INSTITUTO SUPERIOR TÉCNICO
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NEWSLETTER

CIB Student Chapter

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Dear members
Congratulations to our CIB Student Chapter of Technical University of Lisbon, finishing a five year cycle of existence. I wish to acknowledge to all members and especially to our Faculty Advisor, all the activities that were possible to make in order to strength the collaboration within TU Lisbon CSC members and also with other European Chapters / CIB commissions. It was with great pleasure, and sense of responsibility, that I was the president of this Chapter, in these past 5 years, and I wish all the best to José Silvestre, the new president of our CSC. Thank you all for your friendship! Ms. Inês Flores-Colen (Former President).

Dear members
As the new President of the CIB Student Chapter of Technical University of Lisbon, and one of the founder members in 2004, I am really proud of all the achievements already made and confident in the future of our group. At this time, we congratulate our new honorary members for their PhDs but we will miss their important contribution as permanent members. Simultaneously, our members' community will increase till the end of the year with the admission of eight new PhD students.
I believe that our CIB Student Chapter will continue to fulfill all the initial CIB requests, creating and sharing knowledge within the members and enhancing virtual and physical networks with other Chapters worldwide. For that accomplishment, the collaboration of all the permanent and honorary members is important, along with the experience and supervision of our Faculty Advisor Prof. Jorge de Brito.
José Dinis Silvestre (Mr.), President, The CIB Student Chapter of Technical University of Lisbon

STUDENT CHAPTER

OVERVIEW

1. PUBLICATIONS

The members published several papers at national and international conferences and journals. These publications were gathered in a first three year book (2004-2006). A second one is almost finished with the publications produced between 2007 and 2009. The relevant international publications are listed in the TU Lisbon CIB Student Chapter webpage (http://sites.google.com/site/cscdecivil/publications) . Between them, the publications in ISI referenced journals were:

- Silvestre, J.; Brito, J. de: "Statistical Analysis of Defects of Tiles' Joints", Materiales de Construcción, 57 (285), Instituto Eduardo Torroja, Spain, January/March 2007, pp. 85-92.
- Evangelista, L.; Brito, J. de: "Mechanical Behaviour of Concrete Made with Fine Recycled Concrete Aggregates", Cement & Concrete Composites, V. 29, No. 5, Elsevier, UK, May 2007, pp. 397-401.
- Gaspar, P.; Brito, J. de: "Service Life Estimation of Cement-Rendered Facades", Building Research and Information, V. 36, n.º 1, Taylor & Francis, UK, January / February 2008, pp. 44-55.
- Flores-Colen, I.; Brito, J. de: "Stains in Facades Rendering - Diagnosis and Maintenance Techniques' Classification", Construction and Building Materials, 22 (3), Elsevier, UK, March 2008, pp. 211-221.
- Gaspar, P.; Brito, J. de: "Quantifying Environmental Effects on Cement-Rendered Façades", Building and Environment, V. 43, n.º 11, Elsevier, UK, November 2008, pp. 1818-1828.
- Silvestre, J.; Brito, J. de: "Ceramic Tiling Inspection System", Construction and Building Materials, V. 23, n.º 2, Elsevier, UK, February 2009, pp. 653-668.
- Flores-Colen, I.; Brito, J. de; Branco, F. A.: "In Situ Adherence Evaluation of Coating Materials", Experimental Techniques, V. 33, n.º 3, SEM, May/June 2009, pp. 51-60.
- Flores-Colen, I.; Brito, J. de; Freitas, V. de: "Expected Render Performance Assessment Based on Impact Resistance In-Situ Determination", Construction and Building Materials, V. 23, n.º 9, Elsevier, UK, September 2009, pp. 2997-3004.

Many papers were presented in international conferences during this period, namely in the following events:

- INCOS06 - International Conference on Concrete for Structures, IBRACON, Rio de Janeiro, Brazil, September 2006;
- 7th International Masonry Conference, London, UK, November 2006;
- Workshop "Achieving Low Energy Masonry", Sumacon, Exeter, UK, March 2007;
- International Conference on Building Envelopes Systems and Technology, Bath, March 2007;
- Portugal SB07 - Sustainable Construction, Materials and Practices, Lisbon, Portugal, September 2007;
- 11th DBMC International Conference on Durability of Building Materials and Components, Istambul, May 2008;
- Meeting of CIB W80 / RILEM 100-TSL - Service Life Prediction of Building Materials and Components, Istambul, May 2008;
- "Historical Mortars (HMC 08)", Lisbon, Portugal, September 2008;
- Meeting of CIB W86 - Building Pathology, Porto, Portugal, March 2009;
- Conference on Progress of Recycling in the Built Environment, RILEM, São Paulo, December 2009.

Our member Mr. Antonio Lobato dos Santos won a "best conference paper award" with the paper "Building Deconstruction: A Portuguese Case Study" in the Conference "Portugal SB07 - Sustainable Construction, Materials and Practices", Lisbon, Portugal, September 2007".

2. EVENTS

In conjunction with the "Portugal SB07 - Sustainable Construction, Materials and Practices" Conference in Technical University of Lisbon - IST, Lisbon, 12-14 September 2007, a CIB Student Chapters Workshop took place on 14 of September. This workshop was organized by the TU Lisbon CIB Student Chapter; was financed from the Sebestyén Award 2006 and was intended as the first event from the "Young Researchers Network" created in 2006 (see our newsletter nº 2 for more detail about this European network).

In this 3 hour meeting various representatives attended from already established CIB Student Chapters (Lisbon, Delft, Milan, Eindhoven) and from universities without Student Chapters (Dublin and Leeds).

Research themes represented in this meeting included: building supply chain integration, built stock management and maintenance, service life assessment, heritage management, passive cooling technologies, deconstruction. The strength of contact networks and of exchange knowledge was accomplished.

3. EXAMINATIONS OF PhD and MSc THESES

2007

Our member Mr. Luís Evangelista (zodiac @netcabo.pt) presented his MSc. Thesis on Construction at the Instituto Superior Técnico (IST), Technical University of Lisbon. His work has the following title "Concrete made with fine recycled concrete aggregates".

The evolution of Civilization came with serious environmental problems. Not only the emission of greenhouse gases has reached dangerous levels, but also the uncontrolled consumption of natural resources is about to cause a major environmental collapse.

World population growth, associated with mass population exodus to the urban centres, is causing an increase in construction, which is one of the least existing environmental efficient industries. Not only resource consumption grows, both renewable and non-renewable, followed by the unavoidable greenhouse gas emissions, but also wastes from construction increases.

Considering this, there are currently efforts to promote environmental efficiency in the construction business, the reuse of construction and demolition waste being one of the key aspects explored. Within reuse of waste, the use of recycled aggregates as replacement for natural ones is assumed to be one of the better ways to contribute to construction sustainability. However, recycling of debris for concrete aggregates has been focused on the coarse part, rejecting the fines.

In this work, the performance of concrete made with fine recycled concrete aggregates has been studied in order to establish its practical viability, allowing, by this, the reduction of natural sand consumption, whose extraction has severe environmental costs.

Our member Mr. Miguel Barreto Santos (mbarreto@estg.ipleiria.pt) presented his MSc. Thesis on Construction at the Instituto Superior Técnico (IST), Technical University of Lisbon. His work has the following title "Alkali-silica reaction in concrete with recycled aggregates".

The main purpose of this dissertation is to describe the state of the art of alkali-silica reactions in concrete with recycled aggregates. The characteristics and development of alkali-silica reaction in concrete, with recycled aggregates of other concretes, which may have undergone the influence of this reaction, is a subject that deserves some attention, when using this kind of material with or without a structural function.

The study relevance of the alkali-silica reaction in concrete with recycled aggregates is introduced in the context of a sustainable construction and the use of concrete with recycled aggregates.

Survey related to the state of the art reactions in Europe was performed, including in the same document the knowledge of alkali-silica reaction in conventional and recycled concrete, as well as the specifications and the normalization valid in Europe.

The work will be useful for a future and more detailed experimental study of the alkali-silica reactions in concrete with recycled aggregates.

Our member Mr. André Coelho (ascmenow@gmail.com) presented his PhD thesis on Construction at the Instituto Superior Técnico (IST), Technical University of Lisbon.

His work falls within the sustainability domain and has the following title "Concrete with high-percentage of replacement of cement with fly ash". The investigation was focused in the mechanical and durability properties of concrete mixtures with fly ash, up to high percentages in substitution of Portland cement (as high as 65%).

The purpose was to demonstrate that, with local produced materials and with local fly ash (from Sines), the high percentage fly ash mixtures would constitute capable materials to withstand most of the mechanical and durability challenges usually put on concrete structures. On top of that, also a swift environmental analysis was conducted, in order to quantitatively show the environmental benefits, using a burden oriented LCA program, called Ecoconcrete.

The results show (as expected) a high water reducing capacity of the high percentage fly ash mixtures, which improves most of the studied properties, both mechanical and durability. Even at very high percentages (65%), the fabricated concrete can still be used in most applications that do not require fast strength gain, as foundations and most bearing walls.

Overall, the main result from the study is essentially the fact that, in technical, environmental and even economical terms (some cost analysis was done, which actually favors high

percentage fly ash mixtures), there is no reason not to include fly ash, a common by product from burning coal at power plants, as a substitute for Portland cement (the major pollutant component in concrete) in percentages as high as 50% or even more.

2009

Our member Mr. Pedro Gaspar (plgaspar@sapo.pt) presented his PhD thesis on Construction at the Instituto Superior Técnico (IST), Technical University of Lisbon. His work falls within the pathology, durability domain and has the following title "Service life of buildings: methodology for service life prediction of building components. Application to external cement-renders".

This research work presents and discusses a methodology for service life prediction of building elements, based on field-work assessment of buildings in real-life service conditions. The methodology proposed includes the identification, classification and quantification of the condition of defects, which can be collected on Degradation Atlases to be used as reference data for field-work. The results thus obtained are combined into degradation indicators from which can be derived the overall degradation level over time, for the element assessed.

The Jury of Pedro Gaspar (in the center) PhD Thesis examination.

Such degradation models result from statistical regression lines from the data collected (referred to as graphic method) and provide durability information for building elements, such as: degradation patterns, upper and lower performance limits, minimum reference performance levels, reference service life, condition groups, probabilistic condition curves and variation indexes related to durability factors, for the samples analyzed. These data can also be used to quantify durability factors within factorial methods.

The methodology is exemplified through its application to external cement-renders, by which a model is proposed for the durability of this material as well as numerical durability factors to be used within factorial methods.

PhD Thesis examination of Pedro Gaspar: members of CSC (from left to right): José Silvestre, Luís Evangelista, António Santos, Pedro Gaspar, Inês Flores-Colen, Pedro Paulo and Armando Araújo

Our member Mrs. Inês Flores-Colen (ines@civil.ist.utl.pt) presented her PhD thesis on Construction at the Instituto Superior Técnico (IST), Technical University of Lisbon. Her work falls within the pathology, inspection and maintenance domain and has the following title "Methodology for in-service performance assessment of rendering façades for predictive maintenance".

The Jury of Inês Flores-Colen (in the center) PhD Thesis examination.

Proactive maintenance is crucial to guarantee an adequate in-service performance of buildings' elements and fulfill the users' needs, during the expected service life. However, the occurrence of these maintenance actions has not been a current issue in buildings (especially in housing buildings), leading to several problems such as: risks for users' safety, urgent interventions with additional costs, stoppage in normal operation of buildings, among others.

The main issues that can be pointed out as the reasons of this present scenario are: deficient conditions for in-service diagnosis (in terms of human, technical and economical resources), absence of criteria and decision-making methodologies, and also absence of requirements in current codes and governmental support. In this sense, the near national future publication of the General Buildings Code (RGE) can be an important turning-point, since this code already includes the requirements of periodic inspections and the elaboration of inspection and maintenance manuals for buildings.
This thesis develops a methodology to be applied in rendering of current buildings' façades (with cement-based renders, mixed on-site or pre-mixed in a factory), in order to improve reliability of inspections' diagnosis during service life. Therefore, a set of in-service parameters (visual observation and measurements) are proposed and their methods of assessment are also discussed (based on visual inspections, auxiliary techniques, in-situ and laboratorial testing). Finally, assessment criteria are also proposed to allow the application of the previous parameters in in-service performance assessment of renders applied in façades and also to help the choice of façades' predictive maintenance actions (actions that are the result of inspection's diagnosis).

4. RESEARCH GROUPS

In 2009, two main research groups were established within TU Lisbon CIB Student Chapter, namely: RG1 (Service life of construction) and RG2 (Sustainable Construction). Each group has a student coordinator that is responsible to centralize all the relevant information to the other members. The following table systemizes 10 research studies that are being developed within these two research groups.

Research Group - RG1 -Service life of construction	
Name	Research Theme
Sónia Raposo - PhD student	Maintenance management in public buildings
Pedro Paulo - PhD student	A Building Management System (Buildingslife). Application of Deterministic and Stochastic Models with Genetic Algorithms to Building Façades
Armando Araújo - PhD student	Buildings envelope pathology characterization in the 1970-1995 period in Portugal
Goreti Margalha - PhD student	Traditional methods of mortar preparation: the hot lime mix method and the time factor in lime quality
Research Group - RG2 -Sustainable construction	
Luís Evangelista - PhD student	Concrete made with fine recycled concrete aggregates
Antonio Lobato dos Santos - PhD student	Buildings deconstruction - an architectural perspective
José Dinis Silvestre - PhD student	Life-cycle assessment of building assemblies
Miguel Barreto Santos – PhD student	Alkali-silica reaction in recycled aggregates concrete
Rui Isidoro - PhD student	Concrete made with coarse recycled aggregates - a methodology for long-term performance prediction
André Coelho - Post-PhD student	Construction and demolition waste management and recycling centres

* See member contacts in the in the TU Lisbon CIB Student Chapter webpage:
http://sites.google.com/site/cscdecivil/members

5. OTHERS

In 2009, the following events will occur:

- The PhD thesis examination of our members Mr. Pedro Paulo and Mrs. Goreti Margalha will occur on December 2009.
- During November the presentation of our eight new members, which are all PhD students, will occur:

Research Group - RG1 -Service life of construction	
Name	Research Theme
Dulce Henriques	Repair and consolidation of deteriorated pine wood in old buildings structural elements
Teresa Freire	Rehabilitation of ancient gypsum plasters
Pedro Silva	Durability of self-compacting concrete
António Vilhena	Methods for the evaluation of the buildings conservation level
António Cabaço	Models of contract in construction projects - Public-private partnerships
José Carlos de Almeida (corresponding member)	Support system for life-cycle cost analysis of car bridges
Research Group - RG2 -Sustainable construction	
Margarida dos Santos	Buildings deconstruction - technological solutions involving building indoor systems
Ana Ferreira	High performance sustainable solutions for renovation of commercial buildings