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ABSTRACTS OF CONFERENCE PAPERS

On October 17th and 18th, 2002 the 16th International Specialty Conference on Cold-Formed Steel Structures will be held in Orlando, Florida. The technical program and conference registration will be available in August 2002. For further information regarding the conference, contact the Wei-Wen Yu Center for Cold-Formed Steel Structures (Telephone 573-341-4471, Fax: 573-341-4476, e-mail: ccfss@umr.edu). This Technical Bulletin provides a brief summary of the papers that will be presented and will appear in the conference proceedings:

"The Behavior of Drive-In Storage Structures," M.H.R. Godley

The behavior of drive-in and drive-thru pallet rack structures is discussed. Proposed are simplified two-dimensional models for the analysis of such structures. Discussion of 3-D finite element analysis and friction effects are also discussed.

"GBT-Based Distortional Buckling Formulae for Thin-Walled Channel Columns and Beams," N. Silvestre and D. Camotim

An outline of Generalized Beam Theory fundamentals and linear stability analysis concepts are discussed. The application of GBT is illustrated to assess the accuracy and validity of the equations.

"The Design of the Pallet Program," R.G. Beale and M.H.R. Godley

The development and accuracy of the Pallet software program is presented. The program uses FEM to perform the buckling analysis including non-linear P-Δ effects.

"Optimum Design of Cold-Formed Steel Z-Shaped Purlins Using a Genetic Algorithm," W. Lu, P. Makelainen, J. Kesti

A genetic algorithm is applied to optimize the dimensions of cold-formed Z-shape purlins over two-spans under gravity load. A modified Eurocode 3 method is used in which the elastic buckling load is calculated using finite strip analysis.

"Adaptive Nonlinear Finite Element Analyses of High Strength Steel Cladding Systems," M. Duan, and M. Mahendran

A nonlinear finite element method is presented for the determination of the ultimate strength analysis of high strength steel cladding. Included are comparisons to experimental results and a parametric study that investigated the factors that influence the ultimate strength.

" Web Crippling Strength of Multi-Web Steel Deck Sections Subjected to End-One-Flange Loading," O. Avci and W.S. Easterling

Reported are the findings of an experimental study on the web crippling strength of multi-web deck sections that were tested with both unrestrained and restrained end conditions. The test results are compared with the North American design equations.

‘**Shear Lag Effect on Bolted C-Shaped Cold-Formed Steel Tension Members,” C.L. Pan and P.C. Chiang**

Shear lag effects in C-shaped sections using bolted connections was investigated. A comparison between the test results and predictions computed using the various design codes is presented.

“Experimental Analysis of Cold-Formed Steel Channel and Lipped-Channel Profiles Connected to Roof Panel –R Factor Analysis,” C.E. Javaroni, R.M. Goncalves, and M. Malite

Channel profiles that are frequently used in Brazil were studied experimentally and theoretically. Roof systems with and without sag rods were included in the study.

“A Study on the Flexural Strength Capacity of Wall Stud Assembly,” J.Y. Song, Y.B. Kwon, H.S. Chung, and G.D. Kim

An investigation of the ultimate and service lateral load capacity of cold-formed steel lipped C-section studs is presented. The effect of gypsum board and plywood attached to the tension flange was included in the study.

“Self-drilling Screw Joints for Cold-Formed Channel Portal Frames,” J. Mills and R. LaBoube

This paper describes the development and testing of knee joints for portal frames that used self-drilling screws. Test results are also presented for bolted connection joints.

“Vibration Characteristics of Lightweight Floors Using Cold-Formed Steel Joists,” F.M. Tangorra, L. Xu, and W.C. Xie

The vibration characteristics of cold-formed steel supported residential floor systems were studied for both static and dynamic performance. The test results are compared with different design methods.

“Design of Channels Subjected to Concentrated Bearing Load,” B.Young and G.J. Hancock

End and interior web crippling loading conditions were investigated for channels having web slenderness ratios ranging from 15.3 to 62.7. The experimental findings are compared with appropriate design specifications.

“Experimental Investigation of Cold-Formed Stainless Steel RHS Columns,” B. Young and Y. Liu

Columns having fixed ends and having varying lengths were tested. The tested strengths are compared with the design strengths of several cold-formed steel stainless steel specifications.

“**Numerical Investigation of Fixed-Ended Channel Columns with Complex Stiffeners,” J. Yan and B. Young**

A non-linear finite element analysis is compared to test results and to unfactored design strengths as given by the American and Australian/New Zealand cold-formed steel specifications. Parametric studies of stiffener size and geometric imperfections are also reported.

“Structural Behavior of Bolted Connections in Cold-Formed Steel Members, Emphazing the Shear Lag Effect,” C.H. Maiola, M. Malite, R.M. Goncalves, and J.M. Neto

This paper presents and discusses the results of an experimental investigation of bolted connections in cold-formed steel angles and channels. The test results are compared with both the American and Brazilian Codes.

“Study of Innovative Built-Up Cold-Formed Beams,” G. Di Lorenzo and R. Landolfo

A new generation doubly-symmetric cold-formed steel beam is presented. The section is formed using a combination of pressing and cold-rolling together with new, efficient connecting systems.

"Web Crippling and Combined Bending and Web Crippling of Cold-Formed Steel Box-Beam Headers," S.F. Stephens and R.A. LaBoube

Box-beam header assemblies were investigated for an interior-one-flange loading condition. Based on the experimental results, a modified web crippling and modified interaction equation were developed.

"Axial Strength of Purlins Attached to Standing Seam Roof Panels," J.A. Stolarczyk, J.M. Fisher, and A. Ghorbanpoor

Using finite element analysis, the axial load capacity was determined by developing a relationship between the flexural uplift buckling strength and the axial buckling strength. Confirmatory test results are presented that verify the finite element results.

"AISI Committee on Framing Standards Enabling the Widespread and Economic Use of Steel Framing," K.R. Bielat and J.W. Larson

The paper provides an overview of new cold-formed steel design standards for trusses, headers and a prescriptive method for one- and two-family dwellings. The standards build on AISI specification.

"North American Specification for Design of Cold-Formed Steel," R.L. Brockenbrough and H.H. Chen

Based on collaboration between the representatives from the United States, Canada, and Mexico, the next edition of a cold-formed steel design specification has been expanded to enable use in North America. The paper reviews the differences between previous AISI specifications and the new North American specification.

"An Experimental Study on the Load Carrying Capacity of Cold-Formed Steel Studs and Panels," Y.S. Tian, J. Wang, T.J. Lu, C.Y. Barlow, and J. Evans

An experimental study on the structural performance of C-sections used in load-bearing wall panels is presented. The main variables included in the study were screw spacing, sheathing type, and loading type.

"Stress/Strain Distributions and Role of Sheathing in Partition Wall Panels Subjected to Compression," J. Wang, Y.S. Tian, T.J. Lu, C.Y. Barlow, and J. Evans

The stress/strain distributions in each constituent of a wall panel are examined experimentally. Main variables included in the study are screw spacing, sheathing type, sheathing arrangement (single-sided, double-sided), and loading type.

"Design Provisions for Sections Containing Unstiffened Elements Under Stress Gradients," M.R. Bambach and K.J.R. Rasmussen

Presented is a design method for calculating the effective width of unstiffened elements based on plate test results. The method is shown to be in good agreement with experimental data.

"Behavior of Cold-Formed Thin-Walled Steel Short Columns with Service Holes at Elevated Temperatures," M. Feng, Y.C. Yang, and J.M. Davies

Discussed are the results of an experimental and numerical investigation into the axial strength of cold-formed lipped channels with service holes. The study considered both ambient and uniform high temperatures.

"**Effective Widths of Unstiffened Elements Under Combined Compression and Bending," M.R. Bambach and K.J.R. Rasmussen**

Details of a dual-actuator rig developed for testing rectangular plates simply supported on three sides, with the remaining (longitudinal) edge free, under combined uni-axial compression and in-plane bending are presented. Plate test results are used to establish effective width equations for unstiffened elements.

"A Study on the Factors that Influence the Acoustic Performance of a Steel Stud Wall Assembly," H.S. Chung, G.D. Kim, K.S. Yang, and K.W. Kim

Reported are the findings of a series of acoustic tests performed to evaluate and analyze factors that influence acoustic performance of steel stud wall assemblies. Suggestions for enhancing acoustic performance are given.

"Structural Behavior of Self-Piercing Riveted Connections in Steel Framed Housing," S. Moss and M. Mahendran

The paper presents a progress report on an ongoing research program to assess the behavior and performance of self-piercing rivets. The testing has focused on single lap shear tests and stud-to-plate connections.

"**Plastic Strength of Thin-Walled Members," D. Dubina and V. Ungureanu**

Suggested is the use of a sectional plastic mechanism strength method for the interactive local-overall buckling analysis instead of the traditional effective width section method. Experimental results and finite element simulations are used to evaluate the method.

"Seismic Performance of Wall-Stud Shear Walls," L.A. Fulop and D. Dubina

The paper presents the scope of and results obtained from full-scale wall stud shear tests. Based on the test results, a numerical equivalent model for hysteretic behavior of wall panels was developed and used in a 3D dynamic nonlinear analysis.

"Inelastic Response of Arc-Spot Welded Deck-To-Frame Connections for Steel Roof Deck Diaphragms," M. Peuler, C.A. Rogers, and R. Tremblay

Reported are the findings obtained from an experimental program that investigated the inelastic seismic response of metal deck roof diaphragm systems. The project involved monotonic, cyclic, and seismic testing that included variation in parameters such as with and without weld washers, different electrode types, and various deck thicknesses.

"Preliminary R-Values For Seismic Design of Steel Stud Shear Walls," Y. Zhao and C.A. Rogers

Presented is an overview of the seismic requirements for various design standards and an explanation of how R-values maybe determined from test results. The findings of an evaluation of existing steel stud shear wall test data, in addition to preliminary force modification factors for use in seismic design are presented.

"Variables Affecting the Shear-Bond Resistance of Composite Floor Deck Systems," R. Tremblay, C.A. Rogers, P. Gignac, and G. Degrange

This paper describes the results of two research projects in which the effect of variables such as deck position, time dependency of shear bond capacity, and PVC pipes in the slab influence the shear bond capacity.

"Application of a Finite Element Model to a Cold-Formed Steel C-Section with a Bearing Stiffener," S.R. Fox and G.W. Brodland

Described in this paper is the application of a finite element model to a cold-formed steel C-section with a bearing stiffener installed between its' flanges. Based on the results of the finite element studies, combined with experimental data, a design expression has been proposed.

"Ultimate Failure Behavior of Second-Generation Sheeting Subjected to Combined Bending Moment and Concentrated Load," H. Hofmeyer, M. Kaspers, H.H. Snijder, and M.C.M. Bakker

Reported is an experimental and finite element study of the web crippling and bending behavior of cladding used in roof construction. The effect of bearing stiffeners was also explored.

"Strength and Behavior of Flare-Bevel and Flare-Vee Welded Connections in G450 Sheet Steel," L.H. Teh and G.J. Hancock

Discussed is the scope and findings from a study that investigated the strength of flare-bevel and flare-vee welded connections. The failure modes and ductility of different types of connections are described and compared with the American and Australian design specifications.

"Compression Test of Cold-Reduced High Strength Steel Long Columns," D. Yang, G.J. Hancock, and K.J.R. Rasmussen

Described is a series of compression tests performed on long columns fabricated from G550 (80 ksi) steel. The test loads are compared with AS/NZS4600, the AISI specification, as well as a finite element study.

"Direct Strength Method for the Design of Purlins," L. Quispe and G. Hancock

The direct strength method is applied to the design of C- and Z-sections used as purlins. Based on the findings of the study, modifications are proposed for the strength equations of the direct strength method.

"Strength and Behavior of Fillet Welded Connections in G450 Sheet Steel," L.H. Teh and G.J. Hancock

Transverse and longitudinal fillet welded connections were tested to failure. The test results serve as the basis for recommended modifications in the design rules of the AS/NZS4600 and the AISI Specification.

"Compression Tests of Cold-Reduced High Strength Steel Stub Columns," D. Yang and G.J. Hancock

The paper describes a series of compression tests performed on stub columns fabricated from G550 steel (80 ksi) to determine the influence of low strain hardening on the compressive section capacity. A proposed design capacity formulation is proposed.

"Local Buckling Tests on Cold-Formed Steel Beams," C. Yu and B.W. Schafer

Described is a series of flexural tests with details selected to specifically insure the local buckling limit state. The test results are compared to the AISI specification and the direct strength method.

"Analysis of Sheathed Cold-Formed Steel Wall Studs," B.W. Schafer and B. Hiriyur

The paper summarizes deficiencies of, and arguments against, current models for estimating the capacity of a sheathed wall stud. Parametric studies provide insight into the behavior of sheathed wall studs.

"Stiffened Elements with Multiple Intermediate Stiffeners and Edge Stiffened Elements with Intermediate Stiffeners," B.W. Schafer

New design rules have been adopted for stiffened elements with multiple intermediate stiffeners and edge stiffeners with intermediate stiffeners. Discussed is the logic behind the development of these new design rules.

"Progress on the Direct Strength Method," B.W. Schafer

Presented is background for the direct strength method and the design rules applicable to cold-formed steel members. The reliability of the direct strength method is demonstrated for both beams and columns.

"Interim Design Rules for Flexure in Cold-Formed Steel Webs," B.W. Schafer and T.W.J. Trestain

Design rules for webs in flexure are presented as a result of the harmonization of the AISI specification and the Canadian Standard. The practical implications of the new design rules are explored in a design example.

"Some Improvements to the Design of Sandwich Panels Subject to Local Buckling Effects," N. Pokharel and M. Mahendran

Research reported in this paper discovered that the Australian rules for the design of sandwich panels did not adequately address the behavior of panels having slender plates. Based on experimental and finite element studies, improved design rules are proposed.

"Numerical and Experimental Studies of an Innovative Cold-Formed Steel Building System," G. Darcy and M. Mahendran

This paper presents the details of a new cold-formed steel building system that does not have conventional frames, purlins, or girts. Also discussed is a series of full-scale tests that simulated wind uplift.

"On the Computation of the Cross-Section Properties of Arbitrary Thin-Walled Structures," C. Xiang, A.C.J. Luo, P. Seaburg, and R. Crain

A generalized computational algorithm based on the line chain and tree models is discussed. Cross-section properties for arbitrary configuration struts without closed loops can be determined using the algorithm.

"Evaluation of Bolt-Hole Elongation Stiffness for the Stiffness Prediction of Cold-Formed Steel Bolted Moment-Connections," J.B.P. Lim and D.A. Nethercot

In this paper a non-linear large-displacement elasto-plastic finite element idealization of a bolt-shank in bearing is presented. The bolt-hole elongation stiffness, a main parameter required for bolted moment-connections is obtained from the analysis.

"Bending and Web Crippling Interaction of Cold-Formed Steel Members," J.A. Wallace, R.M. Schuster, and R.A. LaBoube

Using available test data found in the literature, regression analyses were carried out using the new web crippling equations to substantiate the bending and web crippling equations in the North American Specification for the Design of Cold-Formed Steel Structural Members.

"Calibration of Bolted Cold-Formed Steel Connections in Bearing (With and Without Washers)," J.A. Wallace, R.M. Schuster, and R.A. LaBoube

Contained in this paper are the calibration results of single and double shear cold-formed steel bolted connections with and without washers. The calibrations provide the basis for the factor of safety and phi factor used by the North American Specification for the Design of Cold-Formed Steel Structural Members.

"Calibration of Cold-Formed Steel Welded Connections," F.M. Tangorra, R.M. Schuster, and R.A. LaBoube

The paper summarizes the calibration of welded connection data that was used to develop the factors of safety and phi factors for the North American Specification for the Design of Cold-Formed Steel Structural Members.

"Testing of Bolted Cold-Formed Steel Connections in Bearing (With and Without Washers)," J.A. Wallace and R.M. Schuster

The paper presents the results of tests for both single and double shear bolted connections failing in bearing. The test results are compared with the design equations contained in the AISI specification, S136 Standard, and the North American Specification for the Design of Cold-Formed Steel Structural Members.

"Sway Stability Testing of High Rise Rack Sub-Assemblages," E. Harris and G.J. Hancock

The stability in the down-aisle direction of high-rise storage racks was investigated. Reported is the development of the test rig, and results from the test program. The ability of the test rig to follow the unloading curve is demonstrated.

"Web Crippling of Cold-Formed Steel Members," B. Beshara and R.M. Schuster

The objective of this work was to develop new design equations for predicting the web crippling strength. The North American Specification has adopted the resulting equations for the design of cold-formed steel structural members.

"Design of Industrial Storage Racks," A.T. Sarawit and T. Pekoz

The paper reports on studies to develop a more economical design methodology for industrial storage racks. Studies at both the component behavior and global level behavior indicate that design procedures can be improved and recommendations are suggested.

"Finite Element Modeling of Stainless Steel Columns with Variation in Mechanical Properties," M. Macdonald and J. Rhodes

The paper describes the results obtained from a finite element investigation into the capacity of Type 304 stainless steel column members of lipped cross section. The results are compared with test results and with design code predictions.

"Postbuckling Analysis of Light Gauge Members Using Finite Strips," J. Rhodes

The development of an analysis technique for the behavior of light gauge structural members is outlined. The analysis described is a form of finite strip approach in which the out-of-plane displacements are considered using plate theory and the in-plane displacements are considered using beam theory.