

WEB SITE

A New MSC Web Site!

If you've visited the *Modern Steel Construction* web site (www.modernsteel.com) lately, you may have noticed some changes. If you haven't been there in a while, take a look: We've got a new site!

Besides overhauling the appearance, the biggest change is that we now offer the current issue of the magazine in a digital e-book format. The digital version of MSC shows the magazine exactly as it appears in print, including advertisements. Also, all links and e-mail addresses (in both the text and ads) in the digital version are live links.

Each digital edition will stay live for about a month, until it's replaced by the next issue. And of course, current and past articles are always available in the familiar PDF format. (Check out our revised, easy-

to-browse Archives section).

In addition, the revised About MSC section contains links for advertising, submitting articles, and managing subscriptions.

Other new features:

- ✓ Steel in the News: a regularly updated news section
- ✓ Reader Forum: an opportunity for you to provide feedback and discuss relevant topics
- ✓ A searchable Career Classified section (based on the Marketplace/Employment section of MSC)
- ✓ A searchable Product Directory
- ✓ A "What's the SSC Answering Now?" feature with live questions and answers from AISC's Steel Solutions Center
- ✓ Collections of popular articles (Quality Corner, SteelWise, and Career Resources)

✓ Links to the popular Steel Utilities forum site and Steel Availability information on the AISC site

✓ A searchable database of Steel Interchange questions

In addition, the MSC site now accepts advertisements (click the Advertising link for details).

Please give our new web presence a visit and let us know what you think! E-mail your comments to Keith Grubb at grubb@modernsteel.com.



EVENTS

2007 Bridge Symposium

"Steel Going Strong" is the theme of the 2007 World Steel Bridge Symposium, to take place December 4-7, 2007 in New Orleans.

The WSBS gathers steel bridge owners, designers, and contractors from around the world to discuss all aspects of steel bridge design and construction. The exhibit hall is full of products and services to advance the state-of-the-art of the steel bridge industry. WSBS attendees come to the symposium to learn about the latest innovations in steel bridges.

Focus areas of the symposium's many sessions include, but are not limited to: short span bridges; intermediate span bridges; case studies featuring the use of high-performance steel; restoration, rehabilitation, and reuse; fabrication, construction, and erection; innovative bridge designs; and inspection and maintenance. In addition, this year's program features half-day workshops on AISC Certification and quality management, as well as pre-conference workshops on prefabricated bridge elements and systems and accelerated construction technologies.

The highlight of this year's symposium banquet will be the presentation of the 2007 Prize Bridge Awards.

For exhibit and sponsorship information, contact Jody Lovsness at 402.758.9099 or lovsness@nsbaweb.org. For general information, contact Elizabeth Purdy at 312.670.5421 or purdy@aisc.org. Visit www.steelbridges.org for the latest information.

HSS

AISC Requests HSS Data from Independent Testing

During the past few months, a number of companies in the U.S. and Canada, including producers of hollow structural sections (HSS) and steel service centers, have sponsored a limited number of tests by independent testing facilities on HSS material imported from China, as well as HSS material produced in North America. As a result of those independent tests, the companies have raised questions about the mechanical properties of the imported HSS, as well as the credibility and reliabil-

ity of the documentation provided when the products entered the U.S. and Canada from some of the newer sources in our market. (For more information on HSS products, including a list of traditional suppliers to the domestic market, please visit www.aisc.org/hss.)

"AISC has not been involved in any of this HSS testing. Nor have we thoroughly reviewed the test data," said Roger Ferch, AISC president. "We believe it is premature to draw any conclusions from any of

the tests that have been conducted." It is important to note, however, that from the data we have been provided, AISC has not concluded that there is a building code issue.

AISC is seeking to compile all available test data from its members and others in the steel industry willing to provide their test data. We request anyone who has sponsored recent tests on imported or domestic HSS to please contact Roger Ferch at ferch@aisc.org or 312.670-5401.

Fourth Quarter 2007 Article Abstracts

The following papers appear in the fourth quarter 2007 issue of AISC's *Engineering Journal*. *EJ* is also available online to AISC members and ePubs subscribers at www.aisc.org/epubs.

Improved Flexural Stability Design of I-Section Members in AISC (2005) – A Case Study Comparison to AISC (1989) ASD

DONALD W. WHITE AND CHING-JEN CHANG

The provisions in the AISC 2005 *Specification for Structural Steel Buildings* for the flexural stability design of steel I-section members have been updated relative to previous specifications to simplify their logic, organization, and application, while also improving their accuracy and generality. This paper gives a brief overview of the updated provisions, and compares and contrasts their flexural resistance calculations with the corresponding calculations from the previous AISC 1989 *Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design*. The relative simplicity and accuracy of the AISC 2005 specification equations are highlighted.

Topics: Beams and flexural members, specifications

Direct Analysis and Design Using Amplified First-Order Analysis, Part 1 – Combined Braced and Gravity Framing Systems

DONALD W. WHITE, ANDREA SUROVEK, AND SANG-CHEOL KIM

In 1976 and 1977, LeMessurier published two landmark papers on practical methods of calculating second-order effects in frame structures. LeMessurier addressed the proper calculation of second-order displacements and internal forces in general rectangular framing systems based on first-order elastic analysis. He also addressed the calculation of column buckling loads or effective length factors using the results from first-order analysis. The 2005 AISC specification provides a new method of analysis and design, termed the Direct Analysis Method (or the DM). The DM involves the use of a second-order elastic analysis that includes a nominally reduced stiffness and an initial out-of-plumbness of the structure. The 1999 AISC LRFD and the 2005 AISC

specifications permit this type of analysis as a fundamental alternative to their base provisions for design of stability bracing. In fact, the base 1999 AISC specification and the 2005 AISC specification stability bracing requirements are obtained from this type of analysis. This paper demonstrates how a form of LeMessurier's simplified second-order analysis equations can be combined with the 2005 AISC specification DM to achieve a particularly powerful analysis-design procedure.

Topics: Analysis, lateral systems, stability and bracing

Direct Analysis and Design Using Amplified First-Order Analysis, Part 2 – Moment Frames and General Framing Systems

DONALD W. WHITE, ANDREA SUROVEK, AND CHING-JEN CHANG

This paper presents an application of the Direct Analysis Method (DM) introduced in the 2005 AISC *Specification for Structural Steel Buildings* for moment and general combined framing systems. The DM accounts explicitly for nominal initial out-of-plumbness of the framing as well as the reduction in the stiffness of the structure at the maximum strength limit of its most critical member or members. As a result, this approach provides a more rational estimate of the internal forces at the maximum strength limit. Also, the column and beam-column strength checks in moment frames may be based on $K = 1$ by using this method. One additional modification to a conventional elastic analysis is required in general for beam-columns in moment frames; in other words, the flexural rigidity must be reduced by an additional column inelastic stiffness reduction factor, τ , for columns loaded by axial forces in excess of $0.5P_y$. This paper proposes two modifications to the underlying amplified first-order elastic analysis approach presented in Part 1 of this paper (published in the same issue), to extend this procedure to general rectangular framing involving any combination of moment, braced, and gravity systems. Suggestions are also provided for approximate handling of frames with large axial compression in the beams or rafters and/or nonrectangular geometry.

Topics: Analysis, lateral systems, stability and bracing

Limit State Response of Composite Columns and Beam-Columns, Part I: Formulation of Design Provisions for the 2005 AISC Specification

ROBERTO T. LEON, DONG KEON KIM, AND JEROME F. HAJJAR

The 2005 *Specification for Structural Steel Buildings* contains substantial changes to the design of composite members and composite columns in particular. These revisions are intended to reflect the extensive research in the area of composite steel-concrete structures during the past two decades, as the previous specifications were based on studies from the late 1960s-1970s. This paper describes the databases created and the process followed to develop the new provisions. This process includes the development of both new strength equations for encased and concrete-filled columns and new interaction equations for composite beam-columns, as well as considerable liberalization of local buckling and material limits. The paper also discusses other important areas of composite design, such as bond stress between steel HSS sections and concrete, where specification provisions are under development. This is the first of a two-part paper; the second part contains detailed design examples.

Topics: Composite construction, columns and compression members, combined loading, stability and bracing

The Behavior of Steel Perimeter Columns in a High-rise Building Under Fire

MARIA M. GARLOCK AND SPENCER E. QUIEL

The thermal response of structural steel may affect the behavior of a steel high-rise building exposed to fire. In a plane perpendicular to the exterior wall, a perimeter column is typically laterally braced by one beam. The fire-induced structural response of this beam that frames into the perimeter column (perpendicular to the exterior wall) directly affects the perimeter column behavior and the structural integrity of the frame as a whole. The objective of this research is to evaluate the behavior of perimeter columns in a steel high-rise building that is subjected to a large fire, and examine this behavior as it interacts with the beams that frame into it. This

behavior is examined by several analyses that consider the inclusion of fire protection material on the beams and columns as a parameter. A two-dimensional model of eleven upper level floors of a steel-framed building subjected to fire is analyzed. The thermal expansion of the beams that frame into the perimeter column induce column lateral deformations and moments that combine with axial gravity forces to create a plastic hinge in the perimeter columns. Since these beams are partially restrained from expanding, large axial forces develop in them, which, combined with bending moments, may lead to beam failure. Once these beams, which brace the perimeter column in one plane, fail, the stability of the column, and structure as a whole, is compromised and could potentially lead to structural collapse. The results of this research confirm the design philosophy in current codes that recommends the same level of fire protection material for these beams as the columns to which they are attached, since they significantly affect perimeter column behavior and thus the overall behavior of the frame. This study also shows that the perimeter columns and beams act as beam-columns in a fire (in other words, members under combined axial load and bending), and therefore, their behavior and capacity should be evaluated as such.

Topics: Fire and temperature effects

Current Steel Structures Research

REIDAR BJORHOVDE

This regular feature of the *Engineering Journal* provides information on new and ongoing research around the world. In the 12th installment, research projects are summarized on the following topics: tests on bolted shear connections with high-strength steel, development of a hysteretic model with pinching for steel connections, estimation of cyclic characteristics for thin web plates after shear buckling, system behavior factors for composite and mixed structural systems, practical design methods for steel and composite frames with semi-rigid connections, and storage racks in seismic areas.

Topics: Research

CERTIFICATION

Kentucky Fabricator Wins Free QMC Audit

Since October 2006, Quality Management Company, LLC, provider of quality audits for the AISC Certification program, has been administering a voluntary customer satisfaction survey of AISC Certified Fabricators and Erectors upon receipt of their certificate. Companies that complete the survey are automatically entered into a semi-annual drawing for a free QMC audit. **Harry Gordon Steel Company, Inc.**, a fabricator in Lexington, Ky., has won QMC's most recent drawing for a free audit.

The objective of the survey is to improve the certification process from invoicing to the audit to issuing the certificate. QMC will draw for another free audit in about six months, so keep those surveys coming in!

CODES AND STANDARDS

ASCE/SEI Requests Public Comments

The American Society of Civil Engineers' Structural Engineering Institute (ASCE/SEI) today announced it will conduct a public comment period on the second supplement to its Minimum Design Loads for Buildings and Other Structures standard (ASCE 7-05). The public comment period is now open and will run until December 4, 2007.

The purpose of the standard is to provide minimum load requirements for the

design of buildings and other structures that are subject to building code requirements. This supplement addresses changes to seismic design requirements for building and non-building structures.

To participate in the public comment period, contact Phillip Mariscal, ASCE standards administrator, at pmariscal@asce.org or 703.295.6338. For more information on the standard or ASCE's standards program, please contact Karen Albers at kalbers@asce.org or 703.295.6404.

letters

Dead On, but Expensive

Todd Alwood's September 2007 MSC article "Let's Be Plank..." (p. 39) is a long-needed dissertation on the detailed intricacies of combining precast, prestressed hollow-core slabs (plank) with structural steel. Ted Hazeldine of Benchmark Fabricated Steel is also correct with his tips for fabricators in his sidebar on p. 40.

Alwood's description of plank and its pros and cons was extremely informative and accurate, and his caveat to "know your plank supplier" could not have been more on target. I am therefore dumbfounded by his suggestions to the steel industry on what can be done with steel to optimize the use of plank. The suggestions in his article are expensive and are the type of details that usually preclude the use of structural steel and plank. I was surprised

that no mention was made of the Girder-Slab system, which received the 2007 Special Achievement Award from AISC. It is the first and only innovative system that combines the advantages of structural steel and flat plate concrete for high-rise residential construction, and has been used in 38 completed buildings comprising almost three million sq. ft of built residential construction.

We are tracking new projects totalling almost 12 million sq. ft, and the case studies on our web site (www.girder-slab.com) contain a partial listing of all the prominent and innovative structural engineers that have used Girder-Slab.

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