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

## Contracting and Legal Issues

1. **A Delphi Study on the Effects of Culture on the Choice of Dispute Resolution Methods in International Construction Contracts**  
   Ghada M. Gad and Jennifer S. Shane

11. **Applying Delay Analysis Techniques to the World Bank Funded Projects**  
   Salwa Fawzy and Islam El-Adaway

21. **Comparative Analysis of Design-Bid-Build and Design-Build from the Standpoint of Claims**  
   Pardis Pishdad-Bozorgi and Jesus M. de la Garza

31. **Delivering Solar Highway Project: A Case Study**  
   Xinyuan Zhu and Qingbin Cui

41. **Impact of Unit Time Value on Contractors’ Optimal Bidding Strategies in Price-Time Bi-Parameter Bidding**  
   Saeed Abdollahipour and “David” Hyung Seok Jeong

51. **Implementing a New Doctrine for Health Facility Commissioning**  
   Gregory Lasker, Phillip Dunston, Chen Chen, and Mark Kenneday

61. **Initiating IPD Concepts on Campus Facilities with a “Collaboration Addendum”**  
   Bryan Franz and Robert M. Leicht

71. **Managing the Period Preceding the Calling for a DAB’s Decision**  
   Ayman Makarem, M. Asem Abdul-Malak, and Issam Srour

80. **Mapping the Submittal Process in a Design-Bid Build Project**  
   Ana Catarina V. M. F. Pestana, and Thais da C. L. Alves

90. **Modified Isolated Delay Type Technique**  
   Sasan Golanaraghi and Sabah Alkass

## Construction Means and Methods
A Decision-Support Model Utilizing a Linear Cost Optimization Approach for Heavy Equipment Selection
Ahmad Jrade and Nizar Markiz

Automation System Design and Lab Testing to Facilitate Tunnel Boring Machine Guidance in Construction of Large-Diameter Drainage Tunnels
Xuesong Shen, Ming Lu, and Siri Fernando

Equipment Technology Innovation for Extreme-Batter Pile Driving Operations
David Grau, John Kirk, and Edward W. Back

Evaluation of Data Requirements for Computerized Constructability Analysis of Pavement Rehabilitation Projects
Masoud Gheisari, Laura Florez, Javier Irizarry, and Daniel Castro

Integrated Construction Engineering Activities to Satisfy Challenging Project Objectives
Clyde B. Tatum

Monitoring the Efficiency of Bridge Construction Using LWSM Model
Seonghoon Kim and Yong Bai

Pilot Tube Microtunneling: A Current State of Practice in North America
Jason S. Lueke, Vamseedhar Gottipati, and Jeff Boschert

Task Analysis for Improving Training of Construction Equipment Operators
Robert W. Proctor, Phillip S. Dunston, Joey C. Y. So, and Xiangyu Wang

Construction Planning, Control, and Risk Management

A Conceptual Model to Develop a Worker Performance Measurement Tool to Improve Construction Productivity
Chandana S. A. Siriwardana and Janaka Y. Ruwanpura

A Framework for Construction Strategy Formulation and Visualization
Ngoc Tran, Alan Russell, and Sheryl Staub-French
A Risk-Sensitive Markup Decision Model
Rita Awwad and Photios Ioannou

A Study on Crew Performance Measurement by Using Heart Rate and Oxygen Consumption
Wen-ta Hsiao, Hsien-tang Wu, and Tao-ming Cheng

Accuracy Analysis of Selected Tools for Estimating Contract Time on Highway Construction Projects
Timothy R. B. Taylor, Michael Brockman, Dong Zhai, Paul M. Goodrum, and Roy Sturgill

Algorithm for Time-Cost Tradeoff Analysis in Construction Projects by Aggregating Activity-Level Singularity Functions
Shannon B. Terry and Gunnar Lucko

An Analytic Review of Earned Value Management Studies in the Construction Industry
Shu Chen and Xueqing Zhang

An Optimization Model for Maximizing the Benefits of Fast-Tracking Construction Projects
Youssef Khoueiry, Issam Srour, and Ali Yassine

Analysis of Risk-Response Measures for Tunneling Projects
Veerasak Likhitruangsilp and Photios G. Ioannou

Analysis of the Work Flow in a Complex Project
Adam Frandson and Thais da C. L. Alves

Are Soft Costs Increasing in Transit Projects?
Ye Zhang and Ali Touran

Attribute-Based Risk Model for Measuring Safety Risk of Struck-By Accidents
Behzad Esmaeili and Matthew Hallowell

Comparison of Design Risk Factors of Multistory Commercial Office Buildings
Vineeth Dharmapalan and John A. Gambatese

Continuous Process Planning and Controlling Techniques for Construction Productivity Performance Enhancement
Upul Ranasinghe and Janaka Ruwanpura

Creating Automated Crane Work Plans Using Real Time Operational Data and Predictive Analysis
Amir Zavichi and Amir H. Behzadan

Critical Risk Factors in Project Delivery Method Selection for Highway Projects
Dai (Daniel) Tran and Keith Molenaar

Designer, Contractor, and Owner Views on the Topic of Design for Construction Worker Safety
Nicholas Tymvios, John Gambatese, and David Sillars

Development of a Framework for Identifying Information Bottlenecks and Evaluating Different Data Capture Technologies to Support Proactive Productivity Management
Te Gao, Semiha Ergan, Burcu Akinci, James H. Garrett, Jr., and Lucio Soibelman

Development of Fuzzy Enabled Shuffled Frog Leaping Algorithm with Activity Splitting Allowed in Construction Project Scheduling
Mehdi Tavakolan and Baabak Ashuri

Jing Peng, Aminah Robinson Fayek, Ashraf Mohamed, and Chris Kennett

Finance-Based Scheduling for Multiple Projects with Multimode Activities
Mohammed Saeed El-Abbasy, Tarek Zayed, and Ashraf Elazouni

Formalizing the Four-Dimensional (4D) Topology As the Base for 4D Analysis in Construction Planning
Xing Su, Lei Zhang, Abdul Rahman Andoh, and Hubo Cai

Hazard Recognition Methods in the Construction Industry
Alex Albert and Matthew R. Hallowell
417  Historical Data Driven and Component Based Prediction Models for Predicting Preliminary Engineering Costs of Roadway Projects
   Asregedew Woldesenbet and “David” HyungSeok Jeong

427  Identification of Changes Formation Scenarios in Construction Projects Based on Changes Occurrence Paths Analysis
   Mohammad Hadi Charkhakan and Gholamreza Heravi

437  Information Exchange Requirements for Capital Equipment and Facility Infrastructure for Semiconductor Facilities
   Allan D. Chasey and Shruthi Pindukuri

447  Interface Management Model for Mega Capital Projects
   Samin Shokri, Mahdi Safa, Carl T. Haas, Ralph C. G. Haas, Kelly Maloney, and Sandra MacGillivray

457  Is the Information Available from Historical Time Series Data on Economic, Energy, and Construction Market Variables Useful to Explain Variations in ENR Construction Cost Index?
   Baabak Ashuri, Seyed Mohsen Shahandashti, and Jian Lu

465  Maximizing Labor Stability As a Sustainability Performance Indicator in Project Scheduling
   Laura Florez, Daniel Castro, and Andrés L. Medaglia

475  Method Using Metric-Based Performance Feedback to Predict Client Satisfaction—A Hospital Case Study
   Wendy Li, Leah Jin, Martin Fischer, and John Kunz

485  Modeling Measures of Float Monetization for Quantitative Risk Management of Construction Projects
   Richard C. Thompson, Jr., and Gunnar Lucko

495  Pipe Spool Fabrication Sequencing by Automated Planning
   Di Hu and Yasser Mohamed

505  Predicting the Preliminary Engineering Duration of Bridge Projects
Min Liu, William Rasdorf, Donna A. Hollar, Joseph E. Hummer, and Shalin C. Parikh

515 Relationships between Methods for Constructability Analysis during Design and Constructability Failures in Projects
Gabriel Raviv, Aviad Shapira, and Rafael Sacks

525 Safety Risk Analysis and Proposing Risk Mitigation Strategies for Operations and Maintenance Activities in Highways: A Qualitative Method
Sayanti Mukhopadhyay, Jennifer S. Shane, and Kelly C. Strong

535 Schedule Assessment and Evaluation
S. Farzad Moosavi and Osama Moselhi

545 Stochastic Method for Forecasting Project Time and Cost
Adel Alshibani and Osama Moselhi

556 Understanding of Target Value Design for Integrated Project Delivery with the Context of Game Theory
Wooyong Jung, Glenn Ballard, Yong-Woo Kim, and Seung Heon Han

Knowledge Management and Information Technology

564 A Framework for an Integrated and Evolutionary Body of Knowledge
Daniel Forgues, Ivanka Iordanova, and François Chiocchio

574 A Framework for Automatic Safety Checking of Building Information Models
Sijie Zhang, Jin-Kook Lee, Manu Venugopal, Jochen Teizer, and Charles M. Eastman

582 A Model for Product-Process Integration in the Building Industry Using Industry Foundation Classes and Design Structure Matrix
Jeevan Jacob and Koshy Varghese

591 A Semantic Approach to Representation, Sharing, and Discovery of Construction Simulation Models
Farzaneh Saba and Yasser Mohamed
An Extension of the Technology Acceptance Model for BIM-Based FM
Seul-Ki Lee, Hyo-Kyung An, and Jung-Ho Yu

Automated Generation of 4D Building Information Models through Spatial Reasoning
Yibrah W. Weldu and Gerald M. Knapp

Automated Regulatory Information Extraction from Building Codes: Leveraging Syntactic and Semantic Information
Jiansong Zhang and Nora El-Gohary

Automatic Identification of Unsafe Bending Behavior of Construction Workers Using Real-Time Location Sensing and Physiological Status Monitoring
Giovanni C. Migliaccio, Jochen Teizer, Tao Cheng, and Umberto C. Gatti

Cognitive Analysis of Field Managers
Fernando A. Mondragon Solis and William J. O’Brien

Comparing Information Technology Adoption between Developing and Developed Countries
Mehdi Nourbakhsh, Rosli Mohamad Zin, Javier Irizarry, Samaneh Zolfagharian, and Masoud Gheisari

Conceptual Framework of the Green Building Information Management System
Veerasak Likhitruangsilp, Wanida Putthividhya, and Photios G. Ioannou

Concurrent Data Collection Method for Building Energy Analysis Using Project Temporary Database
Ka-ram Kim and Jung-ho Yu

Construction Research Data Management
Arash Shahi, Kaitlin Carlson, A. J. Antony Chettupuzha, Carl T. Haas, Jeffrey S. West, and Burcu Akinci

Construction to Operations Exchange: Challenges of Implementing COBie and BIM in a Large Owner Organization
Anne Anderson, Andrew Marsters, Carrie Sturts Dossick, and Gina Neff

698  **Context-Aware Computing Framework for Improved Bridge Inspection**
    Manu Akula, Atul Sandur, Vineet R. Kamat, and Atul Prakash

708  **Coordination Process and Network Centrality in ISGI Airport’s Wayfinding Project**
    Sevgi Zeynep Doğan, Suat Gunhan, and Bengi Erbasaranoğlu

718  **Cost-Effective Mobile Application Strategies in a Competitive and Economically Challenged Industry**
    Tim Clancy, Jeong-Han Woo, and Pawel Wyszkowski

728  **Facilities Management Interaction with Healthcare Delivery Process**
    Atefeh Mohammadpour, Chimay Anumba, Tanyel Bulbul, and John Messner

737  **Identifying Energy Auditing Process and Information Exchange Requirements for the Commercial Building Retrofit Sector**
    Tabitha L. Sprau Coulter, Jason Hinsey, Robert M. Leicht, Michael G. Whelton, and David R. Riley

747  **Leveraging Building Information Models to Support Supply Chain Decisions in Construction Projects**
    Marcelo Azambuja, Thais Alves, Fernanda Leite, and Jie Gong

757  **Machine Vision-Based Infrastructure As-Built Documentation Using Edge Points**
    Habib Fathi and Ioannis Brilakis

767  **Providing Query Support to Leverage BIM for Construction**
    Madhav Nepal, Sheryl Staub-French, and Rachel Pottinger

778  **Rethinking the Cost Estimating Process through 5D BIM: A Case Study**
    Daniel Forgues, Ivanka Iordanova, Fernando Valdiviesio, and Sheryl Staub-French
Spatio-Temporal Safety Analysis of Construction Site Operations Using GPS Data
Nipesh Pradhananga and Jochen Teizer

Value-Sensitive Construction: Value Discovery in Building Projects
Hamid Jahani and Nora El-Gohary

Data Sensing and Analysis

A Boundary Condition-Based Algorithm for Locating Construction Site Objects Using RFID and GPS
Abdul Rahman Andoh, Xing Su, and Hubo Cai

A Framework of RFID and GPS for Tracking Construction Site Dynamics
Abdul Rahman Andoh, Xing Su, and Hubo Cai

A Non-Intrusive Occupancy Monitoring System for Demand Driven HVAC Operations
Zheng Yang, Nan Li, Burcin Becerik-Gerber, and Michael Orosz

Activity-Based Data Fusion for Automated Progress Tracking of Construction Projects
Arash Shahi, Jose M. Cardona, Carl T. Haas, Jeffrey S. West, and Gary L. Caldwell

Analysis of XBOX Kinect Sensor Data for Use on Construction Sites: Depth Accuracy and Sensor Interference Assessment
Nima Rafibakhsh, Jie Gong, Mohsin K. Siddiqui, Chris Gordon, and H. Felix Lee

Application of Microsoft Kinect Sensor for Tracking Construction Workers
I. P. Tharindu Weerasinghe, Janaka Y. Ruwanpura, Jeffrey E. Boyd, and Ayman F. Habib

Application Potential of Ultra-Wide Band Radar for Detecting Buried Obstructions in Construction
Junhao Zou, Ming Lu, Rambabu Karumudi, and Xuesong Shen
879 Automated Vision-Based Recognition of Construction Worker Actions for Building Interior Construction Operations Using RGBD Cameras

Víctor Escorcia, María A. Dávila, Mani Golparvar-Fard, and Juan Carlos Niebles

889 Automated Visual Recognition of Construction Equipment Actions Using Spatio-Temporal Features and Multiple Binary Support Vector Machines

Arsalan Heydarian, Mani Golparvar-Fard, and Juan Carlos Niebles

899 Automating and Optimizing Spatial Data Processing Workflows for Civil Infrastructure Inspection

Pingbo Tang and Anu Pradhan

909 Binary and Multi-Class Classification of Fused LIDAR-Imagery Data Using an Ensemble Method

Seyed Hossein Hosseini Nourzad and Anu Pradhan

919 Classification of Bricklaying Activities in Work Sampling Categories Using Accelerometers

Liju Joshua and Koshy Varghese

929 Comparison of Image-Based and Time-of-Flight-Based Technologies for 3D Reconstruction of Infrastructure

Fei Dai, Abbas Rashidi, Ioannis Brilakis, and Patricio Vela

940 Detection of Construction Workers in Video Frames for Automatic Initialization of Vision Trackers

Man-Woo Park, Evangelos Palinginis, and Ioannis Brilakis

950 Effects of Planning and Data Collection Approaches on the Quality of Processed Laser Scanned Data: Lessons Learned

Matineh Eybpoosh, Burcu Akinci, and Mario Bergés

960 Image-Based 3D Mapping of Rebar Location for Automated Assessment of Safe Drilling Areas Prior to Placing Embedments in Concrete Bridge Decks

Mani Golparvar-Fard, Behshad Ghadimi, Kamel S. Saidi, Geraldine S. Cheok, Marek Franaszek, and Robert R. Lipman
971 Productivity Enhancement for Maintenance Equipment Operations Using Telematics Technology
   Bugra Aslan and Dae-Hyun (Dan) Koo

981 Proximity Sensing and Warning Technology for Heavy Construction Equipment Operation
   Eric Marks and Jochen Teizer

991 Rapid 3D Energy Performance Modeling of Existing Buildings Using Thermal and Digital Imagery
   Youngjib Ham and Mani Golparvar-Fard

1001 Real-Time Posture Analysis of Construction Workers for Ergonomics Training
   Soumitry J. Ray and Jochen Teizer

1011 RFID+ for Tracking Earthmoving Operations
   Ali Montaser and Osama Moselhi

1021 Sensor Modeling of Laser Scanners for Automated Scan Planning on Construction Jobsites
   Pingbo Tang and Fahd Saleh Alaswad

1032 Vision-Based Motion Detection for Safety Behavior Analysis in Construction
   SangUk Han, SangHyun Lee, and Feniosky Peña-Mora

1042 Vision-Based Recognition of Dirt Loading Cycles in Construction Sites
   Ehsan Rezazadeh Azar and Brenda McCabe

Construction Simulation, Visualization, and Product Modeling

1052 A Case Study of 3D Imaging Productivity Needs to Support Infrastructure Construction
   Gabriel B. Dadi, Paul M. Goodrum, Kamel S. Saidi, Christopher U. Brown, and Joseph W. Betit

1063 A Hybrid Framework for Modeling Construction Operations Using Discrete Event Simulation and System Dynamics
   Hani Alzraiee, Osama Moselhi, and Tarek Zayed
1074  A Special Purpose Simulation Template for Modeling Tire Usage of Mining Truck Fleet
    Ronald Ekyalimpa, Simaan M. Abourizk, and Rod Wales

1084  A VR Model of Ergonomics and Productivity Assessment in Panelized Construction Production Line
    Ndukeabasi Inyang, SangHyeok Han, Mohamed Al-Hussein, and Marwan El-Rich

1094  Activity Criticality Index Assessment Using Critical Path Segment Technique and Interactive Simulation
    Pei Tang and Amlan Mukherjee

1104  Agent-Based Simulation of Labour Emergency Evacuation in High-Rise Building Construction Sites
    Hisham Said, Amr Kandil, and Hubo Cai

1114  An Ontological Approach to Building Information Model Exchanges in the Precast/Pre-Stressed Concrete Industry
    Manu Venugopal, Charles M. Eastman, and Jochen Teizer

1124  Application of Electimize in Solving the Construction Site Layout Planning Optimization Problem
    Mohamed Abdel-Raheem and Ahmed Khalafallah

1135  Assessing Productivity Improvement of Quick Connection Systems in the Steel Construction Industry Using Building Information Modeling (BIM)
    Yongwei Shan, Paul Goodrum, Carl Haas, and Carlos Caldas

1145  Augmenting BIM with 3D Imaging Data to Control Drilling for Embeds into Reinforced Concrete Bridge Decks
    Manu Akula, Robert R. Lipman, Marek Franaszek, Kamel S. Saidi, Geraldine S. Cheok, and Vineet R. Kamat

1155  Automated 3D Building Envelope Recognition from Point Clouds for Energy Analysis
    Chao Wang and Yong Cho

1165  Automated Planning and Design of Formwork for Freeform Shell Structures
    Khaled Nassar and Ebrahim A. Aly
1175  BIM + AR: A Framework of Bringing BIM to Construction Site
    Xiangyu Wang, Peter E. D. Love, and Peter Rex Davis

1182  Change Management with Building Information Models: A Case Study
    Behzad Pilehchian Langroodi and Sheryl Staub-French

1192  Combined Discrete and Continuous Modeling of Construction Activities Using Three Phase Activity Scanning Approach
    Vivek Puri and Julio C. Martinez

1202  Construction Processes Planning of TBM Tunneling Projects: A System Dynamics Approach
    Mohammad Mahdi Farshchian and Gholamreza Heravi

1212  Creating 3D Web-Based Game Environment Using BIM Models for Virtual On-Site Visiting of Building HVAC Systems
    Zhigang Shen, Landu Jiang, Kevin Grosskopf, and Charles Berryman

1222  Data Management for Construction Processes Using Fuzzy Approach
    Emad El Wakil and Tarek Zayed

1232  Developing As-Built Building Information Model Using Construction Process History Captured by a Laser Scanner and a Camera
    Xuesong Liu, Matineh Eybpoosh, and Burcu Akinci

1242  Development of 4D Public Participation GIS to Improve Communication of City Transformation Processes
    Tim Johansson, Timo Hartmann, Rogier Jongeling, and Thomas Olofsson

1252  GIS-Based Buffering for Construction Workspace Management
    Xing Su, Lei Zhang, Abdul Rahman Andoh, and Hubo Cai

1262  Hybrid Approach to Visualize Building Energy Information Model in Geospatial Application Programs
    Hee Jung Im, Mengmeng Gai, Chao Wang, and Yong Cho
1271  Integrated BIM/Lean Base Production Line Schedule Model for Modular Construction Manufacturing
Mansooreh Moghadam, Aladdin Alwisy, and Mohamed Al-Hussein

1281  Integrated Building Information Model to Identify Possible Crane Instability Caused by Strong Winds
Shafiul Hasan, Hamid Zaman, Sanghyeok Han, Mohamed Al-Hussein, and Yi Su

1291  Integrating Building Information Modeling with Universal Design Requirements for Highly Accessible Homes
Ahmad Jrade and Paola Zurro Valdez

1301  Integrating Structural and Construction Engineering
Clyde B. Tatum and Gregory P. Luth

1311  Modeling Airport Check-In and Security Procedures Using SimFC
Jamal Siadat, Faisal Arain, and Janaka Ruwanpura

1320  Modeling of Continuous Stochastic Construction Operations for Discrete Event Simulation
Vivek Puri and Julio C. Martinez

1330  Monitoring and Visualization of Building Construction Embodied Carbon Footprint Using DnAR-N-Dimensional Augmented Reality Models
Milad Memarzadeh and Mani Golparvar-Fard

1340  Multi-Criteria Design Evaluation and Optimization of School Buildings Using Artificial Intelligent Approaches
Elnaz A. Tabrizi, Mohamed Al-Hussein, and Ndukeabasi Inyang

1350  Photo-Modeling for Construction Site Space Planning
Satish Gore, Lingguang Song, and Neil Eldin

1360  Remote Monitoring of Dynamic Construction Processes Using Automated Equipment Tracking
Reza Akhavian and Amir H. Behzadan

1370  Rendering Stereoscopic Augmented Reality Scenes with Occlusions Using Depth from Stereo and Texture Mapping
Joseph Louis and Julio Martinez
1381 Sensitivity of Energy Simulation Models to Occupancy Related Parameters in Commercial Buildings
   Elie Azar and Carol Menassa

1391 Structural Steel Fabrication Special Purpose Simulation
   Amin Alvanchi, Allen Nguyen, and Simaan M. Abourizk

Organizational and Labor Issues

1400 A Framework of Teamwork Attributes Affecting Workers’ Safety
   Panagiotis Mitropoulos and Babak Memarian

1410 A Quantitative Approach for Measuring Managerial Interfaces in the Development of a Capital Project
   Sungmin Yun, Stephen P. Mulva, and William J. O’Brien

1420 A Research Framework for Work Sampling and Its Application in Developing Comparative Direct and Support Activity Proportions for Different Trades
   Abraham Assefa Tsehayae and Aminah Robinson Fayek

1430 Corporate Safety Performance Benchmarking in Construction
   Jiukun Dai, Stephen Mulva, Arpamart Chanmeka, Sung-Joon Suk, and Sungmin Yun

1440 Effective Methods and Learning Environment for Retaining Cost Estimating Knowledge and Skills
   Anwar Alroomi and “David” Hyung Seok Jeong

1450 Exploring Absenteeism Control Policies with Awareness of the Effect of Group Norms on Absence Behavior, Using Agent-Based Modeling
   Seungjun Ahn, SangHyun Lee, and Moonseo Park

1460 Impact of Inter-Firm Collaboration Networks in International Construction Projects: A Longitudinal Study
   Heedae Park and Seung Heon Han

1471 Implementation of Survey Method in a Construction Team Effectiveness Study
   Nurhidayah Azmy, Jennifer S. Shane, and Mack C. Shelley
1481 Institutional Issues Related to Project Governance of Infrastructure PPP Projects in India
   Venkata S. K. Delhi and Ashwin Mahalingam

1491 Interpreting Design Practice from the Lens of Heidegger’s Modes of Being
   Timo Hartmann

1499 Long and High Jumps: Knowledge Sharing Connections That Span Geographic and Disciplinary Boundaries in Interdisciplinary Intra-Firm Networks
   John Wanberg and Amy Javernick-Will

1510 The Need for Indices to Assess the Health of the Construction Industry
   Nader Naderpajouh, Akhila Boppana, and Makarand Hastak

1520 Relationship between Floor Number and Labor Productivity in Multistory Structural Work: A Case Study
   Long D. Nguyen and Hung T. Nguyen

   Farrukh Arif, Nida Azhar, and Mehmet Emre Bayraktar

1540 Sustainable Management of Infrastructure Projects: The Role of Workers’ Satisfaction through Financial Loss Reduction
   Islam El-Adaway

Quantitative Methods

1550 Assessment of Public Opposition to Infrastructure Developments: The Case of Nuclear Power Projects
   Vanessa Valentin, Dulcy Abraham, Fred Mannering, and Ali Mostafavi

1560 Hybrid Genetic Algorithm Parameter Effects for Optimization of Construction Resource Allocation Problem
   Jin-Lee Kim

1570 Impact of Design Cost on Design Bid Build Project Performance
Pramen P. Shrestha and Nirajan Mani

1580  **Optimal Material Logistics Planning in Congested Construction Sites**  
Hisham Said and Khaled El-Rayes

1590  **Stochastic Optimization of Construction Projects Planning with Genetic Algorithm**  
Mehdi Tavakolan and Baabak Ashuri

1600  **Valuation of Minimum Revenue Guarantees for PPP Wastewater Treatment Plants**  
Mohammed R. Hassan Ali, Hesham Osman, Mohamed Marzouk, and Moheeb Ibrahim

**Environmentally Sustainable Design and Construction**

1610  **A Comparative Study on Environmental Life Cycle Impacts of Curtain Walls**  
Rahman Azari and Yong-Woo Kim

1620  **A Framework for Evaluating Sustainable Rural Development: A Case Study Using a Distributed Water Reclamation Facility**  
Scott Glick, Angela Acree Guggemos, and Alison R. G. Rosso

1631  **A Framework for Managing Construction Demolition Waste: Economic Determinants of Recycling**  
Issam M. Srour, Sandy Tamraz, Ghassan R. Chehab, and Mutasem El-Fadel

1641  **A Real Options Model to Evaluate Investments in Photovoltaic (PV) Systems**  
Hamed Kashani, Baabak Ashuri, Jian Lu, and Mohsen Shahandashti

1651  **An Experimental Approach to Optimizing Natural Ventilation in Public Spaces of Complex Buildings**  
Nathan Taylor and Carol C. Menassa

1662  **Carbon Emissions of On-Site Equipment Use in Post-Tensioned Slab Foundation Construction**  
Sivakumar Palaniappan, Howard Bashford, Ke Li, John Crittenden, Apostolos Fafitis, Leger Stecker, and Steven Hay
1672 Comparison and Analysis of International Construction Waste Management Policies
Yashuai Li and Xueqing Zhang

1682 Concrete Recycling and Utilization of Recycled Concrete: An Investigation of the Barriers and Drivers within the Phoenix Metropolitan Area
J. D. Thompson and H. H. Bashford

1689 Developing a Carbon Footprint Calculator for Construction Buildings
Nicolas Harmouche, Ali Ammouri, Issam Srour, Ghassan Chehab, and Ramsey Hamade

1700 Developing a Framework for Pre-Design Process Simulation for Green Buildings

1710 Developing a Target Value Design Protocol for Commercial Energy Retrofits—Part 1
Hyun Woo Lee, Glenn Ballard, and Iris D. Tommelein

1720 Developing a Target Value Design Protocol for Commercial Energy Retrofits—Part 2
Hyun Woo Lee, Glenn Ballard, and Iris D. Tommelein

1730 Economic and Environmental Assessment of Deconstruction Strategies Using Building Information Modeling
Ali Akbarnezhad, Khim Chye Gary Ong, Lado Riannevo Chandra, and Zhisheng Lin

1740 Effectiveness of Green-Roof on Reducing Energy Consumption through Simulation Program for a Residential Building: Cairo, Egypt
Basil Kamel, Sherine Wahba, Khaled Nassar, and Ahmed Abdelsalam

1750 Environmental Impacts Assessment on Construction Sites
Samaneh Zolfagharian, Mehdi Nourbakhsh, Javier Irizarry, Aziruddin Ressang, and Masoud Gheisari

**1760 Environmentally Friendly Stabilization of Unpaved Shoulders**
Richard Harris, Fangyu Guo, and Charles Jahren

**1770 Estimating the Economic, Energy, and Environmental Impact of Earthwork Activities**
Phil Lewis and Apif Hajji

**1780 Evaluating Energy Savings Potential in United States Residential Buildings**
Sami Kolahdoozan and Fernanda Leite

Jordan Wallpe, William Hutzel, Gregory Lasker, and Clark Cory

**1799 Evaluation Model for Carbon Dioxide Emissions of Construction Methods**
SeungWon Han, ChangTaek Hyun, and HyunSeok Moon

**1809 Exploratory Study of Sustainability Knowledge Management in Capital Project Offices**
Xiao Tan, Ken-Yu Lin, Chimay J. Anumba, Hai-Chen Tan, and Hui-Min Li

**1820 Green and Non-Green School Buildings: An Empirical Comparison of Construction Cost and Schedule**
Pramen P. Shrestha and Nitisha Pushpala

**1830 Human-Building Interaction for Energy Conservation in Office Buildings**
Farrokh Jazizadeh, Geoffrey Kavulya, Jun-Young Kwak, Burcin Becerik-Gerber, Milind Tambe, and Wendy Wood

Endong Wang and Zhigang Shen
Introducing the Concept of Emissions Liability Insurance in Managing Greenhouse Gas (GHG) Emissions and Promoting Sustainability in Construction Projects

Xinyi Song and Feniosky Peña-Mora

Minimizing Greenhouse Gas Emissions from Construction Activities and Processes

Wallied Orabi, Yimin Zhu, and Gulbin Ozcan-Deniz

Minimum Operational Emissions in Earthmoving

David G. Carmichael, Evan H. Williams, and Alireza S. Kaboli

Monitoring System for Operational Efficiency and Environmental Performance of Construction Operations Using Vibration Signal Analysis

Changbum R. Ahn, SangHyun Lee, and Feniosky Peña-Mora

Multi-Attribute Decision Making in Choosing Suitable Construction Waste Management Methods

Xueqing Zhang and Yashuai Li

Multi-Criteria Decision Making to Improve Performance in Construction Projects with LEED Certification

H. L. Sulochana P. Madanayake and Janaka Y. Ruwanpura

Multi-Objective Criteria for the Optimal Design of Sustainable Water Distribution Networks

Kalyan R. Piratla and Samuel T. Ariaratnam

Nitrogen Oxide Reduction and Nitrate Measurements on TiO₂ Photocatalytic Pervious Concrete Pavement

Marwa Hassan, Somayeh Asadi, John T. Kevern, and Tyson Rupnow

Practicality and Sustainability of Using HVFA for Concrete Sidewalks

Hossein Lavasani and Anne Werner

A Project Based Framework for Assessing and Monitoring Highway Construction Greenhouse Gas Emissions

Amlan Mukherjee and Darrell Cass

Review of Existing Transportation Sustainability Initiatives and Their Applicability to Qatar
Karim A. Abdelwarith, Amr A. Kandil, John E. Haddock, Ahmed B. Senouci, and Hassan R. Al-Derham

1961  Sustainable Energy Performance Indicators of Green Building in Developing Countries
    Mahsa Qaemi and Gholamreza Heravi

1971  Sustainable Fuel Cells for Residential Construction: Challenges and Opportunities
    Marcel Granier and Daniel Castro-Lacouture

    Islam El-Adaway and Jerome Knapp

1991  Using a Thematic Framework to Compare Sustainability Rating Systems Applicable to Transportation Projects
    Ross Curz, Jin-Lee Kim, and Hee Sung Cha

2001  Value Creation Chain for Going Green: Evidence from the Construction Industry
    Yujie Lu, Qingbin Cui, and Xianglin Jiang

2011  Water Reclamation Strategies in the Built Environment—A Framework and Case Study of a University Campus
    Saqib Naveed Cheema and Muhammad Irfan

Construction Education

2021  Assessing the Impact of Physical Prototyping in First-Year Engineering Education
    Steven K. Ayer, Robert M. Leicht, and Christie A. Smith

2031  Collaborative Authoring for On-Line Construction Curricula
    Georg Reichard and Vera Novak

2042  Developing a Serious Game for Construction Planning and Scheduling Education
    Saeed Karshenas and David Haber
2052 Ensuring Scientific Rigor of JCEM Papers through Transparent Reviews of Scholarship
Leonhard E. Bernold

2060 Evaluating Construction Management Programs at the Graduate Level in the U.S.
Sangwook Lee and Afshin Esmaeilzadeh

2071 Expected Outcomes of a Construction Career: Gender Identity and Engineers Without Borders-USA
Jessica Kaminsky, Casey Casias, Amy Jaannerick-Will, and Cathy Leslie

2081 Exploration of New Frontiers for Educating Engineers through Local and Global Service-Learning Projects
James L. Huff, Ali Mostafavi, Dulcy M. Abraham, and William C. Oakes

2091 Learning Assessment Strategies for an Educational Construction Safety Video Game
Yuan-Ling Liaw, Ken-Yu Lin, Min Li, and Nai-Wen Chi

2101 Measuring the Value of “All Play and No Work”: Can the Rigorous Assessment of Simulation Games Drive Innovative Teaching in Construction?
Dragana Nikolic and John I. Messner

2111 Problem-Based Learning and Learning-through-Service for Sustainability Education
Islam El-Adaway and Dennis Truax

2120 Student-Centered Teaching Construction Equipment and Methods to 350 Students
Leonhard E. Bernold

2129 Teaching Social Sustainability in Sustainable Construction and Infrastructure Courses: A Collaborative Approach
Rodolfo Valdes-Vasquez, Annie Pearce, and Caroline Clevenger

2139 Using Tele-Engineering As a Tool to Reverse Engineer the Inka Road
Edward J. Jaselskis, Clifford Schexnayder, Christine Fiori, Timothy C. Becker, Wu-Chueh Andrew Hung, Christine Beckman, Manop Kaewmoracharoen, and Kathleen Short

**2149 Working in Inter-Disciplinary, Multi-Cultural Teams: Lessons from the Field**
Christine Fiori, Edward J. Jaselskis, Clifford Schexnayder, Jennifer Shane, Timothy C. Becker, Kathleen Short, Edgar Rodriguez Velásquez, Gerardo Chang Recavarren, and Alexei Vranich

**Disaster Management and Response**

**2160 Creating a Community-Based Housing Response Pool**
Omar El-Anwar and Lei Chen

**2170 GIS for the Geo-Referenced Analysis and Rapid Dissemination of Forensic Evidence Collected in the Aftermath of the Tuscaloosa Tornado**
Andrew J. Graettinger, David Grau, John Van de Lindt, and David O. Prevatt

**2180 Hazard Management: Integrated Framework for Engineering and Public Policy**
Islam El-Adaway, Gerald Emison, and Keith Coble

**2190 Measuring Community Resilience and Recovery: A Content Analysis of Indicators**
Elizabeth Jordan and Amy Javernick-Will

**2200 Modeling Dynamics of Post-Disaster Recovery**
Ali Nejat and Ivan Damnjanovic

**Infrastructure Management**

**2211 Adaptive Stormwater Sewer System Management for Climate Change**
Yeonsang Hwang, Charles Bradsky, and Joo Hyoung Lee

**2221 Agent-Based Modeling and Simulation for Hazard Management**
William M. Bulleit and Matthew W. Drewek
2231 Alternative Quality Organizations in Highway Design and Construction
   Elizabeth Kraft and Keith Molenaar

2241 Analysis of Heterogeneity in Infrastructure Condition Assessment Models
   Yongliang Jin and Amlan Mukherjee

2250 Approval Risks in Transportation Infrastructure Projects in India
   Aneetha Vilventhan and Satyanarayana N. Kalidindi

2260 Assessment of Public Perceptions of Innovative Financing for Infrastructure
   Ali Mostafavi, Dulcy Abraham, Fred Mannering, Antonio Vives, and Vanessa Valentin

2270 Causes for Sustainable Maintenance and Operation of On-Site Sanitation Systems
   Jessica Kaminsky and Amy Javernick-Will

2280 Complex Systems Modeling of Infrastructure Assets, Operators, Users, and Politicians Using System Dynamics
   Hesham Osman and Mohammed R. Hassan Ali

2290 Design of Concession and Annual Payments for Availability Payment Public Private Partnership (PPP) Projects
   Deepak Sharma and Qingbin Cui

2300 Innovation Policy Assessment for Civil Infrastructure System-of-Systems
   Ali Mostafavi, Dulcy Abraham, Daniel DeLaurantis, Joseph Sinfield, and Cesar Queiroz

2310 Long Term Concessions on Public-Private Partnership Projects—How to Make This Right?
   Mehdi Tavakolan, Baabak Ashuri, Reza Tavakolan, and Mohammad Mahdi Farshchian

2320 Maintaining Subway Infrastructure Using BIM
   Mohamed Marzouk and Ahmed Abdel Aty
2329  Optimization Application for Financial Viability Evaluation of PPP Toll Road Projects
    Tanaphat Jeerangsuan, Hisham Said, Amr Kandil, and Satish Ukkusuri

2339  The Relationship between Delivery Processes and Transportation Projects’ Performance
    Yong-Woo Kim, Omar El-Anwar, and Michael Houston

2349  Theoretical Framework for Transportation Infrastructure Asset Management Based on Review of Best Practices
    Farrukh Arif and Mehmet Emre Bayraktar

Global Construction Issues

2359  Advanced Construction Technologies for the Nuclear Construction Industry
    Erik R. Wright, Kyuman Cho, and Makarand Hastak

2369  Challenges in the Planning Process of Infrastructure Projects in Germany
    Meltem Sözüer and Konrad Spang

2379  Characterization of Nano Particles Released during Asphalt and Concrete Laboratory Activities
    Somayeh Asadi, Marwa M. Hassan, and Heather Dylla

2389  Construction and Maintenance of Concrete Piles in Corrosive and Destructive Marine Environments Based on Study of the Persian Gulf Marine Installations
    Nasser Arafati, AbdolHossein Fazli, Seyed Mehdi Mousavi, and Fouzieh Rouzmehr

2400  Cost Normalization for Global Capital Projects Benchmarking
    Jiukun Dai, Stephen Mulva, Sung-Joon Suk, and Youngcheol Kang

2410  Empirical Simulation to Compare Opportunistic Bidding Behavior in China and the U.S.A.
    Muqing Liu, Qinghua Xu, and John E. Taylor
Railroad Construction Opportunities in an Age of Global Warming and Peak Oil

Trefor Williams

Construction Industry Institute Research

A Benchmarking Framework for Public Transportation Projects Delivery

Youngcheol Kang, Jiukun Dai, and Stephen P. Mulva

Assessing CII Best Practices Applicability

Adeniyi Olumide, John Walewski, and Stuart Anderson

Barriers to Applying Probabilistic Risk Analysis in Design and Construction Projects

Christopher Senesi, Amy Javernick-Will, and Keith Molenaar

Common Barriers to Effective Front-End Planning of Capital Projects

G. Edward Gibson, Jr., and Roberta Bosfield

Industry Practices for Estimating, Controlling, and Managing Key Indirect Construction Costs at the Project Level

Timothy C. Becker, Edward J. Jaselskis, Mohamed El-Gafy, and Jing Du

Improving Concrete Trade Labor Productivity through the Use of Innovations

Gabriel B. Dadi, Mahdi Safa, Paul M. Goodrum, Carl T. Haas, Carlos H. Caldas, and David MacNeel

Owner and Contractor Jobsite Organizations

James T. O’Connor and Chong Yao Wang

Quantification of Front End Planning Input Parameters in Capital Projects

Sungmin Yun, Sung-Joon Suk, Jiukun Dai, and Stephen P. Mulva

Safety Incidents and High-Risk Activities of Masonry Construction

Babak Memarian and Panagiotis Mitropoulos
Two-Dimensional Globalizing Index and Globalizing Self-Assessment Tool for Engineering and Construction Companies

Semra Comu, John E. Taylor, and John I. Messner