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## ISISE HIGHLIGHTS

### COST Action TU1404 – “Towards the next generation of standards for service life of cement-based materials and structures”



A new COST Action, whose application has been led by ISISE member Miguel Azenha, has been recently approved. The Action is named TU1404 - “Towards the next generation of standards for service life of cement-based materials and structures”, and currently involves 22 EU countries. The official kick-start of the Action occurs in November 21<sup>st</sup> at the first meeting of its Management Committee. Additional information in: [http://www.cost.eu/domains\\_actions/tud/Actions/TU1404](http://www.cost.eu/domains_actions/tud/Actions/TU1404)

### FCT Evaluation 2013 – Visit of Evaluation Panel, Department of Civil Engineering at University of Coimbra, 8<sup>th</sup> October 2014

After notification of the first stage evaluation results, ISISE was recommended to proceed to the second stage, which included the visit of the Evaluation Panel to the Department of Civil Engineering of the University of Coimbra on the 8<sup>th</sup> of October 2014. The panel members, Prof. William Powrie, Prof. Laurie Boswell and Prof. Barry Clarke accompanied by the FCT representative Dra. Maria Luís Serra were given the opportunity to clarify any unclear aspects of the written proposal submitted by ISISE in the first stage and also to visit the laboratories. During the visit the Evaluation Panel met the ISISE director and vice-director, leaders of the research groups and members of the research staff including permanent University staff and Post-doc and PhD students working in both universities of Coimbra and Minho. The visit was concluded with a lunch where the Director and Vice-Director of the Faculty of Sciences and Technology of the University of Coimbra were also present.



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



# R&D COMPLETED PROJECTS

## > FRAMEUP – Optimization Frames for Effective Assembling

**ISISE Principal Investigators:** Luís Simões da Silva, Carlos Rebelo e Rui Simões

**Budget:** Global 1 558 533€/ / ISISE-UC 264 705€

**ID:** RFSR – PR-10121

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

**Principal contractor:** LTU – Lulea Technical University

**Participating Institutions:** LTU, ULg, Acciona, FCTUC, PartAB, RWTH and V&M

**Duration:** From July 2011 to June 2014

**Summary:** The project aims to develop and test a new concept of execution technique for a skeletal system with 3D modules structurally integrated. Further, it has the objective of establishing the structural performance of the joints developed for this application. The new execution technique starts with the assembly of the roof and the top floor at ground level, in order to get a rigid body which will be lifted up by lift towers and jacks. Then the procedure is successively repeated to assemble the lower floors. With this execution method the protection of the structure against the weather adversity, as rain and moisture, is assured by the own structure. The research intends to define the limits of application where the concept is competitive when compared to the existing building alternatives taking into account a complete sustainability assessment.



## > PrePAM - Pre-fabricated thin panels using advanced materials for structural rehabilitation

**ISISE Principal Investigator:** Joaquim Barros

**Budget:** Global: 181.286,00€ / ISISE-UM: 181.286,00€

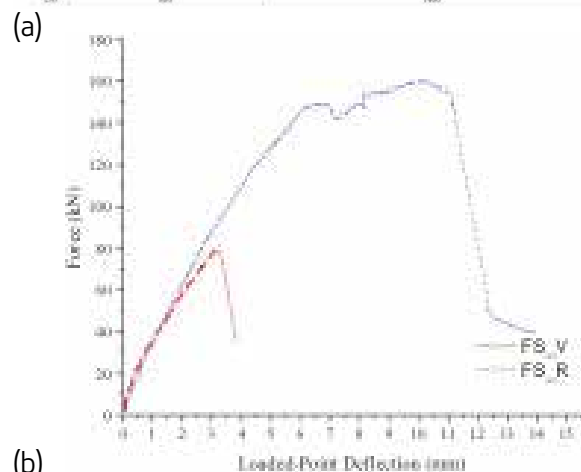
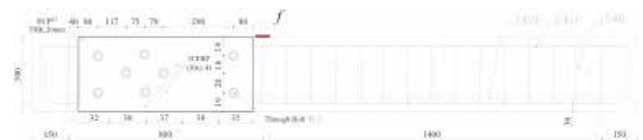
**ID:** PTDC/ECM/114511/2009

**Funding Entity:** FCT

**Principal Contractor:** University of Minho

**Duration:** From March 2011 to August 2014

**Summary:** An innovative strengthening technique was developed based on the concept of combining strain hardening cement composites (SHCC) with carbon fibre reinforced polymer (CFRP) systems for forming thin plates (HCP).



PrePAM: (a) HCP for the shear strengthening of damage RC beam: (b) load versus loaded-point deflection, (c) shear failure of the virgin specimen (FS\_V), (d) lateral concrete cover detachment (FS\_R)



The main outcomes are: (i) development of a high effective and cost competitive strengthening technique that can increase effectively the flexural and the shear strengthening of RC frames, as well as the energy dissipation capacity of this type of structural elements; (ii) development of a guideline for the design and execution of this technique; (iii) formation of young scientists dedicated to the development and characterization of strain hardening cement composites and for the development of design guidelines and numerical tools for the structural rehabilitation using the developed strengthening technique.

**> INFASO+ – Valorisation of Knowledge for Innovative Fastening Solutions between Steel and Concrete**

**ISISE Principal Investigator:** Luis Simões da Silva  
**Budget:** Global: 574.993,00€ / ISISE-UC: 119.912,00€  
**ID:** RFS2-CT-2012-00022

**Funding Entity:** RFCS

**Principal Contractor:** University of Stuttgart

**Duration:** from July 2012 to June 2014

**Summary:** Within RFCS project INFASO design models for innovative, practically relevant steel-to-concrete joints with new concrete components have been developed including electronic tools. The INFASO+ project aimed for the valorization and the dissemination of these results to reach a wide audience among designers and engineers in order to assure the application of the outcome. The implementation of these models in a future revision of Eurocode was prepared to create a basis for easy application by all European designers. Design Manuals for the engineers in practice were prepared including worked examples. All this documentation was provided during the workshops organized in different European countries.



The workshop in Portugal took place in the University of Coimbra on the 14<sup>th</sup> of March 2014. The workshop was provided by Prof. Simões da Silva, Prof. Ruis Simões, Dr. Alexandre Henriques and Dr. Filippo Gentili.



**> PreLami - Performance of reinforced concrete structures strengthened in flexure with an innovative system using prestressed NSM CFRP laminates**

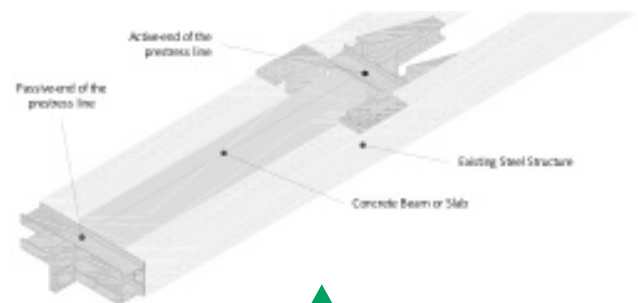
**ISISE Principal Investigator:** Salvador Dias  
**Budget:** Global: 178.674,00€ / ISISE-UM: 178.674,00€  
**ID:** PTDC/ECM/114945/2009

**Funding Entity:** FCT

**Principal Contractor:** University of Minho

**Duration:** From April 2011 to September 2014

**Summary:** In the present research project, the performance of Reinforced Concrete (RC) structures (beams and slabs) strengthened in flexure using an innovative system with Carbon Fibre Reinforced Polymer (CFRP) laminates, was assessed.

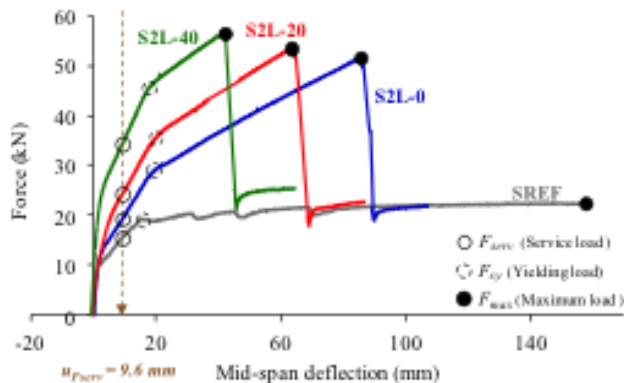


Details of the prestress line

This system, based on the application of CFRP laminates with a certain prestress into thin slits open on the concrete cover of the structural elements to strengthen,



assures the optimal use of durable and high strength materials (CFRP) in order to significantly improve the overall performance of the strengthened RC structures.



Force vs. mid-span deflection of RC slabs (Reference slab without CFRP (SREF); slabs with NSM CFRP laminates with different level of prestress: 0% (S2L-0), 20% (S2L-20) and 40% (S2L-40).

Prestress level, concrete quality, percentage of CFRP, percentage of longitudinal steel reinforcement, cycling load and level of damage in the structure prior to the strengthening were the parameters that were assessed in the extensive experimental research that was carried out. The numerical modelling of the experimental behaviour and the development of a guide for the application and design of the strengthening system with prestressed NSM CFRP laminates were also developed in Prelami project.

### > RehabGFRP - Rehabilitation of Building Floors with Lightweight High Performance GFRP Sandwich Panels

**ISISE Principal Investigator:** Joaquim Barros

**Budget:** Global: 181.896,00€ / ISISE-UM: 87.122,00€

**ID:** PTDC/ECM/113041/2009

**Funding Entity:** FCT

**Principal Contractor:** Instituto Superior Técnico

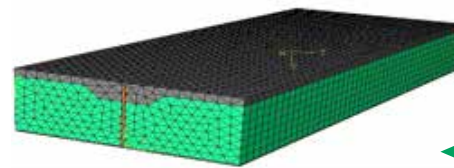
**Duration:** From March 2011 to August 2014

**Summary:** This project addresses the development of innovative sandwich panels for the replacement of degraded building floors, providing an easy solution for their rehabilitation.

Prototypes of glass fibre reinforced polymer (GFRP) and hybrid GFRP-UDFRM (ultra high ductility fiber reinforced mortar) sandwich panels were produced by an innovative vacuum infusion process and their mechanical behaviour and thermal and acoustic performances were studied. The main objectives of this project are (i) to develop and test innovative and optimized GFRP sandwich panels for the rehabilitation of degraded building floors, with several advantages over traditional solutions, in terms of structural/seismic performance, lightness, durability, ease of application and maintenance, economy and sustainability; (ii) to develop numerical models (calibrated based on tests) able to simulate the mechanical behaviour of sandwich panels with arbitrary architecture, as well as their thermal and acoustic performances, thereby constituting a robust tool for their design; (iii) to develop a user's manual, with design methods/rules and design tables, together with construction procedures, technical specifications and quality control procedures for installation.



Fabrication of the specimens



Numerical model on GFRP-UDFRM sandwich panel

### > IMPACTFIRE - Robust Connections for Impact and Fire Loading

**ISISE Principal Investigator:** Aldina Santiago

**Budget:** Global: 183 599,00 € / ISISE-UC: 161 599,00€

**ID:** PTDC/ECM/110807/2009

**Funding Entity:** FCT

**Principal contractor:** Universidade de Coimbra

**Partner Institutions:** Universidade de Coimbra; Soares da Costa Construções S.A.; Luleå University of Technology (Sweden).



**Duration:** From April 2011 to September 2014

**Summary:** Behaviour of connections is considered crucial to fully assess the resistance of structural steelwork for buildings in avoiding progressive collapse due to accidental loadings. A functional requirement raised in FEMA's report is: "Connection performance under impact loads ... needs to be analytically understood and quantified for improved design capabilities and performance as critical components in structural frames". Additionally, a recent report presented by Arup made the following recommendation (rec. nº 26): "... the strain rate enhancement of yield strengths in connections could still be important. It is recommended that research is undertaken to examine this effect using rate-sensitive material models".

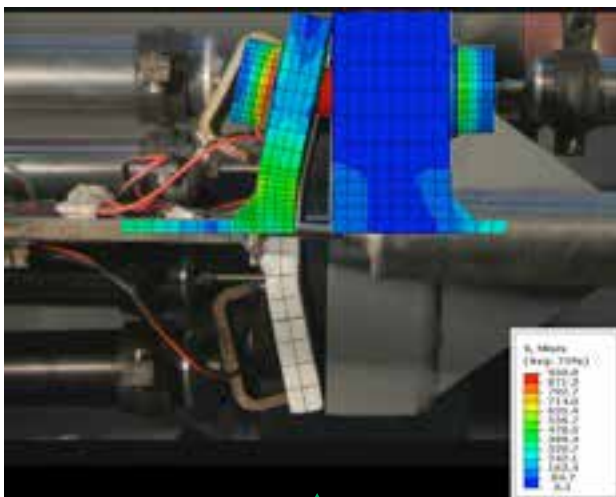


Fig 1 – Experimental versus numerical response of a T-stub in tensión.

This project focused on the design of robust steel joints capable of withstanding accidental impulsive loading. Special attention was paid to the combined scenario of fire after impact loading. It followed a clear thread from the characterization of impulsive loading to the development of an analytical methodology to evaluate the behavior of steel joints under impulsive loading, through an extensive experimental research on connections and components. A new experimental setup was designed and developed to apply high strain-rates in impacts with less than 1 second of duration. The experimental results were used to support and validate numerical models (Fig. 1), which were extended to carry out

parametric studies that complement the experimental work. On the other hand, the tests also provided a means of testing the accuracy of the analytical methodology. Additionally, the combination of two connected hazards: impact and fire, not previously studied for connections, by conducting numerical simulations on components and joints highlighted the innovative nature of the project.

> **CutInDur - Long-term structural and durability performance of concrete elements strengthened with the NSM technique**

**ISISE Principal Investigator:** José Sena Cruz

**Budget:** Global: 157.498,00€/ISISE-UM: 157.498,00€

**ID:** PTDC/ECM/112396/2009

**Funding Entity:** FCT

**Duration:** From March 2011 to September 2014

**Summary:** The main objective of CutInDur research project was to contribute to the knowledge on durability performance of the NSM technique with CFRP laminates under various specific application environments, load conditions and chemical degradation. The project involved three main components: (i) experimental programs, (ii) numerical simulations and (iii) design recommendations.



CutInDur: aging tests

The experimental program was supported by accelerated ageing tests using two distinct scales: bond test specimens and flexural tests with slabs of quasi-real scale. With these specimens the following effects were studied: chlorides, sustained stress (creep), freeze-thaw, wet/dry, thermal cycles, and fatigue. The test results obtained from the experimental programs were used for predicting the service life of NSM technique supported in some numerical models. These numerical models were developed in the FEMIX computer program.



## R&D STARTED PROJECTS

> **CUTINOV – Innovative Carbon Fibre laminates with the capacity of simultaneous flexural strengthening**

**ISISE Principal Investigator:** Joaquim Barros

**Budget:** Global: 431.779,42,00€/ISISE-UM: 228.243,61€

**ID:** n.º 38780

**Funding Entity:** ADI

**Principal Contractor:** Clever Reinforcement Iberica-Materiais de Construção, Lda.

**Participating Institutions:** University of Minho

> **HISTWIN+ – High-Strength Steel Tower for Wind Turbine**

**ISISE Principal Investigator:** Carlos Rebelo

**Budget:** Global: 478.496,00€/ISISE-UC: 64.831,00€

**ID:** RFS2-CT-2014-00023

**Funding Entity:** EU – RFCS

**Principal Contractor:** Lulea University of Technology

**Participating Institutions:** LTU, Sweden (coord.); RTWH, Germany; UC, Portugal; AUTH, Greece; ECCS, Belgium; FOSTA, Germany

> **OPTIBRI- Optimal use of High Strength Steel grades within bridges**

**ISISE Principal Investigator:** Luís Simões da Silva, Helena Gervásio

**Budget:** Global: 1.773.924,00€/ISISE-UC: 82782,00€

**ID:** RFS2-CT-2014-00026

**Funding Entity:** EU – RFCS

**Principal Contractor:** University de Liege

**Participating Institutions:** University de Liege; UNIVERSITAET STUTTGART; UNIVERSIDADE DE COIMBRA; BELGISCH INSTITUUT VOOR LASTECHNIEKVZW INSTITUT BELGE DE LA SOUDURE ASBL; Grid - Consultas, Estudos e Projectos de Engenharia, SA; INDUSTRIEL BELGIUM

## COMPLETED PHD THESES

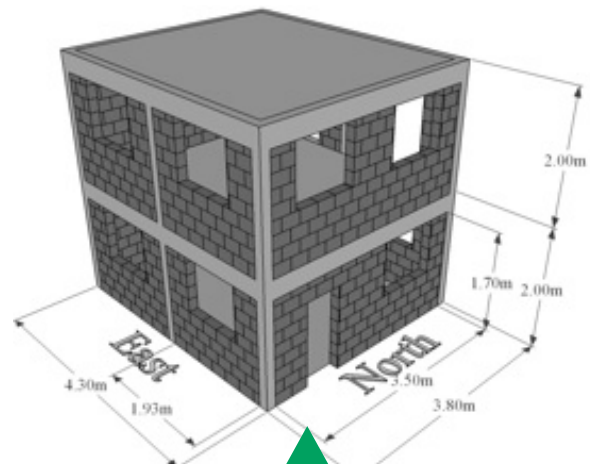
> **Design of masonry walls for building enclosures subjected to extreme actions**

**Author:** João Miguel Carvalho Leite

**Supervisors:** Paulo Lourenço

**Date:** 28<sup>th</sup> July 2014

**Summary:** The new generation of design standards, namely the EC8, impose the use of reinforcement in infill walls in order to prevent a brittle collapse and makes the structural engineer accountable for this requirement, yet it fails to provide enough information for the design. For this purpose, three RC concrete buildings were constructed at a scale of 1:1.5 and tested on the shaking table of the National Laboratory for Civil Engineering, Portugal, each with a different infill solution but with the same geometry. The experimental tests show that the double leaf unreinforced infill walls underperformed during a large earthquake, collapsing out-of-plane by rotating as a rigid body around the base line of the model. The infill walls with bed joint and plaster reinforcement did not collapse out-of-plane due to their connection to the RC frame. A comparison between the experimental results and design standards was also done, showing that EC8's analytical solution presents good results for the out-of-plane demand, and EC6 and FEMA 306 provide acceptable results for the capacity.



Geometry of the tested models reduced to a scale of 1:1.5.



Bed joint reinforcement | Reinforced plaster

CV: The author obtained his degree in Civil Engineering in 2008 and his Master in Civil Engineering in 2009, both at the University of Minho. During his PhD, the author was a trainee at the National Laboratory for Civil Engineering where he participated and helped coordinate several large scale shaking table tests, and also participated in an international team mobilized to New Zealand after the Canterbury earthquake sequence in 2010 – 2011, helping in the damage identification of heritage buildings.

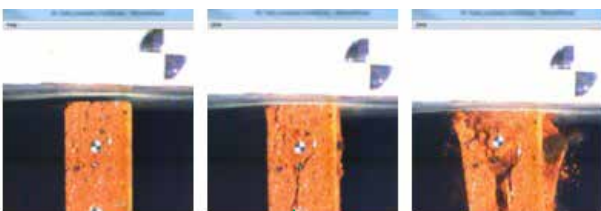
### > Security Evaluation and Design of Structures Subjected to Blast Loading

**Author:** João Miguel Pereira

**Supervisors:** Paulo Lourenço

**Date:** 27<sup>th</sup> June 2014

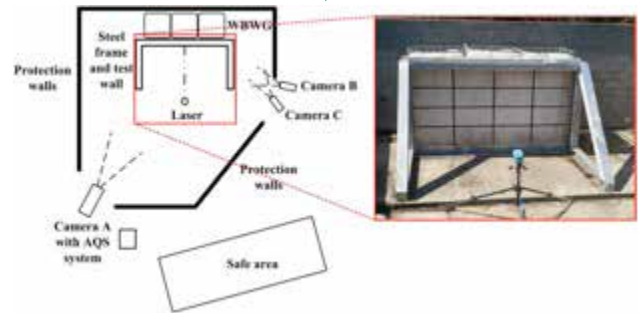
**Summary:** The main purpose of this thesis was to create a basis for blast loading and structural response to impulsive loading. Empirical tools were developed, in the framework of the Buncefield Incident Investigation, to help assess the blast loading parameters for a post-disaster scenario regarding industrial accidents.



High Speed Video sequence for brick under dynamic compression test.

The influence of the high strain rates in the material properties was studied and empirical relations of Dynamic Increase Factors for masonry and its components at high strain rates were developed.

Developed test setup for out-of-plane impulsive loading



A new test setup was developed to test walls under impulsive out-of-plane loading and Pressure-Impulse Diagrams were developed for masonry walls under blast loading. Two case studies were performed: a) a specific risk assessment model for public transportation networks was applied to a Portuguese Operator, highlighting elements with the highest risk due to terrorist actions; b) a structural safety assessment was performed on one of those elements for different explosion scenarios.

CV: **João M. Pereira** obtained his 5-year Civil Engineering degree in 2008 and PhD in 2014 at the University of Minho. His main research topics are related with material properties at high strain rates, risk assessment and structural safety evaluation due to explosions and impacts.



Deformed mesh evolution due to an external explosion far from the structure.





> **Prestressed Carbon Fibrelaminates applied according to Near Surface Mounted technique to increase the flexural resistance of Reinforced Concrete beams**

**Author:** Inês Gonçalves Costa

**Supervisors:** Joaquim Barros

**Date:** 2<sup>nd</sup> June 2014

**Summary:** An emerging technique for the flexural strengthening of reinforced concrete beams was investigated in this work, which consists of bonding prestressed carbon fibre reinforced polymer (CFRP) laminates into slits open on the concrete cover (Near Surface Mounted technique – NSM). In this scope, an experimental program was carried out to determine the long term behaviour of the epoxy-based adhesive adopted in the strengthening operations. In the course of this work, three series of RC beams flexurally strengthened with prestressed NSM-CFRP laminates were produced, monitored and tested up to failure. Relatively low CFRP strain losses were registered and significant benefits in terms of service load carrying capacity were observed. All stages of the prestressing process were modelled numerically, showing good agreement with the experimental results, and an analytical approach was proposed to predict the behaviour of this strengthening system at all the relevant stages.



Strengthening application

CV: **Inês Costa** graduated in Civil Engineering by University of Minho in 2008 and is a researcher in ISISE, since October 2007. She concluded her PhD in June 2014 at University of Minho and she is currently a design engineer in a R&D company. Her research interests are focused on structural analysis, modelling/characterization of fibre-reinforced composite systems, repair/retrofit of civil structures.

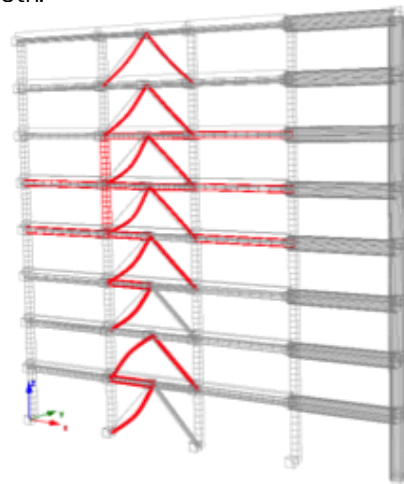
> **Seismic Performance of High Strength Steel Building Frames**

**Author:** Andre Tenchini

**Supervisors:** Carlos Rebelo

**Date:** 17<sup>th</sup> September 2014

**Summary:** In the present thesis, the framing solution studied is obtained by combining two different steel grades: Mild Carbon Steel (MCS) used in dissipative members and High Strength Steel (HSS) used in non-dissipative “elastic” members. A comprehensive parametric study devoted to investigate the seismic design and performance of EN1998-1 compliant dual-steel Moment-Resisting Frames (MRF), Concentrically Braced Frames (CBF) and Dual-Concentrically Braced Frames (D-CBF) was presented and discussed. The analyses have shown that the use of HSS in MRFs is effective in providing overall ductile mechanisms with limited plastic demand, due to the large design overstrength. For the braced frames, the use of the HSS ensured that plastic hinges occurred in the dissipative structural elements with large brace ductility demand, mainly for the braces in compression due to beam flexural stiffness from braced bays. The comparison between dual-steel and conventional structures showed that: i) there was only economical benefits for the CBFs and D-CBFs using HSS and ii) a similar performance can be recognized in both.



CV: **Andre Tenchini** graduated in Civil Engineering in 2008 and MSc in 2009 at the Rio de Janeiro State University; and in 2014, concluded PhD at the University of Coimbra. Nowadays, he is Associate Professor in the Department of Structures and Foundation at Rio de Janeiro State University having research interests lie in the structural analysis, steel and composite structures and finite element analysis.





# ISISE TECHNOLOGIES

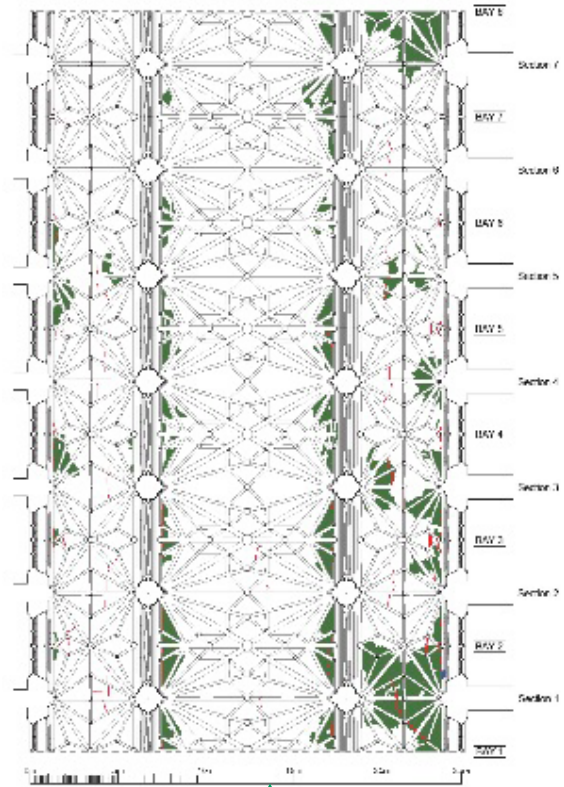
## > Application of innovative NDT and advanced analysis

**Authors:** Paulo B. Lourenço, Andrés Burgos, Claudio Corallo, Francisco Fernandes, Giorgos Karanikoloudis, Nuno Mendes

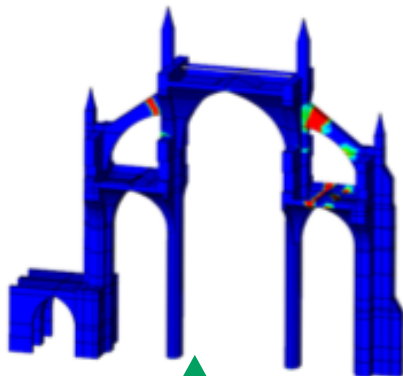
Within the European Master in Structural Analysis of Monuments and Historical Constructions, University of Minho was involved in two major sites in Europe, in cooperation with Morton Partnership Ltd in the UK and Nanyang Technological University, Singapore, respectively.

Canterbury Cathedral is one of the most prestigious ecclesiastic structures in UK, dated from 1070, and a Unesco World Heritage site. The existing damage in the main nave was mapped and dynamic identification was carried out, with a focus in the South aisle. Slowly progressing cracks in the flying arches and tilting of the buttresses seem to occur. Using advanced numerical analysis and with the data gathered, it was possible to discuss the existing damage and suggest remedial measures.

In 2008, Famagusta (Cyprus) was placed on the World Monuments Watch List of 100 Most Endangered Sites. The Armenian church is datable to the 14<sup>th</sup> century, and is modest in dimension and architecturally unpretentious, but valuable because of its still surviving frescoes. The church belongs to a Monastery complex which is unknown and without visible remainings. The works carried out included georadar identification of the underground construction, dynamic identification of the church and seismic safety assessment.



Canterbury Cathedral: damage map in the main nave



Canterbury Cathedral: finite element model with predicted damage (in red)



Armenian Church: in situ testing

### References:

Burgos, A., "Study of the Armenian Church in Famagusta", MSc Thesis in Structural Analysis of Monuments and Historical Constructions, University of Minho, 2014.  
Karanikoloudis, G., "Canterbury Cathedral – Structural Analysis of the South Aisle", MSc Thesis in Structural Analysis of Monuments and Historical Constructions, University of Minho, 2014.



## AWARDS & PRIZES

- > Chrysl Aranha: Best Presentation Award in the scope of the II Workshop of the PhD Students in Civil Engineering, University of Minho, September 2014.
- > J. Sena-Cruz, P. Silva, P. Fernandes, M. Coelho, M. Azenha, A. Benedetti, J. Granja: 1st place on the poster

competition held in the scope of the COST Action TU1207 - Next Generation Design Guidelines for Composites in Construction with the poster entitled "CutInDur - Long-term structural and durability performance of concrete elements strengthened with the NSM technique", Kaiserslautern, Germany, October 2014.

## EVENTS

### > fib Commission 5 Seminar on Durability of Concrete Structures

**Venue:** Guimarães

**Date:** 8 May 2014

**Website:** <http://civil.uminho.pt/fibdurability2014>

**Summary:** In an effort to disseminate knowledge, fib Commission 5 conducted a seminar on Durability of Concrete Structures. Durability is a key component to sustainability of concrete structures and a vital role in design, construction and rehabilitation. This successful seminar sparked a desire for further research in this field and the application of sustainability in everyday practice to participants.



### > 9<sup>th</sup> International Masonry Conference

**Venue:** Guimarães

**Date:** 7-9 July 2014

**Website:** [www.9imc.civil.uminho.pt](http://www.9imc.civil.uminho.pt)

**Summary:** This was the largest conference ever in masonry with 500 participants and exciting new initiatives including a student competition for predicting the collapse load of masonry under eccentric loading, a panel session with representatives from the world industry and selected invited sessions on trendy subjects. More than 100 student participants also provided the ground for a lasting masonry community.





> **Lectures from Prof. Fumio Tatsuoka, International Specialist in Geotechnics**

**Venue:** Guimarães

**Date:** 17<sup>th</sup> September 2014

**Summary:** On September 17, 2014, two lectures were held in the Department of Civil Engineering, School of Engineering of University of Minho. The speaker was Prof. Fumio Tatsuoka (Tokyo University of Science), addressing two interrelated topics: Seismic Disaster Mitigation by Geosynthetic-Reinforced Soil Structures and Stress-Strain Properties and Permeability of Compacted Soil Controlled by the Dry Density and Degree of Saturation.



> **2<sup>nd</sup> Seminar on the Project of Reinforced Concrete Structures with FRP's (SPREB-FRP 2014)**

**Venue:** Guimarães

**Date:** 19 September 2014

**Website:** <http://civil.uminho.pt/spreb-frp2014/>

**Summary:** The 2<sup>nd</sup> seminar on the design of reinforced concrete structures strengthened in FRP materials was held at the University of Minho. In this event, with 50 participants, relevant aspects related to the serviceability limit states were discussed. The SPREB-FRP 2014 included 4 keynote lectures: Prof. Gonçalves da Silva from Univ. Nova of Lisbon, Prof. João Ramôa Correia from Univ. of Lisbon, Prof. Luis Juvandes from

Univ. of Porto and Eng. Filipe Dourado from S&P.



> **9<sup>th</sup> International Conference on Structural Analysis of Monuments and Historical Constructions**

**Venue:** México-City, México

**Date:** 14-17 October 2014

**Website:** [www.sahc2014.mx](http://www.sahc2014.mx)

**Summary:** This conference series is run under the auspices of an Advisory Board (Paulo Lourenço, Pere Roca and Claudio Modena). The next one is in 2016 in Leuven, Belgium, and applications for 2018 (outside Europe) are open. Mexico-City was a great location, given the incredible pre-Colombian, Colonial and Modern Heritage. 11 students and 11 lecturers from the SAHC European Master Course were present!





> **2<sup>nd</sup> Edition of the Building Information Modelling Course**

**Venue:** Ordem dos Engenheiros (Lisbon and Porto)

**Date:** October to December 2014

**Website:** <http://www.cursobim.com>

**Summary:** Based on the success of the 1st edition of the National Course on Building Information modelling (BIM), the coordinators, Miguel Azenha and José Carlos Lino (ISISE members) have promoted a second edition to take place between October and December 2014 (simultaneously in Lisbon and Porto). The course continues to be a joint organization of 'Ordem dos Engenheiros' and the Universities of Minho, Lisbon and Porto. This second edition of the course had a high demand and rapidly became fully booked.



> **International intensive course focuses on steel structures and sustainable development**

**Venue:** HAMK - University of Applied Sciences, Hämeenlinna, Finland

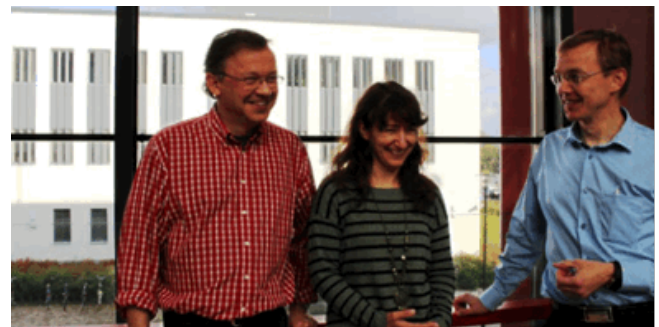
**Date:** 8<sup>th</sup> to 9<sup>th</sup> October 2014

**Website:** [ISISE.net/smct](http://ISISE.net/smct)

**ISISE members:** Helena Gervásio e Paulo Santos

**Summary:** A international intensive course was held from 8<sup>th</sup> – 9<sup>th</sup> October 2014 with participants including students and staff from VIA University College in Denmark, Voronezh State University of Architecture and Civil Engineering in Russia, as well as students from the Degree Programmes in Construction Engineering and Building and Construction Engineering. The main topics addressed in this course were: (i)

Sustainability of constructions & Life-Cycle Assessment (LCA), (ii) Thermal Behaviour and Energy efficiency in buildings, and (iii) Assessment of the sustainability of buildings.



> **2<sup>nd</sup> Workshop on the Industrial Application of Friction Stir Welding Technologies**

**Venue:** Civil Engineering Department, University of Coimbra

**Date:** 30, October 2014

**Website:** <http://isise.net/smct>

**ISISE members:** Luís Simões da Silva

**Summary:** The main objective of this conference was to disseminate the technologies of Friction Stir Welding (FSW) and Friction Stir Processing (FSP), highlighting its potential as alternatives to traditional procedures for welding and surface treatment of metallic materials tech-

niques. Looking ahead to the future application of these technologies in Portuguese, Spanish and Italian industries, the workshop gave special emphasis to the presentation of research results and/or applications developed in universities and research laboratories in Portugal, Spain and Italy, with specific industrial purposes.

Speakers:

- > Antonino Squillace, University of Naples Federico II
- > Aurélio Tronci, University of Cagliari, Sardenha
- > David Verdera, technology center AIMEN



- > Dulce Rodrigues, Department of Mechanical Engineering, University of Coimbra
- > Egoitz Aldanondo, Senior Researcher in Process industry Connection of IK4 LORTEK
- > Mike Skinner, Business Development vice-president at PaR Systems, USA
- > Pedro Moreira, Coordinator of the Laboratory of Optics and Experimental Mechanics INEGI
- > Rosa Miranda, PhD in Metallurgical Engineering from the Instituto Superior Técnico in Lisbon



### > Course of "Offshore Structures"

**Venue:** Civil Engineering Department, University of Coimbra

**Date:** 9 – 17, May 2014

**Website:** <http://isise.net/smct>

**ISISE members:** Luís Simões da Silva, Maria Constança, João Pedro Martins

**Summary:** The 1<sup>st</sup> edition of the course "Offshore Structures" was held at the Civil Engineering Department of the University of Coimbra. This new course, organised by ISISE-SMCT with the support of CMM, including the participation of Jérémy De Barbarin from Subsea 7, was a great success with a full attendance list.

The "Offshore Structures" course aims at providing knowledge about the global design and design of steel

elements in offshore structures, identification of key actions and loading arrangements, characterisation of materials used in offshore steel structures, and the most relevant aspects in marine operations.



### > WORKSHOP - DESIGN OF DISSIPATIVE JOINTS FOR SEISMIC RESISTANT STEEL FRAMES

**Venue:** Dept. de Eng. Civil, da Universidade de Coimbra

**Date:** 24 and 25 June 2014

**Website:** <http://isise.net/smct>

**ISISE members:** Aldina Santiago

**Summary:** The workshop was held in the Department of Civil Engineering at the University of Coimbra, and it included two lessons lectured by Gianvittorio Rizzano. He is Professor at the Università degli Studi di Salerno in Italy; specialist on issues related to seismic behavior of structures, and co-author of the well-known book Structural Steel Semirigid Connections. In the first lecture, on 24<sup>th</sup> June, Prof. Rizzano presented the behavior of beam-to-column joints and of base plate joints, the influence of the joint behavior on the steel frames dissipation capac-

ity and the ductility of bolted connections. In the second lecture, on 24<sup>th</sup> June, Prof. Rizzano presented the work in development at the University of Salerno: the modelling of the cyclic behavior of bolted beam-to-column joints; the joint's design rules for steel frames with full and partial strength joints and the behavior and design rules of innovative beam-to-column joints.





> **“3<sup>rd</sup> PhD Students Workshop Sweden-Portugal”**

**Venue:** Civil Engineering Department, University of Coimbra

**Date:** 30 -31, October 2014

**Website:** <http://isise.net/smct>

**ISISE members:** Carlos Rebelo, Luís Simões da Silva.

**Summary:** The “3<sup>rd</sup> PhD Students Workshop Sweden-Portugal” took place on October 30<sup>th</sup>, comprising a joint organization between the University of Coimbra, Portugal, and Lulea University of Technology.

The opening session was presented by Prof. Simões da Silva. Several PhD students from both universities were present and had the opportunity to present their research work under development and sharing their ideas.

The students also had the opportunity to attend presentations on the scope of Friction Stir Welding (FSW) technology, by:

*Mike Skinner* – (USA) – responsible for the product line development of FSW: I- STIR. 2001 - MTS Circle of Innovators;

*Dulce Rodrigues* – Professor at DEM – FCTUC. Over the past years, her activity has been focused on the research and development of FSW and FSP technologies.

Finally, the students visited several places of technical and touristic interest, in Coimbra, Porto and Sintra.





## UPCOMING EVENTS

> *Course of Structural Glass*

**Venue:** Civil Engineering Dept., University of Coimbra

**Date:** 7 - 15, November, 2014

**Website:** [www.isise.smct](http://www.isise.smct)

> *3<sup>rd</sup> Luso - African Conference on Sustainable Steel Construction*

**Venue:** Universidade Metodista de Angola, Luanda

**Date:** 20-21 November, 2014

**Website:** [www.cmm.pt/cla3](http://www.cmm.pt/cla3)

> *Course of "Offshore Structures"*

**Venue:** Universidade Metodista de Angola, Luanda

**Date:** 17-19 November, 2014

**Website:** [www.isise.net](http://www.isise.net)

> *Course of Rehabilitation and Maintenance of Structures*

**Venue:** Civil Engineering Dept., University of Coimbra

**Date:** 5 - 13, December, 2014

**Website:** [www.isise.smct](http://www.isise.smct)

> *LVS3 - Large Valorisation on Sustainability of Steel Structures, Final workshop*

**Venue:** Civil Engineering Department, University of Coimbra

**Date:** 11, December, 2014

**Website:** [www.isise.smct](http://www.isise.smct)

> *iFireSS 2015*

**Venue:** Civil Engineering Department, University of Coimbra

**Date:** 20 - 24, April, 2015

**Website:** [www.ifress2015.org](http://www.ifress2015.org)



## ERASMUS MUNDUS MASTER COURSE APPLICATIONS 2015-2017



Applications are now available for the master course 2015/2017 of SUSCOS\_M - Erasmus Mundus European Master Course on Sustainable Constructions under natural hazards and catastrophic events . The DEADLINE FOR APPLICATION IS 10 JANUARY 2015 and the signed Application form and all required documents have to be sent in pdf format through the ON-LINE registration page or as an alternative by e-mail to the address [suscoss\\_m@fsv.cvut.cz](mailto:suscoss_m@fsv.cvut.cz).