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

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Upcoming Events

Pacific Coast Builders Conference: San Francisco, CA Contact:www.pcbc.com	June 15-18
LGSEA Atlanta Southeast Chapter meeting: Columbia, SC	July 22
Southeast Builders Conference: Orlando, FL	Aug 5-7
National Council of Structural Engineers Associations 12th Annual Conference: New Orleans, LA Contact: www.ncsea.com	Sept 23-25
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

Stiffened Floor Joist Assemblies w/ Offset Loading

By Steven R. Fox, PhD, 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 – General Provisions* (AISI 2001a). This document gives the requirements for construction with cold-formed steel framing that are common to prescriptive and engineered designs. One of the requirements in the *General Provisions* standard calls for "in-line" framing unless a structural load distribution member is included. In-line framing means that the "joist, rafter, truss and structural wall stud shall be aligned so that the centerline (mid-width) is within ¾ inch (19 mm) of the centerline (mid-width) of the load bearing members beneath".

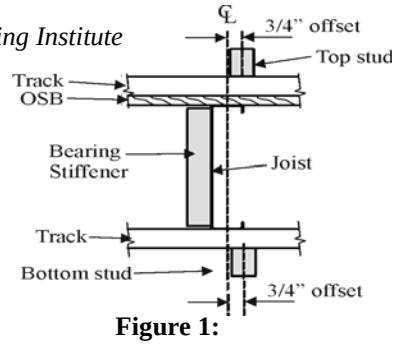

Figure 1:
Alignment Offset Limits

Preliminary tests on floor joist assemblies (Black et. al., 2002) revealed that there could be a significant reduction in the strength of the assembly with an offset load path such as that shown in Figure 1. Based on these findings, it was decided that a more extensive investigation of these assemblies was needed to determine the actual behavior, and to define more appropriate alignment rules as needed. A research project was carried out at the University of Waterloo to investigate the behavior of cold-formed steel floor assemblies subjected to variations in the alignment of the components. This project involved testing 110 assemblies subjected to end- and interior-two-flange loading.

The test assemblies were constructed to model actual floor assemblies following the AISI *Prescriptive Method* (AISI 2001b). Each specimen was 4-foot square and included four floor joist pieces, rim track, bearing stiffeners, and load bearing stud wall. Tests were carried out loading the end of a joist (end-two-flange) as well as at an interior location (interior-two-flange) simu-

(Continued on page 2)

AISI Creating Code of Standard Practice

By Jeffrey M. Klaiman, ADTEK Engineers, Inc.

The lines of responsibility in cold-formed steel framing design and construction have been vague and unclear. In response to this situation, the American Iron and Steel Institute's Committee on Framing Standards has been developing a *Code of Standard Practice* for the Cold-Formed Framing Industry for several years. Now in its fourth draft version, the document is being prepared for the first full review in its complete form by the entire committee, as well as representatives of AWCI, AIA, SSMA, STCA and LGSEA..

The purpose of this document is to help define the roles of the owner's representative, architect of record, engineer of record, specialty engineer, manufacturer, framing contractor and truss/wall panel supplier in the design and construction of cold-formed steel framed structural systems. The document is loosely based on similar documents by AISC and SJI, as well as WTCA and TPI.

Among the many topics covered in the *Code of Standard Practice* will be con-

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Newsletter for the

Light Gauge Steel Engineers Association

Department Staff

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(Stiffened Assembly -Continued from page 1)

lating a continuous member over an interior support. The range of variables investigated in the experimental program included: joist depth, joist thickness, rim track thickness, wall stud and track sizes, wall track thickness, bearing stiffener type, bearing stiffener thickness, in-line and ¾" offset loading; sub-floor; joist bearing width, bearing condition.

The following summarizes some of the conclusions resulting from the behavior of the assemblies as they were tested and the comparisons of the various test results.

- The ¾ inch offset can cause a significant reduction in the strength of the assembly compared to the in-line conditions, at a capacity less than what would be predicted for a joist with a bearing stiffener.
- Some form of load distribution is beneficial if there is an offset in the load path. This load sharing can come from a thicker wall track or sub-floor sheathing.
- The assembly is made up of a number of components that all influence the strength and behavior of the collection (e.g. joist size, rim track size, sub-floor, wall track thickness, offset).
- There can be significant deformation associated with the ultimate capacity of the assemblies, particularly with load applied at the ¾ inch offset.
- The interior location is more sensitive to the offset in the load path than the end location.

Based on these results, a change has been recommended to the wording of the AISI *General Provisions Standard* that would limit the amount of offset allowed. The proposed wording is as follows:

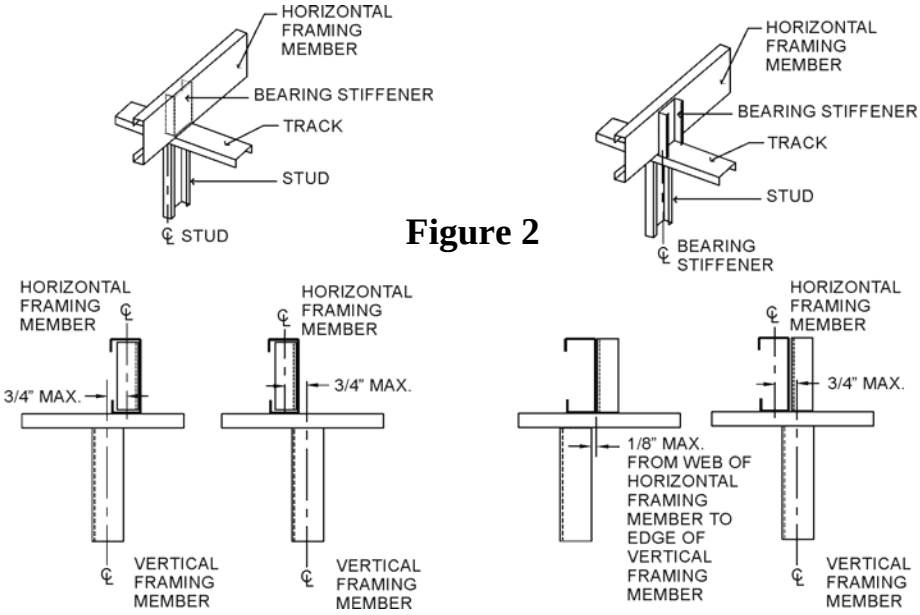

Figure 2

"Each joist, rafter, *truss*, and structural wall *stud* (above or beneath) shall be aligned vertically according to the limits depicted in Figure 2. The alignment tolerance is not required when a structural load distribution member is specified in accordance with an *approved* design or a recognized design standard. For an engineered design it may be possible to use the research results to accommodate less stringent requirements."

Editors note: This article does not address wall assemblies that include structural panel sheathing placed on the wall. Such conditions could significantly increase the stiffness of the top track. For the complete report on this subject refer to Fox, S.R., (2003) *The Strength of Stiffened CFS Floor Joist Assemblies with Offset Loading*, American Iron and Steel Institute, Washington, D.C. ❒

LGSEA April Committee Meeting Updates

In mid-April, four of the five LGSEA committees and task groups held meetings in conjunction with the Association of Wall and Ceiling Industries, International (AWCI) annual meeting and expo in Las Vegas, Nevada. The Joint Task Group on Corrosion and Durability, which is a joint committee with the American Iron and Steel Institute's Committee on Framing Standards (AISI/COFS), had their very first face-to-face meeting. This group, which was responsible for the development and technical review of the recently released *Coastal Corrosion Protection Technical Note*, discussed other publications either recently completed or under development in the steel industry. Also, current research with respect to corrosion and durability, as well as future actions, were discussed.

The Structural Assemblies Committee approved the final version of the *Slip Connector Technical Note* with some comments on the included details. Future research, as well as upcoming research notes on *Alternative Slip Track Design* and the final version of the *Behavior of Shear Transfer Brake Blocking Research Note* were reviewed. The Brake Blocking note was approved for publication. The committee also voted on two assemblies as the priority for technical note development (see article on page 4).

The Fastener Connector Committee reviewed proposals for future tech notes, including one for a note on Clip Angle Design. Also reviewed was a compilation note with information on fasteners and fastening systems used with steel and their suitability for particular applications. The current draft of the tech note *Screws for Wood to Steel Construction* was thoroughly reviewed and comments were passed along to John Lyons, the primary author. The updated note is currently going through the committee review process, and should be posted on the web by the time this article is published.

The Truss Task Group met on Friday, April 16, in conjunction with the AISI/COFS Truss Committee. New chairman Brad Cameron, who was appointed in October to replace retiring chairman Mike Pellock, had the committee look at several tech notes that are currently under review or being updated. The latest version of the tech note on permanent roof truss system bracing is available in the Truss Task Group page of the LGSEA website. If you have comments on this version, or any of the website content, please send these to dallen@lgsea.com. The subcommittee working on this will have a new version posted on the website sometime this month. In new business, the committee is looking at developing a document for steel trusses that is similar to what the Building Component Safety Information (BCSI) is for wood. The latest version of BCSI was available and passed out to members. Several of the current documents from the Steel Truss and Component Association (STCA) as well as the Wood Truss Council of America (WTCA) were also distributed. The committee also discussed the suggested methodology of design for truss wind loads, including a discussion of when it is appropriate to use main wind force resisting system loads. Jerry Peters suggested that the next Truss Task Group meeting be in conjunction with the COFS Truss Committee meeting in September.

The Research and Development Committee has developed and pilot tested a new L-Header assembly. The new L-Header assembly is different than those currently available in the AISI Standard for Cold-Formed Steel Framing-Header Design. The new assembly involves the same single or double L-header but with vertical legs that are longer extending to the head track of the opening below. Connecting the bottom of the L-header to the track significantly increases the assembly strength. These assemblies are currently being used on isolated production projects and have been found to be very efficient and offer a more cost effective design for many common residential details. The RDC is in the process of completing a proposal for more comprehensive testing. Engineers and contractors that are interested should contact Dean Peyton at dpeyton@anderson-peyton.com. Look for the next LGSEA NL to have a report summary with preliminary load tables.

Other than Truss, the next series of committee meetings are scheduled in conjunction with the LGSEA 10th anniversary and other industry events at METALCON, October 20-22 in Las Vegas. ❑

STEEL STUD MANUFACTURERS ASSOCIATION

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(Code of Std Practice -Continued from page 1)

tract documents, classification of materials, dealing with discrepancies, approval of erection and installation drawings, material characteristics, quality control and contractual relations.

Two special task groups are preparing the final two sections this summer for inclusion in the next draft version, scheduled to be distributed to the Main Committee this fall. John Carpenter of Alpine Engineered Structures is heading one task group to finalize the portions of the document related to trusses and wall panels, and Steve Walker, President of Light Gauge Steel Engineering Group, Inc. in Florida, is chairing the other task group to finalize the documents overall direction and coordination. ❑

Technical Exchange Section

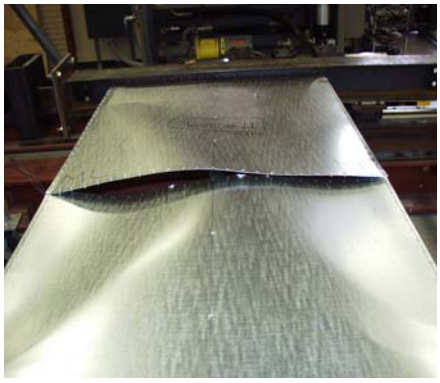
*The Light Gauge Steel Engineers Association needs you and your experience. Please mail or fax your opinions, questions, and design details that are relevant to the light gauge industry (fax to **(253) 941-9939**). Upon editorial staff review, your submission may be printed in the Technical Exchange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

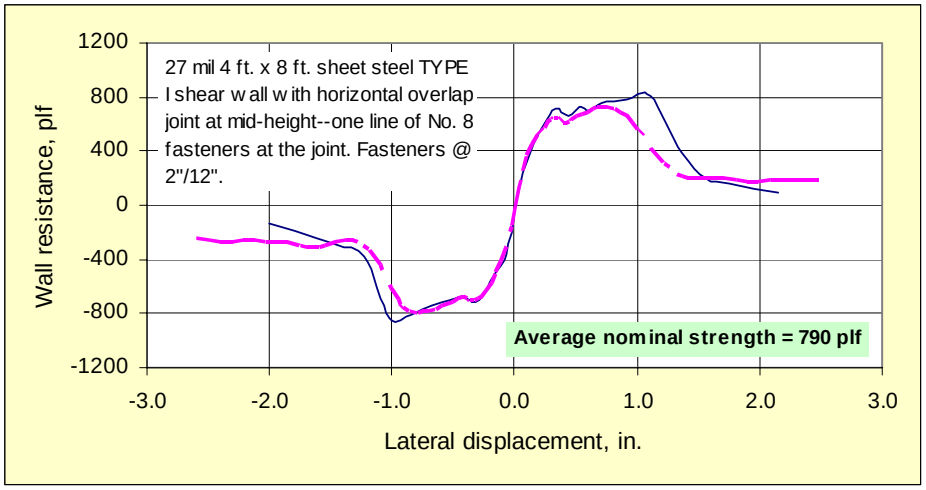
Horizontal Joints in Sheet Steel Shear Walls

By Reynaud Serrette, Center for Light Frame Structural Research (CLFSR), Santa Clara University

The 2003 International Building Code (IBC), Section 2211.2.2.1, and 2003 edition the NFPA Building Construction and Safety Code (BCSC), Section 44.8.1.2.1, provide detailed requirements for connections at the edges of sheet steel panels in shear wall applications. Both model codes require that "All edges of the steel sheets shall be attached to framing members, strap blocking or shall be overlapped and attached to each other with screw spacing as required for edges." The IBC and BCSC also notes in Clauses 2211.2.2(7) and 44.8.1.2(7), respectively, that where horizontal strap blocking is used at panel edges, it shall be a minimum of 1-1/2 inches wide and of the same material and thickness of the framing members (studs and tracks). What is not clear in the codes are specific requirements (as provided for strap blocking) when sheets are simply lapped.

Research conducted by the CLFSR with sponsorship from the National Association of Home Builders Research Center and LGSEA, provides some guidance of the issue of the lapped connection. Reversed cyclic tests were conducted to evaluate and compare the response of a 4 ft. x 8 ft. shear wall with a lapped joint with the code values. The lap detail called for a 1.5 inch overlap with a single line of fasteners (edge spacing per code) at the mid-width of the overlap. The response envelope results from two lapped joint tests are shown in the graph below. Comparing the nominal strength of the lap-jointed wall (790 plf) with the values given in the code for a 2 inch edge and 12 inch field schedule (1170 plf), it is evident that a simple lapped joint with the same edge fastener schedule is incapable of developing the strength of a solid sheet of steel. A ratio of the strengths suggests that a 30 percent reduction should be taken for the simple lap connection discussed here. ❑





Two Assemblies for Tech Note Development Underway

At their meeting in April, the Structural Assemblies Committee of the LGSEA reviewed several assemblies as possible candidates for additional research as well as development into LGSEA Technical Notes. Two assemblies were approved for Technical Note development.

The first assembly was the design of a shear wall, based on the soon to be released American Iron and Steel Institute (AISI) *Standard for Cold-Formed Steel Framing: Lateral Design*. This would include an example with the design of the collectors, boundary elements, selection of the sheathing and fasteners, design of the shear anchorage, and design of the overturning restraint. Jeff Ellis of Simpson Strong-Tie, and Chairman of

(Continued on page 7)

News Briefs

CCFSS Specialty Conference November 4-5 in Orlando

The Wei-Wen Yu Center for Cold-Formed Steel Structures, University of Missouri-Rolla, will present the Seventeenth International Specialty Conference on Cold-Formed Steel Structures on November 4th & 5th, 2004. The Conference will be held in Orlando, Florida.

Recent cold-formed and stainless steel research discoveries, as well as application of research and developments will be discussed. Examples of topics of interest to engineers in the light-steel framing industry include a discussion of research on sheathing braced wall stud behavior, stud-to-track connection behavior and design, discussion of truss gusset plate behavior and design, and an overview of Committee on Framing Standards accomplishments. Approximately 50 technical papers will be presented during the two-day conference.

Written papers for all presentations delivered during the two-day conference will be contained in the bound conference proceedings.

For more information regarding the conference venue and lodging accommodations, visit the Center's website at www.umr.edu/~ccfss. To be added to the mailing list for conference brochures and other Center mailings, please email ccfss@umr.edu and provide your contact information.❑

Educational sessions for design professionals announced for METALCON 2004

During the week of October 18, the Metal Construction Association will host several activities and educational sessions in conjunction with METALCON, the official trade show of steel framing. METALCON 2004 will be held in Las Vegas, Nevada, October 20-22. Following is a preview of the suggested engineering related presentations and educational sessions that are currently being reviewed. Note that all METALCON sessions will be pre-approved for AIA Continuing Education, as well as Professional Development Hours and Continuing Education Units in most states.

Sunday through Tuesday, October 17-19: *STUD University*, a 3-day integrated program designed to teach carpentry framing skills with light gauge steel.

Tuesday, October 19: ***Using the North American Specification and the Wall Stud Standard:*** Real world examples and detailing choices.

Wednesday and Thursday, October 20-21: ***New Building Code Issues:*** The challenges for metal framing and roofing design and construction in the ever-changing code environment**.** ***Beyond the Curtain-Wall:*** design and detailing in mid-rise construction. ***Special Issues in Roof and Truss Construction and Design:*** Developing integrated systems in non-combustible construction with metal roofing and roof framing. ***Design Details:*** the pros and cons of specific details used in load bearing and curtain-wall construction. ***Design in High-Seismic Areas:*** from the engineer and builder perspectives. ***Current research:*** issues, needs, and programs for cold-formed steel framing. ❑

Software Survey to be published in September

Every two years the LGSEA performs a software survey. The survey addresses computer aided products and software services that apply to cold-formed steel design and construction. This year we will include the software survey in our September issue of this Newsletter, and we are planning a software symposium and roundtable as part of the METALCON training sessions this October in Las Vegas. Applicable products include the following:

- Structural design software for cold-formed steel members
- Structural design software for cold-formed steel systems
- Structural design software for cold-formed steel trusses and frames
- Whole-house and whole-structure software that tracks loads and designs portions of cold-formed steel systems.
- Software that calculates loads on cold-formed steel systems.
- Takeoff and cut list development software, either stand-alone or as add on to one of the systems noted above.
- Any other member, assembly, or component software that incorporates the North American Specification for the Design of Cold-Formed Steel Structural Members (NASPEC) or previous versions of the AISI specification to design building members, components, or systems.

A submittal form is available at the LGSEA website at www.LGSEA.com. Follow the link on the home page. Once the survey is complete, details will be available in the members only section of the website. Deadline for submittals is midnight July 30, 2004.❑

New Directors Elected

LGSEA members elected four directors in a general membership ballot closing on March first. Pat Ford, a former president of the Light Gauge Steel Engineers Association, was again elected to the board after leaving his board position last year. Howard Lau, President of Shigemura, Lau, Sakanashi, Higuchi & Associates, Inc., as well as Nader Elhajj of the National Association of Homebuilders Research Center, were re-elected to serve two-year terms as director. Elhajj had been appointed to fill the position vacated earlier this year by Randy Daudet. Mr. Elhajj has worked with the steel industry through the research center for more than ten years. He was one of the primary authors of the first edition of the American Iron and Steel Institute's *Standard for Cold-Formed Steel Framing - Prescriptive Method*, and has been actively involved in AISI's standards development procedure. He has also authored many of the current tech notes in the LGSEA library. Howard Lau has been active as an officer in the Hawaii chapter of the LGSEA, and earlier this year was one of their first two inductees into their "Hall of Fame." Lau is currently serving as chairman of the LGSEA bylaws task group.❑

(Tech Committee -Continued from page 4)

the Structural Assemblies Committee, will lead the task group developing this document.

The second document will address X-braced walls. Topic areas to be covered will include single sided and double sided walls, and assemblies with single tension braces on either side of an opening. The design examples would include design of the various elements, including the collectors, boundary elements, gusset plates, anchors, and the straps themselves. Calculation of drift for a specific panel would be included as well. Greg Greenlee of USP/Gibraltar Connectors will lead a tack group for developing this document.

If you are interested in participating in the development of these or any other LGSEA technical documents, contact the task group leaders, or the LGSEA at 866-GO LGSEA.. ❑

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