Newsletter for the **Light Gauge Steel Engineers Association** *September 2004*

Contents

Upcoming Events

METALCON International, Las Vegas, NV Contact: www.metalcon.com	Oct 20-22
17th International Specialty Conference on Cold-Formed Steel Structures, Orlando, FL Contact: ccfss@umr.edu	Nov 4-5

Reinforced Holes in CFS Floor Joists

By Steven R. Fox, Ph.D., PE
General Manager, Canadian Sheet Steel Building Institute

The AISI Committee on Framing Standards (*AISI COFS*) has published the *Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings* (AISI 2001a). This document provides specific requirements for residential construction with cold-formed steel framing. One of the issues that is commonly faced by a homebuilder is cutting holes in floor joists (larger than the standard knockouts) to run services.

The *Prescriptive Method* includes tables of floor joist spans calculated on the basis of a cold-formed steel joist with a standard 2.5 x 4.5 in. knockout in the web. The objective of this research project is to determine prescriptive rules for reinforcing larger holes in joists so that the full capacity of the member is retained and the span tables in Prescriptive Method can be used. This note presents some testing that is currently underway in the area.

Preliminary testing was carried out at the University of New Brunswick (Fredericton, New Brunswick, Canada), and the University of Waterloo (Waterloo, Ontario, Canada). This work indicated that it was practical to reinforce round holes in high moment

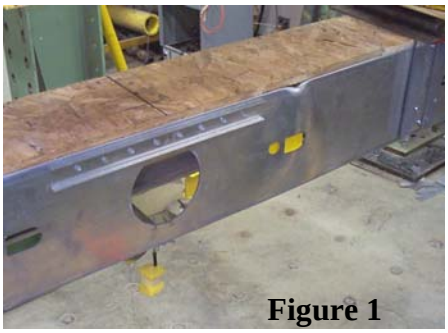

Figure 1

regions to regain the full capacity of the member. Based on the success of this earlier work, a more in-depth research project has been initiated at McMaster University (Hamilton, Ontario, Canada).

The test specimens were constructed to

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Code Requirements for Wall Stud Bracing Update

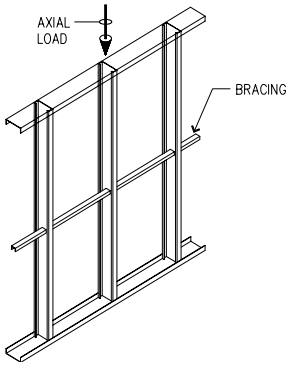
By Tom Sputo, Ph.D., PE and Perry S. Green, Ph.D.

Under the sponsorship of the American Iron and Steel Institute and the Steel Stud Manufacturers Association, research to determine required levels of strength and stiffness for axially loaded stud bridging are nearing completion at the University of Florida (UF). A draft of the final report with recommendations for design has been submitted to the project sponsors, and approval of the recommendations is expected within the next six months.

Central to this research was a two-phase testing program conducted at UF. The first phase centered on experimentally determining the bracing strength and stiffness demands of typical cold-formed studs.

To simulate actual installation conditions, the studs were axially loaded with the ends installed flat-ended in standard track. From this testing, equations for the required bridging strength and stiffness were developed for adoption in the AISI Specification.

Through evaluation of testing conducted at UF, it has been determined



that provisions similar to the nodal bracing requirements found in the AISC Specification can be adapted for use with cold-formed steel studs. Testing also showed that local buckling had negligible effects on bracing requirements for these studs.

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Newsletter for the

Light Gauge Steel Engineers Association

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The President's Corner

Reynaud Serrette, Ph.D.

As the 7th president of the LGSEA, it is an honor and privilege to be elected and to serve you in 2004-05. Continuing a tradition that started with the formation of the association, the current Board reflects the diversity, strength and relevance of LGSEA charateristics that makes LGSEA a key constituent of the cold-formed steel market. Your Board for 2004-05 includes Ken Vought (vice-president), John Lyons (Secretary-Treasurer), Pat Ford, Howard Lau, Nader Elhajj, Dean Peyton and myself. We are excited about the opportunities ahead and we look forward to engaging each of you as we advance the state of cold-formed steel design to meet the challenges of our profession.

On behalf of the Board and the entire membership, I would like to extend a sincere thank you to outgoing president, Dean Peyton, for his tireless commitment and leadership. As a continuing Board member, I intend to draw on Dean's experience and wisdom, as well as that of Pat Ford (another LGSEA past president) to build on our past successes. I would also like to thank 2003-04 outgoing Board members Ray Grage and Randy Daudet for their service to the association.

This year LGSEA will be celebrating its 10th anniversary as an association. We have come a long way and there is still much to do. One of the primary reasons for our existence is to provide you with the best current thinking with regard to the design of cold-formed steel structures, and to facilitate advancement of practical engineering knowledge in cold-formed steel. Thus, as we collectively look forward to the opportunities and challenges of the next five to ten years, we need to renew our commitment to our mission and reach out to your peers and others with an interest in design of cold-formed structures. With regard to LGSEA's outreach program, I am sure you have fellow engineers who you think will benefit from membership in LGSEA. Within the next month, we will be inviting you to nominate your peers for membership.

As many of you know, our industry has undergone numerous changes and there have been many innovations over the last several years. To ensure that members remain at the forefront of new technologies and methods, the Board is developing a five-year strategic plan and we would like to invite you to provide input. You may contact me or any of the Board members with your ideas and suggestions for how we can better serve you.

On behalf of your Board of Directors, thanks for your continued membership and your commitment to the practice of cold-formed steel design. ❐

LGSEA Celebrates 10th Anniversary

By Ken Vought, Vice-President of LGSEA

2004 marks the 10th Anniversary of the LGSEA. On an important occasion like this, one can't help but to look back and ask such things as who were the founders, why did they establish LGSEA and how successful has LGSEA been? I would like to take a moment to reflect back over the LGSEA's history and beginning. The LGSEA would like to give a special thanks to those that gave so much of their time as founding fathers of this Association. Their names are listed in the adjacent table.

LGSEA was established because of the serious lack of residential and light commercial steel framing design information, education and standardization. In addition, there was a considerable amount of research and testing that needed to be identified and performed, as well as an urgent need to get steel framing into the Building Code and educate the Building Official on steel framing.

LGSEA's success has been outstanding. They have become the core group for expanding and improving steel design and educating people on the subject. LGSEA has been one of the primary groups to identify, sponsor and conduct needed research and testing. LGSEA has supplied numerous individuals to various committees in order to perform the work required to get steel framing into the Building Codes, an ongoing process. LGSEA has educated more than one thousand building officials concerning steel framing design across the country.

Another measure of LGSEA's great success is the growth of our membership. Starting with only 15 members from 4 states, in less than 10 years LGSEA has grown to over 1,000 members from 45 states and 35 foreign countries. This illustrates that LGSEA has provided good value and service to its membership.

Concerning the future, the LGSEA plans on improving and increasing service to membership by increasing the number and frequency of newsletters, Technical Notes, and Research Notes. Additional information is being added daily to the LGSEA website, and more seminars are planned. LGSEA will continue to support and conduct more research and testing, and work with allied organizations to expand and improve steel framing design.

On Wednesday, October 20, 2004, LGSEA will have a 10th Anniversary Celebration Luncheon at our meeting at METALCON in Las Vegas, Nevada. All LGSEA members are invited and encouraged to attend. For details contact Howard Lau at hkclau@lava.net or register on the LGSEA website @ www.LGSEA.com.

In addition, as part of LGSEA's 10th Anniversary Celebration, LGSEA thought it fitting to look back and put together a series of "Honor Roll" lists of those individuals and companies that:

- Founded LGSEA.
- Helped LGSEA to grow over the years.
- Helped to expand and improve cold-formed steel design.
- Helped to educate cold-formed steel designers and others interested in steel framing.
- Conducted needed research for cold-formed steel design.
- Made an impact by helping LGSEA achieve the goal of increasing the number of design professionals competent in the design of cold-formed "steel framing". This has increased market share in Residential and Light Commercial Construction.

Consequently, LGSEA has put together these Honor Roll lists, which have been posted on the LGSEA website (click on **About LGSEA** to review the Honor Roll Lists). In your review of these Honor Roll lists, if you know of someone that we missed that should be on one of the subject lists, e-mail the subject information to Ken Vought at kvought@msn.com so that they may be added to the appropriate Honor Roll list. Please title your e-mail "Proposed Addition to LGSEA Honor Roll List".

LGSEA would like to sincerely Honor and Thank all the individuals and companies that are on these Honor Roll Lists. ❐

LGSEA Founders

Kjell A. Bo	*Structural Consulting Engineers*
Jim McCausland	*Glen Consultants*
Jim Nicoli	*Nicoli Engineering (deceased)*
Neal Peterson	*Devco Engineering (retired)*
Dean Peyton	*Anderson-Peyton Structural Engineers*
George Richards	*Borm Structural Engineers*
Allan J. Swartz	*Swartz & Kulpa*
Tony Wu	*TWU Engineering Consultants*
Art Linn	*Simpson Strong Tie*
John Carpenter	*Alpine Engineered Products*
Michael Quiroz	*Carpenters/Contractors Co-Operative Comm.*
Ken Vought	*USS-POSCO Ind. (retired)*
Bruce Ward	*RES-TEK International*
Larry Williams	*Steel Framing Alliance*
Robert Smith	*USS-POSCO Ind.*

Technical Exchange Section

*The Light Gauge Steel Engineers Association needs you and your experience. Please mail or fax your opinions, questions, and design details that are relevant to the light gauge industry (fax to **(253) 941-9939**). Upon editorial staff review, your submission may be printed in the Technical Exchange Section of this newsletter.*

Detailing Help for Gusseted Flat Strap X-Braces

By John C. Lyons, P.E.—Walter P. Moore and Associates

Flat strap "X-braces" are commonly used to resist lateral loads in load-bearing cold formed steel framed structures. These braces are used as tension members on one or both sides of the wall and multiple stud "wind posts" on each side of the bracing bay, as shown in the adjacent figure. Straps are often attached to the top and bottom tracks and the "wind-posts" using a rectangular cold formed steel gusset plate.

Cold formed steel framing drawings should show the required length of the strapping and the proper dimensions of the gusset plate. Doing so is of great help to the estimator and also helps ensure that the bracing is installed properly. Undersized gussets or straps may result in improper screw spacing or unplanned field splicing of strapping. Oversized pieces waste material and result in additional field cutting.

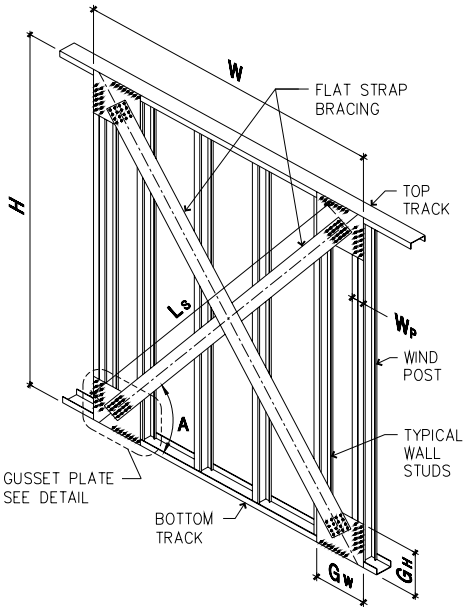
Once straps and posts have been designed through engineering analysis, strap and gusset dimensions can be computed using the following equations. These are easily performed on a spreadsheet. This is especially helpful on projects with many different bracing bay widths. Resulting designs may be shown on a schedule.

A = angle of strapping
= atan (H / (W-Wp))
Where: H = height of the wall, W = width of bracing bay, Wp = width of wind post

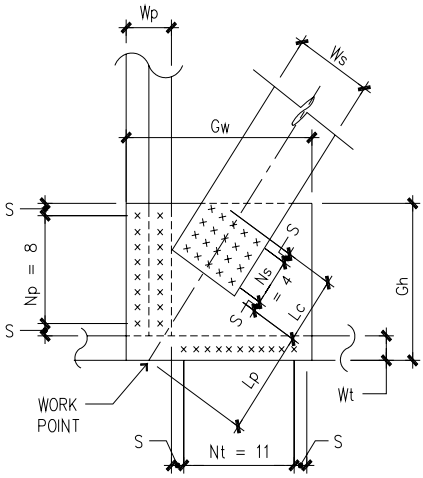
Lp = strap deduction for post
= (Wp/2cosA) + (Ws/2)tanA

Ls = length of flat strap
= Sqrt(H^2+(W-Wp)^2) – 2Lp

Lc = length of screw connection
= (Ns+1)S



FLAT STRAP X–BRACING BAY
SHOWING STRAPS, WIND POSTS, TRACKS AND GUSSET PLATES



GUSSETED FLAT STRAP DETAIL
SHOWING GUSSET SIZE AND SCREW PATTERNS

Where: Ns = number of rows of screws on strap, Nt = number of gusset screws on track, Np = number of rows of gusset screws on post, Ws = width of strap, S = desired screw spacing and edge distance

Gw = Gusset plate width
Maximum of:
Wp + (Nt+1)S…….or
(Lp+Lc)cosA+(Ws/2)sinA+ 0.5Wp

Gh = Gusset plate height
Maximum of:
Wt + (Np+1)S or
(Lp + Lc)sinA + (Ws/2)cosA

Example:

Given: 10' high wall (H=120"),
6'-8" wide bay (W=80")
6" wide stap (Ws=6")
double 2" flange "wind post" (Wp=4")
1 ¼" flange track (Wt=1.25")
1" screw spacing (S=1")
20 screws to strap using 5 columns and 4 rows (Ns=4)
16 screws to post using one column of screws per stud (Np=8)
11 screws to track (Nt=11)

Find: Length of strap and size of gusset plate.

Solution:

A = angle of strapping
= atan (120 / (80-4))
= 57.7 deg.

Lp = strap deduction for post
= (4/2cos57.7) + (6/2)tan57.7
= 8.49"

Ls = length of flat strap
= Sqrt(120^2+(80-4)^2) – 2(8.48)
= 10'-5"

Lc = length of screw connection
= (4+1)1
= 5"

Gw = Max. of: 4 + (11+1)1
= 16" or
(8.48+5)cos57.7+(6/2)sin57.7+ 0.5(4) = 11 3/4"

Gh = Max. of: 1.25 + (8+1)1
= 10 ¼" or
(8.48 + 5)sin57.7+ (6/2)cos57.7
= 13"

Use 10'-5" Long Strap and 16" W x 13" H Gusset Plates ❑

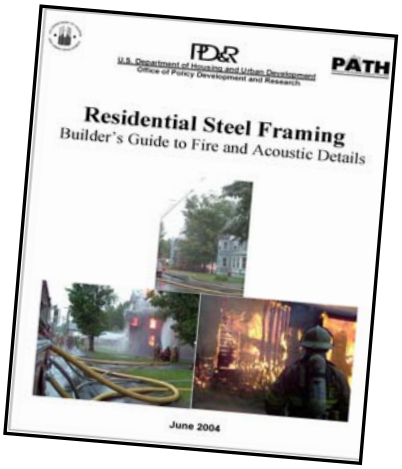
Two New Fire and Acoustic Registries Available

By: Nader Elhajj, P.E. NAHB Research Center, Inc. Upper Marlboro, MD

Good news for engineers and designers. Now there are two new comprehensive documents that list cold-formed steel fire and sound rated assemblies. Both of these documents act as a starting search point for designers, engineers and builders who do not want to go through dozens of directories and catalogs looking for a particular rated assembly. Both documents contain a registry of all available fire and sound rated steel floor and wall assemblies.

The first publication titled "*A Guide to Fire and Acoustic Data for Steel Floor and Wall Assemblies*" was published by the Steel Framing Alliance (SFA) and the Canadian Steel Construction Council (CSCC). It contains over 100 steel fire and sound rated assemblies from US and Canadian sources. You can download a copy of the SFA/CSCC publication at www.genesistp.com/download/ArchitectGuide.pdf or at www.cisc-icca.ca/material/PDF/Guide_Fire_Acoustic_V2.pdf.

The second document titled "*Residential Steel Framing - Builder's Guide to Fire and Acoustic Details*" was prepared by the NAHB Research Center. This guide was developed with sponsorship from the U.S. Department of Housing and Urban Development (HUD), the Steel Framing Alliance and the National Association of Home Builders (NAHB) under the auspices of PATH program. The project started a couple of years ago to document and gather existing fire and sound rated steel assemblies from private, public and industry sources. Frequently used assemblies that did not have a rating (where their wood counterparts do) were tested, and fire and sound ratings were established. Over 500 steel fire and sound rated assemblies are tabulated in the Builder's Guide. The assemblies were compiled from dozens of sources such as UL Directory, Gypsum Systems Fire Resistance Design Manual, Factory Mutual, and California Catalog of STC and IIC Ratings. In addition to the listings, the Builder's Guide contains construction and design tips and guidelines on how to improve the fire and sound rating of a steel wall or floor assembly.



For more information on the Builder's Guide, please contact Nader Elhajj at (301) 430-6281. Soon you'll be able to download a copy of this guide from www.pathenet.org, www.toolbase.org or www.steelframingalliance.com.❐

Next LGSEA meetings at METALCON in Las Vegas

The next series of meetings of the LGSEA working committees will be held at the Las Vegas Convention Center on Wednesday, October 20, in conjunction with METALCON (room N258). As meeting rooms are announced, the full schedule along with room numbers and agendas, will be posted at www.lgsea.com. For the first time this year, all committees and task groups will meet, and all meetings will be on the same day. We have worked to consolidate meeting times and the awards luncheon, to allow the maximum number of participants to attend. For additional information, visit the LGSEA web page, or call 866-GO LGSEA. See other articles in this newsletter for additional information on METALCON technical programs, show hours, and special programs for architects, engineers, and contractor members of LGSEA.

LGSEA Committee and Task Group Meetings
Las Vegas Convention Center: 3150 Paradise Road, Las Vegas, NV 89109

11:00 am – noon	Fastener/Connector Committee, Roger LaBoube, Chair
noon – 1:30 pm	LGSEA 10th Anniversary Banquet and Awards Luncheon
1:30 pm – 3:00 pm	Structural Assemblies Committee, Jeff Ellis, Chair
3:00 pm – 4:30 pm	Research & Development Committee,Dean Peyton, Chair
4:30 pm – 5:30 pm	Truss Task Group, Brad Cameron, Chair
5:30 pm – 8:30 pm	LGSEA Board of Directors Meeting, Reynaud Serrette, President

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February 5, 2004

Re: A deserved testimonial

Dietrich Design Group
1414 Field Street
Building C
Suite 1
Hammond, Indiana 46320

Attention: Mr Michael C. Kerner, Manager of Technical Services

Dear Mike,

Our relationship spans many years. This is our twenty-fifth year…and throughout our history, we can say with all candor that Dietrich Design Group has been a silent partner in aiding us to attain a strong presence in the cold-formed metal framing sector of the market which we serve. We have said in the past and continue to believe that *our* destiny, indeed Dietrich Inc.'s destiny *too*, rests squarely on the shoulders of Dietrich Design Group.

Dietrich Design Group elevates metal framing from being just another commodity item to essential entity status through its well-staffed, well-educated, dedicated and committed engineering group, where the byword is the epitome of professionalism. More often than not, one speaks with a REAL person…and for those few occasions where a voice message is necessary, human follow-up ALWAYS occurs.

We rely on Dietrich Design Group's technical support quite dramatically; it is rare that a week passes whereby we have not effected several communications to various members of your staff. We have NEVER had a negative experience throughout our association with DDG.

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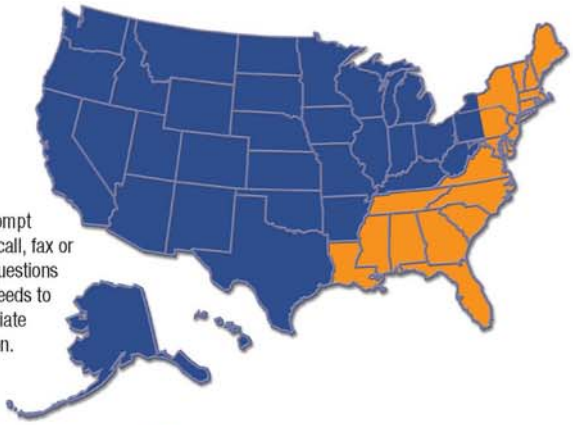

For fast, prompt assistance call, fax or mail your questions or design needs to the appropriate DDG location.

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Through our in-house engineering staff, Dietrich Design Group provides certified shop drawings and calculations. This service provides our customers with the most detailed, easy-to-use drawings and the most cost-effective framing solutions in the industry. From multi-story load-bearing structures to curtain-wall construction, no matter how big or small the job, DDG is there to help. Our lead-times and fees are among the best available.

The "Dietrich" Advantage

Dietrich Metal Framing is the industry leader in steel-framing products for the residential and commercial markets. Dietrich Design Group supports these products through engineering and technical expertise and superior customer service. Together, customers have a one-stop resource for completing projects on time and within budget — all backed by safe, reliable and trusted products and technical expertise.

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News Briefs

New Officers Elected

In May 2004 the LGSEA membership re-elected Nader Elhajj and Howard Lau and electing Pat Ford to serve two year terms on the Board. Reynaud Serrette, Ken Vought, John Lyons, and Dean Peyton round out the sevemember Board of Directors. In July, the Board elected new officers as follows: Reynaud Serrette, President; Ken Vought, Vice President; and John Lyons, Secretary-Treasurer.

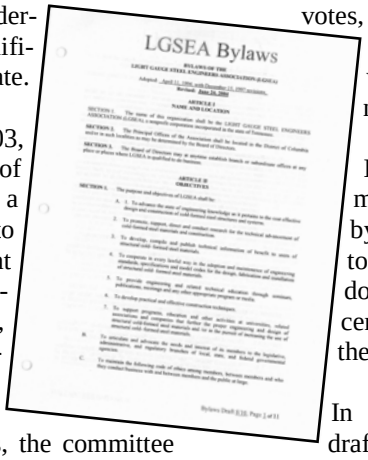
Reynaud Serrette is an Associate Professor at Santa Clara University where he also serves as director of the *Center for Light Framed Structural Research.* Serrette has been involved with the LGSEA for many years, and has served on the board of directors, as well as co-chair of the Research and Development committee. Serrette also serves on the American Iron and Steel Institute's Committee on Framing Standards (AISI/COFS,) and has been the LGSEA representative to the Steel Framing Alliance Research Team.

Ken Vought, formerly of USS Posco, is considered the originator of the idea to start the LGSEA. Vought's vision for the future of cold-formed steel engineering, his tireless efforts to other individuals and organizations in fulfilling the mission of the LGSEA, and his persistent optimism and enthusiasm have been instrumental in making the association what it is today. Currently retired, Mr. Vought continues to devote much of his time to serving LGSEA, particularly in his new role as vice-president. He is active in a number of areas including membership growth, fund raising, education, outreach and organizational relationships.

John Lyons is a Senior Associate with Walter P. Moore and Associates in their Atlanta, Georgia office. Lyons has previously served as president of the Atlanta/Southeast Chapter of the LGSEA, and has authored many LGSEA tech notes, including the upcoming note on screw to wood connections. ❒

Members Provide Input to Revised Current Bylaws

Having adequately served the association for over 10 years with only one proposed revision, the Bylaws of the LGSEA are now undergoing their first significant review and update.


LGSEA Bylaws

Starting in mid-2003, the LGSEA Board of Directors appointed a bylaws committee to review the current document and recommend changes, corrections, and revisions. After multiple meetings and input from members, the committee presented their findings to the Board of Directors. In conjunction with the mailing of the April, 2004 LGSEA newsletter, a copy of these revised bylaws, as well as a ballot form, was mailed to all LGSEA members in good standing.

The response was overwhelmingly positive for the new bylaws; over 90% of the responses were positive for adopting all sections. However, several members included comments with their votes, which raised some questions about how the association would operate under these new rules.

In light of membership comments, the Board asked the bylaws committee to go back to work, on a new draft of the document to address the concerns expressed by members in the previous ballot.

In early September a revised draft was sent out to membership for another vote. Members may view both the current bylaws as well as the balloted bylaws on the LGSEA web site at www.LGSEA.com. If you have specific questions or comments about the content or application of this material, please email Don Allen at dallen@LGSEA.com, or call 866-GO LGSEA. ❒

Upcoming LGSEA Publications


Newsletter for the Light Gauge Steel Engineers Association June 2004

Contents page

TECHNICAL NOTE $5.00 On Cold-Formed Steel Construction

CORROSION PROTECTION FOR COLD-FORMED STEEL FRAMING IN COASTAL AREAS

Both the committees and the staff of the Light Gauge Steel Engineers Association are working hard to develop technical documents on cold-formed steel design and application to fill some gaps currently in the industry. Members should notice a stepped-up level of technical products being included with mailings and newsletters, and more are slated for future issues. The Newsletter is scheduled for four issues per year; each quarter, two additional technical documents are scheduled: either Tech Notes, Research Notes, or other publications. Also, the LGSEA is working with other organizations such as local Structural Engineer Associations to sponsor educational presentations.

Upcoming Technical Note topics include screw fasteners for steel to wood attachment, structural general notes, lateral load design, and slip track design. Other possible topics that are in the works but have not yet been assigned include wall stud design, fastener corrosion, and clip angle design.

If you have particular interest in a technical note on a specific topic, or would like to author or co-author a note call 866-GO LGSEA. Also, many of the upcoming notes will be discussed at the committee meetings in October (see related article). In particular, the Structural Assemblies committee has a full list of potential notes and how they relate to current assemblies. For more information, visit the "committees" section at www.LGSEA.com. ❒

News Briefs

Abstracts of Conference Papers for 17th Specialty Conference - 2004

By Roger LaBoube,Ph.D., P.E.

On November 4th and 5th, 2004 the 17th International Specialty Conference on Cold-Formed Steel Structures will be held in Orlando, Florida. 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). A total of 48 papers are scheduled to be presented at the conference and the following provides a brief summary of some of the papers relevant to cold-formed steel framing.

1. "Strength and Stiffness of Conventional Bridging Systems for Cold-Formed Cee Studs" Perry S. Green, Thomas Sputo, and Viswanath Urala
An experimental testing program has been carried out on typical bridging components and connections used in North American practice to provide bracing to cold-formed lipped cee-studs in order to determine the in-plane and out-of-plane strength and stiffness of the bridging components and connections. The stud sizes ranged from 362S-125-33 to 800S-162-97. Bridging systems tested included cold-formed bridging channels directly welded to the stud, bridging channels connected to the stud web through a welded connection to a clip angle, and bridging channels connected to the stud web through a screwed connection to a clip angle. Bridging connections were loaded axially (into the stud web) and laterally (parallel to the stud web). Load-deformation response curves were plotted for each tested connection type and stud cross-section and thickness. Analysis of the test results indicates that conventional bridging used in current North American practice has adequate stiffness and strength to brace axially loaded and curtain wall steel studs.

2. "Cold-Formed Steel Slip-Track Connection" James R. Gerloff, H. Peter Huttelmaier, and Patrick W. Ford
The slip-track connection is one of the most commonly used connections in the design of curtain wall systems. There is little guidance for the design of this connection in the North American Specification for the Design of Cold-Formed Steel Structural Members (2001). The purpose of this research was to determine appropriate guidelines for the effective distribution width of the track. A parametric test program of slip-track connections was conducted as well as finite element modeling. Tests included specimens with stud widths of 1 5/8" and 2 ½", stud spacing of 16" and 24", and track thickness varying from 14, 16, and 18 gauge. A gap between the web of the track and the top of the stud of ½" and 1" was used in the tests. Finite element analyses of the test specimens were conducted and compared with the test results. Proposed design procedures based on the results of the project are provided.

3. "Performance of Deep Leg L-Headers" Reynaud Serrette, Khanh Chau, Dean Peyton, and Bud Waters
The L-header assembly as an alternative to back-to-back and boxed header assemblies is an efficient means of supporting openings in cold-formed steel frame construction. The design of L-headers is currently governed by the AISI Header Standard and the North American Specification for the Design of Cold-Formed Steel Structural Members. The research effort described in this paper involved an evaluation of a modified L-header configuration aimed at developing higher strength than the conventional L-header. Specifically, a series of modified 13-¼ in. (337 mm) deep 33 ksi (227.5 MPa) single- and double-sided modified L-header configurations were tested under monotonic gravity and uplift loads. The basic modification involved an extension and attachment of the long leg of the L-header to the head track of the spanned opening. The results showed that higher strengths can indeed be obtained with the extended leg and an appropriate fastener schedule. Further, it was found that single-sided L-headers can be designed to develop the same capacity as a double-sided L-header of the same dimensions and thickness by a nominal change in the number of fasteners used. In the uplift load tests, capacities similar to those obtained under gravity load were measured. These test results suggest that additional research should be undertaken to provide a broader evaluation of the modified L-header and provide data for a possible expansion of the Header Standard.

4. "Design Criteria for Seam and Sheeting –to- Framing Connections of Cold-formed Steel Shear Panels" Ludovic Fulop and Dan Dubina

5. "Behavior of Complex Hat Shapes Used as Truss Chord Members" Nuthaporn Nuttayasakul and W. Samuel Easterling

6. "Cold-Formed Steel Frame Shear Wall Applications with Structural Adhesives" Reynaud Serrette, Ioi Lam, Henry Qi, Hugo Hernandez, and Al Toback

7. "Compression Behavior of Thin Gusset Plates" D. G. Lutz and R. A. LaBoube

8. "Bracing Strength and Stiffness Requirements for Axially Loaded Cee Studs" Perry S. Green, Thomas Sputo, and Viswanath Urala

9. "Experimental Capacity Assessment of Cold-Formed Boxed Stud Wall Systems used in Australian Residential Construction" M. Pham, J.E Mills, and Y Zhuge

10. "An Update on Cold-Formed Steel Framing Standards Development in the U.S." Jay W. Larson

11. "Seismic Performance of Sheathed Cold-Formed Shear Walls" R. Landolfo, L. Fiorino, G. Della Corte ❐

Cold-Formed Steel Design Software

Cold-formed steel offers engineers and architects tremendous design flexibility, but performing the necessary calculations can be an extremely time-consuming and iterative process. To shortcut this process, a growing number of design professionals are turning to software that is specifically written for the design of cold-formed steel. The September 1998 and Winter 2002 issues of the LGSEA Newsletter included directories of software programs that LGSEA and steel framing industry members identified as those that are frequently used. The following directory updates that list, and includes several new engineering design software packages that have come out since our 2002 survey. The information in this guide was provided by developers of the individual software programs. As space does not permit inclusion of all of the capabilities of the individual programs, the LGSEA encourages readers to contact software providers for additional information. The LGSEA does not endorse specific products. The following programs are listed alphabetically. Note that programs that require the use of proprietary materials or truss shapes have not been included.

Program name Contact info	***Codes & Standards***	***Input/Interface Description***	***Design Modules & Features***	***Structural Components***	***Demo Price***
AISIWIN v6.0 ***Clark Steel Framing*** 888-437-3244 joew@clarksteel.com www.clarksteel.com	NASPEC (USA), AISI 96; AISI 99; AISI 89	Uniform loads, bearing lengths, and bracing intervals (bending and axial) are input from a graphics screen. Sections are chosen from drop-down style database boxes or input from a graphics screen. Allowable span lengths are generated for framing member checks. Sections can be modified interactively, allowing the user to select the most efficient member	• The AISIWIN Solver features searches for wall studs, ceiling joists, or floor joists based on the specific parameters input by the user – eliminating trial and error member sizing. • Yield point (Fy) toggle between 33 and 50 ksi. Change Fy without using the geometry input module or changing databases. • Includes built-up compression members	SSMA and custom databases.	free download of full software from website
CFS® v4.1 RSG Software 816-524-5596 info@rsgsoftware.com www.rsgsoftware.com	NASPEC (USA, Canada, Mexico), AISI 96; AISI 99; ASCE-8-02	Easy to create geometry for common shapes. Graphical interface allows you to create virtually any cold-formed steel shape, including closed shapes, built-up sections, and elements with holes. List of predefined carbon and stainless steel materials, or customizable material properties. Shape geometry can be output to a DXF file. Analysis Wizard assists in the creation of design problems such as beam-columns, continuous beams, and multi-span beams with laps. Transverse loads may be concentrated or distributed, and applied at any angle, producing biaxial bending. Axial loads may include eccentricities which induce additional moments.	• Full, net, and effective section properties using exact integrations • Strengths for compression, tension, moments, shears, and web-crippling • Strength increase from cold work of forming • Member checks for combined axial/bending, bending/shear, and bending/ web-crippling • Messages are given for exceeded limits such as w/t, D/t, KL/r, etc. • help file • Display and print diagrams for reactions, shears, moments, and deflection, including envelope diagrams for all load combinations.	Section Libraries include SSMA, LGSI, AISI, and HUD shapes. Custom databases may be created.	Yes; free “light” version at website $595 for full version $295 for additional copies for same company; $500 for DLL for full version owners
intelliModel DSi-digital Ken Wharton 877-220-1447 770-248-0090 fax sales@dsi-digital.com www.dsi-digital.com	ASCE-7 93, ASCE-7 95, IBC, LGSEA, AISI NASPEC (UBC, BOCA, CABO and Florida codes are being added)	Windows and AutoCAD compliant with additional proprietary user interface options for improved functionality, ease of use and speed. Runs within AutoCAD 2000i and later and Architectural Desktop	• Automated building modeling • Automated generation of plans, elev.’s & sections • Automated f truss layouts • Schedule based wall and member designation • Metal load-bearing and non-load-bearing wall framing material optimizer • Automated roof & floor truss framing • Automated truss and wall shop drawings • Material cut-lists for wall framing and trusses • Loading generator, applicator and load tracking • Estimator for material, fabrication and erection	SSMA, LGSEA, AISC	Yes; Full version usage available via web conferencing. Price varies with requirements

KeyBuild Keymark Enterprises, LLC Catherine Rust 303-443-8033 303-443-9054 fax crust@keymark.com www.keymark.com	NASPEC	The user constructs an accurate three-dimensional model of the structure, locating the floor system, roof system, and walls.	• The software tracks the gravity loads on the roof and floor, and ensures that the loads are passed through the structure appropriately. The horizontal framing members of the floor system, including floor joists or floor trusses, roof joists and roof trusses, and beams and girders are located by the user. The software will then determine the load on the member, and for prismatic members will allow the user to select members that will resist the loads.	Most of the standard SSMA sections are available for use.	Citrix demonstrations are available - contact vendor call or email for pricing.
KeyLat Keymark Enterprises, LLC Catherine Rust 303-443-8033 303-443-9054 fax crust@keymark.com www.keymark.com	Seismic: UBC 97, IBC 2003 Wind: ASCE 7 98 and 2003	Lateral load development utilizing the flexible diaphragm theory and / or the rigid diaphragm theory for box type structures up to 5 stories tall. Cantilever and perforated shear wall design. Drag force and chord force calculations.	• Graphical presentation of forces on diaphragms, drag and chord members, and shear walls. Information provided to assist in the design of horizontal diaphragms, shear walls, and holddowns.		
KeyPanel Keymark Enterprises, LLC Catherine Rust 303-443-8033 303-443-9054 fax crust@keymark.com www.keymark.com	NASPEC; ASCE 7-98; ASCE 7-02	Input from various modeling software.	• Large walls are split either according to user preferences or manually. Wall profiles are then framed in according to extensive user defined rules. The user may accept the framing as automated or adjust the framing manually. Wall names are either user defined, or automatically assigned, or a combination of the two. Point loads from supported floor and roof systems are tracked, allowing for either automated in line framing, or the user of a distributed header. Virtually endless user presets allow for extreme automation of wall panel design. Individual wall panel drawings are available. Panel stacking and truck loading diagrams are included. Electronic output to rollformers is available.	Most of the standard SSMA sections are available for use.	Citrix demonstrations are available - contact vendor call or email for pricing.
KeyTruss Keymark Enterprises, LLC Catherine Rust 303-443-8033 303-443-9054 fax crust@keymark.com www.keymark.com	NASPEC; ASCE 7-98; ASCE 7-02	Input from various modeling software, or direct user input of the truss geometry and loading.	• Trusses profile is defined either by import from another package or by direct user input. Loading is imported from another package or directly input by the user. Truss web layouts are automated with user adjustment as needed. The trusses' multinode analog model is automatic. A user defined priority file determines the initial selection of the chord and web members. Chord and web members are checked at many locations along its length for all applicable interaction equations. Overstressed members are then automatically "bumped" to the next entry in the priority file. Graphical output includes load, deflection, shear, moment, and axial load diagrams. Electronic interface to roll formers is available. Material and labor pricing is tracked and reported.	Most of the standard SSMA sections are available for use.	Citrix demonstrations are available - contact vendor call or email for pricing.

Cold-Formed Steel Design Software cont.

Program name Contact info	*Codes & Standards*	*Input/Interface Description*	*Design Modules & Features*	*Structural Components*	*Demo? Price*
KeyWind Keymark Enterprises, LLC Catherine Rust 303-443-8033 303-443-9054 fax crust@keymark.com www.keymark.com	NASPEC; ASCE 7-98; ASCE 7-02	3 dimensional model produced by numerous software packages	• All applicable three-dimensional maps of the wind loads on each surface of a structure, including the roof and walls. Different maps for components and cladding, and for Main Wind Force Resisting Systems	Most of the standard SSMA sections are available for use.	Citrix demonstrations are available - contact vendor call or email for pricing.
LGBEAMER version 6 Professional Devco Software, Inc. Rob Madsen 541-426-5713 541-757-9885 fax rob@devcosoftware.com www.devcosoftware.com	NASPEC, AISI 96; AISI 99	Graphical modeling of single and multi-span members with and without cantilevers.	• Complete analysis and design of cee's, zee's and channel sections. Uniform, concentrated, partial span and axial loads. Single, boxed, back-to-back and built-up members.	SSMA as well as several manufacturer's databases	Free demo on website. Professional version: $699 Standard version: $399
Load Bearing Wall (LBW) V1.0 Applied Science International (ASI) Lance Schloot (919) 645-4090 (919) 645-4085fax lance@appliedscienceint.com www.appliedscienceint.com	Design Specifications: NASPEC 2001 and AISI 96 Spec. w/ Supp. 99 (ASD and LRFD).	Windows-based interface. Design optimization for members per weight, depth, or thickness. Single or back-to-back section design. Auto-calculate or user-defined lateral bracing (bridging).	Design the following components: • Load bearing interior/exterior studs • Curtain wall studs • Web crippling/Deflection checks • Output is in form of professional one-page report .	SSMA Stud sections, TSN proprietary shear wall and stud sections (Wide flange - Double lip for higher capacity).	No demo; however software is free through ASI or The Steel Network. User Manual, phone tech support
Strap ATIR Engineering Software Abraham J. Rokach 847-677-1945 847-677-3456 fax rokach@atir.com www.atir.com	Latest AISI (ASD & LRFD), Canadian, Eurocode, and/or British for light-gauge steel. Similarly for structural steel (AISC etc.) and reinforced concrete (ACI etc.)	Completely graphical 2D and 3D frame and truss, finite element, static and dynamic analysis and design program, with award winning, user friendly graphical interface. Analyze and design a structure of any shape in cold-formed, hot-rolled, and concrete using the same program. Design concrete slabs and shear walls. Up to 1000 load cases and 1000 load combinations. Tapered members, prestress, cables, and support settlement.	• Automatically creates wind and seismic forces to UBC and other international codes. automatically optimizes the structure for overall deflection. The same model can have both cold-formed steel and hot-rolled sections, and the program will design them in the same run to different codes. Automatically designs for both strength and deflection. Automatically determines Lt for each load. Composite section design to several US and international codes. Concrete design to US, Canadian, and other codes.	Databases for AISI sections and custom sections	Free demo on website Price depends upon capacity

RISA 2D v6, & RISA 3D v5 Risa Technologies, Inc. Chris Minichiello, P.E. 800-332-RISA chrism@risatech.com www.risatech.com	AISI 99; Model building code load combinations, various code checks for non-cold-formed steel materials, including: ACI 99 concrete AISC ASD 9th edition AISC LRFD 2nd & 3rd edition AISC HSS NDS 91 wood	General purpose two- and three-dimensional analysis and design software developed to model, solve and optimize 2D & 3D structures as fast and easily as possible. Analysis may be done on structures constructed of any material or combination of materials. Design of hot rolled steel, concrete, cold formed steel, and wood is fully supported. RISA has powerful graphical modeling capabilities. You can draw your model on the screen and perform extensive graphical editing. To modify your model data directly, RISA employs a powerful, proprietary spreadsheet. Combined with flexible data generation algorithms, this makes modeling very easy. Graphic display of the model along with applied loads, boundary conditions and much more, is always available.	• Comprehensive CAD-like graphic drawing/editing capabilities that let you draw, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, sub-mesh, delete, apply, etc. • Powerful graphic selection tools including box, line, polygon, invert, property criteria and locking or select from sorted spreadsheet data • Real spreadsheets with cut, paste, fill, math, sort, find, etc • Simultaneous view of multiple spreadsheets • Constant in-stream error checking and data validation • Unlimited undo/redo capability • Generation templates for grids, disks, arcs, trusses, etc • Automatic data backup • Support for all units systems & conversions at any time • DXF importing and exporting of CAD files • Static analysis and P-Delta effects • Physical member modeling that does not require members to be broken up at intermediate joints • Member end releases & rigid end offsets • Enforced joint displacements • Stress calculations on any arbitrary shape • Story drift calculations provide relative drift and ratio to height	Shapes from AISI 96 Design Manual	Free demo on website. Call or email for pricing
VisualAnalysis 5.1 Package Integrated Engineering Software, Inc Garrett Baldensperger 800-707-0816 406-586-2665 fax info@iesweb.com www.iesweb.com	2001 AISI USA (ASD and LRFD) 2001 AISI Mexico (ASD and LRFD). 2001 AISI Canada (LSD) 1999 AISI USA (ASD and LRFD) 2002 ASCE - ASD and LRFD (Stainless steel) Plus load combinations for IBC, ASCE, etc.	Sketch-pad drawing and many import and generation methods for modeling 2D or 3D frames and trusses. Very easy to use with a standard Windows interface, advanced analysis and design capabilities with help, tutorials, and free maintenance and support.	• Analysis of just about any structural configuration • Design in steel, wood, concrete, and cold-formed steel • Built on RSG's CFS technology for accuracy • CAD import/export • Many more benefits and features…	All AISI shapes, SSMA, LGSI, HUD, and custom shapes are supported.	Yes; free demo on website: www.iesweb.com/demo.htm price range: $995 to $1995

Cold-Formed Steel Design Software cont.

Program name Contact info	Codes & Standards	Input/Interface Description	Design Modules & Features	Structural Components	Demo? Price
Steel Smart System v3.1 Applied Science International (ASI) Lance Schloot (919) 645-4090 (919) 645-4085fax lance@appliedscienceint.com www.appliedscienceint.com	Design Specifications: NASPEC 2001 – AISI 96 Spec. w/ Supp. 99 -CAN S136-94. Loads Standards: IBC2000 – ASCE	Windows-based interface. Templates for each design component. Imports .dxf CAD files for Truss component. Wind and seismic loads calculated automatically based on chosen Standard, geometry of component and building, and site conditions. Editable load combinations. Design optimization for members per weight, depth, or thickness. 400 different light gauge detailed connections available in CAD formats. Light gauge steel editable Specifications and Inspection Reports.	Analysis and design of the following project components (ASD/LRFD): • Wall Studs and Wall Openings (Curtainwall/Load Bearing) • Roof Trusses and Roof Rafters • Floor Joists • X-Bracing Shear Walls • Screw, Bolt, and Clip Connections • General design of light gauge sections • Design covers check for combined loads and web crippling. Output professional report and CAD details.	SSMA Stud and Track sections, TSN proprietary deflection, drift, and fixed connectors, TSN proprietary X-brace shear wall systems, and Hilti fasteners.	Yes; free demo on website $1050 full version; $60 monthly lease Technical and user manual; phone tech support
Truss D&E John F. Butts & Associates Julie Bagley 719-598-7666 719-598-0258 fax info@jfba.com www.jfba	Currently 21 building codes: ASCE7, BOCA, SBC, IBC, UBC, Military Handbook, California, Florida, NBCC, Australian Standards, British Standards, French Standards, Caribbean, Japan, Philippines, Puerto Rico Material Standards: 1996 AISI, 2001 NASPEC, British Stds, Aluminum 2000, AISC, ASCE80-90 (stainless steel)	Windows 98, 2000, XP	• Truss Design – Individual trusses or complete building • 3D modeling – Entire structure • Wall Panel Design - Complete building gravity, wind and seismic analysis. (Jan 05) • Component Design - Beams, columns, headers and rafters. (Jan 05)	Section Libraries: Dale-Incor, Dietrich, SSMA, KMI, MBCI, Allied Tube & Conduit, Aluminum Cees & Tubes, Jobsite Proprietary: Amkey, CSI, Framemax, Gus Truss, Rosette, Voltec	Free Demo on website. Call for pricing

(**Stud Bracing** -*Continued from page 1*)

A second phase of testing was performed to develop a limited database of stiffness and strength performance for typical generic bridging connections using cold-rolled channel (CRC) through the stud web. Key to this testing was the development of a standard test fixture for conducting these tests. It is expected that this test fixture and associated protocol will be adopted by the AISI as a standard test procedure for bridging systems.

An unintended bonus to the first phase of the test program was the "back-calculation" of effective length factors for flexural and torsional bucking (Kx, Ky, Kt) for studs installed flat-ended in standard track. The use of effective length factors less than unity in design will allow for higher design capacities for studs whose capacity is limited by long-wave (flexural or torsional-flexural) buckling.

Once the contents of the report and the design recommendations are approved by the AISI and SSMA, an upcoming LGSEA Technical Note will be published to disseminate the specifics to the design community. ❐

(Holes in Joist -Cont. from page 1)

simulate typical residential floor assemblies. Each specimen consisted of two C-section joists with OSB subflooring screwed to the top flange and bearing stiffeners under the supports and at the load application points. The joists had standard 1.5 x 4 in. knockouts at 24 in. centers in addition to a hole that was 70% of the web depth. The holes were cut in the member using either a plasma cutter or a water jet cutting system. The majority of testing so far has been with 8 in. deep members 0.075 in. thick.

The joists were loaded equally at two points located at the third-points in the span. This creates a constant moment region in the center portion of the specimen where the hole was located. The reinforcement of the hole is done with a standard 1.5 in. bridging channel (CRC) fastened to the web above the hole with #10 self-drilling screws. Shown in Figure 1 (on page1) is a photograph of a specimen that has been tested; the local buckling failure occurred at the knockout and not at the reinforced hole.

In addition to round holes, tests have been carried out with square and rectangular holes. These tests have shown the importance of the location of the fasteners connecting the reinforcing channel to the member.

The following additional work is being considered:

- Repeat the test program with 12 in. joists 0.054 in. thick to verify the results with joists having a high web slenderness.
- Test reinforcement strategies for the high shear zones.
- Determine how much shear the moment reinforcement detail can accommodate.
- Only round holes will be tested up to 70% of the web depth.
- Test the effects of more irregular torch-cut holes.

As results are published they will be made available through the Canadian Sheet Steel Building Institute and the LGSEA. ❒

Continuing Education @ METALCON in Las Vegas

At METALCON the LGSEA and other industry groups will sponsor a series of educational seminars on cold-formed steel framing. Below is a list of some of the more technical seminars, geared to architects, engineers, and LGSEA members. For a full list of seminars visit the METALCON website at www.METALCON.com. Registration will also be available from the website, or by calling 800-537-7765.

The Light Gauge Steel Engineers Association will also be exhibiting on the show floor during METALCON. LGSEA member volunteers are needed to help inform practitioners in the metal construction industry about our products, services, and seminars. Participants will receive a free exhibitor's pass for entry to the show floor. To volunteer, call Don Allen at 866-GO LGSEA. ❒

Technical Seminars in conjunction with METALCON

Date	Time	Title/Description
Tuesday, October 19	8:00 am – 4:00 pm	Steel Framing in Wall Systems: Studs, tracks and other components in steel-framed curtain wall and load bearing systems, for commercial and residential construction
Wednesday, October 20	8:30 am – 10:00 am	Corrosion or Lack Thereof
Wednesday, October 20	8:30 am – 10:00 am	Low and Mid-Rise Construction – Beyond the Curtain Wall
Wednesday, October 20	10:15 am –11:45 am	Special Issues in Roof and Truss Construction
Thursday, October 21	8:30 am – 10:00 am	*Details, Details, Details – The New Details Manual*
Thursday, October 21	10:15 am –11:45 am	Market Opportunities for Cold-Formed Steel Framing – Through the New Codes

The Light Gauge Steel Engineers Association

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