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Residential Prescriptive Code is Submitted to CABO

by Jay H. Crandell, P.E. - NAHB Research Center

A building code change was recently submitted to the Council of American Building Officials (CABO) One and Two-Family Dwelling Code as a result of a collaborative effort between the U.S. Department of Housing and Urban Development (HUD), the American Iron and Steel Institute (AISI), and National Association of Home Builders (NAHB). The proposed code change, if approved by CABO in 1996, will be a major step in establishing the use of cold-formed steel in the context of "conventional" residential construction practices. These practices are defined in CABO by simple prescriptive requirements that address the most common situations encountered in typical home construction using

materials such as wood, concrete, and masonry. Outside of these materials and certain applicability limits, the CABO code requires the home to be designed by a professional engineer or architect.

The code change is intended to provide an alternative construction method that is at least equivalent to the other recognized methods in the CABO code. To assist in decisions related to product standardization, specifications, and details, an engineering steering committee of industry experts was formed.

Development of this submittal required the committee to balance the interest of

(Continued on page 2)

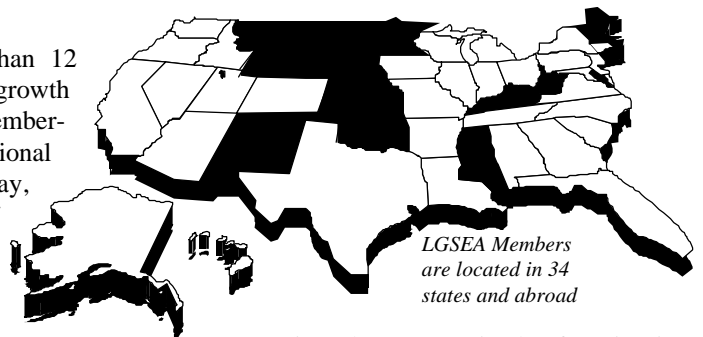
Upcoming Events 1996

LGSEA Meetings Oakland, CA Info: (615) 386-7139	Apr 15
LGSEA Meetings San Francisco, CA Info: (615) 386-7139	Jun 26
Pacific Coast Builders Conference San Francisco, CA Info: (916) 325-9300	Jun 27-29
LGSEA Meetings Oakland, CA Info: (615) 386-7139	Aug 15
METALCON '96 Chicago, IL Info: (617) 965-0055	Oct 1-3
Building & Industry Show Anaheim, CA Info: (909) 396-9993	Nov 7-8

LGSEA Membership Spans the Continent, And to Become More Local

In a little more than 12 months, the rapid growth of the LGSEA's membership has made it a national organization. Today, the 225 members of the association can be found in 34 states from Florida to Fairbanks, Hartford to Honolulu. Canada, Japan, and Europe are also represented in the ranks of the organization.

Like in most industries, the technical knowledge that is developed in one location can frequently be applied to similar design and application problems in another market. As it grows the LGSEA is playing an important part in this transfer of knowledge. In addition to helping improve access to this infor-



LGSEA Members
are located in 34
states and abroad

mation, the LGSEA is also focusing its effort to drive this knowledge down to the grassroots level. For that reason, the LGSEA is initiating the development of regional chapters in markets where a substantial group of members is located, or in markets where steel has made inroads and there is a need for increasing the number of qualified engineers.

Watch future Newsletters and mailings for more information. □



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(CABO Code - Continued from page 1)

simplicity and flexibility. Many code changes never gain acceptance because they are too long or complicated. While this meant the loss of more detailed breakdowns of design options and conditions, care was also taken to prevent unnecessary cost impacts.

The CABO code proposal addresses a number of issues including Steel Material and Protective Coating specifications, Dimensional Limitations for C-Shapes, Wall Stud Tables, Wall Bracing, and other major subjects. The code change also includes details to illustrate a basic assembly of the major cold-formed steel framing components. The CABO

submittal also was limited to lower wind an seismic design conditions so that it would parallel the CABO limits for "conventional" construction.

If the initial code change is accepted by CABO, the NAHB Research Center plans to submit additional requirements and enhancements during the 1997 code change cycle. A number of other research projects scheduled for the coming year is expected to improve the engineering assumptions and data.

For information about the code change or the activities of the NAHB Research Center, contact Jay Crandell at (301) 249-4000, ext. 540. □

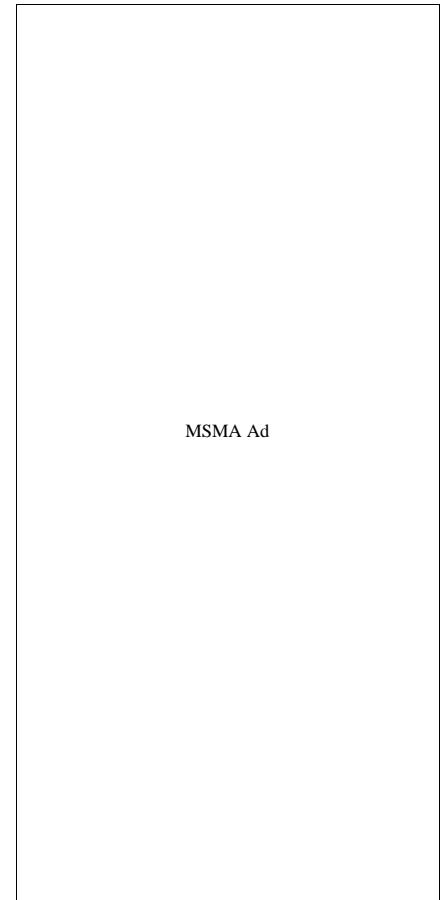
LGSEA Reviews CABO Code Submittal

Some members of the LGSEA recently received a copy of the AISI/NAHB proposed Code Change for a residential prescriptive standard for the one and two family dwelling units. This submittal has been made to CABO for consideration of a Code change to accept a prescriptive standard for light gauge construction. LGSEA recommends that this important document be reviewed by all LGSEA members and that any comments or concerns be forwarded to LGSEA. During the Code change hearings, the LGSEA will be monitoring this document for technical completeness and will be offering input during the Code adoption process.

to Dennis McCreary Senior Staff Engineer ICBO (310) 692-3425. □

LGSEA intends to work closely with AISI and NAHB to review the document during the Code change process.

As summarized by one LGSEA Board Member, "there are many valid reasons for pursuing a simplified version of a light gauge steel design code. Efforts towards that end should continue. However, as with all codes, I think this Code submittal in its current form may have areas that need to be improved upon in the review process". LGSEA members may receive a copy of the code submittal by faxing your request (include your mailing address)



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Design of Shear Walls for Wind & Seismically Induced Loads

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

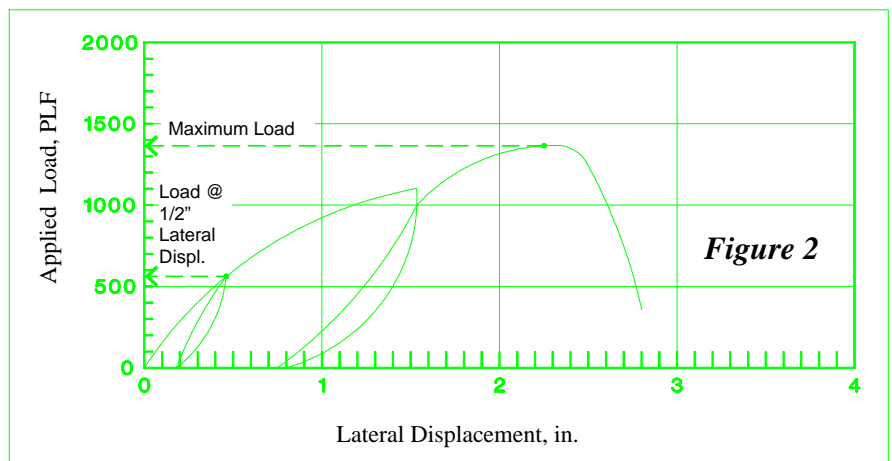
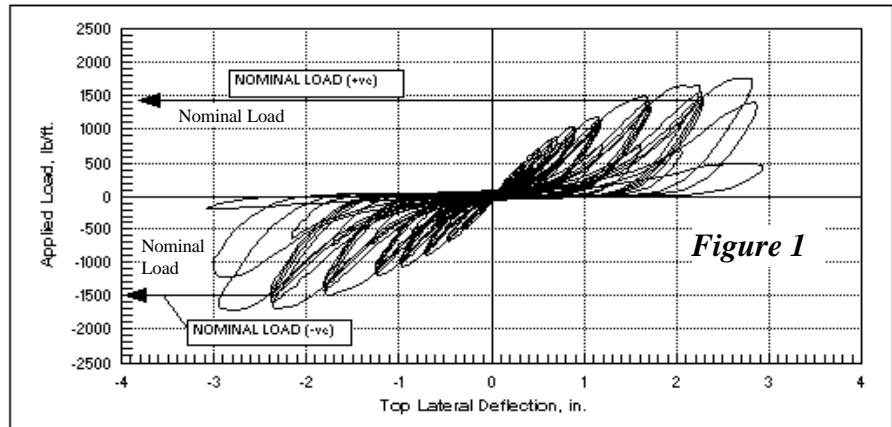
This article provides an update on the status of the AISI shear wall test program. The first phase of the AISI shear wall program has been completed and the test data are currently under review by a joint AISI/LGSEA technical committee. The test results were reviewed by an Ad Hoc Committee of the Structural Engineers Association of Northern California (committee chaired by Ed Zacher), and by SEAOC Seismology.

The tests conducted under the AISI program included both static and cyclic displacement controlled loading. Wall assemblies evaluated in the static test program included 4 ft. x 8 ft. and 8 ft. x 8 ft. walls with panels parallel and perpendicular to framing. The walls were sheathed with either 15/32-in. APA rated plywood sheathing on one side, 7/16-in. APA rated OSB sheathing on one side, 1/2-in. gypsum wallboard (ASTM C 36) both sides, or 7/16-in. APA rated OSB sheathing on one side and 1/2-in. gypsum wallboard (ASTM C 36) on the other side.

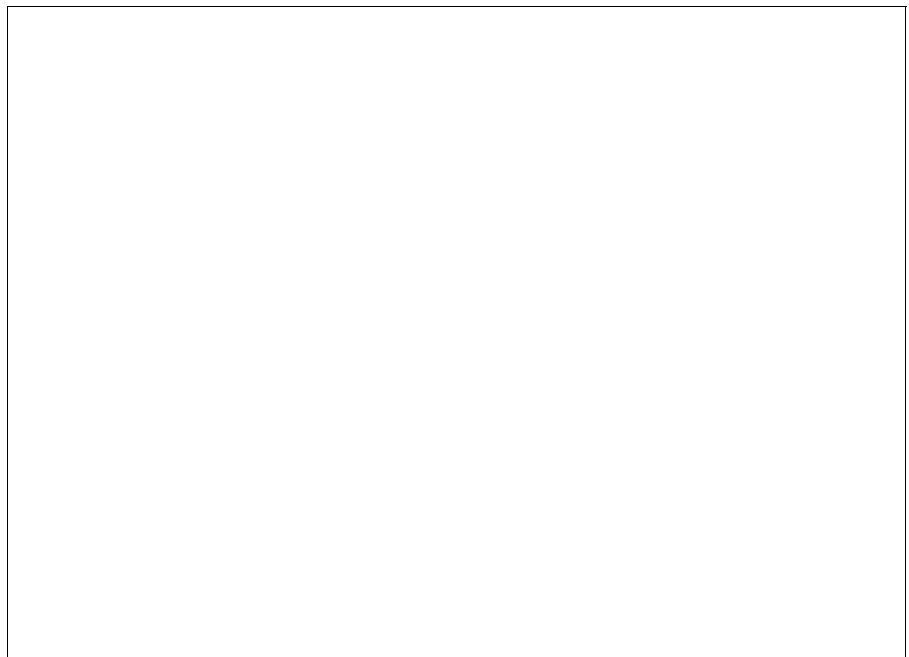
In the static tests, the walls were displaced (top of wall displacement) at a rate of approximately 0.3 in. per minute. The cyclic shear tests were conducted using a sequential phase displacement protocol shown in Figure 1. The wall assemblies in the cyclic test program were all 4 ft. x 8 ft. with panels parallel to framing. The walls were sheathed on one side with either 15/32-in. APA rated plywood sheathing or 7/16-in. APA rated OSB sheathing .

Based on the test data, the AISI code change was drafted to include two sets of design tables. One set provides recommended nominal wind load capacities based on the static test data and the other gives nominal seismic load capacities based on the cyclic test data.

Figures 1 and 2 indicate typical load versus measured displacement relationships for the cyclic and static



tests. Additional information can be obtained from the American Iron and Steel Institute. □



Deflection Clips: A Commercial Application

by Dean Peyton, P.E. - Anderson-Peyton Structural Engineers

Construction of commercial non-load bearing curtainwalls is typically placed on the drywall subcontractor as a bidder design package. This means the subcontractor must retain a professional engineer to design and detail the building's curtainwall system as an afterthought to the original set of design documents. Typically the Architect and Engineer of Record will specify varying degrees of performance criteria to ensure the longevity of the exterior finish against potential degradation such as cracking.

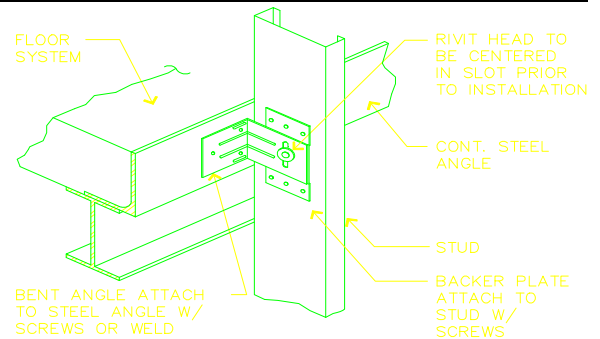
The performance criteria specified will depend on the main structural system used for the superstructure (i.e. concrete vs. steel frame etc.), the type of cladding finish (i.e. EIFS vs. brick veneer, etc.), and the Architect's personal experience. For example a stiffness requirement for out-of-plane bending for a EIFS finish system may require an L/240 or an L/360 specification. Typical performance criteria are:

- **Out-of-Plane Wall Deflection Limitations**
- **Horizontal Story Drift Limitations** (Items to be addressed in future articles)
- **Vertical Floor Deflection Limitations:** The Engineer of Record will typically direct the Architect by specifying the maximum allowable deflections of the floor system. If the structural floor is a steel framing system rather than a concrete frame system, then the steel may be more deflection sensitive and thus the vertical deflection requirements may be larger, say 3/4" verses less than 1/2" respectively.

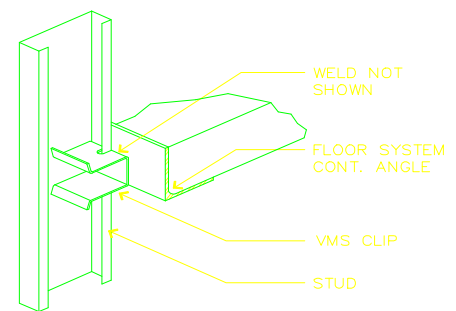
Engineers designing light gauge steel curtainwall systems often find

themselves designing a floor to wall connection that is difficult given the performance criteria specified. It has only been in the last ten years that this performance criteria has evolved and come to the forefront, and even more recently become a standard practice. To meet the vertical movements being specified, engineers were forced to design cumbersome clip angle attachments combining screws, special hat shaped washers, slotted holes, and other various arrangements to ensure the floor deflection movements would not impose vertical loads to the independent wall system. These connections have added excessive labor costs to the contractor.

The industry has been slow to answer the contractor's need. However, at least two products are available that have attracted the interest of contractors and engineers. Angeles Metal Systems makes a **VMS** clip which must be welded to a continuous angle as shown in the detail. Super Stud's **DC** clip also attaches to a continuous angle but has the option of being screwed or welded. An additional feature of the **DC** clip is that it allows for horizontal tolerance during placement between the face of the support angle and the aligned wall stud. The **VMS** clip requires the installation of a continuous support angle which must be accurately located to provide for a plumb and aligned wall. To reduce labor costs, the **DC** clip may be installed in prior to stud placement. The **DC** clip will also provide the stud resistance to rotation during construction. Given the **DC** clips prefabricated two piece construction this allows for its direct attachment to



SUPER STUD DC CLIP



ANGELES VMS CLIP

the web of the stud thus helping to eliminate flange "roll" resulting from the transfer of lateral loads. The **DC** clip is reversible meaning it is not dependent on which direction the stud is turned.

An advantage of the **VMS** clip is that it can handle unlimited vertical movement requirements. The **VMS** clip is 1/3 to 1/2 the cost of the **DC** clip therefore the contractor needs to weigh the initial material cost savings for the **VMS** clip against the labor savings for the **DC** clip.

Both clips have certified tests with published design load ratings that easily meet typical load requirements for this type of connections. If you have questions concerning either clip contact *Hugh Harold* @ (718) 545-5700 for the Super Stud **DC** clip and for the Angeles **VMS** clip call *John McNulty* @ (213) 268-1777. □

Pinky Header Presented @ the LGSEA Membership Meeting

By Michael Roddy, Green Framing Systems

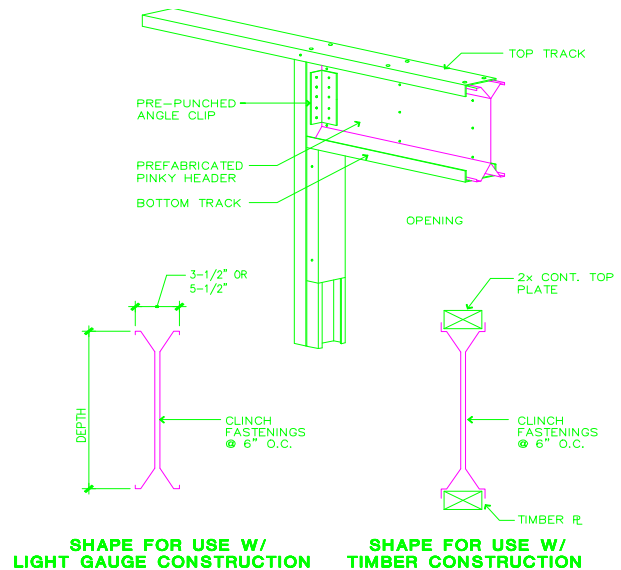
At an LGSEA group meeting the members were introduced to an alternative light gauge beam system, referred to as the Pinky Header. Engineers in attendance noted that the product is preassembled, eliminating cumbersome field screw connections. The header may fill the entire space between the top track and the opening, which means that cripple studs may be eliminated for typical openings. The header is developed for both light gauge construction as well as timber framed construction (see detail).

Another key to the product is the equilateral triangle appearing on the top and bottom to receive loads. Some of the benefits of this design are biaxial symmetry, lateral stability, and reduction of the web ratio. Testing has been performed by Dr. Serrette at Santa Clara University to confirm allowable

loads for 20 gauge headers for typical openings. Engineering calculations performed per AISI specifications and ICBO submittals are being prepared as well.

The initial market will be in residential construction for standard header openings (14.5"). The product is also available in different depths for other applications, such as garage door headers. Software is being developed for all web depths, and for different wall thicknesses.

Manufacturing will be under way this month. Labor savings resulting from



the design are expected to make the product more economical than existing headers. Technical questions and information requests may be directed to Michael Roddy, at (310) 983-8081. □

Steel Pins: Performance & Speed Increases Contractor Acceptance

By Les Butler, Aerosmith, Inc.

The development of the steel pin is offering an important alternative to builders. In addition to providing the necessary load capacities, they can be used in many of the same pneumatic tools that framers currently use for wood-to-wood attachments. As a result, fastening speeds for steel are on par with wood framing and the cost of transition to steel is lower since fewer new tools are needed.

Aerosmith first proved the viability of using pneumatically driven pins for connecting studs and attaching sheathing in 1991 when we contracted Western Technologies to run an extensive battery of tests. The fastener was a ballistic point, hardened steel pin with .100" shank diameter, a .250" head diameter and an overall length of 1-3/8". It was used to attach plywood light gauge studs in both shear and tension.

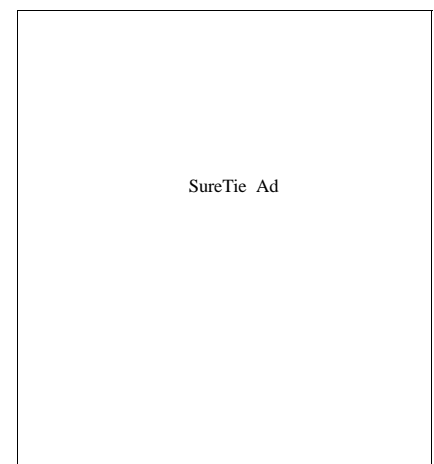
These tests confirmed earlier

experiments that showed steel drive pins have greater shear values than screws but typically have less withdrawal strength.

Five years have passed since the tests and nearly 400,000 sheets of wood have been attached to steel studs with a pneumatically driven pin and there have been no reported problems or failures.

This experience has also taught us that using pneumatic pins to fasten sheathing to steel is NOT the same as in wood frame construction. Wood framers typically lay out the sheathing, tack the corners down until the roof or deck is complete, and then fill in the balance of the fasteners. If there is a bow in the roof sheathing, the load of the roofing materials will force the sheathing down to the trusses or rafters, causing the fasteners to protrude. The contractor will then pound down the nails or recall the framer. In either case, the nails will retain their withdrawal values.

Steel pins, however, cannot be driven home from their initial set since nearly all withdrawal values will be lost. In addition, pins lack the ability to draw materials together as well as screws. For this reason, it is imperative that the material being fastened is in contact with the substrate when the fastening takes place. □



Habitat for Humanity Permits were Delayed

...But "Steel" was Built

Tim Waite, P.E. - NAHB Research Center

Three years after thousands of homes were devastated by Hurricane Andrew in South Florida, many residents still wait for permanent housing. The American Iron and Steel Institute (AISI) and the Homestead Habitat for Humanity teamed up to meet this need and tackle the most ambitious project ever undertaken by a Habitat affiliate: construction of 187 homes. Named Jordan Commons, each house is being framed with steel supplied by the AISI. Other contributors are supporting the project, including the National Association of Home Builders (NAHB) which is sending builders to the project to learn how to frame with steel.

While the concept may sound straightforward, it was quickly complicated by strict post-hurricane Andrew building codes, the lack of prescriptive standards, and steamy South Florida weather. Of these, perhaps the most difficult hurdle to overcome was the tough building requirements of Dade County, multiplied by the continuing fear of another destructive hurricane.

Metro Dade County maintains a Product Control department that regulates what products are approved for construction. Products that receive

this qualification must undergo rigorous tests at Dade County approved laboratories, which includes special impact testing where a 9-foot 2x4 is fired at a wall or window at 50 feet per second. The Building and Zoning Department issues building permits for those products that already have approval. As a result of this regulation, stick framing has been virtually eliminated in Dade County because the requirements have made that type of wood framing non-competitive.

Fortunately, the combined efforts and expertise of the project partners - and a few friendly ears at Dade County Product Control - allowed the project to go forward. Despite complaints from the Building and Zone Department, Dade County Product Control determined that steel framing was an alternative framing material and must be engineered. This requirement effectively exempted steel from the tough testing procedures that prescriptive building materials must undergo. Nevertheless, the design calculation required by Dade County Building and Zoning is almost as thick as commercial building calculations. In addition, approval of the framing for each house required engineering inspections. One test was required by Dade County: The impact test. Five

Posco Ad

2x4's were fired out of an approved cannon at an 8-foot steel framed test panel. Sheathed with 5/8 -inch plywood and coated with 1/2-inch stucco, the panel won Dade County's Product Approval.

Finally, 8 months after the initial meeting with Product Control, the first building permits for steel framed houses in Dade County were issued. □

Habitat Picture

Since ground was broken on the Jordan Commons Project, 7 groups of home builders from around the country have been trained in steel framing and 10 homes have been built.

Commercial Messages

For information about placing Commercial Messages in this Newsletter please contact Larry Williams at (615) 386-7139. 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 To Debut “TECH NOTES”

Development of a comprehensive series of technical papers on light gauge steel framing design and assembly has begun with the first issue set for release in May. To be called “Tech Notes”, the publications will be four-to-eight pages in length and will provide a close examination and discussion of design and assembly issues related to light gauge steel framing. The purpose of “Tech Notes” is to help facilitate the process of engineering and construction by:

- filling in gaps of information left by building codes and other source materials, and
- consolidating technical information on a specific subject into a single, easy to access document.

The first five subjects to be covered in the “Tech Notes” include “Truss Bracing”, “Fire Ratings and Codes”, “Sheathing Attachments”, “Screw Definitions/Specifications”, and “Shear Wall Design and Performance”. Ultimately, the “Tech Notes” series will encompass as many as 50 to 100 subjects with the pace of development determined by the LGSEA’s ability to fund new issues. Copies of “Tech Notes” will be distributed to LGSEA members at no charge, although there will be a fee for non-members. For more information, call (615) 386-7139

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