

Architectural Engineering Conference (AEI 2013)

Building Solutions for Architectural Engineering

**State College, Pennsylvania
3-5 April 2013**

Volume 1 of 2

Editors:

**Chimay J. Anumba
Ali M. Memari**

ISBN: 978-1-62748-407-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2013) by the American Society of Civil Engineers
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact the American Society of Civil Engineers
at the address below.

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, VA 20191

Phone: (800) 548-2723
Fax: (703) 295-6333

www.asce.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Volume 1

EDUCATIONAL ISSUES IN AE – I

BIM Collaboration in Student Architectural Technologist Learning	1
<i>Malachy Mathews</i>	
Integration in the Classroom: Structural Planning and Design	13
<i>Marci S. Uihlein</i>	
Entrepreneurial Characteristics of Architecture and Building Students in Nigeria: A Case of Covenant University	23
<i>Patience Tunji-Olayeni</i>	
Assessing the Impact of Using Photographic Images to Influence Building Retrofit Design Education	33
<i>Steven K. Ayer, John I. Messner, Chimay J. Anumba</i>	
Results of a Pilot Multidisciplinary BIM-Enhanced integrated Project Delivery Capstone Engineering Design Course in Architectural Engineering	43
<i>M. Kevin Parfitt, Robert J. Holland, Ryan L. Solnosky</i>	

CONSTRUCTION ENGINEERING AND MANAGEMENT – I

Causes of Construction Delays for Engineering Projects: An Egyptian Perspective	53
<i>A. Samer Ezeldin, Mohamed Abdel-Ghany</i>	
The Application of Lean Construction Tools in United Kingdom Construction Organisations: Findings From a Qualitative Inquiry	63
<i>Abubakar M. Bashir, Subashini Suresh, David A. Oloke, David G. Proverbs, Rod Gameson</i>	
Relationships Among Contracting Parties and Their Effects On Outcomes of Public Construction Projects in China	73
<i>Yongjian Ke, Florence Y. Y. Ling, Shouqing Wang, Patrick X. W. Zou, Mohan M. Kumaraswamy, Yan Ning</i>	
Value Management in Building Construction Industry of Northern Cyprus: Addressing a Theory and Practice Gap	83
<i>A. Afsharhotli, Alireza Rezaei</i>	
An Analysis of Causes of Disputes in the Construction Industry Using Analytical Hierarchy Process (AHP)	93
<i>Pinar Irlayici Cakmak, Emre Cakmak</i>	

BUILDING RETROFITS

Improving Campus Chilled Water Systems with Intelligent Control Valves: A Field Study	102
<i>Gregor P. Henze, Walter Henry, Marc Thuillard</i>	
Methods for Assessing Longitudinal Variations of Energy Production by PV Systems	112
<i>Seyed Mohsen Shahandashii, Kia Mostaan, Baabak Ashuri</i>	
An Approach for Capturing Requirements of Collaborative Design Teams to Facilitate Evaluation of Energy Efficient Retrofit Design Options	122
<i>Jennifer Frazier, Burcu Akinci, Semiha Ergan</i>	
The Need for Change and Dependency Management in Energy Efficient Retrofit Projects	132
<i>Abdou Karim Jallow, Fangxiao Liu, Chimay J. Anumba, John Messner</i>	

HIGH PERFORMANCE BUILDING SYSTEMS

Finish Materials of Hospital Operating Rooms of the USA and Egypt: Selection and Actual Performance-in-Use	144
<i>Ahmed H. Sherif</i>	
Mortar Joint Maintenance – From Abomination to Preservation	154
<i>Erik Valentino, Brian Chilton</i>	
Pre-Occupancy Evaluation of High-Rise Building Forms	164
<i>Seyed Saleh Kalantari Hematabadi</i>	

Process Management Approach for Achieving Total Building Performance: Essential Requirements for Sustainable Construction	173
<i>Moshood Olawale Fadeyi, Abdou Karim Jallow, Chimay Anumba, Mohammad Dulaimi</i>	
Building Science Integrated Systems Methodological Framework	183
<i>Rodrigo Mora, David Croft</i>	

EDUCATIONAL ISSUES IN AE – II

A Critical Comparison of Construction Engineering and Architectural Engineering Curricula	205
<i>Jenny Ziegler Baker, Douglas Gransberg, Charles Jahren</i>	
Architect and Engineer Collaboration: The Solar Decathlon As a Pedagogical Opportunity	215
<i>Michele Chiuini, Walter Grondzik, Kelsey King, Mark McGinley, Jamie Owens</i>	
Apparatus for Building Electrical Systems Education	225
<i>Lisa Lyons, Clarence E. Waters</i>	
Supporting Students Structurally: Engaging Architectural Students in Structurally Oriented Haptic Learning Exercises	235
<i>Robert Whitehead</i>	

BUILDING CONTROL SYSTEMS

Quantifying the Impact of Occupant Behavior in Mixed Mode Buildings	245
<i>Ryan A. Tanner, Gregor P. Henze</i>	
Probabilistic Identification of Inverse Building Model Parameters	255
<i>Gregory S. Pavlak, Anthony R. Florita, Gregor P. Henze, Balaji Rajagopalan</i>	
Comparison of Shading Control Modes on Offices Space Energy Performance	265
<i>Hui Shen, Athanasios Tzempelikos</i>	
Modeling and Predictive Control of Mixed-Mode Buildings with MatLab/GenOpt	275
<i>Jianjun Hu, Panagiota Karava</i>	

BUILDING FAILURES AND FORENSICS

A Probabilistic Approach to Nonstructural Failure	285
<i>Jonathan Ochshorn</i>	
Assessment of the Quality Steel Reinforcement Bars Available in Nigerian Market	295
<i>Opeyemi Joshua, Kolapo O. Olusola, Calistus Ayegba, Adekunle I. Yusuf</i>	
Above and Beyond: Access Techniques for the Assessment of Buildings and Structures	305
<i>Emma Cardini, Erik Conrad Sohn</i>	

IT SYSTEMS FOR DESIGN AND CONSTRUCTION

Exploiting Modern Opportunities in AEC Industry: A Paradigm of Future Opportunities	320
<i>S. Abrishami, J. S. Goulding, A. Ganah, F. Pour Rahimian</i>	
Parametric Design Procedures: A New Approach to Generative-Form in the Conceptual Design Phase	333
<i>H. K. Abdullah, J. M. Kamara</i>	
A Fuzzy Risk Management Framework for the Egyptian Real Estate Development Projects	343
<i>Ahmed M. Aboshady, Mohamed M. G. Elbarkouky, Mohamed M. Marzouk</i>	
An Integrated Mobile Material Management System for Construction Sites	353
<i>Zhiliang Ma, Zhe Liu, Dongdong Zhang</i>	
Spatial Mapping Approach to Component Tracking Using RTLS System	363
<i>A. Akanmu, S. Hammad Rasheed, I. Abdel Qader</i>	

CONSTRUCTION ENGINEERING AND MANAGEMENT – II

IPD in Practice: Sustaining Collaboration in Healthcare Design and Construction	376
<i>Carrie Sturts Dossick, Rahman Azari, Yong-Woo Kim, Omar El-Anwar</i>	
Predicting Construction Duration with Typical Construction Sequences for High-Rise Buildings	386
<i>Long D. Nguyen, Duc H. Phan, Llewellyn C. M. Tang</i>	

Assessment of Effectiveness of Planning Techniques and Tools on Construction Projects in Lagos State, Nigeria	396
<i>Ayodeji Olubunmi Ogunde, Olabosipo Ishola Fagbenle</i>	

BUILDING ENVELOPE SYSTEMS

Comparative Study of Energy Efficiency of Glazing Systems for Residential and Commercial Buildings	408
<i>Tim Ariosto, Ali M. Memari</i>	
Temporary Masonry Stabilization and Containment - How to Address an Unsafe Condition on a Building Façade	418
<i>Scott Siegfried, Erik Valentino</i>	
Building Envelope Leakage Measurement Using the Air-Handler Fan Pressurization Approach	428
<i>Seul-Ki Han, Jae-Weon Jeong</i>	
Factors Contributing to Global Differences in Building Enclosures	437
<i>David H. Tran, Richard A. Behr</i>	
Hurricane Mitigation Design of Glazing Systems: Requirements for Wind and Windborne Debris Protection	446
<i>Rick De La Guardia</i>	

BIM

Standardisation of Building Information Modelling in the UK and USA: Challenges and Opportunities	457
<i>Energy Maradza, Jennifer Whyte, Graeme D. Larsen</i>	
De-Normalize IFC Model for Data Extraction	467
<i>Hong Gao, Matthew Yu, Hao Liu</i>	
Process Modeling Focusing on BIM and Interdisciplinary Design Relating to Structural Planning and Design	476
<i>Ryan L. Solnosky</i>	
Capturing As-Built Information for a BIM Environment Using 3D Laser Scanner: A Process Model	485
<i>Vasiliki Tzedaki, John M. Kamara</i>	

BUILDING MECHANICAL SYSTEMS

A Library of Standardized Model Components for Retail Plug Loads	495
<i>Emily R. Rader-Neely, Gregor P. Henze, Luigi Gentile Polese, Larry J. Brackney</i>	
Development of Desiccant and Evaporative Cooling Based 100% Outdoor System	505
<i>Min-Hwi Kim, Jae-Weon Jeong</i>	

Volume 2

A Simplified Model for Predicting Dehumidification Effectiveness of a Liquid Desiccant System	516
<i>Joon-Young Park, Jae-Weon Jeong</i>	
Energy Saving Potentials of Demand-Controlled Ventilation Based on the Real-Time Traffic Load in Underground Parking Facilities	524
<i>Hong-Jae Cho, Jae-Weon Jeong</i>	
Creating “As-Operated” Whole-Building Energy Models for Existing Commercial Medium Sized Office Buildings—A Case Study	534
<i>Ke Xu, Payam Delgoshaei, Scott Wagner, James D. Freihaut</i>	

BUILDING ILLUMINATION SYSTEMS

High Dynamic Range Photogrammetry for Light and Geometry Measurement	544
<i>Hongyi Cai</i>	
Office Worker Response to Fluorescent Lamps of Different CCT and Lumen Output	554
<i>Minchen Wei, Kevin W. Houser, Brian Orland, Dean H. Lang, Nilam Ram, Martin J. Sliwinski, Mallika Bose</i>	

Analysis of Balance Between Modeling Accuracy and Computational Speed for a Hybrid Ray-Tracing and Radiosity Method Used in Lighting Simulation	564
<i>Ying-Chieh Chan, Athanasios Tzempelikos</i>	

INNOVATIONS IN BUILDINGS

Diagrids, the New Stability System: Combining Architecture with Engineering	574
<i>Terri Meyer Boake</i>	
Evidence-Based Assessment of Geometrical Staircase Configurations for Older Adults	584
<i>Mona Afifi, Belinda Parke, Mohamed Al-Hussein</i>	
Sustainable Innovations in Building Design: The Courtyard and Veranda Concepts in Nigeria	594
<i>Adetokunbo O. Ilesanmi, Misan Egbe</i>	
Microclimate Analyses for the Design of Building-Integrated Wind Turbines	604
<i>Nicholas M. Rekstad, Jelena Srebric, Ute Poerschke</i>	

SUSTAINABILITY OF BUILDINGS AND CITIES

Urban Electricity Systems: A UK Case Study	614
<i>Sara Louise Walker</i>	
Fire Safety Design and Construction Considerations for Sustainable Residential Structures	624
<i>Thomas M. Korman</i>	
Sustainability Through Collaboration-Based Corporate Social Responsibility	633
<i>Unite Simon Ekwo</i>	

INNOVATIVE BUILDING MATERIALS

Low Carbon Construction Materials and Techniques for Sustainable Housing Development in Nigeria	643
<i>Y. M. D. Adedeji, A. A. Taiwo, O. A. Olotuah, G. Fadairo, D. A. Ayeni</i>	
Recycled Asphalt Pavement As Course Aggregate Replacement in High Strength Concrete Mixes	652
<i>Tara Capson, Andrew D. Sorensen</i>	
Effect of Spent Catalyst as a Fine Aggregate on the Properties of Concrete	662
<i>Khalifa Al-Jabri, Zahran Al-Kamyani, Ramzi Taha, Mahad Baawain, Khalid Al-Shamsi, Abdullah Al-Saidy</i>	

FACILITIES MANAGEMENT

Challenges and Opportunities Involving Facilities Management in Data Handover: London 2012 Case Study	670
<i>Carmel Lindkvist, Jennifer Whyte</i>	
Developing Standards to Assess the Quality of BIM Criteria for Facilities Management	680
<i>Colleen Kasprzak, Ashwin Ramesh, Craig Dubler</i>	
A Case Study Implementation of the BIM Planning Procedures for Facility Owners	691
<i>Sreelatha Chunduri, Ralph Kreider, John I. Messner</i>	
A Methodological Approach to Identify Key Performance Indicators and Measures in Maintenance Services in Infection Control	702
<i>Stanley Njuangang, Champika Liyanage, Akintola Akintoye</i>	

STRUCTURAL SYSTEMS

Use of Mechanical Couplers in Concrete Columns	715
<i>Donald J. Phillippi, Gilbert A. Hegemier</i>	
Racking Performance Analysis of Four-Sided Structural Sealant Glazing Curtain Wall Systems through Video Capture Technique	725
<i>Nicholas C. Simmons, Ali M. Memari</i>	
Finite Element Modeling to Predict Racking Test Results and Performance of Four-Sided Structural Sealant Glazing Curtain Wall Systems	735
<i>Nicholas C. Simmons, Ali M. Memari</i>	

Effects of Bolt Spacing on Prying Forces in WT Connections	745
<i>Christopher H. Raebel, Richard G. Desimone, Austin M. Meier</i>	

DAYLIGHTING AND SUSTAINABILITY

The Impermanence of Permanence: Questioning Permanence As a Central Tenant of Sustainability	755
<i>Melanie Panutsos</i>	
Maximizing Daylight Use Potential in Retail Shopping Environments in the Context of Dhaka, Bangladesh	765
<i>Kumar Biswajit Debnath, Khandaker Shabbir Ahmed</i>	
High Performance Facades: The Effect of Sun Breakers on Daylighting Performance and Energy Consumption in South Oriented Office Spaces	776
<i>Mahmoud Gadelhak, Mohamed Aly, Hanan Sabry</i>	
A Study of Multi-Zone Daylight-Responsive Dimming Systems.....	785
<i>Richard G. Mistrick, Sarith Subramaniam</i>	

ENERGY EFFICIENT BUILDINGS

Assessment of the Potential Savings Resulting from Shutting Down University Buildings during Periods of Very Low Occupancy: A Case Study	795
<i>Carlos Torres, Evelio Siller, Yolanda Allen, Jorge A. J. Caeiro</i>	
Analysis of Residential Energy Consumption Characteristics: A Comparative Study Between Two Cities in China and the U.S.	804
<i>Jing Hong, Hazem Rashed-Ali</i>	
Energy Efficiency of External Perforated Window Solar Screens in Desert Environments: Effect of Screen Surface Reflectance	817
<i>Abbas El-Zafarani, Ahmed Sherif, Rasha Arafa</i>	
Hourly Plug Load Measurements and Profiles for a Medium Office Building - A Case Study	827
<i>Payam Delgoshaei, Ke Xu, Scott Wagner, Richard Sweetser, James Freihaut</i>	

BUILDING DESIGN AND PERFORMANCE

Review and Preliminary Evaluation of the Performance of Weather Resistive Barriers under Seismic Induced Light Frame Wall Deformations.....	837
<i>Jennifer M. Thiede, Ali M. Memari</i>	
Reducing Impact of Wind on Tall Buildings through Design and Aerodynamic Modifications (Architectural and Structural Concepts to Mitigate Wind Effect on Tall Buildings)	847
<i>M. Alaghmandan, M. Elnimeiri</i>	
Material Condition and Deterioration Assessment Program for a 3rd Century Roman Temple.....	857
<i>E. Erdogmus, J. Freedland, A. Jording, A. Kousgaard, C. M. Buckley</i>	

ENERGY AUDITING AND ANALYSIS

Evaluating the Tradeoffs of Occupant Comfort and Energy Savings: A Study of Window Control Sensitivity	867
<i>James Hauswirth, Gregor P. Henze</i>	
Housing and Society: Need for Progressive Sustainability Indicators for Societal Sustainability	877
<i>Renuka Thakore, Jack Goulding, Andrey Benuzh</i>	
Developing a Standard Energy Auditing Process for Pennsylvania State University	891
<i>Tabitha L. Sprau Coulter, Craig R. Dubler, Robert M. Leicht</i>	
Stochastic Energy Simulation for Risk Analysis of Energy Retrofits.....	902
<i>Ralph T. Muehleisen, Yeonsook Heo, Diane J. Graziano, Leah B. Guzowski</i>	
Towards an Integrated Process Model and Decision Support System for High Performance Green Retrofits	912
<i>Pelin Gultekin, Chimay J. Anumba, Robert M. Leicht</i>	

SUSTAINABILITY

Sustainable Development of Urban Heritage at Fort Kochi, Kerala, India	924
<i>A. K. Kasthurba</i>	
Integrating Space-Syntax and Discrete-Event Simulation for E-Mobility Analysis.....	934
<i>Eiman Y. Elbanhawy, Ruth Dalton, Khaled Nassar</i>	
Building Sustainability into the UAE: ESTIDAMA	946
<i>Yasemin Nielsen</i>	
A Methodology to Quantify Visual Quality into Smart Communities: An Optimization Approach.....	956
<i>E. Y. Elbanhawy, O. Hosny, K. Nassar</i>	

STRUCTURAL PERFORMANCE

Architecturally Exposed Structural Steel: Clear Communications for a Better Project	968
<i>Terri Meyer Boake</i>	
Masonry Wall Flashing – Critical to Performance, but Often Overlooked	978
<i>Scott Siegfried, Erik Valentino</i>	
Advancing the Structural Use of Earth-based Bricks: Assessing the Reliability of Existing Testing Procedures.....	988
<i>E. A. Obonyo, P. Donkor, M. Baskaran, F. Amezugbe</i>	
Development of Kinematic Equations for Racking Performance Evaluation of Four-Sided Structural Sealant Glazing Curtain Wall Systems	997
<i>Nicholas C. Simmons, Ali M. Memari</i>	

DESIGN AND CONSTRUCTION

A Framework for Construction Labor Productivity Improvement in Egypt.....	1007
<i>Ahmed H. El-Batreek, Ahmed S. Ezeldin, Mohamed M. G. Elbarkouky</i>	
Design Philosophy of the Traditional Kuwaiti House	1018
<i>Mohammad Alhazim, John Littlewood, Keireine Canavan, Paul Carey</i>	
Author Index	