Call for Papers: T.R. Higgins Lectureship Award

AISC is seeking nominations for its 34th annual T.R. Higgins Lectureship program. Each year the T.R. Higgins Lectureship Award recognizes an outstanding lecturer and author whose technical paper or papers are considered an outstanding contribution to the engineering literature on fabricated structural steel.

The Award is named for Theodore R. Higgins, Ph.D., former AISC Director of Engineering and Research, who was widely acclaimed for his many contributions to the advancement of engineering technology related to fabricated structural steel. The award honors Higgins for his innovative engineering, timely technical papers and distinguished lectures.

A certificate will be presented to the lecturer at the 2005 North American Steel Construction Conference, and the winner will receive a $10,000 cash award. Co-authors of the paper or papers named in the successful nomination will be recognized.

The award will be made to a nominated individual on the basis of two criteria: (1) the individual's reputation as a lecturer and (2) the jury's evaluation of the paper or papers named in the nomination. The papers will be judged for originality, clarity of presentation, contribution to engineering knowledge, future significance and value to the fabricated structural steel industry.

The author must be a permanent resident of the United States, and available to fulfill at least six lectureship commitments. The paper or papers must have been published in a professional journal within the five-year period from Jan. 1, 1999 to Jan. 1, 2004.

AISC encourages everyone involved with steel construction to submit nominations. The deadline is Aug. 20, 2004.

For nomination guidelines and more information, please contact Janet T. Cummins, AISC Engineering and Research Coordinator at cummins@aisc.org or 312.670.2400. ★

Engineering Journal Seeks Papers on Steel Design and Construction

AISC is always looking for *Engineering Journal* articles on interesting topics pertinent to steel design, research, steel-fabrication methods, or new products of significance to the uses of steel in construction. *Engineering Journal* is especially seeking technical articles with practical applications in the steel industry. If you have a new idea or an improvement on an old idea, please submit a paper to AISC for publication. Detailed instructions for paper submittal and a description of the review process are provided at **www.aisc.org/ej**.

Send your paper in duplicate to:

Engineering Journal
Attn: Cynthia J. Duncan, Editor
American Institute of Steel Construction
One E.Wacker Drive, Suite 3100
Chicago, IL 60601-2000 ★

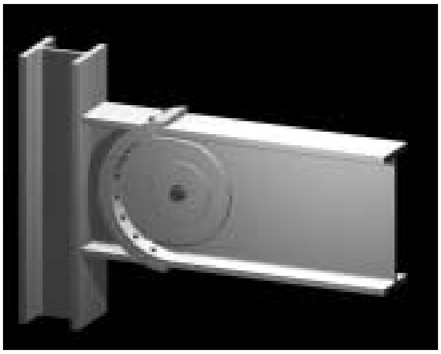
New Patented Joint for Seismic Applications

The U.S. Patent and Trademark Office has issued a patent for a new seismic structural device, the Pin-Fuse Joint, invented by Structural Engineering Partner Mark Sarkisian, P.E., S.E., of Skidmore, Owings & Merrill LLP (SOM) in San Francisco.

The invention was approved with unusual speed; the patent office rejects more than 95 percent of first submissions, and usually takes more than two years to review each one. SOM applied for a patent only a year and a half ago, and the first submission was accepted without comment.

The Pin-Fuse Joint is designed to keep buildings safe in a major earthquake, without incurring major structural damage. Currently, most steel frames feature beams directly welded or bolted to columns. These kinds of joints are designed to successfully keep buildings safe, but usually at their own expense; they allow the building to flex during severe seismic events, becoming inelastic by bending or twisting in the process.

The Pin-Fuse Joint operates something like a ball and socket joint. The curved end of the beam fits into the concave end of a plate assembly welded to the column. A brass shim rests between the two end plates, creating a predictable friction interface. A connecting pin serves as a hinge. High-strength torqued bolts tightly clamp the plate assembly and beam end together. The friction from the bolts and the shim is carefully calculated to keep the joints from slipping under most circumstances, even during strong winds and moderate seismic events. When a severe earthquake strikes, however, the degree of force overcomes the friction, and the joints rotate through slotted bolted connections in the end plates without breaking or disconnecting. This allows the building to flex as the shock waves pass through it, dissipating the energy and reducing the potential damage to the structure. When the earthquake is over, the Pin-Fuse Joints return to their usual positions, with the torque in the bolts maintained.



Using the Pin-Fuse Joint would allow builders to rely on smaller frame members than otherwise would be required to withstand an extreme seismic event. As a result, overall building costs are predicted to be lower. Composed of standard structural steel building materials, the joint can be employed in structures made of structural steel, reinforced concrete, or some combination of the two. SOM is planning to test the full potential of the Pin-Fuse Joint concept in collaboration with a leading university. ★

2004 Student Steel Bridge Competition

Forty-four student teams traveled to Golden, CO on May 28-29 for the 2004 National Student Steel Bridge Competition, hosted by the Colorado School of Mines. The teams of aspiring civil and structural engineers raced to assemble model replacement bridges, which the students designed and fabricated themselves. Winners were announced at a May 29 awards banquet, with nearly 700 students, faculty and guests attending.

National Winners

I. North Dakota State University
II. University of Michigan
III. Southern Polytechnic State University

Category Winners

Construction Speed

I. Illinois Institute of Technology
II. Iowa State University
III. University of Wisconsin - Madison

Lightness

I. North Dakota State University
II. University of Michigan
III. University of Wisconsin -Madison

Aesthetics

I. North Dakota State University
II. University of Puerto Rico-Mayagüez
III. University of Wisconsin - Madison

Stiffness

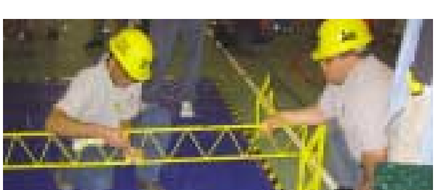
I. North Dakota State University
II. Southern Polytechnic State University
III.University of Michigan

Economy

I. Illinois Institute of Technology
II. Iowa State University
III. University of Wisconsin - Madison

Efficiency

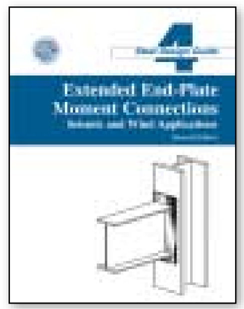
I. North Dakota State University
II. University of Michigan
III. Southern Polytechnic State University



Next year's competition will be held at the University of Central Florida in Orlando, May 27-28, 2005. For information on how your university can get involved, please contact Fromy Rosenberg, rosenberg@aisc.org or 312.670.2400. Watch for more coverage of the 2004 competition in the September issue of *Modern Steel Construction*. ★

New Edition of AISC Design Guide 4 Available

The second edition of *Design Guide 4: Extended End Plate Moment Connections* is now available. The recently updated design guide presents a new design philosophy for the design of extended end-plate moment connections in wind and seismic applications. The guide incorporates the state of the art in end-plate connection design by making use of yield line theory.



The authors of the new design guide are Thomas Murray, Ph.D., P.E., Montague-Betts Professor of Structural Steel Design at Virginia Tech and Emmett Sumner, Ph.D., P.E., Assistant Professor at North Carolina State University

Because of the change in design theory, this revised design guide "extends end-plate moment connection design to seismic applications" and "presents design procedures for 50 ksi steel" according to Thomas Murray.

The *Design Guide* is available to AISC members and *e*Pubs subscribers as a free download from AISC's *e*Pubs web site, **www.aisc.org/epubs.** Hard copies can be purchased at **www.aisc.org/bookstore** ($30 for AISC members, $60 for non-members), or call 800.644.2400. ★

CSI Releases New Numbers for 2004 MasterFormat

The Construction Specifications Institute (CSI) released the section numbers and titles for the upcoming 2004 edition of MasterFormat™, the specifications-writing standard for most nonresidential building design and construction projects in North America. The information is available on CSI's web site, **www.csinet.org/masterformat**.

A difference in the 2004 edition's numbers and titles is a new six-digit numbering system that replaces the old five-digit format. It creates room for users to systematically organize more comprehensive specifications amid the growing volume and complexity of information generated by new products and technologies. For example, the old five-digit number for the section titled "Structural Steel Framing" changes from 05120 to 05 12 00 in the six-digit format. The first two digits signify the MasterFormat division number (05). The second pair of numbers represents information classification level two, and the third pair, level three. A fourth level is defined for some sections. It is represented by a dot and another pair of numbers (Example: 05 12 00.00). By using pairs of digits for each classification level instead of single digits, the six-digit numbering system provides room for more than ten times as many subjects at each level of classification than is available in the five-digit format.

The 2004 edition also expands the number of divisions and broadens MasterFormat's scope to cover engineering-related construction. A new Site and Infrastructure subgroup of divisions covers transportation, utility, and marine construction, and the new Process Equipment subgroup addresses industrial and process engineering projects.★

engineering journal abstracts

The following papers appeared in the Second Quarter 2004 issue of AISC's Engineering Journal*, which mailed in June and is available online at* ***www.aisc.org/ePubs****.*

Behavior of Transverse Fillet Welds: Experimental Program

Anthony K.F. Ng, Kam Deng, Gilbert Y. Grondin, and Robert G. Driver

The main objective of the research presented in this paper is to expand the body of experimental results on transverse fillet welds to include the flux cored arc welding (FCAW) process and to confirm the applicability of the current provisions of the Canadian Standard, CSA–S16–01, and Appendix J2.4 of the AISC Specification to a broader range of electrode types and other conditions. In particular, the selected filler metals were to possess varying levels of material toughness. The effects of wire manufacturer, steel fabricator, weld size and number of passes, root notch orientation, and ambient temperature were also investigated.

A review of the literature is presented in order to obtain a better understanding of the basis for the current design equation and its limitations. A description of the comprehensive test program recently conducted at the University of Alberta to investigate the strength and behavior of transverse fillet welds is then presented. A companion paper, also published in this issue of the Engineering Journal, presents parametric and reliability analyses of the test results to evaluate the level of safety being provided by the current design equation.

Behavior of Transverse Fillet Welds: Parametric and Reliability Analyses

Anthony K.F. Ng, Robert G. Driver, and Gilbert Y. Grondin

Transverse fillet weld specimens were tested to assess the influence of various parameters on fillet weld strength and ductility and to evaluate the level of safety being provided currently by North American design standards. Details of the test procedures and results are reported in the companion paper by Ng, Deng, Grondin, and Driver, also published in the 2nd Quarter 2004 issue of the *Engineering Journal*. The variables included in the study were the filler metal classification (including classifications both with and without a toughness requirement), fillet weld size and number of passes, electrode manufacturer, steel fabricator, root notch orientation, and test temperature.

Fabrication Aids for Cold Straightening I-Girders

Antoine Gergess and Rajan Sen

Fabrication out-of-straightness in steel girders can be rectified using heat straightening or cold straightening. While heat straightening has been extensively researched, little information is available on cold straightening where loads are used to achieve the same result. This paper provides an analytical framework for an innovative cold straightening (also referred to as cold bending) system developed by a fabricator. Maximum safe limits on loads, out-of-straightness and load frame configurations that are consistent with prevailing load and resistance factor design (LRFD) criteria are proposed. Fabrication aids for Grade 250 (F_y = 36 ksi) and 345 (F_y = 50 ksi) steel are developed and their application illustrated by three numerical examples.

Lateral-Torsional Buckling of Wide Flange Cantilever Beams

Bo Dowswell

The American Institute of Steel Construction, *Load and Resistance Factor Design Specification for Structural Steel Buildings* includes provisions for the design of beams to prevent lateral-torsional buckling. The design method uses an equation that was derived for a simply supported beam with equal end moments. The equation is not accurate for cantilever beams because the mechanics of buckling are different from simply supported beams. The AISC procedure produces over-conservative results for cantilever beams that are braced laterally at the tension flange, and unsafe results for cantilever beams that are braced laterally at the compression flange. Equations to predict the lateral-torsional buckling capacity of cantilever beams were developed by curve fitting elastic finite element data from the program BASP. The equations explicitly account for the effects of bracing, load height, and moment distribution along the length of the beam. Simplified equations are proposed that are generally conservative compared to the finite element data. A design method is proposed that uses a modified factor to be used with the AISC procedure. ★

Suggested Reading from Other Publishers

The following abstracts summarize papers published in the March 2004 issue of ASCE Journal of Structural Engineering *that may be of interest to readers of AISC's* Engineering Journal*.*

Postbuckling Behavior of Axially Restrained and Axially Loaded Steel Columns under Fire Conditions

Y. C. Wang

This paper presents the results of a theoretical study of the postbuckling behavior of an axially loaded steel column at elevated temperatures whose thermal expansion is restrained by the adjacent structural members. This study investigates the effects on the column failure temperature by various factors, including the restraint stiffness during the column loading (expansion) and unloading (contraction) phases, column slenderness, and the initially applied column load ratio. The column failure temperature is defined as the temperature at which the load in the column during the postbuckling phase returns to its initial load. Results of this study indicate that the column failure temperature can be much higher than that of the column at first buckling and the higher the column slenderness, the larger the difference between temperatures of column failure and first buckling. Consequently, the column postbuckling behavior should be considered. Nevertheless, for columns with light restraints (restraint stiffness to column stiffness less than 5%) or high load ratios (load ratio higher than 0.5), the failure temperature of the column with realistic unloading stiffness of the restraint is only slightly affected by the postbuckling behavior.

Effect of Column Stiffness on Braced Frame Seismic Behavior

Gregory A. MacRae, Yoshihiro Kimura, and Charles Roeder

Steel concentrically braced frames are generally designed to resist lateral force by means of truss action. Design considerations for columns in these frames are therefore governed by the column axial force while column bending moment demands are generally ignored. However, if the columns cannot carry moments, then dynamic inelastic time-history analyses show that a soft-story mechanism is likely to occur causing large concentrated deformations in only one story. Such large concentrations of damage are not generally seen in real frames since columns are generally continuous and they possess some flexural stiffness and strength. This paper develops relationships for column stiffness and drift concentration within a frame based on pushover and dynamic analyses. It is shown that continuous seismic and gravity columns in a structure significantly decrease the possibility of large drift concentrations. An assessment method and example to determine the required column stiffness necessary to limit the concentration of story drift is provided. ★