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Civil Engineering Abstracts

Sixth Annual International Conference on Civil Engineering, 20-23 June 2016, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

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8 Valaoritou Street
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(In Alphabetical Order by Author's Family name)

Preface

This abstract book includes all the abstracts of the papers presented at the *6th Annual International Conference on Civil Engineering, 20-23 June 2016,* organized by the Athens Institute for Education and Research. In total there were 40 papers and 41 presenters, coming from 17 different countries (Algeria, China, Canada, Japan, India, Iraq, Italy, Lebanon, Mexico, New Zealand, Nicaragua, Oman, Russia, Serbia, South Africa, Turkey, and USA). The conference was organized into twelve sessions that included areas of Advanced Composites, Sustainable Materials in Civil Infrastructures, Sustainable Civil Engineering Materials General Civil Engineering Topics and other related disciplines. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books and/or journals of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
6th Annual International Conference on Civil Engineering, Structural Engineering and Mechanics 20-23 June 2016, Athens, Greece

PROGRAM

Conference Venue: Titania Hotel, 52 Panepistimiou Street, 10678 Athens, Greece

Monday 20 June 2016
(all sessions include 10 minutes break)

08:00-08:30 Registration and Refreshments

08:30-09:00 Welcome & Opening Address (ROOM B-Mezzanine Floor)

- Gregory T. Papanikos, President, ATINER.
- George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

09:00-10:30 Session I (ROOM E-10th Floor): A Panel on Advanced Composites, Sustainable Materials in Civil Infrastructures I

Chair: Thomas Attard, Head, Civil Engineering Research Unit, ATINER & Associate Professor, The University of Alabama at Birmingham, USA.

1. Murad Abufarsakh, Professor, Louisiana State University, USA & Allam Ardah, Ph.D. Student, Louisiana State University, USA. Evaluating the Resilient Modulus of Treated Very Weak Subgrade Soils for Sustainable Pavement.
2. Wanlin Cao, Professor, Beijing University of Technology, China. Seismic Behavior of Steel-concrete Multi Energy Dissipation Composite Shear Walls.
3. *Mang Tia, Professor, University of Florida, USA, Ohhoon Kwon, Assistant Scientist, University of Florida, USA, Larry Muszynski, Associate Professor, University of Florida, USA & Michael Bergin, State Structural Materials Engineer, Florida DOT, USA. Use of Maturity Method in Concrete Pavement Replacement Slab Construction.

10:30-12:00 Session II (ROOM E-10th Floor): A Panel on Optimization and Advanced FEA/Structural Analysis Methods	**10:30-12:00 Session III (ROOM F-10th Floor): Earthquake Engineering**
Chair: Fouad Mohammad, Academic Member, ATINER & Senior Lecturer, Nottingham Trent University, U.K.	**Chair:** Wanlin Cao, Professor, Beijing University of Technology, China.
1. *Shankar Bhavikatti, Emeritus Professor, K.L.E. Technological University, India & Harshavardhan Velpur S., Consulting Civil Engineer, Dharwad, India. Optimum Deign of Grid Floors. 2. Marcelo Epstein, Professor, University of Calgary, Canada. What is a Homogeneous Shell? 3. Jihad Rishmany, Assistant Professor, University of Balamand, Lebanon, Nicolas Saba, Assistant Professor, University of Balamand, Lebanon & Issam Tawk, Associate Professor, University of Balamand, Lebanon. Optimization of a Vertical Axis Wind Turbine Using FEA, Multibody Dynamics and Wind Tunnel Testing. 4. Nicolas Saba, Assistant Professor, University of Balamand, Lebanon, Jihad Rishmany, Assistant Professor, University of Balamand, Lebanon & Issam Tawk, Associate Professor, University of Balamand, Lebanon. Optimization of the Production Process of an A-Pillar using a Differential Thickness Profile Approach	1. *Antoine Gergess, Professor, University of Balamand, Lebanon. Seismic Provisions for Elastomeric Bearings in Bridge Structures. 2. Idriss Rouaz, Researcher, National Center for Studies and Integrate Researches of Building "CNERIB", Algeria. Study of Screws' Spacing Influence on Cold Formed Steel Shear Wall Panel. 3. *Santosh Yonjan, MSc Student, Shinshu University, Japan, Toshiyuki Ohkami, Professor, Shinshu University, Japan & Koyama Shigeru, Associate Professor, Shinshu University, Japan. Study on the Impacts of April 2015 Earthquake at Lisankhu Village, Sindhupalchok Nepal. 4. Madi Rafik, Vice Dean of Pedagogy Charge, University May 08 1945, Algeria & Mohamed Guenfoud, Dean, University May 08 1945, Algeria. Evaluation of the Capacity after Rehabilitation of Buildings against the Earthquake.

via FEA. 5. Kseniia Zhaivoronskaia, Ph.D. Student, Southern Federal University, Russia, Sergey Shevtsov, Professor, Southern Federal University, Russia & Ilya Tarasov, Project Leader, Carbonstudio LLC, Russia. Model Based Control Optimization for Curing the Shell-like Composite Structures in Autoclave Processing.	

12:00-13:30 Session IV (ROOM E-10th Floor): Dynamical Systems I

Chair: *Mang Tia, Professor, University of Florida, USA.

1. Farhad Mohammad, Head of Engineering Department, Kurdistan Regional Government, Iraq. Assessing Response of Structural Key Elements to Blast and Impacts.
2. Adrian Pozos-Estrada, Associate Researcher, National Autonomous University of Mexico, Instituto de Ingeniería (UNAM), Mexico & Adrián López-Ibarra, National Autonomous University of Mexico, Instituto de Ingeniería (UNAM), Mexico. Serviceability Limit State for Wind-Sensitive Buildings in Mexico.
3. Antonio Ventura, Ph.D. Student, Politecnico di Torino, Italy, Bernardino Chiaia, Professor, Politecnico di Torino, Italy & Valerio De Biagi, Postdoctoral Fellow, Politecnico di Torino, Italy. Impact of Falling Rock Blocks on Metallic Structures: Contact Law and Dynamic Response.

13:30-14:30 Lunch

14:30-16:00 Session V (ROOM E-10th Floor): General Civil Engineering Topics

Chair: *Antoine Gergess, Professor, University of Balamand, Lebanon.

1. Mumtaz Usmen, Professor, Wayne State University, USA, Mohsen Isa, Researcher, Wayne State University, USA & Emrah Kazan, Lecturer and Researcher, Wayne State University, USA, Quality Modelıng Approach to Improving Unıversity Facılıtıes Services: An Empical Study.
2. Soon Duck Kwon, Professor, Chonbuk National University, South Korea. A Comparative Study on Wind Tunnel Test and Design Codes in

Evaluation of Wind Loads on Tower.
3. Najib Saliba, Assistant Professor, University of Balamand, Lebanon and Johnny Issa, Assistant Professor, University of Balamand, Lebanon. Numerical Modelling of Lean Duplex Stainless Steel and Assessment of Existing Design Methods.
4. Robert Evans, Senior Lecturer, Nottingham Trent University, U.K. Detection of Excessive Moisture within Bituminous Pavements using Ground Penetrating Radar (GPR).

16:00-17:30 Session VI (ROOM E-10th Floor): Geotechnical Engineering

Chair: *Shankar Bhavikatti, Emeritus Professor, K.L.E. Technological University, India.

1. Venu Chandra, Assistant Professor, Indian Institute of Technology Madras, India, Ananth Wuppukondur, Indian Institute of Technology Madras, India & Ranjith K B, Indian Institute of Technology Madras, India. An Experimental Study to Reduce Sediment Entry into an Intake Canal.
2. Hacene Benyaghla, University of Guelma, Algeria. Influence of the Friction Angle in Calculating in Tree-Dimentional Active Earth Pressure behind Pile and Screen.

17:30-20:00 Session VII (ROOM A- Mezzanine Floor): A Round Table Discussion on 'The Future of Sciences, Engineering and Technology'

Chair: Lampros A. Pyrgiotis, Scholar & President, Greek Society of Regional Scientists, Greece.

1. Dr **Miryam Barad**, Professor, Tel Aviv University, Israel.
2. Dr **Rolf Steinbuch**, Professor, Reutlingen University, Germany
3. Dr **Venkatachalam Rapur**, Professor, National Institute of Technology, India.
4. Dr **Ru-Shi Liu**, Professor, National Taiwan University, Taiwan.
5. Dr **Mahmoud Aminlari**, Professor, Shiraz University, Iran.
6. Dr **Ingo Ehrlich**, Professor, Ostbayerische Technische Hochschule Regensburg, Germany.
7. Dr **Theodore Trafalis**, Head, Industrial Engineering Research Unit, ATINER, Professor of Industrial and Systems Engineering & Director, Optimization & Intelligent Systems Laboratory, The University of Oklahoma, USA.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 21 June 2016

08:00-09:30 Session VIII (ROOM E-10th Floor): A Panel on Sustainable Civil Engineering Materials

Chair: Mumtaz Usmen, Professor, Wayne State University, USA.

1. Jovana Jovanovic, Ph.D. Student, University Union Nikola Tesla, Serbia, Svetlana Stevovic, Professor, University Union Nikola Tesla, Serbia & Ivan, Stevovic, Teaching Assistant University Union Nikola Tesla, Serbia, Serbia. Windmill's Breakthrough in the Governance of Energetic Landscapes.
2. Junliang Wang, Ph.D. Student, Chongqing University, China. Standards and Case Studies of Green Retrofitting of Existing Buildings in China.

09:30-11:00 Session IX (ROOM E-10th Floor): Dynamical Systems II	09:30-11:00 Session X (ROOM F-10th Floor): A Panel on Earthquake Masonry Structures
Chair: Najib Saliba, Assistant Professor, University of Balamand, Lebanon.	**Chair:** Robert Evans, Senior Lecturer, Nottingham Trent University, U.K.
1. Roberto Gomez, Associate Professor, Institute of Engineering, National Autonomous University of Mexico, Mexico, R. Sánchez, Institute of Engineering, National Autonomous University of Mexico, Mexico, A. Pozos, Institute of Engineering, National Autonomous University of Mexico, Mexico, L. Arenas, Institute of Engineering, National Autonomous University of Mexico, Mexico, O. Rosales, Institute of Engineering, National Autonomous University of Mexico, Mexico & M. Mendoza, Institute of Engineering, National Autonomous University of Mexico, Mexico.	1. Shihong Qin, Professor, Chongqing University, China, Bang Rao, Graduate Student, Chongqing University, China, Tianxiang Pi, Associate Professor, Chongqing University, China & Dengwei He, Chongqing University, China. Experimental Study on Seismic Behavior of Horizontal Prestressed Brick Masonry Wall. 2. Xiang Li, Associate Professor, Tongji University, China & Xianglin Gu, Professor, Tongji University, China. Modeling and Critical Member of Unreinforced Masonry Schoolhouse under Earthquake. 3. Weifan Xu, Ph.D. Candidate, Harbin Institute of Technology, China, Fenglai Wang, Professor, Harbin Institute of Technology,

Wind Tunnel Testing of an Airport Terminal Building. 2. *Juan Alejandro Vazquez Feijoo, Senior Lecturer, CIIDIR-Oaxaca, Instituto Politecnico Nacional, Mexico. Extension of the Short Time Fourier Transform for Nonlinear Systems. 3. Emrah Sevinc, Ph.D. Student, Dokuz Eylul University, Turkey & Mehmet Sukru Guney, Professor, Dokuz Eylul University, Turkey. Experimental Study of the Influence of Plant Configuration on the Wave Propagation Resulting from Dam Break. 4. Fuat Aras, Associate Professor, Istanbul Medeniyet University, Turkey. Operational Modal Analysis to Confirm the Numerical Model of a Reinforced Concrete Building. 5. Alexander Tyapin, Senior Specialist, ATOMENERGOPROJECT, Russia. Non-Classical Damping and Limitations of the Modal and Spectral Dynamic Analyses.	China, Yan Zhao, Associate Professor, Jiamusi University, China & Xujie Sun, Instructor, Heilongjiang Institute of Technology, China. Research on Seismic Performance of Hectometer Reinforced Block Masonry High-Rise Buildings.

11:00-14:00 Educational and Cultural Urban Walk Around Modern and Ancient Athens (Details during registration)
14:00-15:00 Lunch

15:00-16:30 Session XI (ROOM E-10th Floor): A Panel on Advanced Composites, Sustainable Materials in Civil Infrastructures II
Chair: *Juan Alejandro Vazquez Feijoo, Senior Lecturer, CIIDIR-Oaxaca, Instituto Politecnico Nacional, Mexico.
1. George Frantziskonis, Professor, University of Arizona, USA, Sourav Gur, Graduate Student, University of Arizona, USA & Sudib Mishra,

Assistant Professor, Indian Institute of Technology Kanpur, India. Shape Memory Alloy (SMA) base Vibration Absorber via Strain Rate Dependent Thermo-Mechanical Behavior and Comparison with Conventional Absorbers.

2. Hongying Dong, Associate Professor, Beijing University of Technology, China & Wanlin Cao, Professor, Beijing University of Technology, China. Experimental Research on Flexural Performance of High Strength Recycled Aggregate Concrete Slabs.
3. Aleksandar Savic, Assistant Professor, University of Belgrade, Serbia & Marina Askrabic, Teaching Assistant, University of Belgrade, Serbia. Investigation of Self-Compacting Mortars with Fly Ash and Crushed Brick.
4. Xuan Dai Lu, Postgraduate Student, University of Canterbury, New Zealand & Mofreh Saleh, Associate Professor, University of Canterbury, New Zealand. Evaluation of Performance of a New Warm-Mix Asphalt Additive.
5. Safiullah Omary, Ph.D. Student, University of Cergy Pontoise, France & Elhem Ghorbel, Professor, University of Cergy Pontoise, France. Influence of Coarse Demolition Waste Aggregates on Physical and Mechanical Properties of Concretes.

16:30-18:00 Session XII (ROOM E-10th Floor): Special Topics

Chair: George Frantziskonis, Professor, University of Arizona, USA.

1. Svetlana Stevovic, Professor, University Union Nikola Tesla, Serbia & Jovana Jovanovic, Ph.D. Student, University Union Nikola Tesla, Serbia. Techno Economic, Environmentally and Socially Optimal Small Hydro Power Plant Construction.
2. Dimos Polyzois, Professor, University of Manitoba, Canada & Eleoussa Polyzoi, Professor, University of Winnipeg, Canada. Exploring the Links between Household Mould, Children's Respiratory Health, and School Absenteeism.
3. Hafez Al Sadeq, Assistant Professor and Civil Engineering Programme Leader, Caledonian College of Engineering, Oman. Review of Earthquake Forces in the New Seismic Design Code of Oman.
4. Victor Rogelio Tirado Picado, Director, Construction Department, Universidad Nacional Autonoma de Nicaragua, Nicaragua. Forecast Model of Rainfall for Hydrological Units using Artificial Neural Networks (ANN).
5. Mounir Mabsout, Professor, American University of Beirut (AUB), Lebanon, Ghassan Fawaz, Instructor and Former Graduate Student, American University of Beirut (AUB), Lebanon, Michel Waked, Senior Transport Planne, WSP Middle East, Dubai, United Arab

Emirates (UAE) & Kassim Tarhini, Professor, U.S. Coast Guard Academy (USCGA), USA. Wheel Load Distribution in Concrete Slab Bridges Stiffened with Side Railings.

21:00-22:30 Dinner (Details during registration)

Wednesday 22 June 2016
Cruise: (Details during registration)

Thursday 23 June 2016
Delphi Visit: (Details during registration)

Murad Abufarsakh
Professor, Louisiana State University, USA
&
Allam Ardah
Ph.D. Student, Louisiana State University, USA

Evaluating the Resilient Modulus of Treated Very Weak Subgrade Soils for Sustainable Pavement

This research study was performed to examine the appropriate treatment/stabilization schemes for very weak subgrade soils at high moisture contents, and to evaluate the corresponding performance-related properties [e.g., the resilient modulus and permanent deformation] for use in the design and analysis of sustainable pavement structures. Four different subgrade soil types having low, medium, high, and heavy plasticity indices were selected and considered in this study. Three different moisture contents were selected at the wet side of optimum that produce a raw soil strength value of 172 kPa (25 psi) or less. All the soils were treated with different combinations of Class C fly ash (or Portland cement type I) and hydrated lime to achieve a target 7-day strength target values of 345 kPa (50 psi) to create a working platform and 690 kPa (100 psi) to stabilize the subgrade for subbase application. The repeated load triaxial (RLT) tests were performed on the laboratory molded specimens to evaluate their resilient modulus and permanent deformation behavior under cyclic loading. AASHTO T-307 procedure was followed in this study to conduct the resilient modulus tests. A good correlation was observed between the water/additive ratio and the resilient modulus/permanent deformation; i.e., the soil specimens compacted at low water/additive ratio showed better performance than those compacted at high water/additive ratio. The test results also showed that the use of direct correlation between the unconfined compressive strength (UCS) and the resilient modulus for cementitiously treated/stabilized soils can be misleading.

Hafez Al Sadeq
Assistant Professor and Civil Engineering Programme Leader,
Caledonian College of Engineering, Oman

Review of Earthquake Forces in the New Seismic Design Code of Oman

Seismic design code for buildings in Oman was recently developed. This paper aims at studying the level of the earthquake forces in the newly introduced code. Base shear coefficients were generated for the two seismic hazard regions in Oman and for different fundamental natural periods, and as a function of soil profile type and behavior factors. The effects of the earthquake loads on design of RC structural elements will be addressed as well. It seems that the level of earthquake forces in Oman is mostly low to moderate compared with other earthquake prone areas surrounding Oman.

Juan Alejandro Vazquez Feijoo
Senior Lecturer, CIIDIR-Oaxaca, Instituto Politecnico Nacional, Mexico

Extension of the Short Time Fourier Transform for Nonlinear Systems

So far, the methods of analysis of variant time have been limited to linear systems, including the most common methods such as the wavelet analysis and short time Fourier transform. The goal is now that the Fourier transform can be modified in some way to be applied to continuous nonlinear systems. A continuous nonlinear system can be modeled by the Volterra series; the terms (Volterra operators) are obtained through unitary impulse response and higher order kernels. Each Volterra operator can be modeled by a linear model known as Linear Associated equation. On which any method of identification or analysis of linear systems can perhaps be applied. Here an extension of the short time Fourier transform for time varying nonlinear systems through associated linear equations is presented. Through the appropriate windows, you can see the generation of harmonics due to previous states of the system from linear or nonlinear part, distinguishing the origin in time of that part of the signal.

Fuat Aras
Associate Professor, Istanbul Medeniyet University, Turkey

Operational Modal Analysis to Confirm the Numerical Model of a Reinforced Concrete Building

Numerical models are frequently constructed to investigate the civil engineering problems related to design and assessment issues. However there are always some uncertainties in modeling stemming from generalizations, assumptions and ignorance. Recently experimental modal analysis is a frequently applied technique to check the performance of constructed numerical models. Comparison of the numerically and experimentally obtained dynamic properties gives a chance to assess the performance of the numerical model. Furthermore experimentally obtained dynamic properties are used to tune the numerical model of the structure.

In this study a similar application is presented. Experimental dynamic analysis has been performed for an existing building constructed in 1980s and retrofitted in 2001 in Istanbul. Mode shapes and modal frequencies of the building have been determined by ambient vibration survey. Later on the numerical model of the building has been constructed with determined structural system and material properties obtained by concrete testing for the original and retrofit members separately. Numerical dynamic analysis was performed. A two-step calibration process is pursued to tune the numerical model of the building. The result showed that the partition walls of the buildings should be included into the model and the modulus of elasticity obtained from the concrete testing should be decreased by 37% in order to predict the experimentally obtained mode shape by numerical analysis.

Shankar Bhavikatti
Emeritus Professor, K.L.E. Technological University, India
&
Harshavardhan Velpur S.
Consulting Civil Engineer, Dharwad, India

Optimum Deign of Grid Floors

Grid floors are two-way ribbed slabs consisting of beams spaced at regular intervals in perpendicular directions, which are monolithic with the slab. They are generally used for large halls like auditoriums, theatre halls and show rooms in the shops where large column free space with flat roofs are required. Optimization problem is formulated as finding depth and with of ribs and thickness of slab such that material cost of the slab is minimum subject to all the design constraints as per Indian code IS: 456–2000 are satisfied.

Program was developed to design grid floors as per the provisions of IS: 456–2000 and was connected to optimizer sequential linear programming. Study was carried out for various square grid and rectangular grid floors. Based on the study guide lines are drawn for choosing the width and depth of ribs and thickness of slab and also for spacing of ribs. Study was carried for optimum design if cost ratio (ratio of cost of unit volume of steel to cost of unit volume of concrete) varies. It was found that the variation of cost from 50 to 100 do not affect the optimum parameters of the grid floor.

Wanlin Cao
Professor, Beijing University of Technology, China

Seismic Behavior of Steel-concrete Multi Energy Dissipation Composite Shear Walls

Venu Chandra
Assistant Professor, Indian Institute of Technology Madras, India
Ananth Wuppukondur
Indian Institute of Technology Madras, India
&
Ranjith K B
Indian Institute of Technology Madras, India

An Experimental Study to Reduce Sediment Entry into an Intake Canal

Purpose of an intake canal is supplying water to irrigation, industrial, thermal power plants etc. Quantity of water decreases in the canal because of sedimentation caused due to sediment entry from main water source. Experiments are conducted to identify a method to reduce sediment entry into the canal. A physical model which consists of main rectangular channel of bed width 55cm filled with sediment of size *d50*=0.28mm and also a rigid bed trapezoidal channel of bed width 12cm with side slopes of 1:1, is used for this purpose. The rectangular and trapezoidal channels in the model represent river and intake canal, respectively. Both channel bed levels are meeting at same elevation. The diversion angle of intake canal is 450. All experiments are conducted at a constant discharge of 0.025m3/s with flow depth of H=8cm. The sediment entry into the intake channel (*Qs*) is estimated first without vane arrangement. Then, seven rectangular vanes of equal height 0.375H, width of 0.18H and 1 mm thick, are installed at canal entrance making an angle of 150, 300 and 450 with respect to flow direction in rectangular channel, to reduce *Qs*. Two vane arrangements with 8cm and 12cm vane spacing (*Sv*) are used to conduct the experiments. When *Sv* is 8cm, *Qs* decreases by 52%, 51% and 44% for 150, 300 and 450 vane angle, respectively. Further, with an increase of *Sv* to 12cm, *Qs* reduces by 59%, 55% and 52% for 150, 300 and 450 vane angle, respectively. However, *Qs* decreases to 60%, 57% and 49% by introducing a second parallel row of vanes at 8cm spacing for 150, 300 and 450, respectively. Hence, *Qs* reduces with an increase of vane spacing and increases with an increase of vane angle. Also, *Qs* decreases with an addition of vane row except 450 vane angle.

Xuan Dai Lu
Postgraduate Student, University of Canterbury, New Zealand
&
Mofreh Saleh
Associate Professor, University of Canterbury, New Zealand

Evaluation of Performance of a New Warm-Mix Asphalt Additive

Warm mix asphalt (WMA) gradually becomes more popular in the road industry owing to its benefits compared to traditional hot mix asphalt (HMA), such as lower energy consumption, lesser emissions, and higher ability of incorporating high portion of reclaimed asphalt pavement (RAP) in WMA mixtures. So far, there have been numerous WMA additives available in the market. Among them, Evotherm is one of well-known additives, which has been studied in many publications and applied on many road sections worldwide. Sylvaroad is a new type of WMA additive. Sylvarod is still a new product and there has been limited research about its performance. In this paper, the authors investigated the performance of Sylvaroad to compare with the performance of Evotherm and HMA. In the first stage, tests were carried out on the viscosity of binder with and without additives, and at different temperatures. In the second stage, mechanical performance was evaluated, including moisture susceptibility, fatigue cracking and rutting resistance. The results showed that Sylvaroad and Evotherm reduced binder's viscosity. Sylvaroad produced larger reduction in the binder viscosity than Evotherm. HMA performed the best resistance to rutting, followed by Evotherm mixture. Sylvaroad mixture had the highest number of cycles to reach fatigue failure; HMA came second. However, only Evotherm mixture in this study passed the moisture resistance test, with tensile strength ratio (TSR) of 91%. Both HMA and Sylvaroad mixtures showed considerable stripping, with the most severe case belonged to Sylvaroad mixture.

Hongying Dong
Associate Professor, Beijing University of Technology, China
&
Wanlin Cao
Professor, Beijing University of Technology, China

Experimental Research on Flexural Performance of High Strength Recycled Aggregate Concrete Slabs

To study the differences of flexural performance of high-strength recycled concrete slabs and high-strength ordinary concrete slabs, four full-scale high-strength recycled concrete slabs and two high-strength ordinary concrete slabs comparison tests were carried out. Recycled concrete coarse aggregate replacement rate was 100% and the fine aggregate was natural sand. The design strength grade of concrete for all specimens was C65. The loading method was three points one-way repeated loading. The cracking strength, yielding strength, ultimate strength, deflection, crack and damage process were studied. Results show that comparing with the high-strength ordinary concrete slab，the flexural failure process, cracking strength and ultimate strength of the high-strength recycled concrete slab are similar but its midspan deflection is slightly larger. When using the steel bar truss construction, cracks can be restricted by steel bar truss after slabs crack and the ultimate load, late stiffness and ductility can be increased. The bearing capacity of recycled concrete slabs can be calculated using the method in the code for design of concrete structures but reduction factor should be considered according to recycled coarse aggregate rate, in order to consider the difference of the long term behavior and short term test behavior.

Soon Duck Kwon
Professor, Chonbuk National University, South Korea

A Comparative Study on Wind Tunnel Test and Design Codesin Evaluation of Wind Loads on Tower

The research objective of present study was a comparative study of wind induced responses of a high rise tower evaluated from the wind tunnel test and the four major design specifications in the world. The target structure of this comparative study between design codes and wind tunnel tests was the 120m high Busan Tower in Busan, Korea.

In order to identify the dynamic properties of the Busan Tower, the accelerations at top of the tower were measured. The natural frequencies and damping ratio for lowest three modes were extracted from the field measurements by applying the frequency domain decomposition Method. Then a scaled wind tunnel model of the tower was tuned to the target modal frequencies and damping ratio for reproducing the actual behaviors under natural winds. In the wind tunnel tests, the base shear force and overturning moment and top dynamic displacements were measured.

Wind load criteria from KBC-2009 in Korea, ASCE7-10 in USA, EUROCODE-2010 in European Union and AIJ-2004 in Japan were chosen to conduct the comparative analysis. The base shear forces, overturning moments and dynamic displacements of the tower were compared at the basic wind speed of 40m/s. Maximum displacement at top of the tower was lower in ASCE7-10, EUROCODE, AIJ-2004 andKBC-2009. The KBC-2009 provided the most conservative results.

When we compared the results evaluated from the design codes and the measured data, the ratio between specificationsand experiment ranged around 0.84~1.01 in base shear forces and 1.23~1.49 in overturning moment. However the ratio between code and experimentin dynamic displacements were relatively low and were in the range of 1.04~1.17. From the results, it would be concluded that the four design codes are acceptable but need to be improved for evaluation of overturning moment.

Marcelo Epstein
Professor, University of Calgary, Canada

What is a Homogeneous Shell?

A layered cylindrical shell with each layer in the shape of a circular cylinder is clearly to be considered as a homogeneous structure. Indeed, the local material response to changes in membrane and bending strains will be the same no matter which point of the middle surface is considered. But, if we were to regard a shell as a structure carved out of a homogeneous three dimensional block of material, would we obtain a homogeneous shell? If the original block were made, say, of a homogeneous orthotropic material, and if a cylindrical shell were carved out of it, the axes of orthotropy would be found at different angles in different points of the middle surface, thereby resulting in different material responses. We then have a situation of a medium which, as a three-dimensional entity, is homogeneous but, when seen through the prism of a structural theory (beams, shells), must be regarded as heterogeneous. The question posed and answered in this paper is the following: Given a shell model in terms of membrane forces and bending moments as functions of membrane and bending strains, is there any way to ascertain whether or not this structure has been carved out of a homogeneous material? We call this the problem of homogeneity of embedding. From the physical point of view it is worth noting that, given a small sample of a shell, a material scientist would not take into consideration any theorized two-dimensional shell model, but rather would look for any detectable presence, under the microscope, of micro-structural sources of lack of homogeneity. In this paper, an elegant solution of the embedded homogeneity problem is given in both analytic and geometrical terms.

Robert Evans
Senior Lecturer, Nottingham Trent University, UK

Detection of Excessive Moisture within Bituminous Pavements using Ground Penetrating Radar (GPR)

This paper reports on the ability of ground penetrating radar (GPR) to identify and locate areas within asphalt (bitumen-bound) road pavements where moisture ingress has occurred.

Bitumen-bound materials are susceptible to damage as a result of the presence of water, particularly as a result of the reduction in cohesion between bitumen and aggregate, which can lead to deterioration such as stripping and de-bonding of pavement layers. The capability to identify areas of excessive moisture presence, or moisture ingress, is thus of great significance for the assessment and maintenance of asphalt pavements. This issue is especially relevant in regions where climatic records suggest trends of increasing total rainfall and increasing frequency of very wet weather.

GPR is a non-invasive technique used routinely in several countries for pavement investigation, and has had various claims reported concerning its ability to locate moisture within pavements. This study uses a series of laboratory tests on number of bituminous core samples taken from in-service roads, to establish the relationship between the amount of moisture present in the material and the materials 'dielectric constant' value determined from GPR data. In addition, case study evidence is provided from GPR moisture detection work carried out by the author on in-service pavements.

From the work conducted, it has been possible to observe and quantify the changes in the dielectric constant value of asphalt as it changes as a result of changing moisture content. The findings of the paper can be applied to GPR pavement moisture investigations in order to more accurately assess moisture amounts and to determine locations for possible moisture ingress within asphalt pavements.

George Frantziskonis
Professor, University of Arizona, USA
Sourav Gur
Graduate Student, University of Arizona, USA
&
Sudib Mishra
Assistant Professor, Indian Institute of Technology Kanpur, India

Shape Memory Alloy (SMA) base Vibration Absorber via Strain Rate Dependent Thermo-Mechanical Behavior and Comparison with Conventional Absorbers

The aim of the reported work is to study shape memory alloy (SMA) based vibration absorbers by considering the strain rate dependent thermo-mechanical behavior of SMA materials. An imperative factor in the constitutive behavior of SMAs is the strain rate and temperature-dependent behavior, which significantly affects their energy dissipation capacity under cyclic loading. A robust strain-rate–dependent thermo-mechanical constitutive model for SMAs is considered which also accounts for the thermo-mechanical aspects of SMA phase transformation. The specific structure examined herein is a beam subjected to cyclic load. To demonstrate the behavior and control efficiency of the SMA absorber the behavior of the beam with SMA absorbers is compared to that of the same beam with conventional absorbers. It is observed that with increasing structural (beam) flexibility, the hysteretic loop size of SMA dampers increases due to the increasing strain rate which decreases the response of the structure (beam) under cyclic excitation. Parametric studies reveal that even at the resonance frequency of the beam-damper system the SMA absorber shows superior control efficiency over the conventional one. A rather striking behavior of the SMA absorbers is discovered in that they absorb energy from the fundamental vibration mode and from higher modes. In contrast the conventional absorbers transfer energy from the fundamental to higher vibration modes and this activates higher vibration modes. For the beam with the absorbers, stiffness requirements for the SMA absorbers are significantly less than the conventional ones; this substantially reduces the cost and space requirements for the absorbers. Different response quantities of interest show improved performance of the SMA absorbers over the conventional ones under varying excitation intensity, frequency, temperature, and strain rate. The study concludes that SMAs offer a very viable option as structural control systems to protect structures subjected to cyclic load from wind or earthquake excitations.

Antoine Gergess
Professor, University of Balamand, Lebanon

Seismic Provisions for Elastomeric Bearings in Bridge Structures

Elastomeric bearings are often used to accommodate displacements and rotations in bridge structures subjected to traffic live loads, temperature loads, creep, shrinkage, elastic shortening due to prestress and other construction loads. Depending on its stiffness, these bearings can transmit horizontal loads to the bridge substructure components (piers, columns and foundations). Current AASHTO (American Association of State Highway and Transportation officials) specifications do not explicitly account for seismic loads for bridge bearings. It is only stated that they should be provided with adequate seismic and extreme event resistant anchorage to resist horizontal forces in excess of those accommodated by shear in the pad. This paper shows how elastomeric bearings can adequately perform under seismic loads if they are properly designed. Provisions are based on Section 14 of the AASHTO LRFD Bridge Design Specifications in addition to Caltrans (California Department of Transportation) criteria. It is shown how the displacement capacity of the bearing can incorporate seismic and non-seismic movements without affecting its stability. Moreover, testing procedures of the laminated elastomeric bearing are presented to confirm its adequacy as a seismic isolator especially if the displacements are high. A numerical example from a recently completed project is included. Finally recommendations are made for the use of elastomeric bearing pads as seismic isolators.

Roberto Gomez
Associate Professor, Institute of Engineering, National Autonomous University of Mexico, Mexico
R. Sánchez
Institute of Engineering, National Autonomous University of Mexico, Mexico
A. Pozos,
Institute of Engineering, National Autonomous University of Mexico, Mexico
L. Arenas
Institute of Engineering, National Autonomous University of Mexico, Mexico
O. Rosales
Institute of Engineering, National Autonomous University of Mexico, Mexico
&
M. Mendoz
Institute of Engineering, National Autonomous University of Mexico, Mexico

Wind Tunnel Testing of an Airport Terminal Building

Jovana Jovanovic
Ph.D. Student, University Union Nikola Tesla, Serbia
Svetlana Stevovic
Professor, University Union Nikola Tesla, Serbia
&
Ivan Stevovic
Teaching Assistant University Union Nikola Tesla, Serbia, Serbia

Windmill's Breakthrough in the Governance of Energetic Landscapes

Mitigation measures of climate changes will have large-scale effects on the landscapes. Landscapes have energetic constraints, so mitigation measures of climate changes, divide landscapes into new categories. As environmental boom, proliferate wind farm projects, clusters of windturbines, with audio-visual effects under enquiry. Obsolete and outdated coal-fired backdrop, turns into new environmentalism enriched with top new sustainable technologies and digital discoveries. Placing windmills is conducted through initial project mapping and visualization, by locating appropriate topographic points and mixing criteria. One of the, for example, Danish energetic goals is in fact procurement of 70% current in ecological way (from alternative sources). At the moment, procurement of the current in ecological way is around 43 %, which is a Christopher Bateau's statement (assistant director of Danish energy organization).

Xiang Li
Associate Professor, Tongji University, China
&
Xianglin Gu
Professor, Tongji University, China

Modeling and Critical Member of Unreinforced Masonry Schoolhouse under Earthquake

A lot of unreinforced masonry schoolhouses damaged in earthquake. It was important to understand the collapse mechanism of this structure for life saving. Based on field investigation and further analysis, the pier was proved as the critical member of the system. The longitudinal wall between two windows would fall out of plane under transversal vibration. Seismic performance of unreinforced masonry structure would be improved by constructional column and ring beam.

Mounir Mabsout
Professor, American University of Beirut (AUB), Lebanon
Ghassan Fawaz
Instructor and Former Graduate Student, American University of Beirut (AUB), Lebanon
Michel Waked
Senior Transport Planne, WSP Middle East, Dubai, United Arab Emirates (UAE)
&
Kassim Tarhini
Professor, U.S. Coast Guard Academy (USCGA), USA

Wheel Load Distribution in Concrete Slab Bridges Stiffened with Side Railings

The design of highway bridges in the United States conforms to the American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Highway Bridges (Specs) or AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications. The analysis and design of any highway bridge must consider live loads such as HS20 (truck or lane) or HL93 (combination of truck or tandem, and lane loading). To analyze and design reinforced concrete slab bridges, AASHTO specifies a distribution width for live loading that simplifies the two-way bending problem into a beam or one-way bending problem. Empirical expressions for estimating the wheel load distribution and live-load bending moment are provided in the AASHTO procedures. These equations do not take into account the many factors that govern the actual live load such as the transverse position of a truck or tandem on a specific lane, leading to over-estimation or under-estimation of the live-load bending moment. The objective of this paper is to assess the reliability levels that are inherent in concrete slab bridges which are designed based on the simplified empirical live load equations in the AASHTO Specs and LRFD procedures. To achieve this objective, typical one- and two-lane straight bridges with different span lengths were modeled using finite-element analysis (FEA) subjected to HS20 truck loading, tandem loading, and standard lane loading as proposed by AASHTO procedures. These loading cases were positioned transversally and longitudinally in order to create the maximum live load longitudinal bending moments in the slab deck. The FEA results were compared with the AASHTO moments to quantify any biases that might result from the simplifying assumptions adopted in AASHTO. Next a reliability analysis was conducted to quantify the reliability index for bridge designs using AASHTO procedures. The results from this study

will provide structural engineers with more consistent provisions to design concrete slab bridges or evaluate the load-carrying capacity of existing bridges.

Farhad Mohammad
Head of Engineering Department, Kurdistan Regional Government, Iraq

Assessing Response of Structural Key Elements to Blast and Impacts

Safiullah Omary
Ph.D. Student, University of Cergy Pontoise, France
&
Elhem Ghorbel
Professor, University of Cergy Pontoise, France

Influence of Coarse Demolition Waste Aggregates on Physical and Mechanical Properties of Concretes

The reuse of recycled aggregates from construction and demolition waste is a conceivable and beneficial solution for environmental preservation and effective utilization of the natural resources. Therefore, it is necessary to reuse waste concrete as recycled concrete aggregates (RCA) for new concrete structures.

This study was carried-out in an attempt to analyze the effect of coarse recycled aggregates from construction and demolition waste (CWD) on physical and mechanical properties of recycled aggregate concrete (RAC) of concrete mixes.

Tow series of concretes were prepared differing in the state of RAC before mix design. In the first one the recycled gravels (RGC) were introduced at the saturated state while in the second they were incorporated at natural state (non-saturated). For both series of concretes different replacement ratios of natural gravels (NG) by RGC were selected (0%, 10%, 25%, 50%, 75% and 100%) and the binder dosage is maintained constant. Water and super plasticizer dosages were adjusted in order to achieve the same consistency class of S4 (18±2 cm) and compressive strength class of C35/40.

First of all, the used gravels (NG and RGC) were characterized by the sieving, the density, the water absorption, the porosity and the Los Angeles tests. The results point out that the RGA are characterized by low density and a significant capacity of water absorption and porosity than that of natural ones (NG). In addition, the wear resistance and fragmentation resistance of RGA is lower than NG.

The air content was measured. It appears that this property increases by increasing the replacement ratio of NG by RGC. At the hardened state, the density, the water absorption coefficient, the porosity, the dynamical modulus of elasticity, the compressive strength, tensile splitting strength and flexural strength were measured and experiments were conducted according to European standards.

The density of hardened concrete decreases and their porosity increase by increases of RGC content. The mechanical properties at 7, 14 and 28 days have been evaluated. It appears that they decrease by increasing the substitution rate. Relationships between mechanical

properties of concretes and those of aggregates and the mix design parameters were established.

Dimos Polyzois
Professor, University of Manitoba, Canada
&
Eleoussa Polyzoi
Professor, University of Winnipeg, Canada

Exploring the Links between Household Mould, Children's Respiratory Health, and School Absenteeism

In this presentation, results from a study examining the relationship between housing conditions, respiratory health and school absenteeism of grades 3 and 4 children in Winnipeg, Manitoba, Canada are presented. The paper focuses on four questions. What is the relationship between: (1) selected aspects of the child's home environment and his/her respiratory health, (2) children's respiratory health and school absenteeism, (3) children's socio-economic status (SES) and their respiratory health, and (4) children's SES and school absenteeism?

The study encompassed two parts. First, a survey was sent to over 13,700 parents of nine-year-old children (all grades 3- and 4- children attending schools in six Winnipeg school divisions). Approximately 3,400 parents agreed to participate in the study. The survey focused on children's respiratory-related illnesses and home-based triggers for these ailments. Second, an extensive home audit of 715 homes was conducted by trained engineering graduate research assistants. In addition, 2,145 air samples were taken and analyzed for mold by a professional lab.

Results from this study indicate that self-reported visible mold is a significant independent predictor of children's persistent colds alone (four or more a year). Also, children who have persistent colds in combination with asthma miss significantly more school than children who have only asthma or only persistent colds. Of the children who have persistent colds in combination with asthma, 30% missed a maximum of 2-4 school days, 39% missed a maximum of 5-10 days, and an additional 12% missed a maximum of 12-42 days. Children from poorer families tend to have more persistent colds reported than children from high-income families. No association was found between income and asthma. Furthermore, SES was not a significant factor for the number of school days missed. Children miss school due to poor respiratory health, not due to family income level.

Understanding how respiratory health risks are associated with housing is essential to designing effective strategies to improve children's quality of life.

Adrian Pozos-Estrada
Associate Researcher, National Autonomous University of Mexico, Instituto de Ingeniería (UNAM), Mexico
&
Adrián López-Ibarra
National Autonomous University of Mexico, Instituto de Ingeniería (UNAM), Mexico

Serviceability Limit State for Wind-Sensitive Buildings in Mexico

Currently, there are several codes and standards for wind design that propose the use of perception curves of acceleration, that are employed to check a service ability limit state. These perception curves are associated with return period values from one to ten years. Some codes and standards that include these perception curves are: ISO6897 (1984), ISO10137 (2007), National Building Code of Canada (2005) and Architectural Institute of Japan (2004). In Mexico, the Manual of Design of Civil Structures (2008) also proposes the use of two perception limits of acceleration. Moreover, the Federal District Code of Mexico for wind design (2004) includes a limit of acceleration. The criteria propose in these codes and standards do not incorporate the uncertainty in the structural response, the dynamic properties and wind characteristics; although some recent investigations have incorporated the effect of uncertainty associated with the limits of perception.

With the growing construction rate of tall building in Mexico, together with the use of new technologies that allow the construction of more resistant and light buildings, with low damping ratio, it is necessary to develop a serviceability limit state to check the excessive accelerations induced by wind in tall buildings that include the wind characteristics of Mexican climate. The latter is the main objective of this work. For the development of the serviceability limit state, the characteristics of the Mexican wind climate, uncertainty in the structural response and dynamic properties are considered. To illustrate the employ of the serviceability limit state proposed, a mathematical model of one of the tallest buildings in Mexico is developed.

Shihong Qin
Professor, Chongqing University, China
Bang Rao
Graduate Student, Chongqing University, China
Tianxiang Pi
Associate Professor, Chongqing University, China
&
Dengwei He
Chongqing University, China

Experimental Study on Seismic Behavior of Horizontal Prestressed Brick Masonry Wall

One of the effective measures to improve the seismic performance of masonry structures is to apply prestress to masonry structures. However, in the past, the research and engineering application were mostly about vertical prestress masonry. In order to know the effect and mechanism of the horizontal prestress to improve the seismic performance of masonry, the low cycle repeated load test of three brick masonry wall specimens was carried out.The specimens were built by cement mortar and fired shale perforated brick which size is 240mm×90mm×115mm, and hollow rate is about 30%.Among them one specimen was the ordinary masonry contrast specimen, and other two specimens were prestressed with different sizes through tensioning unbonded steel strand which was set in horizontal perimeter beam at the top of the wall .The results of the tests showed that: the crack expansion of the prestressed masonry wall was obviously reduced; the development of crack was delayed; the number of cracks and the damage of the wall were also reduced; the cracks were re closure after unloading; and increasing the prestress can significantly improve the ultimate deformation capacity and energy dissipation capacity of masonry wall. When failure, it showed as "split and not loose" and maintained good integrity and resistance to collapse. The comparison showed that the cracking load and ultimate load of the vertical prestressed masonry wall had a certain degree of increase, but the ductility had decreased. Therefore, it is believed that the effect of horizontal prestress is better than the vertical prestress in improving the deformation capacity and ductility of masonry wall.

Madi Rafik
Vice Dean of Pedagogy Charge, University May 08 1945, Algeria
&
Mohamed Guenfoud
Dean, University May 08 1945, Algeria

Evaluation of the Capacity after Rehabilitation of Buildings against the Earthquake

Several existing buildings don't have the necessary resistance to earthquakes and could seriously compromise the safety of persons. One of the main causes of the lack of resistance is the poor quality of concrete used during construction. In this case, the rehabilitation of the construction is needed to increase its capacity to resist forces generated during earthquakes. The aim of this paper is to evaluate the capacity of buildings whose resistance of existing concrete is less than the resistance required, and this after reinforcement by addition of reinforced concrete walls and / or repair of element of low resistance elements jacketing. The results obtained from a Pushover analysis in terms of demand capacity and plastic hinges provides insight into the behavior and the actual condition of the structure and its capacity to resist to the regulatory seismic forces applied before and after improving of the capacity of the structure. Capacity after rehabilitation in terms of displacement and shear force is better compared to that of the original structure.

Jihad Rishmany
Assistant Professor, University of Balamand, Lebanon
Nicolas Saba
Assistant Professor, University of Balamand, Lebanon
&
Issam Tawk
Associate Professor, University of Balamand, Lebanon

Optimization of a Vertical Axis Wind Turbine Using FEA, Multibody Dynamics and Wind Tunnel Testing

Wind as a renewable energy source is not yet fully exploited especially in the Middle East region despite the permanent availability of this source. In addition, Lebanon suffers of electricity shortages reaching up to 50% during peak times. For this reason, a domestic vertical axis wind turbine is designed and furthermore a prototype was manufactured and tested. The final configuration was adopted after a series of wind tunnel tests conducted on geometrically similar models of three different airfoil categories: thin airfoil lift-type, thick airfoil lift-type, and drag-type airfoil. Three and five blade configurations were tested for each airfoil family. Optimization of system performance and appropriate component selection were realized with the aid of a multibody dynamics analysis tool and the loading profile was revealed via finite element analysis.

Victor Rogelio Tirado Picado
Director, Construction Department, Universidad Nacional Autonoma de Nicaragua, Nicaragua

Forecast Model of Rainfall for Hydrological Units using Artificial Neural Networks (ANN)

One of the main environmental concerns in Nicaragua, is focused on the posible effects of global climate change and how it affects the country.

Water is the most important formost human activities, but especially for the country's natural ecosystems natural resource. Often, wateris a scarce commodity, especially when the effect of the child makes its ravages, clearly denoting as a limiting resource in the natural environment and activities such as agriculture and industry.

Sometimes, abundance orinadequate wáter distribution can be derived risk situations, which affect stheurban environment and human activity. The study of rainfall in the context of global climate change is crucial for a coherent territorial planning with environmental conservation.

Climate models show significant systematic errors in projecting precipitation. The low spatial resolution of global models causes theprojectionsunderestimatetheimportantspatialvariabilitysmoothedvalues resulting in precipitation.

Rain fall is very irregular variable in its spatial and temporal distribution, so far the behavior of other physical variables such as temperature, pressure etc.

However, the most probable value of daily rainfallis "zero", so the peak probability distribution remain around that value, causing the probability curve is completely asymmetric; a priori no negative rain fall, and low distribution tailgently for positive rainfall.

It is necessary to find new probability distributions, and new proposals for predictive models that can adequately correct model and precipitation climate projections.

Idriss Rouaz
Researcher, National Center for Studies and Integrate Researches of Building "CNERIB", Algeria

Study of Screws' Spacing Influence on Cold Formed Steel Shear Wall Panel

Cold-formed steel shear wall systems have been extensively used in lightweight steel construction. Although effective design recommendations for lightweight steel members and structures have been available, due to the specific characteristics of thin-walled sections and their assembly features, the stability of the thin-walled members, the failure modes of connections and the load-bearing capacity of overall structural wall systems are still attracting designers and researchers' attention.

In seismic design of light gauge steel structures made of cold formed steel elements, a particular attention is paid to the lateral resisting systems. However, a typical cold-formed steel shear wall panel "CFSSWP" which resist to a seismic or wind lateral load consists of a cold-formed steel sheathing, stud, track members, and connectors join the sheathing boards and stud frame. This makes the panel being a composite member and thus its structural behavior might be complicated. These panels are complex assemblies generally modeled using macro-elements to portray the overall shear behavior. Full detailed finite element models are often cumbersome and present difficulties in integrating instability phenomena and nonlinear behavior.

In this context, the present paper put forward a sufficiently detailed modeling technique using "Abaqus" software, capable to simulate with reasonable precision the effect of screws' spacing on the shear wall panel behavior under a lateral load. A special emphasis is placed on the modeling technique of the fasteners that govern the global response of the shear wall panel. For this purpose an adequate force-displacement envelope curve for each screw which integrates the material nonlinearity has been introduced. The mechanical properties for cold-formed steel, boundary conditions of the panel have been also taking into account.

Finally, the model have been validated using existing experimental data. Confirming the reliability of the numerical analysis by finite element and the influence of screws spacing of the model on the behavior of the shear wall panel.

Nicolas Saba
Assistant Professor, University of Balamand, Lebanon
Jihad Rishmany
Assistant Professor, University of Balamand, Lebanon
&
Issam Tawk
Associate Professor, University of Balamand, Lebanon

Optimization of the Production Process of an A-Pillar using a Differential Thickness Profile Approach via FEA

Energy efficiency of car body structures includes, in addition to the obvious aspect of fuel consumption, an ultra-high level of passenger safety. However, with traditional manufacturing processes, an acceptable level of passenger safety results in an increased car body weight. The realization of ultra-high strength properties and, at the same time, improved structural weight could be achieved through different tailoring routes such as: Tailor-Rolling, Tailor-Welding, and differential thermo-mechanical processes. In this technological context, an FE model is developed for the improvement of tailored-rolled technology through which an optimization of state of the art thickness can be realized by using different high-strength materials in the proposed FE model of an existing A-Pillar geometry.

Najib Saliba
Assistant Professor, University of Balamand, Lebanon
&
Johnny Issa
Assistant Professor, University of Balamand, Lebanon

Numerical Modelling of Lean Duplex Stainless Steel and Assessment of Existing Design Methods

The longevity and unique mechanical properties of stainless steel are sufficient reasons for adopting it as a main material in the construction industry. However, its high initial cost, which is largely influenced by the level of nickel content (8% - 10% in the common austenitic grade), relatively restricts its application in structures. The development of lean duplex stainless steel, a low nickel grade that offers twice the strength of the austenitic grade and at nearly half the initial cost, and refining the codified design equations may increase the usage rate of stainless steel in construction. The aim of this paper is to continue the previous research conducted on this new grade by providing more data on its structural performance using numerical modelling. A detailed description of the modelling using the general-purpose finite element analysis package ABAQUS is presented. More than forty lean duplex stainless steel welded I-sections loaded in bending and shear were modelled. The obtained numerical results are reported and used in conjunction with existing experimental and numerical data on stainless steel welded I-sections to assess the codified slenderness limits and shear resistance design equations, the continuous strength method (CSM) for bending and newly proposed shear design equations. Analysis of the results reveals that the current codified design provisions are generally conservative and improved predictions can be achieved using the CSM and the recently proposed shear resistance equations.

Aleksandar Savic
Assistant Professor, University of Belgrade, Serbia
&
Marina Askrabic
Teaching Assistant, University of Belgrade, Serbia

Investigation of Self-Compacting Mortars with Fly Ash and Crushed Brick

The use of industrial by-products and waste materials in cement composites production has been one of the most intriguing topics in construction materials science for several decades.This paper reports an investigation into effects of fly ash (FA) and crushed brick powder (CBP), on the properties of fresh and hardened self-compacting mortars (SCM). These waste materials partially replace limestone powder (LP) which was used as mineral filler. Also, special attention is paid to the combined effects of the mentioned mineral fillers and crushed brick (CB) and recycled concrete aggregate (RCA) on properties of SCM. These waste materials were used as fine river aggregate replacement (0.09/0.25 mm). The composition of one reference and eight more different mixtures with the mentioned materials were adopted in such a manner to preserve constant ratio between all the solid components. Following data were deduced: filling and passing ability (slump flow test, V-funnel test), bulk density of fresh and hardened mortar, compressive and flexural strength, ultrasonic pulse velocity, dynamic modulus of elasticity and adhesion (pull-off strength). These values were used for the global comparison of mortars properties and for the comparison of the effects that each of the recycled components produces. Results of slump flow test ranged from 15 cm to 28 cm. Most of the mixtures after 28 days reached satisfactory compressive strengths (ranged from 26.5 to 48.4 MPa) and flexural strengths (ranged from 6.0 to 8.8 MPa). The results indicate higher final strengths in mixtures with FA used as mineral filler replacement than in those with CBP. Also, although similar results were obtained in mixtures with CB and RCA used as aggregate replacement, mixtures with RCA showed higher values of the measured physical and mechanical properties. Based on the experimental results, a good correlation between compressive strength and dynamic modulus of elasticity, dependent upon material properties, was obtained.

Emrah Sevinc
Ph.D. Student, Dokuz Eylul University, Turkey
&
Mehmet Sukru Guney
Professor, Dokuz Eylul University, Turkey

Experimental Study of the Influence of Plant Configuration on the Wave Propagation Resulting from Dam Break

The influence of plant configuration was investigated experimentally on the flood wave propagation resulting from the sudden dam break. Experimental studies were carried out on a distorted physical model of Ürkmez Dam and its downstream region, built in the scope of the TÜBİTAK 110M240 project titled "Physical and numerical investigation of dam break flood waves - Application to real dams in GIS environment". The model was built in open area of Hydraulics Laboratory of Dokuz Eylül University Civil Engineering Department, with a horizontal scale of 1/150 and vertical scale of 1/30. The distorted physical model contains the reservoir, the residential area in the downstream of the dam until the sea and the plant configuration. The geometrical dimensions of the physical model were determined by using the Froude similitude law, topographic maps and projects of the dam. The model crest length is 2,84 m and its height from the foundation is 1,07 m.

In the experiments; water depths and the flood wave propagation times were measured. Water depths were determined by using of "e+ WATER L" ultrasonic sensors placed in various locations for the measuring of the water levels and "e+ CONTROL" controller. The wave propagation was recorded by high definition digital cameras located at the downstream part.

In this paper, some of experimental findings with plant configuration in the whole area are presented and they are compared to those without plant configuration.

Svetlana Stevovic
Professor, University Union Nikola Tesla, Serbia
Jovana Jovanovic
Ph.D. Student, University Union Nikola Tesla, Serbia
&
Ivan Stevovic
Teaching Assistant University Union Nikola Tesla, Serbia, Serbia

Techno Economic, Environmentally and Socially Optimal Small Hydro Power Plant Construction

Water resources engineering is facing with the complex problem when the construction of hydro power plants and its techno economic evaluations is charged with environmental and social problems. This paper is dealing with the selection of optimal small hydro power plants construction in the catchment area of Babinopoljska river, in Prokletije region in Montenegro. Total available potential, technically available and technically usable potential on the fifteen small hydro power plants profile and for catchments area in total was calculated, as well as average and installed discharge, net head, installed power and energy production for each constructed power plant. Cost benefit analyses for fifteen possible small hydro power plants is conducted, together with belonging environmental and social parameters. Delphi method was applied for the results quantification of Environmental and Social impact assessment study of the project.

Mang Tia
Professor, University of Florida, USA
Ohhoon Kwon
Assistant Scientist, University of Florida, USA
Larry Muszynski
Associate Professor, University of Florida, USA
&
Michael Bergin
State Structural Materials Engineer, Florida DOT, USA

Use of Maturity Method in Concrete Pavement Replacement Slab Construction

This study investigated the use of maturity method to determine early-age-strength of concrete in slab replacement application. Specific objectives were (1) to evaluate effects of various factors on the maturity-strength relationship of concrete at early age, (2) to develop appropriate test procedures for applying maturity method to predict early-age strength of concrete, and (3) to validate the accuracy of the prediction of maturity method using the proposed test procedures.

The maturity method using the Arrhenius maturity function was found to be quite reliable and convenient for use in predicting the early-age compressive strength of concrete in replacement slab application. Some limitations of maturity-strength prediction, such as the strength loss due to high curing temperature and insufficient moisture, supply were observed in the laboratory studies. However, these limitations were observed at the later age of the concrete when the compressive strength reached around 21 to 24 MPa (3,000 to 3,500 psi), and thus the observed limitations did not have any negative effect on the early-age-strength prediction of the concrete in the replacement slab.

Using the strength of the protection specimens as strength determination of the in-place concrete is unreliable and may result in over-prediction of its strength. The maturity method using the Arrhenius maturity function is recommended for use to estimate the early-age compressive strength of concrete in slab replacement application. A testing protocol for the generation of maturity-strength curve for prediction of early-age compressive strength of concrete was recommended. The concrete used in the replacement slab must have exactly the same water-cement ratio, mix ingredients, and fresh concrete properties as those of the laboratory concrete used to develop the maturity curve. In the event that differences in fresh concrete properties, with more than ±2.5 cm (1 inch) slump and/or ±1 % in air contents, are observed between the actual concrete used at the project site and the concrete which has been used to develop the maturity-

strength curve, the maturity-strength curve should not be used to make strength predictions without proper adjustments of the predicted strengths due to effects of the variations in the fresh concrete properties.

Alexander Tyapin
Senior Specialist, ATOMENERGOPROJECT, Russia

NonClassical Damping and Limitations of the Modal and Spectral Dynamic Analyses

If the natural modes and frequencies of the undamped system are used in the modal approach, mass and stiffness matrices become purely diagonal, but damping matrix generally does not. Systems made of a single material (e.g., fixed-base concrete structures) demonstrate almost diagonal damping matrix in the "main coordinates". The combined structure (e.g., made of concrete and steel) usually also has almost diagonal damping matrix.

For the soil-structure systems the off-diagonal damping terms are comparable to diagonal terms. This is "non-classical damping". If the off-diagonal terms are neglected in this case, the results are non-conservative in some parts of the frequency domain.

The author considers a simple 3 DOFs system and compares four variants. The first variant is a full solution without modal approach. The second variant is a modal solution neglecting the off-diagonal terms of the damping matrix. The third variant is also modal, but after cutting down the modal damping coefficients to 20%. The fourth variant is a full solution, but after cutting down parameter of the "soil damper" (to shift all modal coefficients below 20%).

The comparison of the transfer functions from the platform to the structural nodes shows that cutting down the damping is not always conservative both in the full analysis (variant 4 versus 1) and in the modal analysis (variant 2 versus 3) above the first natural frequency. So, the approach of German KTA – to cut "soil dampers" – is not conservative. Standard ASCE4-98 limits the applicability of the modal approach by 20% "composite" modal damping. But if modal damping exceeds this limit, one should not try to cut it down directly or indirectly.

Possible alternative is direct integration, but there is another way to save the modal and spectral approach to the analysis of soil-structure systems - combined asymptotic method, briefly described in the paper.

Mumtaz Usmen
Professor, Wayne State University, USA
Mohsen Isa
Researcher, Wayne State University, USA
&
Emrah Kazan
Lecturer and Researcher, Wayne State University, USA

Quality Modelıng Approach to Improving Unıversity Facılıtıes Services: An Empical Study

Universities build, renovate, maintain and operate a large number of facilities, which requires providing services that must meet the requirements of users. While some universities outsource most of such services, many have substantial facilities management units that mobilize multiple resources through organized efforts to meet customer (student, faculty, staff) expectations. Understanding service quality and pursuing continuous improvement efforts in service delivery are essential for successful operations. The proposed paper will present the development and implementation of a service quality evaluation and improvement project undertaken at Wayne State University, Detroit, MI, USA, for facilities management functions. A review of past service quality modelling research will be presented, and the steps involved in the development of a service quality model for the specific case mentioned will be covered. The approach includes a customer satisfaction survey on different service categories such as restrooms, elevators, lighting, heating and cooling, doors and keys, ceilings, floors, and painting types of services, followed by a nominal group technique (NGT) exercise through participation of facilities management unit leaders, top management input, and progressively refining the initial quality model adopted, so areas needing the highest attention can be identified and improvement recommendations can be advanced. The model utilizes the Service Quality Gap (SQG) concept that is based on the discrepancy between customer expectations and perceived quality ratings, and it incorporates service design, workmanship and resources, and management role as the factors affecting service quality. The importance of effective project management, communications, skills training, standardization of specifications, sufficiency of adequate materials, tools and equipment, as well as the robustness of the IT support system, are emphasized in the conclusions. Although the study pertains to U.S. higher education facilities, the concepts and principals presented should be applicable globally.

Antonio Ventura
Ph.D. Student, Politecnico di Torino, Italy
Bernardino Chiaia
Professor, Politecnico di Torino, Italy
&
Valerio De Biagi
Postdoctoral Fellow, Politecnico di Torino, Italy

Impact of Falling Rock Blocks on Metallic Structures: Contact Law and Dynamic Response

We present the dynamical structural response of a steel member subjected to a localized impact arising by falling blocks in mountainous regions. Different contact models are considered for the interaction between the metallic member (the target) and an impacting spherical rock block.

A simplified SDOF analytical model accounting for nonlinear contact interaction and material nonlinearities has been used to describe the dynamic response of the steel member.

For validation, the investigated contact laws and the dynamic analytical model are compared with more detailed static and dynamic analyses conducted with finite element software Ansys. The results are compared and commented in order to be implemented in future civil engineering design calculations. As a possible application, the study of the impact of a falling block against a planar metallic truss, e.g., a power line tower is proposed.

The uncertainties related to size, velocity and material characteristics of the rock blocks are considered in the simulations.

Junliang Wang
Ph.D. Student, Chongqing University, China

Standards and Case Studies of Green Retrofitting of Existing Buildings in China

More than 50 billion square meters buildings have been built, most of which are high energy consumption and in poor sustainable condition. Green retrofitting offers one of the significant opportunities for the sustainable development of construction industry in improving energy efficiency and comfort level of existing buildings in China. The government have paid great attention to the retrofitting work ,several measures have been adopt to promote its development, for example, funded national science and technology support program, edited national standards,demonstrated green retrofitting building projects, etc.

China Academy of Building Research and other institutes are authorized to edit the national Standard for Green Assessment of Existing Building Retrofitting(Simplified as the" Standard ")by the ministryof housing and urban-rural development People Republic of China. The "Standard" consists of 11 chapters contents, an general provisions in the former three chapters, 7 main categories of green assessment index of exist building retrofitting are included in fields of planning and construction, structure and materials, HVAC, water supply and drainage, electrical and lighting, construction and operation management respectively from chapter 4 to 10, and an innovation and improving measures also considered in chapter 11.Now, the draft has been completed.

A total of 1446 projects,162.7 million square meters of green buildings have been certificated in China by Dec,2013. But new buildings is an absolute majority in the labeling program composition, only 31projects were certificated as exist buildings retrofitted labels, accounting for about 1% in areas, with 1.658 million square meters. According to the comprehensive effect analysis of 31 certificated existing buildings, concluded the result of energy efficiency ratio, energy consumption per unit area,unconventional water utilization, recycled material utilization, incremental cost of public and residential buildings that were shown in table 1.

Weifan Xu
Ph.D. Candidate, Harbin Institute of Technology, China
Fenglai Wang
Professor, Harbin Institute of Technology, China
Yan Zhao
Associate Professor, Jiamusi University, China
&
Xujie Sun
Instructor, Heilongjiang Institute of Technology, China

Research on Seismic Performance of Hectometer Reinforced Block Masonry High-Rise Buildings

Combined with construction of the first hectometer reinforced block masonry building in the world, this paper intends to investigate the seismic performance and design method of reinforced block masonry high-rise buildings through shaking table test and numerical simulation. The 10-storey 1:4 scale model of fully grouted reinforced block masonry shear wall structure was designed and tested under different ground motion intensities on shaking table. The acceleration response, displacement response and steel strain response of the structure were extracted from the test. The dynamic characteristics and dynamic response of the model are analyzed for elastic, cracking and damage phases. It is demonstrated that the fully grouted reinforced masonry shear wall structures have good seismic performance and deformation capacity, and they can meet the requirement of seismic fortification intensity 7. Furthermore, the elastic response of structure under frequent seismic actions and the elastoplastic response under infrequent seismic actions were calculated by the method of time-history. The results meet the requirements of 6 degree and 7 degree seismic fortification intensity, and prove constructing hectometer high-rise buildings by reinforced concrete masonry are feasible.

Santosh Yonjan
MSc Student, Shinshu University, Japan
Toshiyuki Ohkami
Professor, Shinshu University, Japan
&
Koyama Shigeru
Associate Professor, Shinshu University, Japan

Study on the Impacts of April 2015 Earthquake at Lisankhu Village, Sindhupalchok Nepal

Devastating earthquake hit Nepal on 25th April, 2015 taking lives of more than 8800 people. The major cause of the deaths was the collapse of the houses and other structures especially build using traditional building materials in traditional way by local masons. After the major earthquake, it has been obvious that the there is a need for new earthquake resistant structure. However there are risks that locals in rural village may build the same kind of structure. So, there is a burning need to conduct research on complications on introducing new earthquake resistant structure and find out the solution for them. This research identifies the methods to introduce earthquake resistant technology in rural Lisankhu village of Sindhupalchok district in Nepal.

Kseniia Zhaivoronskaia
Ph.D. Student, Southern Federal University, Russia
Sergey Shevtsov
Professor, Southern Federal University, Russia
&
Ilya Tarasov
Project Leader, Carbonstudio LLC, Russia

Model Based Control Optimization for Curing the Shell-like Composite Structures in Autoclave Processing

The paper studies a problem of optimal control synthesis for curing the shell-like compositestructure using open die molding in an autoclave. The necessary control should eliminate early hard skin formation, emergence of resin-rich or resin-dry areas, insufficient consolidation, and uneven cure. This purpose can be achieved through providing uniform distribution of temperature and degree of cure within the cured part volume. The used approach, including the cure problemformulation, its finite element implementation where the correct timing of heating-up and isothermal hold should be found by the optimization procedure, is illustrated using the example of the shell-like composite part manufactured by means of two-stage curing in an autoclave. The control synthesis problem is formulated as a multi-objective optimization problem where minimization objectives are deviations of temperature and degree of cure within a cured part considering constraints imposed by thermokinetic properties of prepreg and manufacturing requirements. The Pareto-based optimization procedure and means of its results visualization allow estimating the best achievable quality indicators of manufactured composite parts, finding satisfactory parameters of the control law, and decision-making considering all imposed constraints.