Institute for Sustainability and Innovation in Structural Engineering

ISISE NEWSLETTER

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Univ. of Minho · School of Engineering · Civil Engineering Dep. · Campus of Azurém · Guimarães, Portugal · isise@civil.uminho.pt

▪ SAHC 2025 Reunion Celebrates 18 Years of a Global Alumni Community

During the recent 14th Int. Conf. on Structural Analysis of Historical Constructions (SAHC 2025), in Lausanne, Switzerland, over 50 alumni from the SAHC MSc program led by the University of Minho came together to celebrate 18 years of collective learning, collaboration, and friendship.

The energy, passion, and knowledge shared were truly inspiring. With participants from 14 different editions, from the earliest graduates of 2008/2009 to the most recent class of 2022/2023, the gathering was a vibrant reflection of strength, diversity, and continuity. The SAHC MSc community is now over 500 alumni from 80 countries.

More than a reunion, this was a celebration of everything SAHC MSc stands for: scientific excellence, networking, multidisciplinary collaboration, and a shared commitment to conserving cultural heritage buildings through innovation and practical impact, across generations, borders, and cultures.

ISISE is proud to make a true change and help to create a strong team of professionals. As the 20th edition of the SAHC MSc is opening, let us celebrate the memories made, the collaborations ahead, and the ever-growing SAHC family!

▪ 2nd PhD Students Webinar

On July 2nd, 2025, ISISE held the second edition of the PhD Student Webinar. Once again, our doctoral researchers took the virtual stage to share their cutting-edge research in a fast-paced three-minute format. This edition featured 11 inspiring presentations from all ISISE clusters, showcasing the breadth and quality of ongoing research within the institute. The event also included interactive breakout sessions that encouraged discussion, exchange of ideas, and networking among participants.

The webinar concluded with the announcement of the Best Presentation Award — congratulations to Rand Askar for her remarkable presentation!

You can watch the full webinar on the ISISE YouTube channel: **https://youtube.com/playlist?list=PL1DdIwrD0Zd-2nHTmxKpwgvRNfsxlro45j&si=Uva6hziDzPZ7QWOe**

▪ New ISISE Video

We are pleased to share our new ISISE institutional video, which offers an insightful journey into who we are, what we stand for, and how our research is shaping the future of structural engineering.

In this video, you will discover the wide range of topics that define ISISE's research. You will meet our people, explore our laboratories, and see how we push the boundaries of knowledge in areas such as advanced steel and mixed construction systems, the behaviour of historical masonry, and the development of digital tools for asset management and resilience to extreme events.

The video was created to renew and strengthen ISISE's image, both within our community and beyond, showcasing our shared vision, collaborative culture, and the tangible impact of our work on industry and society. Watch the video and discover ISISE: **https://www.youtube.com/watch?v=f6g7jcdINC8&list=PL1DdIwrD0Zd3wp_s5WT6exBHoWr1Uji36&index=4**

IMPACT STORIES

Matheus Pereira
Product Manager at
NTi Audio AG

The access to a high-quality, multidisciplinary environment, along with a supportive network, greatly enhanced my understanding of how research and development can collaborate and directly influence society...

▪ In which circumstances did you join ISISE?

I joined ISISE in the second semester of 2016, when I started my PhD in Civil Engineering, in the field of Construction, after completing my degree in Acoustical Engineering at the Federal University of Santa Maria (UFSM) – RS, Brazil, where I was part of the second class of this course in the entire country, and after having been a scientific initiation scholarship student for three years in the Acoustics and Vibrations Research Group (Grupo de Pesquisa em Acústica e Vibrações – GPAV – UFSM).

▪ How would you describe your experience in ISISE?

My experience at ISISE, as well as at the University of Coimbra and in the beautiful city of Coimbra, has been truly wonderful. From the outset, I was warmly welcomed by both professors and colleagues, which made it easier for me to integrate and feel part of a highly qualified group. I want to emphasize how grateful I am for the opportunity to work with such excellent, available, and motivated professors to develop studies that really make a difference—remarkable people whom I deeply admire and respect. I still maintain a great relationship with many of them today.

ISISE gave me all the support I needed, quality equipment, and laboratory facilities to carry out my work. It was a personal challenge and helped me grow professionally. I can say with all sincerity that this was the most challenging, but also the most rewarding period of my life.

▪ Is there any anecdotal situation that you experienced in ISISE, that is worthy of sharing?

There are so many good memories! I had countless moments of excellent collaboration in the lab, and working on tasks with such nice people made everything much more enjoyable. We spent countless hours underground in the acoustic chambers, exchanging knowledge, helping each other, and sharing lots of laughs. The barbecues and afternoons in the park were also incredibly fun and memorable.

One experience that stands out was when our car broke down on the way back from the Tecniacustica conference in Cádiz, Spain, in 2018. We ended up waiting hours on the road for help. Although it was certainly an inconvenience, it turned into a positive memory. We made the most of the situation, joking around and enjoying each other's company. It is moments like these that really highlight the connection we have built during our time at ISISE.

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

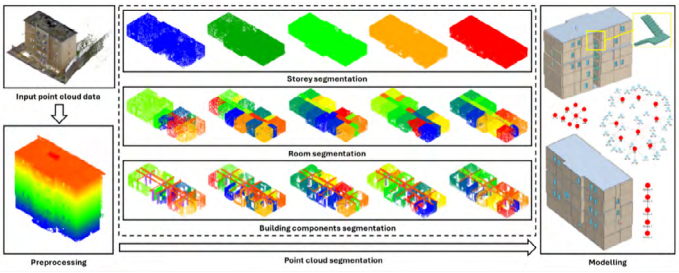
Without a doubt, my time at ISISE had a profoundly positive and fundamental impact on my professional growth. The access to a high-quality, multidisciplinary environment, along with a supportive network, greatly enhanced my understanding of how research and development can collaborate and directly influence society. During my time at ISISE, I also had the opportunity to participate in Short Term Scientific Missions through the European Cooperation in Science and Technology (COST) program. These opportunities arose not only because of my work but also due to the incredible support and resources available around me.

On a personal note, I made many friends during my time there! I consider myself lucky to have built friendships and professional contacts that will last a lifetime. Thank you, ISISE, and thank you, Coimbra!

R&D COMPLETED PROJECTS

▪ RecycleBIM – Integrated Planning and Recording Circularity of Construction Materials through Digital Modelling

ISISE Principal Investigator: Miguel Azenha
Budget: Global: 147 228€ / ISISE-UM: 147 228€
ID: ERA-MIN3/0006/2021
Funding Entity: FCT (ERA-NET NEURON Cofund2)
Principal Contractor: University of Minho
Duration: From 01/05/2022 to 30/04/2025
Summary: RecycleBIM developed an integrated framework to promote the circularity of construction materials through digital modelling. The project explored methodologies for surveying buildings to be demolished using handheld laser scanning, enabling cost-effective creation of digital twins. It defined BIM modelling rules to support deconstruction analysis, safety, material quantification, and reuse potential. An open-source IFC-based tool for multi-criteria optimisation of deconstruction strategies, including LCA/LCC, was created, along with applications for municipalities to manage BIM-based permitting and material circularity records. The project also explored the strategic use of recycled demolition waste in 3D printed concrete. A major achievement resulting from the development of the project was the proposal of a new demolition business model, positioning contractors as suppliers of secondary materials and key enablers of downstream circular practices. Together, these outcomes provide accessible, open tools and knowledge to accelerate circular economy adoption in the construction sector.



▪ DREAMERS – Design REsearch, implementation And Monitoring of Emerging technologies for a new generation of Resilient Steel buildings

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 1 893 509,95€ / ISISE-UM: 113 190,00€
ID: RFCS-PDP – 101034015
Funding Entity: RFCS – Research Fund for Coal and Steel
Principal Contractor: University of Salerno, Italy
Duration: 42 months
Summary: The DREAMERS project aimed to prove the feasibility and improved performance of the FREEDAM friction-damper beam-to-column connection in a real-scale setting, previously developed within the FREEDAM project. An 800 m² resilient steel building was constructed at the University of Salerno, using seismic-resistant moment frames equipped with FREEDAM joints. Alongside the structural design, architectural and MEP systems were developed according to advanced standards, with non-structural elements designed to accommodate horizontal displacements and limit damage. Mechanical/electrical installations and claddings followed LEED sustainability requirements. The University of Coimbra conducted research on the building's fire behaviour, including real-scale fire tests on FREEDAM joints to evaluate their thermo-mechanical performance and confirm their efficiency under fire conditions.

R&D STARTED PROJECTS

- **EcoRehabPanel – Desenvolvimento de painéis pré-fabricados com gradação funcional e mecânica para uma reabilitação mais eficiente e sustentável do ambiente construído**

ISISE Principal Investigator: José Sena Cruz
Budget: Global: 791 689,15€ / ISISE-UM: 791 689,15€
ID: NORTE2030-FEDER-02718000
Funding Entity: Comissão de Coordenação e Desenvolvimento Regional do Norte | CCDR-N
Principal Contractor: University of Minho
Duration: From 01/04/2025 to 31/12/2028

- **EasyWall – Desenvolvimento de solução inovadora de painéis sanduíche multifuncionais EPS-BA para uma construção rápida, eficiente e sustentável**

ISISE Principal Investigators: José Sena Cruz; Luís Godinho
Budget: Global: 799 754,40€ / ISISE-UM: 383 279,36€ / ISISE-UC: 255 549,12€
ID: COMPETE2030-FEDER-01491400
Funding Entity: Agência Nacional de Inovação
Principal Contractor: Sérgio Fonseca – Materiais de Construção, Lda
Duration: From 01/04/2025 to 30/03/2028

- **COL3NATUR – Re-naturalization of educational buildings, playgrounds and paths for adaptation to Climate Change, through the development methodologies for the demonstration of their effectiveness**

ISISE Principal Investigator: Manuela Almeida
Budget: Global: 2 294 091,19€ / ISISE-UM: 234 530,72€
ID: S2/2.4/E0276
Funding Entity: Agência para o Desenvolvimento e Coesão (Interreg SUDOE 2021-2027)
Principal Contractor: Universidad de Navarra
Duration: From 01/06/2025 to 31/08/2028

- **Invatherm – Desenvolvimento de produtos de isolamento térmico à base de plantas invasoras para uma construção regenerativa**

ISISE Principal Investigator: Ricardo Mateus
Budget: Global: 249 091,20€ / ISISE-UM: 249 264€
ID: COMPETE2030-FEDER-00800400
Funding Entity: Fundação para a Ciência e Tecnologia
Principal Contractor: University of Minho
Duration: From 30/06/2025 to 28/06/2028

- **DIGIMAS – Plataforma Digital para Integração da Avaliação Sísmica Estrutural e Reforço de Edifícios Tradicionais em Alvenaria**

ISISE Principal Investigator: Graça Vasconcelos
Budget: Global: 249 091,20 € / ISISE-UM: 149 040€
ID: COMPETE2030-FEDER-00684000
Funding Entity: Fundação para a Ciência e Tecnologia
Principal Contractor: University of Minho
Duration: From 25/07/2025 to 23/07/2028

- **TOOL.Blackbox – Sistema de Armazenamento de informação Digital Twin**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 1 122 534,29€ / ISISE-UC: 232 247,88€
ID: COMPETE2030-FEDER-01468300
Funding Entity: Compete 2030
Principal Contractor: MOLDETIPO II – ENGINEERING MOULDS AND PROTOTYPES (PORTUGAL), LDA
Duration: From 01/04/2025 to 30/03/2028

- **WATER.TECH – Inteligência Artificial para Injeção Sustentável e Eficiente**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 1 317 806,64€ / ISISE-UC: 218 233,90€
ID: COMPETE2030-FEDER-01435900
Funding Entity: Compete 2030
Principal Contractor: MOLDETIPO II – ENGINEERING MOULDS AND PROTOTYPES (PORTUGAL), LDA
Duration: From 01/04/2025 to 30/03/2028

- **HEATCOLDTOOLING**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 998 320,33€ / ISISE-UC: 253 909,28€
ID: COMPETE2030-FEDER-01490900
Funding Entity: Compete 2030
Principal Contractor: SOCÉM – E. D. – FABRICAÇÃO, ENGENHARIA E DESENVOLVIMENTO DE MOLDES, S.A.
Duration: From 01/04/2025 to 30/03/2028

- **LSAMzero – Ecossistema zero desperdício para a produção por impressão 3D de moldes para materiais compósitos de grandes dimensões**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 1 812 775,71€ / ISISE-UC: 208 552,19€
ID: COMPETE2030-FEDER-01483500
Funding Entity: Compete 2030
Principal Contractor: LUZ COSTA & RODRIGUES LDA
Duration: From 01/06/2025 to 30/05/2028

- **MULTISCALELED – Fabrico aditivo multi escala e estrutura, orientado para o fabrico aditivo de grande dimensão**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 2 033 662,61€ / ISISE-UC: 394 802,56€
ID: COMPETE2030-FEDER-02304300
Funding Entity: Compete 2030
Principal Contractor: AGIX, LDA
Duration: From 01/07/2025 to 30/06/2028

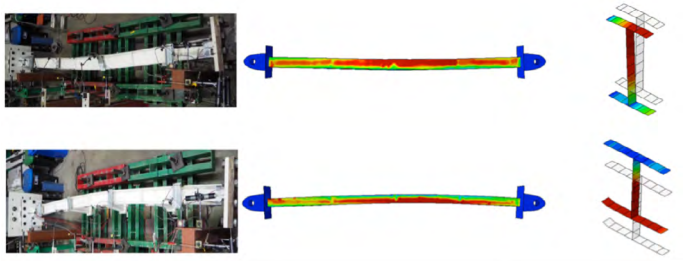
- **MAP02 – Plataforma de Adesão à Medicação 02**

ISISE Principal Investigator: Luís Simões da Silva
Budget: Global: 1 389 309,49€ / ISISE-UC: 89 282,64€
ID: COMPETE2030-FEDER-01487800
Funding Entity: Compete 2030
Principal Contractor: BHT, UNIPESSOAL LDA
Duration: From 01/05/2025 to 29/04/2028

COMPLETED PHD THESES

- **Stability design of high strength steel members: reliability and general formulation for slender sections**

Author: José Osvaldo Ferreira Filho
Supervisors: Luís Simões da Silva; Trayana Tankova; Hermes Carvalho
Date: 22/04/2025
Summary: This PhD work investigated the stability design of high-strength steel (HSS) welded I-section members, focusing on the S690 grade. The current Eurocode 3 buckling rules, derived for normal strength steel, often underestimated HSS resistance and restricted its broader adoption. A validated finite element model supported extensive parametric studies and Monte Carlo simulations, assessing nearly 300,000 cases. The results showed that Eurocode 3 rules were overly conservative, while the amendment by Simões da Silva et al. (2022) provided more accurate safety levels. As the use of HSS led to slender cross-sections, the General Formulation by Tankova et al. (2018) was extended to slender HSS I-sections, proving reliable across geometries, grades, and loading conditions, including tapered members. The findings offered practical design recommendations, improved safety and efficiency, and supported the wider adoption of HSS in structural engineering.

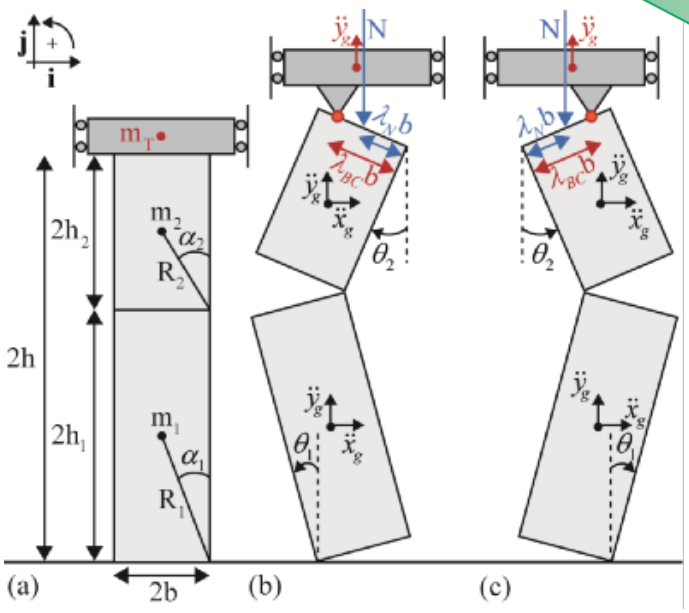


In-plane flexural buckling – tests versus numerical model

José Osvaldo Visiting Professor at UEM – Brazil, coordinating a CNPq-funded project on AI for composite cellular beams of HSS and UHPC. PhD in Steel and Composite Construction (UC – Portugal), MSc in Structural Engineering (UFMG - Brazil), and BSc in Civil Engineering (UTFPR – Brazil, with USC – USA exchange). Research focuses on high-strength steel structures and structural stability.

▪ Rocking and contact models for out-of-plane mechanisms of unreinforced masonry structures

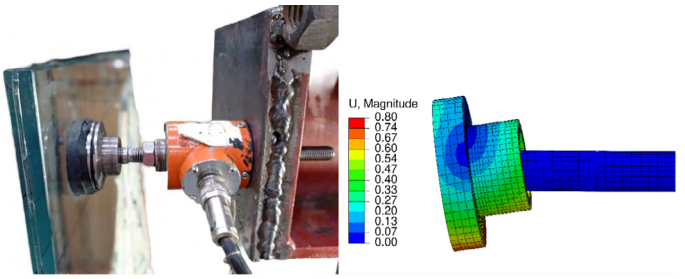
Author: Georgios Vlachakis
Supervisors: Paulo José Brandão Barbosa Lourenço; Anastasios I. Giouvanidis
Date: 05/05/2025
Summary: Earthquakes pose a serious risk to unreinforced masonry. Out-of-plane (OoP) mechanisms are especially vulnerable. Modeling is challenging because of negative stiffness, repeated impacts, and energy losses, plus high sensitivity to small disturbances that hinder validation. This thesis develops and validates models for OoP dynamics and energy loss: (i) generalized kinematic single- and multi-impact models, verified against extensive free-rocking experiments; (ii) a viscous-damping strategy for two- and one-sided rocking in block-based FE/DE modelling tools, calibrated to reproduce instantaneous losses and matching experiments; (iii) an experimentally informed, physics-based compliant contact model with rate-independent and viscous terms for rocking motion, and iv) a rocking model for vertically spanning strip walls that accounts for overburden mass and boundary conditions, a detailed study on the energy losses of the mechanism, and a study of their effect on dynamic stability.



Georgios Vlachakis holds a PhD in Structural Engineering (Univ. of Minho) specializing in masonry dynamics and seismic response. Extensive experimental and numerical research on rocking and vibration of masonry (ERC Stand4Heritage). Professional experience as consulting engineer in structural assessment and retrofit of buildings and infrastructures.

▪ Structural Behaviour of Point-Fixed Laminated Glass Façades Systems Subjected to Seismic Load

Author: Eliana Inca Cabrera
Supervisors: Professor Sandra Jordão (University of Coimbra), Professor Carlos Rebelo (University of Coimbra), and Professor Chiara Bedon (University of Trieste)
Date: 27/05/2025
Summary: This PhD work investigated the seismic performance of point-fixed laminated glass façade systems (PFGFS), combining experimental, numerical, and analytical methods. The study explored the role of interlayer stiffness, mechanical and bonded fixings, and large-deformation effects through multi-scale testing and modelling. Full-scale cyclic racking tests demonstrate significant drift capacity and post-breakage integrity. Validated numerical models inform design optimisation, leading to performance-based recommendations for safer, more resilient glass façades in seismic regions.



(a) Experimental layout; (b) Numerical results, displacement in mm

Eliana Inca Cabrera is a structural engineer with international experience in structural design and seismic analysis. PhD in Steel and Composite Construction (UC-Portugal). MSc in Structural Engineering (UAM, Mexico) and Erasmus Mundus MSc in Steel and Composite Construction (UC, UNINA-Italy, CVUT-Czech Republic). Researcher at UC focused on glass structures, façade systems, skilled in experimental testing and advanced numerical modelling.

▪ Self-healing efficiency of asphalt mixtures trough heating and addition of capsulated rejuvenator

Author: Marina Maria Cabette
Supervisors: Jorge Carvalho Pais; Rui Alexandre Lopes Baltazar Micaelo
Date: 28/05/2025
Summary: This thesis developed an innovative healing asphalt mixture that integrates microcapsules and conductive materials. Laboratory investigations assessed effects across binder, mastic, and mixture scales. At the bitumen level, adding bio-oil demonstrated promising results by softening the binder and increasing penetration. At the mastic level, the combination of bio-oil and steel slag filler showed enhanced healing properties, with bio-oil counteracting aging effects while steel slag improved stiffness. In parallel, calcium-alginate capsules containing bio-oil were developed and incorporated into asphalt mixtures. Findings demonstrate that, at the asphalt mixture level, the developed system integrating bio-oil capsules and steel slag filler did not enhance recovery, suggesting limited contribution to healing in the conditions tested. Therefore, further improvements in capsule design and activation strategies are essential to fully realise the healing potential of bituminous mixtures.

Marina M. Cabette is a Civil Engineer at Infraestruturas de Portugal. She received a PhD in Civil Engineering from the University of Minho in 2025, focusing on healing asphalt mixtures with five journal papers published. She also holds an MSc in Construction Engineering from the Polytechnic Institute of Bragança, 2019, on the geotechnical characterisation of low-traffic unpaved roads.

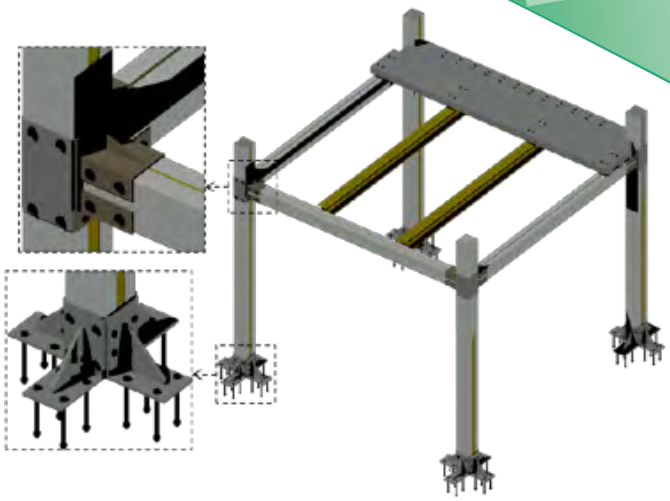
▪ Extending the potentialities of the near surface mounted strengthening technique for fire scenarios using cement-based adhesives'

Author: Reza Mohammadi-Firouz
Supervisor: Joaquim António Oliveira de Barros
Date: 06/06/2025
Summary: This thesis aimed at enhancing NSM FRP strengthening systems, with objectives: (1) The development of an applicable cement-based adhesive (CBA) and assessing its physical and mechanical performance; (2) Development of rough surfaced CFRP strips by sand-coating. Bonding performance of the was assessed through direct pull-out testing in ambient and thermo-mechanical conditions. Structural performance was assessed in comparison to the conventional systems to evaluate its fire-safety feature. Finally, a concise complementary study, addressing the environmental aspects of using cementitious materials as adhesive for NSM CFRP systems is discussed. The obtained results showed that the NSM sand-coated CFRP strengthening with CBA materials is a practical technique for flexural strengthening of RC members where fire safety is an important factor. Moreover, the environmental advantages of this novel system showed that it would be an eco-friendly approach compared to conventional techniques.

Reza M. Firouz has a PhD in civil engineering, with research interests in concrete structures, structural composites, fire safety, and building physics with aiming to develop innovative materials and techniques. Currently involved in an acoustic and vibration study of the pre-fabricated concrete walls for modular construction. Member of several international scientific committees and reviewer in scientific journals.

▪ Innovative hybrid structural solution using cold-formed steel and lightweight concrete

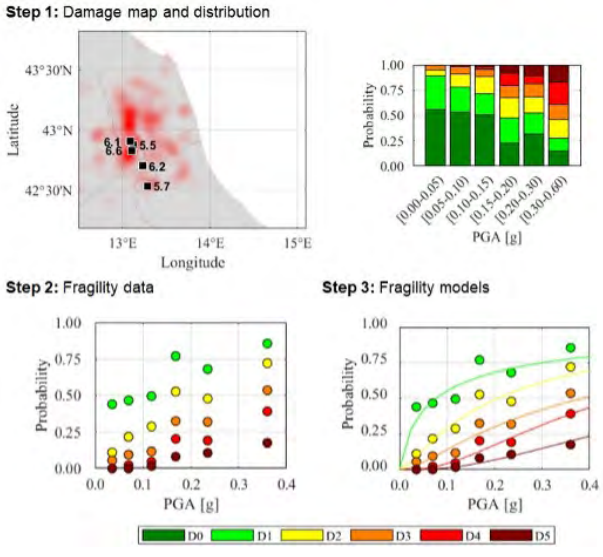
Author: Rohola Rahnavard
Supervisors: Hélder Craveiro; Rui Simões
Date: 26-06-2025
Summary: The construction sector needs structural systems that are efficient and sustainable. This thesis proposes a modular system combining cold-formed steel (CFS) and lightweight concrete (LWC) for light, strong, fire-resistant performance. It develops and validates key components—concrete-filled CFS (CF-CFS) columns, CFS-LWC beams, bolted shear connectors, and plug-and-play joints—as a cohesive system. Review maps gaps in current design standards. Experiments and simulations examine CF-CFS columns under axial compression at ambient and high temperatures, clarifying capacity, failure modes, and fire response. A validated finite-element model supports studies. For beams, it characterizes connector shear and flexural behavior, proposing formulas and design updates, including for fire. The joint concept streamlines assembly and is feasible. Results provide methods and a framework for safe, efficient adoption of CFS-LWC in modern infrastructure. The study advances design guidance and adoption.



Rohola Rahnavard PhD — Structural & façade engineer and researcher, now active in façade engineering. Advances in modular CFS–LWC systems: CF-CFS columns, composite beams, bolted shear connectors, plug-and-play joints, FE modeling, fire design. Led experimental/numerical programs; creates practical methods. Recognized in the global Top 2% Scientists (2024, 2025).

▪ Development and Validation of Empirical Seismic Vulnerability Models for Historic Masonry Towers

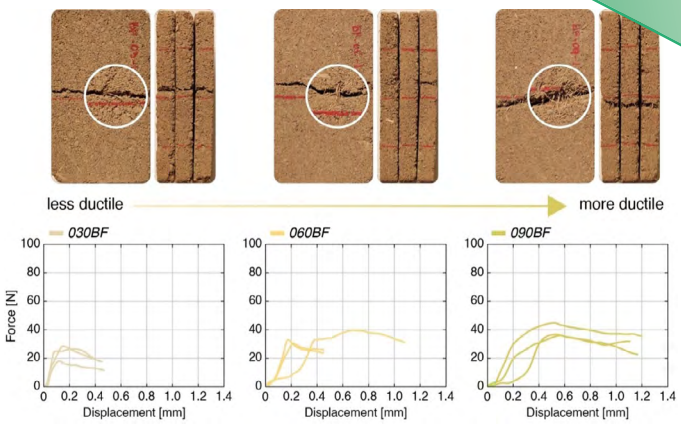
Author: Francesco Testa
Supervisors: Alberto Barontini; Paulo José Brandão Barbosa Lourenço
Date: 30/06/2025
Summary: This research aimed to assess the seismic vulnerability of historic masonry towers, a heritage typology highly prone to earthquake damage yet scarcely studied at the territorial scale. Two large datasets of post-earthquake surveys, including the 2016-2017 Central Italy sequence, were analysed. Novel vulnerability and fragility models were calibrated and tested considering distinct seismic scenarios (single or multiple main shocks) and tower-specific attributes (geometry, interaction with adjacent structures, maintenance condition, and geographical location). Various seismic intensity measures were used, including MCS intensity, PGA, and Spectral Acceleration; the latter supported by new empirical formulas for tower fundamental periods. The research advances territorial scale risk assessment by providing robust, transferable tools for forecasting damage and supporting mitigation strategies for cultural heritage assets.



Francesco Testa is an Italian qualified structural engineer with a PhD in Civil Engineering from the University of Minho and a Master's degree in Architectural Engineering from the University of Naples "Federico II". His research focused on heritage conservation, structural health monitoring and disaster risk assessment.

▪ Circular strategies, data-driven design and novel applications for the advancement of compressed earth building materials

Author: Chiara Turco
Supervisors: Ricardo Filipe Mesquita da Silva Mateus; Elisabete Rodrigues Teixeira
Date: 01/07/2025
Summary: This research aimed to improve compressed earth materials for modern building applications. The thermophysical properties of compressed earth blocks were improved by refining particle size and incorporating local natural by-products. Predictive models based on artificial neural networks were developed, allowing for more efficient and accurate mixture design than traditional trial and error methods. The recyclability of soils stabilised with cementitious materials was evaluated, providing information on their end-of-life scenarios. Finally, the research explored bio-stabilisation strategies using natural fibres and biopolymers to create thin earth-based elements, demonstrating the functionality and potential of more sustainable alternatives to conventional cement-based solutions.



Chiara Turco is a researcher in sustainable building materials, circular approaches and nature-based solutions. She is a chartered engineer with a MSc in Building and Architectural Engineering. She obtained her PhD from the University of Minho, collaborating with industry and Columbia University's Natural Materials Lab. She is a member of RILEM TC 318-BEC. Through the Med-IREN project, she is currently working on climate resilience in EU communities.

▪ Optimisation of Fatigue-Sensitive Wire Arc Additive Manufactured Components

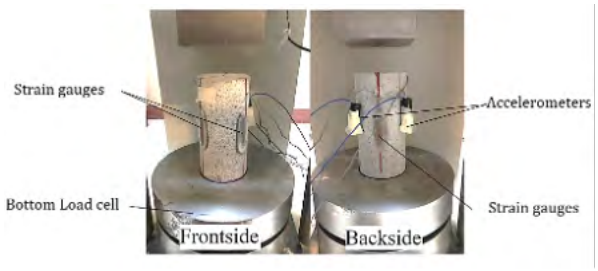
Author: Mariela Mendez-Morales
Supervisors: Carlos Rebelo (DEC-UC); Trayana Tankova (TU Delft) and Ricardo Branco (DEM-UC)
Date: 11/07/2025
Summary: This doctoral research addressed the need for novel design approaches in wind tower structures by studying structural optimisation techniques that incorporate fatigue criteria. The work focused on components produced by Wire Arc Additive Manufacturing (WAAM), enabling the design of parts that can safely withstand time-varying loads while reducing material usage.
A two-level optimisation methodology was developed, where the first level applies topology optimisation, and the second incorporates durability-based shape optimisation. To enable this second level, the fatigue behaviour of WAAM carbon steel was characterised via a comprehensive experimental campaign, producing fatigue-life relationships essential for reliable and safe design.
The results confirmed that the proposed methodology successfully supports the design of WAAM components for structural applications, while refining geometries with fatigue criteria substantially extends their operational lifespan.

WAAM carbon steel material produced at ISISE AMConstruction Lab

Mariela is currently a Visiting Assistant Researcher at ISISE, University of Coimbra. Her research interests include steel structures, structural design for renewable energy systems, structural optimisation, additive manufacturing, and the fatigue behaviour of metals. Before starting her PhD, she earned a Master of Science in Steel Construction from the University of Sheffield, United Kingdom, and a Licentiate Degree in Civil Engineering from the University of Costa Rica.

▪ Analytical and Experimental Investigation of Dynamic Performance of Steel Fiber Reinforced Concrete for Enhanced Protective Structure Design

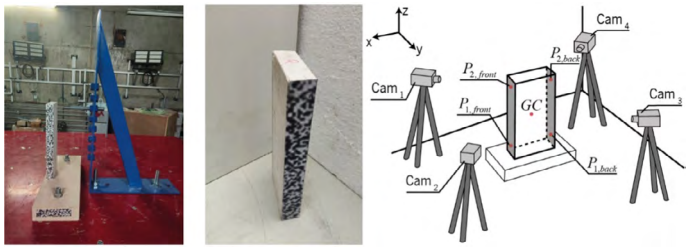
Author: Mohammad Bakhshi
Supervisors: Honeyeh Ramezansefat; Maria Isabel Brito Valente
Date: 23/07/2025
Summary: Concrete structures face dynamic loading throughout their service life, raising significant concerns in the wake of increasing terrorist attacks on both civilian and military structures. Fiber-Reinforced Concrete (FRC) has emerged as a promising material, with enhanced tensile strength provided by the bridging action of embedded fibers. This research addresses the critical need to understand the dynamic properties of concrete structures, with a focus on Steel Fiber Reinforced Concrete (SFRC) and its response under various loading conditions. The study explores a large range of strain rate regimes. Experimental methodologies are used to evaluate the dynamic response of SFRC, which include quasi-static tests under different strain rates and impact loading using an instrumented drop-weight setup.The results obtained highlight the substantial influence of strain rates on compressive, tensile and flexural strength. The strain rate effect during impact loading is more significant than in quasi-static conditions. Dynamic to static ratios of SFRC properties are discussed and compared with existing studies, demonstrating significant enhancements in predicting dynamic increase factor values. New models are proposed, accounting for strain rate and test type, offering improved predictions of mechanical characteristics. This research contributes to advancing the understanding of SFRC behaviour under dynamic conditions, providing valuable insights for the design of protective structures in civil applications.



Mohammad Bakhshi 2024 - 2025: Structural designer, TOPBIM, Grupo Casais, Braga, Portugal. **2019 – 2024:** Ph.D in Civil Engineering, University of Minho, Guimarães, Portugal. 2014 - 2016: M.Sc: Earthquake Engineering, Tarbiat Modares University, Tehran, Iran. **2010 - 2014:** B.Sc.: Civil Engineering, Imam Khomeini International University, Qazvin, Iran. 8 publications in international journals and 8 publications in international conferences.

▪ Experimental evaluation of the static and dynamic out-of-plane response of block-type masonry structures

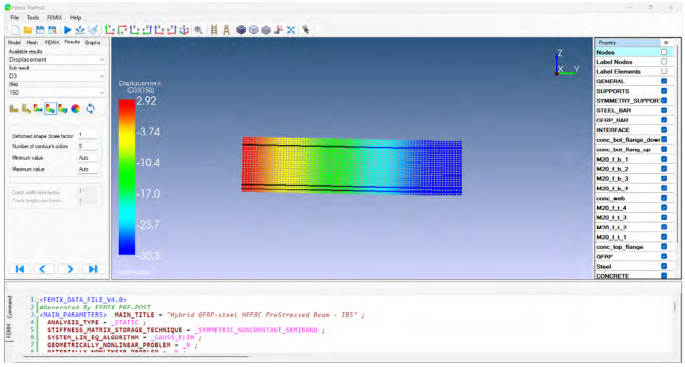
Author: Carla Colombo
Supervisors: Paulo José Brandão Barbosa Lourenço; Nathanael Cristophe Baudouin Savalle; Nuno Adriano Leite Mendes
Date: 18/07/2025
Summary: Masonry is one of the oldest construction techniques, valued for its simplicity, material availability, and adequate vertical capacity. However, it remains highly vulnerable to seismic actions, particularly out-of-plane loading, which can compromise local and global stability. Capturing masonry dynamic behaviour is challenging, and the development of reliable predictive tools requires trustworthy experimental data. This PhD thesis addresses this gap by providing a comprehensive experimental dataset on three critical out-of-plane failure mechanisms of block type dry-joint masonry. The work includes a characterisation campaign of masonry units and interfaces, focusing on interface stiffness and damping. It then examines the behaviour of masonry corners via tilting tests, followed by shaking table tests on rocking blocks and vertically spanning strip walls, investigating both free and forced rocking, the latter under pulses and ground motion inputs to define performance limit states.



Carla Colombo holds a Master's degree in Building Engineering and Architecture from the University of Palermo (Italy) and a PhD in Civil Engineering from the University of Minho (Portugal). Her expertise lies in the seismic behaviour of masonry structures, with a specialisation in structural dynamics, rocking dynamics, and experimental testing.

▪ Integrated approach for the optimization of structural systems for the pre-fabrication industry using high performance materials and advanced numerical tools

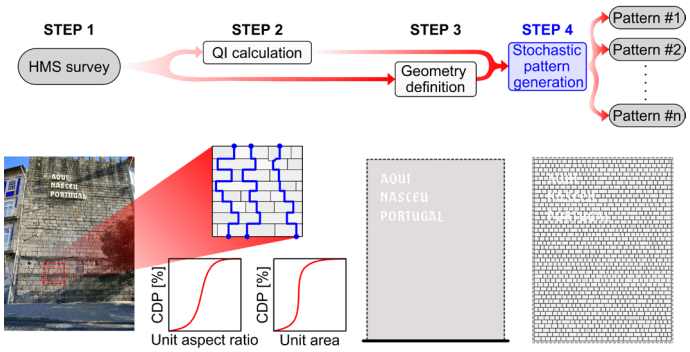
Author: Kamyar Bagherinejad Shahrbijari
Supervisors: Joaquim António Oliveira de Barros; Maria Isabel Brito Valente
Date: 17/07/2025
Summary: This research investigates the potential of hybrid reinforcement systems combining Glass Fiber Reinforced Polymer (GFRP) bars and steel bars, along with steel fiber-reinforced concrete (SFRC). This research adopts a multidisciplinary approach, integrating experimental, numerical, and analytical methods. Experimental work involved testing large-scale hybrid beams reinforced with prestressed GFRP and steel bars, alongside SFRC elements. The research also involved the optimization of hybrid reinforcement ratios to achieve cost-effective designs with improved structural performance. Advanced computational tools were developed to investigate fracture mechanisms, crack propagation, and tension stiffening effects.
The outcomes of this research not only advance the understanding of hybrid reinforcements but also present a practical pathway for developing durable and sustainable concrete beams tailored for aggressive environments.



Kamyar Shahrbijari is a Civil Engineer and Software Developer specializing in structural analysis and design. Expert in applying advanced engineering principles to develop innovative, efficient, and reliable solutions for structural systems. Passionate about developing engineering software, integrating new technologies in structures, exploring innovations in smart devices, and actively engaging in research activities.

▪ Influence of the masonry pattern in the safety assessment of historic masonry structures

Author: Simon Szabó
Supervisors: Paulo José Brandão Barbosa Lourenço; Marco Francesco Funari
Date: 16/07/2025
Summary: Historic masonry structures (HMS) are often constituted by an assemblage of natural stone units with variable dimensions, resulting in complex arrangements. Although masonry patterns strongly influence structural behaviour, they remain underexplored due to challenges in generating irregular layouts, defining representative parameters, and accounting for survey uncertainties. This PhD thesis addresses these issues by studying how different masonry arrangements affect the behaviour of HMS while also considering incomplete knowledge. Patterns are classified through geometric indices (QI) describing their dimensions and regularity. A generator algorithm creates realistic layouts adhering to predefined QI values, enabling systematic variations. Results reveal correlations between QIs and structural performance, leading to an assessment framework that integrates pattern generation, structural simulation, and data analysis for more accurate capacity predictions with minimal surveying.

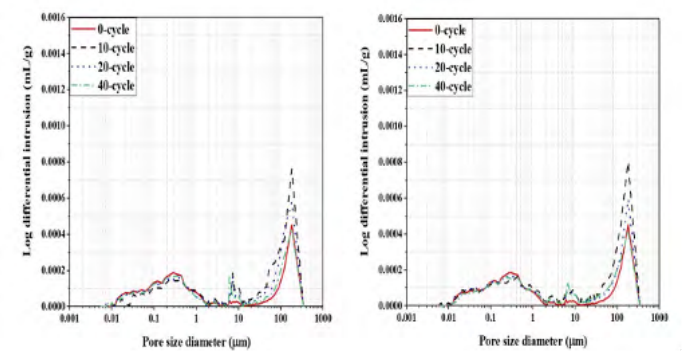


Simon Szabó is passionate about the preventive conservation of historic buildings, our invaluable cultural heritage at risk. Simon Szabó began his career in Hungary, later completing a PhD at the University of Minho on masonry structures with irregular patterns. Now at University Federico II, Simon Szabó studies the interpretation of earthquake damage on churches using AI, tackling real-world heritage preservation challenges.

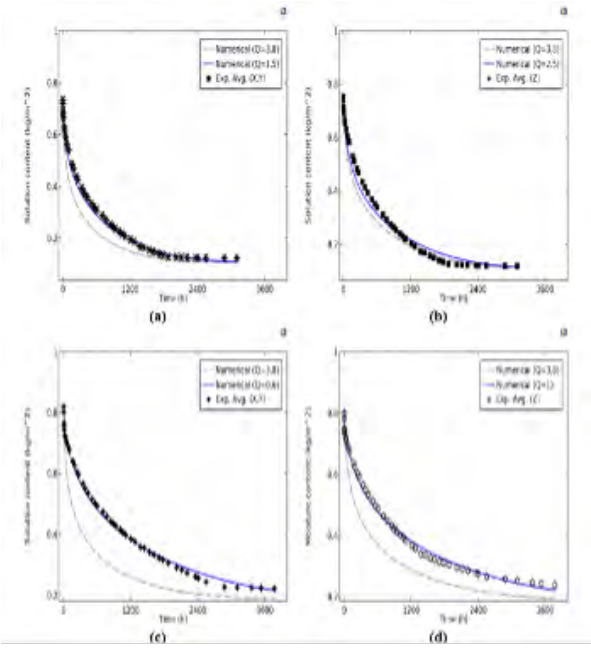
- **Assessment of salt decay in granite masonry: Experimental and numerical approaches'**

Author: Amin Nazerigivi
Supervisors: Graça de Fátima Moreira de Vasconcelos; Bahman Ghiassi; Maria Amélia Alves Rangel Dionísio
Date: 29/07/2025

Summary: This research analysed the influence of salt crystallization damw and computational modelling were combined to assess physical, hygric, and mechanical behaviour. Results highlight the complexity of salt crystallization, showing how pore structure, anisotropy, and environmental factors (temperature and humidity) govern damage initiation and progression. The study advanced predictive models of salt deterioration and, by linking experimental and numerical evidence, provides a framework to assess and mitigate salt-induced decay in heritage stone masonry.



The pore size distribution curves of Pedras granite for different zones of granites after different numbers of salt crystallization cycles: (Pedras granite); right (Pedra Granite) (a) Z1 and (b) Z2 zones



Updated diffusivity factor for drying test for NaCl solutions in Pedras granite: (a, b) 1.9 [mol/kg] in X, Y and Z directions; (c, d) 4.2 [mol/kg] in X, Y and Z directions

Amin Nazerigivi has a Master's in Mining Engineering - Rock Mechanics from Tarbiat Modares University, Iran, and a PhD in Civil Engineering from the University of Minho, Portugal. He has been working as a researcher in the project INHAVIT-Sustainability-led approaches for the rehabilitation and revitalization of the cultural built heritage of Montesinho Natural Park (MTS/BRB/0086/2020

AWARDS & PRIZES

▪3rd place at 13th ARRISCA C Business Ideas with the project "Freguesia +Segura

Winner: Andreia Rodrigues (University of Coimbra – ISISE)
Venue: University of Coimbra
Date: 09/04/2025
Website: https://www.arriscac.pt/#o-que-e-o-arrisca-c

▪RILEM award for the best experimental paper at SAHC 2025 with the work "Experimental dynamic behaviour of vertical spanning strip walls under free and forced vibrations"

Winner: Carla Colombo
Venue: SAHC 2025 – 14th International Conference on Structural Analysis of Historical Constructions, Lausanne (Switzerland)
Date: 17/09/2025

▪ Young engineer meritorious award with the work "Seismic fragility curves of multi-span masonry arch bridges in Portugal"

Winner: Carlos Cabanzo, Nuno Mendes, Mitsuyoshi Akiyama, Paulo B. Lourenço & Jose C. Matos
Venue: IABSE symposium Tokyo
Date: 21/05/2025

▪ Best Paper award with the work "Scour Detection with Monitoring Methods and Machine Learning Algorithms—A Critical Review"

Winner: Sinem Tola, Joaquim Tinoco, José C. Matos and Eugene Obrien
Venue: Applied Sciences Journal, Basel
Date: 01/06/2025

▪ Outstanding contribution award with the work "Alternative bio-stabilisers for thin earth elements"

Winner: Chiara Turco, Elisabete Teixeira, Ricardo Mateus (ISISE) and Olga Beatrice Carcassi, Lola Ben-Alon (Columbia University)
Venue: Sustainable Built Environment (SBE25) conference, Zürich
Date: 25/06/2025

EVENTS

- **12th International Conference on Fiber-Reinforced Polymer (FRP) Composites in Civil Engineering**

Venue: Lisboa, Portugal
Date: 14-16 July 2025
Website: https://cice2025.org/
ISISE Members: Jose Sena cruz, Joaquim Barros, Luis Correia
Summary: The CICE 2025 conference, organized by Técnico – University of Lisbon, the National Laboratory for Civil Engineering, and the University of Minho, took place at Técnico's main campus in Lisbon from July 14 to 16. The event brought together 426 participants from 38 countries, with the support of 15 sponsors and 8 institutional partners. The diverse and engaging programme included 6 keynote lectures delivered by renowned speakers, 373 technical presentations, and several award ceremonies recognizing excellence, including the IIFC Medal, the IIFC Distinguished Young Researcher, the Best PhD Thesis, and prizes for outstanding papers in two categories. The conference also featured a student benchmark competition and a variety of social events, fostering both professional exchange and networking.

UPCOMING EVENTS

- **International Conference on Moisture in Buildings"**

Venue: Guimarães, Portugal
Date: 23-24 October 2025
Website: https://icmb25.pt/
ISISE members: Jorge Branco, Yina Moscoso, Sandra Silva, Rafael Lara

- **CONGREGA 2026**

Venue: Braga, Portugal
Date: 14-16 October 2026
Website: https://www.congrega.eu/congrega-2026/
ISISE members: José Campos e Matos

- **European Safety and Reliability Conference (ESREL 2026)**

Venue: Braga, Portugal
Date: 14-19 June 2026
Website: https://www.esrel2026.com/
ISISE members: José Campos e Matos, Paulo B. Lourenço

- **Special Issue in Structures (Elsevier) – Modular Composite Structurs: Advances in design, Processing, Demountability, and Performance**

Submission start: 1 November 2025 – 01 june 2026
Date: 23-24 October 2025
Website: https://www.sciencedirect.com/special-issue/327174/modular-composite-structures-advances-in-design-processing-demountability-and-performance
ISISE members: Helder Craveiro and Rohola Rahnvard

COURSES

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

Venue: Dept. of Civil Engineering, University of Minho
Website: www.msc-sahc.org

- **Erasmus Mundus Master Waves**

Venue: Dept. 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

- **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/

- **International Master in Risk Assessment and Management of Civil Infrastructures (NORISK)**

Venue: Dept. of Civil Engineering, University of Minho
Website: https://msc-norisk.org/

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

Venue: Dept. of Civil Engineering, University of Minho
Website: https://civil.uminho.pt/imisbe/

- **Master in Steel and Composite Construction**

Venue: Dept. of Civil Engineering University of Coimbra
Website: https://ucpages.uc.pt/fctuc/dec/descobre-o-dec/mecmm/

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

Venue: Dept. of Civil Engineering, University of Minho
Website: http://civil.uminho.pt/mcrs/

- **Doctoral Programme in Civil Engineering**

Venue: Dept. of Civil Engineering, University of Minho
Website: https://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

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

Venue: Dept. of Civil Engineering, University of Minho
Website: http://civil.uminho.pt/idisbe/