

Structures Congress 2022

Selected Papers from the Structures Congress 2022

Atlanta, Georgia, USA
20 – 23 April 2022

Editor:

James Gregory Soules

ISBN: 978-1-7138-5200-1

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© (2022) by American Society of Civil Engineers
All rights reserved.

Printed with permission by Curran Associates, Inc. (2022)

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

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

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: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Contents

Blast and Impact Loading

Analysis of Impact-Induced Fracture of Laminated Glass Using Multi-Objective Genetic Algorithm	1
Moheldeen Hejazi, Mesut Kucuk, and Ali Sari	
Deep Neural Network (DNN) Model to Predict Close-In Blast Load	10
David Holgado, Arturo Montalva, Jason Florek, Khaled El-Domiaty, and Bryan Calidonna	
Development and Validation of an Inertial Vehicle Barrier Calculator	26
Tyler W. Norman, Jeffrey P. Nielsen, and James S. Davidson	
Heavy Goods Truck: Can We Stop It?	39
Ashish Bhargava and Yousef Alostaz	
How Should I Design My Blast Resistant Glazing Connections?.....	48
Joseph Harijanto and Ross Cussen	
Predicting Fragment Velocity of Masonry Walls Subjected to Blast.....	60
John E. Hatfield, Genevieve L. Pezzola, Robert E. Walker, John M. Hoemann, Catherine S. Stephens, and James S. Davidson	
Public Schools—Ballistic Attacks: Assessment and Mitigation.....	69
Yousef Alostaz and Lazar Kesic	
Safety Assessment of Cables of Suspension Bridge under Blast Load.....	79
Atta E. Mustafa, Ali Javed, and Khawaja Ali	

Bridges, Tunnels, and Other Transportation Structures

Investigation of the Rotation Capacity and Flexural Strength of Web Tapered Hybrid High Strength Steel Simple Supported I-Section	94
Chungom N. Ntonifor, Mehdi Shokouhian, and Muritala Adegoke	
AFRP Reinforced Concrete Column with Controlled Rocking Connection	113
Muritala Adegoke, Mehdi Shokouhian, and Chungom Ntonifor	
California’s First Major Vehicular Cable-Stayed Bridge.....	135
Michael J. Borzok	

Innovative Methods for Evaluation of Precast Box-Beam Bridges	148
Mohammad Abedin, Francisco J. De Caso y Basalo, Nafiseh Kiani, Armin B. Mehrabi, and Antonio Nanni	
Machine Learning Approach to Visual Bridge Inspection with Drones	160
Junwon Seo, Euisook Jeong, and James P. Wacker	
Manulife Place Plus 15 Pedestrian Bridge Connections and Details	170
Kevin Chang, Dane Rankin, and William Baker	
Optimization and Evaluation of Pipe-Tie System in Limiting the Exterior Girder Rotation during Deck Construction	179
Li Hui, Faress Hraib, Miguel Vicente, and Riyadh Hindi	
Stainless Steel-Concrete Composite Beams Strengthened with External Tendons	189
My-Lin Van and Ayman El-Zohairy	
Steel Shark Fin Deck Anchors for Cable-Stayed Bridges: Form, Function, and Fabrication	202
Jason Salonga	

Buildings

Experimental Study of a Novel Self-Centering Beam-Column Connection Equipped with Shape Memory Alloy Plates	215
Michael C. H. Yam, Xuhong Zhou, Yun Huang, and Ke Ke	
Innovative CLT Gravity and Lateral Systems for Vancouver School Projects	225
Md. Shahnewaz, Carla Dickof, Nick Bevilacqua, and T. Tannert	
Novel Hold-Down Solutions for Cross-Laminated Timber Shear Walls	232
Thomas Tannert	
Resistance of Eccentrically Connected Gusset Plates in Compression	239
Jan Vesecký, Michal Jandera, and Kamila Cábová	
The Arbour: An Innovative Composite Floor System	251
Md. Shahnewaz, Robert Jackson, and Thomas Tannert	

Business and Professional Practice

Business Resilience as Strategy for Survival and Pandemic Recovery of Selected Engineering Construction Companies in Thailand	260
Soontorn Piromsartkoon	
Design Behavior: How to Save Our Planet and Influence People	271
Dan Bergsagel	

Education

- Mixed Reality Applications for Teaching Structural Design.....283**
M. A. Kraus, I. Čustović, and W. Kaufmann

Forensic

- Alkali-Silica Reaction Induced Damage and Strength Degradation in Textile Mill296**
Ahsan R. Khokhar and Fizza Hassan

- Forensic Investigation of Fire-Induced Collapse of a Steel Building312**
Mohammadreza Eslami, Khalid M. Mosalam, Ankit Agrawal, Amarnath Kasalanati,
Shalva Marjanishvili, and Venkatesh Kodur

- Investigation of Fire Incidents and Associated Damage to Buildings.....330**
M. Mehdi Mirzazadeh and Mark P. Milner

- Scott Candler Electrical Building Forensic Investigation and Repair.....340**
Donnell Duncan

Innovative Research

- Cross-Laminated Timber Concrete Composite Systems for Long-Span Floors356**
Md. Shahnewaz, Robert Jackson, and Thomas Tannert

- Failure Modes of 3D-Printed Tessellated-Tile Beams364**
Grace F. Crocker, Sida Dai, Brandon E. Ross, Michael Carlos Kleiss,
Pinar Okumus, Negar Elhami-Khorasani, and Seth Moore

- Repairable Modular Structural-Architectural Shear Walls.....377**
Mohammad Syed, Grace F. Crocker, Negar Elhami-Khorasani, Pinar Okumus,
Brandon E. Ross, and Michael Carlos Barrios Kleiss

- Replaceable Buckling-Restrained Brace Coupling Beams in Core Walls.....387**
Joseph Collins and Kion Nemati

- Ultimate Foundation Moment Capacity of Any Plan Shape under
P-M-M Loading.....398**
Roy Lobo and Chris Tokas

Natural Disasters

- The Statistical History of US Tornadoes413**
William J. Kirkham

Nonbuilding and Special Structures

An Overview of the Upcoming ASCE Report on Design of Modular Structures for Industrial Facilities426
Silky Wong

Analysis of SPMT Transport of Large Onshore Modules430
William Bounds and Bradley Tann

Nonstructural Components and Systems

Effects of Permeability on the Dynamic Properties and Weathertightness of Double Skin Curtain Walls444
Kehinde J. Alawode, Krishna Sai Vutukuru, Amal Elawady, Seung Jae Lee, Arindam Gan Chowdhury, and Guido Lori