Newsletter for the
Light Gauge Steel Engineers Association
April 2004

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Upcoming Events

Association of the Wall and Ceiling Industries, International (AWCI), trade show and convention: Las Vegas, NV	April 12-16
LGSEA committee meetings, in conjunction with AWCI show, Las Vegas, Nevada. See schedule, page 5.	April 14, 16
American Iron and Steel Institute/Committee on Framing Standards meetings, in conjunction with AWCI show, Las Vegas, Nevada	April 15-16
American Society of Civil Engineers / Structural Engineering Institute (ASCE/SEI) 2004 conference: Nashville, TN. http://www.asce.org/conferences/structures2004/index.cfm	May 22-26

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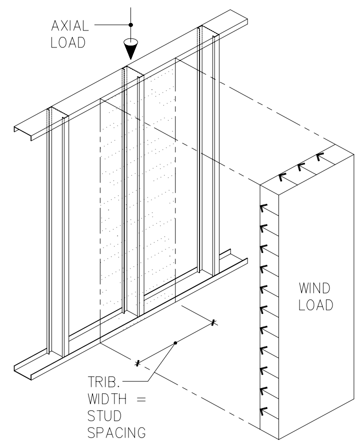
Wind Load Combinations for Design of Wall Studs

By Roger LaBoube, Ph.D., P.E.; and Don Allen, P.E.

The soon to be released *Standard for Cold-Formed Steel Framing: Wall Stud Design* from the American Iron and Steel Institute's Committee on Framing Standards (AISI/COFS) provides excellent coverage of the design of wall studs under wind loading. The forthcoming standard states that wall studs should be analyzed and designed for the worst case for the following three conditions:

1. Combined bending and axial strength based on Main Wind Force Resisting System (MWFRS) wind loads.
2. Bending strength based on components and cladding (C&C) wind loads only.
3. Deflection limits based on 70% of components and cladding (C&C) wind loads with no axial loads.



The basis for consideration of these three conditions stems from the language contained in Section 1609.6.2.3 of the 2000 International Building Code: *"Members that act as both part of the main force resisting system and as components and cladding shall be designed for separate load cases."*

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New Wood Treatment Chemicals Pose Increased Corrosion Risk

By Don Allen, PE

As of December 31, 2003, the United States Environmental Protection Agency (EPA) has banned the sale of chromated copper arsenate (CCA) as a wood preservative. Companies that pressure-treat lumber to prevent insect infestation and decay no longer are able to buy CCA to treat their products. This does not mean that CCA treated products will no longer be available; however when stockpiled quantities of CCA are gone, treatment will be by alternate methods.

The three most popular alternatives currently being used are copper azole (CA), ammoniacal copper quaternary (ACQ), and sodium borate (SBX). The high copper content in the CA and the ACQ products can lead to accelerated corrosion of steel connectors, steel fasteners, and steel framing members in contact with the treated wood. Borates, while fine for applications where the wood will remain dry, is not recommended for outdoor use or in areas where it may get wet or come in contact with the ground. This is because sodium borate is water soluble.

Compared with CA, ACQ has been aggressive when in contact with steel, but a recent reformulation has lowered the corrosion rate to about that of CA. Still, both formulations are more corrosive than CCA.

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LGSEA Newsletter for the
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City of Jacksonville Issues Policy Change on Truss Placement Shop Drawings

by Don Allen, PE

At the end of January, 2004, the city of Jacksonville, Florida, issued a bulletin amending their rules governing truss design submittals for the areas under their jurisdiction. Jacksonville, the largest (land area) city in the U.S., had previously required all truss placement plans to be sealed by a registered Florida engineer. This has not been the traditional position of either the steel or wood truss industry, since the truss designer usually is not involved in the design of the overall framing system. The city, however, was concerned about the coordination between the roof framing design and the overall building design, and was justifiably concerned that design elements, such as uplift connections and lateral load resisting elements, were not being designed. Therefore, their initial bulletin, issued as bulletin G-20-03, stated that "all truss placement or layout plan drawings submitted for a Building Permit were signed, sealed and dated by a Florida licensed engineer."

The latest bulletin, numbered G-02-04 and available at http:// apps1.coj.net/pw/BIPost/entryresults.asp?ID=355, makes a distinction between truss placement plans prepared by a professional engineer and those prepared by individuals that are not registered engineers. The main body text of the bulletin reads as follows:

"After further review of Florida Board of Professional Engineers, Laws and Rules Chapter 471, Florida Statutes and Rules Chapter 61G15, Florida Administrative Code, and in particular 61G15-31.002 (6)(a), the law states that drawings prepared solely to serve as a guide for fabrication and installation and requiring no engineering input, are not required to be signed and sealed by a professional engineer.

*Therefore, truss placement or layout plan drawings **not prepared** by a Florida registered professional engineer **will not** require the signature and seal of a professional engineer. Truss placement or layout plan drawings **prepared** by a Florida registered professional engineer **shall** require the signature and seal of a professional engineer.*

*If the truss placement or layout plan drawings **are not** signed and sealed by a Florida registered professional engineer, then they shall bear the **APPROVED** or **APPROVED AS NOTED** Shop Drawing Stamp of the ENGINEER OF RECORD. The Shop Drawing Stamp shall clearly indicate the name of the Professional Engineer of Record and bear the original signature or initials of that engineer.*

All requirements set forth in 61G15-23.002 Seal, Signature and Date Shall Be Affixed, shall be strictly followed and adhered to."

Several jurisdictions, in a similar move to what Jacksonville had done, have called for sealed truss placement plan.

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Stud Wind Load Combinations

(*Continued from page 1)*

An expanded discussion of the intent of IBC Section 1609.6.2.3 can be found in the 1999 Standard Building Code Commentary. The SBC commentary states that

"Some elements of a building will function as part of the main wind force resisting system and components and cladding also. Such members include but not limited to roof panels, rafters, and wall studs. These elements are required to be designed using the loads that would occur by considering the element as part main wind force resisting system, and also separately checked or designed for loads that would occur by considering the element as component and cladding. The use of this section can be demonstrated by considering, for example, the design of a wall stud. When designing the stud for main wind force resisting system loads, all loads such as bending from the lateral force with the wind on the wall in addition to any uplift in combinations with the dead load of the roof or a story above induced by the simultaneous action of roof forces should be considered together. When designing the stud for component and cladding loads, only the bending resulting from the wind force normal to the stud and the dead load associated with that member should be considered. The member should be sized according to the more critical loading condition."

The wood industry adopted a similar policy as stated in the 1995 Wood Frame Construction Manual (WFCM). Section 2.4 of the WFCM states that

"Stud tables are based upon bending stresses induced by C&C Loads. The bending stresses are computed independent of axial stresses. In addition, the case in which bending stresses from MWFRS loads act in combination with axial stresses from wind and gravity loads have been analyzed. For buildings limited to the conditions in the WFCM-SBC, the C&C loads control stud design."

For the selection of wind loads for the serviceability limit state, the commentary to Appendix B of ASCE 7 (1998), Section B1.2 indicates that

"[the] Use of factored wind load in checking serviceability is exclusively conservative. The load combination with an annual probability of 0.05 of being exceeded [a mean recurrence interval of 20 years] , which can be used in checking short-term effects, is D + 0.5L + 0.7W."

On this basis, use of 70% of the Components and Cladding load for checking deflections is both appropriate and conservative.

Designers should also note that in Table 1604.3 of the 2000 and 2003 IBC, footnote *f* states that "*The wind load is permitted to be taken as 0.7 times the "component and cladding" loads for the purpose of determining deflection limits herein. Note that this applies to both wall and roof framing, but only for the deflection limits that are listed."*

It is interesting that even though the above guidelines exist, many designers still use the full (100%) components and cladding load for checking serviceability. The impact of using the reduced component and cladding wind load may be most apparent when tight deflection limits (L/600 say for brick veneer and masonry) are required. By using the 70% "rule" economical designs can be developed and applied, consistent with an accepted standard.

Some architects have included loading requirements along with the deflection limits in section 05400 of their specifications, or engineers have included them in their structural general notes. By referencing the new wall stud standard, along with its companion document, *Standard for Cold-Formed Steel Framing: General Provisions* (GP), loading requirements may be removed from the architect's specifications, and designers can know that they are accurately and economically specifying their wind loaded wall framing member. ❒

City of Jacksonville

(Continued from page 2)

This action by Jacksonville could lead to changes in policy in other jurisdictions. The Wood Truss and Component Association, as well as the Steel Truss and Component Association, were instrumental in helping Jacksonville make this change. For additional information, go to www.steeltruss.org. For information on the Florida bulletin, contact William L. Lyle, Plans Examiner Supervisor: 904-630-2351.❒

Upcoming Tech Notes:

At the April LGSEA meetings, the following tech notes will be reviewed for final publication:

Slip Connectors in Curtain Walls
Truss System Bracing
Steel to Wood Screw Connections

Other proposed tech notes for 2004-2005:

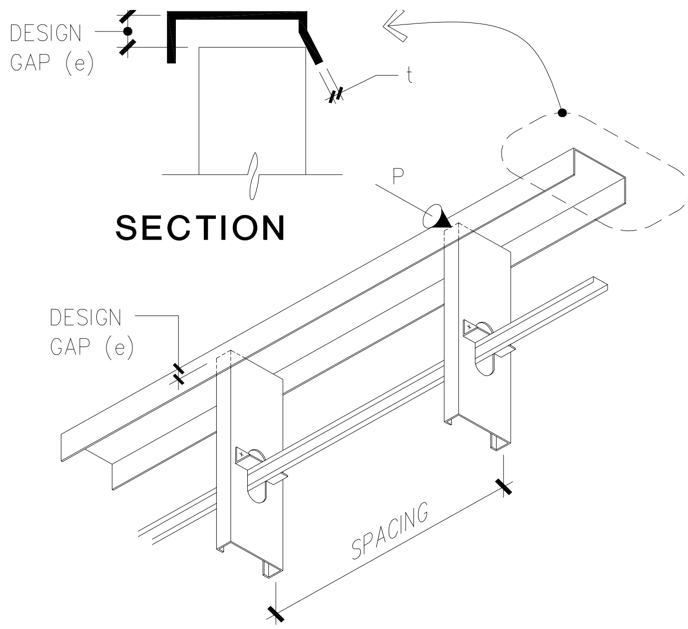
Structural general notes
Architectural specifications
Wall stud design
Clip Angle Design
Roof Diaphragms
Prescriptive Standards
Inspection Checklist Commentary
Fastener Corrosion

*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.*

Deflection Track Testing Summary

By Pat Ford, PE

The slip track is one of the most commonly used connections in cold-formed steel framed curtain wall assemblies yet there is little to no guidance in the American Iron and Steel Institute's North American Specification for the Design of Cold-Formed Steel Structural Members directly related to design of these connections. To develop data and preliminary design guidelines for the slip track connection, a testing program was recently conducted and completed at the Milwaukee School of Engineering (MSOE) Construction Science and Engineering Center Laboratory.



$b_{eff} = 0.11 \text{ x } (e^{0.5} / t^{1.5}) + 5.5$ < or = S

$P_n = b_{eff} \text{ x } t^2 \text{ x } F_y / 4 \text{ x } e$

Where:

P_n = Nominal capacity of the slip track leg (Kips)

b_{eff} = Effective distribution width (inches)

t = Nominal thickness of the slip track (inches)

F_y = Yield strength of track (Ksi)

e = Design slip gap (in)

S = Stud spacing (in)

Ω = 2.51 (for ASD)

Φ = 0.61 (for LRFD)

The MSOE research resulted in the development of expressions for computing the nominal capacity for slip track connections, as well as their effective load distribution widths, which is a critical aspect of the analytical solution for the capacity of the connection detail.

The scope of the MSOE research included a review of several existing methods of analysis, finite element modeling and physical testing. A total of 108 specimens were tested in different combinations of stud flange width (1-5/8 in. and 2-1/2 in.), stud spacing (16 in. and 24 in. on center), vertical slip gap (1/2 in. and 1 in.), and track thicknesses (0.0713 in., 0.0566 in. and 0.0451 in). Another variable was the location of the fastener connecting the deflection track to the structure above. One third of the tests were conducted with this fastener connection located at mid stud bay verses directly adjacent to the studs themselves. Tested assemblies with fasteners located at mid bay (between the studs) resulted in slightly higher failure loads. In the interest of developing conservative design guidelines, only tests with track fasteners located adjacent to the studs were used.

This research indicated that the stud flange width, as well as the locations of the slip track fasteners, did not significantly vary the capacity of the connection. In addition, it was demonstrated that most existing analytical models are overly conservative in determining the capacity of the slip track. The nominal capacities of the slip track connection and the effective distribution width (or tributary flange loading area) can be described by the equations listed below the figure.

The equations yield generally more economical results along with greater formulated safety factors and reliability. The complete research paper contains limits to the applicability of the equations presented, as well as comparisons between this and existing analytical methods.

The research was conducted by graduate student James Gerloff under the advisement of Dr. H. Peter Huttlemaier, and Douglas Stahl, Ph.D., Director of the CSEC Lab, along with Richard DeVries, Ph.D., Director of MSOE's Structural Engineering Masters Degree program. Sponsorship for the testing program was provided in part by Dietrich Industries and Matsen Ford Design Associates, Inc. For a complete summary see http://www.msoe.edu/~gerloffj.

News Briefs

ASCE-SEI Committee Defines Research Needs

by *B.W. Schafer, Ph. D.*

Designing shear walls, understanding the performance of stud-to-track details, and the lack of standardization in all connection details, are the top research needs for cold-formed steel as identified by the ASCE-SEI committee on cold-formed steel. This committee has recently put together a ranked list of research needs. At the time that the survey was conducted, the committee consisted of 16 members: 9 consulting engineers, 5 academics, and 3 manufacturing/industrial representatives.

Based on the committee's findings *the top five research needs for state-of-the-art/practice summaries* are ① shear walls, ② headers, ③ seismic design, ④ bracing, and ⑤ the Direct Strength Method. Shear walls are an area where little guidance exists for engineers, and a summary of best practice is sorely needed. For headers, the recent AISI SG02-6 publication helps in many situations. For seismic design, little specific guidance currently exists, and little funding for fundamental research on cold-formed steel seismic design is available. This is clearly an area of significant concern and need. Bracing is always an important issue and Tom Sputo, a member of the ASCE-SEI committee on cold-formed steel, has recently been awarded a special project by ASCE to provide a state-of-the-art summary on bracing.

Dissemination of practical knowledge is active, but fundamental research is lacking. The *top five research needs on basic behavior* identified by the committee are ① stud-to-track connection performance, ② lateral load transfer, particularly diaphragm loads, ③ boxed headers and determining the amount of composite action, ④ multi-story lateral stiffness (particularly understanding the role of the floor in platform construction with shear wall-floor-shear wall as the lateral system… is the floor a weak link?) and ⑤ bridging needs for purlins, girts, and joists to address when bracing is needed to stop distortional buckling. ❒

Upcoming Meetings of the LGSEA

The Light Gauge Steel Engineers Association will have meetings April 14 and 16 in conjunction with the Association of Wall and Ceiling Industries (AWCI) meetings and trade show in Las Vegas.

Wednesday, April 14, 2004:

- Noon - 1pm: LGSEA Structural Assemblies Committee Meeting
- 1:00 - 2:00: LGSEA Fastener /Connector Committee Meeting
- 2:00 - 3:30: Joint LGSEA/COFS Corrosion Committee Meeting (First meeting of new group)
- 3:30 - 9:30: LGSEA Board of Directors Meeting

Friday, April 16:

- 10:30 - 11:30: Truss Task Group (LGSEA)

For specific meeting room locations visit the LGSEA website at www.LGSEA.com. ❒

LGSEA Executive Director to take on New Roles

The Steel Stud Manufacturers Association (SSMA), announced in December that Don Allen will be taking on the role of SSMA Technical Director. Allen will be reducing his responsibilities as Executive Director for the Light Gauge Steel Engineers Association (LGSEA) to accommodate new responsibilities as the Director of Engineering Development for the Steel Framing Alliance (SFA) in addition to the SSMA position. Through an agreement between the SFA and SSMA, Allen will staff a technical services office provided by the SFA at their headquarters in Washington, DC.

"I am excited about the opportunity for synergy between the organizations" said Allen, when asked about this shortly after the announcement. *"The SSMA position will allow the LGSEA as well as the SFA to work more closely with manufacturers and use joint resources to better support our mission to educate engineers and provide resources for designers."*

Allen may still be reached at the LGSEA headquarters office at 202-263-4488, or via email at steeldon@earthlink.net. For additional information on the SSMA go to www.SSMA.com or call their Headquarters office (Augie Sisco) at 312-456-5590. ❒

New Wood Treatments

(Continued from page 1)

The Steel Framing Alliance has issued guidelines on the use of steel framing with pressure treated wood; they give the following recommendations to alleviate problems:

1. If using wood in dry areas, specify sodium borate pressure treatment, and ensure that the wood is transported and installed in a manner where it will remain dry.
2. Corrosion can be prevented by isolating the steel and wood components. This can be as complex as designing a system of corrosion resistant connectors, or as simple as applying paint or building felt between the steel and wood.
3. Avoid the use of pressure-treated wood altogether.

For connectors and fasteners that must be in contact with the pressure-treated wood, the primary option is to provide heavier galvanizing on the material. For nails and other fasteners, hot-dipped galvanized is recommended. For hangers and connectors, products such as Triple Zinc® from USP Connectors or Z-Max from Simpson Strong-Tie will provide added protection. For a more detailed discussion of the problem and some of the solutions, go to: http://www.taunton.com/finehomebuilding/pages/h00127.asp. For additional information and a full copy of the Steel Framing Alliance report, go to: www.steelframingalliance.com ❒

Positions Available

TrusSteel, a technology leader in the cold-formed steel truss industry, has an opening for an engineer. Qualified candidates will possess an B.S. degree in civil engineering or related field. Cold-formed steel design experience a plus. Come work with a leader in the cold-formed steel truss industry. Please contact Bill Babich at bbabich@trussteel.net or call (800) 755-6001. EOE/DFWP

Steel-Framing Manager: Growing light-gauge steel framing company in Riverside County, Southern California, is searching for a Field Operations Manager. Key responsibilities include managing a framing crew of 40 up to 200, and acting as key contractor interface. Individual must be a problem solver in a fast-paced environment, team oriented and have the ability to recommend and implement process improvements. Must have several years of similar residential framing experience in a fast-paced home building environment. Excellent salary (DOQ) and comprehensive benefits package. Email resumes to: gkrammer@koffassociates.com or call 925-831-9794.

The Light Gauge Steel Engineers Association

LGSEA

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