

# **Annual Stability Conference of the Structural Stability Research Council (SSRC 2025)**

Louisville, Kentucky, USA  
1-4 April 2025

ISBN: 979-8-3313-1941-0

**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.**

**Disclaimer**

The opinions, findings, conclusions, and recommendations expressed herein are those of the Authors only and do not necessarily reflect the views of the Structural Stability Research Council, the editors, or the conference sponsors.

Copyright© (2025) by the  
Structural Stability Research Council (SSRC)  
All rights reserved.

*Proceedings Compiled by*  
Martin T. Downs  
SSRC Coordinator

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact  
the Structural Stability Research Council (SSRC)  
at the address below.

Structural Stability Research Council (SSRC)  
c/o AISC  
130 E. Randolph Street, Suite 2000  
Chicago, IL 60601-6204  
USA

Phone: (312) 670-7015  
Email: [ssrc@aisc.org](mailto:ssrc@aisc.org)  
Web: [www.ssrcweb.org](http://www.ssrcweb.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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## **SS2 - ANALYSIS METHODS I**

|                                                                                                                           |    |
|---------------------------------------------------------------------------------------------------------------------------|----|
| Critical Moment of Doubly-Symmetric Beams with Prebuckling Deflection: The Effect of Intermediate Supports.....           | 1  |
| <i>Sándor Ádány, Ghaith A. A. Reden</i>                                                                                   |    |
| The Modal Finite Strip Method (mFSM) for Buckling Mode Decomposition of Built-Up Members: Applications and Examples ..... | 8  |
| <i>Mani Khezri, Kim J. R. Rasmussen</i>                                                                                   |    |
| On the Definition of Geometric Imperfections in the F.E. Modelling of Local Buckling in Hot-Rolled Channel Sections.....  | 28 |
| <i>Morane C. M. Wack, Oudom Chhoeng, Robert Tremblay, Nicolas Boissonnade</i>                                             |    |
| Thin Shell Finite Element Formulations Implemented in Open-Source Software .....                                          | 45 |
| <i>Cristopher D. Moen, Sándor Ádány</i>                                                                                   |    |

## **SS3 - ANALYSIS METHODS II**

|                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------|----|
| Nonlinear GBT for Thin Truncated Conical Shells with Circular Cross-Section.....                                  | 59 |
| <i>Victor D. Popa, Mihai Nedelcu, Rodrigo Gonçalves</i>                                                           |    |
| AIJ Structural Stability Topics in Steel Structures: Summary of the AIJ-SSRC Collaboration Effort .....           | 73 |
| <i>Masahiro Kurata, Ryota Matsui, Andres Sanchez, Masae Kido, Yoshihiro Kimura, Kazuya Mitsui, Hiroshi Tagawa</i> |    |
| Mechanics-Informed Data-Driven Prediction Model of Steel Column Strength.....                                     | 85 |
| <i>Zhidong Zhang, Kai Chen, Cem B. Cevik, Cristopher D. Moen</i>                                                  |    |
| On the Structural Behavior of Tapered Thin-Walled Convex Polygonal Tubes with Deformable Cross-Section.....       | 93 |
| <i>Rodrigo Gonçalves</i>                                                                                          |    |

## **S1 - BRIDGES**

|                                                                                                                        |     |
|------------------------------------------------------------------------------------------------------------------------|-----|
| Reuse Design of CFS Columns Subjected to Interaction Buckling for the Application of Circularity in Construction ..... | 110 |
| <i>Sivaganesh Selvaraj, Tak-Ming Chan</i>                                                                              |     |
| Influence of Residual Stresses on the Strength of Horizontally Curved Steel I-Girders .....                            | 119 |
| <i>Aanandh Nandakumar, Lakshmi Subramanian</i>                                                                         |     |
| Practical Stability Design of General I-Section Members for Combined Forces .....                                      | 137 |
| <i>Donald W. White, Bálint Vaszilievits-Sömjén</i>                                                                     |     |

## **S2 - BUILDINGS I**

|                                                                                                                                                                                                  |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Is Your Industrial Building Structure Suitably Braced: Should the EOR Be Concerned When Detailing and Fabrication Differ from Analysis, Modeling, and Design - The Sixth Study in a Series ..... | 155 |
| <i>Damon G. Reigles, Perry S. Green, Hunter J. Brown</i>                                                                                                                                         |     |
| Seismic Design of Partially Concrete-Filled Steel Tubular Columns .....                                                                                                                          | 183 |
| <i>Iraj H. P. Mamaghani</i>                                                                                                                                                                      |     |
| Investigation on Load Transfer Mechanisms in Concrete-Filled Steel Tubular (CFST) Columns with Beam Shear Connections.....                                                                       | 198 |
| <i>Weijie Ning, Partha P. Debnath, Tak-Ming Chan, Ahmed Y. Elghazouli</i>                                                                                                                        |     |
| Experiments to Understand the Impact of Local and Global Slenderness on Inelastic Deformation Capacity of Round HSS Braces .....                                                                 | 211 |
| <i>Lily A. Swanson, Dawn E. Lehman, Jeffrey W. Berman, Charles W. Roder, Andrew D. Sen</i>                                                                                                       |     |

## **S3 - BUILDINGS II**

|                                                                                                                                     |     |
|-------------------------------------------------------------------------------------------------------------------------------------|-----|
| Stability Assumptions in Numerical Modeling of Cold-Formed Steel-Framed Buildings Under Seismic Loading .....                       | 223 |
| <i>Mohammed M. Eladly, Zhidong Zhang, Amanpreet Singh, Jiachen Zhang, Tara C. Hutchinson, Benjamin W. Schafer</i>                   |     |
| A Low-Cost System for Enhanced Seismic Stability and Mitigation of Residual Deformations in Steel Eccentrically Braced Frames ..... | 242 |
| <i>Pedram Mortazavi, Constantin Christopoulos, Oh-Sung Kwon</i>                                                                     |     |
| Buckling Behavior of Metal Building Systems Under Dynamic Wind Loads .....                                                          | 258 |
| <i>Shihang Wang, Xinyang Wu, Delong Zuo, Hannah B. Blum</i>                                                                         |     |

## **S4 - EXPERIMENTS IN THIN-WALLED STRUCTURES**

|                                                                                                                            |     |
|----------------------------------------------------------------------------------------------------------------------------|-----|
| Flexural Tests on High Strength Cold-Formed Steel Solar Piles .....                                                        | 279 |
| <i>Fidence C. Rukundo, Sophrenia David, Shahabeddin Torabian, Benjamin W. Schafer</i>                                      |     |
| Ultimate Flexural Capacity of Cold Formed Section Purlins Laterally Supported by Tie Rods .....                            | 297 |
| <i>M. El Sadawy, M. T. Hanna, M. Nashaat</i>                                                                               |     |
| Double-Storey Cold Formed Steel Shear Wall Tests with Integrated Built-Up Uprights Subject to Monotonic Load .....         | 310 |
| <i>Xinxin Liu, Mani Khezri, Kim Rasmussen</i>                                                                              |     |
| Experimental Study on the Behavior of Cold-Formed Lipped Channels Under Uniform and Non-Uniform Elevated Temperatures..... | 327 |
| <i>Jiangyue Xie, Thomas Gernay</i>                                                                                         |     |

## **S5 - EXTREME LOADS**

|                                                                                          |     |
|------------------------------------------------------------------------------------------|-----|
| Analytical Investigation of Plate Buckling Capacity Under Inelastic Cyclic Loading ..... | 339 |
| <i>Eman M. A. Abdullah, Andrew J. Ziccarelli</i>                                         |     |

|                                                                                                                          |     |
|--------------------------------------------------------------------------------------------------------------------------|-----|
| O.I.C.-Based Design of Steel H.S.S. At High Temperatures .....                                                           | 355 |
| <i>Gabrielle Pomerleau, Mina Aleseyedan, Pablo Rico, Mariana Echeverri, Nicolas Boissonnade</i>                          |     |
| Numerical Modeling of the Post-Earthquake Fire Performance of Cold-Formed Steel Members .....                            | 382 |
| <i>Yu Niu, Zhanjie Li, Sean Enright, Joshua Dillard, Tara Hutchinson, Richard Emberley, Brian Meacham, Thomas Gernay</i> |     |
| Local Stability of WF Sections in Fire .....                                                                             | 395 |
| <i>Gabrielle Pomerleau, Jeanne Paquet, Nicolas Boissonnade</i>                                                           |     |

## **S7 - FLOORS AND ROOFS**

|                                                                                                                                            |     |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Stability and Response of Lacing Systems in Laced Built-Up Truss Bridge Columns .....                                                      | 423 |
| <i>Oudom Chhoeng, Morane C. M. Wack, Robert Tremblay, Nicolas Boissonnade</i>                                                              |     |
| Sensitivity of Open-Web Steel Joist Stability to Material and Geometric Property Variability.....                                          | 446 |
| <i>Kubilay Cicek, Thomas Sputo, Hannah B. Blum</i>                                                                                         |     |
| Global Buckling Measurement in Steel Decks using Fiber Optic Sensing, Infrared Optical Tracking, and Point Clouds .....                    | 464 |
| <i>Monamy Mustaq, Gowshikan Arulananthan, Richa D. Rakhee, Nate Opperman, Hyeyoung Koh, Qiquan Xiong, Jesse C. Hampton, Hannah B. Blum</i> |     |

## **S6 - BEEDLE SESSION**

|                                                                                |     |
|--------------------------------------------------------------------------------|-----|
| Lateral Torsional Buckling and Torsional Bracing of Steel Girder Systems ..... | 485 |
| <i>Todd Helwig</i>                                                             |     |

## **S8 - FRAMES AND SYSTEMS**

|                                                                                                                   |     |
|-------------------------------------------------------------------------------------------------------------------|-----|
| System-Based Design Methods: Reliability and Stability of Benchmark Structural Steel Frames .....                 | 506 |
| <i>Damir Akchurin, Sándor Ádány, Ronald D. Ziemian, Kim J. R. Rasmussen, Benjamin W. Schafer</i>                  |     |
| Behaviour of Bolted Apex Connector in Single-Channel Cold-Formed Steel Portal Frames- An Experimental Study ..... | 522 |
| <i>Hareesh Sirigiri, Mahendrakumar Madhavan</i>                                                                   |     |
| A Novel Bracing Concept for Structural Stability of Ideal Plane Frames .....                                      | 529 |
| <i>M. Rosa, A. Pinto da Costa, P. Mendes</i>                                                                      |     |

## **S9 - SPECIAL TOPICS I**

|                                                                                                                                                                       |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Developing Axial-Flexure (P-M) Interaction Curve for High-Strength Steel Members with Local and Global Stability Considerations .....                                 | 543 |
| <i>Abdullah Alghossoon, Amit Varma, Duaa Omoush</i>                                                                                                                   |     |
| Comparison of AISC 360 and Eurocode 3 Lateral-Torsional Buckling Predictions to Results from a Comprehensive Experimental Database for Rolled I-Section Members ..... | 557 |
| <i>Aakash R. Eetikala, Donald W. White, Ryan J. Sherman</i>                                                                                                           |     |

|                                                                                                                                          |     |
|------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Design and Collapse Simulation Strength Sensitivity of Large-Scale Cylindrical Tubes for Wind<br>Turbine Support Towers in Flexure ..... | 580 |
| <i>Xi Peng, Dehui Lin, Sándor Ádány, Andrew T. Myers, Benjamin W. Schafer</i>                                                            |     |

## **S10 - SPECIAL TOPICS II**

|                                                                                                                                           |     |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Optimizing the Structural Performance of Extruded Aluminum RHS and SHS with Internal<br>Stiffeners .....                                  | 592 |
| <i>Juan D. Orozco-Sosa, Moufahdilou Ouro-Yendou, Carlos Graciano, Liya Li</i>                                                             |     |
| Determination of Minimum Concrete Layer in Hollow Concrete-Filled Steel Tubular Columns<br>using Plate Buckling in an Elastic Medium..... | 606 |
| <i>Mashudha Sulthana, M. Surya Prasanth</i>                                                                                               |     |
| Experimental and Analytical Stability of Thick Origami Panels for Deployable Anchors to Prevent<br>Coastal Erosion.....                   | 621 |
| <i>Elizabeth Capretta, Khuzaima Hummad, Ann C. Sychterz</i>                                                                               |     |

## **S11 - STAINLESS STEEL AND ALUMINUM**

|                                                                                                       |     |
|-------------------------------------------------------------------------------------------------------|-----|
| Strategic Use of Austenitic Stainless Steel in Dissipative Zones of Eccentrically Braced Frames ..... | 631 |
| <i>Lucy Lázaro, Rolando Chacón</i>                                                                    |     |
| Local Stability of 3D-Printed Stainless Steel Channel Sections Under Compression.....                 | 644 |
| <i>Xi Chen, Kaiyang Wang, Yao Sun</i>                                                                 |     |
| Local Buckling of Extruded Aluminum Circular Hollow Sections Under Combined Load Cases .....          | 657 |
| <i>Moufahdilou Ouro-Yendou, Nicolas Boissonnade, Liya Li</i>                                          |     |

## **S12 - THIN-WALLED STRUCTURES I**

|                                                                                                                                              |     |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Lipped Channel Cold-Formed Steel Columns: “All-In-One” Design Approach Including the<br>Buckling Interaction Models LG, LD, DG and LDG ..... | 672 |
| <i>Eduardo de M. Batista, Gustavo Y. Matsubara, Marcílio S. de Rocha Freitas, Victor A. M. de Faria, André L. R. Brandão</i>                 |     |
| Web Crippling Analysis of CFS Open Built-Up Sections Subjected to Interior One-Flange Loading.....                                           | 691 |
| <i>Mohammad A. Dar, S. Kavın Kumar, M. Anbarasu</i>                                                                                          |     |
| Evaluating the Effectiveness of Stay-in-Place Forms to Improve the Torsional Stability of Box<br>Beam Bridges During Erection.....           | 708 |
| <i>Karl E. Barth, Michael W. Seek, Gregory K. Michaelson, Dimitra Pyrialakou, Brook T. Woldegabriel</i>                                      |     |
| Feasibility Study of Composite Floor System with Cold-Formed Z-Sections .....                                                                | 727 |
| <i>Israel Barreto, Michael W. Seek</i>                                                                                                       |     |

## **S13 - THIN-WALLED STRUCTURES II**

|                                                                        |     |
|------------------------------------------------------------------------|-----|
| Flexural-Torsional Buckling of Built-Up Cold-Formed Steel Columns..... | 746 |
| <i>Kim J. R. Rasmussen, M. Khezri</i>                                  |     |

|                                                                                                                 |     |
|-----------------------------------------------------------------------------------------------------------------|-----|
| Optimum Web Stiffener for the Buckling Stability of Web Perforated Cold-Formed Steel Storage Rack Columns ..... | 764 |
| <i>Amoke Shabhari, Vijaya V. K. Jeyapragasam</i>                                                                |     |

|                                                                                                                                                   |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Numerical Assessment and Seismic Performance Evaluation of Thin-Walled Cylindrical Liquid-Filled Steel Storage Tanks Supported on Rigid Soil..... | 785 |
| <i>Shafqat Ullah, Iraj H. P. Mamaghani</i>                                                                                                        |     |

## **PROCEEDINGS ONLY**

|                                                                                                       |     |
|-------------------------------------------------------------------------------------------------------|-----|
| Methods to Improve the Computational Efficiency of Geometric Nonlinear Analyses of Steel Frames ..... | 802 |
| <i>Nadine Faramawi, Barry T. Rosson</i>                                                               |     |

|                                                     |     |
|-----------------------------------------------------|-----|
| Why Do Cantilever Beams Buckle the Wrong Way? ..... | 816 |
| <i>Ian J. MacPhedran</i>                            |     |

## **ADDITIONAL PAPER**

|                                                        |     |
|--------------------------------------------------------|-----|
| Modeling Steel Deck Diaphragms using Beam Element..... | 827 |
| <i>Saleh Alshammari, Thomas Sputo, Hannah B. Blum</i>  |     |

## **Author Index**