



Basis of Structural Timber Design  
from Research to Standards



Member fact sheets WG3

# **COST Action FP1402 “Basis of Structural Timber Design from Research to Standards”**

## **Working Group 3**

### **“Connections”**

#### **Member fact sheets**



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**Dr. Jørgen Munch-Andersen – WG3 Leader (Denmark)**

Danish Timber Information  
Lyngby, Denmark

[jma\(at\)traeinfo.dk](mailto:jma@traeinfo.dk)

COST FP1402, MC Member, WG3 Leader



<i>Personal</i>		<i>Organisation</i>		
Years of experience in relevant field: 10 Expertise: Design of connections, Statistical data analysis, Loads, Performance requirements Degree: PhD (31.10.1989)		Danish Timber Information ( <a href="http://www.traeinfo.dk">www.traeinfo.dk</a> ) Focus: practical research / innovation and education / training Facilities: None		
		No. of staff	PhD students	MSc/year
		5	0	1
<i>Research projects</i>				
Running projects (Jørgen Munch-Andersen): - Background for development of EC5 - Maintenance of the webpage CIB-W18.com - Development of the programme SØMDIM for calculating the load-carrying capacities of fasteners				
<i>Publications</i>				
– Svensson, S., Munch-Andersen, J.: Study on the Rope-effect on the Load-carrying Capacity of Nailed Connections. In: Proc. of 1st INTER meeting. Bath, UK, 1 - 4 Sept. 2014. – Munch-Andersen, J., Svensson, S.: Fasteners and connections in the next Eurocode 5. In: Proc. of CIB W18 meeting 46. Vancouver, Canada, 25 - 29 Aug. 2013. – Munch-Andersen, J., Svensson, S.: The withdrawal strength of 8 threaded nails types. In: Proc. of CIB W18 meeting 45. Växjö, Sweden, 26 - 30 Aug. 2012. – Munch-Andersen, J., Sørensen, J. D.: Pull-through capacity in plywood and OSB. In: Proc. of CIB W18 meeting 44. Alghero, Italy, 29 Aug. - 1 Sept. 2011. – Munch-Andersen, J., Sørensen, J. D., Sørensen, F.: Estimation of load-bearing capacity of timber connections. In: Proc. of CIB W18 meeting 43. Nelson, New Zealand, 22 - 26 Aug. 2010.				

**Dr. Carmen Sandhaas – WG3 Vice leader (Germany)**

Karlsruhe Institute of Technology (KIT)

Karlsruhe Germany

[sandhaas\(at\)kit.edu](mailto:sandhaas(at)kit.edu)

COST FP1402, MC Member, WG3 Vice Leader

*Personal*

Years of experience in relevant field: 5

Expertise: wood material and joint modelling, execution of tests, seismic behaviour of timber buildings

Degree: PhD (01.06.2012)

*Organisation*Institute for Timber Structures and Building Construction ([www.vaka.holz.kit.edu](http://www.vaka.holz.kit.edu))

Focus: theoretical and practical research/innovation and education, training.

Facilities : testing lab (joint and element tests, shear wall tests, monotonic and cyclic tests, all relevant tests on fasteners), measuring equipment, drying chambers

No. of staff	PhD students	MSc/year
21	5	30

*Research projects*

## WG2 CLT:

Contact joints in CLT (Tobias Schmidt)

CLT Beams (Marcus Flaig)

## WG3 connections:

High-performance joints for engineered softwood and hardwood structures (Marcus Enders-Comberg)

Mechanical performance of timber joints with slotted-in steel plates (Carmen Sandhaas)

*Publications*

## WG2 CLT:

Flaig, M., 2014, 'Design of CLT beams with rectangular holes and notches', Paper 47-12-4, Meeting 47 of International Network on Timber Engineering Research (INTER), Bath, United Kingdom, pp. 193-207.

Flaig, M., Blaß, H. J., 2014, 'Bending strength of cross laminated timber beams loaded in plane', Proceedings of the 13th World Conference on Timber Engineering (WCTE), Quebec, Canada.

## WG3 connections:

Steilner, M., Blaß, H. J., 2014, 'A method to determine the plastic bending angle of dowel-type fasteners', RILEM bookseries 9: Materials and Joints in Timber Structures. Ed.: S. Aicher, Springer, Berlin, pp. 301-306.

Van de Kuilen, J. W. G., Sandhaas, C., Blaß, H. J., 2014, 'ASteel-to-timber joints with very high strength steel dowels using spruce, beech and azobé', RILEM bookseries 9: Materials and Joints in Timber Structures. Ed.: S. Aicher, Springer, Berlin, pp. 157-165.

Enders-Comberg, M., Blaß, H. J., 2013, 'Influence of holes in the compression area of members - Querschnittsschwächung bei Druckbeanspruchung parallel zur Faser', European Journal of Wood and Wood Products, Vol. 70, Issue 3, pp. 309-317..

**Dr. Thomas K. Bader (Austria)**

Vienna University of Technology  
Vienna Austria

[thomas.bader\(at\)tuwien.ac.at](mailto:thomas.bader@tuwien.ac.at)

COST FP1402, WG3 Member



*Personal*

Years of experience in relevant field: 4  
Expertise: Wood mechanics  
Modelling and experimental  
characterization of dowel connections  
Modelling of timber structures  
Degree: Dr.techn. (09.06.2011)

*Organisation*

Institute for Mechanics of Materials and Structures  
([www.imws.tuwien.ac.at](http://www.imws.tuwien.ac.at))  
Focus: theoretical and practical research / innovation  
and education / training  
Facilities: high performance computation facilities  
and mechanical testing facilities (including uniaxial  
and triaxial testing machines for up to 250 kN; full-  
field deformation measurement system)

No. of staff	PhD students	MSc/year
6	3	15

*Research projects*

2011-2015

"Characterization of Wood Products and Connections - From Mechanical Modeling to Engineering Applications"

FFG-Project in cooperation with the Association of the Austrian Wood Industries

2007-2010

"Mechanical characterization of wood for knowledge-based timber industry"

FFG-Project in cooperation with the Association of the Austrian Wood Industries

*Publications*

for WG 3 "Connections":

[1] G. Hochreiner, T.K. Bader, K. de Borst, J. Eberhardsteiner: "Stiff förmige Verbindungsmittel im EC5 und baustatische Modellbildung mittels kommerzieller Statiksoftware"; Bauingenieur, 88 (2013), S. 275 - 289, in German.

[2] Schweigler, M. (2013) "A Numerical Model for Slip Curves of Dowel Connections and Its Application to Timber Structures", Master Thesis, IMWS, TU Vienna

[3] T.K. Bader, M. Schweigler, G. Hochreiner, J. Eberhardsteiner: "Berechnungsmodell für das Last-Verformungsverhalten von Stabdübelgruppen im Ingenieurholzbau"; in: "Berichte der Fachtagung Baustatik-Baupraxis 12", TU-München, 2014, ISBN: 978-3-00-041256-1, 113 - 121, in German.

[4] T.K. Bader, M. Schweigler, G. Hochreiner, E. Serrano, B. Enquist, M. Dorn: „Dowel deformations in multi-dowel LVL-connections under moment loading“; submitted for publication in Wood Material Science and Engineering, 2015

Material Science and Engineering, 2015

[5] T.K. Bader, M. Schweigler, G. Hochreiner, B. Enquist, M. Dorn, E. Serrano: „Experimental characterization of the global and local behavior of multi-dowel LVL-connections under complex loading“; submitted for publication in Materials and Structures, 2015

**Dr. Jorge Branco (Portugal)**

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Guimarães Portugal

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COST FP1402, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 15 Expertise: Carpentry joints; Reinforcement, Cyclic behavior of joints Degree: PhD. (28.07.2008)	Civil Engineering ( <a href="http://www.hms.civil.uminho.pt/">http://www.hms.civil.uminho.pt/</a> ) Focus: theoretical and practical research / innovation, design of structures and education / training Facilities: Testing labs, NDTs equipment		
	No. of staff	PhD students	MSc/year
	3	3	6

*Research projects*

(2007-2010): Safety evaluation of timber structures through nondestructive methods and stochastic analysis. PTDC/ECM/66527/2006 da Fundação para a Ciência e a Tecnologia. (Paulo Lourenço, Saporiti Machado, Jorge Branco).

(2012-2013): Seismic performance of multi-storey timber buildings. Seismic Engineering Research Infrastructures for European Synergies SERIES. EU Framework Program 7 (Jorge Branco, Paulo Lourenço, Maurizio Piazza, Roberto Tomasi, Gerhard Schickhofer, Georg Flatscher).

(2012-2015): WoodenQuark – Wooden Houses. Contract n.º 2011/21635 do Quadro de Referência Estratégico Nacional. (Jorge Branco). <http://www.woodenquark.com/>

(2014-) SISMO – Seismic design of multi-storey Cross Laminated Timber buildings. Stora Enso. (Jorge Branco, Paulo Lourenço).

*Publications*

Branco, J.M., Kekeliak, M., Lourenço, P.B., In-plane stiffness of timber floors strengthened with CLT. European Journal of Wood and Wood products. (in-press DOI: 10.1007/s00107-015-0892-2)

Branco, J.M., Tomasi, R. (2013), Analysis and Strengthening of Timber Floors and Roofs. In Structural Rehabilitation of Old Buildings. Costa, A, Miranda Guedes, J, Varum H. (eds.), Springer, ISBN: 978-3-642-39685-4, pp. 235-258. URL: <http://dx.doi.org/10.1007/978-3-642-39686-1> <http://hdl.handle.net/1822/26659>

Sena-Cruz, J.M., Jorge, M., Branco, J.M., Cunha, V.M.C.F. (2013), Bond between glulam and NSM CFRP laminates. Construction and Building Materials. 40 (2013) 260–269. URI: <http://hdl.handle.net/1822/21509>

Branco, J.M., Araújo, J.P. (2012), Structural behaviour of log timber walls under lateral in-plane loads. Engineering Structures. 40 (2012), 371-382. URI: <http://hdl.handle.net/1822/19907>

Branco, J.M., Piazza, M., Cruz, P.J.S. (2011), Experimental evaluation of different strengthening techniques of traditional timber connections. Engineering Structures. 33 (8), 2011, 2259-2270. URI: <http://hdl.handle.net/1822/13592>

Branco, J.M., Cruz, P.J.S., Piazza, M. (2009), Experimental analysis of laterally loaded nailed timber-to-concrete connections. Construction and Building Materials. 23 (1), 2009, 400-410. URI: <http://hdl.handle.net/1822/9208>

**Prof. Dr. Jose Manuel Cabrero Ballarin (Spain)**

University of Navarra  
Pamplona Spain

[jcabrero\(at\)unav.es](mailto:jcabrero(at)unav.es)

COST FP1402, MC Member, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 7 Expertise: Numerical modelling. Failure criteria for wood. Dowelled connections. Fiber reinforced wood. Architectural design Degree: PhD (26.09.2006)	Department of Building Construction, Services and Structures ( <a href="http://www.unav.es/madera">www.unav.es/madera</a> ; <a href="http://www.unav.es/estructuras">www.unav.es/estructuras</a> ) Focus: theoretical and practical research / innovation and education / training Facilities: Testing lab with loadoto carnet cells up to 400 kN, specialized in building components and materials characterisation. Computer Numerical Control (CNC). Laser cutting printer. 3D printer.		
	No. of staff	PhD students	MSc/year
	5	2	0

*Research projects*

- RETICC - structures durability: REinforcemet of Timber and Concrete Constructions. (2011). <http://www.unav.edu/centro/madera/reticc>
- esMADERA (isWOOD). efficient and sustainable: Timber Applied to the Design of High Performance Structures (2008-2011). <http://www.unav.edu/centro/madera/esmadera>
- Timber mechanical connections. (2012-2015) <http://www.unav.edu/centro/madera/optimizaciondeunionesmecanicasdemadera>
- New applications, treatments and products for beechwood. (2011-2013) <http://www.unav.edu/centro/madera/nuevos-mercados-para-la-madera-de-haya>
- Characterisation, modelling and automated design of 3D semi-rigid steel joints. (2015-2018). <http://www.structuralconnections.es>
- Analysis and design of 3D semi-rigid connections in steel and concrete structures (2007-2016)
- METAJOINT2D - A new methodology for the direct and automatic characterization of 2D steel and timber joints based on specialized metamodels built from deformation modes. (2017-2019)

*Publications*

- Yurrita M., Cabrero J.M. (2018) New criteria for the determination of the parallel-to-grain embedment strength of wood, *Construction and Building Materials*, 173, pp. 238-250. doi: 10.1016/j.conbuildmat.2018.03.127
- Cabrero J.M., Yurrita M. (2018) Performance assessment of existing models to predict brittle failure modes of steel-to-timber connections loaded parallel-to-grain with dowel-type fasteners. *Engineering Structures*, 171, pp. 895-910. doi: 10.1016/j.engstruct.2018.03.037
- Stepinac M., Cabrero J.M., Ranasinghe K., Kleiber M.(2018) Proposal for reorganization of the connections chapter of Eurocode 5. *Engineering Structures*, 170, pp. 135-145. doi: 10.1016/j.engstruct.2018.05.058
- Iraola B., Cabrero J.M. (2016) An algorithm to model wood accounting for different tension and compression elastic and failure behaviors, *Engineering Structures*, 117, pp. 332-343. doi:10.1016/j.engstruct.2016.03.021
- Cabrero JM, Gebremedhin K (2008) Finite Element Model for Predicting Stiffness of Metal-Plate Connected Tension Splice and Heel Joints of Wood Trusses, *Transactions of the ASABE*.
- Gil B, Goñi R (2015) T-Stub behaviour under out-of-plane bending. I: Experimental research and finite element modelling. *Engineering Structures*.
- Gil B, Bijlaard FSK, Bayo E (2015) T-Stub behaviour under out-of-plane bending. II: Parametric Study and analytical characterization. *Engineering Structures*.
- Gil B, Goñi R, Bayo E (2013) Experimental and numerical validation of a new design for three-dimensional semi-rigid composite joint under general loads
- Cabrero JM, Heiduschke A, Haller P (2010) Analytical assessment of the load carrying capacity of axially loaded wooden reinforced tubes, *Composite Structures*.
- Blanco C, Cabrero JM, Martin-Meizoso A, Gebremedhin KG (2015) Design oriented failure model for wood accounting for different tensile and compressive behavior. *Mechanics of Materials*.
- Cabrero JM, Blanco C, Gebremedhin KG, Martin Meizoso A (2012) Assessment of phenomenological failure criteria for wood. *European Journal of Wood and Wood Products*.
- Cabrero JM, Vargas G (2015) Analysis of the validity of the three-point off-axis bending method. *Applied Mathematical Modelling*.
- Iraola B, Cabrero JM, Gil B (2015) A three dimensional direction dependent wood model. *Wood Science and Technology* (under review)
- Bayo E, Gracia J, Gil B, Goñi R (2012) Efficient modelling of semirigid composite connections for frame analysis. *Journal of Constructional Steel Research*

**Dr. Wen-Shao Chang (United Kingdom)**

University of Bath

Bath United Kingdom

[wsc22\(at\)bath.ac.uk](mailto:wsc22@bath.ac.uk)

COST FP1402, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 3 Expertise: Earthquake Engineering, Structural Dynamic, Timber Connections Degree: PhD (15.05.2006)	Department of Architecture and Civil Engineering ( <a href="http://www.bath.ac.uk/ace/">http://www.bath.ac.uk/ace/</a> ) Focus: theoretical and practical research / innovation , and education / training Facilities: Standard testing machines, strong walls and floor, field vibration measurement equipment		
	No. of staff	PhD students	MSc/year
	2	6	6

*Research projects*

## WG1:

Title: Wind loading on tall timber buildings

Duration: 10/2013-10/2014

People involved: Dr. Wen-Shao Chang, Prof. Richard Harris, Dr. Thomas Reynolds

## WG3:

Title: Understanding stress distribution of screws with various thread patterns and their effectiveness

Duration: 10/2014 - 10/2018

People involved: Mr. Cong Zhang, Dr. Wen-Shao Chang

## WG4:

Title: Thin topping timber concrete composite floor

Duration: 10/2010 - 10/2013

People involved: Dr. Jon Skinner, Prof. Richard Harris, Prof. Pete Walker

Title: New hybrid timber concrete (HTC) system for timber floor

Duration: 10/2013-12/2013

People involved: Dr. Wen-Shao Chang, Mr. Ioannis Thanopoulos

*Publications*

1. Thomas Reynolds, Richard Harris, Wen-Shao Chang, Julie Bregulla, Jonathan Bawcombe. 2015. "Ambient vibration tests of a cross-laminated timber building". Proceedings of ICE – Construction Materials. 168:121-131.
2. Jon Bawcombe, Richard Harris, Pete Walker and Martin Ansell. 2015. The quality of Douglas-fir grown in the United Kingdom. Proceedings of the Institution of Civil Engineers: Construction Materials.
3. Thomas Reynolds, Richard Harris, Wen-Shao Chang. 2014. " Nonlinear pre-yield modal properties of timber structures with large-diameter steel dowel connections". Engineering Structures. 76:235-244.
4. Thomas Reynolds, Richard Harris, Wen-Shao Chang. 2014. "Stiffness of dowel-type timber connections under pre-yield oscillating loads". Engineering structures . 65:21-29.
5. Thomas Reynolds, Wen-Shao Chang, Richard Harris. 2013. "An analytical model for embedment stiffness of a dowel in timber under cyclic load". European Journal of Wood and Wood Products. 71(5): 609-622.
6. Thomas Reynolds, Wen-Shao Chang, Richard Harris. 2013. "Viscoelastic behaviour of dowel-type timber connections under in-service vibration". European Journal of Wood and Wood Products. 71(5): 623-634.



**Mr. Matthew Collins (Ireland)**

University of Limerick  
 Castletroy, Limerick  
 matthew.collins(at)ul.ie  
 COST FP1402, MC Member, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 2 Expertise: Modelling of connections, Material testing, Connection testing, Timber Gridshells Degree: BE(Hons) in Civil Eng. (26.08.2012)	University of Limerick ( <a href="http://www.ul.ie">www.ul.ie</a> ) Focus: theoretical and practical research / innovation, education and training Facilities: 100 kN Universal Testing Machine 10 kN Universal Testing Machine Small sized conditioning chamber		
	No. of staff	PhD students	MSc/year
	3	1	1

*Research projects*

Title: Form Finding and Structural Analysis of actively bent Irish OSB timber grid shells  
 Duration: 4 years (currently in year 3)  
 People involved: Matt Collins (PhD Candidate)  
                           Prof. Tom Cosgrove (Supervisor)  
 Webpage: <http://www.ul.ie/civileng/research/>

*Publications*

Collins, M. ; O'Regan, B. ; Cosgrove, T. (2015), 'Potential of Irish Orientated Strand Board in Bending Active Structures', World Academy of Science, Engineering and Technology, International Science Index 99, International Journal of Civil, Structural, Construction and Architectural Engineering, 9(3), 309 - 316.

**Prof. Dr. Thierry Descamps (Belgium)**

University of Mons  
Mons - Belgium

[thierry.descamps\(at\)umons.ac.be](mailto:thierry.descamps@umons.ac.be)

COST FP1402, MC Member, STSM Manager, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 11 Expertise: Old carpentry connections, glued-in rods, modelling, semi-rigidity, optimization. Degree: PhD (01.03.2008)	Civil engineering and Structural Mechanics (www.umons.ac.be) Focus: theoretical and practical research / innovation, design of structures and education / training Facilities: FE softwares		
	No. of staff	PhD students	MSc/year
	3	2	6
<i>Research projects</i>			
Development of a new "Structural Insulated Panel" made of CLT panels, biobased insulation and connected by self-tapping screws.			
Modelling of glued-in rods connections under axial and shear solicitations			
<i>Publications</i>			
Aira José-Ramon, Descamps Thierry, VanParys Laurent, Leoskool Laurent, (2015). "Study of stress distribution and stress concentration factor in notched wood pieces with cohesive surfaces" in European Journal of Wood and Wood Products, (DOI) 10.1007/s00107-015-0891-3			
Léoskool Laurent, Serrano Erik, Descamps Thierry, Avez Coralie (2014). "Cross-laminated timber: modelling of connections using self-tapping screws". European Journal of Wood and Wood Products.			
Bléron Laurent, Lathuilière Damien, Descamps Thierry, (2014). "Reinforcement of dowelled-type connections". To be published in Construction and Building materials. 16 pages.			
Branco Jorge, Descamps Thierry (2014). "Design and reinforcement of old carpentry connections". To be published in Construction and Building materials. 18 pages.			

**Prof. Dr. Massimo Fragiaco (Italy)**

University of Sassari

Alghero (SS), Italy

[fragiaco\(at\)uniss.it](mailto:fragiaco(at)uniss.it)

COST FP1402, MC Member, WG3 Member

*Personal*

Years of experience in relevant field: 15  
 Expertise: Seismic resistance of timber structures; Timber-concrete composites; Fire resistance of timber structures; FE modelling; Use of low-grade timber.

Degree: PhD. (08.02.2001)

*Organisation*

Architecture, Design and Urban Planning  
 (<http://www.architettura.uniss.it/>)

Focus: theoretical research / innovation and education / training

Facilities: -

No. of staff	PhD students	MSc/year
4	3	1

*Research projects*

1. "RELUIS-Research line: Timber Structures – WP4: Timber buildings with special systems and/or protective devices (Log-haus buildings)", 2014-2016, 1 Fixed Term Assistant Professor (Chiara Bedon).
2. "FE modelling of cross-lam multi-storey timber buildings for earthquake resistance", 2014-2016, 1 Postdoc (Giovanni Rinaldin) and 1 PhD student (Matteo Izzi).
3. "Revision of the Section 8 - Timber Structures - of the Eurocode 8 - Design for earthquake resistance", 2015-2016, 1 Postdoc (Maurizio Follesa).
4. "Sustainable use of Sardinia forests for production of timber panels and bio-energy", 2014-2016, 1 PhD student (Riccardo Riu).
5. "Determination of a procedure for seismic design of log house timber buildings with 'Blockbau' system", 2012-2014, 1 Postdoc (Chiara Bedon).
6. "Numerical modelling of timber elements and timber structures as part of the Cornet project OptimberQuake", 2011-2013, 1 PhD student (Herve Pohsie) and 1 postdoc (Giovanni Rinaldin).

*Publications*

1. Bedon, C., Rinaldin, G., and Fragiaco, M. (2015). "Non-linear modelling of the seismic behaviour of 'Blockhaus' structures." *Engineering Structures*, Vol. 91, pp. 112-124.
  2. Gavric, I., Fragiaco, M., and Ceccotti, A. (2015). "Cyclic behaviour of typical screwed connections for cross-laminated (CLT) structures." *European Journal of Wood and Wood Products*, 73(2), 179-191.
  3. Gavric, I., Fragiaco, M., and Ceccotti, A. (2015). "Cyclic behavior of cross-laminated timber (CLT) wall systems: Experimental tests and analytical prediction models." *ASCE Journal of Structural Engineering*, 14 pp., 04015034.
  4. Bedon, C., and Fragiaco, M. (2015). "Numerical and analytical assessment of the buckling behaviour of Blockhaus log-walls under in-plane compression." *Engineering Structures*, Vol. 82, pp. 134-150.
  5. Fragiaco, M., and Lukaszewksa, E. (2015). "Influence of the construction method on the long-term behavior of timber-concrete composite beams." *ASCE Journal of Structural Engineering*, 15 pp., 04015013.
  6. Gavric, I., Fragiaco, M., and Ceccotti, A. (2014). "Cyclic behaviour of typical metal connectors for cross-laminated (CLT) structures". *RILEM Materials and Structures*, published online.
  7. Fragiaco, M., Balogh, J., To, L., and Gutkowski, R.M. (2014). "Three dimensional modeling of long-term structural behavior of wood-concrete composite beams." *Journal of Structural Engineering*, ASCE, Vol. 140 No. 8, 11 pp., A4014006.
  8. Rinaldin, G., Amadio, C., and Fragiaco, M. (2013). "A component approach for the hysteretic behaviour of connections in cross-laminated wooden structures." *Earthquake Engineering and Structural Dynamics*, Vol. 42 No. 13, pp. 1885–2042, doi: 10.1002/eqe.2310.
- Carina Fonseca Ferreira, Dina D'Ayala, Jose L. Fernandez Cabo, Marina Arce Blanco, Rafael Díez Barra, Pedro Hurtado Valdez (2015): Numerical Modelling and Seismic Assessment of Historic Planked Timber Arches. *International Journal of Architectural Heritage*. DOI: 10.1080/15583058.2015.1041194

**Prof. Dr. Steffen Franke (Switzerland)**

Bern University of Applied Sciences

Bern, Switzerland

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COST FP1402, WG3 Member

*Personal*

Years of experience in relevant field: 15  
 Expertise: Investigation and development of new structural systems; material behaviour of softwood and hardwood; connections; finite element modelling, assessment and monitoring of timber structures

Degree: Dr.-Ing. (03.07.2008)

*Organisation*

Architect, Wood and Civil Engineering  
 (www.ahb.bfh.ch)

Focus: theoretical and practical research / innovation, design of structures and education/training.

Facilities: structural and material testing labs and equipment, NDT-Equipment, robotic and CNC machinery, sawmill, vakuu and kiln dryer, chemical investigation equipment, microscops ...

No. of staff	PhD students	MSc/year
30	2	10

*Research projects*

- Development of hybrid CLT panels from hard- and softwood, 1 year, S. Franke, B. Franke, A. Müller
- Development of Design Tool for Adhesively bonded timber joints, 3 years, A. Moshtagin, S. Franke, A. Vasilopolous, T. Keller
- Enhancement of compression perpendicular to the grain strength and stiffness of glulam members with the use of pin shaped fasteners, 2 years, S. Franke, B. Franke, R. Widmann, R. Jockwer
- Investigation and analysis of press glued connections for timber structures, 2 years, S. Franke, M. Schiere
- Assessment of the residual load-carrying capacity of large span members in wood, 2 years, S. Franke, B. Franke, R. Steiger, R. Widmann, R. Jockwer

*Publications*

- Magnière N., Franke S., Franke B. (2014): Investigation on Elements Presenting Cracks in Timber Structures. WCTE 2014. Quebec, Canada.
- Franke S., Magnière N. (2014): Discussion of testing and evaluation methods for the embedment behaviour of connections. INTER 2014.01-04/09/2014.Bath, UK.
- Franke S., Franke B. (2014): Causes, assessment and impact of cracks in timber elements. COST FP 1101 Workshop.Biel, Switzerland.
- Franke S., Franke B. (2014): X-Ray technology for the assessment of timber structures. COST FP 1101 Workshop.Biel, Switzerland.
- Magnière N., Franke S., Franke B. (2014): Numerical investigation of the residual load-carrying capacity of cracked timber elements. COST FP1004 - Experimental research with timber. Prague, Czech Republic.
- Franke S. (2013): Analysis of the elasto-plastic failure behavior of wood under compression. ICSA 2013. Guimaraes, Portugal.
- Franke B., Franke S., Quenneville P. (2012): Numerical modelling and analysis of the failure. In Tagungsband der ECCOMAS, Wien, Österreich.
- Tannert T., Vallée T. Franke S., Quenneville P. (2012): Comparison of test methods to determine weibull parameters for wood. In Tagungsband der WCTE, Auckland, Neuseeland.
- Franke S., Quenneville P. (2012): Embedding behaviour of douglas fir. In Tagungsband der WCTE - 12th World Conference on Timber Engineering, Auckland, Neuseeland.
- Leitjen A.J.M., Franke S., Quenneville P., Gupta R. (2012): Bearing Strength Capacity of continuous Supported Timber Beams : Unified approach for test methods and structural design codes.

**Prof. Dr. Kiril Gramatkov (fYR Macedonia)**

Civil Engineering Faculty, University "Sts Cyril & Methodius"

Skopje, Macedonia

[gramatkov\(at\)gf.ukim.edu.mk](mailto:gramatkov(at)gf.ukim.edu.mk)

COST FP1402, MC Member, WG3 Member



<i>Personal</i>		<i>Organisation</i>	
Years of experience in relevant field: 30 Expertise: experimental (static and dynamic) testing of timber, timber elements, connections and structures, evaluation and analysis of traditional and prefabricated timber houses, composite Degree: PhD (25.07.1990)	Department on Concrete and Timber Structures ( <a href="http://www.gf.ukim.edu.mk">www.gf.ukim.edu.mk</a> ) Focus: theoretical and practical research/innovation, design of structures, education/training and consultancy and quality control Facilities: Testing basic properties of timber, real scale testing of structural timber elements		
	No. of staff	PhD students	MSc/year
	7	2	4
<i>Research projects</i>			
No current funded research project due to the lack of funding by the government.			
<i>Publications</i>			
none			

**Prof. Dr. Tomaž Hozjan (Slovenia)**

University of Ljubljana, Faculty of Civil and Geodetic Eng.  
Ljubljana Slovenia

[tomaz.hozjan\(at\)fgg.uni-lj.si](mailto:tomaz.hozjan(at)fgg.uni-lj.si)

COST FP1402, MC Substitute Member, WG3 Member

<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 10 Expertise: modeling of heat and mass transfer, mechanical response modelling, modeling of composite structures. Degree: PhD (12.03.2009)	Chair of Mechanics ( <a href="http://www3.fgg.uni-lj.si/en/">http://www3.fgg.uni-lj.si/en/</a> ) Focus: theoretical and practical research / innovation, design of structures and education/training. Facilities: testing lab for structures including horizontal response		
	No. of staff	PhD students	MSc/year
	6	5	40

*Research projects*

EU Hardwoods, European hardwoods for the building sector, 2014-2016, FCBA and SIMONIN SAS (FRA), HFA, BFW and FHO (AUT), MPA and FVA (GER), CBD and UL (SLO), <http://km.fgg.uni-lj.si/hardwood/index.html>

## PAST:

Gradewood, Grading of timber for engineered wood products, 2008-2010, VTT(FIN), BRE (UK), FCBA F(FRA), TUM (GER), SP (SWE), HFA and TUF (AUT), UL (SLO).

Classification of timber structural elements by the strength (applied research project), 2009-2012, Slovenian project together with Slovenian National Building and Civil Engineering Institute and Biotechnical Faculty.

Methods of classification of timber by strength (applied research project), 2004-2007, Slovenian project together with Slovenian National Building and Civil Engineering Institute and Biotechnical Faculty.

Glulam timber beams in natural environment (applied research project), 2001-2004, Slovenian project together with Slovenian National Building and Civil Engineering Institute.

*Publications*

## WG2:

HOZJAN, Tomaž, SVENSSON, Staffan. Theoretical analysis of moisture transport in wood as an open porous hygroscopic material. *Holzforschung*, ISSN 0018-3830. 2011, 65(1), pp. 97-102, doi: 10.1515/HF.2010.122.

SVENSSON, Staffan, TURK, Goran, HOZJAN, Tomaž. Predicting moisture state of timber members in a continuously varying climate. *Engineering structures*, 2011, 33(11), pp. 3064-3070, doi: 10.1016/j.engstruct.2011.04.029.

## WG4:

HOZJAN, Tomaž, SAJE, Miran, SRPČIČ, Stane, PLANINC, Igor. Geometrically and materially non-linear analysis of planar composite structures with an interlayer slip. *Computers & Structures*, 2013, 114-115, pp. 1-17, ilustr., doi: 10.1016/j.compstruc.2012.09.012.

SCHNABL, Simon, PLANINC, Igor, TURK, Goran. Buckling loads of two-layer composite columns with interlayer slip and stochastic material properties. *Journal of engineering mechanics*, 2013, 139, 8, pp. 1124-1132, doi: 10.1061/(ASCE)EM.1943-7889.0000478.

## WG1:

TORATTI, Tomi, SCHNABL, Simon, TURK, Goran. Reliability analysis of a glulam beam. *Structural safety*, 2007, 29(4), pp. 279-293, doi: 10.1016/j.strusafe.2006.07.011.

**Dr. Robert Jockwer (Switzerland)**

ETH Zurich, Institute of Structural Engineering  
Zurich Switzerland

[jockwer\(at\)ibk.baug.ethz.ch](mailto:jockwer(at)ibk.baug.ethz.ch)

COST FP1402, MC Member, WG3 Member

*Personal*

Years of experience in relevant field: 6  
Expertise: connections, reinforcement, modelling of moisture induced stresses, fracture mechanics  
Degree: Dr. sc. (01.06.2014)

*Organisation*

Institute of Structural Engineering, Chair for Timber Engineering ([www.ibk.ethz.ch](http://www.ibk.ethz.ch))  
Focus: theoretical and practical research / innovation and education/training.  
Facilities: Universal testing machines -2MN, Strong floor, Optical Measurements, Climate chambers

No. of staff	PhD students	MSc/year
-	8	20

*Research projects*

<http://www.ibk.ethz.ch/fr/research/index>

## WP 2: Solid Timber Construction

- "Influence of local strain differences on the bearing capacity of glulam", Dr. Gerhard Fink
- "Structural behaviour of glued-laminated timber members subjected to axial compression or combined compression and bending (2nd order analysis)", Dr. Matthias Theiler
- "Structural behaviour of glued-laminated timber beams with notches or holes", Dr. Robert Jockwer
- "Glued laminated timber from Beech wood", Thomas Erhardt

## WP 3: Connections

- "Enhancement of compression perpendicular to the grain strength and stiffness of glulam members with the use", Dr. Robert Jockwer
- "Assessment of the residual load-carrying capacity of large span members in wood", Dr. Robert Jockwer

## WP 4: Hybrid Timber Structures

- "Post-tensioned timber frame structures", Flavio Wanniger
- "Reliable timber and innovative wood products for structures - Beam-type structural elements made of LVL beech wood", Peter Kobel
- " - Plate-type structural elements made of LVL beech wood", Lorenzo Boccadoro
- "ETH House of Natural Resources", Claude Leyder

*Publications*

## WP 1: Basis of Design

Kohler, Jochen; Steiger, René; Fink, Gerhard; Jockwer, Robert, "Assessment of selected Eurocode based design equations in regard to structural reliability", 45th CIB-W18 Meeting 2012, 45, CIB-W18/45-102-1.

Steiger, René; Jockwer, Robert, "Tragwerksanalyse und Bemessung", Dokumentation SIA, Holzbau: Teilrevision der Norm SIA 265, Ausgabe 2012, Zürich, Switzerland.

## WP 3: Connections

Jockwer, Robert; Steiger, René; Frangi, Andrea, "Fully Threaded Self-tapping Screws Subjected to Combined Axial and Lateral Loading with Different Load to Grain Angles", Materials and Joints in Timber Structures, 2014, 9, 265-272.

Jockwer, Robert, "Structural behaviour of self-tapping screws - Theory", COST Timber Bridge Conference - CTBC 2014, Biel, Switzerland.

Jockwer, Robert, "Self-tapping screws as reinforcement in areas of recessed beams under transverse shear loads", 20. Internationales Holzbau-Forum (IHF 2014), 2014, Garmisch-Partenkirchen, Germany.

Jockwer, Robert; Steiger, René; Frangi, "Design model for inclined screws under varying load to grain angles", International Network on Timber Engineering Research: 1st INTER Meeting, 2014, Bath, United Kingdom.

**Prof. Dr. André Jorissen (the Netherlands)**

SHR

Wageningen The Netherlands

[a.j.m.jorissen@tue.nl](mailto:a.j.m.jorissen@tue.nl)

COST FP1402, MC Member, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 30 Expertise: timber connections - composite structures - structural design Degree: PhD (21.12.1998)	SHR, Built Environment ( <a href="http://www.shr.nl">www.shr.nl</a> ) Focus: practical research/innovation, design of structures, education/training and durability aspects-performance of existing(historical) structures Facilities: TU/e: structural design testing equipment + timber related testing equipment like moisture measurement - timber grader. SHR: small structural design testing equipment + durability, etc.		
	No. of staff	PhD students	MSc/year
	20	2	10
<i>Research projects</i>			
<p>(1) connections related</p> <ul style="list-style-type: none"> <li>- roof to casco (general and related to earthquake design)</li> <li>- timber floor to masonry walls (earthquake related)</li> <li>- compression perpendicular (deciduous wood species)</li> <li>- pile foundation to structure</li> <li>- finger joints in portal frames</li> <li>- capentry connections</li> <li>- tube connections (in LVL and related to earthquake design)</li> <li>- traditional portal frame analyses (brace to column and beam connections)</li> </ul> <p>(2) composite structures related</p> <ul style="list-style-type: none"> <li>- "multi deck / box" element properties</li> <li>- sandwich elements (pure sandwich with hole + creep; elements with reinforcements + creep)</li> <li>- timber concrete (ordinary concrete - light weight concrete)</li> </ul> <p>(3) other topics</p> <ul style="list-style-type: none"> <li>- timber floor (vibration) design</li> </ul>			
<i>Publications</i>			
<p>1. Leijten A.J.M, Leijer, B. &amp; Jorissen, A.J.M. (2012). The perpendicular to grain compressive behaviour of timber beams. In Hugh Morris &amp; Pierre Quenneville (Ed.), Oral : Oral : Paper presented at the World Conference on Timber Engineering (WCTE 2012), 16-19 July 2012, Auckland, New Zealand, (pp. 356-361). <a href="http://www.WCTE2012.com">www.WCTE2012.com</a>.</p> <p>2. Daniela Wrzesniak, Massimo Fragiaco, André Jorissen. (2013). Alternative approach to avoid brittle failure in dowelled connections. In: proceedings of the RILEM International Symposium on Materials and Joints in Timber Structures – Recent advancement of technology – From 08 October 2013 to 10 October 2013 in Stuttgart, Germany</p> <p>3. André Jorissen, Jaco den Hamer, Ad Leijten. 2014. Traditional timber frames. In Alexander Salenikovich (Ed.), Paper presented at the World Conference on Timber Engineering (WCTE 2014), August 10-14, 2014, Québec City, Canada, (paper 055). <a href="http://www.WCTE2014.ca">www.WCTE2014.ca</a>.</p> <p>4. André Jorissen, Luc Castelijns, Johnny van Rie and Herm Hofmeyer. 2014. Sandwich panels with holes. In Alexander Salenikovich (Ed.), Paper presented at the World Conference on Timber Engineering (WCTE 2014), August 10-14, 2014, Québec City, Canada, (paper 056). <a href="http://www.WCTE2014.ca">www.WCTE2014.ca</a>.</p>			



**Ms. Marion Kleiber (Germany)**

Harrer Ingenieure  
 Karlsruhe Germany

[m.kleiber\(at\)harrer-ing.net](mailto:m.kleiber@harrer-ing.net)

COST FP1402, WG3 Member

*Personal*

Years of experience in relevant field: 7  
 Expertise: Planning of structural framework, structurally engineered check of all materials and for all kind of constructions  
 Degree: Dipl.-Ing. (Master) (17.05.2005)

*Organisation*

Structural Design and Civil Engineering ([www.harrer-ing.net](http://www.harrer-ing.net))  
 Focus: design of structures, execution of structures and education/training.  
 Facilities: Structural Design and Civil Engineering, Bridge Construction and Foundation Engineering, Industrial Facility, Overall Plan and Project Management, Risk Management

No. of staff	PhD students	MSc/year
45	1	4

*Research projects*

1) DIN EN 1995 – Eurocode 5 Timber Structures – application testing, 2009-2010, Dipl.-Ing. Marion Kleiber, Dipl.-Ing. Matthias Gerold, Dipl.-Ing. Thomas Di Risio (all Harrer Ingenieure, Karlsruhe), Dipl.-Ing. Joachim Sauter (Holzbau Stephan, Gaildorf), Prof. Dr.-Ing. Josef Trabert (Ingenieurbüro Trabert + Partner, Geisa), no webpage

2) DIN EN 1998 – Eurocode 8 Earthquake – application testing, 2010-2011, Dipl.-Ing. Marion Kleiber, Dipl.-Ing. Matthias Gerold, Dr.-Ing. Sascha Schnepf (all Harrer Ingenieure, Karlsruhe) - part Timber Structures, Dr.-Ing. Werner Röser (H + P Ingenieure GmbH & Co. KG, Aachen) - part Concrete Structures, Dr.-Ing. Markus Hauer (Büro für Baukonstruktionen GmbH, Karlsruhe) - part Masonry Structures, Dr.-Ing. Heribert Spitz (Ingenieurgesellschaft für Tragwerksplanung mbH, Euskirchen) - part Composite Structures, Dr.-Ing. Ralf Egner (Ingenieurgruppe Bauen, Freiburg) - part Steel Structures, no webpage

*Publications*

WG 1 and 3:

1) GEROLD, M.; KLEIBER, M. 2012

Design of timber structures of the future

in Bauen mit Holz, magazine 3 - 5, page 42 – 44, 40 - 34, 34 - 36

2) KLEIBER, M.; GEROLD, M.; SCHNEPF, S. 2013/2014

Seismic design of timber structures to EC8

in bauen mit Holz, magazine 11 + 12 (2013), page 23-27, S. 35-39, magazine 1 (2014), page 24-28

**Prof. Dr. Charalampos Mouzakis (Greece)**

National technical University of Athens (N.T.U.A)  
Athens, Greece

[harrismo\(at\)central.ntua.gr](mailto:harrismo@central.ntua.gr)

COST FP1402, MC Substitute, WG3 or 4 Member

<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 25 Expertise: Earthquake response of timber structures. Design of timber structures. Timber and masonry Degree: PhD. (01.09.2000)	School of Civil engineering ( <a href="http://www.lee.civil.ntua.gr">www.lee.civil.ntua.gr</a> ) Focus: theoretical and practical research / innovation, design of structures Facilities : Shaking Table 6DOF , reaction wall for StaticTests		
	No. of staff	PhD students	MSc/year
	10	2	15
<i>Research projects</i>			
'Cyclic response of timber diaphragms' Diploma thesis a post graduate student, a Phd student was also involved 'Earthquake response of timber diaphragms' Diploma thesis of a graduate student, a Phd student was also involved			
<i>Publications</i>			
Both thesis are sent for possible publication			

**Dr. Tomaž Pazlar (Slovenia)**

Slovenian National Building and Civil Engineering Institute

Ljubljana Slovenia

[tomaz.pazlar\(at\)zag.si](mailto:tomaz.pazlar@zag.si)

COST FP1402, MC Member, WG3 Member

*Personal*

Years of experience in relevant field: 6

Expertise: Inspection and assessment of timber structures, laboratory testing of fasteners, timber based structural elements and timber structures, certification of timber based construction products and fasteners, preparation of national and European Technical Approvals/Assessments

Degree: PhD (03.10.2008)

*Organisation*Section for Metal, Timber and Polymer Structures (<http://www.zag.si>)

Focus: practical research/innovation

Facilities : Modular equipment for performing tests of building structures and their elements under static or dynamic loadings (max. length: 30 m, max. load: 6000 kN), onedirectional shaking table (2 m x 3.2 m), Zwick 250 kN, Resistograph IML PD500, Brookhuis Timber Grader MTG

No. of staff

PhD students

MSc/year

10

0

0

*Research projects*

National projects:

- 1.) Strength grading of timber structural elements, 2008-2011.
- 2.) Seismic behaviour of multi-storey shear walls with openings, 2014-2017.
- 3.) Technical-economic analysis of energy retrofitting of residential buildings, 2007-2009.

COST actions:

- 1.) COST Action E53: »Quality Control for Wood and Wood Products«, 2006-2010, <http://www.coste53.net/>
- 2.) COST Action FP1004: »Enhance mechanical properties of timber, engineered wood products and timber structures«, 2010-2015, <http://costfp1004.holz.wzw.tum.de/>
- 3.) COST Action FP1101: »Assessment, Reinforcement and Monitoring of Timber Structures« 2010-2015, <http://www.costfp1101.eu/>
- 4.) COST Action FP1404: »Fire safe use of bio-based building products«, 2014-2019, <http://www.costfp1404.com/en/Sidor/default.aspx>

*Publications*

- 1.) PAZLAR, Tomaž, KRAMAR, Miha. Traditional timber structures in extreme weather conditions. International Journal of Architectural Heritage: Conservation, Analysis and Restoration, 2015.
- 2.) SEIM, Werner, KRAMAR, Miha, PAZLAR, Tomaž, VOGT, Tobias. OSB and GFB as Sheathing Materials for Timber-Framed Shear Walls: Comparative Study of Seismic Resistance. ASCE Journal of Structural Engineering, Special issue on Seismic Resistant Timber Structures, 2015 (accepted for publication).
- 3.) HOZJAN, Tomaž, PAZLAR, Tomaž. Experimental and numerical analysis of glulam beams in natural climatic conditions. Proceedings of 12th World Conference on Timber Engineering, 2012.
- 4.) PAZLAR Tomaž. Assessment and rehabilitation of timber structures in slovenian cultural heritage structures. Proceedings of International Scientific Conference - INDIS, 2012.
- 5.) PAZLAR Tomaž, SRPČIČ Jelena, PLOS Mitja, TURK Goran. Strength grading of Slovenian structural timber masonry buildings in Ljubljana. Proceedings of 12th World Conference on Timber Engineering, 2012.

**Prof. Dr. Maurizio Piazza (Italy)**

DICAM - University of Trento  
Trento, Italy

[maurizio.piazza\(at\)unitn.it](mailto:maurizio.piazza@unitn.it)

COST FP1402, MC Substitute, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 30 Expertise: Seismic resistant of timber structures Timber connections TCC timber concrete composite structures Degree: PhD (14.03.1978)	Department of Civil, Environmental and Mechanical Engineering ( <a href="http://lpms.dicam.unitn.it/?lang=en">http://lpms.dicam.unitn.it/?lang=en</a> ) Focus: theoretical and practical research / innovation and education /training Facilities: Please refer to the web page: <a href="http://lpms.dicam.unitn.it/?page_id=176">http://lpms.dicam.unitn.it/?page_id=176</a>		
	No. of staff	PhD students	MSc/year
	3	3	160

*Research projects*

SERIES Project - Seismic performance of multi-storey timber buildings (2010-2013) - European Framework Program 7. Duration 36 months. People of my organization involved: 7. Webpage: [http://www.series.upatras.gr/TIMBER\\_BUILDINGS](http://www.series.upatras.gr/TIMBER_BUILDINGS)

RELUIS Project – Timber structures (2010-2013) - DPC-ReLUIS (National Network of Seismic University). Duration 36 months. People of my organization involved: 7. Webpage: <http://www.reluis.it/index.php?lang=en>

RELUIS Project – Timber structures in earthquake prone areas (2014-2016) - DPC-ReLUIS (National Network of Seismic University). Duration 36 months. People of my organization involved: 6. Webpage: <http://www.reluis.it/index.php?lang=en>

*Publications*

Piazza M., Tomasi R., Crosatti A., Theoretical and experimental analysis of timber-to-timber joints connected with inclined screws, *Construction and Building Materials* 24, 9 (2010), pp. 1560–1571

Zonta D., Loss C., Piazza M., Zanon P., Direct Displacement Based Design of glulam timber frame buildings, *Journal of Earthquake Engineering*, Taylor & Francis, 2010

Andreolli M., Piazza M., Tomasi R., Zandonini R., Ductile moment resistant steel-timber connections, *SPECIAL ISSUE IN TIMBER ENGINEERING*, Proceedings of the Institution of Civil Engineers - Structures and Buildings, Vol. 164, Issue 2, 2011, p. 65-78, ISSN: 0965-0911

C. Loss, D. Zonta, M. Piazza (2013), On estimating the seismic displacement capacity of timber portal-frames, *Journal of Earthquake Engineering*, 17:879–901, 2013 (available on line: DOI:10.1080/13632469.2013.779333)

Tomasi R., Sartori T., Casagrande D., Piazza M., Shaking table testing of a full-scale prefabricated three-story timber-frame building, *Journal of Earthquake Engineering*, 19:505-534, 2015 (on line: DOI: 10.1080/13632469.2014.974291)

**Prof. Dr. Pierre Quenneville (New Zealand)**

The University of Auckland  
Auckland, New Zealand

[p.quenneville\(at\)auckland.ac.nz](mailto:p.quenneville@auckland.ac.nz)

COST FP1402, IPC Member, MC Observer, WG3 Member



*Personal*

Years of experience in relevant field: 29  
Expertise: connections, brittle failures  
Degree: PhD. (01.05.1992)

*Organisation*

Civil and Environmental Engineering  
([www.cee.auckland.ac.nz](http://www.cee.auckland.ac.nz))  
Focus: theoretical and practical research /  
innovation, design of structures and  
education/training  
Facilities : Structures testing lab, 1000 kN Tension  
and Compression capacity, fabrication

No. of staff	PhD students	MSc/year
4	6	2

*Research projects*

1. development of the connection chapter for the New Zealand timber design standard (NZS 3603)
2. Development of design rules for small-dowel type fasteners with brittle behaviour (these results are to be incorporated in the next version of the NZS 3603 and the Canadian O86 "Design of Timber Structures" design standard)
3. development of design rules for timber moment connection that exhibit brittle failure
4. verification of design rules for self-tapping screws connections that exhibit brittle failure

*Publications*

- Franke, B., & Quenneville, P. (2014). Analysis of the fracture behavior of Radiata Pine timber and Laminated Veneer Lumber. *Engineering Fracture Mechanics*, 116, 1-12.
- Loo, W., Quenneville, P., & Chouw, N. (2014). Experimental testing of a rocking timber shear wall with slip-friction connectors. *Earthquake Engineering and Structural Dynamics*. doi:10.1002/eqe.2413
- Zarnani, P. & Quenneville, P. 2014, "Group Tear-Out in Small Dowel-Type Timber Connections: Brittle and Mixed Failure Modes of Multinail Joints", *J. Struct. Eng.*, doi: 10.1061/(ASCE)ST.1943-541X.04014110.
- Zarnani, P. & Quenneville, P. 2014, "Strength of timber connections under potential failure modes: An improved design procedure", *Construction and Building Materials*, 60(2014), p. 81-90.
- Zarnani, P. & Quenneville, P. 2014, "Wood Block Tear-out Resistance and Failure Modes of Timber Rivet Connections: A Stiffness-Based Approach", *J. Struct. Eng.*, 140(2), 04013055.
- Zarnani, P., & Quenneville, P. (2014). Splitting Strength of Small Dowel-Type Timber Connections: Rivet Joint Loaded Perpendicular to Grain. *Journal of Structural Engineering*, 140(10)

**Dr. Keerthi Ranasinghe (United Kingdom)**

BM TRADA  
 Buckinghamshire, United Kingdom  
[kranasinghe\(at\)bmtrada.com](mailto:kranasinghe(at)bmtrada.com)  
 COST FP1402, WG3 Member



<i>Personal</i>		<i>Organisation</i>		
Years of experience in relevant field: 18 Expertise: Structural Engineering Design, Testing, Inspections & Investigations and Provision of Training Courses, Publications & Certification of Materials, Systems and Software related to Structural Eurocodes. Member of UK and European Standardisation Committees  Degree: PhD. (01.09.2003)	Building Products and Services ( <a href="http://www.bmtrada.com/">http://www.bmtrada.com/</a> ) Focus: practical research / innovation, design of structures, execution of structures, education/training, structural investigations, product certification, publications Facilities : Structural, Fire, Mechanics, Dynamics and Acoustics Testing Facilities and capability to carry out on-site structural assessments			
	No. of staff	PhD students	MSc/year	
	137	0	0	
<i>Research projects</i>				
-				
<i>Publications</i>				
1. National Structural Timber Specification - Book, Specification Document (In preparation) 2. Eurocode 5 Span Tables - Book 3. Manual for the Design of Timber Building Structures to Eurocode 5 - Book 4. Concise Illustrated Guide to Timber Connections - Book 5. Timber in Contemporary Architecture - Book 6. Timber Frame Construction - Book 7. Introduction to Eurocode 5 - Wood Information Sheet 8. Eurocode 5 and CE Marking - Information Sheet 9. Eurocode 5, the Supply Chain Perspective - Information Sheet 10. Vibration in Timber Floors to Eurocode 5 - Guidance Document 11. Design of Structural Timber Connections - Guidance Sheet				

**Mr. Erik Hilmer Riberholt (Denmark)**

H. Riberholt ApS  
 Lyngby Denmark

[Hilmer\(at\)Riberholt.com](mailto:Hilmer(at)Riberholt.com)

COST FP1402, WG3 Member



<i>Personal</i>		<i>Organisation</i>		
Years of experience in relevant field: 40 Expertise: Research in timber structures. Preparation of structural codes and standards. Design of practical timber structures. Degree: Civil Engineering –Structural (30.06.1970)	H. Riberholt ApS ( <a href="http://www.Riberholt.com">www.Riberholt.com</a> ) Focus: design of structures, preparation of standards and codes Facilities: None			
	No. of staff	PhD students	MSc/year	
	15	0	0	
<i>Research projects</i>				
Reinforcement of existing glulam structure by glued in rods. 3 months June to September 2014. 4 people.				
<i>Publications</i>				
None				

**Mr. Andreas Ringhofer (Austria)**

Graz University of Technology  
Graz, Austria

[andreas.ringhofer\(at\)tugraz.at](mailto:andreas.ringhofer@tugraz.at)

COST FP1402, WG3 Member

*Personal*

Years of experience in relevant field: 5  
Expertise: timber engineering, wood technology, joints & fasteners, especially connection technique with self-tapping screws

Degree: Dipl.Ing. (24.11.2010)

*Organisation*

Institute of Timber Engineering and Wood Technology ([www.lignum.tugraz.at](http://www.lignum.tugraz.at))  
Focus: theoretical and practical research / innovation, design of structures, execution of structures and education/training  
Facilities : testing lab collaboration of the Faculty of Civil Engineering, especially for determination of mechanical strength and stiffness properties, various test machines with applicable forces up to 4 MN, climatic chambers, etc.

No. of staff	PhD students	MSc/year
7	4	10

*Research projects*

COMET K-Project 'timber.engineering', 01/2008-12/2012, mainly staff of the competence centre holz.bau forschung gmbh and of the institute, [www.holzbauforschung.at](http://www.holzbauforschung.at)

COMET K-Project 'focus\_sts', 01/2013-12/2016, mainly staff of the competence centre holz.bau forschung gmbh and of the institute, [www.holzbauforschung.at](http://www.holzbauforschung.at)

European Framework Programme 7 'Seismic Engineering Research Infrastructures for European Synergies (SERIES)', part Cross Laminated Timber, 07/2011-02/2013, Georg Flatscher, Andreas Ringhofer, Gerhard Schickhofer, [www.series.upatras.gr/TIMBER\\_BUILDINGS](http://www.series.upatras.gr/TIMBER_BUILDINGS)

FFG BRIDGE Project 'SCREWS', 03/2010-12/2012, Gernot Pirnbacher, Andreas Ringhofer, Gerhard Schickhofer

*Publications*

Pirnbacher, G., Brandner, R., Schickhofer, G. 2009 'Base parameters of self-tapping screws', CIB-W18/42-7-1, Duebendorf, Switzerland.

Krenn, H., Schickhofer, G. 2009 'Joints with inclined screws and steel plates as outer members', CIB-W18/42-7-1, Duebendorf, Switzerland.

Huebner, U. 2013 'Withdrawal strength of self-tapping screws in hardwoods' CIB-W18/46-7-4, Vancouver, Canada.

Ringhofer, A., Brandner, R., Schickhofer, G. 2014 'Entwicklung einer optimierten Schraubengeometrie für hochbeanspruchte Stahl-Holz-Verbindungen', Bautechnik, Vol. 91, pp. 31-37.

Ringhofer, A., Grabner, M., Silva, C.V., Branco, J., Schickhofer, G. 2014 'The influence of moisture content variation on the withdrawal capacity of self-tapping screws', Holztechnologie, Vol. 55, pp. 33 - 40.

Ringhofer, A., Brandner, R., Schickhofer, G. 2015 'Withdrawal resistance of self-tapping screws in unidirectional and orthogonal layered timber products', Materials and Structures, Vol. 48, pp. 1435 - 1447.

Flatscher, G., Bratulic, K., Schickhofer, G. 2015 'Experimental tests on cross-laminated timber joints and walls.', Structures and Buildings, DOI: 10.1680/stbu.13.00085 (in press).

Flatscher, G., Schickhofer, G. 2015 'Shaking table test of a cross-laminated timber structure.' Structures and Buildings, (accepted for publication).



**Dr. Felix Scheibmair (New Zealand)**

The University of Auckland, Dept Civil and Env Engineering  
 Auckland New Zealand  
[f.scheibmair\(at\)auckland.ac.nz](mailto:f.scheibmair@auckland.ac.nz)  
 COST FP1402, IPC Member, MC Observer, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 6 Expertise: timber connections  Degree: PhD. (05.05.2013)	Civil and Environmental Engineering ( <a href="http://www.cee.auckland.ac.nz/">http://www.cee.auckland.ac.nz/</a> ) Focus: theoretical and practical research/innovation, design of structures and education/training Facilities: Large scale strong wall/ floor testing facilities		
	No. of staff	PhD students	MSc/year
	4	6	2

- Research projects*
1. development of the connection chapter for the New Zealand timber design standard (NZS 3603)
  2. Development of design rules for small-dowel type fasteners with brittle behaviour (these results are to be incorporated in the next version of the NZS 3603 and the Canadian O86 "Design of Timber Structures" design standard)
  3. development of design rules for timber moment connection that exhibit brittle failure
  4. verification of design rules for self-tapping screws connections that exhibit brittle failure

*Publications*

Franke, B., & Quenneville, P. (2014). Analysis of the fracture behavior of Radiata Pine timber and Laminated Veneer Lumber. *Engineering Fracture Mechanics*, 116, 1-12.

Loo, W., Quenneville, P., & Chouw, N. (2014). Experimental testing of a rocking timber shear wall with slip-friction connectors. *Earthquake Engineering and Structural Dynamics*. doi:10.1002/eqe.2413

Zarnani, P. & Quenneville, P. 2014, "Group Tear-Out in Small Dowel-Type Timber Connections: Brittle and Mixed Failure Modes of Multinail Joints", *J. Struct. Eng.*, doi: 10.1061/(ASCE)ST.1943-541X.04014110.

Zarnani, P. & Quenneville, P. 2014, "Strength of timber connections under potential failure modes: An improved design procedure", *Construction and Building Materials*, 60(2014), p. 81-90.

Zarnani, P. & Quenneville, P. 2014, "Wood Block Tear-out Resistance and Failure Modes of Timber Rivet Connections: A Stiffness-Based Approach", *J. Struct. Eng.*, 140(2), 04013055.

Zarnani, P., & Quenneville, P. (2014). Splitting Strength of Small Dowel-Type Timber Connections: Rivet Joint Loaded Perpendicular to Grain. *Journal of Structural Engineering*, 140(10)

**Mr. Mislav Stepinac (Croatia)**

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Zagreb Croatia

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COST FP1402, MC Substitute Member, WG3 member

*Personal*

Years of experience in relevant field: 6  
Expertise: joints in timber structures,  
glued in rods, glass-timber composites,  
timber frames with glass infill  
Degree: MSc. (12.06.2008)

*Organisation*

Faculty of Civil Engineering, Structural department  
([www.grad.hr](http://www.grad.hr))  
Focus: practical research / innovation, design of  
structures and education / training  
Facilities: Testing lab, NDT instruments for timber,  
quadcopter

No. of staff	PhD students	MSc/year
3	2	55

*Research projects*

SMOONS - European Commission (EU), Seventh Framework Programme - ENVIRONMENT, Project Reference: 212939, duration 4 years, people involved: Vlatka Rajčić, Mislav Stepinac, [www.smoons.eu/tiki-index.php](http://www.smoons.eu/tiki-index.php)

“ Seismic resistance of composite structural systems timber-structural glass with optimal energy dissipation“ - bilateral project with IZIS institute from Skopje, Macedonia, duration 1 year, people involved: Vlatka Rajčić, Mislav Stepinac

*Publications*

1. Antolinc, David; Rajčić, Vlatka; Žarnić, Roko.  
Analysis of hysteretic response of glass infilled wooden frames. // Journal of Civil Engineering and Management. 20 (2014)
2. Pavković, Krunoslav; Rajčić, Vlatka; Haiman, Miljenko.  
Large diameter fastener in locally reinforced and non-reinforced timber loaded perpendicular to grain. // Engineering structures. 74 (2014) ; 256-265
3. Čizmar, Dean; Kirkegaard, Poul Henning; Sorensen, John Dalsgaard; Rajčić, Vlatka.  
Reliability-based robustness analysis for a Croatian sports hall. // Engineering structures. 33 (2011) , 11; 3118-3124
4. Kirkegaard, Poul Henning; Sørensen, John Dalsgaard; Čizmar, Dean; Rajčić, Vlatka.  
System reliability of timber structures with ductile behaviour. // Engineering structures. 33 (2011) , 11; 3093-3098
5. Stepinac, Mislav; Hunger, Frank; Tomasi, Roberto; Serrano, Erik; Rajčić, Vlatka; van de Kuilen, Jan-Willem, Comparison of design rules for glued-in rods and design rule proposal for implementation in European standards // CIB-W18, 2013.

**Prof. Dr. Staffan Svensson (Sweden)**

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Borås, Sweden

[staffan.svensson\(at\)hb.se](mailto:staffan.svensson@hb.se)

COST FP1402, WG3 Member



<i>Personal</i>	<i>Organisation</i>		
Years of experience in relevant field: 10 Expertise: Modelling connections, moisture induced stress, duration of load effects  Degree: PhD. (10.01.1998)	School of Engineering ( <a href="https://www.hb.se/Forskning/Forskare/Svensson-Staffan/">https://www.hb.se/Forskning/Forskare/Svensson-Staffan/</a> ) Focus: theoretical and practical research, education/training Facilities : Laboratory for Mechanical testing and material physics (moisture)		
	No. of staff	PhD students	MSc/year
	5	3	0

*Research projects*

Moisture induced strains and stresses in timber structures, Professor, Assistant Prof. Agnes Nagy and PhD student (starts June 15)

Kinematics of timber connections, Professor and Post-Doc (starts fall 15)

Composite concrete-wood-CLT joist elements, mechanical modelling, Professor, Assistant Prof. Agnes Nagy and PhD student (starts fall 15)

*Publications*

Svensson S and J. Munch-Andersen 2014. Study on nail connections in deformed state. 1st INTER meeting, Bath UK.

Köhler J. and S. Svensson, 2011: Probabilistic representation of duration of load effects in timber structures. Engineering Structures, 33 pp 462-467.

Engelund, E. T., S. Svensson, 2011: Modeling time-dependent mechanical behavior of softwood using deformation kinetics. Holzforschung, 65 pp 231-237.

Svensson, S. and S. Thelandersson, 2003: Aspects on reliability calibration of safety factors for timber structures. Holz als Roh- und Werkstoff, 61 pp. 336-341.

**Mr. Eero Tuhkanen (Estonia)**

Tallinn University of Technology

Tallinn, Estonia

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COST FP1402, MC Member, WG3 Member

*Personal*

Years of experience in relevant field: -  
 Expertise: Joints with Dowel Type  
 Fasteners in CLT Structures;  
 CLT shear wall systems  
 Degree: Master Degree (06.12.2007)

*Organisation*

Faculty of Civil Engineering, Department of Structural  
 Design  
 (<http://www.ttu.ee/>)  
 Focus: theoretical and practical research /  
 innovation, design of structures and education and  
 training  
 Facilities: Zwick/Roell Z250 strength testing device

No. of staff	PhD students	MSc/year
4	3	5

*Research projects*

\* Determination of embedment strength values for dowel type fasteners in GLT and CLT with different layups. In process of completion (10.2014 - 06.2015)  
 Eero Tuhkanen; Joosep Mölder

*Publications*

Tuhkanen, E.; Öiger, K (2013). The behavior of toothed-plate connectors under reversed cyclic loading. In: Structures and Architecture: Concepts, Applications and Challenges: Second International Conference on Structures and Architecture - ICSA 2013, 24.-26.juuli 2013, Guimarães, Portugal. (Eds.) Paulo J.S. Cruz. Taylor & Francis, 2248 - 2254.

**Dr. Johan Vessby (Sweden)**

Linnaeus University

Växjö Sweden

[johan.vessby\(at\)lnu.se](mailto:johan.vessby@lnu.se)

COST FP1402, MC Member, WG3 Member

*Personal*

Years of experience in relevant field: 10

Expertise: numerical modelling, experimental tests, shear walls, connections

Degree: PhD (11.05.2011)

*Organisation*

Building Technology

(www.lnu.se)

Focus: theoretical and practical research / innovation, design of structures and education and training

Facilities: Testing lab with three hydraulic test rigs of which one is setup for biaxial experiments, several other hydraulic pistons, DIC evaluation systems

No. of staff	PhD students	MSc/year
6	1	10

*Research projects*

[1] Expert competence for sustainable timber buildings (master courses for practicing engineers), 2012-2018, e.g. J. Vessby, J. Oscarsson, S. Ormarsson, M. Johansson, A. Olsson, lnu.se/ehtb (in Swedish)

[2] Part in the research project Mechwood 2, 2012-2014, T. Bader, E. Serrano, M. Dorn, B. Enquist, <http://www.imws.tuwien.ac.at/en/mechwood/mechwood/>

[3] Simulation of effects of moisture in members and connections in timber structures, 2015-, S. Ormarsson

*Publications*

[1] T.K. Bader, M. Schweigler, G. Hochreiner, B. Enquist, M. Dorn, E. Serrano: „Experimental characterization of the global and local behavior of multi-dowel LVL-connections under complex loading“; submitted for publication in Materials and Structures, 2015

[2] S. Ormarsson and Ó. V. Gíslason: Moisture-induced stresses in timber structures, European Journal of wood and wood products, In process for publication, 2015.

[3] Vessby, J., Serrano, E., Olsson, A. (2010). Coupled and uncoupled nonlinear elastic finite element models for monotonically loaded sheathing-to-framing joints in timber based shear walls. Engineering structures. 32. 3433-3442.

[4] Vessby, J., Källsner, B., Olsson, A., Girhammar, U.A. (2014). Evaluation of softening behaviour of timber light-frame walls subjected to in-plane forces using simple FE models. Engineering structures. 81. 464-479.

