Newsletter for the October 1995

Light Gauge Steel Engineers Association

INSIDE page

Upcoming Events 1995

METALCON ‘ 95 — Oct 24-26
Washington, D.C.
Info: (617) 965-0055

BIA Building & Industry Show — Nov 2-3
Anaheim, CA
Info: (909) 396-9993

NAHB National Convention — Jan 26-29
Houston, TX
Info: (800) 368-5242

Prescriptive Method for Residential Steel Construction

A Code Development Update from The NAHB Research Center

by Nader Elhajj, P.E. - NAHB Research Center

The NAHB Research Center, with funding from the U.S. Department of Housing and Urban Development (HUD), the National Association of Home Builders (NAHB), and the American Iron and Steel Institute (AISI), kicked-off the second year of standardizing light gauge steel sections for the residential market, and developing the ***Prescriptive Method For Residential Cold-Formed Steel Framing.***

The project started in mid 1994 by assembling a steering committee and an advisory committee composed of industry experts. The committees represent manufacturers, code officials, steel producers, AISI, HUD, engineering professionals, architects, builders, and researchers.

In the second meeting, the steering committee decided to form an engineering subcommittee to review and decide on the design methodology and assumptions to be used in the development of *Prescriptive Method.*

After four steering committee meetings, several revisions of the *Prescriptive Method*, and many correspondences between the committee members and industry, NAHB RC recommendations for the residential steel standard sections are as found listed in the table on page 3. Some of the widely debated

(Continued on page 3)

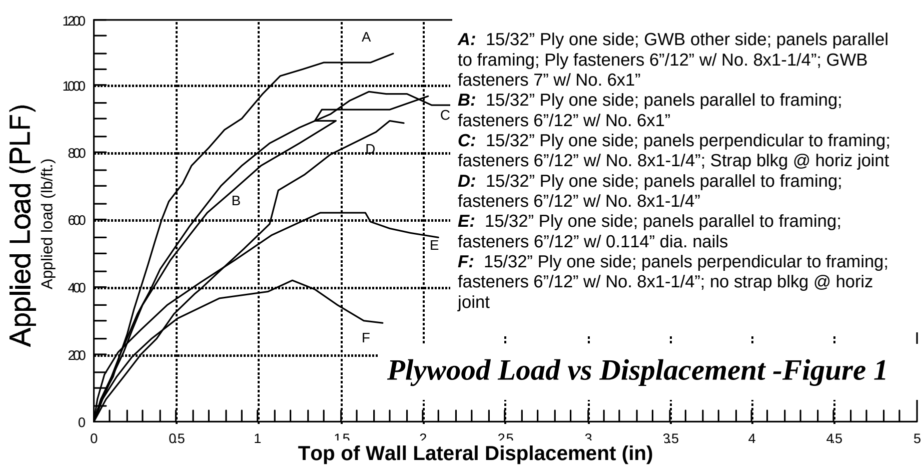
Behavior of Light Gauge Steel Framed Shear Walls

Shear Wall Design and Testing Results - Part III

Light Gauge Steel Research Group, Santa Clara University
by Professor Reynaud Serrette

Previous editions of the LGSEA Newsletter (January and April 1995) presented test results for different configurations of statically loaded 8 ft. by 8 ft. light gauge steel framed shear walls. This article summarizes and compares (graphically) the static response of the systems test. Specifically, the load-lateral deflection curves are given for 15/32-in. rated plywood (Figure 1), 7/16-in. rated oriented strand board (Figure 2), 1/2-in. gypsum wallboard (Figure 3), and 1/2-in. FiberBond wallboard

(Continued on page 10)



Plywood Load vs Displacement -Figure 1

LGSEA

Newsletter for the

Light Gauge Steel Engineers Association

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Steel in the Spotlight at the Pacific Coast Builders Conference

by Larry Williams

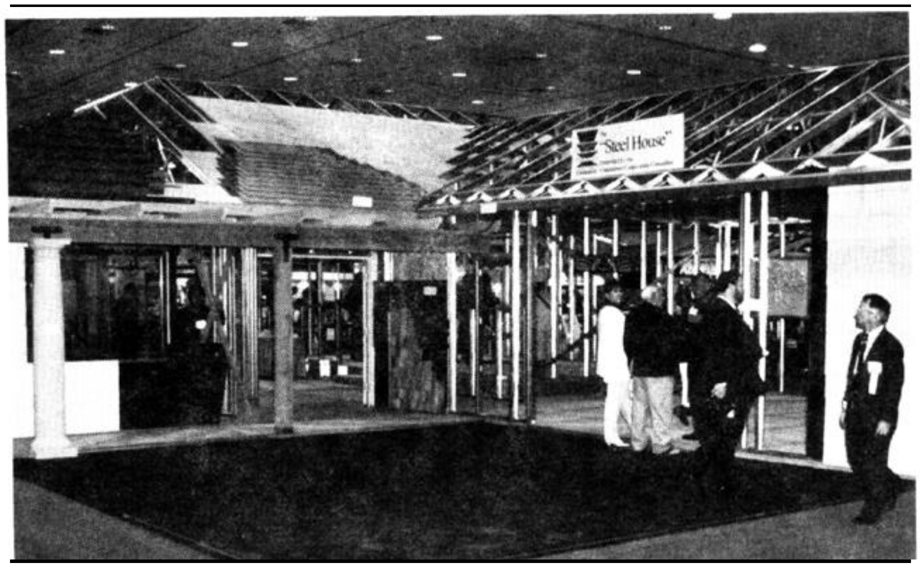
For the third straight year, steel stole the show at the Pacific Coast Builders Conference, the nation's second largest building trade show held last June in San Francisco's Moscone Center. Concentrated in a 4,000 square foot area on the exhibit floor, dubbed "Steel Central", the residential steel framing industry was showcased by the broadest industry representation to date. Participants included toolmakers, steel stud manufacturers, fastener and connector manufacturers, truss and pre-engineered component companies, and steel producers.

Attendance at PCBC went up this year, to more than 10,000 visitors during the three-day conference, and once again "Steel Central" attracted the lion's share of traffic. However, some "Steel Central" exhibitors noticed that the type of questions that visitors were asking had changed. "We saw a lot more serious buyers than casual, first-time shoppers," says Curt Kinney, president of Tri-Chord Systems.

In the "Steel Central" Information Center, LGSEA members were on hand to answer a host of technical questions posed by visitors to "Steel Central." Engineers manning the booth included Dean Peyton, Kjell Bo, George Richards, and Reynaud Serrette. These engineers also provided information about engineering through small presentations and seminars held during the three-day trade show.

Centerpiece of this year's "Steel Central" was a 1,200 square foot steel framed house that was erected on the floor of Moscone Center by workers trained through a program jointly developed by the Carpenters/ Contractors Cooperation Committee and the Joint Apprenticeship Training Committee. The work took only three days, a particularly remarkable feat since the house was partially finished with stucco, wood sheathing and metal roofing products, an interior wall and door installation, and a unique domed ceiling. The house was engineered by George Richards, president of BORM Associates and member of the LGSEA Board of Directors.

As the LGSEA generates needed technical information, events like the Pacific Cost Builders Conference will increasingly be important channels we can use to share data with the market.❒



This 1,200 SF steel framed house was the centerpiece of "Steel Central" at the June '95 Pacific Coast Builders Conference in San Francisco.

Prescriptive Code Method

(Continued from page 1)

Item	Proposed Code Minimums
Minimum Uncoated Thickness	0.0329", 0.0428", 0.0538", 0.0677", & 0.0966" for 20, 18, 16, 14, and 12 gauge respectively.
Minimum Galvanization	G-60 for structural members & G-40 for non-structural members. (excluding construction in harsh environments)
Minimum Yield Strength	33 ksi
Minimum lip size	3/8" (maximum of 1/2")
Minimum Flange size	1- 5/8" (maximum 2")
Inside Bend Radius	The greater of 3/32" or 2 x thickness
Joist size	2 x 6, 2 x 8, 2 x 10, & 2 x 12 (2 x 6 size is 1 5/8" x 5 1/2")
Stud size	2 x 4 & 2 x 6 (2 x 4 & 2 x 6 sizes are 1-5/8" x 3-1/2" & 1-5/8" x 5-1/2" respectively)
Floor Deflection Criteria	L/480 for Live Loads, L/240 for Total Loads

issues among the steering committee members were the flange size, the lip size, the deflection criteria, the yield strength, and loading combinations.

Floor vibrations and nuisance were the main factors driving the discussions on deflection criteria. The committee decided on increasing the deflection criteria from the currently used L/360 to L/480 (for live loads) to alleviate these concerns.

Several sensitivity analyses were performed for floor joists with different flange sizes, lip sizes and yield strengths. Deflection controlled the design in almost all cases, therefore, using higher sensitivity analysis indicated that by increasing the flange size from 1 5/8" to 2", a typical floor joist span would increase by approximately 2 to 4%. This slight increase does not justify the use of 2" as a minimum flange width. The lip size sensitivity analysis showed similar results. The floor joist spans increased by approximately 2 to 4% by increasing the lip size form 3/8" to 1/2". This increase was deemed insignificant relative to other engineering concerns.

Another debated issue is the loads and loading combinations to be used to develop the wall stud and header tables. Different approaches were presented by members of the engineering subcommittee which reflect different interpretations of the codes and ASCE 7-93, particularly for load combinations involving wind. We prepared a letter documenting a compromised approach, without sacrificing the structural integrity or safety of the houses. Once this approach is agreed upon, the wall stud and header tables can be finalized.

Several other issues remain to be resolved before the *Prescriptive Method* is finalized. The results of the shear wall testing at University of Santa Clara by Dr. Serrette will be incorporated in the *Prescriptive Method*. A design criteria to handle large round holes (e.g. 4" diameter) in joist webs (for trades) to be used with the *Prescriptive Method* tables needs to be developed. This task is currently being performed by Dr. LaBoube at University of Missouri-Rolle (UMR). Construction details need to be finalized with alternate details provided and a fastening schedule needs to be developed.

The fifth meeting of the steering committee is scheduled for late October. It is expected that after the meeting a final draft will be issued in time for a 1996 code change submittal to the CABO One and Two Family Dwelling Code.

NAHB Research Center is assembling a code strategy committee to guide dissemination activities including building code changes, NES review, and ANSI standardization.

For additional information, comments or questions, please contact Nader Elhajj at (301) 249-4000 extension 581,

Performance of Static and Cyclically Loaded Light Framed Shear Walls

by Professor Reynaud Serrette -Light Gauge Research Group, Santa Clara University

Under the current UBC design methodology, the lateral resistance of light framed shear walls is generally based on the consideration of two basic criteria: strength and deformation. The tabulated allowable strength values in the Code are based on static racking tests. In the static test, the base of the wall is held in place and the top of the wall is pushed over. The resulting load-top of wall lateral deflection curve is illustrated in Figure 1(a) and may be described as a nonlinear response with decreasing stiffness and increasing strength as the lateral deflection is increased. After the maximum strength is attained, the system exhibits a negative stiffness with increasing displacement (leading to possible instability under gravity loads).

Since the Northridge earthquake there has been more discussion about the need for cyclic testing. In cyclic/dynamic testing, the wall may be

loaded by exciting the base (with weights attached at the top of the wall) or by displacing the top of the wall (with the base of the wall fixed). The latter method is usually used since it is the less expensive and it provides the necessary design information. Figure 1(b) shows the load vs. top of wall

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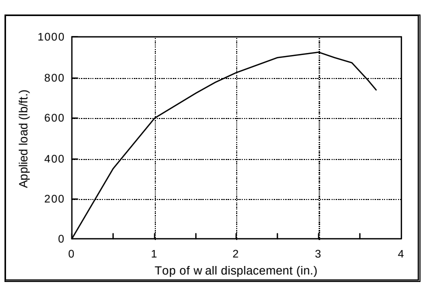

Fig 1 (a) - Static Loading

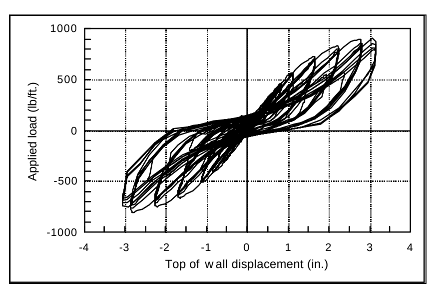

Fig 1 (b) - Cyclic Loading

Technical Exchange Section

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

Installation and Pretension of Tension only "X" Bracing For Cold Formed Steel Stud Wall Systems

by John Kelly

A common type of horizontal lateral load resisting system for cold formed steel structures is tension only strap bracing. This is also known as X-bracing. The Uniform Building Code has specific minimum force level design requirements for the tension strap, gusset plate, and connecting elements, but not very specific requirements for the pre-tensioning of the straps themselves. Per Section 2710(j).7 of the 1991 UBC or Section 2211.11.7 of the 1994 UBC:

> *"Provision shall be made for the pre-tensioning or other methods of installation of tension-only bracing to guard against loose diagonal straps."*

The practical method we found for adequately pre-tensioning strap bracing is detailed in figure 1. Straps are first installed with a nominal number of screws to provide stability during construction. As the roof is loaded and the drywall stacked, normal deflections occur and space between framing members begin to close up. The straps must then be permanently tightened. Remove the screws from one end of a given strap, taking care to assure that the structure remains braced or is shored. Drive a single #12 hex head screw at approximately a 2:1 angle through the strap into the gusset. The strap should be held away from the gusset as the screw is started. The screw can then "pull" the strap tight as it is tightened down. Care should be taken to start this tensioning screw at least 1/4" from prior screw holes to minimize the potential for pullout. A larger #12 hex head screw is easier to drive and normally strong enough to tension the strap properly. Finish the connection by driving the specified number and size of screws at each end of the strap and removing the #12 hex head screw. Care should be taken to ensure proper alignment of the strap with the control point. The connection of the gusset plate to the track and stud should be done prior to strap installation to control alignment problems.

Until more specific code requirements are adopted, this type of commonsense approach should be adequate to pretension X-bracing for cold formed steel stud wall systems.❒

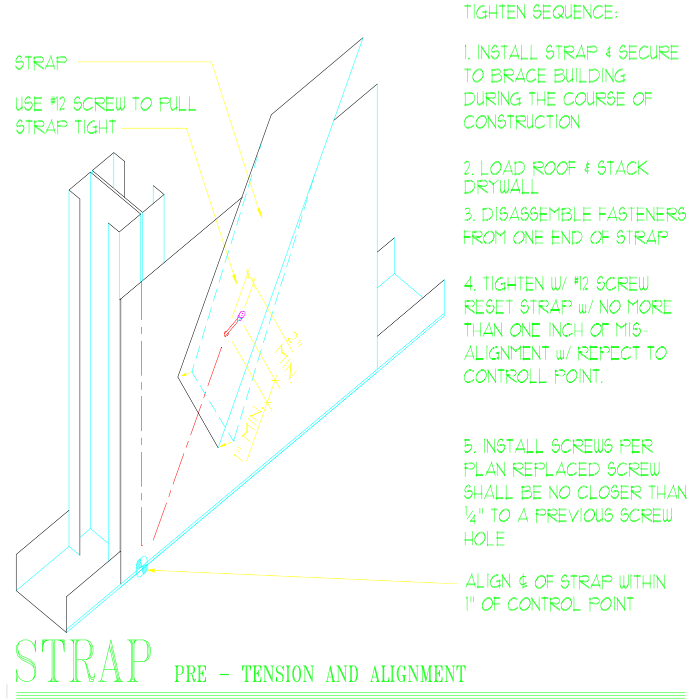

Figure: 1

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Quality Engineering - A Key to Success

by Jerry Delgadillo, Steel Standards Inc.

As a builder or developer contemplating on making the switch from wood to steel framed homes, a key to successful projects starts with your selection of engineers. A qualified engineer, that is, one who is experienced and knowledgeable with light gauge steel framing, will give you a step in the right direction.

Proper planning and design will set the stage for a successful project. Thoroughness and care acquired from a seasoned engineer will affect all aspects of the finished product.

Random selection of an engineer without qualifying their background and experience can lead to a very distasteful initial exposure to the light gauge market.

Typical problems encountered due to engineer's unfamiliarity with light gauge steel are over engineering and lack of design clarity. When a project is over engineered, you will find more steel used than is structurally necessary. Added costs result due to the simple fact that steel is sold by the pound. Labor costs are also increased because productivity is reduced when heavier steel is used.
Lack of design is another common problem caused by in-experience. Comparing a set of drawings from a competent engineer with those of someone just coming into the light gauge steel sector is like night and day. I have done projects where prior to the start of framing, meetings had to be held to identify structural supports that were totally missing on the plans.

While evaluating your potential engineer, a major issue is the costs involved with engineering. I have seen builders go with an engineer strictly based on cost and ended up paying more for his project than he anticipated due to poor engineering. I would rather pay a little more for a design that is cost effective in the long run.

If steel framing is designed by a qualified engineer familiar with the structural properties and performance of steel, the results are a design that is properly sized and detailed. With this in hand, a builder can assure himself of obtaining the best value for using steel on the project.

Qualified engineers can be found through the various metal stud manufacturers. Some have had years of light gauge metal experience. Most have incorporated details initiated by field personnel who have a practical knowledge of light gauge steel framing methods. This combination achieves a product for builders and contractors that is cost effective to erect and maintains a competitive edge with other building materials.

Evaluating engineers should not be a tough process when you know what to look for. Check past projects and obtain references. Speak to the builders and contractors connected with jobs and see if they were satisfied. Planning, detailing, and flexibility while working with the construction team are some of the items to be assessed.

Be cautious when working with an engineer who is designing his first steel project. Typically, you will find a person used to designing with wood who is trying to make the transition to light gauge steel. The end result is a builder and contractor who are dissatisfied with using steel and return to wood framing. When a builder and an engineer have an existing working relationship and want to carry it over to steel, I suggest adding a qualified light gauge steel engineer to your design team. There will be a cost savings long term and prevent a bad experience that is unnecessary.❐

A Roof Hip Framing Detail

by Neal Peterson, P. E.

One of the areas commonly discussed is how to frame a roof hip using light gauge steel framing. One option that has been successful is to use two sections of track that are fastened together on one side where the web meets the track flange with tek screws.

The two pieces of track can then be splayed apart to set the proper roof slope to receive the roof rafters from each roof at the hip condition.

To hold the two track sections at the proper angle, a light gauge wedge piece can be inserted between the two track sections, as shown on the detail, to hold the track sections apart when load is applied to the roof system.

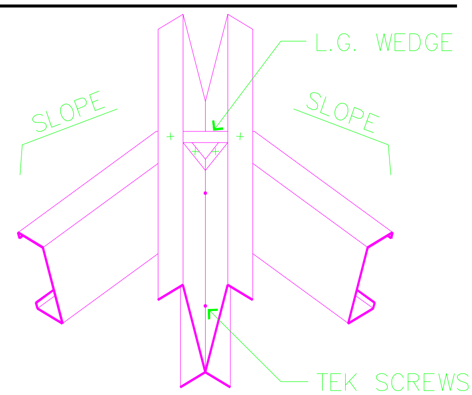
The advantage for utilizing the two track sections to form the hip of the roof are as follows:

1. Square cut ends on the roof rafters can be used thus eliminating any field cuts.

2. The proper slope for each roof where the two track sections cross the corner of the support wall and also where the track sections connect to the girder truss and half truss/roof rafter at the peak.

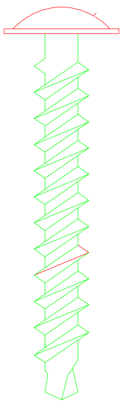
3. Eliminates any compound miter cuts.

The above represents one simplified way to form a hip connection which has



Screw Fastening of Light Gauge Steel

by Alan Swartz, P. E.



Several considerations are important to the Design Engineer when specifying self tapping self threading fasteners (commonly called tek screws). Briefly stated they are as follows: fastener size, length, drill tip type and style, head style, and corrosion resistant coating. This issue's article will be devoted to a discussion of the information required to correctly specify the right fastener for a given job.

Head Style: Some commonly used head styles are: pan heads, hex washer heads, wafer heads, pancake heads, bugle heads and flat heads. The choice of head style is based on the material type and thickness being fastened as well as finish considerations. For example, it would be a mistake to use hex washer heads screws in a location where they would cause bumps under drywall sheathing. A better choice would be a pan head or even better pancake head.

Length: How long should the fastener be? In general, it is desirable to select fasteners that are long enough to penetrate the last layer of steel in an assembly by at least three (3) full threads.

Drill Tip Type and Style: Drill tips are designated as numbers 2, 3, 4, or 5. Usually, the maximum total steel thickness that can be drilled equals the length of the flute in the drill point (consult the manufacturer's catalog). Note: the total thickness should include all steel layers in an assembly. The number 3 tip is most commonly used for light gauge steel to steel connecting. Drill tips are also available with special application points such as pilot points, for penetrating large material thickness, and winged tip points (which cut clearance holes in sheathing for the screw threads).

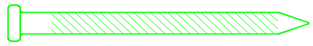
Fastener Size: Typical fastener sizes are called out as #6, #8, #10 or #12, with #10 and #12 being the most commonly used for structural steel to steel framing connections. Fastener size requirements and allowable loads can be determined using the manufacturers published information or the "AISI Specification Provisions for Screw Connections" dated February 1993.

Corrosion Resistant Coating: The correct corrosion resistant coating should be selected for each fastener application. The manufacture's catalog should be consulted for coating types, availability, and coating performance in salt spray per ASTM B117.

All of the above information is readily available from the top fastener manufactures. Care should be taken to clearly note which manufactures are acceptable sources for fasteners. Alternate substitutions should not be permitted unless they are carefully reviewed by the Design Engineer. Beware, some distributors are not as careful as they should be about the quality of the screws they supply. Low quality screws can and have resulted in connection failure. ❐

Nail to Steel ?

by David Nolan, P. E.
Erico Tool & Fasteners, Inc.



Often heard objections to the use of light gauge steel in residential framing include carpenters' unfamiliarity with new tools needed for steel, and that installation of existing fasteners is not efficient. Several companies have sought to overcome these objections by introducing pneumatic nailing systems which allow carpenters to nail plywood to steel just like they do when nailing wood.

The use of air driven fasteners, called pins, for fastening into relatively thick steel, 14 gauge to 3/8", has been common in commercial construction for almost 15 years. ICBO first recognized the use of such pins in horizontal diaphragms and shear walls constructed with minimum 14 gauge supports in 1986. Traditionally, a pin of about 0.140" diameter, similar to a powder actuated drive pin, is used in these applications. Intuitively we can accept a pin's holding strength in a 3/8" thick steel beam, but how do these pins hold in a 20 gauge steel stud?

At first glance, these pins look like nails, but the similarity stops there. Pins are made of high carbon steel and are heat treated by a special process which makes them very hard, yet ductile. This enables pins to easily pierce steel studs, but will not produce a brittle failure when subjected to shear or tensile loads.

As the pin is driven, steel from the stud is moved outward and down. The compressive strength of the steel causes the stud to grip the pin. So long as the pin's point completely penetrates the steel, all compressive forces are perpendicular to the pin, holding it in the steel. Also, the deformed surface of the pin, called a knurl, increases the surface area of the pin in contact with the stud, creating additional holding strength through friction. The thicker the stud, the greater the pin's pull out resistance.
Pin fasteners are most commonly used in residential steel frame construction to fasten plywood to wall studs, floor joists and roof trusses from 16 gauge to 22 gauge steel. ICBO issues approval for air driven pin type fasteners by brand name. Design values approved by ICBO for shear walls and horizontal diaphragms show that pins in steel provide similar strengths to nails in wood. Values in 18 gauge studs are close to those for 8d nails; values in 20 gauge studs are similar to 6d nails. See accompanying table for suggested shear wall values for 20 gauge framing. Design values are also available for other gauges and for horizontal diaphragms.

These pins are supplied collated in coils of up to 300 pins and are available in lengths from 1-1/2" to 2-1/2". They are driven with an air tool similar to tools used in traditional wood frame construction at air pressures available from most conventional air compressors. The result is a familiar, labor saving fastening method that further enhances the use of light gauge steel in residential construction.❐

Suggested Shear (Lb. per foot) for Structural Use Panel Shear Walls for Wind or Seismic Loading (1) (2) (3)
(For ET&F 0.100" dia. pins and minimum 20 ga. steel framing)

Structural Panels	Minimum Panel Thickness (inches)	Framing Spacing (inches)	Shear PLF @ Fastener Spacing (4) (5) (in. o.c.)			
			6"	4"	3"	2"
STRUCTURAL I	3/8"	24"o.c. (6)	145	220	290	370
	3/8"	16" o.c.	180	265	355	455
	7/16"	24" o.c. (6)	160	245	325	415
	7/16"	16" o.c.	180	265	355	455
RATED SHEATHING AND SIDING	3/8"	24"o.c. (6)	130	195	265	335
	3/8"	16" o.c.	160	240	320	410
	7/16"	24" o.c. (6)	145	220	290	370
	7/16"	16" o.c.	160	240	320	410

(1) These values are for short-time loads due to wind or earthquake and must be reduced 25% for normal loading.
(2) The pin must be long enough to penetrate through the metal framing a minimum of 1/4".
(3) The values shown are for structural panels on one side of the wall. The addition of 1/2"gypsum wallboard fastened with #6 screws on the second side increases the suggested design shear by 50 plf for studs 24" o.c. and screws 12" o.c. or by 100 plf for studs 16" o.c. and screws 7" o.c.
(4) Pins can be overdriven a maximum of 1/8".
(5) The suggested edge distance is 3/8". Up to 50% of the fasteners may have a minimum edge distance of 5/16"and an occasional fastener may have an edge distance of 1/4".
(6) Space fasteners a maximum of 6" o.c. along intermediate framing members. For other stud spacings and panel thicknesses, space fasteners 12" o.c.

Steel Framing Yellow Pages Now Available

The most comprehensive directory of product and service providers to the residential steel framing industry is now available through USS-POSCO Industries, the largest steel maker in the Western U.S.

"The rising tide of interest in steel framing left us swamped with calls from builders and engineers who have needed help with finding a manufacturer who could provide product information and technical data," says Ken Vought, USS-POSCO Marketing Manager. "Now there's a resource that people can turn to".

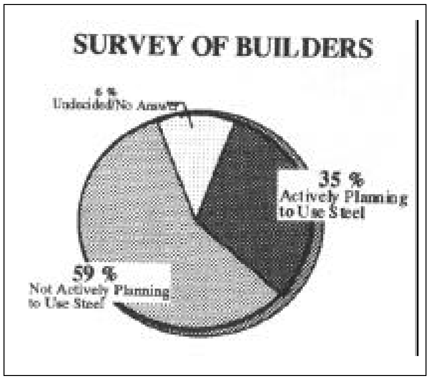
The directory contains more that 300 entries in 17 categories, ranging from stud and tool manufacturers to energy consultants. The free directory is updated each quarter and can be obtained by calling Mr. Vought at (510) 439-6241. ❐

Survey Says: Builders are Stuck on Steel

A survey of builders attending the Pacific Coast Builders Conference showed that 35 percent are actively considering the use of steel in a future residential development and that 20.5 percent have already incorporated steel into their home construction projects. The poll was taken in the weeks immediately prior to the June opening of the nation's second largest building trade show and included 50 builders from across the United States.

"Home builders are serious about finding an alternative to wood framing, and the survey confirms the widely-held belief that the market is making a significant move toward steel," says Allan Swartz, LGSEA president.

The emergence of steel framing was sparked several years ago by highly volatile lumber prices and a perceived decline in the quality of wood. In fact, 35 percent of builders participating in the survey indicated their move to steel was motivated by lumber prices while



31 percent cited lumber quality. Steel is currently being used in the construction of two percent of new homes and the American Iron & Steel Institute estimates that steel will capture 25 percent of the housing market by the year 2,000.

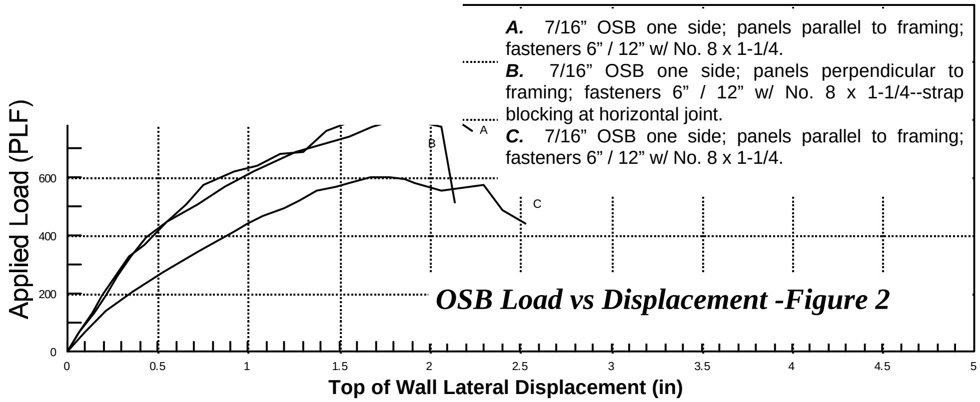
Steel also rates very high in repeat usage, with 78 percent stating they plan to use steel again in a future project. These builders stated they found steel's greatest advantages to be "ease of use" (37 percent), "environmental benefits" (21 percent), and "better finish" (7 percent). Swartz believes that these figures are important because they reflect actual experience of those who have gone through the learning curve and found steel to be a viable alternative to wood.

Although the vast majority of builders who have tried steel will be repeat users, the survey pointed out two areas that need continuing development. Builders who have worked with steel felt a larger base of skilled workers, contractors or engineers is still needed (49 percent) and that cost for tools, fasteners, subcontractors needed to be more competitive (39 percent).

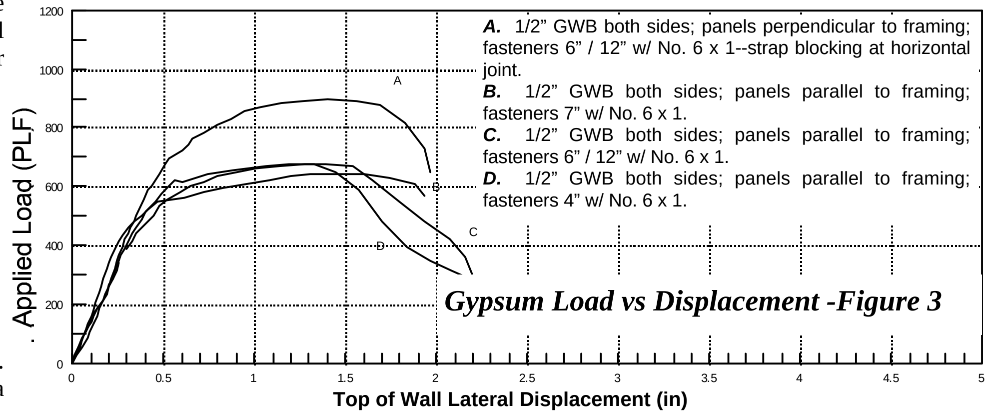
According to the survey, improving access to information about how to build with steel will be an important factor to the widespread growth in the use of residential steel framing. Thirty eight (38) percent of builders who have not yet used steel stated that the primary barrier to making the switch is a lack of information about how to get started. ❒

*(**Shearwalls**-Continued from page 1)*
(Figure 4).

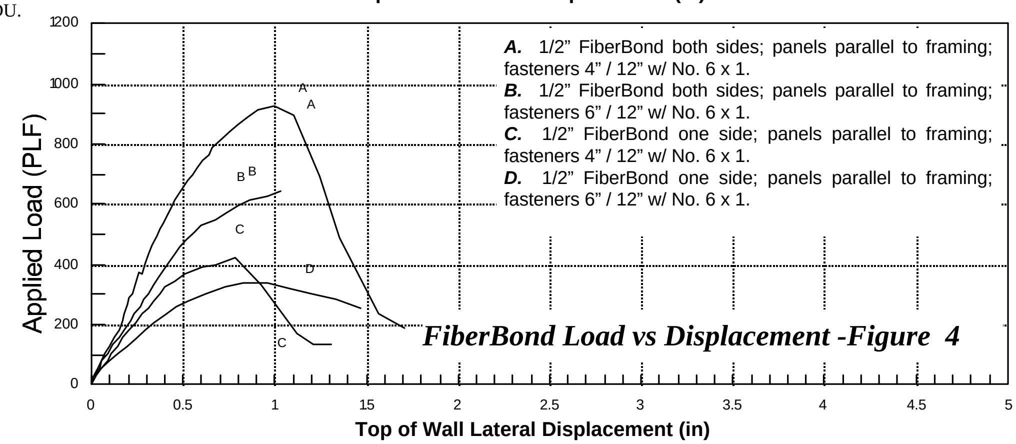
Using the curves shown in the figures, the engineer can determine an appropriate level of design, corresponding to specific performance requirements. Ideally, performance levels should be established by considering stiffness, elastic versus inelastic behavior, hysteretic behavior of the wall (not possible in the static test), yielding, strength, and mode of failure. In the static test, the mechanism of failure of the light framed shear wall typically involves a rotation of the fastener at the stud flange and deformation of the panel at the fastener (as a result of fastener rotation). After the maximum load is attained, the stiffness of the wall becomes negative as one of the following mechanisms begins to govern behavior: fastener breaks off the edge of the panel; the panel pulls over the fastener; the fastener pulls out of the stud (where nails are used); or the fastener fractures in combined tension and shear. For further discussion of these test results, please contact Prof. Reynaud Serrette at (408) 554-6868 or via E-mail @ RSERRETTE@SMAILER.SCU.EDU. ❐



OSB Load vs Displacement -Figure 2



Gypsum Load vs Displacement -Figure 3



FiberBond Load vs Displacement -Figure 4

Performance of Static and Cyclically Loaded Light Gauge Framed Shear Walls

(Continued from page 3)
lateral deflection response for the cyclically test wall.

The static curve is familiar to the engineer. Based on the static test results, an allowable design strength can be determined as the lower of the maximum strength divided by a safety factor and the strength at some specified allowable deflection. The cyclic curve shows a more complex response. To simplify the observed cyclic response, some designers construct a load-displacement curve representing the strength envelope of the behavior for the different loading cycles. Utilization of only the envelope curve in design can be misleading for systems with degrading stiffness (except probably in very low load ranges). The cyclic load response shows two important and related features that must be considered in seismic design (particularly in areas of high seismicity): significant stiffness degradation with increasing displacement and a reduction in hysteretic energy dissipation capacity (loads deformation loops are "flattened" or "pinched"). The question now arises, given these two sets of data (cyclic and static), how should design criteria be set? These questions are currently under review and further discussion can be expected in future issues of the LGSEA Newsletter.❐

METALCON to Feature Diverse and In-Depth Educational Programs

By Claire Kilcoyne, METALCON Conference Manager

Metalcon International '95, the metal industry's only annual conference and exhibition, this year features a fast-paced conference program to complement the largest and most comprehensive range of product exhibits assembled to date.

Now in its fifth year, Metalcon International takes place October 24-26, 1995 at the Washington D.C. Convention Center. This year, we expect to draw over 7,000 architects, engineers, contractors, building owners and developers from around the world. The convention floor will feature more than 400 exhibitors and live demonstrations.

The in-depth technical seminars cover a range of topics from the basics of product selection and installation techniques, management, government regulations and future markets and trends. The interactive format lets attendees benefit from the experience of industry experts who have been asked to lead the sessions, and are designed so that the content is useful to both seasoned professionals and apprentices.

The particular interests of architects and engineers are explored in special symposiums. The first, "The A/E Design Symposium," provides an interactive analysis of the design-build process. The second, "The A/E Liability Symposium - Metal Shop Drawings, Who's Responsible?" covers one of the most critical and debated topics in the industry. Dale Ellickson, Counsel to the Contract Documents Program of the American Institute of Architects, leads this presentation of various viewpoints using real-life scenarios.

A substantial base of technical information is also presented in such sessions as "The Design and Analysis of Architectural Metal Roof Systems" and "Low Slope Metal Roof Construction Detailing." LGSEA board member Neal Peterson, President of DEVCO Engineering, is also slated to present a seminar entitled, "Steel Framing from an Engineer's Perspective."

More information about Metalcon can be obtained by writing to Practice Management Associates, Ten Midland Ave., Newton, MA 02158, or calling (617) 965-0055.❒