4-02)  
L. Hu, E. Karsh, S. Gargnon, C. Dagenais, R. Ramzi  
Dynamic performance measured on two 6-storey buildings made from wood structures before and after their completion and occupancy |
| 13:48 | Tall buildings - Dynamic performance from measurements of completed structures by Richard Harris (MS4-02)  
A. Feldmann, H. Huang, W.-S. Chang, R. Harris, P. Dietsch, M. Grafe, C. Hein  
Dynamic properties of tall timber structures under wind-induced vibration |
| 14:06 | Tall buildings - Dynamic performance from measurements of completed structures by Richard Harris (MS4-02)  
S. Rossi, D. Casagrande, S. Bezzi, R. Tomasi  
Response spectrum analysis of light timber-frame buildings by means of an iterative approach |

**TIME TABLE | Parallel Sessions**

**59**

**Fire safety of structures made of timber and other bio-based products - COST Action by Andrea Frangi (FP1404)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
</table>
| 13:30 | Fire safety of structures made of timber and other bio-based products - COST Action by Andrea Frangi (FP1404)  
M. Neumann, T. Kolb, N. Rüther, P. Guindos, L. Hecker, L. Hackl  
Examination of the smoldering combustion behaviour of wood fiber insulation materials |
| 13:48 | Fire safety of structures made of timber and other bio-based products - COST Action by Andrea Frangi (FP1404)  
T. Kolb, M. Neumann, L. Hackl  
Thermal degradation of wood fiber insulation bords – chemical analysis and the effect of flame retardants |
| 14:06 | Fire safety of structures made of timber and other bio-based products - COST Action by Andrea Frangi (FP1404)  
Y. Wang, J. Zhang, L. Li  
Numerical analysis on thermo-mechanical behaviour of timber members under fire-exposure |
| 14:24 | Fire safety of structures made of timber and other bio-based products - COST Action by Andrea Frangi (FP1404)  
L. E. Hasburgh, K. J. Bourne, P. Peralta, P. Mitchel, S. Schiff, W. Pang  
Effect of adhesives and ply configuration on the fire performance of Southern pine cross-laminated timber |

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:30</td>
<td>Break</td>
</tr>
</tbody>
</table>

**TIME TABLE | Parallel Sessions**

**59**

**Realized examples by Robert Malczyk (GS5-03A)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
</tr>
</thead>
</table>
| 13:30 | Realized examples by Robert Malczyk (GS5-03A)  
S. Speigner  
Retirement home - Hallein, Austria |
| 13:48 | Realized examples by Robert Malczyk (GS5-03A)  
S. Winter, J. Haas  
The Kampa Building Innovation Center |
| 14:06 | Realized examples by Robert Malczyk (GS5-03A)  
E. Beneder, A. Fischer  
The wooden parish church in Gallspach: topographical reference and tradition beyond materiality |
| 14:24 | Realized examples by Robert Malczyk (GS5-03A)  
J.-M. Weill  
Paris / Aqualagon-Village Nature / complex wood structural design |
| 14:42 | Realized examples by Robert Malczyk (GS5-03A)  
J.-M. Weill  
Paris / restructurations / hybrid structures / the Halle Pajol project / Françoise Helene Jourda and Raphaele Laure Pertaudin Architects |

**TIME TABLE | Parallel Sessions**

**59**
### POSTER SESSIONS | 15:10 - 16:00

**Time Table | Tuesday, August 23**

<table>
<thead>
<tr>
<th>Time Table</th>
<th>Tuesday, August 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTER SESSIONS</td>
<td>15:10 - 16:00</td>
</tr>
</tbody>
</table>

**Wolfgang Winter**

**Ulrich Schwarz**

**Werner Seim**

#### Joints

**PS1-03: 1 J. Kowalewski, M. Augustin**

SHERPA - standardized timber connection system based on aluminium plates and inclined fully threaded screws

**PS1-03: 6 N. Sekino, Y. Tamaki, K. Hinata, Y. Tajima**

Shear resistance of nailed joints of red pine edge glued panels: single shearing tests focused on corner nails

**PS1-03: 2 K. Wang, Z. Li, M. He**

Investigation into the hysteretic performance of self-centering timber beam-column joints

**PS1-03: 7 S. Matsumoto, H. Okamoto, M. Tokemoto, M. Sato**

Development of assembling large cross-section timber joint system by high ductility wood frame structure

**PS1-03: 3 M. De律, S. Roche, Y. Weinard**

Shear resistance and failure modes of edgewise multiple tab-and-slot joint (MTSJ) connection with dovetail design for thin LVL spruce plywood Kerto-Q panels

**PS1-03: 8 S. Roche, J. Garnero, Y. Weinard**

Multiple tab-and-slot joint: improvement of the rotational stiffness for the connection of thin structural wood panels

**PS1-03: 4 K. Sawata, H. Kawamura, R. Takenashi, Y. Ohashi, Y. Sasaki**

Effects of arrangement of steel plates on strength of dowel-type cross laminated timber joints with two slotted-in steel plates subjected to lateral force

**PS1-03: 9 S. Onishi, Y. Karube, H. Nasu**

Study on control wooden joint rigidity, strength and ductility with combinations of wooden fibre directions

**PS1-03: 5 T. Mori, K. Tanaka, M. Shibao, S. Nishina, Y. Yanase, M. Inoue, H. Isoda**

Estimation of single shear strength of screwed joint after termite attack

**PS1-03: 10 L. Xu, X. Song, H. Wu, J. Cai**

Experimental study on mechanical performance of wood pegged semi-mortise and tenon connections

#### Moisture / durability

**PS1-04: 1 A. Vodicula, M. Maslova, J. Vocelak, P. Mejnek**

Sensor system for continuous moisture monitoring in wooden buildings and structures

**PS1-04: 6 A. Voss, A. Seppänen, S. Siltanen, L. Salokangas, D. Baroudi**

Imaging of moisture content in wood using electrical capacitance tomography

**PS1-04: 2 M. Vanpacohenbeke, J. Van den Bulcke, I. De Windt, J. Van Acker, J. Langmans, E. Vereecken, S. Roels**

An experimental set-up to study mould growth and wood decay under dynamic boundary conditions

**PS1-04: 7 J. Popovic, M. Djiporovic-Momcilovic, M. Popovic, J. Govrilovic-Grmusa**

The influence of chemical treatments on dimensional stability of narrow leaved ash

**PS1-04: 3 A. A. Dias, M. R. Carreira, P. G. d. A. Segundinho**

Influence of moisture content in the evaluation of modulus of elasticity of timber beams using dynamic boundary conditions

**PS1-04: 8 J. Wehsener, C. Brischke, J. Hortig, L. Meyer-Veltrup, P. Haller**

Thermally and thermo-mechanically treated wood for outdoor applications – bending strength, structural integrity and set recovery

**PS1-04: 4 N. Furuta, Y. Hirabayashi, T. Miyuuchi, T. Naito, W. Lee**

Durability of structural laminated veneer lumber in outdoor use

**PS1-04: 9 C. Montero, J. Grill**

Comparison between wood hygromechanical description and deformation modification factors of Eurocode 5

**PS1-04: 5**

#### Cross Laminated Timber (CLT) / Laminated Veneer Lumber (LVL)

**PS1-05: 1 A. Solán Cañada, M. C. Touza Vázquez, F. Arriaga, M. Guaita**

Bending stiffness increasing of existing pitch pine beams by means of LVL reinforcement

**PS1-05: 6 Y. Liu, C. She, X. Miu, C. Zhou, X. Sheng**

Test research on compressive behaviour of poplar LVL column

**PS1-05: 2 N. M. Willey, W. Davids, R. Lopez-Anido, S. Scholer, D. J. Gardner, R. Edgar, M. Tajvidi**

Structural performance of hybrid cross-laminated timber panels using laminated strand lumber and Northeastern U.S. spruce

**PS1-05: 7 J-F. Grandmont, B. Wong**

Composite cross laminated timber (CCLT) made with engineered wood products (EWP) and hardwood


Mechanical performances of hybrid cross-laminated timber fabricated by lumber and LVL

**PS1-05: 8 T. Nagashima, H. Suda, Y. Ide, Y. Ohashi**

Development of I-beam using Kizure panel and LVL

**PS1-05: 4 W. Kambe, M. Nakamura**

An experimental study on bucking strength with laminated veneer lumber of three wood species

**PS1-05: 9 C. H. S. Del Menezzi**

New approaches for production of laminated wood products from tropical woods

**PS1-05: 5 S. Nakajima, A. Miyatake, T. Shibusava, Y. Araki, K. Shinoda, T. Haraishi, Y. Kudo**

Evaluation of buckling strength of cross laminated timber

**PS1-05: 10 S. Hirschmüller, J. Pravida, R. Marte**

Bending stiffness of existing pitch pine beams by means of LVL reinforcement


Laminated veneer lumber poles for temporary soil nailing - investigation of material properties
**Time Table | Tuesday, August 23**

**POSTER SESSIONS | 1510 - 1600**

**AR C**

**Building physics / skin**

PS3-02:1  E. Jansson, M. Venäläinen, E. Verkasalo, A.-M. Kaia, L. Rautkari
Selection of raw material for a demanding wooden façade and the quality control of timber from harvesting to construction site

PS3-02:2  S. Kim, Y.-S. Chong, J.-S. Park
Airtightness and air leakage causes of timber houses in Korea

PS3-02:3  F. Dolezel, M. Neusser, M. Teibinger, B. Nusser
Akustik Center Austria - a research and testing competence for timber constructions

PS3-02:4  I. Burud, K. A. Smeland, T. This, L. R. Gobakken, A. Sandak, J. Sandak, K. H. Liland
Modelling weather degradation of wooden facades using NIR hyperspectral imaging of thin wood samples

PS3-02:5  T. Mizutani, H. Ishiyama
Appropriate shape of timber for the rain

PS3-02:6  A. Pousette, C. Schüller Geissler
Innovative façade elements of wood with modern design and new technology

PS3-02:7  R. Hausamann, S. Franke, M. Schiere, N. Giordano
Development of a long-span self-supporting compact façade system for industrial buildings

PS3-02:8  A. Sandak, J. Sandak, B. Simoes
Bio4ever project approach for modelling of bio-based building materials weathering

**ENG**

**Fire - basics**

PS4-03:1  S. Ali, G. Hadjipsofocleous
Influence of various parameters on the fire performance of concealed shear tap connections between steel columns and a timber beam using full scale tests and finite element modeling

PS4-03:2  W.-T. Liu, M.-T. Tsai, L. Fitzhara
Experimental study on residual compressive strength of bamboo column under fire with different time limitation

PS4-03:3  A. Nicolaidis, R. Emberley, D. Fernandez, J. Torero
Thermally driven failure mode changes in bonded timber joints

PS4-03:4  A. Lowton, R. Emberley, J. Torero
Heat transfer through mass timber connections

PS4-03:5  R. Emberley, Z. Yu, D. Fernandez, J. L. Torero
Delamination occurrence in engineered mass timber products at elevated temperatures

PS4-03:6  G. C. A. Martins, J. Munoz-Neta, C. Call Junior
The charring rate of glulam beams of Brazilian wood species

PS4-03:7  R. Pelanko, G. Turk, S. Huč, T. Hozjan
Reliability of curved timber beam exposed to natural fire

PS4-03:8  S. Zhang, W. Wang, X. Fan
Fire behaviour of dowel-type timber connection with slotted in steel plates under bending and shear

**Seismic**

PS4-04:1  H. Kagikawa, Y. Okada
Study of seismic force exerted on the footing of wooden construction housing in a co-operative housing on hillside

PS4-04:2  H. Sugiyama, N. Kawai, K. Miyazawa, A. Nishimura, T. Takumoto
Shake table tests on full scale timber houses with vibration control devices

PS4-04:3  C. Ni, M. Popovský, J. Wang, E. Karacabeyli
Advanced topics in seismic analysis and design of mid-rise wood-frame structures

PS4-04:4  M. Nakao, T. Inoue, K. Inagaki
Evaluation of seismic performance of mortar finishing external wall with ventilation space

PS4-04:5  M. Sugina, S. Ohmura, S. Tokuoka, Y. Hayashi
Maximum response evaluation of traditional wooden houses based on microtremor measurements

PS4-04:6  C. Fayé, Y. Verdret, S. M. Elachachi
Vulnerability analysis of conventional timber frame walls under seismic action

PS4-04:7  H. Shimizu, Y. Wakashima, Y. Fujisawa
Study on seismic grid walls using compressed wood for its shape recovery behavior

PS4-04:8  K. Yamada
Relative storey displacement homogenization by continuous columns on wooden houses

PS4-04:9  N. Sato, K. Uetsuki, K. Tanaka, T. Hagino, K. Noda, N. Satomura, M. Kashihara, M. Inoue
Development of glulam-column-RC base connection system for multi-stories large-scale timber building

PS4-04:10  J. A. Marin, M. He
Comparison of the seismic performance of different hybrid timber-frame steel frame configurations

**IMP**

**Buildings / examples**

PS5-02:1  A. Campbell, R. Gill, R. Harrison
Design and detailing of timber structures for fitness and gymnasium buildings: experience from Sky-Health & Fitness Centre

PS5-02:2  H. Fujikura
Structural design of a traditional open-air theater stage

PS5-02:3  J. A. Silva
A healthy log housing concept for senior citizens

PS5-02:4  V. Kotradová, B. Kohlíková, M. Boleš
Wood for health care and therapeutic facilities - second generation of wood properties related to increasing of well-being and public health

PS5-02:5  M. Zojec, M. Hainman
Single-family house made of wood and straw

Development of a folding timber bridge for recovery from disasters

PS5-02:7  M. Morandotti, E. Zamperini, V. Cineri
Temporary shelters for the archaeological excavation at Kınık Höyük. Considerations after three years of work

PS5-02:8  B. Misztal
Wooden shell domes

**1610 - 1700**

Poster Discussion & Coffee Break
16:30 COMPANY PRESENTATIONS

16:30 Partner Hasslacher Norica Timber

16:40 Premium Partner KLH Massivbau

16:30 Partner Mayr-Melnhof Holz

16:40 Partner TS3AG / Timbatec

17:00 SEMI-PLENARY LECTURES - SESSION A

17:00 The recovery of wood culture and urban tectonic in Korea
SPL-A: 1 K.-C. Bae, University of Ulsan, Korea

The aim of this article is for the necessity of wood culture and urban tectonic as practical strategy in Korea. Architecture is not mere result of physical form or style but culture of the day combined people's wisdom and thought. Therefore, the recovery of wood culture is important for the future of Korean architecture. The Wood culture is defined as common values, knowledge, norms and lifestyle of the social members who prefer to use wood products, and it is expression of hearts for forest, which embodies emotional and physical value, and thus culture of life and furnish are finally included in wood culture. It is very important for architectural identity to make an urban tectonic which is the art of assembling the local materials used in construction for high-level values. There is a couple of practical progressive strategies, which could promote and expand wooden architecture are necessary. The first strategy is wooden architecture of urban commercial housing or multiple housing, and another is to implement infill wall that can increase energy performance of old apartments needed for redevelopment.

17:30 Wood is good!? - worldwide threats and consequent opportunities for building with wood
SPL-A: 2 S. Winter, Technische Universität München, Germany

Wood is good! - A statement - used by the New Zealand wood promotion - which should face on a World Conference of Timber Engineering no opposition. But - is it true without any restrictions? Aren't there a lot of prejudices of customers and pure rejections from other building industries and often from building authorities? Is the material sustainable available? Are enough skilled workers and fabrication facilities and is enough knowledge available? These and other questions are raised in the presentation and options for possible consequences, further research, development of woodworking industry or education and knowledge spread are given.

18:00 Recent attempts on timber structures in Japan
SPL-A: 3 K. Fujita, M. Koshihara, The University of Tokyo, Japan

This paper attempts to introduce the recent situation of timber structures and timber architecture in Japan. Examples of fire resistant timber structures, light frame construction, new application to public buildings and Cross Laminated Timber structures are introduced and discussed.
17:00 **Opportunities and limits of timber in construction**  
SPL-B: 1 A. Teischinger, University of Natural Resources and Life Science, Austria  

Wood has to be seen as a complex biological structure, a composition of various cell types and chemistries acting together to serve the needs of a living tree which are mechanical support, transport of water, storage and the synthesis of bio-chemicals. All fundamental properties of wood, such as physical, mechanical, chemical, biological as well as the technological utilization of wood as a material are derived from the fact that wood is formed to meet the needs of the living tree. Wood as one of the most traditional materials lost track in the new material design of the synthetically produced materials and composites but new approaches in wood modification and Engineered Wood Products paired with environmental benefits pave the way for a wider application in the building sector. Additionally some trade-offs and limits for an increased future use of wood in the construction sector is discussed.

17:30 **Wood properties from roundwood to timber engineering**  
SPL-B: 2 J.-W. van de Kuilen, TU Munich, Germany  

Measuring and assessing wood properties during the production chain is getting more and more important for an optimal use of the resource. Over the years, research has been performed with the focus on establishing important wood properties, with the final goal of an optimized use in timber engineering. It is recognized that not all research results are easily translated into applications or code provisions. Timber grading, the conversion of grading results into strength class assignments, mechanical properties perpendicular to the grain of soft- and medium dense hardwoods are presented. The influence of density and fastener steel grade on the load carrying capacity of joints is discussed. Time-to-failure behaviour of joints is presented and it is shown that slightly more penalizing duration of load factors are required for joints behaving more brittle. Numerical modelling of joints is shown applying a modified Hill-criterion and a continuum damage mechanics model.

18:00 **Development of engineered wood products - the industry perspective**  
SPL-B: 3 J. Hakkarainen, Metsä Wood, Finland  

Engineered wood products are developed to utilise the advantages of wood materials in the most efficient way. In addition to the material and production efficiency for a commercial success it is important to identify the suitable routes to market and provide the additional services they need. New markets can be created for engineered wood structures based on their main advantages which are the cost competitiveness, fast construction time, light weight and sustainability. There are still needs for joined research and development work of the industry and scientist at least in the following areas: 1. Open building systems for wooden multi storey buildings are needed to make them easier to use. 2. Stability design rules for typically slender engineered wood constructions maybe optimised better. 3. Wood modification for better durability. 3. International model code for fire safety requirements. 4. Measurement methods and requirements that describe better the acoustics in wooden buildings. 5. Measurable comparison information of the environmental performance of engineered wood products.
### Time Table | Wednesday, August 24

#### PARALLEL SESSIONS | 0830 - 1000

**MAT**

**M51 05A**

- **09:05** B.-D. Park, K.-H. Kim, K.-B. Shim, M.-K. Hong
  - Adhesion performance of melamine-urea-formaldehyde resins with various melamine contents for glued laminated timber by high frequency heating system

- **09:24** G. Grütz, A. Wegscheider, J. Konnerth, A. Teischinger, A. Neumüller
  - Planing quality of glulam laminae and its impact on bonding quality and fracture surface characteristics

- **09:42** X. Wang, O. Hagens, B. Sundqvist, S. Ormannsson, H. Wan, P. Niemz
  - Effect of cold temperatures on the shear strength of Norway spruce & Scots pine joints with different glues

**M51 08A**

- **08:30** X. Zhang, M. Popovski, T. Tannert
  - Timber connections by the under-40’s

- **08:48** T. Claus, W. Seim, B. Schröder
  - High-capacity hold-down for tall timber buildings

- **09:06** M. Schick, W. Seim, S. Krüger
  - Multiple tenon - experimental study on load-bearing capacity and deformation characteristics

- **09:24** T. M. Logger, G. Ratscher, G. Schickhofer
  - Dowel-type fasteners with small diameters - review and improvement of design formulations

- **09:42** M. Weigl, D. Strolov, C. Fürhapper, E. Habla, M. Nohava, S. Niedermayer
  - Combined loading of self-tapping screws

**G51 01C**

- **08:30** J. Wacker, C. A. Senalik, X. Wang, F. Jalinoos
  - Structural performance of materials

- **08:48** M.-L. Sortland, T. Kringlebøtn Thøs, D. Kramiotis, K. Vore
  - Moisture induced deformations in prefabricated wooden building modules

- **09:06** B. Franke, S. Franke, M. Schiere, A. Müller
  - Immediate effect of moisture content gradient on apparent modulus of elasticity engineered wood product manufacturers

- **09:24** M. Weigl, D. Strolov, C. Fürhapper, E. Habla, M. Nohava, S. Niedermayer
  - Moisture diffusion in wood - experimental and numerical investigations

- **09:42** M. Weigl, D. Strolov, C. Fürhapper, E. Habla, M. Nohava, S. Niedermayer
  - Wood borne emissions in a real room environment - a modelling approach

**M52 02E**

- **08:30** E. Mergny, R. Matea, M. Esteban, T. Descamps, P. Latteur
  - Computational mechanics of wood and wood-based products

- **08:48** M. Oppel, K. Rautenstrauch
  - Multi-faceted elastic-plastic material behavior with softening and damage

- **09:06** M. Weigl, D. Strolov, C. Fürhapper, E. Habla, M. Nohava, S. Niedermayer
  - An analytical validation of numerically determined load configuration factors

- **09:24** P. Pichler, M. Leitner, F. Grün, C. Guster
  - Experimental evaluation of cutting forces for chipping process and development of wood material model

- **09:42** T.-Y. Kuo, W.-C. Wang
  - Determination of effective modulii of elasticity of wood from proportion of latewood

**G52 03**

  - IT-based architectural design & computer-aided manufacturing

- **08:48** C. Robeller, Y. Weinand
  - Design of glulam structure in the concert hall renovation of the existent concrete building

- **09:06** B. Çökcan, W. Winter, J. Braumann, R. Krobath
  - Additive manufacturing of individualised wood joints – addition

- **09:24** K. Henke, D. Tolle, S. Winter
  - Additive manufacturing of building elements by extrusion of wood concrete

**G53 01A**

- **08:30** M. Morandotti, E. Zapperini, S. Lucenti, M. D’Andrea
  - High-capacity hold-down for tall timber buildings

- **08:48** H. A. Liebich
  - Design of glulam structure in the concert hall renovation of the existent concrete building

- **09:06** G. Eßer, G. Styler-Aydin, G. Hochrein
  - Timbers connections by the under-40’s

- **09:24** W. Rug, G. Linke, A. Lüßner
  - Timber connections by the under-40’s

- **09:42** T. Hisuchi, S. Blumthäir
  - timber connections by the under-40’s

**M54 03**

- **08:30** E. Karsh
  - Design of tall wood buildings for lateral loads

- **08:48** K. Below, F. Sarti
  - Design of tall wood buildings for lateral loads

- **09:06** A. Bernascioni
  - Design of tall wood buildings for lateral loads

- **09:24** M. Johansson, A. Linderholt, K. Jarrner, P. Landel
  - Design of tall wood buildings for lateral loads

- **09:42** M. Weigl, D. Strolov, C. Fürhapper, E. Habla, M. Nohava, S. Niedermayer
  - Design of tall wood buildings for lateral loads

**G54 01C**

- **08:30** J. P. Trembley-Audair, A. Solnikovich, C. Frewer
  - Design of tall wood buildings for lateral loads

- **08:48** J.-P. Trembley-Audair, A. Solnikovich, C. Frewer
  - Design of tall wood buildings for lateral loads

- **09:06** E. Karsh
  - Design of tall wood buildings for lateral loads

- **09:24** M. Johansson, A. Linderholt, K. Jarrner, P. Landel
  - Design of tall wood buildings for lateral loads

- **09:42** M. Johansson, A. Linderholt, K. Jarrner, P. Landel
  - Design of tall wood buildings for lateral loads
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Mixed, composite &amp; hybrid structures</td>
</tr>
<tr>
<td></td>
<td>B. J. Hansen, J. Tan, J. M. Gattas, D. Fernando, M. Heitzmann</td>
</tr>
<tr>
<td>08:48</td>
<td>Grouted joints in timber engineering</td>
</tr>
<tr>
<td>09:06</td>
<td>Development of steel-timber composite system for large scale construction</td>
</tr>
<tr>
<td>09:24</td>
<td>Design of timber-glass structures: the IFAM bridge</td>
</tr>
<tr>
<td>09:42</td>
<td>Timber-steel-composite – a possibility for hybrid structures of long</td>
</tr>
<tr>
<td></td>
<td>span timber floors</td>
</tr>
<tr>
<td>08:30</td>
<td>Structural design and engineering - beams</td>
</tr>
<tr>
<td></td>
<td>Y. Du, M. Mohareb, G. Doudak</td>
</tr>
<tr>
<td>08:48</td>
<td>Post-tensioned LVL beams: experimental results and numerical modelling</td>
</tr>
<tr>
<td>09:06</td>
<td>Comparison of verification and reinforcement concepts for timber beams</td>
</tr>
<tr>
<td></td>
<td>with large round holes</td>
</tr>
<tr>
<td>09:24</td>
<td>Evaluation of effective flange width in the CLT composite T-beams</td>
</tr>
<tr>
<td>09:42</td>
<td>Dynamic characteristics of glulam beam and deck-element floors</td>
</tr>
<tr>
<td>08:30</td>
<td>Structural design and engineering - seismic full scale</td>
</tr>
<tr>
<td></td>
<td>S. Ohmura, Y. Nambu, Y. Shibuya, M. Sugino, Y. Hayashi</td>
</tr>
<tr>
<td>08:48</td>
<td>The seismic reinforcement of traditional wooden building by &quot;the wooden</td>
</tr>
<tr>
<td></td>
<td>built-up seismic wall with rabbit joint&quot;</td>
</tr>
<tr>
<td>09:06</td>
<td>Experimental study on structural response of two story wooden houses</td>
</tr>
<tr>
<td></td>
<td>focusing on dynamic characteristics of each story</td>
</tr>
<tr>
<td>09:24</td>
<td>First considerations on the design approach and criteria for seismic</td>
</tr>
<tr>
<td></td>
<td>resistant moment resisting and bracings timber frames</td>
</tr>
<tr>
<td></td>
<td>Coffee Break</td>
</tr>
<tr>
<td>10:00</td>
<td></td>
</tr>
</tbody>
</table>
### Time Table | Wednesday, August 24

**PARALLEL SESSIONS | 1030 - 1200**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td><strong>MAT</strong> Current progress in adhesive bonding of solid wood</td>
</tr>
<tr>
<td></td>
<td><strong>COM</strong> Computational mechanics of wood and wood-based products</td>
</tr>
<tr>
<td></td>
<td><strong>ARC</strong> Reinforcement of timber elements in existing structures</td>
</tr>
<tr>
<td>10:30</td>
<td><strong>ENG</strong> Seismic design and behaviour of innovative timber systems</td>
</tr>
<tr>
<td>10:30</td>
<td><strong>ENG</strong> Mixed, composite &amp; hybrid structures</td>
</tr>
</tbody>
</table>

#### MAT

**M51 05B**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>P. Niemz, S. Ammann Mechanical performance of glue joints in structural hardwood elements</td>
</tr>
<tr>
<td>10:30</td>
<td>T. Bogensperger, M. Augustin Introduction of concentrated loads in CLT wall elements parallel to plane – analytical model for the determination of stresses and simplification for practice</td>
</tr>
</tbody>
</table>

#### COM

**M52 02F**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Eberhardsteiner BGS1 Computational mechanics of wood and wood-based products</td>
</tr>
</tbody>
</table>

#### ARC

**M53 02A**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>N. Yamaguchi, N. Shibata Reinforcement of dowel type timber joints using cross-laminated CFRP</td>
</tr>
</tbody>
</table>

#### ENG

**M51 01D**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>H. Bauer, G. Schickhofer Structural performance of materials</td>
</tr>
<tr>
<td>10:30</td>
<td>M. O. Amini, J. W. van de Lindt, D. Rammer, S. Pei, P. Line, M. Popovski Determination of seismic performance factors for CLT shear walls systems (Extended Lecture)</td>
</tr>
</tbody>
</table>

#### ENG

**M54 10D**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Keith Crews HS23 Mixed, composite &amp; hybrid structures</td>
</tr>
</tbody>
</table>

#### MAT

**M51 08B**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>A. Hassain, M. Popovski, T. Tannert Shear connections with self-tapping-screws for cross-laminated-timber panels</td>
</tr>
<tr>
<td>10:30</td>
<td>M. Fragiacomo, B. Dujic, I. Sustersic (Extended Lecture) An overview of CLT research and implementation in North America</td>
</tr>
</tbody>
</table>

#### MAT

**M51 05B**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>F. Wolfthaler, M. Augustin Development of a measurement screw and application for laboratory tests and building monitoring</td>
</tr>
<tr>
<td>10:30</td>
<td>N. Yamaguchi, N. Shibata Reinforcement of dowel type timber joints using cross-laminated CFRP</td>
</tr>
</tbody>
</table>

#### MAT

**M51 08B**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>M. Nakashima, A. Kitamori, Y. Araki, H. Isoda Effect of array on tensile load carrying capacity CLT drift pinned joint</td>
</tr>
<tr>
<td>10:30</td>
<td>M. Nakashima, A. Kitamori, Y. Araki, H. Isoda Effect of array on tensile load carrying capacity CLT drift pinned joint</td>
</tr>
</tbody>
</table>

#### MAT

**M51 01D**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>S. Iwamoto, Y. Qiu, W. Wang Flexural strength evaluation of steel jacketed splice-joint timber beams</td>
</tr>
<tr>
<td>10:30</td>
<td>A. Dutu, H. Sakata, Y. Yamazaki, T. Shindo Influence of an AFPR retrofit solution when applied to timber framed masonry panels</td>
</tr>
</tbody>
</table>

#### MAT

**M51 08B**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
</table>

#### ENG

**M51 01D**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:24</td>
<td>J. Kand´ık, V. Bajercakova Investigations on the slip modulus of a notched connection in timber-concrete composite floors</td>
</tr>
</tbody>
</table>

#### ENG

**M54 01A**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:24</td>
<td>S. Iwamoto, Y. Qiu, W. Wang Flexural strength evaluation of steel jacketed splice-joint timber beams</td>
</tr>
</tbody>
</table>

#### ENG

**M54 01A**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:24</td>
<td>J. Balogh High performance CFRP-timber-concrete laminated composite members</td>
</tr>
<tr>
<td>11:24</td>
<td>J. Kan ´dik, V. Bajercakova Investigations on the slip modulus of a notched connection in timber-concrete composite floors</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>Building made of dowel-laminated timber: joint and shear wall properties</td>
</tr>
<tr>
<td>10:48</td>
<td>Wood char development and temperature profile of intumescent fire retardant coated Norway spruce</td>
</tr>
<tr>
<td>11:24</td>
<td>Influence of moisture content on the structural properties of wood under high temperature</td>
</tr>
<tr>
<td>10:30</td>
<td>Structural design and engineering - walls</td>
</tr>
<tr>
<td>10:30</td>
<td>Buildings made of dowel-laminated timber: joint and shear wall properties</td>
</tr>
<tr>
<td>10:48</td>
<td>A comparative analysis of three methods used for calculating deflections for multi-storey wood shearwalls</td>
</tr>
<tr>
<td>11:06</td>
<td>Establishing the failure sequence of light-frame wood stud walls under the effects of blast loads</td>
</tr>
<tr>
<td>11:24</td>
<td>Sandwich panels with stiffeners</td>
</tr>
<tr>
<td>11:42</td>
<td>Hybrid wall-slabs for multi-storey buildings – made of timber with a directly applied mineral cover layer</td>
</tr>
<tr>
<td>10:30</td>
<td>Structural design and engineering - seismic</td>
</tr>
<tr>
<td>10:30</td>
<td>Experimental study on the seismic behavior of wide-board walls in existing traditional wooden structures</td>
</tr>
<tr>
<td>10:48</td>
<td>Lateral testing of glued laminated timber Tudor arch</td>
</tr>
<tr>
<td>11:06</td>
<td>Seismic base shear modification factors for timber-steel hybrid structure: steel moment resisting frames with CLT infill walls</td>
</tr>
<tr>
<td>10:30</td>
<td>The Rose</td>
</tr>
<tr>
<td>10:48</td>
<td>Parametric fabrication of engineered timber products in a pedagogical environment</td>
</tr>
<tr>
<td>11:06</td>
<td>Teaching timber technology to architecture students: real buildings and digital technologies</td>
</tr>
<tr>
<td>11:24</td>
<td>Aalto Wood: interdisciplinary teaching and research</td>
</tr>
<tr>
<td>11:42</td>
<td>Wood on the rise: innovative timber construction systems as a pedagogical framework for teaching sustainable design</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>ARC</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>ARC</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>ENG</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
<tr>
<td>13:30</td>
<td>MAT</td>
</tr>
</tbody>
</table>

**WCTE 2016 World Conference on Timber Engineering**

**August 22-25, 2016 | Vienna, Austria**
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:30</td>
<td>Fire engineering</td>
</tr>
<tr>
<td></td>
<td>Z. Ahmad, S. Aicher, Z. Bakri</td>
</tr>
<tr>
<td></td>
<td>Fire resistance characteristics of glued laminated timber manufactured</td>
</tr>
<tr>
<td></td>
<td>from Malaysian tropical hardwood timber (Malagangai): charring rate</td>
</tr>
<tr>
<td></td>
<td>and fire classification</td>
</tr>
<tr>
<td>13:48</td>
<td>Structural design and engineering - CLT walls</td>
</tr>
<tr>
<td></td>
<td>B. Richardson, D. Hindman</td>
</tr>
<tr>
<td></td>
<td>Lateral resistance of cross-laminated timber panel-to-panel connections</td>
</tr>
<tr>
<td>14:06</td>
<td>Structural design and engineering - CLT walls</td>
</tr>
<tr>
<td></td>
<td>M. A. Kovacs, L. A. Wiebe</td>
</tr>
<tr>
<td></td>
<td>Multifunction timber wall design for high loads: use of reinforced CLT</td>
</tr>
<tr>
<td></td>
<td>thin panel</td>
</tr>
<tr>
<td>14:24</td>
<td>Structural design and engineering - CLT walls</td>
</tr>
<tr>
<td></td>
<td>A. Sandoli, D. Moroder, P. Pompanin, B. Calderoni</td>
</tr>
<tr>
<td></td>
<td>Simplified analytical models for coupled CLT walls</td>
</tr>
<tr>
<td>13:30</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>V. Rajic, R. Zarnic</td>
</tr>
<tr>
<td></td>
<td>Highly energy dissipative and ductile timber-glass hybrid element</td>
</tr>
<tr>
<td>13:48</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>J. Barbalic, V. Rajic</td>
</tr>
<tr>
<td></td>
<td>Numerical evaluation of seismic capacity of structures with hybrid</td>
</tr>
<tr>
<td></td>
<td>timber-glass panels</td>
</tr>
<tr>
<td>14:06</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>K. Saleh Pascha, V. Saleh Pascha, W. Winter</td>
</tr>
<tr>
<td></td>
<td>Geometrical aspects for the design of prefabricated load-bearing</td>
</tr>
<tr>
<td></td>
<td>timber-glass facades</td>
</tr>
<tr>
<td>14:24</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>C. Hackspiel, P. Schober</td>
</tr>
<tr>
<td></td>
<td>Timber-glass composites – new ways of bracing systems in structural</td>
</tr>
<tr>
<td></td>
<td>engineering</td>
</tr>
<tr>
<td>14:42</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>A. Fadai, M. Rinnhofer, W. Winter</td>
</tr>
<tr>
<td></td>
<td>Timber-glass composite beams: experimental study</td>
</tr>
<tr>
<td>13:30</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>S.-J. Lee, K.-B. Shim, K.-M. Kim, S. Kim, Y.-S. Choi, H.-K. Shin, Y.</td>
</tr>
<tr>
<td></td>
<td>Han, M.-J. Park</td>
</tr>
<tr>
<td></td>
<td>Condition assessment of the first vehicular timber bridge in Korea</td>
</tr>
<tr>
<td>13:48</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>J. H. Mork, S. H. Dyvik, B. Manum, A. Rønnquist, N. Labonnote</td>
</tr>
<tr>
<td></td>
<td>Introducing the segment lath - a simplified modular timber gridshell</td>
</tr>
<tr>
<td></td>
<td>built in Trondheim, Norway</td>
</tr>
<tr>
<td>14:06</td>
<td>Mixed composite and hybrid structures - timber glass</td>
</tr>
<tr>
<td></td>
<td>F. Albrecht, B. McCarthy</td>
</tr>
<tr>
<td></td>
<td>Application of innovative engineered driven timber piles at Ararat</td>
</tr>
<tr>
<td></td>
<td>windfarm terminal station</td>
</tr>
<tr>
<td>14:24</td>
<td>Structural design and engineering - bridge constructions</td>
</tr>
<tr>
<td></td>
<td>F. Miebach, D. Nieswirth</td>
</tr>
<tr>
<td></td>
<td>Latest developments in timber bridge constructions</td>
</tr>
<tr>
<td></td>
<td>Kay-Uwe Schober</td>
</tr>
<tr>
<td></td>
<td>H57</td>
</tr>
<tr>
<td>15:00</td>
<td>Break</td>
</tr>
</tbody>
</table>

**Note:** The document includes a schedule for parallel sessions on Wednesday, August 24, covering various topics related to fire engineering, structural design, and hybrid structures.
### POSTER SESSIONS | 1510 - 1600

**MAT**

<table>
<thead>
<tr>
<th>PS1</th>
<th>06</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1-06</td>
<td>M. He, J. Zhang, Z. Li</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Compressive behaviour of timber columns with longitudinal cracks</td>
</tr>
<tr>
<td>PS1-06</td>
<td>H. Nasu, M. Itou, T. Yoshida, K. Terui, H. Kawase</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Study on suppression effect against structural performance degradation of wooden shear walls by using damping materials</td>
</tr>
<tr>
<td>PS1-06</td>
<td>K. Kohara, M. Inada, K. Ito, Y. Kawabata, T. Takada, T. Nomura</td>
</tr>
<tr>
<td>PS1-06</td>
<td>A study on the effect of the visco-elastic damper on the full scale shaking table test</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Y. Wakashima, H. Shimizu, Y. Fujisawa, K. Ishikawa, A. Kitamori, D. Matsubara</td>
</tr>
<tr>
<td>PS1-06</td>
<td>High damping shear walls using wood friction joints</td>
</tr>
<tr>
<td>PS1-06</td>
<td>An innovative hybrid timber structure in Japan: beam-to-beam moment resisting connection</td>
</tr>
</tbody>
</table>

**MAT**

<table>
<thead>
<tr>
<th>PS1</th>
<th>07</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1-07</td>
<td>J.-H. Wu, K.-C. Huang</td>
</tr>
<tr>
<td>PS1-07</td>
<td>Effect of wood acetylation on mechanical properties and extended creep behavior of wood-recycled polypropylene composites using the time-temperature superposition principle</td>
</tr>
<tr>
<td>PS1-07</td>
<td>F. S. Ferro, L. Santos, T. Almeida, F. Icimoto, F. Rocco Lahr</td>
</tr>
<tr>
<td>PS1-07</td>
<td>Performance of OSB panels with different preservative treatments to dry wood termite attack</td>
</tr>
<tr>
<td>PS1-07</td>
<td>A. Zerriaa, M. El Ganaoui, A. TAzibit, S. Gabsi, E. Masson, C. Gerardin</td>
</tr>
<tr>
<td>PS1-07</td>
<td>Physical incorporation of metallic and plastic particles in timber by the nitrogen jet method “JAZOLTHOP”</td>
</tr>
<tr>
<td>PS1-07</td>
<td>H. Ishiyama, M. Nokajima, T. Mori, Y. Noda, T. Tsuchimoto</td>
</tr>
<tr>
<td>PS1-07</td>
<td>Improvement of image analysis - exposure test of surface-treated steel plates on preservative-treated woods</td>
</tr>
<tr>
<td>PS1-07</td>
<td>P. Nakos, C. Achelonoudis, E. Papadopoulou, E. Athanassiadou, E. Karagiannidis</td>
</tr>
<tr>
<td>PS1-07</td>
<td>Environmentally-friendly adhesives for wood products used in construction applications</td>
</tr>
</tbody>
</table>

**MAT**

<table>
<thead>
<tr>
<th>PS1</th>
<th>08</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1-08</td>
<td>M. Gu, W. Pang, M. W. Stoner</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Bending and rolling shear capacities of Southern Pine cross laminated timber (CLT)</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Effect of layups and grades of lumber on bending strength properties of sugi (Cryptomeria japonica) cross laminated timber under in-plane loading</td>
</tr>
<tr>
<td>PS1-08</td>
<td>K. Sullivan, T. Miller, R. Gupta</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Behavior of cross-laminated timber diaphragm panel-to-panel connections with self-tapping screws</td>
</tr>
<tr>
<td>PS1-08</td>
<td>S. Ulyq, K. Shinoda, A. Miyake</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Evaluation of the shear strength of cross-laminated timber under out-of-plane loading</td>
</tr>
<tr>
<td>PS1-08</td>
<td>S.-H. Park, K.-H. Kim, S.-J. Lee, S.-J. Pang</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Bending properties of cross laminated timber with layer arrangement using different species</td>
</tr>
</tbody>
</table>

**Wood modification**

<table>
<thead>
<tr>
<th>PS1</th>
<th>06</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1-06</td>
<td>M.-C. Yeh, Y.-L. Lin, G.-P. Huang</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Moment-resisting performance of residential portal frame constructed with self-tapping screws</td>
</tr>
<tr>
<td>PS1-06</td>
<td>A. Iqbal, S. Popper, M. Fragiacomo, A. Buchanan</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Response of plywood-coupled post-tensioned LVL walls to repeated seismic loading</td>
</tr>
<tr>
<td>PS1-06</td>
<td>M. Hatej, R. Jbara, J. Pośta, P. Kuklik</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Timber structural bar with triangular cross section</td>
</tr>
<tr>
<td>PS1-06</td>
<td>T. Suda, Y. Nomura, H. Tanahashi, Y. Suzuki</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Experimental study on lateral-load resistance mechanism of diagonal-crisscross reinforced lattice</td>
</tr>
<tr>
<td>PS1-06</td>
<td>L. Melzerová, M. Šejnoha</td>
</tr>
<tr>
<td>PS1-06</td>
<td>Influences of distribution of finger joints and timber flaws on the damage evolution of laminated glued timber beams during four point bending</td>
</tr>
</tbody>
</table>

**Cross Laminated Timber (CLT)**

<table>
<thead>
<tr>
<th>PS1</th>
<th>08</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1-08</td>
<td>H. Yagi, S. Shiyoa, E. Tomiyoshi</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Innovative hybrid timber structures in Japan: bending behaviour of T-shaped CLT-to-hybrid timber composite beam</td>
</tr>
<tr>
<td>PS1-08</td>
<td>V. Ballio, D. Godoy, A. Vega</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Experimental and numerical evaluation of cross-laminated timber (CLT) panels produced with pine timber from thinnings in Uruguay</td>
</tr>
<tr>
<td>PS1-08</td>
<td>C. Polanco-Tapia, J. N. Garcia, R. Árevato-Fuentes</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Mechanical performance evaluation for two laminated timber growing in Colombia</td>
</tr>
<tr>
<td>PS1-08</td>
<td>R. Masoudnia, P. Zarrani, A. Hashemi, P. Quenneville</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Introducing new board lamination to cross laminated timber</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Y. Noda, H. Ido, K.-i. Sugimoto, M. Karube, J. Ogiso, A. Miyake</td>
</tr>
<tr>
<td>PS1-08</td>
<td>Short-column compressive strength properties of representative Japanese cross-laminated timber</td>
</tr>
</tbody>
</table>
### Fire - applications

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS4-05:1</td>
<td>T. Naruse, J.-I. Suzuki, T. Mizukami, N. Yasui, M. Kawai, Y. Hasemi</td>
</tr>
<tr>
<td></td>
<td>Fire resistance of cross-laminated timber in Japan</td>
</tr>
<tr>
<td>PS4-05:2</td>
<td>M. P. Giraldo, L. Houarte, J. Sotomayor, A. Lacasta, J. Montón, M. Palumbo, A. Navarro</td>
</tr>
<tr>
<td></td>
<td>Characterization of the fire behaviour of tropical wood species for use in the construction industry</td>
</tr>
<tr>
<td>PS4-05:3</td>
<td>C. Dagenais, L. Osborne, S. Guerin-Aucœur</td>
</tr>
<tr>
<td></td>
<td>Understanding fire performance of wood-concrete composite floor systems</td>
</tr>
<tr>
<td>PS4-05:4</td>
<td>D. Kamiwaka, T. Harada, T. Inada, Y. Kuratomi, I. Shiozaki, T. Murata</td>
</tr>
<tr>
<td></td>
<td>Fireproof tests and heat conduction analyses for development of 2-hour fire resistant structures</td>
</tr>
</tbody>
</table>

### Structures

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS4-06:1</td>
<td>X. Sun, W. Liu, W. Lu</td>
</tr>
<tr>
<td></td>
<td>Experimental investigation on eccentric compression performance of semi-rigid joints in reticulated timber shells</td>
</tr>
<tr>
<td>PS4-06:2</td>
<td>H. Nakaji, Y. Suzuki</td>
</tr>
<tr>
<td></td>
<td>Influence of penetrating tie beams visible from the front of wall on restoring force characteristics of mud-walls</td>
</tr>
<tr>
<td>PS4-06:3</td>
<td>H. Osawa, Y. Sakamaki, N. Michiba, K. Kogawa, T. Makita, S. Takanashi, Y. Ohashi</td>
</tr>
<tr>
<td></td>
<td>Experimental study on the properties of wooden rigid frame with structural plywood wall</td>
</tr>
<tr>
<td>PS4-06:4</td>
<td>R. Ara, H. Nasu</td>
</tr>
<tr>
<td></td>
<td>Study on suppression of performance degradation in bearing shear walls using damping materials</td>
</tr>
<tr>
<td>PS4-06:5</td>
<td>M. Popovski, Z. Chen, B. Gofner</td>
</tr>
<tr>
<td></td>
<td>Structural behaviour of point-supported CLT floor systems</td>
</tr>
</tbody>
</table>

### Teaching / research

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS5-03:1</td>
<td>M. Augustín, T. Lierzer</td>
</tr>
<tr>
<td></td>
<td>Focus on cross laminated timber - the current project programme - “focus, sts” at the holz-bau forschungs gmbh in Graz/Austria</td>
</tr>
<tr>
<td>PS5-03:2</td>
<td>J. T. Christensen, M. F. Christensen, L. Damkilde</td>
</tr>
<tr>
<td></td>
<td>Architectural and structural qualities in timber joints - an attempt to establish a methodology for early conceptual design studies</td>
</tr>
<tr>
<td>PS5-03:3</td>
<td>S. Kawai, A. Tsubuchi</td>
</tr>
<tr>
<td></td>
<td>Evaluating teaching effectiveness using a wooden truss bridge strength contest</td>
</tr>
<tr>
<td>PS5-03:4</td>
<td>D. Hindman</td>
</tr>
<tr>
<td></td>
<td>Wood structures education in North America: survey of content and needs</td>
</tr>
<tr>
<td>PS5-03:5</td>
<td>R. Németh, M. Bok, N. Horváth, J. Ábrahám, F. Fodor, K. Csapar, L. Csóka</td>
</tr>
<tr>
<td></td>
<td>Wood modification related research at the University of West Hungary</td>
</tr>
</tbody>
</table>

### Poster Discussion & Coffee Break

1600 - 1700
17:00 Performance prediction in wood structures: the pitfalls and promise of fundamental mechanics
SPL-C:1 E. Landis, University of Maine, USA

The advantages and disadvantages of different predictive simulation tools, including micromechanics, multi-scale, discrete element, and hybrid approaches are reviewed through the lens of strength prediction. A case is made that we may have backed ourselves into a corner with traditional stress-based characteristics of strength, and that a significant gain can be made through development and deployment of models that are based on physically measurable material structure. Continual advances in sensing and nondestructive measurement techniques mean that moisture, density, local grain variations, and distribution of flaws will be measurable in situ. If the model parameters can be measured in situ, then the model utility is vastly improved by dramatically reducing the number of specimens required for statistical significance. Ultimately this can accelerate code approval of new products, and enhance our ability to develop new structural design details that exploit advantages of new products.

17:30 Determination of sawn timber properties using laser scanning – development potentials and industrial applications
SPL-C:2 A. Olsson, Linnaeus University, Sweden

This paper starts with an overview of methods for machine strength grading of timber being used in industry. It discusses attempts that have been made over the years to improve the accuracy of different grading concepts. Then a newly approved method based on laser scanning and utilization of the tracheid effect is presented. It utilizes high resolution data supplied by an industrial scanner and it gives, in comparison to other methods, very accurate results. Still it is based on several crude assumptions. Therefore the latter part of the paper takes a starting point in the limitations of this scanning based method and discusses what can be done within research and development to reach an even higher grading accuracy. Future work should lead to detailed and accurate models for timber, including geometry of knots, growth layers and fibre orientation in 3D and information of local material stiffness properties, and it should be possible to establish such models for individual boards in productions speed. Some recent and ongoing research that contributes in this direction is discussed. With access to accurate timber models several different strategies for prediction of strength and other engineering properties would be possible.

18:00 The challenges for designers of tall timber buildings
SPL-C:3 A. Buchanan, University of Canterbury, New Zealand

This paper describes several major challenges facing the designers of tall timber buildings. “Tall” in this context generally means 10 storeys or more, although many of the challenges also apply to timber buildings over 4 or 6 storeys, becoming more severe as the buildings get taller. Structural design starts with the selection of structural form and structural materials, the major objective being to control lateral displacements under wind or earthquake loading. The challenges then include the structural engineering difficulties of wind and earthquake design, followed by design for fire safety. Brief reference is made to other design challenges in the areas of longevity, construction and connections. While solutions to all these challenges do exist, they can be difficult to find or implement. Top quality advice and engineering judgement is always required.
17:00 The contribution of wood to climate/energy challenges – resource policy and wood action plan using the example of Switzerland
A. W. Kammerhofer, Federal Office for the Environment FOEN, Switzerland

Wood is an ingenious raw and construction material and offers the possibility for a substantial contribution to solving climate and energy challenges for society, economy and the environment. In order to make this potential available – in political and market context – there is a need for a resource policy approach, a need for cooperation between all state levels and private sectors as well as with other sectoral-policies. Research and development is also necessary for essential innovations (in processes, products, material flow and systems) in addition for product and market development.

17:30 Optimization process in the use of wood and wood-based materials in hybrid and composite structures
M. Piazza, University of Trento, Italy

The structures assembled using different materials are up-and-coming also in the timber construction industry, since these technologies allow to take full advantage of the mechanical characteristics of different materials and to optimize their performances. The examples are many and very different: composite materials, composite elements, hybrid structures. Important examples outside of the world of timber are surely the reinforced concrete elements and the steel-concrete composite structures. In the timber constructions, some interesting applications were made, at the level of material, element, structure, specifically in the field of rehabilitation of old existing structures, where the deficiencies observed are generally ascribed to material decay or insufficient stiffness/strength presented by wooden elements. The strengthening techniques generally resort to the use of new elements or new materials, which are made to collaborate with the original timber member according to various modalities. Other more recent applications involve the use of timber structural elements or sub-structures associated with substructures made with other materials, thus realizing interesting "hybrid" structures.

18:00 From Europe with love
G. C. Williams, Timber Systems Limited, Canada

Over the last two decades or so, increasing familiarity with European creativity in building with wood has excited wood designers and constructors world-wide. This has led to new visions of daring and adventure to change building codes and design standards, establish new manufacturing and distribution channels, all to bring expanded opportunities to work with wood that Vogue Paris describes as "a trendy product...undoubtedly one of the most elegant building materials". This paper will examine how the North American exposure to European product development and production techniques has contributed to the explosion of interest and vigour to challenge well established barriers to build with materials other than steel or concrete in non-residential construction.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>MAT G51 01F</td>
<td>Structural performance of materials</td>
<td>Gerhard Dill-Larger</td>
<td>H541</td>
</tr>
<tr>
<td>08:30</td>
<td>MAT G51 01G</td>
<td>Structural performance of materials - connections</td>
<td>Till Vallée</td>
<td>H550</td>
</tr>
<tr>
<td>08:30</td>
<td>COM G52 02A</td>
<td>Modeling of materials</td>
<td>John van de Lindt</td>
<td>BIG1</td>
</tr>
<tr>
<td>08:30</td>
<td>ENG M50 01C</td>
<td>Seismic design and behaviour of innovative timber systems</td>
<td>Massimo Fragiacomo</td>
<td>HS31</td>
</tr>
</tbody>
</table>

**MAT G51 01F**

- 08:30: G. Stecher, R. Maderebner, P. Zingerle, M. Flach, A. Krauer
- 08:48: D. Buck, K. Wang, O. Hagman, A. Gustafsson
- 09:05: S. Aicher, M. Hirsch, Z. Christian

**MAT G51 01G**

- 08:30: J. Roubé, T. Costa, F. Moro, G. Tonoli, C. H. S. Del Menezzi
- 09:05: S. Koch, P. Guindos, G. Wisner, A. Zillesen, F. Fischer, M. Brodel
- 09:42: M. Gong, Y. H. Chu, L. Li

**COM G52 02A**

- 08:30: J. Viguer, G. Pot, L. Béron, R. Collet

**ENG M50 01C**

- 08:30: H.-E. Blomgren, J.-P. Koppitz, A. Diaz Velazquez, E. Ko
- 09:05: C. A. Anranga, J. M. Branco, P. B. Lourenço, G. Flatscher, G. Schickhofer
- 09:24: M. Schick, W. Seim

**ENG M50 01D**


**ENG M54 03G**

- 08:30: A. Hashemi, W. P. Luo, R. Masoudinia, P. Zarrani, P. Quemeneur
- 08:48: J. Wang, M. Mohammad, B. Di Lenardo, M. Sultan
- 09:24: J. B. Chapman, Q. Mu, V. Pham, J. Whitehead

**COM G52 02A**

- 08:30: J. Viguer, G. Pot, L. Béron, R. Collet

- 08:48: Various boundary connections when subjected to blast loads
- 09:06: Further development of cross laminated timber (CLT) – mechanical tests on 45° alternating layers
- 09:06: Hybrid beech and spruce cross-laminated timber

- 08:30: Resistance of bonded joints of Eucalyptus sp. with resorcinol-formaldehyde resin modified by the addition of silica nanoparticles (nano-SiO2)
- 08:48: Factors that lead to failure with wood adhesive bonds
- 09:06: Soy protein substitution in phenol formaldehyde adhesive used in oriented strand board
- 09:42: Evaluation of adhesive bond strength of two-layer asymmetric cross-laminated LSL specimens

- 08:30: A novel timber dowel-type connection using shape memory alloy
- 08:48: Contact joints in engineered wood products
- 09:06: Employing super-elastic alloy to enhance the damping and re-centering capacity of a single bracket unit in traditional temples in Asia
- 09:24: Adhesive bonded steel connectors for moulded wooden tubes in spatial truss structures
- 09:42: Investigating the dynamic response of light-frame wood stud walls with various boundary connections when subjected to blast loads

- 08:30: The heavy timber buckling-restrained braced frame as a solution for commercial buildings in regions of high seismicity
- 09:06: Structural possibility of CLT panel constructions in high seismic area
- 09:24: Finite element modelling of the cyclic behaviour of CLT connectors and walls
- 09:24: Local energy dissipators for skeleton structures - testing results and design considerations
- 09:42: Experimental investigation of self-centering cross laminated timber walls

- 08:30: Non-linear connection models in timber engineering
- 08:48: Numerical modelling of steel-to-timber joints and connectors for CLT structures
- 09:06: Cyclic testing and simulation of hold down connections in radiata pine CLT shear walls
- 09:24: Pressure-overclosure law for the simulation of contact in spruce joints
- 09:42: An analytical, numerical and experimental study of non-metallic mechanical joints for engineed timber constructions

- 08:30: Ductile cross laminated timber (CLT) platform structures with passive damping
- 08:48: CLT panels subjected to combined out-of-plane bending and compressive axial loads
- 09:06: Mechanical characterization and seismic behaviour of cross laminated timber panels made of Chilean radiata pine
- 09:24: Test method for determining the in-plane shear strength and stiffness of cross laminated timber (CLT)
- 09:42: Integrating CLT panels for building cores: introduction, rocking response & foundation connection testing
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Abstract/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>ENG</td>
<td>Sustainable modular building systems in wood</td>
<td>Michael Flach</td>
<td>Prefabrication – the future of North American wood frame construction</td>
</tr>
<tr>
<td>08:48</td>
<td>IMP</td>
<td>Developments in wood engineering education</td>
<td>Mikhail Gershfeld</td>
<td>Learning by doing: a joint studio experiment on the theme of timber building design</td>
</tr>
<tr>
<td>09:06</td>
<td>IMP</td>
<td>Human perception and health in wooden buildings</td>
<td>Elisabet Cronhjort</td>
<td>Latent heat sorption phenomena in three building materials: American spruce (Picea Abies), gypsum board, and concrete</td>
</tr>
<tr>
<td>09:24</td>
<td>IMP</td>
<td>Coffee Break</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PARALLEL SESSIONS | 0830 - 1000**

**TIME TABLE | Thursday, August 25**
**Time Table | Thursday, August 25**

**PARALLEL SESSIONS | 1030 - 1200**

---

**MAT**  
**Structural performance of materials**  
Anders Olsson  
**ENG**  
**Seismic design and behaviour of innovative timber systems**  
Shiling Pei

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>A. Kraller, W. Beikircher</td>
<td>GS1-01H2</td>
</tr>
<tr>
<td>10:48</td>
<td>D. N. Lacrocq, G. Doudak</td>
<td>GS1-01H2</td>
</tr>
<tr>
<td>11:06</td>
<td>D. N. Lacrocq, G. Doudak</td>
<td>GS1-01H3</td>
</tr>
</tbody>
</table>

---

**MAT**  
**Structural performance of materials - connections**  
Leander Bathon  
**ENG**  
**Glued-in rods – Application and design rules**  
Vlatka Rajcic

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>L. Bathon, F. Diehl, O. Blatt-Mühldorfer, J. Schmidt, M. Weil</td>
<td>GS1-01D1</td>
</tr>
<tr>
<td>10:48</td>
<td>J. Liu, F. Lam</td>
<td>GS1-01D1</td>
</tr>
<tr>
<td>11:06</td>
<td>P. Zarnani, P. Quinnville</td>
<td>GS1-01D1</td>
</tr>
<tr>
<td>11:24</td>
<td>G. Doudak</td>
<td>GS1-01D1</td>
</tr>
</tbody>
</table>

---

**COM**  
**Computational modeling of joints in timber structures**  
Jose Manuel Cabrero  
**ENG**  
**Structural design and engineering - floors**  
Alexander Salenikovich

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>A. Livingstone, P. Pattakas, M. Milne, S. Smith, R. Hirstans</td>
<td>MS2-01C2</td>
</tr>
<tr>
<td>11:06</td>
<td>W. Billersteiner</td>
<td>MS2-01C3</td>
</tr>
<tr>
<td>11:24</td>
<td>Z. Ling, W. Liu, H. Yang, W. Lu</td>
<td>MS2-01C4</td>
</tr>
<tr>
<td>10:30</td>
<td>G. Hochreiner, G. Eßler, G. Styhr-Aydin</td>
<td>GS4-03A1</td>
</tr>
<tr>
<td>10:48</td>
<td>D. Stefanoudakis, A. Fadai, W. Winter</td>
<td>GS4-03A2</td>
</tr>
<tr>
<td>11:24</td>
<td>Y. Hayashi</td>
<td>GS4-03A4</td>
</tr>
</tbody>
</table>

---

**COM**  
**Modeling of materials**  
Lech Muszyński  
**ENG**  
**Structural design and engineering - historic**  
Minjuan He

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>P. Guindos, C. Avez, T. Vallée, T. Tannert</td>
<td>MS4-06E2</td>
</tr>
<tr>
<td>10:48</td>
<td>M. Quenneville</td>
<td>MS4-06F2</td>
</tr>
<tr>
<td>11:24</td>
<td>Y. Hayashi</td>
<td>MS4-06F4</td>
</tr>
<tr>
<td>11:42</td>
<td>A. Angeli, P. Salenikovich</td>
<td>MS4-06F5</td>
</tr>
</tbody>
</table>

---

**Notes:**

- **MAT** denotes Mathematics
- **ENG** denotes English
- **COM** denotes Computer Science
- **WCTE 2016** denotes World Conference on Timber Engineering

---

**WCTE 2016**  
World Conference on Timber Engineering  
August 22–25, 2016 | Vienna, Austria
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Sustainable modular building systems in wood</td>
<td>Michael Flach</td>
</tr>
<tr>
<td>10:30</td>
<td>Developments in wood engineering education</td>
<td>Peggi Clouston</td>
</tr>
<tr>
<td>10:30</td>
<td>F. Riola Parada, W. Winter, K. Tavousssi</td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>P. Clouston, A. Schreyer</td>
<td></td>
</tr>
<tr>
<td>10:48</td>
<td>K. Tavoussi, W. Winter, A. Bradley, F. Riola Parada</td>
<td></td>
</tr>
<tr>
<td>10:48</td>
<td>C. Barnes, M. Karn-Biron, U. Okoye, B. Perkins</td>
<td></td>
</tr>
<tr>
<td>11:06</td>
<td>A. Valadbeigi, P. Zarnani, P. Quenneville</td>
<td></td>
</tr>
<tr>
<td>11:06</td>
<td>M. Schultz, M. Gershfeld</td>
<td></td>
</tr>
<tr>
<td>11:24</td>
<td>S. Salem</td>
<td></td>
</tr>
<tr>
<td>11:24</td>
<td>The R&amp;D (Research and Design) studio: a model for integrated design studios fostering material innovation</td>
<td></td>
</tr>
<tr>
<td>11:42</td>
<td>C. Koj, M. Trautz, A. Pranjic</td>
<td></td>
</tr>
<tr>
<td>11:42</td>
<td>Spread the knowledge: educational strategies implemented in Quebec to support the expertise in wood design</td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>S. Shioya, T. Koga, Y. Kumon, K. Outsuki, K. Uchimura</td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>An innovative hybrid timber structure in Japan: performance of column and beam</td>
<td></td>
</tr>
<tr>
<td>10:48</td>
<td>C. Gilbert, J. Erochko</td>
<td></td>
</tr>
<tr>
<td>10:48</td>
<td>Adaptation of advanced high R-factor bracing systems into heavy timber frames</td>
<td></td>
</tr>
<tr>
<td>11:06</td>
<td>V. Schmid, O. Vádiz</td>
<td></td>
</tr>
<tr>
<td>11:06</td>
<td>Constructive wood protection for modern timber structures with polyurethane thick film coatings</td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>N. S. Bergen</td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td>Case study of UBC Brock Commons - construction details and methods</td>
<td></td>
</tr>
<tr>
<td>10:48</td>
<td>J. d. N. Bastos</td>
<td></td>
</tr>
<tr>
<td>10:48</td>
<td>An heritage manège building – a timber roof structure design and detailing</td>
<td></td>
</tr>
<tr>
<td>11:06</td>
<td>Y. Lu, K. Namiwai</td>
<td></td>
</tr>
<tr>
<td>11:24</td>
<td>P. Fast, B. Gafner, R. Jackson, J. Li</td>
<td></td>
</tr>
<tr>
<td>11:24</td>
<td>Case study: an 18 storey tall mass timber hybrid student residence at the University of British Columbia, Vancouver</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>Break</td>
<td></td>
</tr>
</tbody>
</table>
# Time Table | Thursday, August 25

## CLOSING & PLENARY LECTURE

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:10</td>
<td><strong>Timber awakening in America</strong></td>
</tr>
<tr>
<td>12:10 - 12:40</td>
<td><strong>PLENARY LECTURE SESSION B</strong></td>
</tr>
<tr>
<td>12:10 - 12:40</td>
<td>G. Epp, Structurecraft, Canada</td>
</tr>
<tr>
<td>12:10 - 12:40</td>
<td><strong>PL-B:1</strong></td>
</tr>
<tr>
<td>12:40 - 13:00</td>
<td><strong>Closing</strong></td>
</tr>
<tr>
<td>13:00 - 14:00</td>
<td><strong>Farewell</strong></td>
</tr>
<tr>
<td>14:00 - 21:00</td>
<td><strong>Technical Tour Timber in Vienna</strong> Group 1</td>
</tr>
<tr>
<td>14:00 - 21:00</td>
<td><strong>Technical Tour Timber in Vienna</strong> Group 2</td>
</tr>
</tbody>
</table>

## Friday, August 26

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 - 20:15</td>
<td><strong>Technical Tour Along the Danube</strong> Group 1</td>
</tr>
<tr>
<td>8:00 - 20:15</td>
<td><strong>Technical Tour Along the Danube</strong> Group 2</td>
</tr>
<tr>
<td>8:00 - 21:00</td>
<td><strong>Technical Tour Graz</strong> one day tour</td>
</tr>
<tr>
<td>8:00 - 21:00</td>
<td><strong>Technical Tour Graz and Carinthia</strong> two day tour</td>
</tr>
</tbody>
</table>

Being endowed with a wealth of timber, America has a long history of its use in construction. By the end of the nineteenth century, cities were building multi-storey commercial buildings using heavy timber, and, because of fire concerns, were building large floor plates out of what we would now call mass timber. With advances in structural steel and then reinforced concrete, such use died out. However, the recent development in Europe of prefabricated mass wood panels, along with wood's natural aesthetics and sustainability features, has led to renewed interest in North America. With the 2008-2014 recession behind us, American developers and architects are now pursuing mass timber with vigour.