TECHNICAL DOCUMENTS

2005 AISC Seismic Provisions Now in Print

Printed copies of the 2005 AISC *Seismic Provisions for Structural Steel Buildings* including *Supplement No. 1* are now available to purchase through AISC's online bookstore at **www.aisc.org/bookstore**. The *Seismic Provisions* are a free download at **www.aisc.org/2005seismic**.

The 2005 seismic provisions supersede the 2002 *Seismic Provisions for Structural Steel Buildings* and all previous versions of this specification. This new standard has been approved by the AISC Committee on Specifications and is ANSI-accredited. The 2005 seismic provisions have also been adopted by reference in the 2006 *International Building Code*, and as a result will soon govern the seismic design of all steel buildings in the United States.

A major change to the 2005 seismic provisions is in format: consistent with the 2005 AISC *Specification for Structural Steel Buildings*, it combines allowable strength design (ASD) and load and resistance factor design (LRFD) into a single, unified approach. Part III, which accommodated ASD in previous editions, was absorbed into Part I (Structural Steel Buildings) and Part II (Composite Structural Steel and Reinforced Concrete Systems).

Other revisions have been incorporated throughout the document, including new quality criteria and two new seismic systems—buckling-restrained braced frames and special plate shear walls.

More information about the new and revised provisions can be found in the document's preface, or in James O. Malley's paper, "The 2005 AISC *Seismic Provisions for Structural Steel Buildings*," published in the 2005 North American Steel Construction Conference Proceedings, available as a free download to AISC members and ePubs subscribers at **www.aisc.org/epubs**.

Got News?

Send your news items, announcements, and industry events to Keith Grubb, grubb@modernsteel.com or Lena Singer, singer@modernsteel.com.

CONTINUING EDUCATION

First Quarter Seminars from AISC Continuing Education

AISC's Continuing Education Department will offer two seminars in the first quarter of 2006: "Design Steel Your Way with the 2005 AISC Specification" and "Seismic Braced Frames."

"Design Steel Your Way with the 2005 AISC Specification" will accelerate your ability to design steel buildings according to the 2005 *Specification for Structural Steel Buildings*, whether you design in ASD or LRFD. Presentation topics will include proper material selection, design philosophies and analysis requirements, member and structure stability provisions, member design, and connection design. This seminar also includes extensive handouts: Each attendee will receive a copy of the course notes and design examples, the AISC *Design Examples* CD, and a copy of the 13th Edition AISC *Steel Construction Manual*, which includes the 2005 AISC specification, the 2004 RCSC specification, and the 2005 *Code of Standard Practice for Steel Buildings and Bridges*.

This year's 2005 AISC specification seminars also include "extras" available only to attendees. Each attendee will receive laminated copies of the Basic Design Values cards—two 5" × 8" cards that include the most-used information from the 2005 AISC specification, in both ASD and LRFD. With these cards, users can design all typical beams, columns, braces, tension members, and connections and perform simplified analyses. Attendees will also be eligible to win an Apple iPod Nano—one per seminar—courtesy of AISC Certification.

"Seismic Braced Frames" is a full-day seminar that concentrates specifically on design of seismic braced frames. The course will focus on the design requirements in the 2005 AISC *Seismic Provisions for Structural Steel Buildings*. For those proficient in the 2002 AISC seismic provisions, the seminar will highlight the differences between the 2002 and 2005 editions, and the implications of these changes in your design. (Look for another seismic design seminar, "AISC Seismic Design—Updates and Resources for the 21st Century," later in 2006.)

AISC continues to offer its "Bring a Buddy" registration program for all of its seminars. If eligible, paid registrants may add one person to their registration at a reduced rate. And, as always, AISC members attend at discounted rates. To become a member and receive the AISC member discount, please visit **www.aisc.org/membership**. Call 800.809.2364 or visit **www.aisc.org/2006seminars** for more information or to register.

Seismic Braced Frames	
February 28	Boston, Mass.
March 2	New York, N.Y.
March 28	Washington, D.C.
March 30	Houston, Texas

Design Steel Your Way with the 2005 AISC Specification	
February 22	San Diego, Calif.
February 23	Pasadena, Calif.
March 8	Greensboro, N.C.
March 8	Seattle, Wash.
March 9	Raleigh, N.C.
March 9	Portland, Ore.
March 14	San Francisco, Calif.
March 16	Los Angeles, Calif.
March 22	Baltimore, Md.
March 22	Columbus, Ohio
March 23	Cincinnati, Ohio
March 23	Richmond, Va.

UNIVERSITY RELATIONS

2006 AISC Scholarships and Fellowships

Need some extra cash to help you get through this school year? A total of $47,000 is being offered by AISC and its industry partners in 2006. Scholarships and fellowships are available to students in several states and at select universities throughout the country:

2006 Scholarships for Undergraduates

	States and Universities	Award
AISC/Carolina Steel	Va., N.C., S.C., and Ala.	$3,000
AISC/Southern Association of Steel Fabricators	Alaska, Ark., Fla., Ga., Ky., La., Miss., and Tenn.	$2,500
AISC/Associated Steel Erectors of Chicago	IIT, Northwestern U., and U. of Illinois—Chicago	5 × $3,000
AISC/Indiana Fabricators Association	Purdue U., Notre Dame U., and University of Evansville	3 × $500
AISC/Fred R. Havens*	Mo., Kan., and MIT	$5,000

*The AISC/Fred R. Havens Fellowship is offered either as an undergraduate scholarship or as a graduate fellowship.

2006 Fellowships for Graduate Students

	States and Universities	Award
AISC/US Steel	Minn., Wis., Ill., Ind., Iowa, Neb., Okla., Texas, Ark., Hawaii, Md., Ohio, and Del.	$2,500
AISC/Klingelhofer	N.D., S.D., N.M., Mont., Ariz., Utah, Idaho, Ore., Wash., W.Va., Pa., N.Y., N.J., and Washington, D.C.	$2,500
AISC/Great Lakes Fabricators and Erectors Association	Mich.	$5,000
AISC/Southern Association of Steel Fabricators	Alaska, Ark., Fla., Ga., Ky., La., Miss., and Tenn.	$2,500
AISC/Rocky Mountain Steel Construction Association	Colo. and Wyo.	$3,000
AISC/Fred R. Havens*	Mo., Kan., and MIT	$5,000
AISC/Structural Steel Education Council	Calif. and Nev.	2 × $2,500

*The AISC/Fred R. Havens Fellowship is offered either as an undergraduate scholarship or as a graduate fellowship.

Application forms can be downloaded from the AISC web site at **www.aisc.org** (look for "University Programs" under "Learning Opportunities" on the home page). For further information, contact Fromy Rosenberg at 312.670.5408 or rosenberg@aisc.org; or contact Megan Maurer at 312.670.5418 or maurer@aisc.org.

COMING EVENTS

ICC Design Professional Institute

The International Code Council (ICC) will host a Design Professional Institute, March 21-22 in Sacramento, Calif. for architects and engineers. The institute will discuss how to design in compliance with the 2006 International Building Code (IBC), and will highlight key code requirements, including those for accessibility and usability, means of egress, wind loads, materials, and fire resistance and fire protection.

Registration for the Design Professional Institute is available online at **www.iccsafe.org/training**. Contact Sol Alba at salba@iccsafe.org or 888.ICC.SAFE, ext. 4333 for more information.

ENGINEERING JOURNAL

Best EJ Paper of 2005

The winners of the Best *Engineering Journal* Paper of 2005 competition are Robert O. Disque and Louis F. Geschwindner, chosen for their paper, "Flexible Moment Connections for Unbraced Frames Subject to Lateral Forces—A Return to Simplicity." The paper was published in the second quarter 2005 issue of the *Engineering Journal*. Papers are available online to AISC members and ePubs subscribers at **www.aisc.org/epubs**.

The paper was selected by EJ readers from a complete list of papers published in 2005. The award for the paper will be presented to the authors at NASCC: The Steel Conference, February 8-11 in San Antonio during the Wednesday, February 8 plenary session. The winning authors received complimentary registration to the conference, as well as reimbursement for travel expenses and an overnight stay at the conference hotel.

Readers who voted for the paper were eligible for a drawing to also receive complimentary registration, airfare, and a one-night stay at the conference hotel. Boaz Nam of SKC Detailing, Inc. in Gardena, Calif. was this year's lucky recipient. Look for more details later this year about how you can participate in selecting the best EJ paper of 2006.

UNIVERSITY RELATIONS

New Teaching Aids from AISC

New steel design teaching aids will be introduced at a workshop for educators presented by AISC on Thursday, April 6, 2006 at the Hyatt Rosemont Hotel in Chicago. These teaching aids are designed for courses in construction and construction management, as well as university architecture programs.

A $350 travel stipend is available to educators attending the workshop. For more information about registration or the stipend, please contact Fromy Rosenberg at 312.670.5408 or rosenberg@aisc.org; or contact Megan Maurer at 312.670.5418 or maurer@aisc.org.

news & events

CORRECTION

New W36 Shapes

In an article in the October 2005 issue of *MSC* that explained changes to W36 shapes, the k_{det} dimensions were inadvertently substituted for the k_1 dimensions. A portion of Table 1-1 from the 13th Edition *Steel Construction Manual* with the correct dimensions is reproduced below. We apologize for the error.

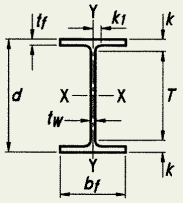

Table 1–1 (continued)
W Shapes
Dimensions

Shape	Area, A	Depth, d		Web			Flange				Distance				
				Thickness, t_w		$\frac{t_w}{2}$	Width, b_f		Thickness, t_f		k		k_1	T	Workable Gage
											k_{des}	k_{det}			
	in.^{2}	in.		in.		in.	in.		in.		in.	in.	in.	in.	in.
W36×800[h]	236	42.6	42 1/2	2.38	2 3/8	1 3/16	18.0	18	4.29	4 5/16	5.24	5 9/16	2 3/8	31 3/8	7 1/2
×652[h]	192	41.1	41	1.97	2	1	17.6	17 5/8	3.54	3 9/16	4.49	4 13/16	2 3/16		
×529[h]	156	39.8	39 3/4	1.61	1 5/8	13/16	17.2	17 1/4	2.91	2 15/16	3.86	4 3/16	2		
×487[h]	143	39.3	39 3/8	1.50	1 1/2	3/4	17.1	17 1/8	2.68	2 11/16	3.63	4	1 15/16		
×441[h]	130	38.9	38 7/8	1.36	1 3/8	11/16	17.0	17	2.44	2 7/16	3.39	3 3/4	1 7/8		
×395[h]	116	38.4	38 3/8	1.22	1 1/4	5/8	16.8	16 7/8	2.20	2 3/16	3.15	3 7/16	1 13/16		
×361[h]	106	38.0	38	1.12	1 1/8	9/16	16.7	16 3/4	2.01	2	2.96	3 5/16	1 3/4		
×330	97.0	37.7	37 5/8	1.02	1	1/2	16.6	16 5/8	1.85	1 7/8	2.80	3 1/8	1 3/4		
×302	88.8	37.3	37 3/8	0.945	15/16	1/2	16.7	16 5/8	1.68	1 11/16	2.63	3	1 11/16		
×282[c]	82.9	37.1	37 1/8	0.885	7/8	7/16	16.6	16 5/8	1.57	1 9/16	2.52	2 7/8	1 5/8		
×262[c]	77.0	36.9	36 7/8	0.840	13/16	7/16	16.6	16 1/2	1.44	1 7/16	2.39	2 3/4	1 5/8		
×247[c]	72.5	36.7	36 5/8	0.800	13/16	7/16	16.5	16 1/2	1.35	1 3/8	2.30	2 5/8	1 5/8		
×231[c]	68.1	36.5	36 1/2	0.760	3/4	3/8	16.5	16 1/2	1.26	1 1/4	2.21	2 9/16	1 9/16		
W36×256	75.4	37.4	37 3/8	0.960	15/16	1/2	12.2	12 1/4	1.73	1 3/4	2.48	2 5/8	1 5/16	32 1/8	5 1/2
×232[c]	68.1	37.1	37 1/8	0.870	7/8	7/16	12.1	12 1/8	1.57	1 9/16	2.32	2 7/16	1 1/4		
×210[c]	61.8	36.7	36 3/4	0.830	13/16	7/16	12.2	12 1/8	1.36	1 3/8	2.11	2 5/16	1 1/4		
×194[c]	57.0	36.5	36 1/2	0.765	3/4	3/8	12.1	12 1/8	1.26	1 1/4	2.01	2 3/16	1 3/16		
×182[c]	53.6	36.3	36 3/8	0.725	3/4	3/8	12.1	12 1/8	1.18	1 3/16	1.93	2 1/8	1 3/16		
×170[c]	50.1	36.2	36 1/8	0.680	11/16	3/8	12.0	12	1.10	1 1/8	1.85	2	1 3/16		
×160[c]	47.0	36.0	36	0.650	5/8	5/16	12.0	12	1.02	1	1.77	1 15/16	1 1/8		
×150[c]	44.2	35.9	35 7/8	0.625	5/8	5/16	12.0	12	0.940	15/16	1.69	1 7/8	1 1/8		
×135[c,v]	39.7	35.6	35 1/2	0.600	5/8	5/16	12.0	12	0.790	13/16	1.54	1 11/16	1 1/8		

letters

Comments on Changes

I enjoyed all of the changes that were made to *Modern Steel Construction* magazine except for what was done at the beginning of the stories. I didn't care for the three lines or so of bold introduction. For whatever reason, I found it hard to read and didn't really feel like it was necessary.

For example, on page 18 in the article about the NASCC, the bold intro is one column wide, while the main article is two columns wide. There also doesn't appear to be much rhyme or reason to what is in bold text other than just the first three lines. It wasn't even the first whole sentence. (Although it does seem to make a little more sense on some of the later articles.)

Overall, it just doesn't work for me. Just my two cents.

I did like the faded drop cap that was added to the beginning of the stories. All the other changes were great and overall it is more readable. Keep up the good work.

Dan Broekhuizen, P.E.
URS Corporation
Grand Rapids, MI

CALL FOR PAPERS

2007 Pacific Structural Steel Conference

Organizers of the Pacific Structural Steel Conference (PSSC) are now accepting abstracts for papers to be presented at the 2007 conference, "Steel Structures in Natural Hazards." Abstracts will be accepted until April 28, 2006.

The 2007 PSSC will be held March 13-17, 2007 in Wairakei, New Zealand and will address steel structures and their performance in hazardous natural events such as earthquakes, wind, fire, waves, volcanic eruption, ice, and snow. Conference papers should address at least one of these topics, or one of the following related topics:

- Advances in fabrication and construction
- Bridges and marine structures
- Case studies
- Buildings
- Composite behavior
- Codes and standards
- Connections
- Design aids
- Durability
- Economics
- Fatigue and fracture
- IT in the industry
- Long-span structures
- Structural architecture
- Welding and bolting

Authors may submit any number of abstracts, but a maximum of two may be presented at the conference. In accordance with the submission guidelines, each abstract:

- Must include an introduction, a summary of key points (where appropriate), and conclusions.
- May not exceed 400 words.
- Should advise which of the conference's topics are applicable, if more than one topic is addressed.

Authors will be notified of acceptance by June 30, 2006. Complete papers must be submitted for review by September 1.

For more information on the 2007 PSSC or the abstract submission guidelines, please visit **www.pssc2007.com**.

ENGINEERING JOURNAL

First Quarter 2006 Article Abstracts

The following papers appear in the first quarter 2006 issue of AISC's *Engineering Journal*. EJ is also available online to AISC members and ePubs subscribers at **www.aisc.org/epubs**.

Solutions for Enhancing the Fire Endurance of HSS Columns Filled with High Strength Concrete

V.K.R. KODUR

Steel-concrete composite columns offer a number of benefits and are often used in multistory buildings and industrial structures. In this paper, the fire performance of high strength concrete-filled steel hollow structural section (HSS) columns is presented for various types of concrete filling. A comparison is made of the fire resistance performance of HSS columns filled with normal strength concrete (NSC) and high strength concrete (HSC). The factors that influence the behavior of HSC-filled HSS columns, under fire conditions, are discussed and solutions are suggested for enhancing fire resistance of these columns.

Topics: Composite Construction, Hollow Structural Sections, Fire and Temperature Effects, Columns and Compression Members

Effect of Loading Angle on the Behavior of Fillet Welds

KAM DENG, GILBERT Y. GRONDIN, AND ROBERT G. DRIVER

The fillet weld design equation in the American and Canadian steel design standards is based upon research on the behavior of SMAW test specimens, therefore, the significant increase in weld strength recognized by these design standards as the loading angle increases might not be suitable for low toughness welds made with other welding processes such as FCAW, which is more commonly used for production welding. An experimental program was conducted to investigate the effect of filler metal toughness on fillet weld behavior. The first phase of this test program included only transverse fillet welds. The variables in the first phase included filler metal classification (both filler metals with a toughness requirement and some without were tested), electrode manufacturer, fabricator, weld size, root notch orientation, and test temperature. A reliability analysis of the test results (102 test specimens) indicated that the current design equation provides a safety index greater than 4.5 for transverse welds. The second phase, which formed the basis of the work presented in this paper, examined the effect of filler metal classification and toughness on the strength and ductility of fillet welds loaded at different angles with respect to their longitudinal axes. The results of this phase were obtained from 30 lap-spliced specimens with nominally 12.7 mm (0.50") fillet welds. Twenty-seven test specimens were prepared using the FCAW process. The specimens were loaded in three different directions with respect to the weld axis: 0°, 45° and 90°.

Topics: Connections and Joints; Welds

A Comparison of the Krawinkler and Scissors Models for Including Beam Column Joint Deformations in the Analysis of Moment Resisting Steel Frames

FINLEY A. CHARNEY AND JUSTIN MARSHALL

Current codes and specifications require that the flexibility of the beam-column joint region of moment resisting frames be included in structural analysis. The two most popular analytical models for modeling the joint are the Krawinkler model and the Scissors model. Each of these models represent a mechanical analog of the joint, with the joint being represented as an assembly of rigid links and rotational springs. This paper provides a complete derivation for the nonlinear spring properties to be used in the Krawinkler and Scissors models, and through nonlinear static and dynamic analysis, shows that the models, when properly used, produce similar but not identical results. It is further shown that the properties for the two models are not interchangeable; the spring properties derived for the Krawinkler model may not be used directly in the Scissors model. Unfortunately, several references that recommend the use of the Scissors model erroneously suggest that the spring properties for this model are the same as those derived for the Krawinkler model. This paper quantifies the effect that this assumption has on the computed nonlinear static and dynamic response of a moment frame, and shows that the result of the error may have a negative impact on the economy of steel moment frames.

Topics: Connections—Moment; Connections and Joints; Analysis

Bracing of Beams, Trusses, and Joist Girders Using Open Web Steel Joists

JAMES M. FISHER

Designers typically use joists as a part of the lateral bracing for the compression flange of beams, or for the lateral bracing of the top chord of trusses and joist girders. Joists serve as the connection to the primary members to deliver the brace force to a diaphragm or horizontal bracing system. The attachment of the joist seat to the primary member is an important element of the bracing system. Traditionally, joist seats have been attached to primary members (beams, trusses, and joist girders) by welding. The OSHA Steel Erection Standard, Part 1926.757–Open Web Steel Joists states: (i) Except for steel joists that have been pre-assembled into panels, connections of individual steel joists to steel structures in bays of 40' (12.2 m) or more shall be fabricated to allow for field bolting during erection; (ii) These connections shall be field-bolted unless constructability does not allow.

The purpose of this paper is to discuss possible alternatives to welding the joists to the primary members in order to provide bracing to the primary members.

Topics: Stability and Bracing, Beams and Flexural Members

Development of Fabrication Guidelines for Cold Bending of Plates

ROGER L. BROCKENBROUGH

To avoid plate cracking during cold bending, it is necessary to use a suitable minimum inside bend radius, which typically varies with plate thickness and grade. However, because of the addition of new plate grades over the years, it was felt that the limits that had been given in ASTM A6 until recently had not been developed on a consistent basis. Also, those limits were intended for material acceptance purposes using small specimen tests, and did not directly reflect fabrication limits. Therefore, a program was initiated by AISI around 1996 to develop rational limits directly applicable to plate fabrication. In the initial study, conducted by Concurrent Technologies Corporation, small speci-

mens of various grades and thicknesses were cold formed using different bend radii and evaluated. In subsequent work, the present study was made to review that information, review historical forming limits, and develop a rational set of consistent limits for fabrication guidelines. It was concluded that radius-to-thickness limits from idealized bending limit diagrams developed from specimen tests could be used to establish fabrication limits, if appropriate allowances were made for conditions in fabrication that differ from those in the tests. This includes adjustments to account for plate properties that approach minimum specified values rather than the typical properties of the test material, thicknesses greater than those tested, and edge or surface imperfections that may be present in typical fabrication. After making such adjustments, a table of suggested limits was developed and subsequently adopted in ASTM A6. The adopted values were generally more liberal (allowed tighter bends) than those that had been given in the AISC manual, thus providing greater flexibility in fabrication in most cases.

Topics: Fabrication

Fatigue Life Prediction and Variability of New and Existing Welded CHS Y-Joints

CHRISTOPHER M. FOLEY, JOHN L. PERONTO, AND RAYMOND A. FOURNELLE

An experimental program was undertaken to quantify fatigue life variability of the ET fatigue detail category for welded circular hollow shape (CHS) connections commonly found in sign support structures. The program included fatigue testing of existing and fabricated Y-joint specimens composed of CHS, detailed material characterization, and comparison of experimentally determined fatigue lives with a variety of analytical methodologies. The results of the research effort serve as the foundation for quantifying the expected service life for overhead sign support structures in relation to the fatigue limit state of the welded connections. The data has been used as the basis for a procedure for predicting the service lives of full-span overhead sign support trusses.

Topics: Connections and Joints, Hollow Structural Sections, Welds