



**CHALLENGES,
OPPORTUNITIES
AND SOLUTIONS
IN STRUCTURAL
ENGINEERING
AND CONSTRUCTION**

**NADER GHAFOORI
EDITOR**

CHALLENGES, OPPORTUNITIES AND SOLUTIONS IN STRUCTURAL ENGINEERING
AND CONSTRUCTION

PROCEEDINGS OF THE FIFTH INTERNATIONAL STRUCTURAL ENGINEERING AND
CONSTRUCTION CONFERENCE (ISEC-5), LAS VEGAS, USA, 22–25 SEPTEMBER 2009

Challenges, Opportunities and Solutions in Structural Engineering and Construction

Editor

Nader Ghafoori

University of Nevada, Las Vegas, USA



CRC Press

Taylor & Francis Group

Boca Raton London New York Leiden

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

A BALKEMA BOOK

CRC Press/Balkema is an imprint of the Taylor & Francis Group, an informa business

©2010 Taylor & Francis Group, London, UK

Typeset by Vikatan Publishing Solutions (P) Ltd., Chennai, India
Printed and bound in the USA by Edwards Brothers, Inc, Lillington, NC

All rights reserved. No part of this publication or the information contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Although all care is taken to ensure integrity and the quality of this publication and the information herein, no responsibility is assumed by the publishers nor the author for any damage to the property or persons as a result of operation or use of this publication and/or the information contained herein.

Published by: CRC Press/Balkema
P.O. Box 447, 2300 AK Leiden, The Netherlands
e-mail: Pub.NL@taylorandfrancis.com
www.crcpress.com – www.taylorandfrancis.co.uk – www.balkema.nl

ISBN: 978-0-415-56809-8 (Hbk)
ISBN: 978-0-203-85992-6 (eBook)

Table of contents

Preface	XV
Acknowledgements	XVII
Reviewers	XIX
Committees	XXI
<i>Keynote papers</i>	
High-performance materials in earthquake-resistant concrete bridges <i>M. Saiidi, C. Cruz & D. Hillis</i>	3
Implications of air pollution on future electricity generation <i>A. Singh</i>	7
“Root of all evils” misunderstanding of construction industry structure <i>D.T. Kashiwagi</i>	15
<i>Concrete and masonry structures</i>	
Application of nonlinear damper in reinforced concrete structure control <i>F. Hejazi, J. Noorzaei & M.S. Jaafar</i>	25
Behavior of cylindrical R/C panel under combined axial and lateral load <i>T. Hara</i>	31
Calculation method research on the flexural capacity of PSRC beam <i>S. Qin, Y. Wang, F. Li & Z. Ding</i>	39
Cyclic loading deterioration effect in RC moment frames in pushover analysis <i>G. Ghodrati Amiri, B. Mohebi & S.A. Razavian Amrei</i>	45
Evaluating shear capacity of RC joints subjected to cyclic loading using ANN <i>A. Said & E. Khalifa</i>	51
Evaluation of drift distribution in performance-based retrofitting of RC frames <i>G. Ghodrati Amiri & A. Gholamrezatabar</i>	57
Experimental research on high-frequency fatigue behavior of concrete <i>Y. Chen, W. Shao, H. Han, Z. Yin & R. Azzam</i>	63
Experimental study of self-centering RC frames with column yielding mechanism <i>K. Sakino & H. Nakahara</i>	69
Experimental study on high-strength R/C member in tension and shear <i>T. Tamura</i>	75
Improving the behavior of reinforced concrete beams with lap splice reinforcement <i>A.M. Tarabia, M.S. Shoukry & M.A. Diab</i>	81
Load testing a historic monument <i>F.D. Heidbrink</i>	87

Modeling of concrete beams prestressed with AFRP tendons <i>Y.J. Kim</i>	93
Nonlinear finite element analysis of unbonded post-tensioned concrete beams <i>U. Kim, P.R. Chakrabarti & J.H. Choi</i>	99
Predicting shear strength of cyclically loaded interior beam-column joints using GAs <i>A. Said & E. Khalifa</i>	105
Punching shear strength of RC slabs using lightweight concrete <i>H. Higashiyama, M. Mizukoshi & S. Matsui</i>	111
Shear strength and deformation prediction in steel fiber RC beams <i>T. Nyomboi & H. Matsuda</i>	119
Torsional resistance of confined brick masonry panel <i>P.K. Singh</i>	127
 <i>Steel structures</i>	
Effect of shear lug on anchor bolt tension in a column base plate <i>P.K. Khan</i>	135
Elastic-plastic bending load-carrying capacity of steel members <i>P. Juhás</i>	141
Local stability and carrying capacity of thin-walled compressed members <i>P. Juhás, M. Al Ali & Z. Kokorud'ová</i>	149
Finite element analysis of wind induced buckling of steel tank <i>S. Borgersen & S. Yazdani</i>	157
Performance based analysis of RBS steel frames <i>P. Alexa & I. Ladar</i>	161
Practical non-prismatic stiffness matrix for haunched-rafter pitched-roof steel portal frames <i>H.K. Issa & F.A. Mohammad</i>	167
Relationship between strength of scaffolds and shear rigidity of frames <i>H. Takahashi, K. Ohdo & S. Takanashi</i>	173
Sequential failure analysis of tension braced MRFs <i>M. Lotfollahi & M.M. Alinia</i>	181
The optimization of the industrial steel building <i>T. Žula & S. Kravanja</i>	189
 <i>Composite structures</i>	
A finite element model for double composite beam <i>S. Duan, R. Niu, J. Xu & H. Zheng</i>	197
A new composite element for FRP-reinforced concrete slabs <i>Y.X. Zhang & Y. Zhu</i>	203
An experimental study on double steel-concrete composite beam specimens <i>S.J. Duan, J.W. Wang, Q.D. Zhou & H.L. Wang</i>	209
Behaviour of FRP wrapped circular reinforced concrete columns <i>M.N.S. Hadi & V. Yazici</i>	215
Contribution of NSM CFRP bars in shear strengthening of concrete members <i>A.K.M.A. Islam</i>	221

Effect of transverse reinforcing on circular columns confined with FRP <i>G. Ghodrati Amiri, A. Jaber Jahromi & B. Mohebi</i>	229
Experimental investigation of FRP wrapped RC circular and square hollow columns <i>M.N.S. Hadi & Y. Kusumawardaningsih</i>	235
Numerical study on strengthening composite bridges <i>K. Narmashiri & M.Z. Jumaat</i>	241
Repair systems for unbonded post-tensioned 1-way & 2-way slabs with CFRP <i>P.R. Chakrabarti, U. Kim, M. Busciano & V. Dao</i>	247
Strengthening a concrete slab bridge using CFRP composites <i>S.H. Petro, J.T. Peaslee & T.G. Leech</i>	253
Strengthening effect of CCFP for RC member under negative bending <i>I. Yoshitake, S. Hamada, K. Yumikura & Y. Mimura</i>	259
Structural behaviour of reinforced palm kernel shell foamed concrete beams <i>U.J. Alengaram, M.Z. Jumaat & H. Mahmud</i>	265
 <i>Dynamic impact and earthquake engineering</i>	
A note on the model based on the constant Q damping assumption and its corrected models <i>A.S. Takahashi</i>	273
A neural-oscillator model for human-induced lateral vibration on footbridges <i>M. Yoneda</i>	279
Analysis of large dynamic structures in the entertainment industry <i>D.P. Cook & R.T. Robinson</i>	285
Comparison of different standards for progressive collapse evaluation procedures <i>A. Saad, A. Said & Y. Tian</i>	291
Correlation between minimum building strength and the response modification factor <i>L.G. Daza</i>	297
Effect of infill walls in structural response of RC buildings <i>I. Idrizi, N. Idrizi, Z. Idrizi, S. Idrizi & I. Idrizi</i>	303
Estimation of statically equivalent seismic forces of single layer reticular domes <i>H. Abdolpour, Z. Zamanzadeh & A. Behravesht</i>	309
Experimental study of RC slab-CFT column connections under seismic deformations <i>Y. Su & Y. Tian</i>	315
Identification of frequency dependency of quality factor in subsurface ground <i>O. Tsujihara</i>	321
Integrated design and construction to mitigate wind-induced motions of tall buildings <i>K. Moon</i>	327
Mitigation of high acceleration shock waves in hybrid structures <i>S.G. Ladkany & S. Sueki</i>	333
Prefabricated multi-story structure exposed to engineering seismicity <i>J. Witzany, T. Čejka & R. Zigler</i>	339
Satisfying drift and acceleration criteria with double FP bearing <i>M. Malekzadeh & T. Taghikhany</i>	345
Seismic analysis of interlocking block in wall–foundation–soil system <i>M.S. Jaafar, F. Hejazi, A.A. Abang Ali & J. Noorzai</i>	351

Shear crack width of RC column with cut-off rebar under cyclic loading <i>T. Tsubaki, M. Dragoi & J. Onishi</i>	357
Structural behavior of steel frame connections subjected to blast <i>G.S. Urgessa & T. Arciszewski</i>	363
 <i>Bridges and special structures</i>	
Applicability of AASHTO LRFD live load distribution factors for nonstandard truck load <i>Y.J. Kim, R. Tanovic & R.G. Wight</i>	371
Full scale test on a bridge PC box girder <i>C. Mircea, A. Ioani & Z. Kiss</i>	377
Long-term deflections of long-span bridges <i>J. Navrátil & M. Zich</i>	385
 <i>Structural optimization and computation</i>	
A revised BESO method for structures with design-dependent gravity loads <i>X. Huang & Y.M. Xie</i>	393
Investigating the buckling behaviour of single layer dome form of space structures <i>Z. Zamanzadeh, H. Abdolpour & A. Behraves</i>	399
Reasoning on structural timber design for target reliability <i>L. Ozola</i>	405
Shape optimization of shell structures with variable thickness <i>M. Kegl, D. Dinevski & B. Brank</i>	411
Structural damage detection in plates using wavelet transform <i>G. Ghodrati Amiri, A. Bagheri, S.A. Seyed Razzaghi & A. Asadi</i>	415
The non-local theories based on different types of weighted functions and its application <i>Z. Wang & Q. Yang</i>	421
The MINLP approach to structural synthesis <i>S. Kravanja & T. Žula</i>	427
 <i>Construction materials</i>	
Basic study on physical property for calcium-solidification material and on Ca-based concrete <i>A. Shimabukuro & K. Hashimoto</i>	435
Correlations between filler type and the self compacted concrete properties <i>M. Gheorghe, N. Saca & L. Radu</i>	441
Delphi study on Portland cement concrete specifications of ITD <i>H. Sadid, V. Miyyapuram & R. Wabrek</i>	447
Effects of bamboo material on strength characteristics of calcium-based mortar <i>H. Kawamura, K. Hashimoto & A. Shimabukuro</i>	451
Effects of remediation and hauling on the air void stability of self-consolidating concrete <i>N. Ghafoori & M. Barfield</i>	457
Estimation of marine salt behavior around the bridge section <i>E. Iwasaki & M. Nagai</i>	463
Evaluation of alkali-silica reactivity using aggregate mineralogy and expansion tests <i>N. Ghafoori & M.S. Islam</i>	467

Evolution of Portland cement pervious concrete construction <i>J.T. Kevern</i>	473
Experimental research on regional confined concrete columns under compression <i>X.M. Cao, J.C. Xiao, Z.H. Huang & T.J. Ren</i>	479
Experimental study on dry-shrinkage of lightweight cement mortar <i>T. Watanabe & A. Mori</i>	485
Flexural behavior of high strength stone dust concrete <i>V. Bhikshma, R. Kishore & N.H.M. Raju</i>	491
Hemp: Rediscovered raw building material <i>F. Khestl</i>	495
Influence of admixtures on performance of roller compacted concrete <i>P. Hafiz & A.R. Khaloo</i>	501
Investigation of the effect of aggregate on the performance of permeable concrete <i>C. Lian & Y. Zhuge</i>	505
Investigations on flexural behavior of high strength manufactured sand concrete <i>V. Bhikshma, R. Kishore & C.V. Raghu Pathi</i>	511
Moisture permeability and sorption-desorption isotherms of some porous building materials <i>R. Miniotaite</i>	515
Nested ANOVA model applied to evaluate variability of ready-mixed concrete production <i>C. Videla & C. Imbarack</i>	521
On characteristics of bamboo as structural materials <i>T. Tada, K. Hashimoto & A. Shimabukuro</i>	527
Optimization of fly ash content in suppressing alkali-silica reactivity <i>N. Ghafoori & M.S. Islam</i>	533
Overdosing remediation of plastic SCC exposed to combined hauling time and temperature <i>N. Ghafoori & H. Diawara</i>	539
Research into the optimum level of rock-derived micro-fine particles in sand for concrete <i>T. Kaya, K. Hashimoto & H. Yamamoto</i>	545
Retempering remediation of transported SCC under extreme temperatures <i>H. Diawara & N. Ghafoori</i>	551
Strength property of concrete using recycled aggregate and high-volume fly ash <i>T. Ishiyama, K. Takasu & Y. Matsufuji</i>	557
Strength, sorptivity and carbonation of geopolymers concrete <i>A.A. Adam, T.C.K. Molyneaux, I. Patnaikuni & D.W. Law</i>	563
Suitability of some Ghanaian mineral admixtures for masonry mortar formulation <i>M. Bediako, E. Atiemo, S.K.Y. Gawu & A.A. Adjaottor</i>	569
Ultra light-weight self consolidating concrete <i>M. Hubertova & R. Hela</i>	575
Wood use in Type I and II (noncombustible) construction <i>D.G. Bueche</i>	581
 <i>Composite materials</i>	
Computational models for textile reinforced concrete structures <i>W. Graf, M. Kaliske, A. Hoffmann, J.-U. Sickert & F. Steinigen</i>	589

Properties of natural fiber cement boards for building partitions <i>Y.W. Liu & H.H. Pan</i>	595
Studies on glass fiber reinforced concrete composites – strength and behavior <i>B.L.P. Swami, A.K. Asthana & U. Masood</i>	601
Use of bamboo composites as structural members in building construction <i>T.H. Nguyen, T. Shehab & A. Nowrozi</i>	605
Young's modulus of newly mixed cementitious extrusion-molded materials <i>T. Watanabe & A. Mori</i>	609
 <i>Construction methods</i>	
Active pier underpinning of Jin-bin light rail bridge in Tianjin <i>J. Bu, N. Sun & S. Huang</i>	617
CFRP liner quality control for repair of prestressed concrete cylinder pipe <i>A. Allan & H. Carr</i>	623
Configuration, evaluation and selection tool (CET) for tunnel construction methods <i>B. Schaiter & G. Girmscheid</i>	629
Formwork specific, process orientated geometrical-path-velocity-time-model (GPVT-model) <i>M. Kersting & G. Girmscheid</i>	635
Open building manufacture systems: A new era for collaboration? <i>M.D. Sharp & J.S. Goulding</i>	641
Precast ferrocement barrel shell planks as low cost roof <i>S.F. Ahmad</i>	645
Tall building boom – now bust? <i>I.R. Skelton, D. Bouchlaghem, P. Demian & C. Anumba</i>	651
The state-of-the-art of building tall <i>I.R. Skelton, D. Bouchlaghem, P. Demian & C. Anumba</i>	657
 <i>Construction management</i>	
An anatomy of speculative claims in construction <i>H.Y. Pang & S.O. Cheung</i>	665
Builders' perceptions of the impact of procurement method on project quality <i>S. Saha & M. Hardie</i>	671
Business model of the prefab concrete industry – a two-dimensional cooperation network <i>T. Rinas & G. Girmscheid</i>	677
Conservation project management by the architectural digital photogrammetry <i>F. Navarro, A.L. Rodriguez, V. Ávila & C. Loch</i>	683
Construction productivity and production rates: Developing countries <i>C.R. Guntuk & E. Koehn</i>	687
Contractors' influence within the design process of design-build projects <i>H. Haroglu, J. Glass, T. Thorpe & C. Goodchild</i>	693
Delays in the Iranian construction projects: Stakeholders and economy <i>E. Asnaashari, A. Knight & A. Hurst</i>	699
Designing the relationship between contractor and client to partnership <i>K. Spang</i>	705

Determining schedule delay causes under the Build-Operate-Transfer model in Taiwan <i>J.B. Yang & C.C. Yang</i>	711
Dey Street Tunnel: The challenges of a design build project in a congested urban setting <i>M. Trabold</i>	717
Developing a document management model for resolving contract disputes for contractor <i>J.B. Yang & K.M. Huang</i>	723
Development of a decision-making model for requirements management <i>N. Krönert & G. Girmscheid</i>	729
Improving the MEP coordination process through information sharing and establishing trust <i>T.M. Korman</i>	735
Key competences of design-build clients in the People's Republic of China <i>B. Xia & A.P.C. Chan</i>	739
PPP-risk identification and allocation model: The crucial success factor for PPPs <i>T. Pohle & G. Girmscheid</i>	745
Privileges and attractions for private sector involvement in PPP projects <i>A.P.C. Chan, P.T.I. Lam, D.W.M. Chan, E. Cheung & Y. Ke</i>	751
Training of skills and thinking in structural timber design <i>L. Ozola</i>	757
Use of alternative dispute resolution in construction: A comparative study <i>S.O. Cheung, P.S.P. Wong & P. Kennedy</i>	763
 <i>Construction maintenance and infrastructure</i>	
Construction safety in the repair and maintenance sector <i>A.P.C. Chan, F.K.W. Wong, M.C.H. Yam, D.W.M. Chan, C.K.H. Hon, D. Dingsdag & H. Biggs</i>	771
Challenges of a substation and infrastructure upgrade in an urban downtown setting <i>M.L. Cochrane & C.D. Wagner</i>	777
Construction of concrete embedded, direct fixation, ballasted, LVT and special trackwork <i>K.H. Dunne, N. Slama & K. Wong</i>	783
Design issues of the Palmdale Water Reclamation Plant expansion <i>K. Monroe, J. Stanton, P. Wong & S. Maguin</i>	789
Fuzzy logic based diagnostic tool for management of timber bridges <i>S. Ranjith, S. Setunge, R. Gravina & S. Venkatesan</i>	795
 <i>Organizational behavior</i>	
Behaviors of leadership in architectural offices <i>E. Kasapoğlu</i>	805
Gendered behavior: Cultures in UK engineering and construction organizations <i>B. Bagilhole</i>	811
Knowledge management (KM): 'Integrating past experiences' <i>A. Weippert & S. Kajewski</i>	817
Managing innovative change within organisations and project team environments <i>A. Weippert & S. Kajewski</i>	823
Personality types of civil engineers and their roles in team performance <i>K. Gautam & A. Singh</i>	829

System service oriented cooperation – lessons for the construction industry <i>D. Lunze & G. Girmscheid</i>	835
 <i>Sustainability and energy conservation</i>	
Building environmental assessment tool <i>S. Vilčeková, E.K. Burdová & I. Šenitková</i>	843
Building passive design and hotel energy efficiency <i>B. Su & Q. Wang</i>	851
Climatic effects on building facades <i>R. Miniotaite</i>	857
Energy consumption related to winter housing thermal performance <i>B. Su</i>	863
Green energy and indoor technologies for smart buildings <i>F. Vranay, Z. Vranayova, D. Ocipova & D. Lukasik</i>	869
Indoor air quality, distribution systems and energy simulations <i>R. Nagy & I. Šenitková</i>	873
Structural sustainability of high performance buildings <i>M.M. Ali & P.G. Dimick</i>	879
The use of green materials in the construction of buildings' structure <i>B.O. Russell</i>	885
 <i>Engineering economics</i>	
An interactive model for reduction of failure costs: A process management approach <i>J.E. Avendano Castillo, S.H. Al-jibouri & J.I.M. Halman</i>	893
Forecasting low-cost housing demand in urban area in Malaysia using ANN <i>N. Yasmin Zainun & M. Eftekhari</i>	899
Influence of construction costs on schedule performance <i>J.A. Kuprenas</i>	903
LC maintenance strategy development and decision-making model for street maintenance <i>A. Fastrich & G. Girmscheid</i>	907
Macroeconomic costs within the life-cycle of bridges <i>T. Zinke, T. Wachholz & T. Ummenhofer</i>	915
Maintenance life cycle cost model for drainage systems of infrastructures <i>T. Gamisch & G. Girmscheid</i>	921
Trend analysis of cost performance for public work projects <i>P.P. Shrestha, D.R. Shields & L. Burns</i>	927
Smoothing methodology for time series data <i>F. Khosrowshahi</i>	933
Underlying mechanisms of failure costs in construction <i>J.E. Avendano Castillo, S.H. Al-jibouri & J.I.M. Halman</i>	939
 <i>Information technology</i>	
A survey of the current i-Build practices in the Taiwanese construction industry <i>H.J. Chien, H.W. Chien & J.R. Chang</i>	947

Construction information technology and a new age of enlightenment <i>P.S. Brandon</i>	953
How building information modeling has changed the MEP coordination process <i>T.M. Korman, L. Simonian & E. Speidel</i>	959
Organisational e-readiness in the built environment: People, process, technology <i>E.C.W. Lou & J.S. Goulding</i>	965
Technology projects and their impact on the engineering and construction process <i>M.M. Shoura</i>	969
 <i>Geotechnical engineering, foundation and tunneling</i>	
Dynamic effects of machines on foundations buildings <i>J. Vondrich & E. Thöndel</i>	977
Investigations of the dynamic state of turbo sets foundations <i>A.O. Kolesnikov, V.N. Popov & O.M. Kolesnikov</i>	983
Model tests on bearing capacity of soil-bags <i>H. Yamamoto & S. Jin</i>	987
The construction pre-control of a foundation pit in Shanghai <i>Y. Chen, Z. Yin, J. Wu, M. Wang, Y. Chen & R. Azzam</i>	993
Using BESO method to optimize the shape and reinforcement of underground openings <i>K. Ghabraie, Y.M. Xie & X. Huang</i>	1001
 Author index	 1007

Preface

The mission of the International Structural Engineering and Construction (ISEC) conference is to promote innovative and integrative approaches in life cycle systems in civil and building engineering that include constructability, specifications, design, bidding and construction.

The previous ISEC conferences were held in Honolulu, USA (2001); Rome, Italy (2003); Shunan, Japan (2005); and Melbourne, Australia (2007). The purpose of the Fifth International Structural Engineering and Construction Conference (ISEC-5), held in Las Vegas, USA, from September 22 to 25, 2009, was to present and publish recent developments and innovations on these subjects and to continue the transfer of advanced knowledge and technologies as widely as possible. The exchange of information included all branches of structural and civil engineering, construction engineering and management, contracting and claims, architecture, quality control, housing, materials, education and ethics.

These proceedings contain 163 technical articles that were presented during ISEC-5 conference. Each manuscript was peer-reviewed and selected from over 325 abstracts and full papers submitted from 40 countries.

My sincerest gratitude is expressed to many reviewers, who are hereby gratefully acknowledged, for their generous efforts. Thanks are also extended to members of the international and local scientific, advisory, and organizing committees; sponsors and cooperating institutions; for their tremendous support towards a successful ISEC-5.

Nader Ghafoori
Editor
Las Vegas, September 2009

Acknowledgements

Sponsor

University of Nevada, Las Vegas

Co-sponsors

American Society of Civil Engineers
American Concrete Institute
Association for the Advancement of Cost Engineering
Canadian Society of Civil Engineers
Chartered Institute of Building, UK
Chinese Society of Civil Engineers
Concrete Reinforced Steel Institute
Japan Concrete Institute
Japan Society of Civil Engineers
Structural Engineering Institute

Reviewers

The Editor gratefully acknowledges the contributions made by the following reviewers who provided valuable comments and recommendations.

Sayed Ahmad
David Akers
Iyad Alattar
Chimay J. Anuba
Mary Barfield
Sai-On Cheung
Paul Chynoweth
Hamidou Diawara
Francis Edum-fotwe
Dongping Fang
Roger Flanagan
Nader Ghafoori
Ian Gilbert
Gerhard Girmscheid
Jack Goulding
Dean T. Kashiwagi
Mohan Kumaraswamy
Kamran Nemati
Indubhushan Patnaikuni
Habib Sadid
Swapan Saha
Aly Said
Ingrid Senitkova
Pramen Shresta
Amarjit Singh
Ying Tian
Ali Touran
Frank Yazdani

Committees

ISEC Executive Committee

Amarjit Singh, Chair, University of Hawaii, USA
Frank Yazdani, Secretary, North Dakota State University, USA
Nader Ghafoori, University of Nevada, Las Vegas, USA
Takashi Hara, Tokuyama College of Technology, Japan
Indubhushan Patnaikuni, RMIT University, Australia

International Scientific and Technical Committee

Nader Ghafoori, Chair, University of Nevada, Las Vegas, USA
Chimay J. Anumba, The Pennsylvania State University, USA
Nemkumar Banthia, University of British Columbia, Canada
Franco Bontempi, University of Rome "La Sapienza", Italy
Fabio Casciati, University of Pavia, Italy
Sai-On Cheung, City University of Hong Kong, China
John Christian, University of New Brunswick, Canada
Paul Chynoweth, University of Salford, UK
Dejan Dinevski, University of Maribor, Slovenia
Francis Edum-fotwe, Loughborough University, UK
Dongping Fang, Tsinghua University, China
Roger Flanagan, University of Reading, UK
Mike Forde, University of Edinburgh, UK
Ian Gilbert, University of New South Wales, Australia
Gerhard Girmscheid, IBB, ETH Zurich, Switzerland
Jack Goulding, University of Salford, UK
Takashi Hara, Tokuyama College of Technology, Japan
Makarand Hastak, Purdue University, USA
Roozbeh Kangari, Georgia Tech, USA
Dean T. Kashiwagi, Arizona State University, USA
Mohan Kumaraswamy, University of Hong Kong, China
Barzin Mobasher, Arizona State University, USA
Antonio Nanni, University of Washington, USA
Kamran Nemati, University of Washington, USA
Indubhushan Patnaikuni, RMIT University, Melbourne, Australia
Janaka Y. Ruwanpura, University of Calgary, Canada
Swapan Saha, University of Western Sydney, Australia
Saiid Saiidi, University of Nevada, USA
Ingrid Senitkova, Technical University of Kosice, Slovakia
Ahmad Shuaib, American Concrete Institute, USA
Amarjit Singh, University of Hawaii, USA
Takahiro Tamura, Tokuyama College of Technology, Japan
Ali Touran, Northeastern University, USA
Francois Toutlemonde, Laboratoire Central des Ponts et Chaussées, France
Mumtaz A. Usman, Wayne State University, USA
Ramakrishnan Venkataswamy, University of South Dakota, USA

Mike Xie, RMIT University, Melbourne, Australia
Frank Yazdani, North Dakota State University, USA

Local Scientific and Technical Committee

Nader Ghafoori, Chair, University of Nevada, Las Vegas, USA
David Akers, California Nevada Cement Association, San Diego, USA
Iyad Alattar, FHWA, Carson City, USA
Reed Gibby, Nevada Department of Transportation, Carson City, USA
Tie He, Nevada Department of Transportation, Carson City, USA
Samaan Ladkany, University of Nevada, Las Vegas, USA
Neil Opfer, University of Nevada, Las Vegas, USA
Habib Sadid, Idaho State University, USA
Aly Said, University of Nevada, Las Vegas, USA
Harry Teng, University of Nevada, Las Vegas, USA
Ying Tian, University of Nevada, Las Vegas, USA

Local Organizing Committee

Nader Ghafoori, Chair, University of Nevada, Las Vegas, USA
Mary Barfield, University of Nevada, Las Vegas, USA
Greg Desart, GES Inc., USA
Hamidou Diawara, University of Nevada, Las Vegas, USA
David Goldstein, Geo Tek, Las Vegas, USA
Mohammad Shahidul Islam, University of Nevada, Las Vegas, USA
Dara Nyknahad, University of Nevada, Las Vegas, USA
Samuel Palmer, Terracon, Las Vegas, USA
Jonna Sansom, City of Henderson, USA