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Carlos Rebelo

GROUPS

**Historical and Masonry
Structures**

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**Steel and Mixed Construction
Technologies**

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Structural Composites

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Functional Performance

Luís Godinho

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ISISE HIGHLIGHTS

Paulo B. Lourenço has just been awarded a EUR 3 million Grant from the European Research Council. These are the most prestigious and competitive individual grants in Europe. An Advanced Grant is attributed for active researchers who are science leaders in the last ten years, in terms of originality and relevance of their contributions.



He will develop an integrated experimental and numerical methodology to accurately describe the structural behaviour of historical buildings. The project will generate new stochastic integrated models to consider the seismic signal in the dynamic response and in the building capacity, a unique set of dynamic response data evaluated using an extensive seismic table testing program, integrated numerical and analytical tools for safety assessment and new standards to safeguard historic buildings in terms of collapse and limitation of damage.

The grant will contribute to solving a societal problem linked to the United Nations 2030 agenda for safe, resilient and sustainable cities and to preserve our identity through the preservation of historic heritage. It is also a recognition of ISISE as an international reference in civil engineering.

The content and opinions expressed within the Newsletter are those of the researchers involved and are not necessarily shared by the Directors of ISISE



R&D COMPLETED PROJECTS

> FREEDAM – FREE from DAMAGE Steel Connections

ISISE Principal Investigator: *Luís Simões da Silva / Aldina Santiago*

Budget: Global: 1.449,860,00€

ID: RFSR-CT-2015-00022

Funding Entity: EU – Research Fund for Coal and Steel

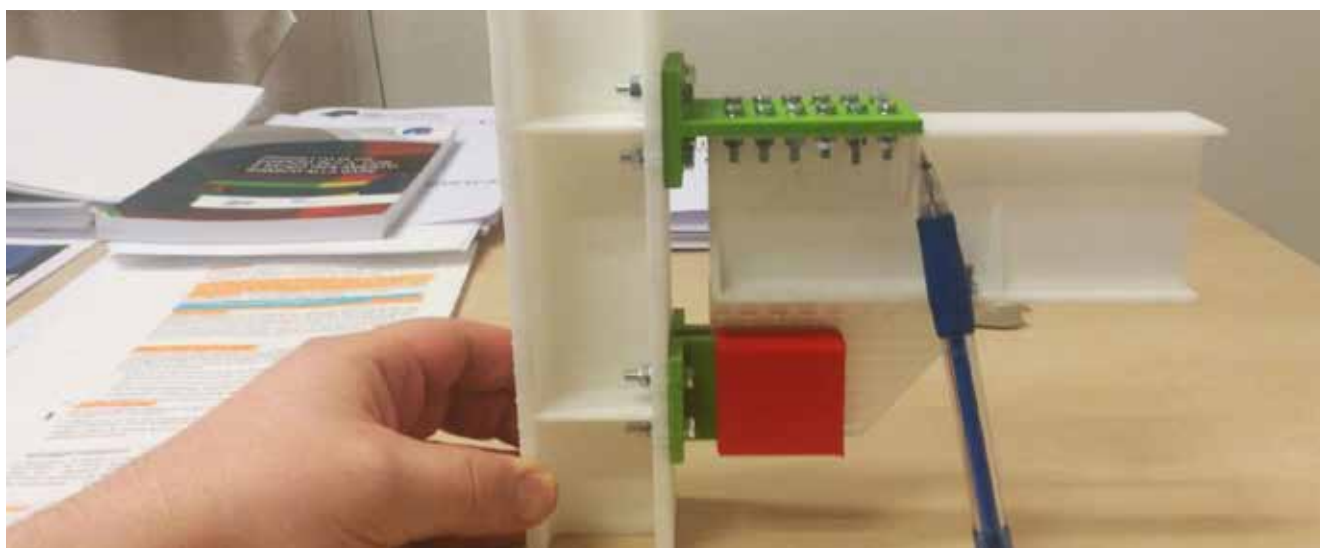
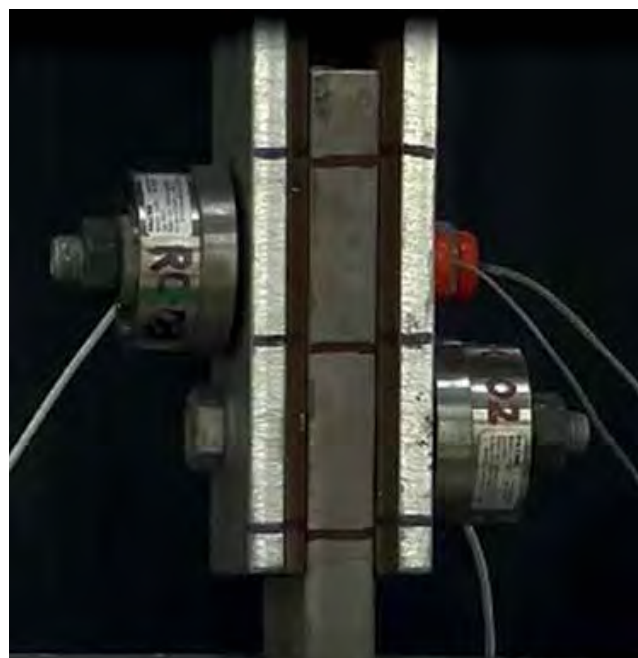
Principal Contractor: *University of Salerno*

Duration: From 01/07/2015 to 30/06/2018

Summary: This project aimed at the development of a new design strategy whose goal was the design of connections able to withstand without any damage the rotation demands due to seismic events. Such innovative beam-to-column connections are equipped with friction dampers located at the bottom flange level of the connected beam to dissipate the earthquake input energy. The friction resistance is calibrated by acting on the number and diameter of bolts and their tightening torque governing the preloading. The flexural resistance results from the product between the damper friction resistance and the lever arm. The connections are conceived to exhibit wide and stable hysteresis loops without any damage to the connection steel plate elements. The development of FREEDAM connections have the benefits coming from the cancellation of the connection repair costs in the aftermath of a seismic

event and, on the other hand, a step towards the ambitious goal of free from damage buildings which will require, additionally, the identification of connection details, between non-structural components and primary structure.

More information about the project can be found in ISISE youtube channel, FREEDAM youtube channel and at the news: expresso.pt, 90segundosdeciencia.pt and sicnoticias.pt.





> INOV_LAMI – Development of a new reinforcing system and evaluation of the existing models for composite slabs

ISISE Principal Investigator: Rui António Duarte Simões

Budget: Global: 322.776,45€

ID: SII&DT 3483 INOV_LAMI

Funding Entity: Agência Nacional de Inovação, S.A.

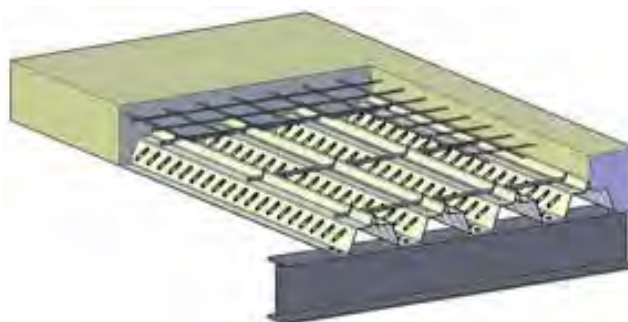
Principal Contractor: O Feliz Metalomecânica, S.A.

Duration: From 01/01/2016 to 31/12/2018

Summary: In order to overcome the main drawbacks concerning the behaviour of steel-concrete composite slabs, a research project - INOV_LAMI, was carried out at the Civil Engineering Department of University of Coimbra in a partnership with a steelwork company – O Feliz Metalomecânica S.A.. The aim of the research project was to improve the behaviour of composite slabs, focusing on the development of an innovative reinforcing system to increase the longitudinal shear resistance. The system consists of a set of steel bars crossing longitudinal stiffeners executed along the upper flanges of the profiled steel sheeting. Two experimental test programmes were carried out: the first was comprised

of a set of small-scale tests to determine the resistance of the reinforcing system and to calibrate an analytical expression to predict its design value; a second experimental campaign comprised a set of full-scale tests on simply supported and continuous composite slabs to prove the efficacy of the system.

The study concludes that the resistance and the ductility of composite slabs using the reinforcing system proposed are significantly increased. This innovative system was the object of a patent registration.



> COST Action TU1406 – Quality specifications for roadway bridges, standardization at a European level

ISISE Principal Investigator: José Campos e Matos

Budget: Global: 821.443,49€

ID: COST - CGA-TU1406

Funding Entity: European Cooperation in Science & Technology/EU

Principal Contractor: Universidade do Minho

Duration: From 01/06/2015 to 15/04/2019

Summary: During the implementation of asset management strategies, maintenance actions are required in order to keep assets at a desired performance level. In case of roadway bridges, specific performance indicators are established for their components. These indicators can be qualitative or quantitative based, and can be obtained during principal inspections, through a visual examination, a non-destructive test or a temporary or permanent monitoring system.

Then, obtained indicators are compared with performance goals, in order to evaluate if the quality control plan is accomplished. It is verified that there

is a large disparity in Europe regarding the way these indicators are quantified and how such goals are specified. Therefore, COST Action TU1406 aimed to bring together, for the first time, both research and practicing community in order to accelerate the establishment of a European guideline in this subject. It will be also analysed new indicators related to sustainable performance of roadway bridges.





R&D STARTED PROJECTS

› Research into enhanced track and switch and crossing system 2

ISISE Principal Investigator: António Gomes Correia
Budget: Global: 13.409.656,14€/ISISE-UM: 193.478,75€
ID: 826255 — IN2TRACK2

Funding Entity: Comissão Europeia - Shift2Rail Joint Undertaking

Principal Contractor: Network Rail Infrastructure Limited

Duration: From 01/11/2018 to 30/04/2021

Partners: Universidade do Minho, Universidade do Porto, Railenium – Institut de Recherche Technologique, Infraestruturas de Portugal, Tatasteel, Universidad Del País Vasco/Euskal Herriko Unibertsitatea, Network Rail, Acciona S.A., Slovenske Železnice Doo, Türkiye Cumhuriyeti Devlet Demir Yolları İletmesi, Genel Mudurluğu, Wiener Linien GmbH & Co Kg, Vossloh Cogiefer SA, Voestalpine Vae GmbH, Voestalpine Schienen GmbH, Trafikverket, Sncf Réseau, Prorail Bv, Plasser & Theurer Export Von Bahnbaumaschinen Gesellschaft Mbh, Obb-Infrastruktur Ag, Materials Center Leoben Forschung GmbH, Kompetenzzentrum - das Virtuelle Fahrzeug, Forschungsgesellschaft Mbh, Kirchdorfer Fertigteilholding GmbH, Getzner Werkstoffe GmbH, Centro de Estudios de Materiales Y Control de Obra SA, Deutsche Bahn Ag, Ansaldo Sts S.P.A., AC2t Research GMBH

› Tech4Timber

ISISE Principal Investigator: Alfredo Dias
Budget: Global: 199.331,00€/ISISE-UC: 122.913,00€
Funding Entity: P2020

Principal Contractor: Carmo Estruturas

Duration: From 01/02/19 to 31/01/2021

› Strengthening infrastructure risk management in the Atlantic area

ISISE Principal Investigator: José António Campos e Matos

Budget: Global: 2.023.994,52€/ISISE-UM: 311.438,64€
ID: EAPA_826/2018 SIRMA

Funding Entity: CCDR-N - Interreg Atlantic Area

Principal Contractor: University of Minho

Duration: From 01/04/2019 to 31/03/2022

Partners: Universidad de Vigo, The University of Birmingham, University College Dublin, Infraestruturas de Portugal, Queen's University Belfast, University of Surrey, University of Nantes, AZVI, S.A., Iarnród Éireann

› New STANDards for seismic assessment of built cultural HERITAGE

ISISE Principal Investigator: Paulo Lourenço

Budget: Global: 2.968.755,00€/ISISE-UM: 2.968.755,00€
ID: 833123 — STAND4HERITAGE (ERC-2018-ADG)

Funding Entity: H2020 - ERCEA

Duration: From 01/09/2019 to 31/08/2024

Partners: University of Minho





COMPLETED PHD THESES

> Health Assessment of Glued Laminated Timber Elements

Author: Carlos Eduardo de Jesus Martins
Supervisors: Alfredo M. P. G. Dias (UC); Helena Cruz (LNEC)

Date: January 28th, 2019

Summary: The Thesis focused on the assessment of glued laminated timber elements made of several species available in Portuguese Forest. The main objectives were: i) assessment of face bonding performance of Maritime pine and Poplar; ii) evaluation of the natural ageing process on glue lines (Maritime pine); iii) assessment of the mechanical properties of glulam in bending; iv) determination of the potential of using non-destructive methods and analytical models for static mechanical properties prediction; and v) development of a simplified numerical model able to describe the mechanical behaviour (load vs deflection) experimentally observed. Longitudinal vibration method played an important role to characterize the raw-material, as well as, to provide reliable data for Transformed

Section Method. On the other hand, hybrid glulam beams made of Eucalyptus and Poplar showed higher structural efficiency values, being also observed a ductile behaviour in several glulam beams.



Failure mode of Eucalyptus beam – punctual propagation of failure along the glue line 2

CV: **Carlos Martins** holds MSc from University of Coimbra (2010). He was a scholarship researcher in different research projects regarding timber-concrete behaviour for 4 years. In 2014 he started his PhD in EcoCoRe Doctoral Programme being concluded in 2019. Is author of 23 published papers (including journal, chapters of books and conference papers). Nowadays is a Post-Doc researcher at UC/SerQ.

> Robustness of multi-story timber buildings in seismic regions

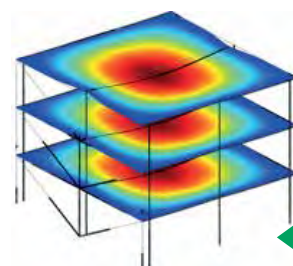
Author: Leonardo Filipe Guilherme Rodrigues

Supervisors: Jorge Branco; Luís A. C. Neves

Date: February 7th, 2019

Summary: The main objective of this thesis is the development of numerical modelling approaches for seismic and robustness assessment of multi-storey timber buildings. A phenomenological computational model approach for CLT diaphragms was proposed and validated by comparing numerical results to experimental data obtained from a two-storey full-scale building tested on a shake-table. Additionally, the seismic performance of a three-storey building was evaluated through a probabilistic approach, which accounts for uncertainties in mechanical properties of members and connections. The results indicate that the detailing requirements of EC5 and EC8 are sufficient to achieve the required performance. Finally, the progressive collapse potential of seismic resistant heavy-timber structures

was studied through an alternate load path analysis (ALPA). The results indicate that the structural capacity for developing alternative load paths is highly dependent on the rotational capacity of connections.



Displacement diagram of a central column loss scenario

CV: **Leonardo G. Rodrigues** obtained his MSc in Civil Engineering in 2011 at FCT/UNL, and his PhD in 2019 at the University of Minho. His main research topics are related with seismic and robustness assessment of timber structures by use of experimental tests, numerical models and probabilistic based methods. Presently, he develops research in the field of timber structures design and modelling.



> Three dimensional behaviour of I beam – SHS column joints with hollo-bolts subjected to monotonic loads

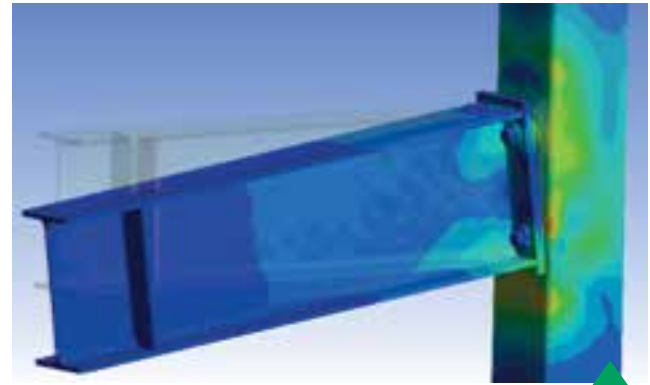
Author: Afonso Carlos Bonina de Mesquita

Supervisors: Luís Simões da Silva, Sandra Jordão

Date: February 28th, 2019

Summary: This thesis presents an experimental, numerical and analytical study to characterize the structural behaviour of I beam – SHS column joints connected using hollo-bolts. The first stage of the program included eight hollo-bolts pull-out tests, considering different values of tightening moment and two commercial diameters. The axial stiffness was evaluated for each of the considered situations as well as identified the tensile strength for the bolts. The second stage reported on 14 tests corresponding to I beam – SHS column joints at external, corner and internal node's configuration, considering real-scale prototypes under a monotonic load applied on the beams. Tests were performed and the respective force-displacement and moment-rotation diagrams were obtained. FEM were processed in the ANSYS® software representing the corresponding joints and connections previously tested.

The theoretical study culminated with a proposal of two analytical models for the plastic moment of those joints.



Numerical simulation of I beam - SHS column joint

CV: **Afonso Mesquita** obtained his PhD in Steel and Composite Structures at the DCE of the CTF of University of Coimbra. Concluded his MSc in Civil Engineering (Structures) at the same institution. He has published 11 papers in scientific events and owns 12 items of technical production. Participated in several national and international conferences. Focuses his work in the field of Steel Structures.

> Sound diffusers with 3D organic shape – Numerical study and optimization

Author: Ricardo Patraquim

Supervisors: Luís Godinho, Paulo Amado Mendes

Date: March 15th, 2019

Summary: Acoustic diffusers are commonly used in acoustic conditioning of spaces, acting mainly to ensure proper acoustics without excessive absorption, by scattering the sound evenly around the room and eliminating acoustic defects. Most of the existing diffuser solutions presently available in the market correspond to Schröder diffusers with sharp geometries and whose appearance is often not appreciated by architects. Therefore, the main objective of this work is to present a methodology for the development of more organic surfaces (i.e., curvilinear), which are potentially more aesthetically pleasing and which are optimized to uniformly disperse the sound impinging them. Thus, this work demonstrates the possibility of developing innovative solutions of acoustic diffusers with maximized acoustic performance, whose shape is generated by

the use of radial-based functions and which are based on the most modern numerical modelling techniques such as BEM and Genetic Algorithms for optimization.

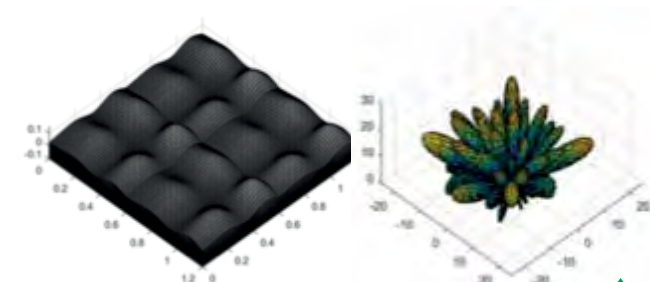


Image of a 3D diffuser (left) and expected sound dispersion pattern (right)

CV: **Ricardo Patraquim** holds a Ph.D. in Civil Eng. in the Department of Civil Engineering of the University of Coimbra, approved with praise and distinction by unanimity. His principal research interests lie in the areas of acoustic diffusers and sound absorbers. Currently he continues to work in the company Castelhana & Ferreira developing products for room acoustic conditioning.

> Risk and evacuation modeling in a Hospital in case of fire - a case study in the Sousa Martins Hospital in Guarda

Author: Amarildo Leonel Mailito Guiane Benzane

Supervisors: Luís Laím & João P.C. Rodrigues

Date: April 4th, 2019

Summary: Partial evacuation performance in a hospital has been studied, which may be appropriate when the building fire protection feature assures that occupants away from the evacuation zone will be protected from the effects of the fire for a reasonable time, as it is the case of hospitals. Three fire compartments (FC) have been selected, including the surgery blocks (SB), emergency department (ED) and infirmary service (IS) of the hospital. Numerical simulations were carried out by the finite volume software Fire Dynamics Simulator (FDS) in combination with the evacuation simulation model Evac. The influence of the smoke control system, the occupants' number and the strategy of using lifts on the evacuation time was investigated. As well as, the effects of the number of exits, the exit width, the fire location, the pre-movement time, the type of occupants, on the evacuation time of the FCs

were still studied. The results showed that the pre-movement time is the parameter that influences more the evacuation process.



CV: **Amarildo Leonel Mailito Guiane Benzane** holds a Ph.D. in Fire Safety Engineering in the Department of Civil Engineering of the University of Coimbra (UC), approved unanimously. His principal research interests lie in the areas of evacuation numerical modelling, fire safety regulation and fire risk assessment.

> Pseudo dynamic tests and numerical analysis of free from damage multistorey steel buildings with innovative connections

Author: Giovanni Ferrante Cavallaro

Supervisors: Gianvittorio Rizzano (UNISA) + Aldina Santiago (UC)

Date: April 5th, 2019

Summary: The present PhD thesis was developed within the FREEDAM research project. First, an extensive experimental campaign was carried out for the choice of material for the friction dampers used in the FREEDAM connections by carrying out a statistical characterization of the static and dynamic friction coefficients. After selection the best material, two different types of internal beam-to-column connections (with FREEDAM friction dampers) were designed and tested under cyclic loading at the University of Coimbra Laboratory. The experimental observations were compared with the numerical results obtained from a finite element model modelled in ABAQUS in order to study in detail the behaviour of this joint. Finally, pseudo-dynamic tests were carried out on full-scale steel

Moment Resistant Frame equipped with traditional full strength beam-column connections (dogbone) and with the innovative connections proposed.



CV: **Giovanni Ferrante Cavallaro** holds his MSc degree in Civil Engineering at the University of Salerno (Italy). He is author of 13 published works (distributed by journals, conference papers and reports) in the field of steel structures in the seismic area. After his PhD, he is currently working as independent contractor on consulting and innovation services in Engineering.



AWARDS & PRIZES

► BERD-FEUP WIBE Prize

The World Innovation Award in Bridge Engineering, awarded by the BERD and FEUP, distinguished three works. The project "São Silvestre footbridge: an innovative GFRP-SFRSCC hybrid structural system" developed by the University of Minho (Joaquim Barros and José Sena Cruz - ISISE Researches), Instituto Superior Técnico, together with the company Alto Perfis Pultrudidos, ranked third place. The prize was delivered by His Excellency the President of Portugal, Marcelo Rebelo de Sousa, last March 26th 2019,



► ACI Fellow

Last March 24th 2019, at the American Concrete Institute (ACI) Spring 2019 Convention, held in Quebec, Canada, Prof. Joaquim Barros has been elected a Fellow of the

Institute in recognition of his significant contributions to the work of ACI. Prof. Joaquim Barros is voting member of the ACI-544 and associate member of the ACI-440 technical committees.

► Honorable mention award at the "Carlos Sousa Oliveira Prize 2019" for the best journal papers in 2016-2019

The Carlos Sousa Oliveira award is attributed in Portugal every three years to recognize outstanding research papers in the fields of seismology and earthquake engineering. ISISE was the recipient of two awards, for the papers: "The use of a large-scale seismic vulnerability assessment approach for masonry façade walls as an

effective tool for evaluating, managing and mitigating seismic risk in historical centres" (Aguado, J., Ferreira, T.M., Lourenço, P.B.) and "Experimental assessment of the out-of-plane performance of masonry buildings through shaking table tests" (Candeias, P.X., Campos-Costa, A., Mendes, N., Costa, A.A., Lourenço, P.B.).

► "Red Temática Conacyt Prize" for the best research thesis in Historic Centres

Santiago Granda has been awarded with the International Prize of "Red Temática CONACYT Centros Históricos" for the SAHC master's dissertation conducted under the supervision of Doctor Tiago Miguel Ferreira, entitled "Multi-scale fire risk assessment and mitigation in urban

areas: The old city centers of Guimarães and Quito as case studies". This prize is awarded annually by the "Red Temática CONACYT Centros Históricos" for the best doctoral thesis and master dissertation on Historic Centres.



> RILEM's Gustavo Colonnetti medal 2019

Dr. Bahman Ghiassi, assistant professor of University of Nottingham and a former PhD and postdoctoral researcher of ISISE, University of Minho, was awarded the RILEM's Gustavo Colonnetti medals in 2019. This highly distinctive medal is annually awarded to two researchers of less than 35 years, who have made an outstanding scientific contribution to the field of construction materials and structures. His research interests cover a vast range of topics related to

durability and mechanics of new and old construction materials.



EVENTS

> Structural Glass Design: Key aspects

Venue: Coimbra CMM

Date: January 17-19, 2019

ISISE Member: Sandra Jordão

Website: <https://www.cmm.pt/site/index.php?o=courses&id=79>

Summary: CMM organized a course on Structural Glass, encompassing 14 modules on several key aspects related with the material and its technology, industrial production, design and building physics. The course had 5 lecturers, from the different sectors referred (Prof.^a Sandra Jordão - coordinator, Prof. Paulo Santos e Prof.^a Andreia Pereira, from UC; Dr. Rui Camposinhos

from ISEP and Eng.^o Pedro Freitas from Martifer). One of the modules was dedicated to a study visit to a glass transformation company near Coimbra (Vidromax).



> As alterações climáticas no contexto da indústria da madeira

Venue: SerQ – Centro de Inovação e Competências da Floresta, Sertã

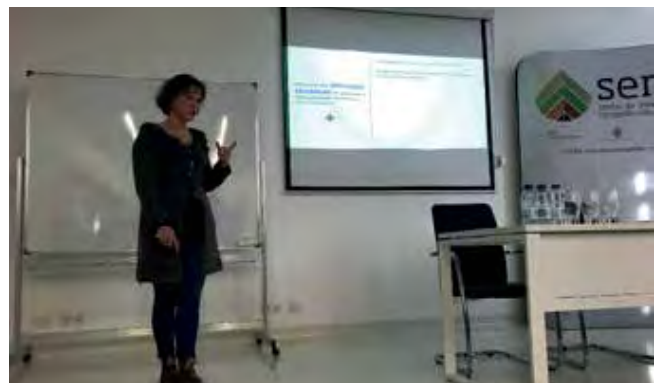
Date: February 6th, 2019

ISISE Member: Aldina Santiago

Website: <https://www.centroadapt.com/>

Summary: CentroAdapt is organizing several workshops about climate changes. On 6th February, Professor Aldina Santiago presented, in Sertã, the workshop “As alterações climáticas no contexto da indústria da madeira”. CentroAdapt is a project that promotes the transfer of scientific and technological knowledge about climate changes between researchers from UC and companies in Coimbra. Partners: ISISE-Institute for Sustainability and Innovation in Structural Engineering; – Universidade de

Coimbra; CISUC – Centre for Informatics and Systems of the University of Coimbra; MARE – Centro de Ciências do Mar e do Ambiente; ADAI – Associação para o Desenvolvimento da Aerodinâmica Industrial.



> 29th Colloquium on Fatigue Mechanisms

Venue: Brno, Check Republic

Date: March 21-22, 2019

ISISE Member: Bruno Pedrosa

Website: <https://www.ipm.cz/colloquium-fatigue-mechanisms-2019/>

Summary: PhD candidate Bruno Pedrosa was invited to present the scientific paper "Fatigue behavior of double shear connections with preloaded injection bolts in a bridge strengthening scenario" on the 29th Colloquium on Fatigue Mechanisms on the occasion of 80th birthday of Prof. Jaroslav Polák. Fatigue experimental results were

discussed and alternative S-N design curves for joints with preloaded injection bolts were proposed.



> COST TU1406 Final Conference Guimarães

Venue: Guimarães

Date: March 25-26, 2019

Organization: COST Action TU1406; University of Minho

Website: <https://www.tu1406.eu/meetings/guimaraes-final-conference>

Summary: The final conference of COST Action TU1406 was dedicated to:

- > Outcomes and balance of COST Action TU1406;
- > Present status of bridge management;
- > Future perspectives for bridge management.



> IABSE Symposium Guimaraes

Venue: Guimarães

Date: March 27-29, 2019

Organization: The Portuguese Group of IABSE; University of Minho

Website: https://www.iabse.org/IABSE/Events/Guimaraes_2019

Summary: The IABSE Symposium 2019 was held at the Vila Flor Cultural Centre, Guimarães, on March 27-29, with the theme "Towards a Resilient Built Environment: Risk and Asset Management". It was a joint organization of the IABSE Portuguese Group and University of Minho. It counted with 38 parallel sessions, with 12 Special Sessions and was attended by more than 350 participants from 48 different countries.



> COST TU1406 Standardization Workshop

Venue: Reykjavik, Iceland

Date: April 11-12, 2019

Organization: COST Action TU1406; Icelandic Road and Coastal Administration

Website: <https://www.tu1406.eu/meetings/reykjavik>

Summary: The workshop focused on Standardization Pathways in the aftermath of the work done and dedicated to:

- > Establishing best practice guidelines;
- > Making findings relevant through strategic liaison with normative bodies;
- > Development of a networking instrument through strategic and coordinated discussions for better policy for public infrastructure in future;
- > Bridge management systems.



> Steel Talk – Construção Metálica em LSF

Venue: Feira Internacional de Lisboa, Lisboa

Date: May 9th, 2019

ISISE Member: Professor Hélder Craveiro

Website: <https://tektonica.fil.pt/>

Summary: On 9th May there was a Steel Talk on “Construção Metálica em LSF – Light Steel Framing” that took place in TEKTONICA – International Building and Construction Fair – FIL. The presentation, lectured by Professor Hélder Craveiro, focused on “Construção em Aço Enformado a Frio I&D – do Comportamento do Material à Resistência ao Fogo”.



> Seismic prequalification of beam-to-column steel joints

Venue: FIL, Lisbon

Date: May 10th, 2019

ISISE Member: Luis Simões da Silva, Carlos Rebelo, Ricardo Costa, Sara Oliveira, Melaku Seyoum

Website: <https://tektonica.fil.pt/>

Summary: The workshop was organized by ISISE-UC and was held in Feira Internacional de Lisboa (FIL), Lisbon, on 10th May 2019. Academics, structural engineers and students were invited. The number of participants was about 25. Each participant received documentation consisting of three printed documents and one pen USB with documents. The objective of this workshop was to

present the developments made in EU funded research project Equaljoints dealing with the prequalification of steel beam-to-column joints for seismic areas. Delegates from several companies, design offices and from universities were present in a total of 25 attendees.



UPCOMING EVENTS

> CMN 2019 – Congress on Numerical Methods in Engineering, Guimarães

Venue: Guimarães, Portugal

Date: July 1-3, 2019

Website: <http://cmn2019.pt/>

> SHATIS'2019 – International Conference on Structural Health Assessment of Timber Structures

Venue: Guimarães, Portugal

Date: September 25-27, 2019

Website: www.shatis19.pt

> ISOC 2019 – International Sustainable Ocean Conference

Venue: Figueira da Foz, Portugal

Date: September 25-27, 2019

Website: <https://isoc2019.com/>

> 3rd International Conference on Information Technology in Geo-Engineering (3rd ICITG 2019)

Venue: Guimarães, Portugal

Date: September 29 to October 2, 2019

Website: www.3rd-icitg2019.civil.uminho.pt

> XII Congresso de Construção Metálica e Mista

Venue: Convento de São Francisco, Coimbra, Portugal

Date: November, 21-22, 2019

Website: www.cmm.pt/congresso12

> 3rd RILEM Spring Convention 2020 – Ambitioning a sustainable future for built environment: comprehensive strategies for unprecedented challenges

Venue: Palácio Vila Flor, Guimarães, Portugal

Date: March, 10-14 2020

Website: <https://www.rsc2020.civil.uminho.pt/>

> IX Workshop on Connections in Steel Structures

Venue: Coimbra, Portugal

Date: June 2-4, 2020

Website: (available soon)

> Conference IPW 2020

Venue: Guimarães, Portugal

Date: September 23-25, 2020

Website: www.ipw2020.com

