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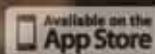
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**on the cover:** Photo courtesy of Plum Building Systems, Waukee, IA.

The mission of *Structural Building Components Magazine (SBC)* is to increase the knowledge of and to promote the common interests of those engaged in manufacturing and distributing structural building components. Further, *SBC* strives to ensure growth, continuity and increased professionalism in our industry, and to be the information conduit by staying abreast of leading-edge issues. *SBC's* editorial focus is geared toward the entire structural building component industry, which includes the membership of the Structural Building Components Association (SBCA). The opinions expressed in *SBC* are those of the authors and those quoted, and are not necessarily the opinions of Truss Publications or SBCA.

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# Supplier Members' Support



## connectors, hangers & fasteners

Our supplier members provide services and expertise that can help you improve your business and your bottom line. This year, **SBC Magazine** will profile several aspects of the component manufacturing industry and highlight the supplier companies that serve those business segments.

This month, we focus on our industry's connector, hanger & fastener suppliers. All the effort you put into designing and manufacturing high-quality structural components is compromised if installers don't use similar high-quality, reliable hardware to ensure proper load resistance. These connector, hanger & fastener suppliers have proven in the field that they produce the hardware you and your customers can consistently rely upon.

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## Running Ragged? Look to SBCA

SBCA has a lot to offer, so it's easy to forget all of the programs available to help CMs. Here are some of my personal favorites.

To be perfectly honest, I've been feeling worn out lately. Rebuilding business as the economy creeps back to a new normal has been a struggle. It can be exhausting, but the truth is a lot of other component manufacturers (CMs) probably find themselves in a similar spot. That got me thinking about what we all have in common—SBCA—our trade association. With too much to do in too little time, it's understandable to get buried, but SBCA is there to help lighten the load.

### Risk Management

- **Jobsite Packages:** For just a few dollars a job, you can protect your business and fulfill your duty to warn by providing customers with our industry-developed best practice information regarding handling and installing components. If you are not currently providing a Jobsite Package with every job, trust me, you need to implement this simple practice at your business. The reason? Should you have any problems on a jobsite, this will be the first-aid kit for solving those issues.
- **ORisk:** This online training course is a great way to inform your employees on critical risk management concepts tailored specifically to building component manufacturers. In a lot of ways, it's like preventative maintenance, and I definitely want my managers to be familiar with these concepts for their everyday activities.

### Operations

- **WorkForce Development (WFD):** Everyone's looking for people right now. SBCA's WFD website is a free member benefit that allows companies to post jobs and view resumés from potential candidates. I know that staff is working hard to find as many resumés as they can to populate the WFD site at [wfd.sbcindustry.com](http://wfd.sbcindustry.com).
- **In-Plant WTCA QC:** As I've said in the past, a reputation for quality is something your truss plant can't afford to be without. The In-Plant WTCA QC program can give you the systems and metrics to get there. Customers are interested in QC too. I recently met with an owner/developer whose eyes literally lit up when I mentioned that we use the industry standard QC program. He said it gave him "warm fuzzies," if you can believe it.
- **Financial Performance Survey (FPS):** This biennial survey covers income analysis, size breakdown, and key ratios. We use this in our internal business for benchmarking purposes and as a support system to ensure we do not have a cost category that is out of control. This year, SBCA has added additional questions and metrics to make managing your costs even easier as you review your bottom line.
- **Wage and Benefit Survey (Wage):** My business uses the Wage and Benefit Survey to help develop our pay and compensation. It includes information on wages, bonuses and promotion; vacation/personal/holiday pay; insurance; retirement plans; and time policies. When a current or potential hire asks about our compensation package, we pull out the survey to show them the breakdown by region and how we are continually evaluating our policies on salaries.
- **Business Solutions Groups (BSGs):** BSGs bring together non-competing business owners and managers to talk openly about their businesses. Peer to peer, they discuss topics such as best business management practices, financial performance, operational management, labor and employment issues, and asset management.

### at a glance

- Everyone's looking for good people right now, and SBCA's WFD website connects CMs with job candidates; CMs can help this effort by posting openings and viewing resumés.
- SBCA's online training programs show new hires how our industry can become a career, and gives them the skills to quickly integrate and be productive at the plant.
- BCMC and BCMC Build are the perfect ways to recharge and help us build an industry community where new ideas, strategies and friendships can converge.

Continued on page 6

## Personnel Training

- **Truss Manufacturing Orientation (TMO):** Rather than throw new hires to the wolves with no truss industry experience, this online training program introduces employees to the basics of component manufacturing, so they begin with an overview and can more quickly assimilate to the operational processes of a truss plant.
- **In-Plant Basic Training:** Putting employees through this training before they hit the shop floor is a win-win for new hires and our company. We've even seen a reduction in turnover within the first few days on the job. If someone sees the training and feels this job isn't for them, they usually leave right away. Those who remain are serious about giving the job a try.
- **Truss Technician Training (TTT):** This is a must-have course for truss technicians. It teaches them the principles of truss design and is one of the building blocks of the SCORE program.
- **Operation Safety:** All of our new hires, both full-time and temporary workers, watch the Operation Safety DVD as part of their initial training. The program also includes Forklift Certification and Combustible Dust Housekeeping Training as add-ons.

## Connect with the Industry

- **Chapters:** Chapters can be a powerhouse when it comes to educating building officials, architects and engineers; getting involved with a local HBA or state legislators; or addressing a local issue affecting CMs. It's also a great way to connect with other CMs and actively participate in shaping the industry's future at the grassroots level.
- **BCMC:** Year after year, I always walk away from BCMC with valuable insight. Here's my challenge to everyone reading this who does not plan to attend BCMC: please attend and call me and tell me why BCMC was not a worthwhile experience and how we can make it better. For those who already attend on a regular basis, please tell me what makes this year's show valuable and how we can improve it.
- **BCMC Build:** Talk about an event to recharge and remind you of how very fortunate we are and how great this industry is. Please call Jill Zimmerman of staff for more information on this very humbling BCMC charity build.
- **Open Quarterly Meetings:** Held throughout the year, OQMs are a great opportunity to see your association in action. Especially valuable is the CM Only Roundtable, where CMs work through some of the industry's most challenging issues, which can help you refine your business' strategic and tactical plans. It is also a place where long-standing industry friendships are formed because it is very much like a support group—everyone has a lot in common and, when we collectively work on industry issues such as lumber design values, camaraderie and depth of knowledge are very helpful.

If you're like me, some days you're running ragged, but the support system, friendships and community of SBCA help lighten the load. **SBC**

*SBC Magazine encourages the participation of its readers in developing content for future issues. Do you have an article idea for an upcoming issue or a topic that you would like to see covered? Email your thoughts and ideas to [editor@sbcmag.info](mailto:editor@sbcmag.info).*



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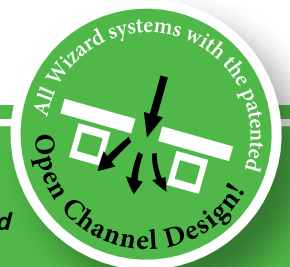


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## Advanced Framing

Optimization and innovation  
go hand in hand  
with advanced framing.

Not that long ago, the term “advanced framing” meant merely using roof trusses, floor trusses and wall panels. Today, with the push for energy efficiency and green building, builders and homeowners are looking for affordable answers to some complex framing questions. Creative and innovative framing ideas are, and will continue to be, developed by companies searching for that competitive edge in the market. In this **Technical Q&A**, we take a look at some of the directions where advanced framing may lead the industry.

### Question

*Where is the structural building components industry heading in terms of advanced framing?*

### Answer

The structural building components industry continually looks for new and better ways to build components and provide a better quality product for framers in the field. One obstacle the industry has fought against ever since its infancy is the traditional-methods mindset, the idea that, “We have always done it that way....” Likewise, this type of mindset looks at new innovations and responds, “That looks different; it can’t possibly have the same level of performance and quality as the old way of doing things.”

When looking at innovation, it’s important to ask what constitutes quality inside the demands of innovation. Is it using more wood? More truss plates? More steel load path connectors? While everyone has their own answers to these questions, here are some basics on which most people can agree. Quality components should:

- Maximize product capacities and resistance through the use of products and connections that are easy to install. Connections should efficiently transfer loads, and it should be easy to understand how loads are transferred with respect to the interactions with other components.
- Use framing materials that are held to a high standard of reliability and that perform at or better than their listed design values.
- Optimize raw material, framing interactions and usage to gain maximum engineering efficiency—also known as engineering economics—providing the best economic solution for the structure.
- Reduce field labor or provide the framer with an “easy button.”

In many cases, innovation and optimization go hand in hand. Here are some areas of the component industry that marry these two concepts.

### Trusses

Since the development of truss design software, the industry has optimized design programs through testing and calculations to take as much material and labor out of each truss as possible. Layout and engineering software aim to ensure the proper truss-to-truss loading, load path, and, ultimately, the most optimal design. While software remains one of the main innovative activities in the truss industry, there are other areas of truss manufacturing that could also benefit from innovation.

For example, using composite lumber for truss chords is one popular option that may lead the next wave of advanced framing. The production of composite lumber includes far greater quality control than the production of conventional lumber, lon-

### at a glance

- Combining fiber reinforcement with finger jointed lumber could be a win for both the lumber and component industries.
- With in-line framing, CMs can remove studs and plate material, and spread the stud spacing out to 24", which, in some cases, allows for better insulation methods.
- The key to new product development is generating sales revenue immediately by establishing design values and engineering reports that give assurance of the product’s equivalent code-compliant performance.



## To market, to market...

**Turning a new idea or innovative framing method into a reality does not have to be as difficult as it used to be. Here are some basic steps that need to be addressed:**

1. Seriously evaluate the idea(s) in the context of market demand for the product. Conduct focus group discussions and create a test of the product or method with end-users.
2. Know the performance of the key competitors' products already in the marketplace. Test their products in the applications that you seek to penetrate. Define the new product's attributes and your end goal with this key knowledge.
3. Determine the required capacities through benchmarking. What are the code requirements? Are there code-adopted capacities? Are the code capacities accurate, and if the code overstates capacities, how can your new product compete?
4. Test the product or method with an approved agency (if required).<sup>1</sup> Prepare a professional engineering report and evaluate the test data to define design values and code compliance characteristics.
5. Take the new product to market and generate sales. There are several vehicles to get the product into the market immediately. The key to new product development is generating sales revenue immediately by establishing design values and assurance that the product is equivalent to the products already defined by the code.

ger available lengths exist, and, in many cases, composite lumber is produced from a smaller diameter log to produce the end product. Some plants already use finger joint floor truss chords to increase span capacities by removing the bottom chord plated splice.

Some plants also take advantage of 2x3 lumber, but for many, 2x3s are viewed as poor quality or cheap. In other industries, getting something to perform by using 25 percent less material is considered an innovation or advanced engineering. For example, the manufactured housing industry uses 2x3s, and each structure undergoes testing through cyclic and vibrating loads applied during the drive to the jobsite.

For years, 2x3s have not been considered for component manufacturing because 2x4s were readily available and 2x3s were not. Innovating with raw materials means putting the right sized material in the right place to do the job of an equivalent 2x4 truss. As an example, if the chord and web member combined stress indices (CSIs) for a 2x3 truss are less than 0.40, why not take advantage of the savings? There is a possibility for margin increases, while at the same time providing a more competitive price to the customer. Innovations like this could make trusses more cost competitive with stick framing based on price alone. Add to this simplicity of installation and labor savings, and trusses and wall panels are positioned as the best economic solution and, therefore, the future of framing.

Another item that may be a ways off but

could be a good fit for the SBC industry is fiber reinforced material. Fiber reinforced products have been used with wood for many years and increase the tension capacity in lumber drastically. While fiber reinforcement has not yet been used in trusses, as the industry looks at longer spans or shallower depths in trusses where the designs require higher tension members, this could be a key to optimizing truss performance economics. Combining fiber reinforcement with finger jointed lumber could be a win for both the lumber and component industries because it could provide for the use of a lower-grade material and yet provide a straighter end product with extremely high tension capacities. While there is a lot to overcome due to the cost of fiber reinforcement material and the manufacturing process, there is no denying the capabilities of carbon fiber, which are commonly used in both the aircraft and auto industries.

### Walls

One of the innovative ideas that has impacted wall panel manufacturing that hasn't fully taken off yet is in-line framing, another example of how a traditional stick-framing mentality is hard to overcome in the housing/framing industry. In-line framing simply lines up the trusses and rafters over the studs, placing the wall studs where they are the most effective. Where allowed by the building code and the Engineer of Record, in-line framing can be effective on two fronts: material efficiency and energy efficiency. Today's software has the ability to view and design components in 3-D, which makes in-line framing easier to imple-

ment. With in-line framing methods and stacking the trusses and joists, CMs can remove both studs and plate material, while maximizing the capacities of the stud. This can also allow CMs to spread the stud spacing out to 24", in some cases allowing for better insulation methods.

Headers, along with window and door bucks, also present opportunities for material usage and structural resistance optimization. As we push toward more energy efficient exterior sheathing, with a wide variety of structural resistance properties, wall components may need to resist loads that traditionally have been resisted by the exterior sheathing. Trussed window and door bucks may be the solution because they can easily be engineered to resist lateral loads, which allows for exterior sheathing solutions from a far more flexible range of alternative sheathing products.

One thing to note on wall panel technology—the industry currently designs panels using software that takes traditional methods and manages material, but the software does not analyze the loads or connection methods for the members. As we continue to move toward 3-D design and engineering, we will start to calculate the load path from all applied loads onto all structural resistance elements from any direction. This assuredly will help load path resistance optimization.

No matter what direction the industry takes with advanced framing, the better we understand raw material and structural element capacities, the better the industry will be poised for increased engineering sophistication and continual improvements. **SBC**

<sup>1</sup> 2012 IBC SECTION 202 DEFINITIONS. APPROVED AGENCY. An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.



# A Light in the Attic

by Sean D. Shields

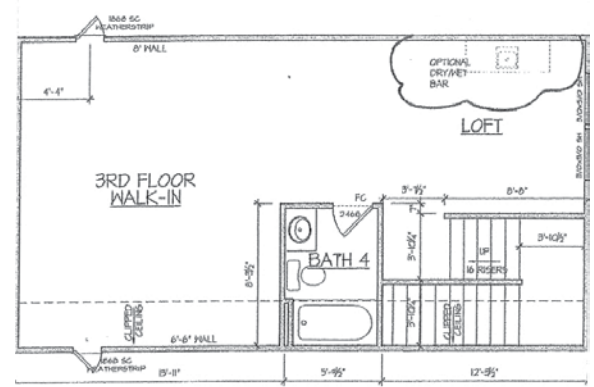
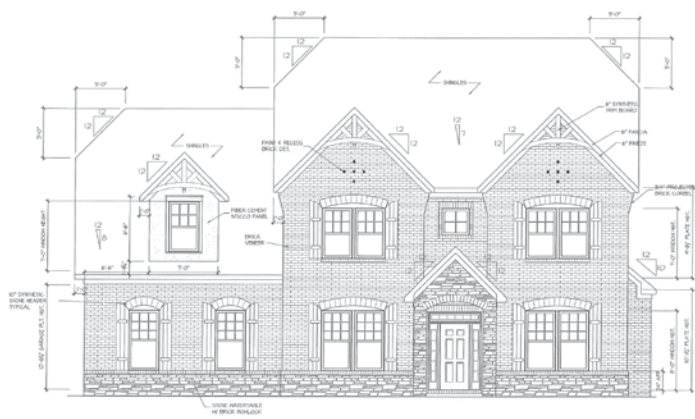
Old tires, scrap lumber, kids toys and holiday decorations—for most home owners, these are the types of things relegated to the attic or rafter area above the garage. However, a new idea on the horizon may spell the end to such underutilization of space. It's a trend that is putting a new face on a tried and true product: the attic truss. To understand why attic trusses are witnessing a new surge in sales, particularly on the East Coast, we need to look first at the impact of Southern Pine design value changes, then at how component manufacturers are able to address emerging builder needs through attic trusses. We'll then look at the prospects for this trend to continue.

## Southern Pine Design Value Changes

In January 2012, the American Lumber Standards Committee (ALSC) approved the first major devaluation of lumber design values in over two decades. The devaluation was limited to visually graded 2x4 #2 Southern Pine (SP) and lower grades. While ALSC also instituted a precedent-setting, six-month implementation period, the impact was dramatic for the roof truss industry. "While we had plenty of advance notice to let our customers know about the change and to prepare for it, there was still a lot of fear of the unknown," said Terry Gonya at 84 Lumber in Charlotte, NC.

"Nearly every house produced in the region had 2x4 #2 and #3 involved in its design and production," added Gonya. The market was left wondering how the decline in design values would materially affect the market. Because the devaluation only applied to visually graded lumber, many wondered if there would be a shift toward machine stress rated or machine evaluated lumber (MSR/MEL). Others, including many lumber producers in the region, were convinced there would be a shift and purchased MSR machines to address that expected shift in demand. However, a dramatic shift to MSR has yet to occur.

**Below:** Instead of being used just over garages for storage, they are now being used in third floor "walk-up" designs.



The second piece to the puzzle occurred in January 2013, when the ALSC adopted a second round of SP design value changes that actually slightly improved the strength values of #2 2x4s, but lowered the design values of all other grades and sizes of SP, including 2x6, 2x8 and 2x10 boards. "We were better prepared for the changes in design values this time around, and the price impact was tempered by a declining SP market," said Gonya.

The SP devaluation in 2012 impacted longer span trusses and scissor trusses. "We found out that, in some cases, it was less expensive to change a top or bottom chord to 2x6 instead of a higher grade of 2x4," said Gonya.

Bob Dayhoff of Shelter Systems in Westminster, MD, agreed, adding, "The SP changes this year had an impact on long span floor trusses, typically increasing the amount of board feet needed to design the project due to the lumber value reductions in the higher SP grades."

Roof girders and attic trusses were not immune to the changes either. "With girder trusses, you can add a ply or change a bottom chord from a 2x6 to a 2x8," said Gonya. "The 2013 design value changes potentially impacted traditional attic trusses the most because the top and bottom chord of the attic trusses were generally 2x6 and greater already," said Gonya. "With this year's changes,

instead of increasing the dimensional size of the chords, you had to decrease span."

The alternative? Make the bottom chords out of parallel chord trusses (see below). That subtle change opens up a whole set of possibilities.

### Selling Attic Trusses

The uses and designs of attic trusses have changed over the past few years. "It used to be the attic truss was used primarily for a bonus room over the garage or for a stand-alone garage with room above," said Gonya. These attic trusses generally had a 2x8 or 2x10 bottom chord with a 2x6 or 2x8 top chord. This meant that the size of the room created within the attic truss was restricted by the span value of the bottom chord. "Typically, you were looking at a maximum room span of around 16 feet," he said. A span that grew even smaller with the SP devaluation this year.

The new style attic trusses are being built with a web pattern in the floor system in place of the 2x10 bottom chord. Gonya observed, "This change enables us to increase the room size to over 20 feet, depending on the overall span of the trusses." Travis Ness of R&R Components in York, PA, agreed, "Attics make a lot of sense for spans over 16 feet. With bottom-chord webbing, the interior room span can be anywhere from 20-24 feet." As a result, attic trusses can be more versatile in meeting the needs of builders.

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Instead of being used just over garages for storage, they are now being used in third floor "walk-up" designs. In other words, an additional stairwell is added to the home layout, and the attic area is finished to be used as regular living space. "One of the only things that change with a walk-up attic is that the roof pitch

Continued on page 14



# Looking for an Alternative to decreasing spans?

Make the bottom chords out of parallel chord trusses. That subtle change opens up a whole set of possibilities.





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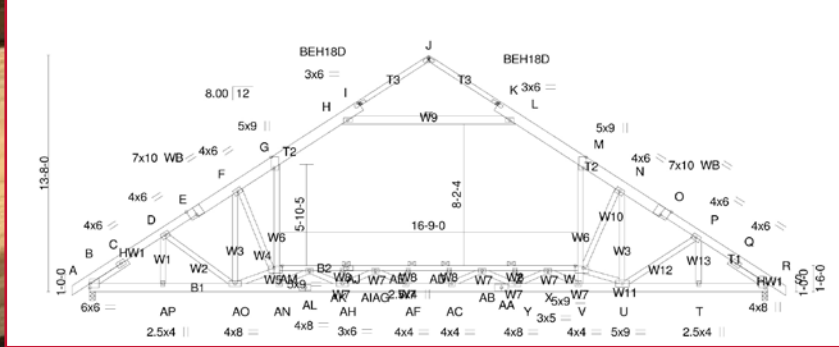
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Transporting attic trusses has also become a lot easier than in the past. Typically, with attic trusses, the push to maximize the interior room span meant greater roof slopes, resulting in roof trusses that could become wide load nightmares for drivers. “A few years ago, we started using hinge plates at the peaks,” explained Gonya. “You can run a 2x8 top chord up to the hinge plate, then add on roof caps in the field using the plates.”

## A Light in the Attic

Continued from page 11

typically will increase from a 6/12 pitch to an 8/12 pitch in order to accommodate higher interior walls,” said Ness. The added depth of the bottom chord of these new attic trusses also makes it easier to match the floors to I-joist or floor trusses used in multi-story homes when adding rooms above attached garages that much easier to do. In other words, the added depth insures both the ceiling on the first floor and the floor on the second match seamlessly, without the need for building up either in the field. It also creates greater depth for insulation.

The overall trend in housing during the downturn was a return to small floor plans. However, the attic truss presents an opportunity to add more livable square footage back into the house without increasing the overall dimensions of the home. “With the decrease in total square footage, builders and owners want to maximize the space they have,” said Ness. “It’s cheaper to add it in the attic.”

“Typically, when a builder introduces a new model, we have the opportunity to sell them on using attic trusses instead of stick building it,” said Gonya. “It gives us a chance to provide some value engineering and give them something they want.”

The energy code is also driving the push for greater energy efficiency, not only during the construction of the home, but over its operational life. Even if homebuilders aren’t looking to add living space, attic trusses are a great way to address this trend. “Attic trusses allow for easy installation of HVAC mechanicals and ductwork into conditioned space, which adds a lot to their efficiency,” said Dayhoff. “That can be particularly valuable for duplexes and townhomes, but are increasingly applicable to single-family units.”

“Particularly in Maryland, a big trend is to place the HVAC mechanicals in the attic,” said Ness. “These attic trusses are not necessarily for living space, but make moving around and

working on the equipment easier after the house is finished.” This solved a big issue for builders, who found that building officials were not approving how the HVAC equipment was installed prior to using attic trusses.

“An additional factor that helps us promote attic trusses to builders is that they will need less interior bearing walls than if they were stick-built,” said Gonya. “Which will save them time and money.” Ness explained further, “A lot of builders who come to us are looking to reduce internal bearing throughout the house. They are using engineering floor systems with long spans for the first floor and can’t place internal bearing locations on that floor.”

Ness added, “Builders increasingly want to be as lean as possible in the construction of a home. While it may cost more for the attic trusses, they can more than make up for it through savings in time and labor at the site by turning a house over from conventional framing and eliminating internal bearing walls.”

## Will It Continue?

“I think, in our part of the country, this trend will definitely continue,” said Gonya. “Most homes in our area are built on a slab foundation, so storage and extra space are always something that people need more of.” When you think about it, without a basement, the only place to get more storage is by going either up or out. With the ‘up’ already there for the taking, it seems an easy sell.

“Our customer base is rather mature when it comes to attic trusses. They’ve been using them heavily in many of their homes for years,” said Ness. “Out of the fifteen roof truss stackers we have running in our yard, at any given time, we may have four that have attic trusses on them.”

Both Gonya and Dayhoff agreed, the greatest obstacle will always be the added cost. “Attic trusses are more than just a common truss,” said Gonya. “However, to sell it, you have to point out that the cost-to-square-footage is really low.” Possibly as low as \$1,500 to add one to two extra rooms on to a house. Spread over a 30-year mortgage, that seems like a deal most homebuyers would jump at. **SBC**



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# You don't know what you don't know

I had an interesting conversation recently with an engineer that I have known for at least 15 years. At the June 7, 2013 ICC-ES hearings, there was a debate regarding the approach to the development of seismic design coefficients in the context of an ICC-ES Acceptance Criteria (AC) entitled “AC440—Proposed New Acceptance Criteria for Using an Equivalency Approach to Verify Seismic Design Parameters for Lateral-Force-Resisting Vertical Wood Truss Wall Assemblies.” AC440 had just been approved, which was a fantastic outcome for all metal plate connector manufacturers, truss software providers and structural building component manufacturers (in case you aren't familiar with the ICC-ES and AC process, see the sidebar on page 19).

During this subsequent conversation, a structural engineer from a prominent company that sells a competing product to trusses said to me forthrightly and directly, “Kirk, the problem with you is that you don't know what you don't know!”

One week later, on June 14, I received an email from another engineered wood engineer that I have also known since the mid-1980s who, in response to my **Exec's Message** in *SBC Magazine*, wrote:

I just read the **Exec's Message** by Kirk Grundahl in the June/July 2013 issue of *Structural Building Components*. I have to say that I am appalled that Kirk measures dramatic failures by the number of people that witness them rather than by the fact that people are killed. He appears to be content risking people's lives for the sake of innovation since very few people would witness a failure compared to those that witnessed the Space Shuttle Challenger disaster.

I've disagreed with much of what he has said lately in regards to fire membrane protection and said nothing, but I couldn't let this go without commenting. He's over the edge.

On the flip side, on June 24 I received an email from a building design engineer in California who has worked in the truss/building design industry for over 30 years. He wrote:

I found your recent [June/July issue] **Exec's Message**, “ingenuity blessing” to be profound and insightful. Unfortunately, I think you may be “preaching to the choir” because I doubt that your magazine is read by the SEAC board or their seismology committee. I think they all deserve a complimentary copy.

All three of these men are great engineers who I know well on a professional basis. Obviously, I struck a chord with each of them. In my view, all these perspectives are helpful, as it means that thoughts are being challenged so forthright debate and growth can take place. I must admit it feels as though I have been doing a lot of this lately, even when it is not my intent. It may stem from the fact I am a strong advocate of

change, innovation and making positive growth and evolution occur swiftly. I realize I do not have that much time left on this earth. That sense of mortality prompts me to believe if we are going to get change-oriented work accomplished, it needs to be happen tomorrow, not 10 years from now.

Indeed, these engineers provided profound and positive statements. I believe they should serve as a key theme for some future articles in **SBC**. A few examples will be: defining what we do not know, how over-the-edge raw material design values are, and how SBCRI public-domain-oriented testing and subsequent engineering analysis have significantly changed what we now know.

The dark edges of this knowledge need to be exposed to the light of day, because when the best economic solution is an IRC (prescriptive) solution versus an IBC (engineered) solution, there is something fundamentally wrong. Engineering analysis should always provide a more efficient solution or we have seriously devalued engineering. I believe a big thank you needs to go out to these engineers for fostering an article series aimed at illumination.

### Important Article Topics

One of the things we did not know previously is that some of the lumber we were using, and the way that lumber design values are derived, caused us to design structures with 30 percent more resistance than the lumber actually had. While this is true from the perspective of ASTM design values, in some cases, this strength reduction was very real in the field as well. The process of reducing Southern Pine (SP) lumber design values, which became well known to most in the construction industry in July of 2012, also became known to SBCRI just as we undertook a set of forensic tests. Through these tests, we evaluated an assembly's ability to resist deformations to prove the trusses were not any part of the problem for the buildings in question. That testing took place in late 2009 and early 2010. (See truss assembly tests photos 1-3 at right.)

What we didn't know at the time we started our testing of the pictured assemblies to failure was that it would lead us to discover a broken 2x4 SP #1 tension web member. The lumber failure was attributable to the board containing the pith center of a SP tree. (See photos 4 and 5 on page 18.)

The result of our testing of this stick of lumber was that its Modulus of Elasticity (MOE) value was approximately 400,000 psi, when it should have been

Continued on page 18

Photo 1. Testing took place in late 2009 and early 2010 to evaluate an assembly's ability to resist deformations.



Photo 2. What we didn't know at the time we started our testing of the pictured assemblies to failure was that it would lead us to discover a broken 2x4 SP #1 tension web member.

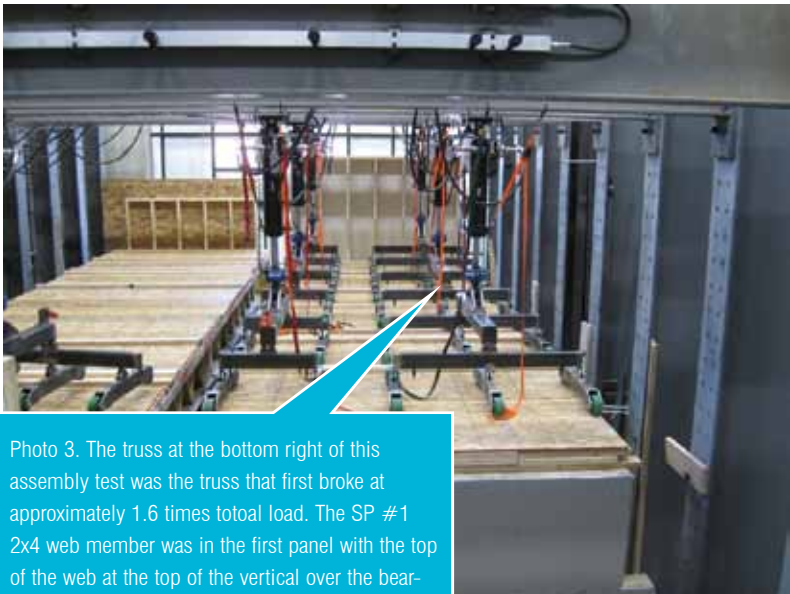
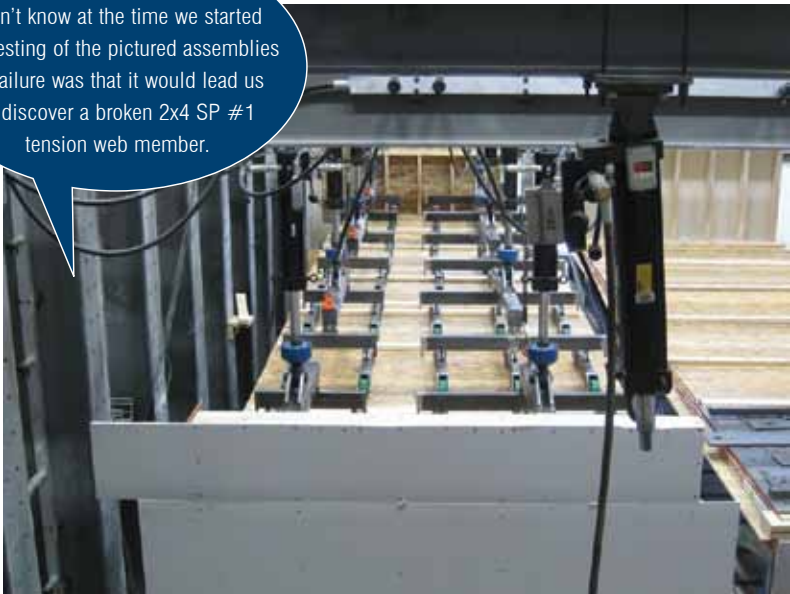


Photo 3. The truss at the bottom right of this assembly test was the truss that first broke at approximately 1.6 times total load. The SP #1 2x4 web member was in the first panel with the top of the web at the top of the vertical over the bearing point. Thus this web member had a very high tension force applied to it and thus broke in tension.





Photo 4 (left). SP #1 2x4 before assembly testing.

Photo 5 (right). SP #1 2x4 after assembly was tested to failure, showing the pith center of a SP tree. The result of our testing of this stick of lumber after the structure failure was that its Modulus of Elasticity (MOE) value was approximately 400,000 psi, when it should have been 1,800,000 psi.

## You Don't Know What You Don't Know

Continued from page 17

1,800,000 psi. Normally, this would have been viewed as a “one-off” occurrence. However, the truss-assembly-tested lumber failure performance similarly occurred over the next four tests (repair, test, repair, etc.) we made of this assembly.

Interestingly, the fifth assembly test had the assembly break at 2.2 times design total load with only four trusses in a five truss set still functional near the end of the test. The last outcome gave us assurance that a truss assembly can typically overcome lower lumber design values that may not be as advertised through the grade stamp on the stick of lumber.

This outcome led us to test 700 pieces of 2x4 SP #2, 250 pieces of 2x4 SP #1 and 200 pieces of 2400F-1.8E SP MSR. The result of the 700-piece SP #2 test set yielded the data contained in the SBCA SP#2 histogram. (See figure 1 below.)

For comparison, the Southern Pine Inspection Bureau (SPIB), the entity charged with monitoring and establishing design values for SP, also undertook testing of 2x4 SP #2 and published the

data found in the SPIB SP#2 histogram. (See figure 2 below.)

Shown side-by-side, these two histograms are remarkably alike, and resulted in a similar assessment of a 30 percent reduction in bending strength of 2x4 SP #2. This eventually led to a complete reassessment of the SP resource, and a refinement of all Southern Pine design values for all grades and sizes.

## What We Did Not Know Then That We Do Know Now

In my opinion, the fascinating aspect of the testing results, when one digs into the historical literature, is that our findings were actually likely given what was known about juvenile wood performance back in 1984 by the lumber industry. Documentation was submitted to the American Lumber Standards Committee (ALSC) and made publically available over the course of the lumber design value evaluation process occurring in 2011 and 2012. (Go to the online version of this article at [sbcmag.info](http://sbcmag.info) to view this documentation.)

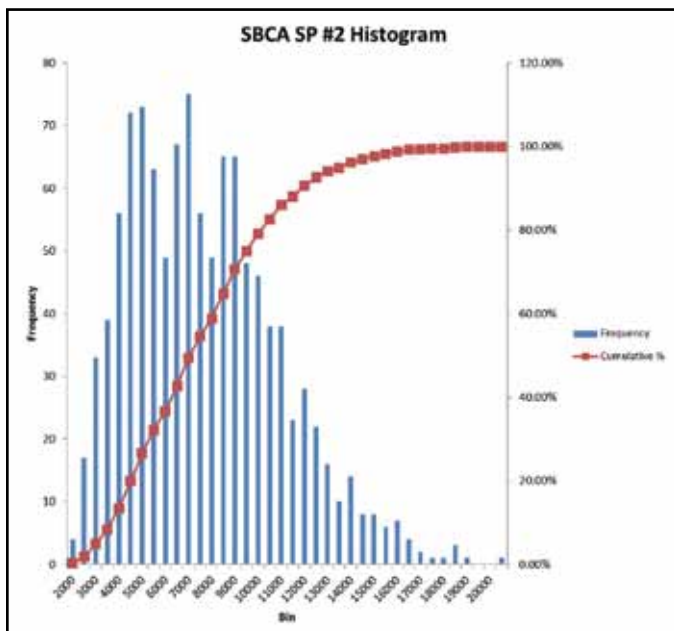


Figure 1.

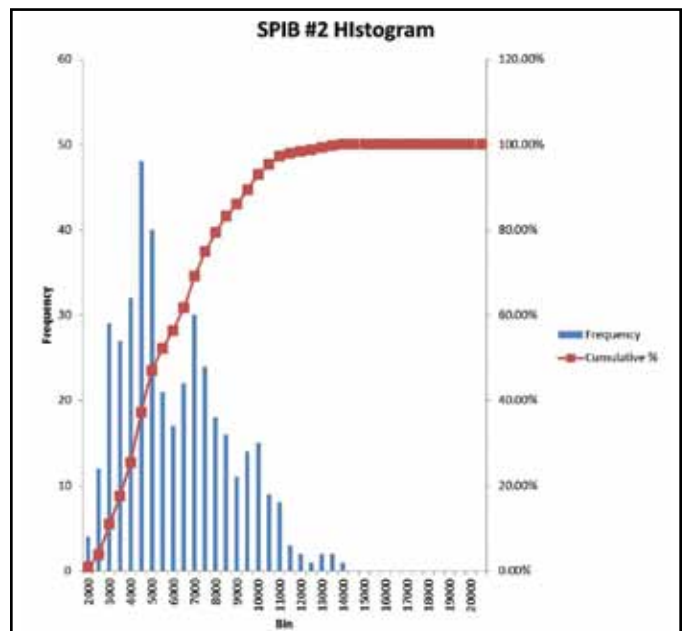


Figure 2.

# acceptance criteria:

ICC-ES states the following regarding its Acceptance Criteria (AC) process:

## ICC-ES Acceptance Criteria

Generally, it is necessary for ICC-ES to develop acceptance criteria for products and systems that are alternates to what is specified in the code, or that fall under code provisions that are not sufficiently clear for the issuance of an evaluation report. Acceptance criteria are developed by the ICC-ES technical staff in consultation with the report applicant and with input from interested parties; are usually the subject of open public hearings of the ICC-ES Evaluation Committee (made up entirely of code officials); and are approved by the Evaluation Committee after issues raised during the hearings are resolved.

After approval, acceptance criteria can be revised at subsequent committee meetings, provided the ICC-ES staff receives a request for revision and adequate substantiating data. The Evaluation Committee has also approved guidelines under which the ICC-ES staff may editorially revise and update some acceptance criteria.

What is typically not as well-known, is the following policy that ICC-ES has created surrounding the AC process:

### 4.0 ACCEPTANCE CRITERIA

**4.1** Acceptance criteria are established by the committee to provide a basis for issuing ICC-ES evaluation reports on products and systems under codes referenced in Section 2.0 of the Rules of Procedure for Evaluation Reports. They also clarify conditions of acceptance for products and systems specifically regulated by the codes.

Acceptance criteria may involve a product, material, method of construction, or service. Consideration of any acceptance criteria must be in conjunction with a current and valid application for an ICC-ES evaluation report, an existing ICC-ES evaluation report, or as otherwise determined by the Evaluation Committee.

This policy can be found in the ICC-ES April 2011 Rules of Procedure by the Evaluation Committee. The key point being that *consideration* of any acceptance criteria must be in conjunction with a current and valid application for an ICC-ES evaluation report, an existing ICC-ES evaluation report, or as otherwise determined by the Evaluation Committee.

Now clearly, SBCRI did not know this history heading into its testing process, but the test results were predicted by lumber industry experts more than 20 year earlier. This outcome clearly shows the value of SBCA's industry testing facility and the power of greater knowledge. When undertaking engineering and engineered design, accurate design values are important. To have anything else seriously devalues engineering, and as a result, all industries that rely upon accurate raw material design values to add value to their products in the marketplace.

## Final Thoughts

It is very difficult for component manufacturers to compete effectively when the best economic solution is an IRC-based prescriptive stick-framing solution. This is especially true when special-interest-based advocacy tries to assert that enforcement of the 30 percent reduction in SP lumber strength is up to a local building official, which may not happen until 2020 or later. This makes the componentized roof, wall and floor solution (which must be engineered using the SP design values effective June 1, 2013) much less competitive because the prescriptive solution has a 30 percent design value advantage if it isn't enforced uniformly). The market, and those who have been advocating this approach, are seriously devaluing engineering. It seems to me this is a sign of something fundamentally wrong.

These are a few of the things I think about when someone says to me, "Kirk, the problem with you is that you don't know what you don't know." More of what I don't know to come in the future as the list is truly unending. **SBC**



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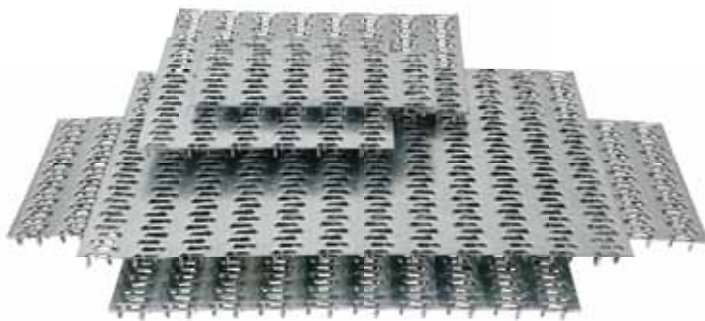
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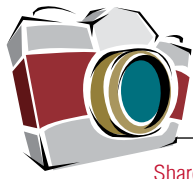
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It's a beautiful sight—trusses being braced properly, of course. That's what Bob Dayhoff of Shelter Systems Limited and Chair of SBCA's E&T Committee saw while celebrating his 32<sup>nd</sup> wedding anniversary with his wife in Hawaii. "It was a welcome sight to see prefabricated trusses being used in construction and being safely erected and correctly braced to boot!" said Dayhoff.

Shortly after spotting the trusses, Dayhoff came across Island Truss in Hanamaulu, Kauai, HI, the company that supplied the trusses for the project he just saw. Dayhoff decided to stop and visit with Dave Vickers, a fellow CM who appreciates proper bracing (Island Truss sends the B1 Summary Sheet with each jobsite delivery).

Island Truss opened its doors to show him around and introduce him to Hawaiian truss manufacturing. One unique island twist the company uses is a Polynesian/Tahitian/Asian combination fascia cut added to the end of the overhang for projects desiring that down-home Hawaiian flare. Dayhoff said he had a delightful stay on the Garden Island and found bracing wood trusses much easier to understand than the pronunciation of the state fish: humuhumunukunukuapuaa. **SBC**



## Meet This Year's BCMC Build Homeowner: SPC Nusbaum

Plans are in full swing for BCMC Build. This year, we have joined with the Building Systems Councils and Operation FINALLY HOME—an

organization that rebuilds lives and builds homes for wounded United States Veterans. We are pleased to announce that this year's home will be built for SPC Cody Nusbaum.

In 2010, Cody enlisted and soon found himself assigned to the "Roughnecks" at Fort Drum, NY, which were deployed to the Kandahar region of Afghanistan in March 2011. His company commander referred to Cody as "a soldier's soldier" who never complained, went beyond expectations, and had a working knowledge of all aspects of his platoon's operational function.

On August 24, 2011, Cody's unit was ambushed by Taliban fighters disguised as Afghan police officers. Cody was shot numerous times (the surgeon stopped counting at 11 gunshot wounds), causing exten-

sive damage to his legs, hips and lower torso. He was initially given 50/50 odds of surviving his injuries.

Since that day, Cody has undergone more than 65 surgeries to repair the extensive damage he sustained that day, as well as complications he experienced along the way. After a series of revolutionary procedures to repair his hip and leg, and months of physical therapy, Cody recently took his first steps—15 months after the attack. In October, Cody will take another important step when he walks across the threshold of his new home.

Contact Jill Zimmerman ([jjzimmerman@qualtim.com](mailto:jjzimmerman@qualtim.com)) for more information on how you can help build a mortgage-free home for this amazing veteran. **SBC**





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*Jess Lohse, Rocky Mountain Truss*



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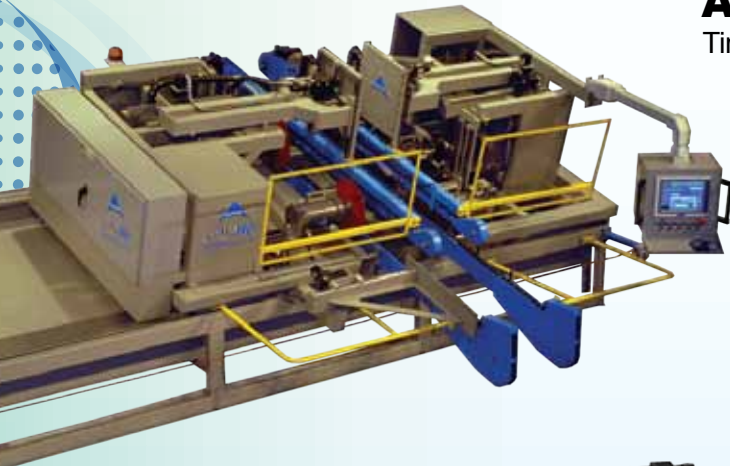
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