

INDEX

- 01 ISISE HIGHLIGHTS
- 03 IMPACT STORIES
- 04 R&D COMPLETED PROJECTS
- 07 R&D STARTED PROJECTS
- 09 COMPLETED PhD THESES
- 13 AWARDS & PRIZES
- 14 EVENTS
- 15 UPCOMING EVENTS
- 16 MASTER COURSES
PHD COURSES

DIRECTOR

Paulo B. Lourenço

CO - DIRECTOR

Luís Simões da Silva

ASSISTANT DIRECTORS

José Sena-Cruz

Carlos Rebelo

Historical and Masonry Structures

Paulo B. Lourenço

Steel and Mixed Construction Technol.

Luís Simões da Silva

Structural Composites

Joaquim Barros

Functional Performance

Luís Godinho

Science communication

Miguel Azenha

Trayana Tankova

Career development

Tiago M. Ferreira

Advisory Committee

Bill Spencer

David Nethercot

Francesco Asdrubali

Henrik Stang

ISISE HIGHLIGHTS

ISISE top-ranked as “Excellent” by the Portuguese Foundation for Science and Technology (FCT) for the period 2020-2023



The evaluation of R&D Units in Portugal is a process of merit recognition and provides yearly operational base funding. It also places the members of the Institute in the best possible position for attracting funding for research projects, post-doctoral collaborators and doctoral students.

ISISE had been incorrectly ranked as “Very Good” according to the evaluation process completed in December 2019. After a formal complaint, ISISE has just been graded as “Excellent”. This is the top rank that a R&D unit can obtain in Portugal, which is a recognition of the scientific leadership of our Institution. Congratulations to all members and thanks to FCT! Now, it is up to all of us to keep this top label.



ISISE is member of the ARISE Associated Laboratory, funded by the Portuguese Foundation for Science and Technology



The Portuguese Foundation for Science and Technology (FCT) announced the preliminary results of the Call for the Statute Associate Laboratory (LA) Status las 24th February 2021. The LA ARISE – Advanced Production and Intelligent Systems (<http://arise-la.org/>), formed by R&D Units Centre for Rapid and Sustainable Product Development (CDRSP), Centre for Mechanical Engineering, Materials and Processes (CEMPRE),

Institute for Sustainability and Innovation in Structural Engineering (ISISE), Institute of Systems and Robotic of University of Coimbra (ISR-UC) and Research Center for Systems and Technologies (SYSTEC), has been recommended for funding. The ARISE has been created to undertake scientific, and technical research of excellence, and innovation activities targeting the areas of the areas of Advanced Productions Systems, Construction, Robotics, Materials, Energy, Management, and Information Technologies, built on solid scientific foundations, in order to support the renovation and the re-industrialization of national production system, within a decarbonization

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



framework to ensure the environmental, and socio-economic sustainability. An unique interdisciplinary framework that articulates fundamental and applied sciences and technologies from Computation, Material, Management and Information Technologies Sciences, with key very diverse branches of Engineering - Civil, Electrotechnical, and Mechanical – yielding the proper synergistic context essential to address most of the challenges arising in the core objectives of the LA. The ARISE is organized in the following thematic-lines: New Materials & Components, Advanced Production Systems and Processes, Sustainable Energy Systems, Thematic Line Intelligent Systems and Robotics, and Digital Eco Systems, Risk, and Management.

ISISE at a glance 2020



– SUBLIME (Sustainable Building Lime Applications Via Circular Economy and Biomimetic Approaches). MSCA Innovative Training Network coordinated by ISISE (15 PhD students and 19 partners).

– A robotized Additive Manufacturing Laboratory was installed with the capacity to produce large scale metallic prototypes (real size) using Wire Arc Additive Manufacturing and Laser Metal Deposition.

– MSCA Individual Fellowship to Lucía Garijo: Improving the self-healing capacity of natural hydraulic lime mortars (see Impact Stories).



– New Erasmus Mundus Master Course in acoustics (WAVES), with Univ. of Coimbra, and coordination of the Aix-Marseille Univ., France.



– Involvement in major national research & innovation initiatives, including Railways 4.0 Project and Forest for Future Project.

– New Journal (Transportation Engineering) by Elsevier. Editor: António G. Correia.



– Vice-President of IABSE (since Jan. 2020): José Matos.

ISISE Board of Directors – new members

ISISE is proud to announce the appointment of three new members to its Board of Directors, effective September 1, 2020. The three Board members are Miguel Azenha and Trayana Tankova, who are responsible for Science Communication, and Tiago M. Ferreira, who is in charge of Career Development.

The Science Communication team aims at developing, updating and monitoring ISISE's communication policies and practices, and also providing a consistent image of excellence of the institute.

The Career Development targets the supporting all ISISE staff and students with building future perspectives of their professional path. It is intended to have a central role in raising awareness of career opportunities, in providing training and support at key career transitions.



Two new Marie Curie Post-Doctoral Grants hosted in ISISE

From the last results announcements for Marie Skłodowska-Curie actions Individual Fellowships, two funded grants were obtained for ISISE: one for Jennifer D'Anna with the topic "Integrated TRM System for the Seismic Strengthening of Masonry Heritage", and another for Rogiros Illampas with the topic "Development and corroboration of a novel Natural Textile Reinforced Mortar System for masonry retrofiting". Congratulations to Jennifer and Rogiros!

IMPACT STORIES



**Konrad J. Krakowiak,
Assistant Professor at the University of Houston, USA**

> In which circumstances did you join ISISE?

Actually, we may say that the ISISE joined me. At the time of ISISE initialization, I was a doctoral student of a great mentor, prof. Paulo B. Lourenço. I joined the Historical and Masonry Structures group at UMinho around 2008. First, thanks to the Erasmus-Socrates student exchange program, I could spend two

semesters working with him on various engineering problems, in particular, the structural analysis of Jerónimos Monastery, which became the subject of my Master Thesis delivered at Warsaw University of Technology Poland. Right after the defense, I returned to Guimarães to continue my work as a researcher, and later as a doctoral student. Sometime in the mid of my doctoral research, the Institute for Sustainability and Innovation in Structural Engineering (ISISE) was established.

> How would you describe your experience in ISISE?

Pretty interesting. First of all, the group of people I was around was great, and this refers to other students, colleagues working in the laboratory, as well as professors. I remember a vibrant atmosphere, a bowl of various nationalities, cultures, religions, and traditions. Everyone had great respect for another, and I am grateful for how much help I received from others when facing difficulties in research, laboratory work, and also in private life. Second, hard work regardless of the type of research you were performing: staying late in the office, casting concrete cylinders at night, or commuting for several hours to another university in the middle of Portugal to carry our experimental job. For me, it was always to perform my best, to do another step forward in my research, and also here I found great support from ISISE institute and its members. Finally, an intellectually stimulating academic environment, great people, and great minds!

> What was the impact of your time in ISISE on your career? And friends?

In one word: tremendous. First I had the opportunity to work with a great mentor. Second, I developed my doctoral research, which in large part became a spring-board to my current achievements. Right after my doctorate, I had an opportunity to join the renowned group at the Massachusetts Institute of Technology, where I further developed research topics investigated during my time at ISISE. Even now I continue this, in part, while delving into new problems of materials science in my lab, at the University of Houston, where I hold the Assistant Professor position. Believe me or not, but I am here also thanks to the tremendous support of numerous people and members of ISISE community, who I met on my career path. And for all of this, Thank You!

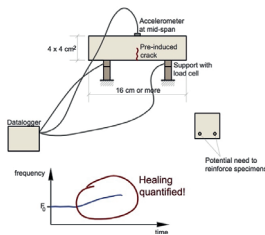
I wish ISISE institute, and its community, further successes, and great achievements!



Lucía Garijo has started a Marie Skłodowska-Curie action Widening individual fellowship (MSCA-WF) at ISISE



Lucía Garijo is from Albacete (Spain). She obtained a PhD in Civil Engineering on the topic of the advanced mechanical characterization of lime mortars at the University of Castilla-La Mancha, Spain. After previous collaborations with ISISE, she decided to apply with Prof. Lourenço and Prof. Miguel Azenha a postdoctoral fellowship on the HeaLime project conducted at the University of Minho. She was awarded through the Widening MSCA call. The project has just started in January 2021.



HeaLime is a postdoctoral project funded by the European Commission with the aim of studying the self-healing capacity of natural hydraulic lime mortars. On the one hand, the project will create a new testing method, based on the technique of EMM-ARM, to measure self-healing in a continuous and quantitative way. On the other hand, it will propose improved materials capable of heal their cracks and increase the service life of masonry structures.

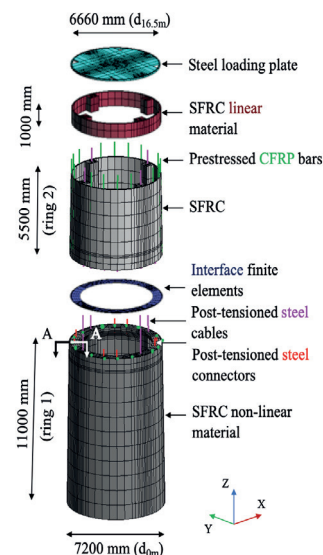
R&D COMPLETED PROJECTS

> InOlicTower – Innovative structural system based on advanced materials for lightweight and durable Offshore Wind Towers

ISISE Principal Investigator: A. Ventura Gouveia
Budget: Global: 197 400€/ISISE-UM: 197 400€
ID: PTDC/ECM-EST/2635/2014 (POCI-01-0145-FEDER-016905)
Funding Entity: Financed by the FCT and co-funded by FEDER through Operational Competitiveness and Internationalization Programme (POCI)
Principal Contractor: UMINHO
Duration: From 01/07/2016 to 30/11/2020

Summary: Regarding the existing structural solutions for offshore wind towers, the material/structural solution proposed in this project in less lightweight, more durable, deserves lesser maintenance costs, lower construction times and presents better structural behavior. The structural system is based on the “LEGO” concept by assembling precast FRSCC ribbed shell rings through a hybrid system composed of CFRP and steel post-tensioned strands located along the ribs in positions and with post-tensioned levels that mobilizes effectively their mechanical and durability potentialities. The advantages do not only reside on the new structural concept but also on the used materials: FRSCC and post-tensioned CFRP and steel strands. The advantage of using

FRSCC is the possibility of replacing all ordinary steel reinforcement by discrete fibers, diminishing significantly the costs related to the preparation and assembling the relatively complex reinforcing systems for this shell system. Due to the higher compacity, better organization of the constituents, derived from an optimized composition methodology, the FRSCC will have suitable durability for the exigencies of offshore environmental conditions.





> **FireComposite – Fire Behaviour of Reinforced Concrete Structures Incorporating FRP Composites**

ISISE Principal Investigator: Joaquim A. O. Barros

Budget: Global: 199 900€/ISISE-UM: 80 000€

ID: PTDC/ECM-EST/1882/2014

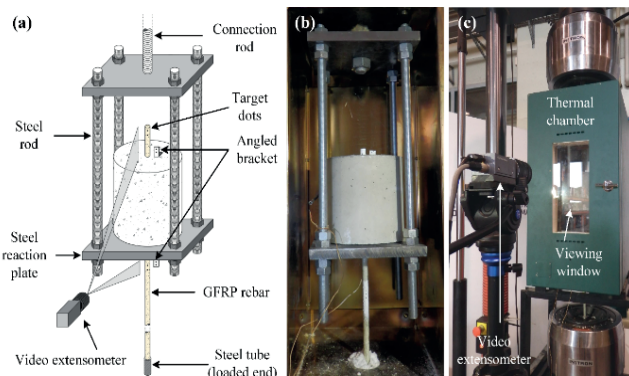
Funding Entity: Financed by the Fundação para a Ciência e a Tecnologia (FCT)

Principal Contractor: IST

Duration: From 01/06/2016 to 30/09/2021

Summary: This research project centres on the behaviour at elevated temperature and under fire of (i) new concrete elements reinforced with all-FRP bars or hybrid steel-FRP prestressed reinforcement and (ii) existing concrete elements strengthened with advanced FRP systems (ETS, prestressed strips, strips with bent extremities or bonded with cement-based adhesives). The main motivation was to improve the understanding of their fire response, to optimize both FRP materials/geometries and fire protection systems, to develop fire design guidelines and ultimately to enable extending the structural use of FRPs in buildings. The influence of the temperature on the tensile properties of FRPs and on the local

bond-slip relationship of these reinforcements to surrounding concrete was assessed from direct pull-out tests. The project has also assessed the fire behaviour of the following techniques: (i) flexural strengthening with near surface mounted (NSM) FRP strips, and (ii) shear strengthening with ETS-FRP bars. In both cases, the project has assessed the effectiveness of cement-based adhesives, less susceptible to thermal degradation than epoxies, and fire protection systems.



> **FRPLongDur – Long-term structural and durability performances of reinforced concrete elements strengthened in flexure with CFRP**

ISISE Principal Investigator: José Sena Cruz

Budget: Global: 200 000€/ISISE-UM: 175 000€

ID: PTDC/ECM-EST/1282/2014 (POCI-01-0145-FEDER-016900)

Funding Entity: FCT

Principal Contractor: UMINHO

Duration: From 01/06/2016 to 31/10/2020

Summary: FRPLongDur aimed at contributing to the knowledge on the long-term behavior and durability of reinforced concrete elements strengthened with CFRP (Carbon Fiber Reinforced Polymers) laminates according to the EBR (Externally Bonded Reinforcement) and NSM (Near Surface Mounted) reinforcement techniques, under the effects of aging by natural environments. The work involved: (i) an extended experimental program, with the creation of five experimental stations distributed throughout Portugal country (Elvas, Guimarães, Lisbon, Serra da Estrela and Viana do Castelo), where test specimens

at three scales (material, bond and structure) were installed to evaluate its performance during the time; (ii) the development of numerical simulations, based on the results obtained in the monitoring carried out; and, (iii) the development of design recommendations by proposing new values for environmental conversation factors for the materials (epoxy adhesives and CFRP laminates) and bond strength for EBR and NSM strengthening techniques.



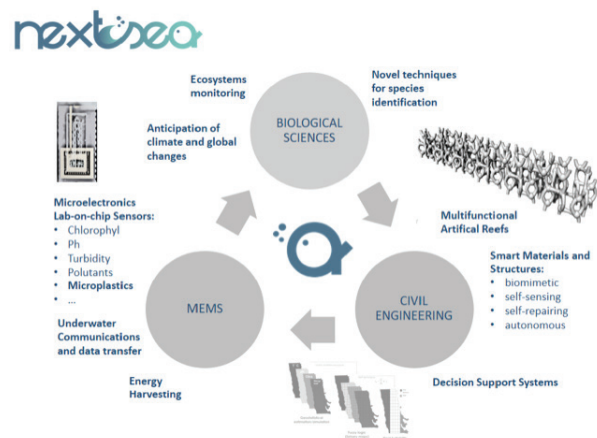


> **NEXT-SEA (ISISE) – Next Generation Monitoring of Coastal Systems in a Scenario of Global Change**

ISISE Principal Investigator: Eduardo Pereira
Budget: Global: 1 226 900 €/ISISE-UM: 328 800€
ID: NORTE-01-0145-FEDER-000032
Funding Entity: CCDR-N
Principal Contractor: UMINHO
Duration: From 01/07/2016 to 31/12/2020

Summary: Next-Sea project was aimed at tackling the current challenges faced by coastal systems due to global changes. The approach was based on a multidisciplinary work involving three knowledge areas: biological sciences, microelectromechanical systems and civil engineering. Throughout approximately four years of joint research, the project has resulted in innumerable achievements that contributed to address some of the challenges faced by coastal systems and open new R&D directions. New sensors and monitoring approaches were developed, aimed at measuring physical, chemical, biological and environmental variables that are essential to describe coastal systems health (including organisms), as well as to increase spatial resolution. Additionally, new

biological sampling and environmental monitoring strategies were developed, aimed at characterizing with greater accuracy the existing species and their abundances. In a perspective of coastal systems restoration, new materials and structural systems were developed, with special characteristics such as ecoefficiency, biomimetism, autonomy, self-sensing and self-healing properties, alongside to new approaches for management and decision-making.



> **Development of alkali binders for geotechnical applications made exclusively from industrial waste**

ISISE Principal Investigator: Tiago Miranda
Budget: Global: 144 900€/ISISE-UM: 54 200€
ID: PTDC/ECM-GEO/0637/2014
Funding Entity: FCT
Principal Contractor: UTAD
Duration: From 01/02/2017 to 31/10/2020

Summary: Development of binders, through alkaline activation (AA), based on industrial wastes, for geotechnical and structural applications of different requirements (pavement bases, structural embankments, deep soil stabilization, pavements with low traffic volume, sidewalks). The replacement of the activator by wastes allowed the improvement of the mechanical performance and provided economic, environmental and durability gains. The manufacture of lenses produces several tons/year of glass wastes, whose soluble silica is, as demonstrated, an alternative in AA reactions, replacing commercial reagents. The aluminum processing industry produces several wastes that constitute a suitable source of aluminum. Two soils

were stabilized with these binders, both well represented in the geology of the Portuguese territory. The results envisage the future application of this solution on a regular basis, with advantages from a mechanical and environmental point of view. Project Outputs:

- Definition of conditions for the use of national wastes in construction.
- Characterization of mechanical and environmental behavior of alternative binders.
- Specific application to the stabilization of national soils.





> **INNO3DJOINTS – Innovative 3D joints for robust and economic hybrid tubular construction**

ISISE Principal Investigator: *Luís Simões da Silva*

Budget: 1 483 700€ / ISISE-UC: 295 600€

ID: 749959

Funding Entity: *RFCS – Research Fund for Coal and Steel*

Principal Contractor: *University of Coimbra*

Duration: *From 01/07/2017 to 31/12/2020*

Summary: The main goal of INNO3DJOINTS was to develop innovative plug-and-play joints for hybrid tubular construction, whereby tubular columns are combined with cold-formed lightweight steel profiles to provide a highly efficient structural system. Within the course of the project, the following was achieved:

– Development of design procedures in the framework of the component method for innovative plug-and-play joints and asymmetrical column splices for tubular RHS sections, where consistency was kept with the structural Eurocodes. This was accomplished by extensive experimental and numerical studies, which were carried out at the joint level and at the component level.

– Characterization of particular aspects of joints involving cold-formed tubular sections, such as manufacturing procedures, the influence of the welded region on the plug-and-play connection and the level of cold working in the corner regions of the cross-section.

– Implementation of a general procedure for analysis of the 3D behaviour of these particular steel joints, essential for due consideration of structural robustness.

Finally, the project demonstrated the suitability of the hybrid system including the innovative joints for low to medium-rise buildings through representative case studies.



R&D STARTED PROJECTS

> **GeoCrit – Sistemas de nova geração para a monitorização e gestão de infraestruturas geotécnicas críticas**

ISISE Principal Investigator: *Eduardo Pereira*

Budget: *Global: 871 800€ / ISISE-UM: 363 500€*

ID: *17/SI/2019 - 047173*

Funding Entity: *ANI*

Principal Contractor: *Levels and Measures*

Duration: *From 01/07/2020 to 30/06/2023*

> **REV@Construction – Digital Construction Revolution**

ISISE Principal Investigator: *Joel Oliveira*

Budget: *Global: 8 217 200€ / ISISE-UM: 333 800€*

ID: *14/SI/2019- 046123*

Funding Entity: *ANI*

Principal Contractor: *Teixeira Duarte, S.A.*

Duration: *From 01/07/2020 to 30/06/2023*

> **FERROVIA 4.0**

ISISE Principal Investigator: *José C. Matos*

Budget: *Global: 8 486 500€ / ISISE-UM: 259 000€*

ID: *14/SI/2019 - 46111*

Funding Entity: *ANI*

Principal Contractor: *EFACEC ENGENHARIA E SISTEMAS, S.A*

Duration: *From 01/07/2020 to 30/06/2023*

> **WAVES – Waves, Acoustics, Vibrations, Engineering and Sound**

ISISE Principal Investigator: *Paulo Amado Mendes*

Budget: *Global: 3 052 000 € / ISISE-UC: 833 000 €*

ID: *WAVES*

Funding Entity: *Erasmus Mundus*

Principal Contractor: *INSA Marseille*

Duration: *From 01/09/2020 to 21/08/2025*



> **EGURALT – Application and dissemination of innovation for the promotion of tall construction**

ISISE Principal Investigator: Alfredo Manuel Pereira
Geraldias Dias

Budget: Global: 541 000€ / ISISE-UC: 227 500€

ID: EGURALT

Funding Entity: SUDOE

Principal Contractor: Navarra de Suelo y Vivienda SA

Duration: From 01/11/2020 to 30/04/2023

> **HeaLime – Self-healing on natural hydraulic lime mortars**

ISISE Principal Investigator: Paulo Lourenço

Budget: Global: 147 800€ / ISISE-UM: 147 800€

ID: 101003395 — HeaLime

Funding Entity: European Commission

Principal Contractor: University of Minho

Duration: From 01/01/2021 to 31/12/2021

> **SUBlime:SUstainableBuildingLimeapplications via Circular Economy and Biomimetric Approaches**

ISISE Principal Investigator: Paulo Lourenço

Budget: Global: 3 713 400€ / ISISE-UM: 1 295 400€

ID: 955986 — SUBLime

Funding Entity: European Commission

Principal Contractor: University of Minho

Duration: From 01/01/2021 to 31/01/2025

> **LIFE4STONE – Valorização de resíduos e subprodutos da transformação da pedra natural para produtos de construção**

ISISE Principal Investigator: Fernando José Garrido
Branco

Budget: Global: 661 500 € / ISISE-UC: 120 900€

ID: LIFE4STONE

Funding Entity: ANI

Principal Contractor: MVC – MÁRMORES DE
ALCOBAÇA LDA

Duration: From 01/01/2021 to 30/06/2023

> **Switch2Steel – A Calculation Framework for Cost Optimization of Industrial and Commercial Pavilions in Steel Structures**

ISISE Principal Investigator: Aldina Santiago

Budget: Global: 470 800€ / ISISE-UC: 169 300€

ID: CENTRO-01-0247-FEDER-047136

Funding Entity: ANI

Principal Contractor: ONE SOURCE, CONSULTORIA
INFORMÁTICA LDA

Duration: From 01/01/2021 to 30/06/2023

> **SET – Self-erecting Tower**

ISISE Principal Investigator: Carlos Rebelo

Budget: Global: 953 000€ / ISISE-UC: 409 300€

ID: 17/SI/2019 – 70138

Funding Entity: ANI

Principal Contractor: WunderOcean

Duration: From 01/01/2021 to 30/06/2023

> **VALUE2PREVENT – Added value of forest biomass as a tool in forest fire risk management**

ISISE Principal Investigator: Sofia Knapic

Budget: Global: 300 000€ / ISISE-UC: 300 000€

ID: VALUE2PREVENT

Funding Entity: FCT

Principal Contractor: SERQ – Centro de Inovação e
Competências da Floresta

Duration: From 01/03/2021 to 29/02/2024

> **EVACUARFLORESTA – Decisões e planos de evacuação em cenários de incêndio florestal**

ISISE Principal Investigator: Aldina Maria da Cruz
Santiago

Budget: Global: 270 000 € / ISISE-UC: 270 000€

ID: EVACUARFLORESTA

Funding Entity: FCT

Principal Contractor: University of Coimbra

Duration: From 01/03/2021 to 29/02/2024





COMPLETED PHD THESES

› Hybrid performance-based wood panels for a smart construction

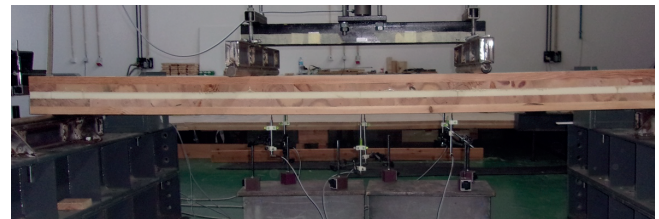
Author: Pedro Gil Girão dos Santos

Supervisors: Luís Manuel Cortesão Godinho, João Pedro Ramôa Ribeiro Correia & Alfredo Manuel Pereira Geraldes Dias

Date: 17/09/2020

Summary: The main objective of the thesis was the development of a Cross-laminated timber-based panel solution, combining mechanical performance with improved thermal insulation and reduced weight. Such solution, named cross-insulated timber (CIT), consists of replacing the inner layer of a five-layer CLT panel by an alternative one made of insulation material, similar to the structural insulated timber panel (SIP) concept. The main aspects focused on the panel development included the characterization of the selected materials, including the adhesive layers; the mechanical characterization of the panels; the functional and economic optimization of the panels; the evaluation of the environmental impact of the panels; the acoustic

characterization of the panels; and development of connection systems. Overall, the study showed that the developed panels have the potential to complement the current CLT systems, namely concerning the elements of the external envelope.



CV: Pedro Santos Completed the MSc (2012) and the PhD (2020) in Civil Eng. at the University of Coimbra (UC). Is Research fellow in UC since 2013 (Projects: PS0204 - timber grading; SCLog - Wood logs for sonic crystal acoustic barriers; OptimizedWood - Optimization of Forest Resources in Construction; HLS - Hybrid Log Shield). Is Invited Assistant Professor in UC since 2020. Published 10 articles in journals.

› A new flat jack test for evaluating shear properties on unreinforced masonry

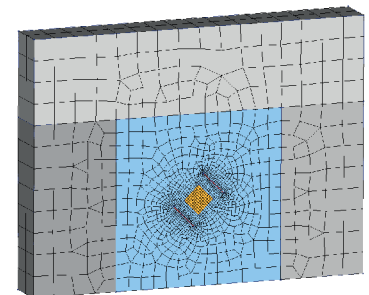
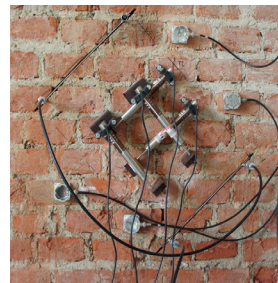
Author: Nicola Viale

Supervisors: Paulo B. Lourenço, Giulio Ventura

Date: 21/09/2020

Summary: The seismic action can be the most demanding for unreinforced masonry structures. Excluding local failure mechanisms, the distribution of horizontal forces in the resisting elements depends on media shear modulus and their failure may be characterized by the media tensile strength. These properties are usually measured using destructive tests that can be incompatible and expensive. In this work, a new minor destructive test method (Shear Flat-Jack test) was conceived using the flat jack technique. FEM analyses were utilized in order to define the best layout that was chosen considering the destructiveness, costs and effectiveness. A parametric study of this layout was then performed giving tools to evaluate the principal stresses and to measure the shear modulus

of the media. The test method was then designed and successfully applied on five in situ experiments. Linear and non-linear numerical analyses were performed to analyse the experimental results.



CV: Now: Research fellow at Polytechnic of Turin | **2020:** Ph.D. in Civil and Environmental engineering (cum laude). Universidade do Minho and Polytechnic of Turin (double degree program). | **2016:** License to practice as engineer in Italy. | **2016:** Master's degree in Civil engineering (110/110). Polytechnic of Turin. | **2013:** Bachelor's degree in Civil engineering (107/110). Polytechnic of Turin.



> **Tall buildings using CLT. An integrated design considering moisture induced effects**

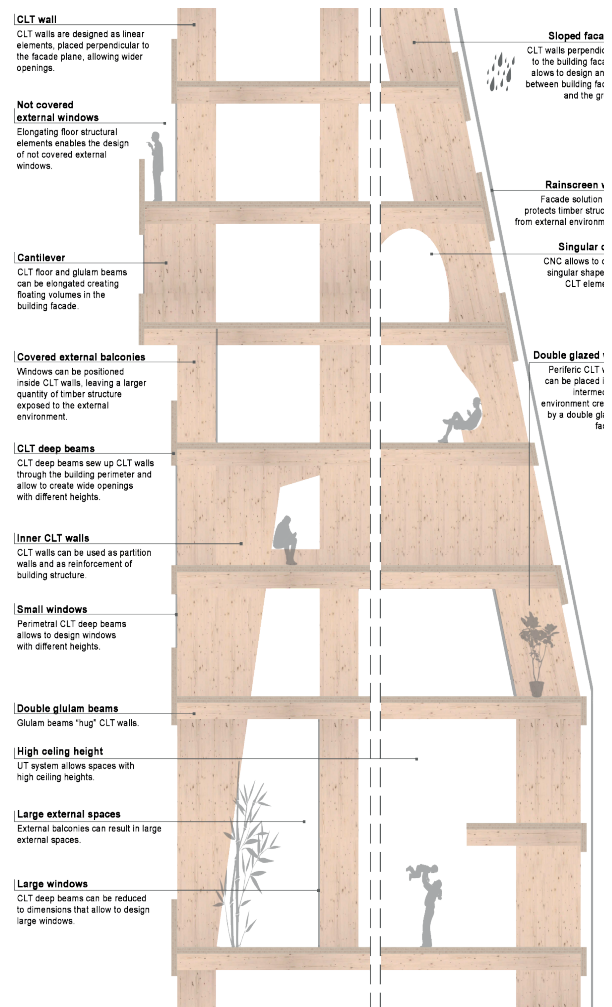
Author: Catarina Vilaça Silva

Supervisors: Jorge Branco, Paulo Lourenço

Date: 23/09/2020

Summary: Aware about the advantages of using Cross Laminated Timber (CLT) as a construction material on the urban environments, and considering the lack of knowledge related with the behaviour of CLT regarding moisture induced effects, present thesis was developed in two parts that complement each other. Part I is based on the development of laboratorial experiments focused on the quantification of moisture induced strains on CLT panels and on the quantification of withdrawal capacity of Self Tapping Screws inserted in CLT panels.

Part II present a proposal for a new structural system for multi-story timber buildings, in which CLT is the main structural material. The proposed structural system was called Urban Timber system and it was designed always taking into account moisture induced effects either on individual structural elements, mechanical connections or on facade solutions. Independent of limitations imposed by moisture induced effects, a structural evaluation of UT system is performed and architectural potentialities are presented individually.



CV: After her master at the School of Architecture of Minho University, Catarina decided to pursue a Doctoral Program in Civil Engineering. A wide experimental program aimed to assess the moisture induced stresses in CLT elements and joints was carried, in collaboration with TU Graz, where Catarina spent 6 months. At the end, Catarina was able to propose an innovative system for CLT buildings.





➤ **Seismic behavior assessment of CLT buildings applying current regulation approaches**

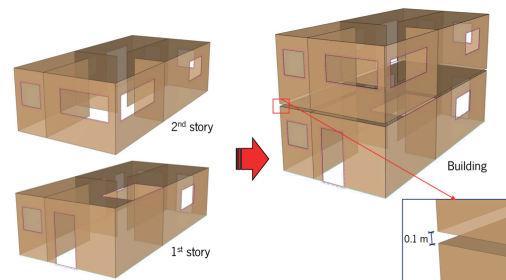
Author: Filipe Tiago de Matos

Supervisors: Jorge Branco, Patrício António Almeida Rocha (IPVC)

Date: 23/10/2020

Summary: The present work studies the seismic action to CLT buildings, through the pushover analysis defined in regulation EC8. To contextualize this objective, presents, initially, an experimental campaign carried out for the typical metal connectors of the CLT construction, where the result was to analyse the behaviour of each connector to monotonic and cyclic loads. The following is an experimental campaign to a 2-story full-scale CLT platform-type building, where the objectives were to analyse the 3-D system performance. Then, the experimental results have been used for the calibration of a numerical model (Dlubal RFEM) for the experimentally tested building. After validation of the obtained results, the pushover analysis was performed

with the application of the N2 method for two study cases, where different elastic response spectra have been considered. Finally, recommendations have been proposed for the seismic design of CLT structures.



CV: **Filipe Matos** got his Master at the Polytechnic Institute of Viana do Castelo in 2016 and came to the University of Minho to proceed his studies in the Civil Engineering Doctoral Program. After his PhD thesis defence, Filipe got a position in the Engineering design office of the most important company of Timber Engineering in Portugal, CarmoWood.

➤ **Hot box apparatus design and construction for the determination of the thermal performance of building elements**

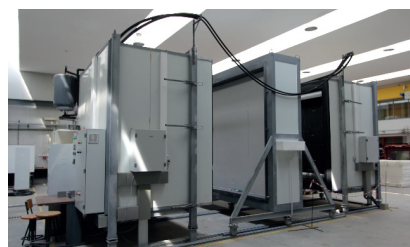
Author: Cláudio Martins

Supervisors: Professor Luís Alberto Proença Simões da Silva, Professor Paulo Fernando Antunes dos Santos

Date: 30/10/2020

Summary: The thermal transmission properties of building elements can be determined in several approaches, being the most accurate methodology, the Hot Box (HB) method. This method allows the determination of the thermal performance of building elements at a steady-state by measuring the heat flux through the building components and the corresponding temperature differences across it. This method can test homogeneous or nonhomogeneous specimens in a laboratory environment and applies to building structures or composite assemblies, e.g., walls with windows or doors. The main objective of this PhD thesis was the construction of a Hot Box (HB) apparatus that allows the study of heavily heterogeneous walls, e.g., LSF walls, with the potential of enabling to make several other future research of different types of vertical elements. This is possible due to the high thermal conductance range of feasible measurements

(0.1 to 15 W/m²·K), large measurement area and the possibility of testing samples with considerable thicknesses. For archiving this goal, the equipment is versatile and allows different configurations, being simultaneously a Guarded and Calibrated Hot Box. The equipment calibration and verification process were performed with success, showing that it has achieved the objective of having fully rigorous equipment, perfectly functional, with several possibilities for studying new constructive solutions.



CV: **Cláudio Martins** concluded the PhD degree in Steel and Composite Construction of the University of Coimbra in 2020. He is currently working as researcher at ISISE-FP, is the ISISE-SMCT Lab Manager, and is the FireLab Executive Director at the University of Coimbra.



➤ **Modelling the life-cycle performance of Portuguese vernacular buildings: assessment and contribution for sustainable construction**

Author: Jorge Emanuel Pereira Fernandes
Supervisors: Ricardo Mateus, Helena Gervásio
Date: 09/12/2020

Summary: In Portugal, there are many expressions of vernacular architecture but there is a lack of quantitative studies on the thermal and environmental performance of vernacular buildings and materials. In this sense, this research work presents a qualitative and quantitative study of i) climate-responsive strategies; ii) the thermal performance and comfort conditions of three different types of vernacular buildings throughout all seasons; and iii) the environmental performance of vernacular materials (Rammed earth and CEB). From the results, in general, it was found that the case studies have shown a good thermal performance by passive means alone and that the occupants feel comfortable, except during winter when there was a need to use heating systems. In the case of materials,

in a cradle-to-gate analysis of different walls, the use of earthen building elements can result in reducing the potential environmental impacts by about 50%, when compared to the use of conventional ones.



CV: Jorge Fernandes is graduated in architecture (2007) by the University of Évora and has a MSc (2012) and PhD (2020) by the University of Minho. He develops research on sustainability principles of vernacular architecture, exploring new ways of integrating those principles into contemporary sustainable/regenerative buildings.

➤ **Structural Response and Cracking Behaviour of Fibre Reinforced Concrete Beams with Hybrid Flexural Reinforcement**

Author: Mahsa Taheri
Supervisors: Joaquim Barros
Date: 18/12/2020

Summary: In the PhD thesis, the structural response of concrete beams with an innovative hybrid flexural reinforcing (HFR) scheme was studied. The adopted HFR comprises fibre reinforced polymer (FRP) bars, steel bars, and the distinct fibres diffused in fibre reinforced concrete (FRC).

A comprehensive experimental program was performed for assessing the effect of three series of steel fibre reinforced self-compacting concrete (SFRSCC) of different concrete strength class and volume fraction of fibres on the flexural capacity and cracking behaviour of SFRSCC beams with HFR scheme.

The potentiality of the HFR scheme was evaluated by developing two closed-form models: (I) moment-curvature approach, being capable of determining the moment-curvature response of a rectangular cross-section made of FRC with HFR scheme (HFR/FRC),

(II) moment-rotation approach capable of prediction of crack width and crack spacing of HFR/FRC beams.

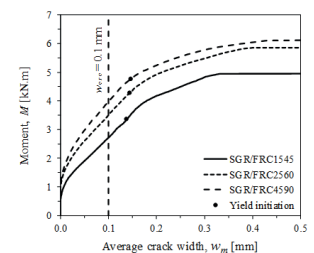
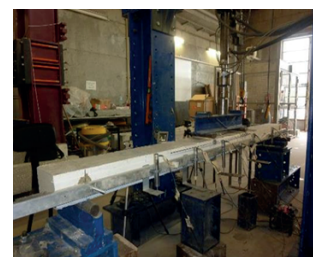
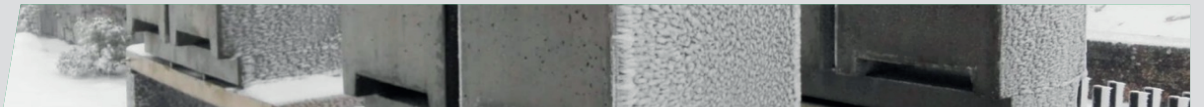


Fig. 1: (a) View of four-point bending test, (b) Moment-crack width response

CV: Mahsa Taheri Concluded her PhD at the Civil Engineering Department of the University of Minho. Her research interest revolves around fibre reinforced concrete (FRC) and she is experienced in advance modelling of reinforced FRC elements. Now she is collaborating on ongoing research project on rehabilitation and strengthening of tunnels.



AWARDS & PRIZES

> “Prize for PhD Thesis 2016” by Sapienza University Press

Angelo Gaetani, author of the PhD Thesis “Seismic Performance of Masonry Cross Vaults: Learning from historical developments and experimental testing”, jointly conducted at Sapienza University and University of Minho (co-supervised by Paulo Lourenço), has won in 2020 the “Prize for PhD Thesis 2016” arranged by Sapienza University Press.



> “Young Engineers’ Contribution Award” on IABSE Symposium Wrocław 2020

PhD student Bruno Pedrosa was awarded with the “Young Engineers’ Contribution Award” for the presentation of the papers titled: “Mode I Fatigue Crack Growth Tests on Puddle Iron Strengthened with CFRP Plates” and “Probabilistic Fields of Fatigue Crack Growth Rates of Puddle Iron Bases on Huffman Local Approach. This Online Symposium, organised by the Polish Group of IABSE and Wrocław University of Science and Technology, took place on October 7-9, 2020, under the theme “Synergy of Culture and Civil

Engineering – History and Challenges”.
<https://iabse.org/Events/Wroclaw-2020/Technical-Programme>



> “Honourable Mention for the Performance in the Execution of Projects and Activities with Competent External Funding during 2019”

In the context of the 248-year celebrations of the Faculty of Sciences and Technology of University of Coimbra (FCTUC), Professor Luís Simões da Silva received the “Honourable Mention for the Performance in the Execution of Projects and Activities with Competent External Funding during 2019”. The distinction was presented by Professor Doutor Paulo Oliveira, Director of FCTUC, on October 12, 2020.

https://www.youtube.com/watch?v=0OPuq6NIMq4&ab_channel=UniversidadeCoimbra

<https://noticias.uc.pt/universo-uc/comemoracao-dos-248-anos-da-faculdade-de-ciencias-e-tecnologia-da-uc/>





EVENTS

> Seminar on experiences and challenges in the design and construction of buildings

Venue: Online

Date: 19/10/2020

Website: <http://www.oern.pt/noticia/2005/sessao-tecnica-com-14-especialistas-da-area-da-engenharia-civil-e-construcao>

Summary: This one-day online seminar has as objective to identify and prioritize technical, economic, environmental, social, regulatory and political aspects to be considered today. 14 specialists from academia and profession construction history, seismic risk, information exchange, BIM, circular construction, structural, complex structures, thermal behaviour, acoustics, hydraulic services, energy, digital transformation, sustainability and the building sector.



> ISISE CHRISTMAS CHALLENGE 2020

Venue: Online

Date: 14/12/2020

Summary: We did not want to miss the opportunity to share a moment together for Christmas. On December 14 we had a joint activity by Zoom! We challenged our members and we tested how much they know about ISISE and their drawing skills! Among us, we found some experts and a lot of artists!

WINNERS: Universidade do Minho

- Rui Silva
- Jacopo Scacco
- Antonio Murano

WINNERS: Universidade de Coimbra

- Felipe Rodrigues
- Luís Laím
- Damjan Cekerevac



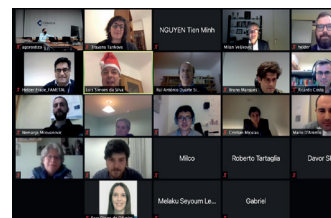
> INNO3DJOINTS Webinar

Venue: Online

Date: 15/12/2020

Summary: The final webinar of the INNO3DJOINTS project disseminated the results obtained from the project. The webinar presentations covered the development of the INNO3DJOINT modular system, design rules for plug-and-play joints, asymmetric column splices in tension and bending. During the

webinar software tools produced in the scope of the project were also demonstrated.



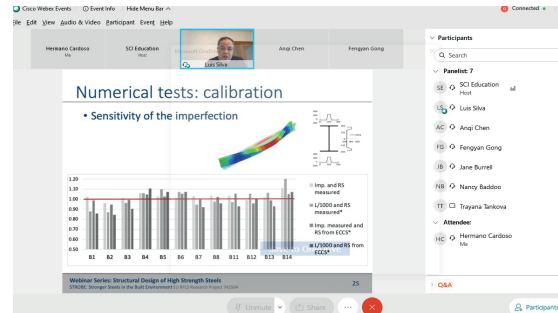


> STROBE Webinar 3

Venue: Online

Date: 04/02/2021

Summary: At the end of the European project STROBE, series of webinars with the project results were streamed online. The ISISE was present on the third webinar by Prof. Luís Simões da Silva presenting the results about the stability design using high strength steel.



UPCOMING EVENTS

> Climate resilience and design codes – factoring in climate projections

Venue: Online, Guimarães, Portugal

Date: March 17-18, 2021

Website: Climate Workshop – SIRMA (sirma-project.eu)

> Conference CRC2021 International RILEM Conference on Early-age and Long-term cracking in RC Structures

Venue: ENS Paris-Saclay, France

Date: April 9, 2021

Website: crc2021.org

> 18th International Probabilistic Workshop – IPW2020

Venue: University of Minho, Guimarães, Portugal

Date: May 12-14, 2021

Website: www.ipw2020.com

> ISCHP 2021 – International Scientific Conference on Hardwood Processing

Venue: University of Coimbra

Date: Summer of 2021

ISISE Member Sandra Monteiro e Prof. Alfredo Dias

> IX ECCS-AISC Workshop on Connections in Steel Structures

– Webinar IX connections – 1: 22 of July 2021: 2pm - 7pm (CET) – Online

– Workshop IX connections – 2: 6-8 of June 2022, Coimbra, Portugal

Venue: Online /Coimbra, Portugal

Date: 22 July 2021 (Online) /6-8 of June 2022 (Coimbra, Portugal)

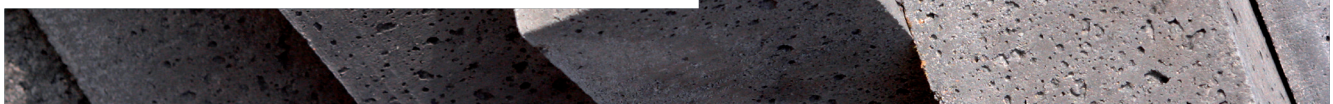
Website: <https://connectionsix.dec.uc.pt>

> XIII Conference on Steel and Composite Construction

Venue: Online, Coimbra, Portugal

Date: November 25-26, 2021

Website: <https://cmm.pt/congresso13>





MASTER COURSES

> **Advanced Masters in Structural Analysis of Monuments and Historical Constructions (SAHC)**

Venue: Dept. of Civil Engineering University of Minho

Website: <http://www.msc-sahc.org/>

Application dates:

> 2nd call: 20th May 2021

> **European Master in Building Information Modelling (BIM A+)**

Venue: Dept. of Civil Engineering University of Minho

Website: <https://bimaplus.org/>

Application dates:

> 2nd call: 30th June 2021

> **Master Course in Steel and Composite Construction**

Venue: Department of Civil Engineering, University of Coimbra

Website: <https://apps.uc.pt/courses/EN/course/333>

Application dates:

> 1st call: 01 April 2021 – 30 April 2021

> **Master Course in Sustainable Construction and Rehabilitation**

Venue: Dept. of Civil Engineering University of Minho

Website: <http://civil.uminho.pt/mcrs/>

Application:

> <https://alunos.uminho.pt/PT/candidatos/Mestrados/>

PHD COURSES

> **Doctoral Program in Civil Engineering**

Venue: Dept. of Civil Engineering University of Minho

Website: <http://www.pdec.civil.uminho.pt/>

> **Doctoral Program Steel and Composite Construction**

Venue: Dept. of Civil Engineering, University of Coimbra

Website: <https://apps.uc.pt/courses/EN/course/8181>

Application dates:

> 1st phase: 01 April 2021 – 30 April 2021

> **International Doctoral Programme in Sustainable Built Environment**

Venue: Dept. of Civil Engineering University of Minho

Website: <http://civil.uminho.pt/idisbe/>

Application dates:

> <https://alunos.uminho.pt/EN/candidates/doctorsdegrees/Pages/default.aspx>

