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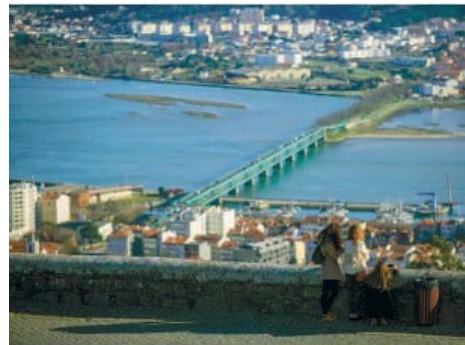
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ISISE HIGHLIGHTS



Source: <https://bitly.com/>

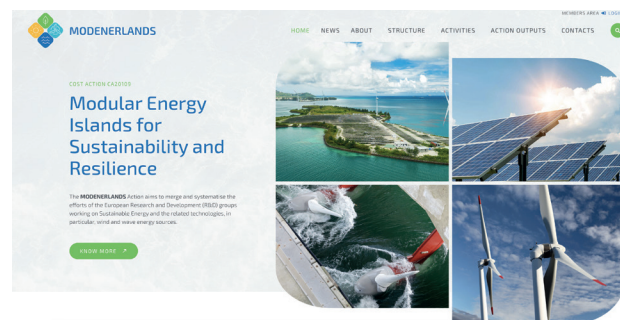
The Civil Engineering Department of University of Minho (UMinho) will develop a study to assess the state of conservation and risk of 54 crossings in the municipality of Viana do Castelo. The project, to be executed over a year, will allow the creation of a database with the “identity card” of each of infrastructure and determine if, and when, they need maintenance or replacement.

Professor José Matos, from the Department of Civil Engineering of UMinho, ensures that the bridge inspection system and future monitoring “for intelligent management” is “innovative” in Portugal. More information on: <https://bitly.com/>

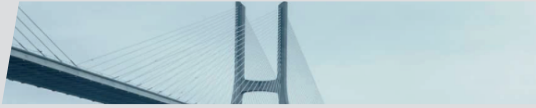
The COST Action CA20109 MODENERLANDS – modular energy islands for Sustainability and Resilience had its first Core Group meeting, which was held at University of Malta at the end of February. The Working Group leaders had intense discussions on future strategies, training school planning and industrial participation.

The MODENERLANDS Action is led by Prof. Carlos Rebelo (University of Coimbra) and it focuses on finding technological solutions for creating artificial islands which produce energy from renewable sources and joining leading European Industrial and Research institutions.

More information about the action can be found on their website: <https://modenerlands.eu>



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



Source: <https://bitly.com/>

The Centre for Architectural Conservation at the University of Pennsylvania Stuart Weitzman School of Design has received a \$1.3 million grant from Getty to develop a conservation and management plan and professional training program for Wupatki National Monument in Arizona. Wupatki National Monument and its sister Monuments, Walnut Canyon and Sunset Crater Volcano, are unique in North America for their exceptionally well-preserved archaeological record, their geographical diversity, and their ancestral significance to Northern Arizona American Indian communities. Professor Paulo Lourenço, from the Department of Civil Engineering from University of

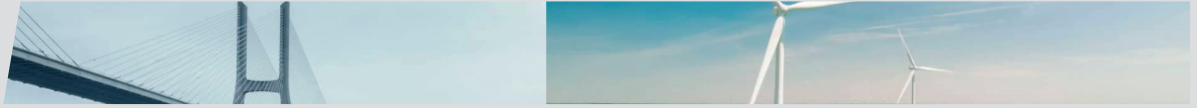
Minho, will participate on the project as an expert in historic masonry and seismic risk, leading a team that will study the structural performance of Wupatki's rubble stone and earthen mortar construction systems.

Excerpts adapted from: <https://bitly.com/>

The FRP++ is a European Master Course in Advanced Structural Analysis and Design using Composite Materials. It will have the first edition in 2022/2023 as an Erasmus Mundus Joint Master Course. The FRP++ offers an advanced integrated educational programme covering key issues of the Composites industry: materials and manufacturing processes; mechanics and modelling; analysis and design; inspection, diagnosis, repair and strengthening; and sustainability and life cycle analysis. The FRP++ has a duration of one academic year (60 ETCS) and combines the latest research advances with the development of activities related to professional practice. The Master's is conducted by University of Minho (Portugal), University of Girona (Spain), University of Naples (Italy), INSA Toulouse (France), and University of Paul Sabatier (France), leading to the awarding of a double master's degree. The FRP++ boasts a large number of Associated Partners worldwide (approximately 50), including HEIs, industry, and R&D Institutions. More information can be found on <https://msc-frp.org/>



Source: <https://msc-frp.org/>



IMPACT STORIES

"... incredible and rewarding. The research group shared a unique dynamic in terms of supporting each other in several dimensions including Professors, Technicians, Assistants, Researchers, etc..."

Patrícia Silva,
Hilti (Development corporation), Munich



> In which circumstances did you join ISISE?

After finalizing/ defending my Master thesis in Civil Engineering at UMinho around 2011, Prof. José Sena Cruz informed me about a research grant available in one of his research projects. The scope of this research project was structural strengthening with FRP materials, and since I had already been in touch with FRPs during my master, which I had enjoyed so much, I saw this as an amazing opportunity to keep working on this topic. Besides that, I already knew Prof. José Sena Cruz, as a great mentor in soft and technical skills that could support towards my career development. Therefore, I joined the project, and I became a member of the Structural Concrete group. Later I applied for a PhD grant within FRP topics as well. For that reason, I could stay a few years longer working in ISISE.

> How would you describe your experience in ISISE?

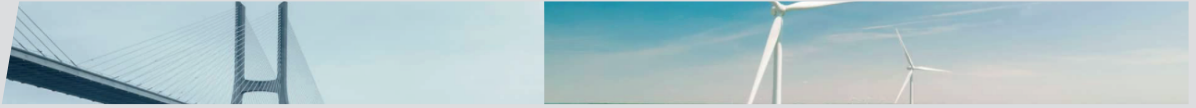
In two words: incredible and rewarding. The research group shared a unique dynamic in terms of supporting each other in several dimensions, including Professors, Technicians, Assistants, Researchers, etc... The entire group was able to share technical knowledge, to cooperate in the laboratory since there are many activities that we cannot perform alone, and additionally we were also having a great environment in terms of friendship that goes beyond work. We could really feel this in both "ups" and "downs" moments. Each PhD student had his/her own topics to deal with individually, but there were many common goals that the whole group embraced as a team. This was the spirit that I found there. I just remember, even during conferences organized by ISISE, everybody

was accountable to support in the preparation phase with an incredible attitude independently of hard-working times. Shortly, the group's mindset in ISISE was positive, energetic, and supportive.

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

No doubt, it had a big impact. I had the opportunity to achieve my PhD degree in ISISE and this was a game changer for my career path. I am grateful for that. After finishing all the activities related to my doctoral research, I have worked some months as a structural engineer in Portugal. However, with the research experience that I had in ISISE, on top of the experience that I acquired as a structural engineer, I could reflect in what I really enjoy working and wanted to pursue. Therefore, I decided to look for positions in Research and Development (R&D) field. That's how HILTI appeared in my life. I found a position where the requirements matched most of the skills I developed during my PhD, even though it was not connected to FRPs. This position was located in Munich, Germany, what for me was great, since I wanted to have an abroad working experience. After a process of interviews, I started as Technical data & Approval Engineer at HILTI. At present, I am still in contact with some of the ISISE members, discussing research topics and spending free time together. At the end, ISISE is a great community that has helped to shape my career, and has made me what I am today and I recommend to everyone to be a part of it.

I wish ISISE keeps growing and achieves a lot of success.



R&D COMPLETED PROJECTS

> Heritage Within

ISISE Principal Investigator: Javier Ortega Heras
Budget: Global: 479 881,67€ / ISISE-UM: 47 778,65€
ID: H-Within – 614719-CREA-1-2019-1-PT-CROSS-SECT-INNOVLAB

Funding Entity: European Commission
Principal Contractor: Universidade do Minho
Duration: From 01/10/2018 to 31-12-2021

Summary: The Heritage Within (HWITHIN) European Research Project has aimed to develop an innovative approach to present buildings and archaeological ruins. The project proposed to implement state-of-the-art technologies to produce an innovative visualization of the cultural heritage by showing what is hidden to our naked eye and the unknown. New technologies developed in the recent years allow the accurate visual 3D reconstruction of monuments,

greatly enhancing the user's experience and interaction with the cultural built heritage. However, 3D modelling techniques typically applied for this matter only allow reconstructing what is visible. A range of advanced technologies, such as Ground Penetrating Radar (GPR) and ultrasonic acoustic tomography, exist and allow to go beyond this barrier to image the interior of constructive elements, helping to understand how the monuments were precisely constructed. Therefore, the main result of the HWITHIN project was to obtain an enhanced three-dimensional reconstruction of ancient monuments that renders not only its exterior surfaces, but also relevant information of the interior of its constructive elements and other non-visible data.



Research team using the novel automatic system to perform acoustic tomography on-site, at the Archeological Museum of Carmo.

> Research into enhanced track and switch and crossing system 2

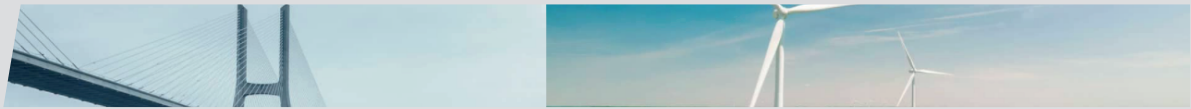
ISISE Principal Investigator: António Gomes Correia
Budget: Global: 13409656,14€ / ISISE-UM: 435 371,93€
ID: IN2TRACK - 826255

Funding Entity: European Commission
Principal Contractor: Universidade do Minho
Duration: From 01/10/2018 to 28/02/2022

Summary: This project has three main contributions:
 1 – Development of an innovative self-sensing cementitious geocomposite with high physical, mechanical, durability, and sensitivity performances that can continuously monitor in a railway layer induced by external factors such as stress and strain based on the fractional change in the electrical resistance (piezoresistivity behaviour). The main

achievements were:

- a) A specific dispersion method for hybrid CNT/GNP dispersion;
 - b) A smart cementitious mortar (Proof of concept);
 - c) A self-sensing cementitious geocomposite development (Smart (CNT+GNP)/cementitious geocomposite and Smart fibre-reinforced cementitious geocomposite).
- 2 – Development of a framework for forecasting the performance of railway track assets over time. The following main achievements are listed.
- a) A literature review concerning the performance indicators and predicted models was performed;
 - b) The most appropriated performance indicators,

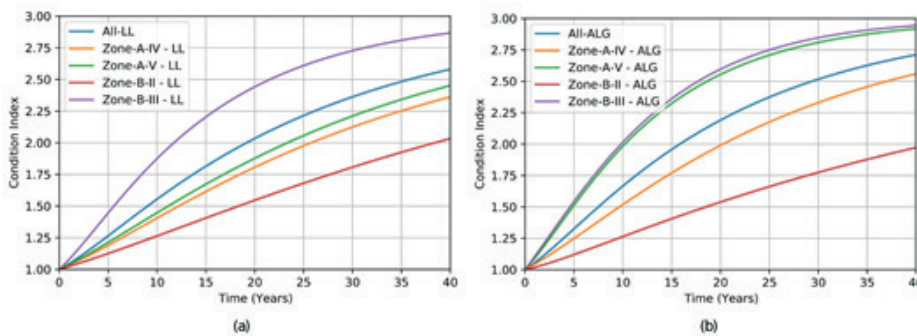


taking into account the possible track defects, environment impact and costs were defined;

c) By using a Markov chain, a framework taking use of data provided by inspections, monitoring and tests was implemented.

3 – The potentialities of different strengthening configurations were numerically assessed for a typical Portuguese underground tunnel by demonstrating the gains in terms of stiffness and

load carrying capacity when proper use of tensile strain softening and/or strain hardening (SSFRC, SHFRC) is adopted. It is demonstrated that, by using a shotcrete technology capable of placing in layers SSFRC and SHFRC according to the outputs of advanced numerical analysis, significant reduction of consumed materials can be achieved (Fig. 3).



Condition state evolution over a time period of 40 years for some railway track extensions according to two of the possible types of performance indicators: a) longitudinal level (LL) and b) alignment (ALG)

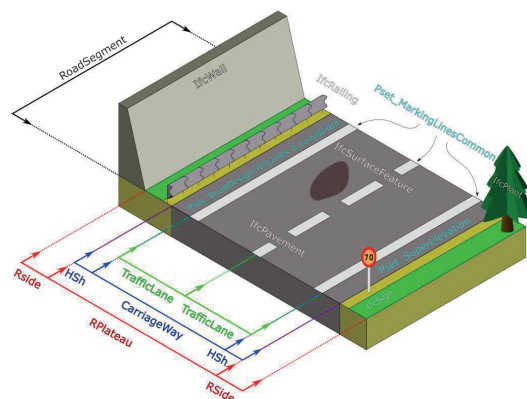
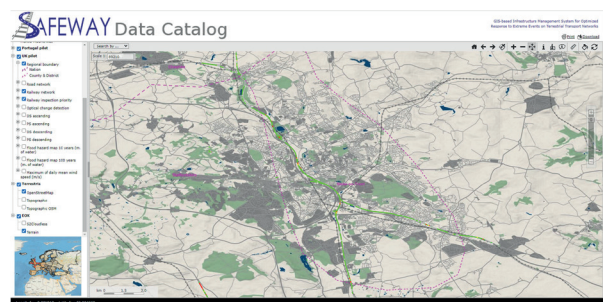
> **GIS-based infrastructure management system for optimized response to extreme events of terrestrial transport networks**

ISISE Principal Investigator: José Campos e Matos
Budget: Global: 4521100€ / ISISE-UM: 372412,5€
ID: SAFEWAY - 769255

Funding Entity: European Commission
Principal Contractor: Universidade do Minho
Duration: From 01/09/2018 to 28/02/2022

Summary: SAFEWAY main aim was to design, validate and implement holistic methods, strategies, tools and technical interventions to significantly increase the resilience of transport infrastructure by reducing risk vulnerability and strengthening network systems to extreme events. The key to achieve this aim is SAFEWAY ICT Platform capable of handling the three dimensions of the disaster management cycle: preparation; response and recovery; mitigation. Within these dimensions, SAFEWAY firstly implemented novel technologies that provide a new multiscale monitoring approach by combining existing remote-sensing technologies to anticipate the impact of extreme events. Secondly, used crowdsourcing and exploited social media infrastructure to monitor human response during and immediately after a natural or man-made extreme event. Thirdly, developed a framework for decision-making considering the mentioned factors

for both single mode transportation (road and railway) as well as in a multimodal context. Finally, it integrated this multidisciplinary approach through a modular cloud-based ICT platform that provides optimal interfacing among the different components of SAFEWAY's resilience solution.





> **ICoSyTec – Innovative construction system for a new generation of high performance buildings**

ISISE Principal Investigator: Joaquim Barros

Budget: Global: 239923,47€/ISISE-UM: 239923,47€

ID: POCI-01-0145-FEDER-027990

Funding Entity: COMPETE2020/FCT

Principal Contractor: Universidade do Minho

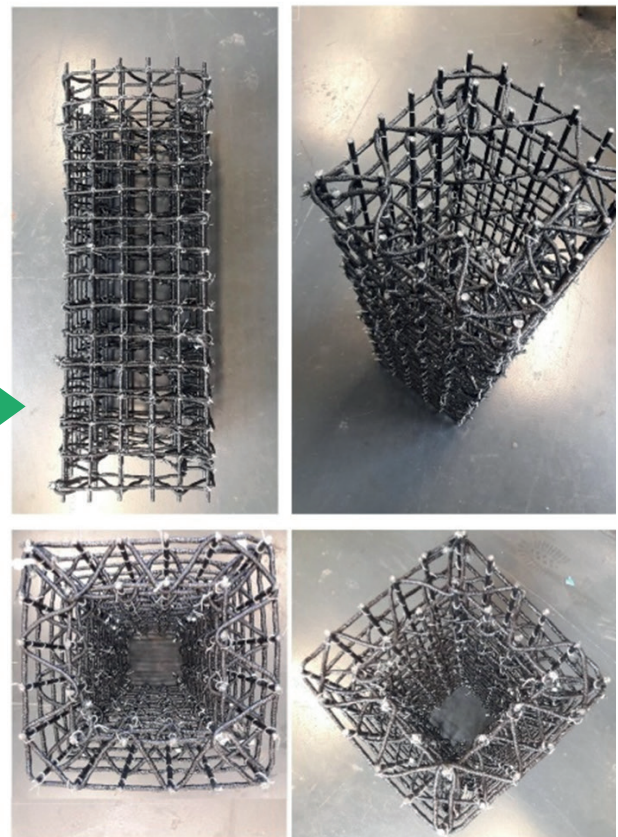
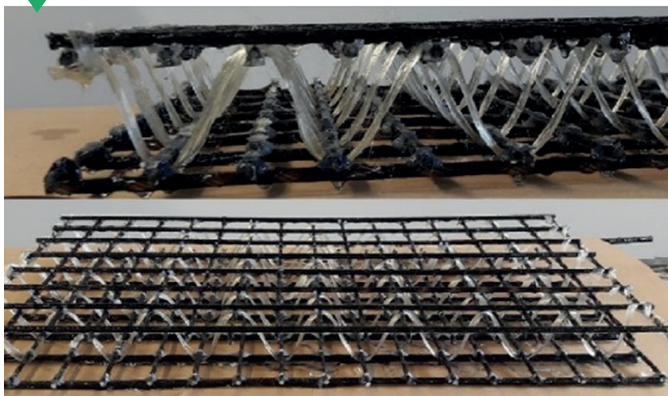
Duration: From 26/07/2018 to 21/01/2022

Summary: This project has combined recent developments in manufacturing 3D systems built from textile fibres (here designated by 3D-SRT) and in high-performance fibre reinforced self-compacting concrete (HPFRSCC) to form a novel construction system that has many advantages over traditional RC systems. Several 3D-SRT systems were conceived, developed, and tested (Fig. 1). The bond behaviour of the bars forming the 3D-SRT was assessed from pull-out-bending tests (Fig. 2) The 3D-SRT were used for the reinforcement of beam, slab and column elements (Fig. 3). The performance of these reinforcements was assessed by executing experimental programs with series of these elements and determining results regarding the behaviour at serviceability and ultimate limit conditions. This performance was also compared with the one registered with conventional reinforcement systems. Advanced numerical simulations were executed for predicting the potentialities of 3D-SRT and HPFRSCC in non-experimentally tested situations. The combined use of these materials was demonstrated very effective, but further research should be executed to optimize their properties for being cost-competitive.



Flexural behavior of plates made by HPFRSCC and reinforced with 3D-SRT

3D-SRT reinforcement systems





> **STRECOLESF – Innovative technique using effectively composite materials for the strengthening of rectangular cross section reinforced concrete columns exposed to seismic loadings and fire**

ISISE Principal Investigator: Mohammadali Rezazadeh / Joaquim Barros

Budget: Global: 238048,43€/ISISE-UM: 238048,43€

ID: POCI-01-0145-FEDER-029485

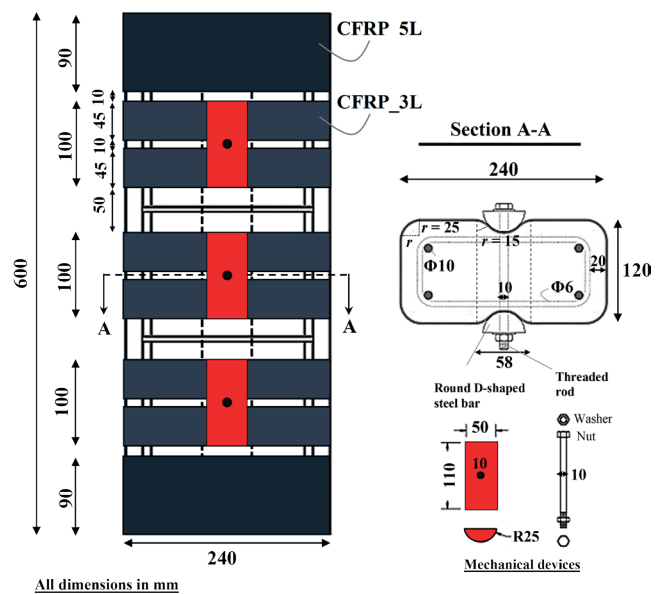
Funding Entity: COMPETE2020/FCT

Principal Contractor: Universidade do Minho

Duration: From 26/07/2018 to 21/01/2022

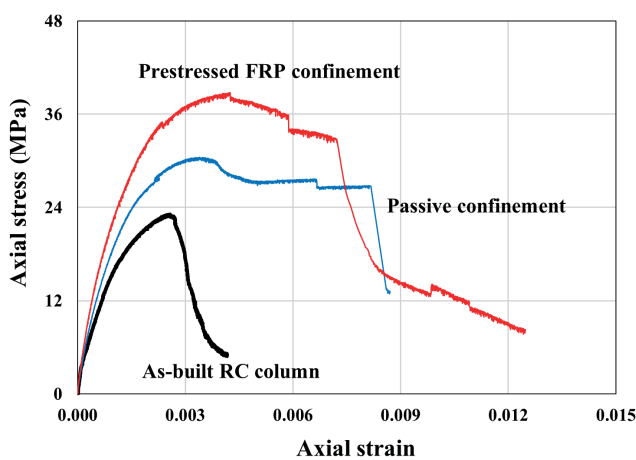
Summary: An innovative FRP-based strengthening strategy was developed to improve the service-life of as-built/fire-damaged RC columns under seismic loading. This strengthening technique comprises prestressed FRP strips applied on fire-damaged columns through early activation of confinement pressure, to improve column axial capacity (Fig. 1). Based on a series of axial compressive tests, the efficiency of FRP prestressing system was evidenced, having been obtained improvements in axial stiffness, peak strength and deformability (Fig. 2). To simulate the axial stress-strain curve of as-built/fire-damaged RC columns, new robust analysis/design-oriented models with an analytical framework was developed, whose calibration was based on an extensive set of experimental results. To achieve the highest level of reliability and predictive performance, these models consider the influence of key parameters in terms of confinement-induced improvements i.e. concrete

transversal expansibility, confinement stiffness, partially imposed confinement, dual confinement mechanism of FRP jacket and steel hoops, sectional non-circularity effect, and pre-existing thermal-induced damage.

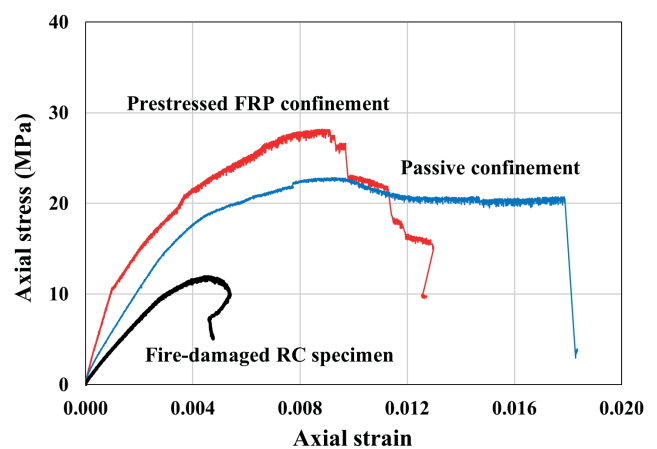


All dimensions in mm

Proposed FRP-based strengthening technique



a)



b)

Typical axial stress versus axial strain relations obtained from the experiment; a) Test results at ambient condition; b) Test results at elevated temperature conditions (completedProjects_STRECOLESF_2a.png and



> **PUFPROTECT – Prefabricated Urban Furniture Made by Advanced Materials for Protecting Public Built Environment**

ISISE Principal Investigator: Honeyeh Ramezan Sefat

Budget: Global: 238 985,97€/ISISE-UM: 238 985,97€

ID: POCI-01-0145-FEDER-028256

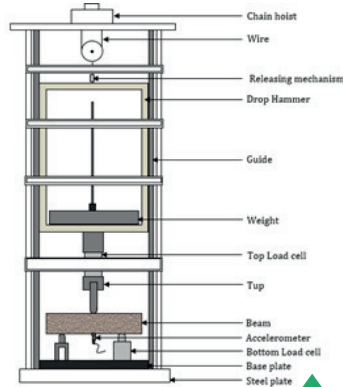
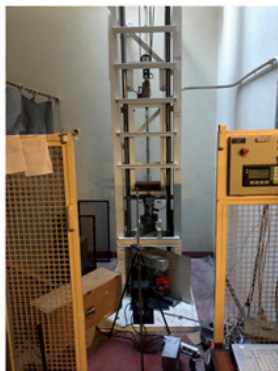
Funding Entity: COMPETE2020/FCT

Principal Contractor: Universidade do Minho

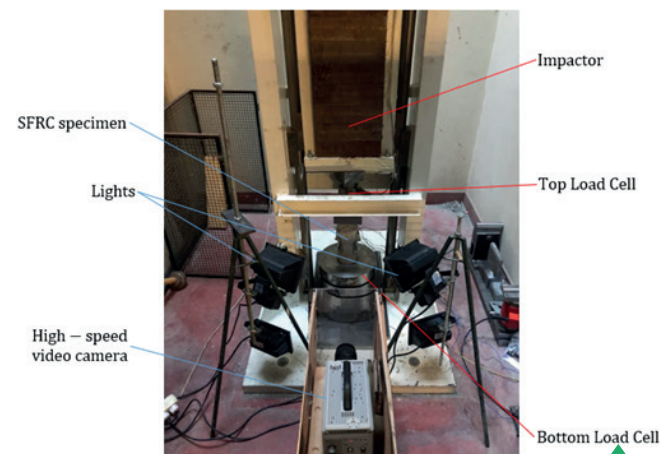
Duration: From 26/07/2018 to 21/01/2022

Summary: The PufProtec project aimed at developing a new generation of prefabricated elements of urban functionalities, designed to give efficient, permanent and active protection against terrorism acts to the built environment of high relevance. The prefabricated elements studied combined ultra-high ductile fiber reinforced cement composites (FRCC) with hybrid reinforcement system formed by high tensile fiber reinforced polymer (FRP) and steel bars. These protecting elements of high robustness, durability, resistance to blast, impact and fire, can

be installed to form a security perimeter system to the built environment. The PufProtec project was divided into five main tasks: Architectural and structural design of prefabricated urban furniture (PUF) in advanced materials for protection against terrorist attacks; Optimization of the properties of fiber reinforced cement composites to assure appropriate behavior for load conditions of terrorist attacks; Optimization of the bond, anchorage and fixing conditions of the bar reinforcements (FRP and steel); Assessment of the behavior of FRCC elements under loading conditions replicating vehicle impact, Development and implementation of constitutive models for modelling the behavior of PUF under blast conditions. The referred tasks included the design of PUF protective elements and the development of experimental tests and numerical models.



Flexural specimens under impact test and drop weight impact machine



Drop weight impact test setup

> **SPAFLAMIS – FRP-based innovative technique with improved fire behavior for the simultaneous flexural-shear/punching strengthening of reinforced concrete elements**

ISISE Principal Investigator: Salvador Dias

Budget: Global: 239923,46€/ISISE-UM: 216173,46€

ID: POCI-01-0145-FEDER-030956

Funding Entity: COMPETE2020/FCT

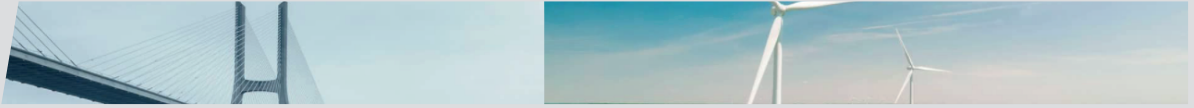
Principal Contractor: Universidade do Minho

Duration: From 01/06/2018 to 27/11/2021

Partners: Universidade de Coimbra

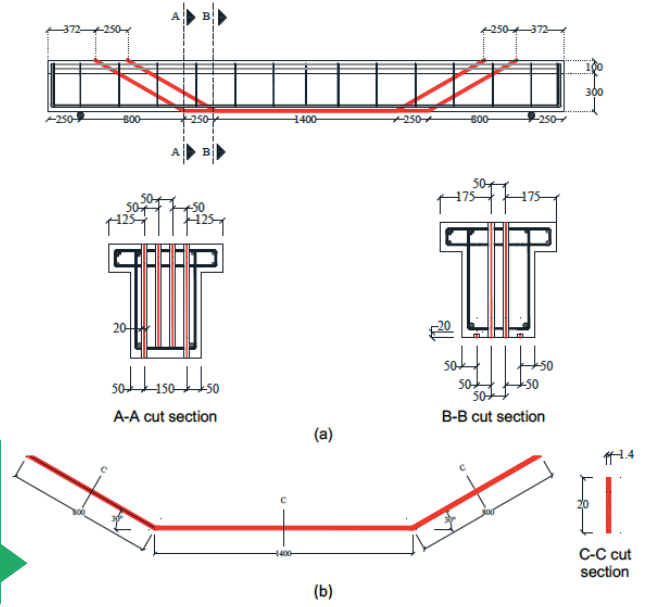
Summary: The project SPAFLAMIS addresses the

development of a new strengthening technique based on the use of innovative Carbon Fibre Reinforced Polymer (CFRP) laminates. This technique combines the best attributes of the near surface mounted (NSM) and embedded through section (ETS) techniques for the strengthening of RC elements. This approach has the main advantage of assuring simultaneously the flexural and shear/punching strengthening



in a single intervention, while being a faster and economic solution with better behavior under high temperatures. The main objectives of SPAFLAMIS project are: (i) in-depth understanding of the behavior of RC elements strengthened simultaneously in flexure and shear/punching with the innovative CFRP laminates; (ii) the effects of high temperature on the developed strengthening system; (iii) rules for the design of RC elements strengthened simultaneously in flexure and shear/punching using the innovative CFRP laminates.

CFRP laminate configuration for strengthening a RC beam:
a) beam geometry and steel and CFRP laminates reinforcement details and b) CFRP laminates geometry



> **FloaTide**

ISISE Principal Investigator: Fatemeh Soltanzadeh

Budget: Global: 237188.76€/ISISE-UM: 197188.76€

ID: POCI-01-0145-FEDER-028112

Funding Entity: COMPETE2020/FCT

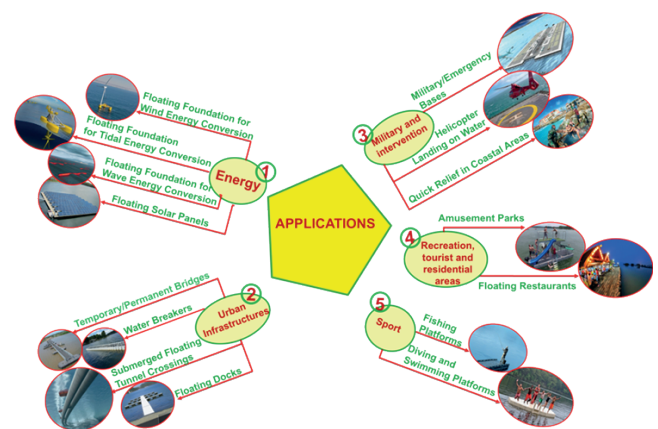
Principal Contractor: Universidade do Minho

Duration: From 07/06/2018 to 05/09/2021

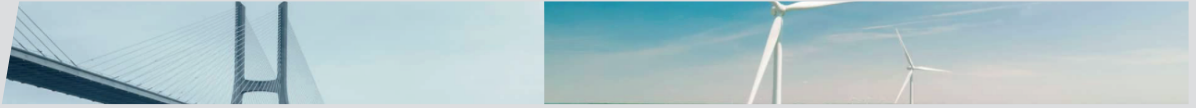
Partners: Universidade do Minho, Civitest – Pesquisa de Novos Materiais Para A Engenharia Civil, Lda

Summary: FloaTide project introduced a multifunctional floating dock system as a sustainable, cost-effective, and eco-friendly alternative to the ones made by conventional materials. These dock blocks are prefabricated in flexible sizes to allow for fast assembly and installation, which makes the proposed system an ideal choice for a variety of offshore demands, especially for tidal energy capitation (Fig.1). In this project, the structural design of the docks was executed and 4 different types of recycled and/or industrial steel fiber reinforced self-compacting concrete (FRSCC) with suitable mechanical properties were designed (Fig.2). Environmental impacts associated with the production of each FRSCC were assessed through life-cycle analysis and the most eco-efficient and sustainable FRSCC for prefabrication of docks were introduced by

considering both mechanical and environmental performances (Fig.3). Bond performance of BFRP rebar embedded in FRSCC was evaluated under both static and dynamic loadings, and the overall structural behavior of a block under quasi-static loading was assessed (Fig.4). The outcome of the study, disseminated through 5 publications, introduces a new generation of offshore infrastructures in-line with Europe program for urban sustainability in 2050.



Application of the proposed multifunctional floating dock system by FloaTide project



R&D STARTED PROJECTS

> **CLIMATESAFE – Assessment of the effects of climate change on the safety of steel and composite structures using Generative Adversarial Networks (GAN) and Advanced Surrogate Models**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 249 834,00€ / ISISE-UC: 249 834,00€
ID: PTDC/ECI-EGC/0954/2021
Funding Entity: FCT
Principal Contractor: Universidade de Coimbra
Duration: From 01/01/2022 to 31/12/2025

> **European Master in Advanced Structural Analysis and Design using Composite Materials – FRP++**

ISISE Principal Investigator: José Sena Cruz
Budget: Global: 2 647 200,00€ / ISISE-UM: 2 647 200,00€
ID: 101048961 (ERASMUS-EDU-2021-PEX-EMJM-MOB — Erasmus Mundus Joint Masters)
Funding Entity: European Commission
Principal Contractor: Universidade do Minho
Duration: From 01/02/2022 to 31/01/2028

> **iBIMD – Introduction to Building Information Modelling and Digitalization**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 326 752,00€ / ISISE-UC: 57 890,00€
ID: KA220-HED-27197A38
Funding Entity: European Commission
Principal Contractor: Politehnica University Timisoara
Duration: From 01/01/2022 to 31/12/2024

> **IntRails – Intelligent prediction tool of ground-borne noise and vibrations induced by railway traffic**

ISISE Principal Investigator: Luís Godinho
Budget: Global: 250 000,00€ / ISISE-UC: 67 686,00€
ID: PTDC/ECI-EGC/3352/2021
Funding Entity: FCT
Principal Contractor: Universidade de Porto
Duration: From 01/01/2022 to 31/12/2025

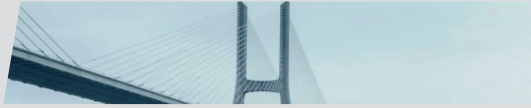
> **InfraROB – Maintaining integrity, performance and safety of the road infrastructure through autonomous robotized solutions and modularization**

ISISE Principal Investigator: José Campos e Matos
Budget: Global: 4 752 117,00€ / ISISE-UM: 298 671,00€
ID: InfraROB - 955337
Funding Entity: European Commission
Principal Contractor: Universidade de Vigo
Duration: From 01/09/2022 to 28/02/2025

> **NaTeRM – Development and corroboration of a novel Natural Textile Reinforced Mortar System for masonry retrofitting**

ISISE Principal Investigator: Daniel Oliveira
Budget: Global: 147 815,00€ / ISISE-UM: 147 815,00€
ID: CONNECT - 101038043
Funding Entity: European Commission (Marie Skłodowska-Curie Individual Fellowships (MSCA-IF))
Principal Contractor: Universidade do Minho
Duration: From 01/02/2022 to 31/01/2024





> **NORISK – Erasmus Mundus Design Measures**

ISISE Principal Investigator: José Campos e Matos
Budget: Global: 55 000,00€ / ISISE-UM: 55 000,00€
ID: Project: 101050410-NORISK
Funding Entity: EU/European Education and Culture Executive Agency
Principal Contractor: University of Minho
Duration: From 01/01/2022 to 31/03/2022

> **RoboShot@FRC: Robotized system for the shotcrete of optimized fibre reinforced concrete in railway tunnels**

ISISE Principal Investigator: Joaquim Barros
Budget: Global: 2 401 396,00€ / ISISE-UM: 418 880,00€
ID: POCI-01-0247-FEDER-047075
Funding Entity: COMPETE2020/ANI
Principal Contractor: Leirimetal, S.A.
Duration: From 01/09/2021 to 30/06/2023

> **Bridge Management System for Viana Castelo Municipality**

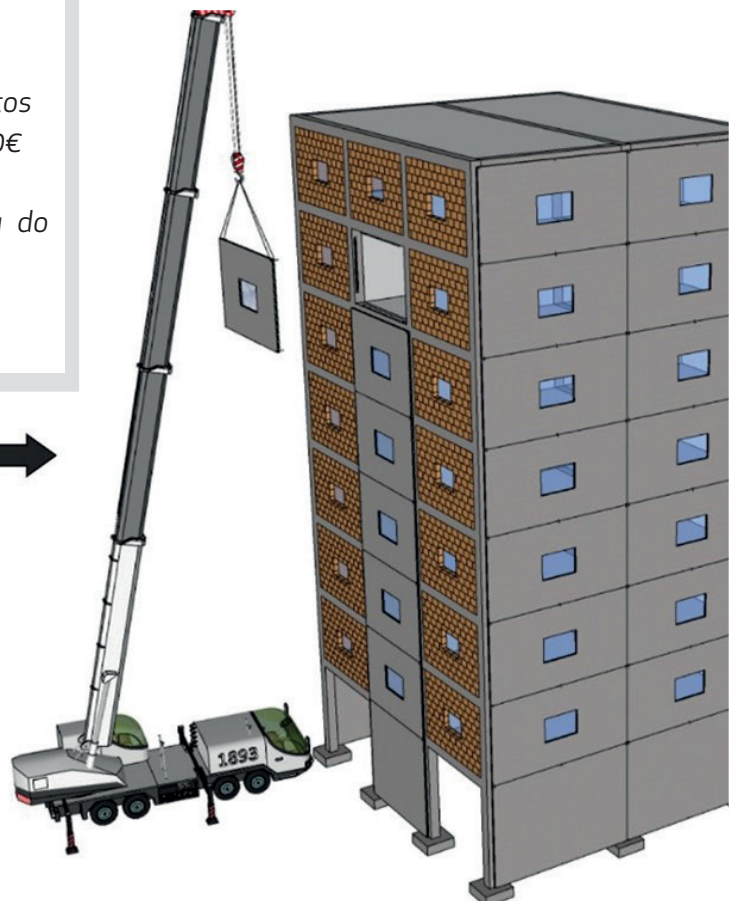
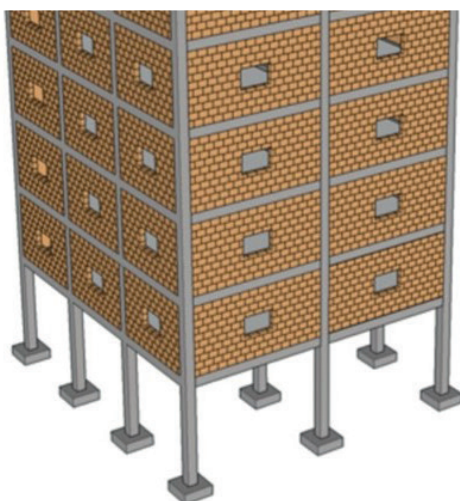
ISISE Principal Investigator: José Campos e Matos
Budget: Global: 71 850,00€ / ISISE-UM: 71 850,00€
ID: 31668
Funding Entity: Câmara Municipal de Viana do Castelo
Principal Contractor: Universidade do Minho
Duration: From 03/09/2021 to 02/09/2022

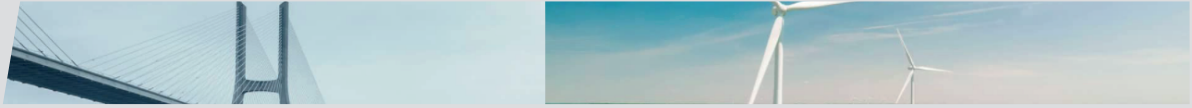
> **VISCO-D – Innovative viscoelastic devices for the reduction of the seismic vulnerability of existing masonry buildings**

ISISE Principal Investigator: Nuno Adriano Leite Mendes
Budget: Global: 49 954, 00€ / ISISE-UM: 49 954,00€
ID: EXPL/ECI-EGC/0940/2021
Funding Entity: FCT
Principal Contractor: Universidade do Minho
Duration: From 19/01/2022 to 18/07/2023

> **Sustainability-led approaches for the rehabilitation and revitalization of the cultural built heritage of Montesinho Natural Park**

ISISE Principal Investigator: Javier Heras
Budget: Global: 248 927,00€ / ISISE-UM: 158 862,00€
ID: INHAVIT - MTS/BRB/0086/2020
Funding Entity: FCT
Principal Contractor: Universidade do Minho
Duration: From 20/10/2021 to 19/10/2024





COMPLETED PHD THESES

> Development of a multifunctional composite sandwich panel for the rehabilitation of building façades

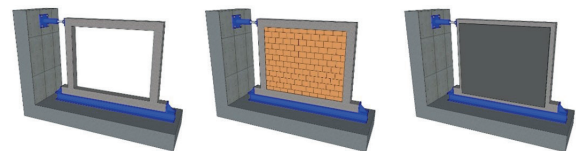
Author: Christoph Fernandes de Sousa

Supervisors: Joaquim António Oliveira de Barros;
João Pedro Ramôa Ribeiro Correia

Date: 06/12/2021

Summary: This work dealt with the development of a sustainable and multifunctional composite sandwich panel for the rehabilitation of reinforced concrete (RC) buildings from the 1960s to mid-1980s. The sandwich panel comprised four main components: (i) thin outer layers of recycled steel fibre reinforced micro concrete; (ii) polystyrene lightweight core; (iii) glass fibre reinforced polymer connectors; and (iv) steel anchors for fixation to the existing structure. The performed research work involved testing different variations of quasi real-scale RC frame specimens under in-plane cyclic loading conditions: (i) bare RC frame; (ii) RC frame with a masonry infill wall; and (iii) RC frame with incorporation of a

sandwich panel prototype. Obtained results showed that, in comparison with traditional masonry infill wall solution, the proposed rehabilitation solution enabled a significant improvement of the RC frame's cyclic performance, providing higher load carrying capacity and energy dissipation.



CV: **Christoph** has been working as a researcher in the field of Civil Engineering. His research work, based on performing experimental research at the material and structural level and advanced numerical simulations, has been focused on the development of: (i) sandwich panels for the rehabilitation of existing buildings; and (ii) new fibre reinforcement solutions for cement matrix materials.

> Analysis of the thermo-mechanical conditions in Friction Stir Based Technologies

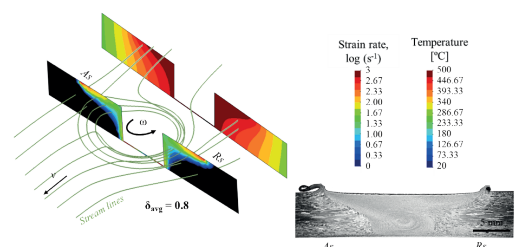
Author: David Gomes Andrade

Supervisors: Dulce Rodrigues, Carlos Leitão

Date: 06/09/2021

Summary: Friction Stir Based Technologies (FSBT), such as Friction Stir Welding (FSW) and Friction Stir Processing (FSP), are assumed as environment-friendly techniques for the joining/mechanical enhancement of several materials. This work aimed to study the thermo-mechanical conditions developed during welding, which were assessed by registering the evolution of the welding temperatures and the tool torque, and by conducting the mechanical and microstructural characterization of the welds. Additionally, the experimental data was coupled with numerical simulation from a 3D thermo-mechanical model for the FSW/P processes. The data from the experiments and from the numerical simulation were used for developing and calibrating analytical models for the torque and temperature, useful for developing real-time process

control strategies, a main requirement of Industry 4.0. Finally, the use of pinless tools was proved to be effective for the lap welding of thin steel plates.



Weld streamlines, temperature and strain rate fields obtained through numerical simulation

CV: **David Andrade** concluded the PhD (2021) in Steel and Composite Structures at the University of Coimbra. His investigation resulted in the production of 7 peer-reviewed scientific articles and the participant in the ongoing project – Friction 4.0. Currently, he investigates the mechanical and microstructural properties of metallic components produced by additive manufacturing techniques.



> Beyond good intentions: building passport for sustainable conservation of built heritage

Author: Joana Maria dos Santos Gonçalves

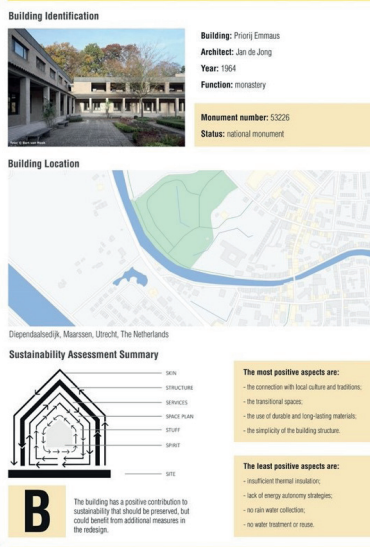
Supervisors: Ricardo Filipe Mesquita da Silva Mateus;

José Dinis Silvestre

Date: 14/01/2022

Summary: This research aims at better understanding the gap in the implementation of best practices of sustainable conservation of built heritage, and at contributing to achieve solutions for behavioural change. It applies an innovative approach drawn from methods from psychology to collect data and analyse designers' decisions behaviours, by eliciting common beliefs, challenges, and opportunities in the implementation of conservation intentions towards heritage buildings. This research is based on the Theory of Planned Behaviour as theoretical framework, where behaviours are influenced by considerations about personal evaluations (attitudes), normative expectations (subjective norms), and factors that may hinder performance (perceived behavioural control). The results demonstrate that design decisions result from conscious and unconscious processes, some of them socially driven while others result from individual attitudes.

BUILDING PASSPORT FOR SUSTAINABLE CONSERVATION



CV: **Joana Gonçalves** graduated as an architect at the School of Arch. of UMinho and is a lecturer in Heritage and Sustainability in the Faculty of Architecture and the Built Environment, at TU Delft. She was awarded with the Iberian Prize on Traditional Architecture Research in 2014 and a guest PhD in the UNESCO chair on Heritage and the Reshaping of Urban Conservation for Sustainability, at TU Delft.

> Stress-Strain Response of a soft soils stabilised with alkali activated industrial byproducts

Author: Manuela Corrêa Alves da Silva

Supervisors: Tiago Filipe da Silva Miranda, Nuno Cristelo, Mohamed Rouainia

Date: 13/12/2021

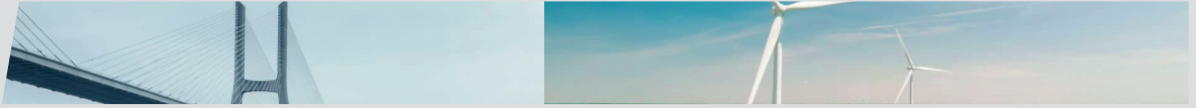
Summary: The present Ph.D. thesis intends to deepen the knowledge concerning the shear behaviour of soft soils stabilized with sustainable binders obtained through the alkaline activation of wastes or industrial by-products. The main objectives were: (i) characterization of the short and long-term behaviour of stabilized soils using triaxial tests. (ii) selection and calibration of a constitutive model for the numerical prediction of the mechanical behaviour of the stabilized soils. (iii) support the construction of a full-scale prototype of a sub-base layer stabilized with alkali-activated binders. The results showed that the mechanical behaviour of soils stabilized with the alternative binders do not differ significantly to those stabilized with conventional binders like cement.

Also, it was possible to calibrate a constitutive model originally developed for naturally cemented clays. Finally, the full-scale prototype showed the potential of using these kind of approach in real conditions.



Details of the construction of the full-scale prototype

CV: **Manuela Silva** holds her M.Sc. and Ph.D. degrees in Civil Engineering at the University of Minho. Author of 8 publications (distributed by journal and conference papers) in the field of Geotechnics, in particular on the improvement of soils using the alkaline activation of wastes and industrial by-products. She is currently working at the dst group, based in Braga, Portugal.



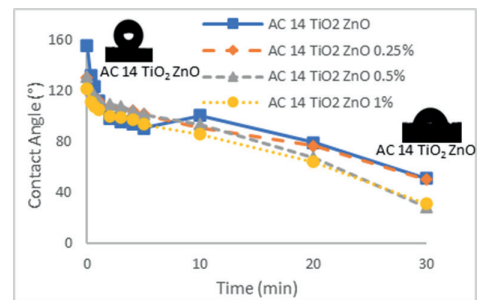
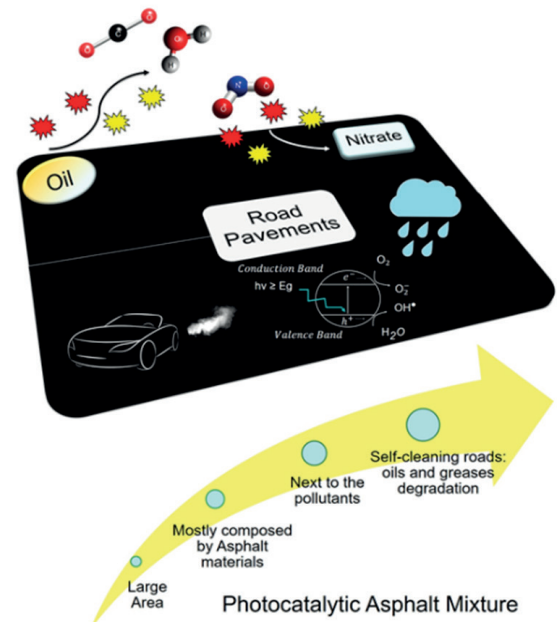
► **Ecological; photocatalytic, superhydrophobic and self-cleaning asphalt pavement surfaces.**

Author: Iran Gomes da Rocha Segundo

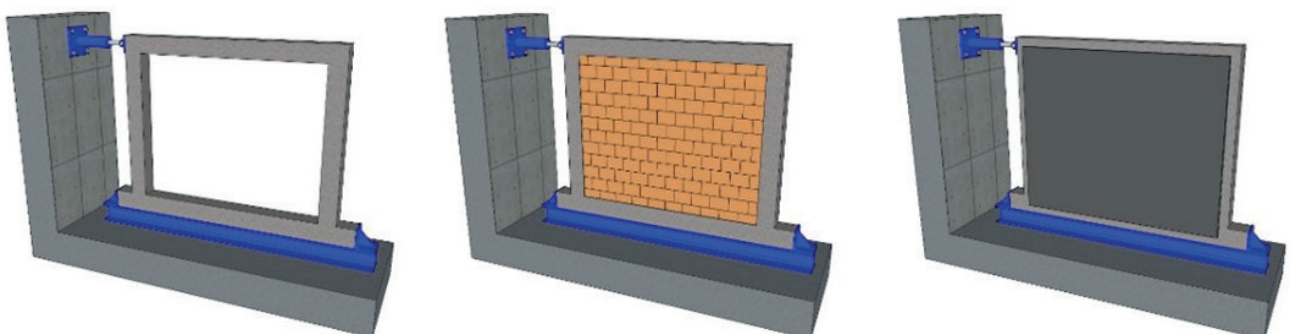
Supervisors: Elisabete Fraga de Freitas; Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro

Date: 13/01/2022

Summary: Currently, there is a growing concern with air pollution, the depletion of natural resources, and, consequently, with the damage imposed on the environment. In this context, this thesis aims to develop recycled asphalt mixtures (ecological through the partial replacement of raw material) and with new functions through the integration of nano/microparticles for the surface layer of asphalt pavements. The integration of nano/microparticles provides new capabilities (functionalization) to asphalt mixtures, namely photocatalytic, superhydrophobic, and self-cleaning with the additional anti-aging effect of asphalt binders. With the development of the photocatalytic capability, the asphalt mixtures are able to photodegrade pollutants, and therefore improving the air quality. Regarding the superhydrophobic capability, the functionalized asphalt mixtures start to repel the water, providing higher road safety, especially in periods of rain and negative environmental temperature. With the self-cleaning effect, the functionalized asphalt mixtures are able to clean pollutants, such as dirt particles, oil, and grease, over their surface, mitigating the decrease of friction due to the presence of these materials over their surface. The main conclusions indicate that these materials can functionalize the asphalt mixtures to provide them with new capabilities, presenting benefits for the environment, society, economy, and for the performance of the asphalt mixtures.



CV: **Iran Rocha Segundo (IRS)** was the best student of the Master in Civil Engineering at UMinho. Although young, IRS presents a h-index of 6 (> 16 documents; > 100 citations), publishing in high-level quality journals including with impact factor of 14.982. He has collaborated with researchers from 3 different international countries, and participated on the writing, development and/or management of 6 (scientific or extension) projects (with more than 450 k€ of approved budget).





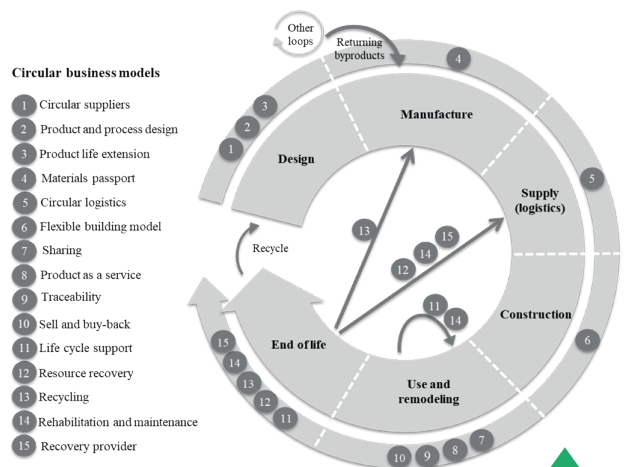
> The circular economy in the construction sector: existing trends, challenges, and tools towards buildings as material banks

Author: Mayara Regina Munaro

Supervisors: Sérgio Tavares (UFPR); Luis Bragança (UM)

Date: 28/03/2022

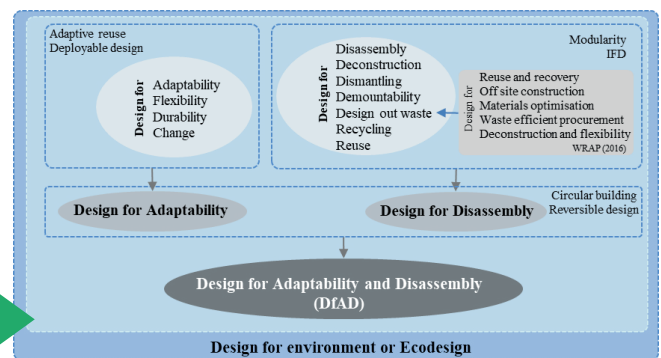
Summary: This research created a theoretical framework based on concepts and tools based on the circular economy (CE) to understand trends and challenges related to the implementation of circular practices in the construction sector. Through qualitative-exploratory research, this study analyzed the current state of the art of CE in the sector; created a model of a materials passport; proposed different circular business models that can be implemented throughout the life cycle of buildings; and understood the criteria and the main eco-design methodologies that support buildings deconstruction. The results show that CE is still incipient and focused on construction and demolition waste management. A systemic review of the model of production and consumption of buildings requires arrangements between supply, demand, policy, and governments. The transition to circular buildings will be possible through public-private partnerships that promote CE information, tax incentive, and the efficient use of resources.



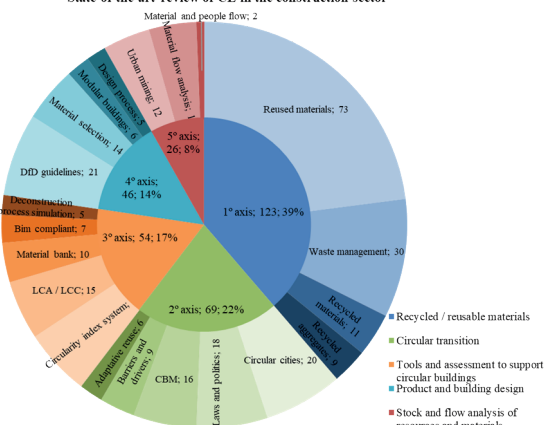
Integration of the eco-design strategies in the Design for Adaptability and Deconstruction (DfAD)

CV: PhD in Civil Engineering from Federal University of Paraná (UFPR), Brazil, working in the research line of circular economy and sustainability in the built environment. Master's in Engineering and Materials Science and specialist in Lean logistics.

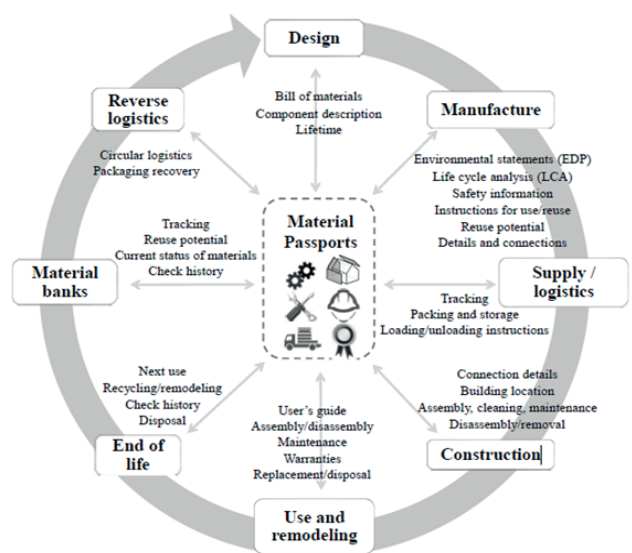
Material passports information shared across a building's lifecycle to improve material recovery and reuse

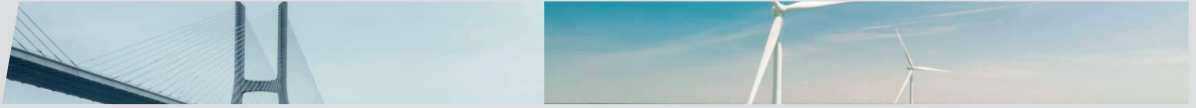


State-of-the-art review of CE in the construction sector



Circular business model framework according to the building life cycle stages



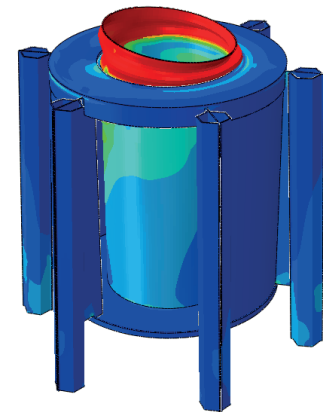
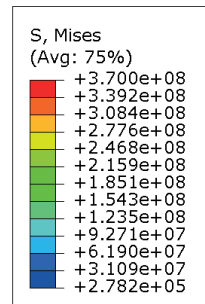


› **Steel Hybrid High-Rise Wind Turbine Tower**

Author: Mohammad Reza Shah Mohamadi
 Supervisors: Professor Carlos Alberto da Silva Rebelo, Professor Milan Veljković and Professor Luís Alberto Proença Simões da Silva
 Date: 22/11/2021

The thesis proposes a hybrid high-rise lattice-tubular structure with novelty lifting mechanism as a new solution for the high wind turbine’s tower structure. The core of the thesis work consists of (i) conceptual development of the hybrid supporting structure including the simulation of the most critical load cases, (ii) the development and analysis of the transition piece details as the key component connecting the lattice structure and the tubular tower and support of the lifting mechanism and (iii) use of new self-lifting mechanism for the high-rise hybrid towers. An iterative process was adopted to investigate the load-structural interaction using aero-servo-elastic simulation and finite element structural analysis of the tower. The transition was investigated exposed to the design loads from aeroelastic simulation for ultimate limit state, buckling and fatigue limit state. Three lifting scenarios were theoretically analysed and tested. The tests demonstrated that the self-

lifting mechanism is feasible though further detail like automatic control of lifting and sufficient roller guidance, should be taken into account for the commercial application.



CV: Multi-disciplinary mechanical engineer specializing in high level programming and numerical analysis of mechanical systems with strong background in servo-hydro-aeroelastic analysis, multi-body dynamics, and finite element methods. Research Trainee at Fraunhofer-Institut für Windenergiesysteme IWES, Germany in 2014-2015, MSCA fellow of the project Aelos4Future and Early Stage Researcher at University of Coimbra from 2015 until 2018 and Team Lead & Consultant Power Lines at DNV Energy since 2018.

AWARDS & PRIZES

› **Award to:** Jorge Emanuel Pereira Fernandes
Prize: Prize for PhD thesis, ex aequo, in the 1st edition of the Prémios Arquitetura, Sustentabilidade e Inovação - categoria de tese, promoted by Ordem dos Arquitectos and Fundo Ambiental.
Date: 18/11/2021
Link: <https://arquitectos.pt/?no=2020497569,154>;
<https://www.facebook.com/ordemarquitectos/photos/a.464904243063/10159773541283064/>

› **Award to:** Luís Simões da Silva
Prize: Honorable Mention for the performance in the execution of projects and activities with competitive external financing during the year 2020
Date: 12/10/2021
Link: <https://www.youtube.com/watch?v=pVpcs5QDc30>





EVENTS

> ISISE Christmas Challenge 2021

Venue: Topia

Date: 14/12/2021

Summary: We did not want to miss the opportunity to share a moment together for Christmas. On December 14 we had a joint activity in brand new world - Topia! We challenged our members, and we tested their sense of humour!



> Seminar “Beira Central Station: conservation and management of the Modern Movement heritage”

Venue: School of Architecture, Art and Design (EAAD) of the University of Minho

Date: 30/03/2022

Website: N/A

ISISE member: Paulo B. Lourenço

Summary: Within the scope of the Keeping It Modern Initiative by the Getty Foundation, the seminar was attended by 60 people. The main objective of the project is to develop the Conservation Management Plan for the building. The related exhibition at EAAD can be visited until April 20. The exhibit will be opening in Porto, Maputo and Beira (Mozambique) in the next months.



UPCOMING EVENTS

> ISIC International Conference – Trends on Construction in the Post-Digital Era

Venue: Guimarães, Portugal

Date: from September 6 to 9, 2022

Website: <https://icisic2022.com/>

> Synercrete’23 – The International RILEM Conference on Synergising expertise towards sustainability and robustness of cement based materials and concrete structures

Venue: Milos, Greece,

Date: June 15-16, 2023

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

> 4th Portuguese Congress of Building Information Modelling

Venue: Braga, Portugal

Date: from May 4 to 6, 2022

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

> fib ICCS2024 – fib International Conference on Concrete Sustainability

Venue: Guimarães, Portugal

Date: from September 11 to 13, 2024

Website: <https://www.fib-international.org/events/fib-events/122-iccs2024.html>



> **The 4^o International Congress on Luso-Brazilian Construction History (CIHCLB)**

Venue: Guimarães, Portugal

Dates: 4-7 September 2023

Website: <https://4cihclb.pt>

> **IPW2024 – International Probabilistic Workshop**

Venue: Guimarães, Portugal

Date: from May 8 to 10, 2024

Website: under development

> **IX ECCS-AISC Workshop on Connections in Steel Structures**

Venue: Coimbra, Portugal

Date: 6-8 June 2022

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

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

Venue: Webinnar

Date: 28 April 2022

Website: <https://www.steelconstruct.com/eu-projects/failnomore/>

COURSES

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

Venue: Department of Civil Engineering, University of Minho, Portugal

Website: www.msc-sahc.org

Application dates:

> 2nd phase: 15 March to 20 May, 2022

> 3rd phase: 15 June to 20 July, 2022

> **Erasmus Mundus Master Waves**

Venue: Department of Civil Engineering University of Coimbra

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

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

Venue: Dept. of Civil Engineering, University of Minho

Website: www.bimaplus.org

Application dates:

> 2nd phase: up to 31 May 2022

> 3rd phase: up to 15 July 2022

> **European Master Course in Advanced Structural Analysis and Design using Composite Materials – FRP++**

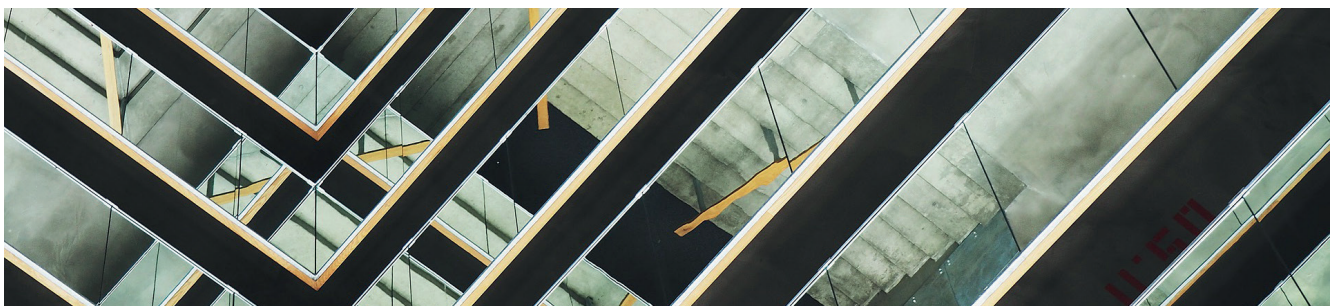
Venue: Dept. of Civil Engineering, University of Minho

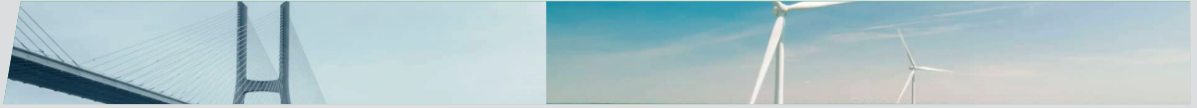
Website: <https://msc-frp.org/>

Application dates:

> 2nd phase: up to 15 July 2022

> 3rd phase: up to 1 September 2022





> **International Master on Sustainable Built Environment iMiSBE**

Venue: Dept. of Civil Engineering, University of Minho

Website: <https://civil.uminho.pt/imisbe/>

Application dates:

> 2nd phase: 04-11 July 2022

> 3rd phase: 06-09 September 2022

> **Master in Construction Management**

Venue: Dept. of Civil Engineering University of Coimbra

Website: <https://www.uc.pt/fctuc/dec/ensino/novos cursos2021/mec/gestao>

Application dates:

> 2nd phase: 01 – 15 July 2022

> 3rd phase: 01 – 13 September 2022

> **Master in Steel and Composite Construction**

Venue: Dept. of Civil Engineering University of Coimbra

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

Application dates:

> 2nd phase: 01 – 15 July 2022

> 3rd phase: 01 – 13 September 2022

> **Master in Structural Mechanics**

Venue: Dept. of Civil Engineering University of Coimbra

Website: <https://www.uc.pt/fctuc/dec/ensino/novos cursos2021/mec/mecest>

Application dates:

> 2nd phase: 01 – 15 July 2022

> 3rd phase: 01 – 13 September 2022

> **Master in Sustainable Construction and Rehabilitation (taught only in Portuguese)**

Venue: Department of Civil Engineering, University of Minho

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

Application dates:

> 2nd phase: 04-11 July 2022

> 3rd phase: 06-09 September 2022

> **Doctoral Programme in Civil Engineering**

Venue: Department of Civil Engineering, University of Minho

Website: <https://pdec.civil.uminho.pt/>

Application date:

> 1st phase: 1 July to 9 September 2022

> **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:

> 2nd phase: 01 – 15 July 2022

> 3rd phase: 01 – 13 September 2022

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

Venue: Dept. of Civil Engineering, University of Minho

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

Application date:

> 1st phase: 1 July to 9 September 2022

