Newsletter for the
Light Gauge Steel Engineers Association
August 2001

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Upcoming Events

LGSEA Seminars: **Practical Design of Cold-Formed Steel**

Honolulu	Sept 13
Los Angeles	Sept 17
S.F. Bay Area	Sept 18
Seattle	Sept 19
Atlanta	Dec 12
Nashville	Dec 13
Birmingham	Dec 14

Info: (202) 263-4486

For more information or to register, visit www.LGSEA.com

Cold-Formed Steel Structures - Short Course — Oct 16-18
St. Louis, MO
Info: (573) 341-4481

METALCON ' 97 — Oct 23-25
Las Vegas, NV
Info: (617) 965-0055

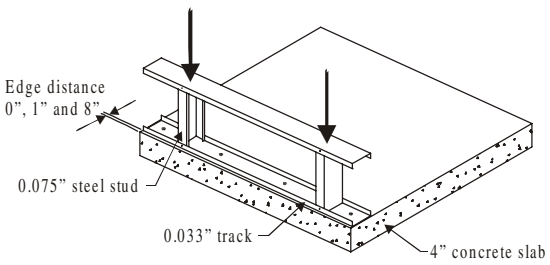
LGSEA Meetings — Oct 23-25
(in conjunction w/ Metalcon)
Info: (202) 263-4486

Building Industry Show (BIS) — Nov 8-9
Long Beach, CA
Info: (909) 396-9993

Bearing of Steel Studs on Concrete

By Dr. Dimos Polyzois, PE, University of Manitoba and Steve Fox, PE, Canadian Sheet Steel Building Institute

A recently completed series of preliminary tests conducted jointly by the *University of Manitoba* and the *Canadian Sheet Steel Building Institute* suggests there is the potential for a capacity reduction in an axial load bearing stud bearing along the edge of a concrete slab. The tests investigated the behavior of axial load bearing steel studs on a concrete slab with the objective of determining if the full local buckling capacity (A_eF_y) of the stud could be developed when it was bearing on a concrete slab, and whether there was any local failure in the concrete. It is anticipated that the final results from these tests will produce a rational design method for this condition *(Note: A calculation method was presented in the October 2000 issue of the LGSEA Newsletter, in an article titled* "Approximate Calculation for Allowable Stud Bearing in Bottom Track Over Concrete").



Typical Test Set-Up

Test Configuration: The series of tests represent the worst-case assembly, which was a 0.075 in. thick stud (14 gauge), a 0.033 in. thick track (20 gauge) bearing on a 4 in. thick concrete slab with a compressive strength of 4,000 psi. The concrete slab was reinforced with only temperature mesh and was completely supported during the test. This configuration is not necessarily representative of typical construction practices and the results should not be taken out of context. A typical test set-up is shown in the drawing above.

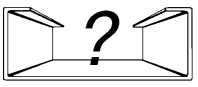
Test Results: The results showed that there is a definite edge effect that influences the capacity of the studs. The studs positioned along the edge of the

(Continued on page 2)

LGSEA Studies Possible Name Change

The LGSEA Board of Directors has begun studying a possible name change and is asking members for their input before a final decision is made.

The LGSEA name was adopted by the Board of Directors when the organization was founded in 1994 and reflected the prevailing language of that time. However, over the past several years the cold-formed steel industry has made huge strides toward the standardization of materials and specifications, nomenclature, and design methods. The LGSEA has been an active supporter and promoter of standardization and for some time the LGSEA Board has considered a name change to help in the effort. One example of one of the developments that has spurred discussion of a name change is the increasing shift away from the use of "gauge" for describing material thickness as it is becomes obsolete. Designators now refer to actual sizes in mils (or thousands of an inch). There also has



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Newsletter for the Light Gauge Steel Engineers Association

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Department Staff

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Officers

Membership Information
To receive the LGSEA Newsletter and other membership benefits of the ***LGSEA*** *call (202) 263-4486.*

Stud Bearing on Concrete

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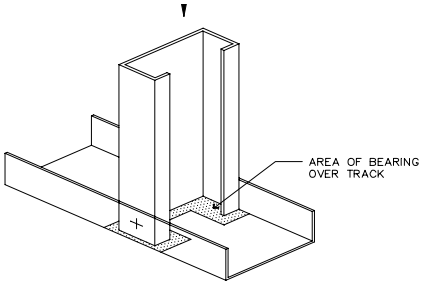
slab exhibited a 15 to 25% lower capacity than the same studs 8 in. away from the edge. There was some spalling along the vertical surface of the concrete slab adjacent to the studs and micro-cracking in the concrete under the stud. It is logical to assume that this cracking of the concrete caused a non-uniform bearing stress distribution in the stud, leading to a lower failure load. The studs located 8 in. away from the edge developed the full post-buckling capacity. The capacity of the assembly will be influenced by additional factors such as thicker track, higher concrete compressive strength and reinforcing steel that would normally be present. Additional testing is required to verify this conclusion, determine the influence of other assembly parameters, and develop appropriate design guidelines.

To obtain a copy of the research report, can be viewed on the University of Manitoba web site at www.umanitoba.ca.❐

Correction: October 2000 Newsletter

This is to notify our readers of corrections to an article found on Page 7 of the October 2000 issue of the LGSEA Newsletter ("Approximate Calculation for Allowable Stud Bearing in Bottom Track Over Concrete"). The chart in that article contains an error. A replacement Page 7 with corrected text and the accompanying chart can be downloaded from the "Publications" page of the LGSEA Web site (LGSEA.com) listed under Newsletters as "10-2000 errata." This document can be opened using Acrobat Reader (.pdf format). If you do not have Acrobat Reader, you can get a free download by opening the



"Publications" page on the LGSEA web site (LGSEA.com) and select the button as directed.

If you would like further information please call the LGSEA office at (202) 263-4486. ❐

Commercial Messages

For information about placing Commercial Messages in this Newsletter please contact Larry Williams at (202) 263-4486. Products identified or advertised in this publication are not necessarily endorsed by the Light Gauge Steel Engineers Association. Such products are identified or provided only as a service to readers.❐

LGSEA Committee Reports

Larry Williams, LGSEA Managing Director

Three of the four main operating committees of the Light Gauge Steel Engineers Association have met twice during 2001, first in Nashville, TN last March and more recently in Las Vegas, NV during July. The following is a brief report on their current activities and near term programs. *(NOTE: Committee Minutes, agendas, and many of the documents referenced here are available for download on the "Committees" page of the LGSEA web site: www.LGSEA.com).*

Structural Assemblies Committee

Chair: Mark Crawford, S.E.

Members of the committee reviewed several Technical Notes:

1. *Design Considerations for Flexural and Lateral-Torsional Bracing* (559) – was released and has been published.
2. *Design Values for Vertical and Horizontal Lateral Load Systems* (558) – an abbreviated version referencing appropriate tables in the UBC and IBC is being reviewed by the author and should be published during August.
3. *Slip Connectors* (554) – is being amended to include top of wall connections, additional discussion of seismic loading, and design examples. Will be reviewed for possible release by committee at the next meeting.
4. *Slip Track Connections* (544) - has been discussed and is in development. Content will include more in-depth discussion of drift than what is currently in the Tech Note on Slip Connectors, a section on corner connections, and will be accompanied by a spreadsheet.

Results from re-testing of brake block assemblies was reviewed by Mark Crawford who outlined some additional testing that would be conducted, including:

1. Additional tests to determine yield and ultimate strengths of steel used,
2. Results will be calculated using an alternate factor of safety,
3. Additional thicknesses will be tested, with a series where no lip is broken into the top of the block.

Fastener/Connector Committee

Chair: Roger LaBoube, Ph.D., P.E.

The Tech Note on *Power Actuated Fasteners* (562) was reviewed and the committee directed for it to be put in a final format for approval and release at the next meeting.

During the March meeting of the committee, Michael LaPensee, Vice President of Henrob Corporation, gave a presentation on self-piercing rivets. The subjects covered included:

- Automation Systems and basic equipment
- Current Applications
- Application to light gauge steel systems
- Research and Testing Programs—past and future
- Fatigue Performance

During the July meeting, the committee held a roundtable discussion about its mission and scope. The committee determined that it would pursue the following objectives during the next 12 months:

1. Development of corrosion requirements for fastener design,
2. Review of existing Tech Notes to ensure they remain current with industry and design standards,
3. Focus on development of information and standards for connectors and connection design.

Truss Task Group

Chair: Mike Pellock, P.E.

Kirk Grundahl of the Steel Truss and Component Association (STCA), provided a review of the Quality Assurance program for Steel Truss Fabricators and asked for guidelines in on issues related to design standards.

An LGSEA Damage Assessment subcommittee was created to develop a standard that would be referenced by the STCA Quality Assurance document. This information developed by this sub-committee also would be considered for publication as a Tech

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2001 LGSEA Corporate Sponsors

Alpine Engineered Products
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International Zinc Association
MiTek Industries
North American Steel Framing Alliance
Simpson Strong-Tie Company
Steel Stud Manufacturer's Association
USS-POSCO Industries

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.*

Test Results for Torsional Loads on Built up Box Beams

By Dr. Reynaud Serrette, Santa Clara University

There are several conditions in light gauge steel framing where built-up members are used in structural applications. In some of these applications load may be transferred to the built-up member via one of the sections that comprise that member. As a result, the member tends to be eccentrically loaded and its performance will depend on the effectiveness of the connections between adjacent sections and the support conditions at the member bearing ends.

Some anecdotal evidence of the performance of eccentrically loaded built-up members was presented in the October 2000 LGSEA Newsletter. That article suggested that there is a potential for an unequal distribution of load to the individual components (sections) of built-up beams. The author also indicated that this unequal load distribution can lead to a reduction in capacity when compared to the sum of capacities of the individual components of that beam.

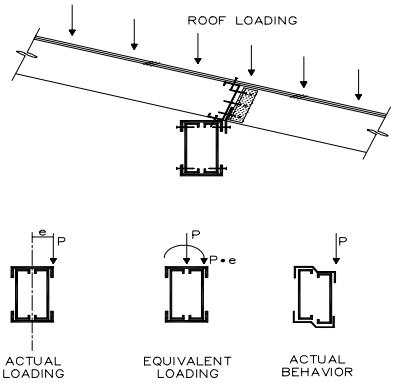


Figure 1. Box beam edge loading and load transfer mechanism

In a recent series of beam tests at Santa Clara University (SCU), the eccentric load condition of a rafter framing over the top edge of a box beam was experimentally investigated. As illustrated in Figure 1, under this condition, the degree of load distribution depends on the effectiveness of the top and bottom tracks to transfer load from one section to the next.

Table 1. Overall test results

TEST SPECIMEN	MAXIMUM RESISTING LOAD [1], lb.
18BOX-T1	1593
18BOX-T2	1591
16-BOX-T1	2768
16BOX-T2	2883
14BOX-T1	3474
14BOX-T2	3060

[1] Concentrated load at each third point
2 Each Beam Response was an initial unequal deflection of the joist components followed by beam twist and local buckling.

The basic setup used in the SCU investigation is shown in Figure 2. The test beams were 12 ft. long by 8 in. deep and had a thickness of 43 mil (18Box-T1), 54 mil(16Box-T1), or 68 mil (14Box-T1).

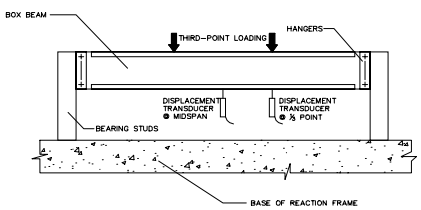
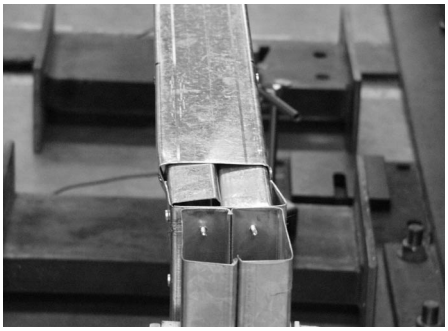


Figure 2. Box beam setup



Picture 1. Deformation at beam ends due to resisting torque

The beam tests revealed a number of important behavioral features for box beams loaded along one edge. Before failure, it was apparent that the section of the box beam that is loaded directly tended to be the primary resisting member. As load was transferred via the track members to the adjacent sections, twisting of the box beam became evident. Ultimately, failure resulted from twisting of the beam. This mode of failure is shown in Figure 1. The measured failure loads are given in Table 1.

For the narrow scope of beams tested a comparison of the tested strengths of eccentrically loaded (edge loading) beams with the computed values (concentric loading) suggests that box beams with edge loading may be capable of developing their computed capacity as if concentrically loaded. Additional testing is needed for varying track thicknesses and end restraint conditions to identify differences between concentrically loaded computed values and eccentrically loaded tested values. ❐

1997 UBC Fire Blocking in Steel Framed Wall Construction

The following question is frequently posed by engineers and contractors using cold-formed steel:

Q: Is it necessary to fire block and draft stop cold-formed steel framed construction? After all, steel is non-combustible.

A: In a March 2000 response to this question, the ICBO has indicated that no fire blocking is required if the cavity is constructed of non-combustible materials. This response also included background information that helps clarify this issue and provides designers with some important guidance.

They noted that when the fire blocking and draft stopping code provisions were written it was clear that the assumption was that all framing members were of combustible construction since the provisions were found in the chapter regulating wood construction (Section 2516(f) of the 1991 UBC). When the codes were reformatted in 1994 these provisions were administratively moved from Chapter 25 (Wood) to Chapter 7 (Fire-Resistant Materials and Construction). The fire blocking and draft stopping requirements found in the 1994 and 1997 UBC remain essentially the same as what is found in the 1991 UBC.

The language in UBC Section 708 that triggers fire blocking and draft stopping requirements is "…in combustible construction fire blocking and draft stopping shall be installed…". Although steel is non-combustible, much of today's cold-formed steel framed construction in residential applications is classified as Type VN construction due to the use of plywood or OSB for floor, roof and wall structural sheathing and thus confuse some.

Although the intent of the fire blocking is not clear from reading the code, some perspective is added by the Commentary to the 1991 UBC where it appears that the purpose of fire blocking is to prevent the unnecessary horizontal and upward spread of a fire from combustible concealed spaces to other combustible framing members. Further, in non-rated construction of single-family dwellings, the code permits openings in walls and ceilings for such applications as electrical outlets, light fixtures and HVAC duct openings. This suggests that it is not the intent of fire blocking to prevent the spread of fire between occupied spaces or from an occupied space into unoccupied spaces such as attics.

When Fire Blocking is Needed

Where a stud cavity consists of wallboard attached to steel studs the provisions of Section 708 do not apply since the cavity is constructed of noncombustible materials and no fire blocking would be required between that wall cavity and floor spaces or attic spaces. Gypsum wallboard meets the definition of non-combustible in Section 215. However if the wall cavity contains combustible sheathing such as OSB or Plywood, the provisions of 708 should be applied. In that case the typical fire blocking would be mineral or glass fiber batts or blankets.

Additional information on this subject can be found on the Web at: www.steelframingalliance.com/tech/fireblocking.html. ❐

New Research Development Committee Formed

The LGSEA has added a new committee to its organizational structure, with the promise of providing design professionals with solutions to problems that can only be resolved by research and testing. Members of the Research Development Committee (RDC) include practitioners (engineers and designers), researchers, manufacturers, code officials and builders who are actively working with cold-formed steel. These members have been given the responsibility of identifying "real world" needs with input from individuals within and outside of the committee, prioritizing these needs, soliciting funding, coordinating research programs, and interpreting and publishing test results.

The first series of testing programs to be managed by the RDC were suggested by two consulting engineers who have a specific need for information that did not already exist. The tests will help expand the options open to designers by developing tested values for the following types of assemblies:

Wood sheathed shear walls

- Boundary studs / ductility
- Doubled-sided wood sheathing
- Shear blocking for sheet steel shear walls.

Gypsum sheathed shear walls

- Performance of unblocked GWB/GSB shear walls under monotonic loading.
- Performance of blocked and unblocked GWB/GSB shear walls under reversed cyclic loading.
- Performance of blocked and unblocked GWB/GSB shear walls with alternative fastener schedules.

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AISI Committee on Framing Standards Update

By Jay Larson, Bethlehem Steel

The AISI Committee on Framing Standards (COFS) and its subcommittees met in Las Vegas, NV on July 9 and 10, 2001. Significant progress was made at these meetings. Work continued towards the updating of three existing COFS standards on *General Provisions*, *Header Design* and *Truss Design*. These standards are intended to apply to both engineered and prescriptive designs. The *General Provisions* document applies to the design, construction and installation of structural and non-structural cold-formed steel framing members where the specified base metal thickness is between 18 mils and 118 mils. The *Header Design* document applies to conventional box and back-to-back C-section headers, as well as the new double L-header beam. The *Truss Design* document applies to design of cold-formed steel trusses for load carrying purposes in buildings, as well as manufacturing, quality criteria, installation and testing as they relate to the design. Work also continued towards the development of a *Prescriptive Method for One and Two Family Dwellings*, including areas subject to high wind and high seismic. Once completed, the above documents will form a solid foundation from which the COFS and the cold-formed steel framing industry can build.

With the completion of the above efforts rapidly approaching, the COFS initiated a process to update their strategic plan. Input is being solicited to identify standards development and research needs, including 1) items which should be improved in an existing COFS standard, 2) items which should be addressed in a new COFS standard, 3) items which need further research, and 4) other items which should be considered in the COFS strategic plan. Please forward suggestions to Mosunmola Adeboyeku at AISI (Fax: 202-463-6573 or E-Mail: madeboyeku@steel.org).

The COFS develops and maintains consensus standards for cold-formed steel framing. The COFS mission is to eliminate regulatory barriers and increase the reliability and cost competitiveness of cold-formed steel framing in residential and commercial building construction. For more information about the COFS, please contact the Kevin Bielat at AISI (202-452-7215) or check the AISI website (http://www.steel.org/construction/framing/). ❐

Three New Market Studies Released By NASFA

The North America Steel Framing Alliance has release three new market reports on residential steel framing offering the latest information about the competitiveness and material performance of cold-formed steel in the residential market segment.

"Steel Framing National Market Share 1997-1999" provides a concise

overview of the national market share data for residential steel framing, including total market opportunity, new housing characteristics, distribution information, and a comparison of average construction costs. Sources include NAHB Research Center's "Builder Practices Survey" for 1997 through 1999 and the U.S. Census Bureau.

"Steel & Wood Costs: A Case Study"

summarizes the results from a time and motion study completed in Valparaiso, Indiana, where two identical homes were built side-by-side, one framed with steel and the other with dimensioned lumber. Costs are measured for framing materials and labor, and are totaled. Costs are also tallied for 15 different trades including HVAC, plumbing and electrical. Actual trade labor hours and costs per square foot are provided.

"Residential Construction Market Characteristics" defines and describes

the new residential construction market in the U.S., providing the most recent statistics available to show number of construction establishments, definitions of establishments, annual number of housing starts by builder category and type, and distribution channels. Consumer preferences for structural material usage are also included. Sources include NAHB's "Housing Economics" 10/00 issue and NAHB Research Center among others.

All three publications can be ordered at www.steelframingalliance.com. ❐

Committee Reports

Continued from page 3

Note. During the July meetings, the Damage Assessment sub-committee reported that it is developing these standards in two phases. The standards and the STCA Quality Control guidelines will then be beta-tested in a manufacturer's facility.

Drafts of the following Technical Notes were reviewed by the committee:

- *Gusset Plate Design* (551c)
- *Permanent Bracing* (551a) – revisions of both documents were reviewed and are posted on the LGSEA Web site.
- *Piggyback Trusses* (551b) - is being developed stand-alone publication, and that a section on design considerations should be added.
- *Gable End Design and Bracing* (551g) - has been added to the list of Tech Notes, and a draft was reviewed in the July meetings.

Information about upcoming LGSEA meetings is available online at www.LGSEA.com. ❐

LGSEA Name Change

Continued from page 1

been discussion of dropping "engineer" from our name to reach a larger segment of the industry.

The Board would like to make a decision whether to change the Association's name and, if so, what it should be, but first wants to encourage all members to weigh in on this subject by voicing their opinions. Please send any comments to LGSEA@AOL.com A brief note is sufficient, but we want to hear from you. ❐

RDC Committee

Continued from page 5

- Among the reasons the committee selected these tests was because they provide a demonstrable benefit to builders through substantially lower construction costs, and aid the steel framing industry by potentially increasing the competitiveness of steel framing.

The committee is comprised of two types of LGSEA members: voting and corresponding. Voting members will have direct responsibility actions undertaken by the RDC. Corresponding members will receive information about the ongoing activities of the committee but they will not be required to provide input. Voting members must be approved by a 75 percent majority of the existing voting members, and there are specific requirements for participation in meetings.

For more information about the RDC, or to apply for membership, contact the Committee Chair, Dean Peyton, at (253) 941-9929 or at dpeyton@anderson-peyton.com ❐

METALCON Goes West to Las Vegas

METALCON, the steel industry's largest conference and exposition, meets this year at the Las Vegas Convention Center (Halls N1 and 2) and is expected to attract more than 8,000 visitors and 700 exhibition booths. On display will be an extensive range of metal construction products including: flat rolled steel products, fasteners, material handling equipment, software, machinery, tools, metal roofing and light gauge steel framing companies.

The centerpiece of the exhibit floor emphasizes this year's focus on the commercial aspects of the cold-formed steel industry through the construction of a two-story office building.

Seminars / Educational Programs

During the mornings of each day, METALCON will be offering its usual broad array of seminars and educational programs, covering topics that range from residential roofing and steel framing techniques, to seismic design and the market for cold-formed steel trusses. The program menu also features several segments from the new LGSEA seminar Practical Design of Cold-Formed Steel Structures, including "Commonly Asked Questions about the AISI Specification," "Applications," and a workshop on design examples.

For more information about call METALCON at (617) 965-0055 or visit www.metalcon.com, or (202) 263-4486 for details about LGSEA-sponsored seminars.❐

EXHIBITION SCHEDULE

Tuesday, October 23
12:00 noon – 5:00 pm

Wednesday, October 24
12:00 noon – 5:00 pm

Thursday, October 25
10:00 am – 3:00 pm

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