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Abstracts of Conference Papers

During October 17-18, 1996 the 13th International Specialty Conference on Cold-Formed Steel Structures will be held in St. Louis, Missouri. The following are simplified abstracts or brief summaries of the 45 papers to be presented and discussed at the conference:

1."Golden Anniversary of the AISI Specification," by W.W. Yu, D.S. Wolford and A.L. Johnson.

This paper summarizes the historical developments of the AISI Specification for the Design of Cold-Formed Steel Structural Members during the past 50 years. Other related publications and activities are also reviewed and discussed.

2."The 1996 AISI Specification," by R.L. Brockenbrough.

The newly revised AISI Specification combines ASD and LRFD provisions for the design of cold-formed steel structural members. This paper discusses the edge stiffeners, lateral buckling strength, web crippling strength, column strength, wall stud compression strength, diaphragm strength, arc spot weld tension strength, and the strength of screw connections.

3."A New AISI Cold-Formed Steel Design Manual," by R.C. Kaehler and P.A. Seaburg.

This paper describes the purpose and contents of a New AISI Cold-Formed Steel Design Manual. In addition to a review of the history of the Manual, authors of the paper discuss the objective and new features of the 1996 Manual relative to dimensions and properties, beam design, column design, connection design, specification, commentary, supplementary information, and test methods.

4."Design of Cold-Formed Steel Stiffened Elements with Multiple Longitudinal Intermediate Stiffeners," by B. Schafer and T. Pekoz.

A new procedure for calculating the effective width of stiffened elements with multiple intermediate stiffeners is presented. The procedure is shown to be a reliable predictor of the bending strength of members with multiple intermediate stiffeners in the compression flange.

5."A Probabilistic Examination of the Ultimate Strength of Cold-Formed Steel Elements," by B. Schafer, M. Grigoriu, and T. Pekoz.

This paper investigates the ultimate strength of cold-formed steel elements in uniform compression and pure bending with the goal of determining the statistical characteristics of the ultimate strength. The results are compared to the deterministic approach of the AISI LRFD Specification.

6."Effective Width of a Simple Edge-Stiffener subjected to a Stress Gradient," by C.A. Rogers and R.M. Schuster.

This paper outlines a comparison of various modifications to the existing procedure used in North American design standards to calculate the effective width of a simple edge-stiffener subjected to a stress gradient. Authors of the paper recommend that the current procedures remain unchanged in the design standards.

7."The Effects of Perforation Length on the Behavior of Perforated Elements on Compression." by J. Rhodes and M. Macdonald.

The effects of perforation length on the behavior of perforated compression elements are discussed. The test results are compared with the design code predictions and with modified predictions set up to take the perforations and perforation lengths into account.

8."Interaction of Flange/Edge-Stiffened Cold-Formed Steel C-Section," by C.A. Rogers and R.M. Schuster.

This paper discusses the modified procedure for calculating the effective width of an edge-stiffened compressive flange as proposed by Dinovitzer, et al. Based on the comparisons made in the paper, the authors recommend that the Dinovitzer approach be adopted by the North American design standards.

9."Cold-Formed Steel Flat Width Ratio Limits, d/t and d/w," by C.A. Rogers and R.M. Schuster.

This paper reports the findings of an investigation of the flat width ratio limit for simple edge-stiffeners of channels in bending. The investigation consists of the testing and analysis of 44 C-section beams with varied lip depths. Evaluation of the test data revealed that a d/t or d/w limit is not required in the Canadian Standard.

10."Comparison of the Distortional Buckling Method for Flexural Members with Tests," by G.J. Hancock, C.A. Rogers, and R.M. Schuster.

This paper presents a design method for distortional buckling of flexural members. This procedure has been compared with the current North American design standards using the results of beam tests carried out at the University of Waterloo and data available in the literature.

11."Design of Thin-Walled Beams for Distortional Buckling," by J.M. Davies and C. Jiang.

This paper deals with the design of cold-formed steel beams for distortional buckling. Based on the Generalized Beam Theory, some recently proposed design approaches are evaluated and improvements are proposed.

12."Comparison of Tests of Purlins with and without Cleats," by G.J. Hancock, M. Celan, and D. Popvic.

This paper describes a series of tests on Z-Section purlins lapped over three spans and subject to wind uplift loading. The purlins were not attached to the rafters by cleats. The test results are compared with earlier tests with the same configurations but including cleats at the supports.

13."Determination of Purlin R-Factors Using a Non-Linear Analysis," by C.J. Rousch and G.J. Hancock.

This paper shows a numerical model of the twisting behavior of channel and Z-section purlins can be used to generate R-factors. Comparisons between experimentally determined and numerically based R-factors are made.

14."Deflection Design of Cold-Formed RHS Steel Beams," by X.L. Zhao and K.P. Kiew.

The moment-deflection results of cold-formed rectangular hollow section steel beams are examined in this paper. A simple design approach is proposed to account for the effect of the material non-linearity on deflection with a general expression derived to predict the deflection.

15."Finite Element Analysis of Hollow Flange Beams with Web Stiffeners," by P. Avery and M. Mahendran.

This paper presents the details of the finite element model and analytical results of hollow flange beams comprising two stiff triangular flanges and a slender web.

16."Buckling Experiments on Hollow Flange Beams with Web Stiffeners," by M. Mahendran and P. Avery.

This paper presents the details of the experimental investigation, the results, and the final stiffener arrangement with a verification of the finite element study.

17."Flexural Strength of Cold-Formed Steel Panels Using Structural Grade 80 of A653 Steel," by S. Wu, W.W. Yu, and R.A. LaBoube.

This paper presents the results of an experimental investigation of flexural strength of cold-formed steel panels using structural grade 80 of A653 steel. The test results are compared with the current design procedure.

18."Experimental Research on the Behavior of Combined Web Crippling and Bending of Steel Deck Sections," by H. Hofmeyer, J.G.M. Kerstens, H.H. Snidjer, and M.C.M. Bakker.

This paper reviews the existing empirical design rules for combined web crippling and bending of steel deck sections and presents the results of an experimental study of trapezoidal hat section subjected to a concentrated load and a bending moment.

19."Design Models of Continuous Sandwich Panels," by P. Hassinen and L. Martikainen.

This paper present experimental and analytical results concerning the static behavior and strength of continuous sandwich panels at interior supports. It also makes proposals for new calculation models on the serviceability limit state design and reports important findings on the strength limit state design.

20."Structural Detailing of Openings in Sandwich Panels," by T. Toma and W. Courage.

This paper provides detailed and simplified rules to determine the strength and stiffness of sandwich panels with openings on the basis of a study made at the Institute TNO Building and Construction Research.

21."Non-Linear Buckling Analysis of Thin-Walled Metal Columns," by J.M. Davies and C. Jiang.

A non-linear solution of eigenvalue problems set up using the finite element method is presented in this paper. The method has been used to analyze some stability problems in the uniformly compressed uprights of steel pallet racks.

22."Effect of Bracing Stiffness on Buckling Strength of Cold-Formed Steel Columns," by P. Gupta, S.T. Wang, and G.E. Blandford.

This paper reports on a three-dimensional second-order analysis used to study the effect of brace stiffness on the buckling strength of cold-formed steel columns. The strength requirement for various brace components, and the effects of varying warping boundary conditions are also investigated.

23."Structural Design Study on a Light-Gauge Steel Portal Frame with Cold-Formed Sigma Sections," by P. Makelainen and J. Kankaanpaa.

This paper discusses the experimental and analytical investigations on a cold-formed steel portal frame using back-to-back sigma sections as columns and rafters.

24."Lower Cost Lightweight Cold-Formed Portal Frames," by B.W.J. van Rensburg and G.P. de Vos.

In this paper an alternative structural concept for low-rise portals for light industries is proposed. The total frame is made of standard cold-formed sections which are cut and welded together on site.

25."Strength and Stiffness Calculation Procedures for Composite Slabs," by B.R. Widjaja and W.S. Easterling.

Two procedures for calculating the strength and stiffness of composite slabs based on a partial interaction model are introduced. Strength calculations using the new procedures are compared with the SDI procedures.

26."Strength of Headed Shear Studs in Cold-Formed Steel Deck," by J.C. Lyons, W.S. Easterling, and T.M. Murray.

Results from 57 push-out tests of headed shear studs in cold-formed steel deck are presented. The results are compared with the predicted strengths using the AISC LRFD Specification.

27."Towards a Numerical Procedure for Composite Slab Assessment," by H.D. Wright and M. Veljkovic.

This paper explores the potential for numerical modeling to provide the required design information on composite slabs.

28."Moment Rotation Behavior for Concrete Filled SHS Column to Composite Beam Connections," by J.S. Lee, Y.B. Kwon, and K.S. Woo.

This paper discusses a series of semi-rigid connection tests for studying the behavior of connections between concrete filled SHS columns and composite W-section beams. Several connection models were considered and compared with the test results.

29."Stability of Standing Seam Roof-Purlin Systems," by J.M. Fisher and J.N. Nunnery.

This paper discusses the design considerations of purlins which support standing seam roofs.

30."Modeling of Cold-Formed Purlin-Sheeting Systems," by R.M. Lucas, F.G.A. Al Bermani, and S. Kitipornchai.

This paper presents two non-linear elasto-plastic finite element models, capable of predicting the behavior of purlin sheeting systems without need for either experimental input or over-simplifying assumptions. The validity of the models is shown by their good correlation with experimental results.

31."Dynamic Performance of Light Gauge Steel Formed Shear Walls," by R. Serrette, G. Hall, and H. Nguyen.

The results of a series of reversed cyclic 4 ft. X 8 ft. (length x height) 15/32-in. plywood and 7/16-in. Oriented Strand Board shear wall tests are presented in this paper. Based on these limited test data, recommendations are presented for interpretation of these data for design.

32."Steel-The Clear Cut Alternative," by R.B. Haws

This paper discusses the use of cold-formed steel in residential construction and reviews the prescriptive standards and design tables developed from the three-year project conducted by the National Association of Home Builders Research Center and the Department of Housing and Urban Development.

33."Residential Applications of Cold-Formed Structural Members in Australia," by G.J. Hancock and T.M. Murray.

This paper describes the design standards used for residential applications of cold-formed steel in Australia. It also presents a brief description of cold-formed steel members used in innovative building systems which have been introduced into the Australian residential construction market.

34."A Study of the Effects of Cold Forming on the Yield Strength of Stainless Steel Type 304 - Hardness Test Approach," by M. Macdonald, J. Rhodes, M. Crawford, and G.T. Taylor.

This paper describes a preliminary experimental investigation of the effects of cold forming on the material properties of stainless steel corner sections. The background and theory behind the research is briefly reviewed and is followed by a description of hardness testing. The research findings are presented in the paper.

35."An Explicit Approach to Design of Stainless Steel Columns," by K.J.R. Rasmussen and J. Ronal.

The paper describes a design procedure for stainless steel columns failing by flexural buckling. It is shown that the column curve can be described in terms of the Ramberg-Osgood parameters by adopting a Perry curve as basic strength curve.

36."The Strength of Partially Stiffened Stainless Steel Compression Members." by W. Reyneke and G.J. van den Berg.

This paper summarizes a study of the effect of the non-linear behavior of stainless steels on the local buckling strength of partially stiffened compression elements.

37."Burst Strength of Type 304L Stainless Steel Tubes Subjected to Internal Pressure and External Forces," by J. Pretorius, P. Van der Merwe, and G.J. van den Berg.

This paper reports the research findings of an investigation concerning the burst strength of cold-formed type 304L stainless steel tubes subjected to internal pressure and static external forces.

38."Additional Design Considerations for Bolted Connections," by R.A. LaBoube and W.W. Yu.

This paper summarizes the scope and findings of recent UMR research on bolted connections pertaining to bolt hole deformation and shear lag. Additional design provisions are recommended for deformation of bearing connections, shear lag effects, and staggered bolt holes.

39."Shear Behavior of Self Drilling Screws Used in Low Ductility Steel," by L.R. Daudet and R.A. LaBoube.

This paper presents the results of shear tests using self-tapping screws. The results are compared with the AISI design provisions. The performance and behavior of self tapping screws in low ductility steel are compared with that used in normal ductility steel.

40."Performance of Self-Tapping Screws in Lap-Shear Metal-to-Metal Connections," by R. Serrette and V. Lopez.

This paper discusses the performance of self-tapping screws in lap-shear metal-to-metal connections as affected by the head and thread style and the method of installation of screws. Results of four series of lap-shear tests were compared and summarized in the paper.

41."Evaluation and Modeling of the Material Properties for Analysis of Cold-Formed Steel Sections," by N. Abdel-Rahman and K.S. Sivakumaran.

The results of two series of experimental investigations to evaluate the mechanical properties and the residual stresses of cold-formed steel sections are reported in this paper. Based on the experimental results, analytical models for the stress strain relationship, the variation of yield strength, and the residual stress in channel sections are established.

42."The Modulus of Elasticity - Is It 200 GPa?," by M. Mahendran.

This paper discusses the tested values of modulus of elasticity and presents tensile test results for a number of steel grades and thickness, and attempts to develop a relationship between modulus of elasticity, yield stress and thickness for the steel grades considered in this investigation.

43."Geometric Imperfections and Residual Stresses for Use in the Analytical Modeling of Cold-Formed Steel Members," by B. Schafer and T. Pekoz.

In this paper, existing literature is reviewed and a new series of measurements were carried out with the goal of providing basic guidelines for the use of geometric imperfections and residual stresses in analytical models.

44."Cold-Formed Steel Sections Experimental Data Base," by D. Dubina, M. Georgescu, D. Goina, V. Ungureanu, and E. Iorgovan.

This paper discusses thin-walled cold-formed member critical load in the coupling point of overall/local buckling modes is defined, together with critical load erosion factor. A calibration method for using an experimental database called DATACOST is also presented in this paper.

45."Cold-Formed Steel Design by Spreadsheet Program," by S.A. Burns.

This paper demonstrates how to use advanced features of a spreadsheet program to design cold-formed steel members efficiently. The example presented in the paper concerns a hat section in flexure which is to be designed for maximum bending strength with a restriction on the total amount of steel that can be used. The nature of the formulas and data entered into the spreadsheet are presented.

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