

COST Action FP1004 with TU Graz

Focus Solid Timber Solutions

European Conference on Cross Laminated Timber (CLT)

The State-of-the-Art in CLT Research



May 21-22, 2013

Graz University of Technology, Austria

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ECOST-MEETING-FP1004-210513-028873

ISBN Number: 1 85790 181 9

Published by The University of Bath

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Preface

The hosting and the organisation of scientific conferences is an important field of activity for internationally operating institutes. Furthermore, this is an inherent role for Universities and should be seen as self-evident. It is also the mission of COST Actions to organise meetings, which enable the international research community to hold a scientific discourse on current interdisciplinary topics. This opportunity has to be emphasised, especially in times of increasing application-oriented research activities. With regard to that, it can be said: Individual freedom of research starts where externally demanded convenience ends.

By playing an active role in the frame of COST actions in the past, Graz University of Technology in general, and the Institute of Timber Engineering and Wood Technology in particular, show their regard for international scientific networking. The organisation of a workshop in the frame of COST action E55 “Modelling of the Performance of Timber Structures” at Graz University of Technology in the year of 2007 and, especially, the contribution “Solid timber construction – A construction system for residential houses, office and industrial buildings” in the frame of the final workshop of COST action E5 “Timber frame building systems” in Venice, in the year of 2000, are worth mentioning in this context. The latter topic, seen as an exotic side issue in the year of 2000, is now – one decade later – easily filling up daily conference programs and large auditoriums. Furthermore, it has grown to an economically significant area of R&D in wood sciences. This is also the link to the very successful on-going COST action FP1004, under the leadership of my colleague Richard Harris. The aim of this CLT COST conference at Graz University of Technology is the summarised demonstration of the European state-of-the-art on this topic, combined with the wish to hold an open discourse, which will lead to further progress in research and development.

I’m also happy to note that we will welcome a worldwide enthusiastic CLT community here in Graz, which is a result of this co-organised event. The conference should thus be seen as a contribution to a high-quality and open scientific dialogue with this community. Bernard of Chartres used to say:

‘...we are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size.’

With regard to this, the current state-of-the-art of the topic CLT, in connection with our own and further scientific activities in this research field, should be seen as the foundation for following generations and provides those basics which are necessary for further innovation.

Gerhard Schickhofer

May 2013

The orthotropic properties of timber are well known – strong and stable along the grain, weak and susceptible to movement across the grain. By placing laminations across the grain, Cross Laminated Timber uses this anisotropy to advantage, enhancing the mechanical properties of wood, by using wood.

This elegant solution has led to Cross Laminated Timber being the most significant recent innovation in timber engineering. It has opened the potential for new construction types, including tall timber buildings. Through their work at TU Graz, Professor Gerhard Schickhofer and his team continue to lead the world in research in the field.

COST Action FP1004, “*Enhance mechanical properties of timber, engineered wood products and timber structures*” provides a network for learning and development in a range of connected topics, which includes Cross Laminated Timber. This conference, with its proceedings, will record the State-of-the-Art of Cross Laminated Timber and its use. In working with TU Graz to host this Conference, the COST Action is able to bring researchers together, from around the world to learn about Cross Laminated Timber and its applications, as well as to take part in discussions about future research and development.

The structure of this conference is based around the material and its use. The topics move from manufacture, through design to application. What are the threats faced by CLT? What are the opportunities? The culture of COST Action FP1004 is to encourage involvement of delegates and the Day 1 programme includes time for debate and discussion between delegates and the expert speakers.

The conference starts, where all engineering studies should start, with an analysis of the material. What is the State-of-the-Art in manufacturing this material? How can manufacture be applied to more species, to low-cost production from wood available local to its use? How are the engineering properties of the manufactured product predicted and assured?

The conference will move on to design and construction. Presentations on the implementation of Ultimate Limit State, and Serviceability Limit State, methods for reinforcing against local high stresses with screws and the design of connections will provide the latest knowledge.

In seismic design, the use of Cross Laminated Timber produces enormous benefits. Obviously, use of a sustainable material is of great advantage but, in addition, Cross Laminated Timber lays out new opportunities for building systems, which remain serviceable, whilst dissipating energy. Three presentations on seismic behaviour set down cutting-edge understanding for this topic.

TU Graz has led the world in the application of CLT to building systems. Their work in developing an understanding of environmental performance of building fabric, incorporating CLT, has been fundamental to success of the material. The use of Cross Laminated Timber to create the tallest modern timber structures in the world opens opportunities that could not have been imagined ten years ago. The latest of these structures, under construction in Australia, could not have been contemplated five years ago. In the final session, learning about this project from its designer, together with learning about lower rise, more local but equally impressive buildings, will bring Day 1 and the formal part of the conference to a fitting conclusion.

Day 2 will provide the opportunity to visit one of the Austrian Cross Laminated Timber manufacturing plants as well as seeing the use of CLT in construction.

The purpose of the COST programme is to strengthen Europe in scientific and technological research, for peaceful purposes, through the support of cooperation and interaction between European researchers. It is based on an inter-governmental agreement, which has proved to be a highly successful way to spread awareness and build networks between Europe's researchers. It helps researchers to share not only the results of their work but also their aims and methods. It is open to global cooperation in the mutual interest and builds bridges between research communities.

This conference adheres to these principles. It will be an extraordinary opportunity to hear presentations from highly specialist, invited speakers and to participate in debate. To ensure the opportunity for discussion, numbers are strictly limited and early application for a place is essential. For those unable to attend in person, the proceedings will record the State-of-the-Art.

Richard Harris

Chair COST Action FP1004

May 2013

About COST Action FP1004

Timber and wood-based engineered products are becoming very important as structural materials, especially in the drive towards sustainable technologies and construction. For structural wooden products, it is very important to improve their properties to be more competitive and reliable as a sustainable low-carbon material and a major contributor to affordable buildings. This applies particularly to larger, more complicated structures where timber is becoming a realistic alternative.

This Action aims to boost the performance of structural timber products/construction, thereby improving use of timber in construction in existing and new applications. This includes the enhanced predictability and reliability of timber structures. Improving the mechanical performance of connections and reinforcing timber in weak zones are large-scale research domains in Europe, which will require coordination and scientific/engineering approaches. This COST Action will deliver increased knowledge of improving strengthening, stiffening and toughening techniques, modelling enhanced performance and experience in real projects to create new opportunities for timber construction. Exchanging information will highlight gaps in knowledge and inform future work and potential collaboration between research groups, supporting timber construction and its wider uptake in the European construction industry. This Action may also create opportunities for patenting possible new technologies and products for reinforcing timber mechanical properties.

The scientific programme is divided into three main scientific areas, expressed as Work Groups (WG) with the same aims but different perspectives:

WG 1: Enhance performance of connections and structural timber in weak zones

WG 2: Enhance the mechanical properties of heavy timber structures with a particular emphasis to timber bridges

WG 3: Modelling the mechanical performance of enhanced wood-based systems

COST Action FP1004 website: <http://costfp1004.holz.wzw.tum.de/>

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Acknowledgements

I would like to express my gratitude to all who voluntarily and with no or limited funding have contributed to this conference and the proceedings.

There is an enormous amount of work that goes into hosting a conference of this size. In addition to the formal presentation of papers, there will be factory and site visits. Many thanks to the administration team at TU Graz, led by Hildegard Weißnar, who have managed the conference registration and organisation.

A special thank you goes to Andreas Ringhofer, who has been vital to the success of the Conference. He has helped manage the submission and editing of papers, has been the link between the COST Action FP1004 and TU Graz and has been part of the organisation team. Thank you to Massimo Fragiaco, who helped with the Theme 3 papers on seismic behaviour, and to Reinhard Brandner who helped edit the papers from TU Graz. Thank you also to Professor Gerhard Schickhofer, who suggested, at our first meeting in 2011, that COST Action FP1004 hold a conference on Cross Laminated Timber and readily agreed to host this conference at TU Graz, the home of CLT.

Richard Harris
May 2013

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Gerhard Schickhofer studied civil engineering at Graz University of Technology and graduated with distinction in 1990 (diploma) and 1994 (doctorate). For his research work he has received different awards (e.g. Josef-Umdasch-Award for his doctoral thesis on “Cross-Laminated Timber” in 1995, the Research Funding Association Award in the area “added value” also for “Cross-Laminated-Timber“ in 1998 and the European Innovation Award for the project “Tanno meets Gemini” in 2004), in his field of activity he has published more than 230 publications and given numerous speeches. In 1999 he habilitated and became an associate professor, between 2002 and 2012 he was manager and scientific director of the Competence Centre “holz.bau forschungs gmbh”. In 2004 he was appointed to a professorship and became the head of the Institute of Timber Engineering and Wood Technology at Graz University of Technology. During his career Prof. Schickhofer was involved in transfer activities in form of more than 20 conferences, workshops and seminars, and has supervised more than 120 diploma theses and numerous doctoral theses.

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Richard Harris after graduating from the university of Bristol in 1972, worked for 12 years in civil engineering construction, in UK and overseas. In 1984, he joined Buro Happold in Bath as a Structural Engineer. Twenty-five years later, in 2009, he moved to the position of Professor of Timber Engineering at the University of Bath. With Buro Happold, as well as working on the design of building structures in other materials, he was responsible for a number of timber engineering projects, including the Globe Theatre, the Downland Gridshell, the Savill Building gridshell, the Pods Scunthorpe and the WISE development at the Centre for Alternative Technology. As Professor of Timber Engineering at the University of Bath, he is responsible for teaching and research. His research includes tall timber Structures, pre-fabrication of timber structures, metal-free connections in timber structures, timber gridshells, folded-plate timber structures, timber-concrete composites, dynamic response of timber structures and the use of local timber, including Douglas fir. As Chair of COST Action FP1004, he is working in helping to integrate international research in the field of reinforcement of timber structures.

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Andreas Ringhofer studied Civil Engineering Sciences with Environment and Construction Management (bachelor programme) and Civil Engineering Sciences and Structural Engineering (master programme) at Graz University of technology. He earned a diploma degree in 2010. From 2011 to 2012 he worked as Project-Assistant and since 2012 he has been Univ.-Assistant at the Institute of Timber Engineering and Wood Technology at Graz University of Technology. His research topics are timber engineering and wood technology, especially connection techniques with self-tapping screws. This is also the topic for his PhD, which he is working on.

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