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GROUPS
**Historical and Masonry
Structures**
Paulo B. Lourenço

**Steel and Mixed Construction
Technologies**
Luís Simões da Silva

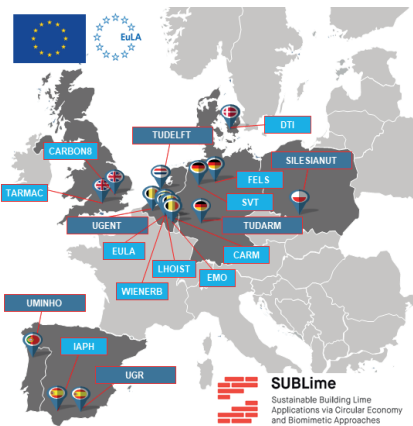
Structural Composites
Joaquim Barros

Functional Performance
Luís Godinho

Advisory Committee
Bill Spencer
David Nethercot
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Henrik Stang

ISISE HIGHLIGHTS

SUBLime: SUstainable Building Lime applications via Circular Economy and Biomimetic Approaches



ISISE will coordinate the only innovative training network (MSCA-ITN) in the field of Civil Engineering in 2020. This network, with a total grant of 3.71 M€, gathers top level institutions on both academic and industrial sides. This project is being coordinated by Paulo B. Lourenço, with the support of Miguel Azenha and João Pereira.

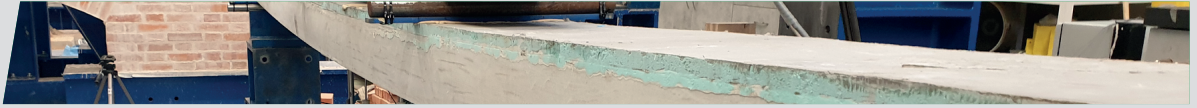
The objective is to train 15 PhD students in multiple scientific and engineering fields aiming a better understanding and

development of sustainable innovation solutions for lime mortars/plasters in new construction and conservation of the built heritage. The project covers the main features of lime-based applications in the masonry construction (both joints and plastering mortars), including material characterization, numerical non-linear modelling of multi-physics behaviour, functionality and sustainability in lime use, all within a framework of performance-based design. Innovations are focused in both added functionalities and sustainability aspects in lime mortars and plasters, strongly based on novel biomimetic and closed-loop recycling approaches. More information on <http://sublime-etn.eu/>.

The premises of ISISE at the University of Minho have endured an important upgrade for postgraduate researchers. An extensive renovation and redesign has taken place in Building 8 of the Campus of Azurém of the University of Minho in Guimarães, constituting the newly named: Co-Work@Civil. This space has 50 working places, as well as an equipped meeting room and a meal area.



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



ISISE HIGHLIGHTS (CONTINUED)



ISISE Board had its first virtual meeting with the new External Advisory Board (EAB). The EAB members for the period 2020 – 2023 are Bill Spencer, University of Illinois, USA; David Nethercot, Imperial College London, UK; Francesco Asdrubali, Università Degli Studi Roma Tre, Italy and Henrik Stang, Technical University of Denmark. We are very excited about this new collaboration with the EAB and expect to have our first live meeting in 2021.

R&D COMPLETED PROJECTS

> EasyFloor - Development of hybrid sandwich panels for the rehabilitation market

ISISE Principal Investigator: José Sena Cruz

Budget: Global: 1.428.449,71€/ISISE-UM: 375.907,23€

ID: POCI-01-0247-FEDER-003480

Funding Entity: ANI, cofinanciado pelo Fundo Europeu de Desenvolvimento Regional (FEDER), através do Programa Operacional Competitividade e Internacionalização (POCI)

Principal Contractor: Alto

Other Partners: Instituto Superior Técnico, Universidade de Lisboa

Duration: From 01/04/2016 to 30/09/2020

Summary: The EasyFloor project aimed at developing innovative sandwich panels in fiber-reinforced polymer (FRP) for the rehabilitation of degraded floor in existing buildings and modular construction.

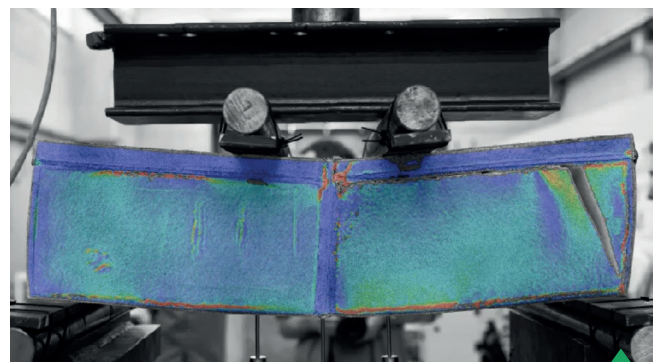
Two sandwich panel prototypes were developed by pultrusion, with different fields of application in terms of spans and/or live load: i) all-composite

panels, composed of glass fiber FRP (GFRP) bottom and top face sheets and webs and a core made of polyurethane (PUR), applicable to short medium spans; and, ii) hybrid panels with similar constitution, but with a fiber reinforced concrete (FRC) at the top layer, ensuring higher axial and flexural stiffness, as well as ultimate carrying capacity.

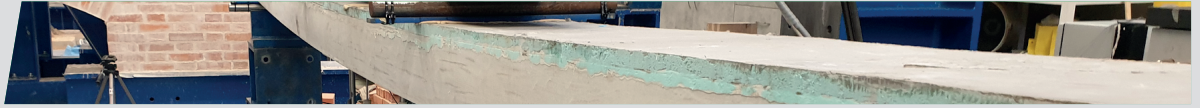
The project involved the development and characterization phases, supported by analytical and numerical modelling, as well as experimental testing. The development of the panels, including optimization, followed the current guidelines in the field. The characterization of the panels involved, characterization of the constituent materials, the assessment of the structural (SLS and ULS), acoustics and thermal performances, fire resistance and connections panel-panel and panel-wall characterization.



Casting the top FRC layer



Experimental characterization of panel-panel connection



R&D STARTED PROJECTS

> **FREEDAM+ Valorisation of knowledge for FREE from DAMAge steel connections**

ISISE Principal Investigator: Aldina Santiago
Budget: Global: 1330638,20 € / ISISE-UM: 136188,10 €
ID: RFCS – 2019 - 899321
Funding Entity: RFCS
Principal Contractor: University of Salerno

> **FAILNOMORE – Mitigation of the risk of progressive collapse in steel and composite building frames under exceptional events**

ISISE Principal Investigator: Aldina Santiago
Budget: Global: 958413,20€ / ISISE-UM: 61312,90€
ID: RFCS – 2019 - 899371
Funding Entity: RFCS
Principal Contractor: University of Liège

> **GIIP – Gestão Inteligente de Infraestruturas Portuárias**

ISISE Principal Investigator: José Matos
Budget: Global: 785629,02€ / ISISE-UM: 267012,12€
ID: POCI-01-0247-FEDER-039890
Funding Entity: ANI
Principal Contractor: 3MAPS – Sistema de Gestão, Lda
Duration: From 01/06/2020 to 01/06/2023

> **E- REDES - Enhancing biodegradable fishnets to promote sustainability: a pilot study in the Northern Littoral Natural Park**

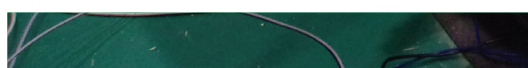
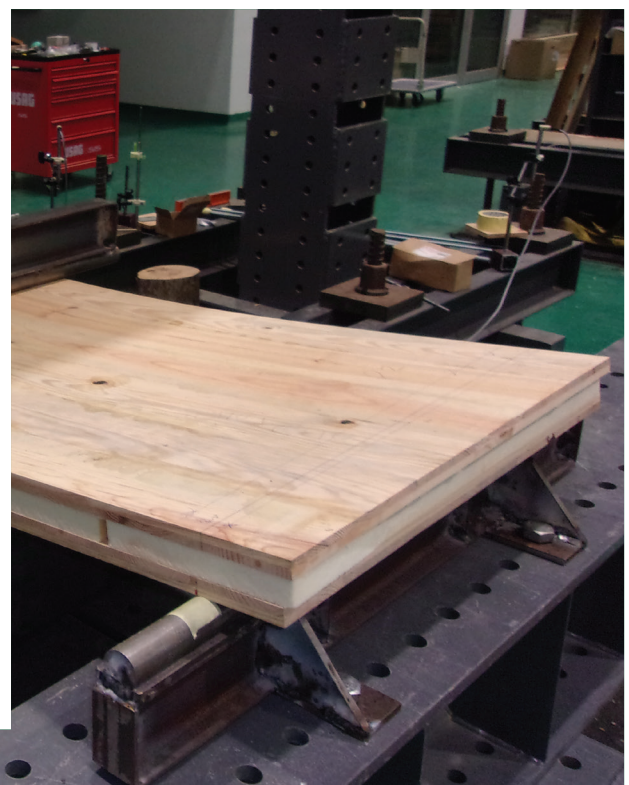
ISISE Principal Investigator: Eduardo Pereira
Budget: Global: 249237,61€ / ISISE-UM: 54351,73€
ID: 12_SGS#1
Funding Entity: Secretaria Geral do Ambiente (EEA Grants)
Principal Contractor: Município de Esposende
Duration: From 01/06/2020 to 30/11/2021

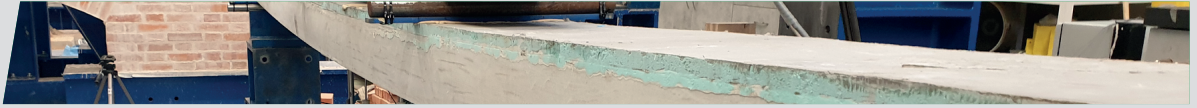
> **SECCLasS – Sustainability Enhanced Construction Classification System**

ISISE Principal Investigator: Miguel Azenha
Budget: Global: 303915,71€ / ISISE-UM: 49940,16€
ID: 19/Call #2_SECCLasS
Funding Entity: Secretaria Geral do Ambiente (EEA Grants)
Principal Contractor: ISCTE - Instituto Universitário de Lisboa
Duration: From 01/10/2020 to 30/09/2022

> **CirMat – CIRcular aggregates for sustainable road and building MATerials**

ISISE Principal Investigator: Vítor Cunha
Budget: Global: 499966,67€ / ISISE-UM: 126802,95€
ID: 16_Call #2 - CirMat
Funding Entity: Secretaria Geral do Ambiente (EEA Grants)
Principal Contractor: Domingos da Silva Teixeira, S.A.
Duration: From 15/09/2020 to 14/09/2022





COMPLETED PHD THESES

› Behaviour of friction joints under impact loads

Author: Ana Francisca Henriques Parente dos Santos

Supervisors: Dr. Aldina Maria da Cruz Santiago (University of Coimbra); Prof. Gianvittorio Rizzano (University of Salerno)

Date: 6 March 2020

Summary: This PhD thesis was developed with the European FREEDAM project and it had as main objectives the study of the robustness of structures equipped with FREEDAM connections under exceptional loads events with a very short duration, such as impact loads coming from vehicle collisions.

The research work developed counted with two experimental campaigns, the first focused on the dissipative component of the FREEDAM connection (friction damper) subjected to tension quasi-static and impact loads, while the second dealt with testing the FREEDAM connection under quasi-static and impact loads bending actions. The results obtained in the experimental tests were used to validate FEM models modelled using ABAQUS software, so that the knowledge acquire during the experimental tests could be extended by considering different parameters for the study.

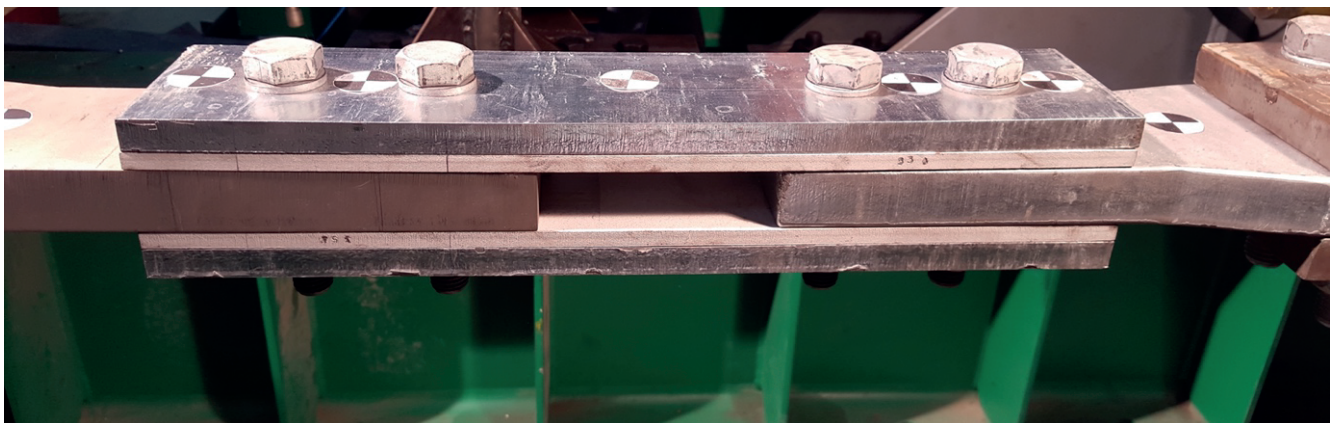
After, an analytical model based on the component method of Eurocode has developed to characterize effects that the strain rates have on each component of the FREEDAM connection, using as base, the results from the experimental tests and FEM analyses.

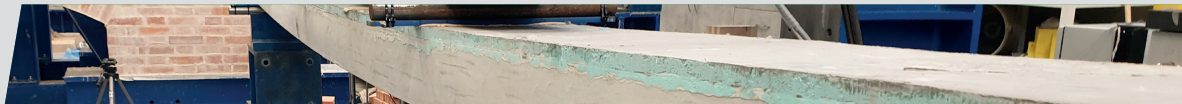
Finally, through numerical analyses using ABAQUS

software, robustness analyses on a 2D frame equipped with FREEDAM connections were conducted in order to check if progressive collapse was likely to happen in the case of vehicle collision in an external base column. These analyses have shown that main advantage of using the FREEDAM connection is its slip mechanism, which allows the dissipation of a great amount of the energy induced to the structure by the exceptional load, avoiding the plastic engagement of the beams and columns as well as the other steel components of the connections.



CV: **Francisca Santos** holds a PhD degree in Steel and Composite Construction of the University of Coimbra in co-tutele with the University of Salerno, Italy. She is the author of 8 published works (journals and conference papers) in the field of robustness of steel structures and impact engineering. She is currently working as a researcher in ISISE and as lecture assistant in the PhD in Steel and Composite Construction course.





> An Innovative SHM Solution for Earthquake-Induced Damage Identification in Historic Masonry Structures

Author: Alban Kita

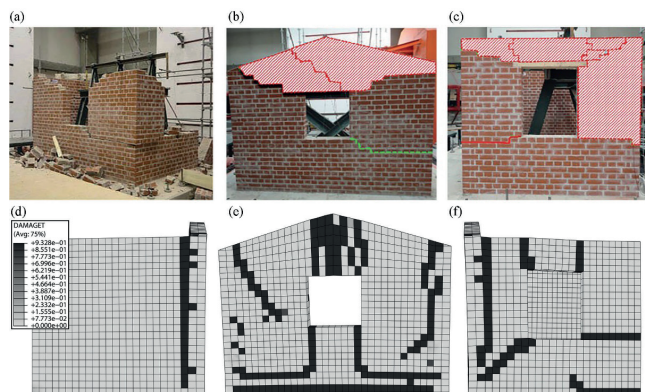
Supervisors: Prof. Filippo Ubertini (University of Perugia); Prof. Paulo B. Lourenço (University of Minho)

Date: 21 April 2020

Summary: The Thesis was developed within a joint international doctoral programme between the Departments of Civil and Environmental Engineering of the Universities of Florence and Perugia, Italy, and the Department of Civil Engineering of the University of Minho, Portugal. The Ph.D. work consisted in the proposal, development and validation of an innovative SHM methodology, based in both data-driven and model-based approaches, for earthquake-induced damage detection, localization and quantification in historic masonry structures.

During the research work, two awards were delivered in the 12th Asia-Pacific-Euro Summer School on Smart Structures Technology held in Rome in July-August 2019: Benedettini fellowship for excellent proficiency in Structural Dynamics and Health Monitoring; Team leader of the winning group of the competition.

The final exam with an Italian-Portuguese committee was concluded with the evaluation "Excellent". Also, it was awarded the mention of "Doctor Europaeus".



CV: **Alban Kita**; alban-kita@hotmail.it. Dual PhD degree in Civil and Environmental Engineering from the University of Florence and Perugia and the University of Minho, with mention of "Doctor Europaeus"; M.Sc. in Civil Engineering, cum laude, concluded on 20/07/2016. Actual post-doctoral researcher position at the Department of Civil and Environmental Engineering, University of Perugia.

> Conception and design of high-performance steel-concrete composite slabs

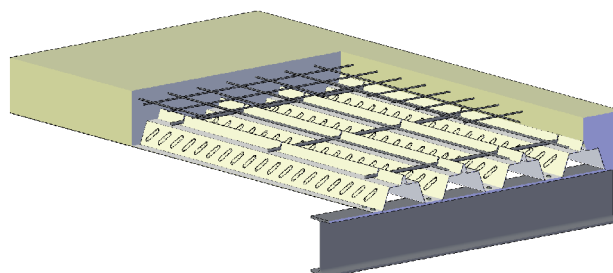
Author: Miguel José Simões Pereira

Supervisors: Dr. Rui António Duarte Simões (University of Coimbra)

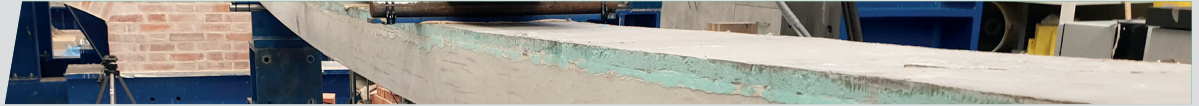
Date: 29 July 2020

Summary: Steel-concrete composite slabs with profiled steel sheeting represent the most common solution for floors in steel and composite buildings. In general, composite slabs with spans currently used tend to collapse by longitudinal shear, so not taking advantage of their high bending capacity. The main objective of the current thesis was to develop an innovative reinforcing system to increase the longitudinal shear capacity, constituted by a set of transversal bars crossing the longitudinal stiffeners executed along the upper flanges of the steel sheeting. This research included an extensive experimental campaign followed by a numerical study using the software ABAQUS. According to the experimental and numerical results, it was observed

that this type of reinforcement allows to increase the connection degree of composite slabs in order to increase their longitudinal shear capacity or even achieve their bending resistance.



CV: **Miguel Pereira** is a civil structural engineer since February 2016 and recently concluded is PhD on Steel and Composite Construction at the University of Coimbra. Lately, have been working as a researcher at the University of Coimbra over consulting projects related with the behaviour of reinforced concrete, steel concrete composite structures and cold-formed steel profiles.



> **Analysis of the sound absorption of granular materials and hybrid systems with resonant structures**

Author: Matheus Pereira

Supervisors: Dr. Luís Godinho (University of Coimbra),
Dr. Paulo Amado Mendes (University of Coimbra),
Dr. Jaime Ramis (University of Alicante)

Date: 31 July 2020

Summary: Porous sound-absorbing materials are of great interest in passive noise control solutions. This doctoral thesis presents effective strategies for developing optimized solutions for use in external environments without the need for structural reinforcement. The study of granular porous materials with expanded clay aggregates was developed in order to understand the influence of water-cement ratio, the thickness and size of the aggregates on the sound absorption coefficient exhibited by these materials when directly exposed to the incidence of sound waves outside. These materials were characterized experimentally with non-destructive techniques, and their macroscopic parameters, obtained using the inverse method, allowed the prediction of the sound absorption coefficient with the Horoshenkov-Swift semiphenomenological model. For the study of absorbent behavior for diffuse incidence, a BEM 3D model was proposed and satisfactorily validated, allowing the application of irregular geometries in finite-sized absorbing panels. This model makes it possible to find configurations where geometrical irregularities provide an increase in the coefficient of sound absorption in a certain frequency range. This is an important step considering that porous materials have absorption coefficient curves composed of

peaks and valleys. The concept called Metaporous concrete is defined and presented, it corresponds to the coupling between two sound absorption devices, namely porous material (porous concrete with light aggregates) and embedded acoustic resonators. Two FEM models, one 2D and the other 3D, were proposed and validated to study the optimization of the geometry of this hybrid solution to increase the sound absorption coefficient. Finally, an absorbing behavior prediction strategy is presented considering diffuse incidence for a finite size meta-surface in 12 m². In addition to the final conclusions and some ideas for future works are listed.



CV: **Matheus Pereira** graduated in Acoustical Engineering at the Federal University of Santa Maria, in 2016, and collaborated in the Research Group on Acoustics and Vibrations of that university. From 2016 to 2020, he did his PhD student at the University of Coimbra, collaborated in project iNBRail and participated in research works related to COST action DENORMS.

EVENTS

> **EuroStruct LiveTalks**

Venue: Online events

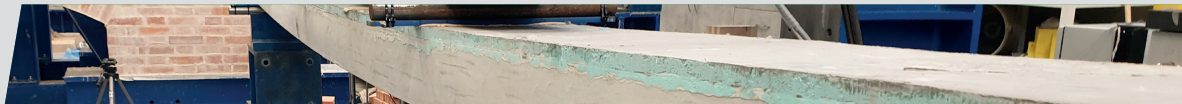
Date: May 12 – July 27, 2020

Website: <https://eurostruct.org/category/livetalk/>

ISISE Member: José Matos

Summary: A set of 12 live lectures was held addressing various topics related to the sustainability of the

built environment. These live conversations brought together different stakeholders from different areas, having shared skills, knowledge and best practices in matters aimed at ensuring the proper management of Europe's built environment and therefore making it as sustainable as possible.



> **Online Seminar: Bridge Durability and Network Resilience**

Venue: Online Webinar via Zoom, Dublin 4, Ireland

Date: September 1, 2020

Website: www.engineersireland.ie/listings/event/6884

ISISE Member: José Matos

Summary: This online seminar seeks to identify bridge design details that might result in future durability

issues and how these details can be improved and durability challenges addressed. It also considers the wider issue of resilience of the entire transportation network. This Seminar is organized in association with the SIRMA Research Project – Strengthening Infrastructure Risk Management in the Atlantic Area.

> **1st IABSE Online Conference 2020: Facing the New Age! – How do Structural Engineers tackle the COVID-19 era?**

Venue: Online Conference via Zoom, China

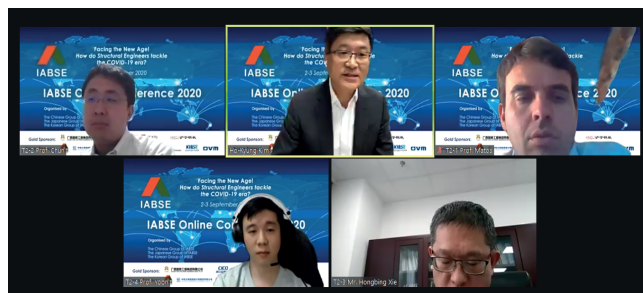
Date: September 2-3, 2020

Website: <https://iabse.org/Events/Online-2020/Event>

ISISE Member: José Matos - Keynote Speaker

Summary: This online conference seeks to identify how do Structural Engineers handle the Covid19 era, to address the new challenges structural engineers across the globe are confronting in the field of disaster reduction and mitigation, the maintenance and rehabilitation of structures, digital solutions for bridge engineering, international cooperation, and so on. On the virtual platform Zoom, the international

bridge and structural engineering community exchanged ideas in four dedicated live Q&A discussion sessions. The Chinese, Japanese and Korean Groups of IABSE organized this 1st IABSE Online Conference.



> **EuroStruct Training School Dublin**

Venue: Online events

Date: September 2-4, 2020

Website: <https://eurostruct.org/university-college-dublin/>

ISISE Member: José Matos

Summary: The Training School Dublin addressed the core value of EUROSTRUCT by promoting tangible

and meaningful interaction among engineers, owners, inspectors and researchers to arrive at an EU-wide approach for managing the performance and safety of bridges and the connection of such approaches to how such maintenance and management is carried out at a global level.

> **IABSE Webinar: “From Quality Control to Decision Making on the Management of Bridges and Structures: What’s Next?”**

Venue: Online

Date: September 18, 2020

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

ISISE Member: José Matos, Sergio Fernandes; Helder Sousa; Mário Coelho; Elisabete Teixeira; Yina Muscoso

Summary: This IABSE Webinar gave an overview about the most recent matters in the whole cycle,

from quality control, addressing extreme events, to the decision-making process. It focused on developments in the assessment and forecasting of a bridge and other structures’ performance. Finally, an overview was made for different types of structures, related to transport, urban, and maritime infrastructures.



UPCOMING EVENTS

> **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

ISISE member: Miguel Azenha



> **ISCHP 2021 – International Scientific Conference on Hardwood Processing**

Venue: University of Coimbra

Date: Summer of 2021

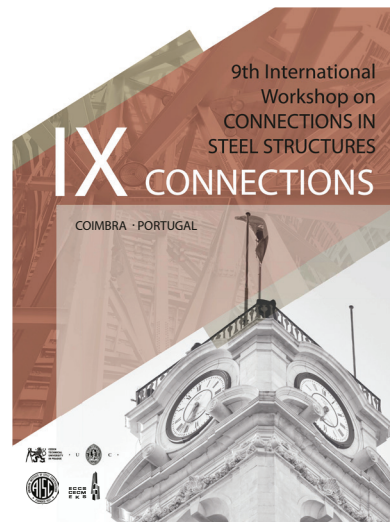
ISISE Member: Sandra Monteiro and Prof. Alfredo Dias

> **IX Workshop on Connections in Steel Structures**

Venue: Coimbra, Portugal

Date: 21-23 July 2021

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



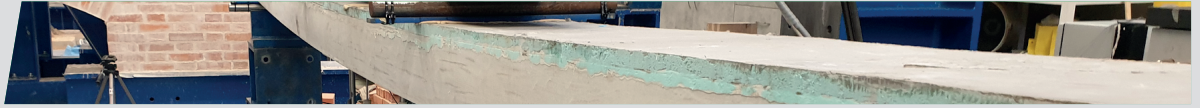
> **18th International Probabilistic Workshop – IPW2020**

Venue: University of Minho, Guimarães, Portugal

Date: May 12-14, 2021

Website: www.ipw2020.com





MASTER COURSES

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

Venue: Department of Civil Engineering University of Minho

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

Application dates:

> 2st Call: 20th January 2021

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

Venue: Department of Civil Engineering University of Minho

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

Application dates:

> 1st Call: 31st January 2021

> Erasmus Mundus Joint Master Degree: WAVES (Waves, Acoustics, Vibrations, Engineering and Sound)

Venue: Department of Civil Engineering, University of Coimbra

Website: <https://master-waves.eu/>

Application dates:

> opens in November 2020

> 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:

> opens in February 2021

PHD COURSES

> Doctoral Program Steel and Composite Construction

Venue: Department of Civil Engineering, University of Coimbra

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

Application dates:

> next call: 6th November 2020

> Doctoral Program in Civil Engineering

Venue: Department of Civil Engineering, University of Minho Website

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

Application dates:

> next call: 18th December 2020

