STRUCTURAL BUILDING COMPONENTS™

THE FUTURE OF FRAMING

March 2015

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TRUSSES WITH A twist

Inside this Issue: SBCRI Testing • Standard of Care • Material Handling

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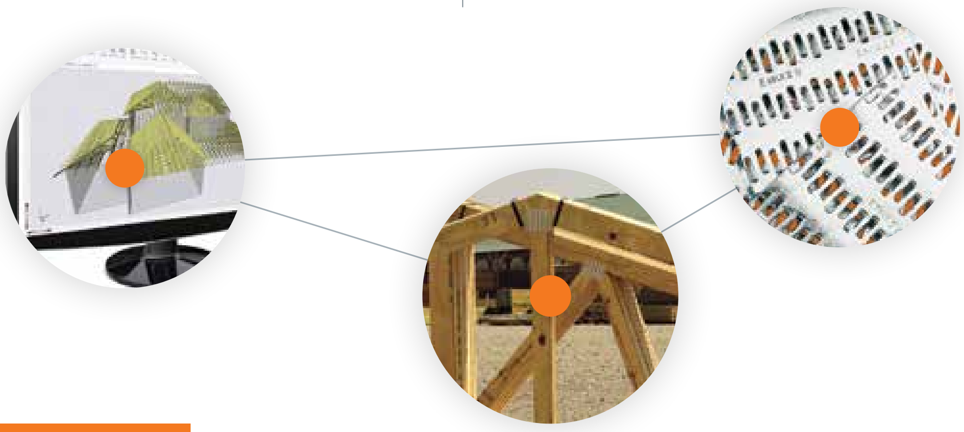

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editor's message

by Rick Parrino

Reevaluating Your Investment Strategy

Long-term investment should go beyond your balance sheet.

How are you are investing in the future of your business?

Primarily, you're probably thinking about your physical assets. What production equipment do you need to meet the growing demand for your product? Can your saws handle the throughput? Do you have enough assembly table space? Is your facility large enough to accommodate additional equipment, if it's needed?

You're probably also thinking about technology. Do you have enough computers and are they fast enough to efficiently run today's software? Is your network capable of handling all the data that needs to be stored and shared? Are you taking full advantage of technology throughout your production process to increase efficiency?

You're likely also concerned about your workforce. Where are you going to find more individuals who can be trained to become good designers and sales staff? If you have to expand, do you have enough production workers to make it possible? Can you run more shifts if you need to?

Okay, stop reading for a minute and think through the specifics of your approach to investing in the future.

Now, how many of your investment activities are focused on areas that aren't recorded on your P&L statement? For example, since you read my previous articles in November and December about the importance and value of relationships, how much time have you invested in reaching out and forging new connections in your market? How much time does your company spend on differentiating itself and marketing those differences to existing and potential customers?

Future growth depends on a growing market and an expanding market share. But how do you grow your market share? Once you grow it, how do you keep it from eroding?

Through SBCA, we've found that one of the most effective approaches is gathering and sharing good information. For example, in 1996, we built two houses side-by-side in the parking lot of the Astrodome in Houston, TX. Called Framing the American Dream® (FAD), this project aimed to quantify the time and financial benefits of componentized framing versus conventional framing. The results were dramatic: the conventional home took 67 percent longer to frame and consumed 26 percent more lumber. For the past 20 years, component manufacturers (CMs) across the country have used that data as a foundation to successfully convince builders to switch to components.

Today, labor is one of the most difficult challenges facing our builder customers. The recent downturn saw many experienced framers leave the industry and, from what I've read, most won't return. There is also increasing pressure to take structural material out of a building to save costs and make room for insulation and other approaches to increase the energy efficiency of a building. Those two forces create more opportunities for our products. Armed with accurate data, we can make increasing market share for components even easier.

That's why the SBCA Board has been talking about updating FAD over the past few years. A lot has changed in the components industry over the past two decades,

Continued on page 6

at a glance

- A lot has changed in the components industry over the past two decades, and a new Framing the American Dream (FAD) project would allow us to quantify just how much, as well as detail our product's benefits over other framing methods.
- Beyond FAD, SBCA is also focusing on helping component manufacturers across the country fight an unfair provision in the model building code, R501.3.
- As you think about investing in the future of your business, think about how much you're willing to invest this year in these two projects to ensure a bright future for our industry.

Editor's Message

Continued from page 5

and a new FAD project would allow us to quantify just how much. This year, SBCA will build two homes in Milwaukee, WI, the host city of the BCMC show. Both homes will have identical floorplans, but one will be entirely framed using components while the other home will be stick built following the prescriptive building code.

We will partner with Operation FINALLY HOME again to ensure these two mortgage-free homes go to deserving wounded veterans, to thank them for their great sacrifice to our nation and to give them and their families a step forward toward pursuing their dreams. When you think about investing in the future of your business, think about how investing in FAD can help you (and the entire industry) effectively grow market share. It will also have the additional benefit of helping secure a better future for some very deserving individuals.

Beyond FAD, SBCA is also focusing on helping CMs across the country fight an unfair provision in the model building code. R501.3 in the *2012* and *2015 International Residential Code (IRC)* mandates that unprotected floor assemblies above basements and storage areas must be sheathed with gypsum. We've covered this issue extensively in past issues of ***SBC*** (see Sept/Oct 2013 and November 2014), and it's clear the exception carved out in this code section by the American Wood Council (AWC) and the National Association of Home Builders (NAHB) for solid sawn 2x10 joists (and equivalent floor systems) puts our industry at a significant cost disadvantage and does considerable harm to the whole structural building component industry.

CMs in states that have adopted this code provision have witnessed their builder customers move away from floor trusses and I-joists toward solid sawn joists, sacrificing span lengths to save the higher costs of construction labor. This is a very real issue for our industry, and because it's in both the *2012* and *2015* versions of the *IRC*, it isn't going to go away any time soon. That's why SBCA is prepared to address this issue head on. SBCA will be talking directly to CMs about their needs with respect to floor system market changes over the coming months. If your company is witnessing changes to your floor product sales because of this code provision, please let me or SBCA staff know.

SBC ASSOCIATION
The Future of Framing

Proposed Revision to Voluntary Product Standard (PS) 20-10 "American Softwood Lumber Standard"

Original Language 2.6 Design values--Mechanical properties of wood as prepared for design use. Allowable properties of wood are identified with stress-grade descriptions and reflect the orthotropic structure of wood.

SBCA Recommended Change to 2.6 Design values--Mechanical properties of wood for use in load bearing resistance equations (e.g. ANSI/AWC NDS). Allowable properties of wood are identified with stress-grade descriptions and reflect the orthotropic structure of wood.

Final PS20 Language 2.6 Design Values--Published design data that are representative of the strength and stiffness of specific grades and species/species groups of lumber. The motion passed unanimously.

Original Language 2.8-Grade marked (grade stamped)--Lumber that displays the official grading mark of an agency that is made by rubber stamps, ink jet sprayers, tags and/or other methods .... Except for marks used in connection with Certificates of Inspection or Reinspection, all grade marks shall indicate the following: 1) the mill number, name, or abbreviation; 2) the agency symbol; 3) the species or combination of species of the lumber; 4) for lumber of less than nominal 5-inch thickness, whether the lumber was dry or green when dressed; and 5) the appropriate grade. Where required by the grading rules, grade marks shall also denote rule paragraphs under which the lumber was graded or other similar information.

SBCA Recommended Change to 2.8-Grade marked (grade stamped)--Lumber that displays the official grading mark of an agency that is made by rubber stamps, ink jet sprayers, tags and/or other methods .... Except for marks used in connection with Certificates of Inspection or Reinspection, all grade marks shall indicate the following: 1) the mill number, name, or abbreviation; 2) the agency symbol; 3) the species or combination of species of the lumber; 4) for lumber of less than nominal 5-inch thickness, whether the lumber was dry or green when dressed; ~~and~~ 5) the appropriate grade and 6) the visual or mechanical, as designated, design values that apply to that grade (at a minimum Fb, Ft and MOE). Where required by the grading rules, grade marks shall also denote rule paragraphs under which the lumber was graded or other similar information.

The original language remained the same in the proposed *PS 20-15*. Here is what the ALSC minutes say about the proposed change by SBCA to Section 2.8:

> Mr. Grundahl stated that placement of the additional information on the grade mark would provide clarity and be beneficial to users of lumber. The group discussed the request. It was noted that the request would not work for all grades assigned design values and the use of grade stamps with allowable properties for the different widths of dimension could present implementation problems. It was noted by counsel that the presence of allowable properties on the grade mark constituted a warranty and could pose problems when used with globally derived design values. Mr. Grundahl made a motion to recommend to the ALSC Standing Committee to revise Section 2.8-Grade marked (grade stamped) as shown above. The motion did not receive a second.

Now, you may not sell floor trusses to residential markets. You may not have to compete very heavily against stick framers in your market. If so, it's natural you might be thinking to yourself, "This isn't my problem." The thing is, you never know what the next issue might be. The association works because it brings us all together to take on tough issues like these. Ten years ago, it was going to bat for northern truss plants that couldn't compete against their Canadian counterparts because of trade tariffs our government put on Canadian lumber. Two years ago, it was helping southern truss plants navigate necessary changes to Southern Pine design values, while at the same time ensuring a stable market for engineered components.

Lumber design values still remain a significant issue for CMs, when you consider the changes recently made to the American Lumber Standards Committee's (ALSC) *Voluntary Product Standard 20-10 American Softwood Lumber Standard* (*PS 20*), which applies to all visually graded lumber, not just Southern Pine. I promise it's worth reading the revised *PS 20* a few times (see sidebar) and understanding what it says about the reliability of the visually graded lumber design values we buy from our lumber suppliers.

What I'm trying to say is that we're all in this together. So as you think about investing in the future of your business, think about how much you're willing to invest this year in these two projects to ensure a bright future for all of us. SBC

framer viewpoint

by Kenny Shifflett, NFC Steering Committee

FrameSAFE's Additional Training Resources: Toolbox Talks & Jobsite Posters

FRAMESAFE™

Training retention is paramount in jobsite safety.

The January/February issue of ***SBC*** featured a story about **FrameSAFE's** upcoming "Site-Specific Safety Plan: Fall Protection" program that's nearing completion. The National Framers Council (NFC) isn't planning on resting once we've rolled that program out to the public, though. This month, I want to talk to you about our efforts in creating **FrameSAFE** Safety Posters in conjunction with Toolbox Talks, which are supplementary training tools of the **FrameSAFE** program.

Toolbox Talks highlight common workplace safety issues and general tips for a safe, efficient jobsite. Initially rolled out in October 2014 with the **FrameSAFE** Safety Manual, there are currently 32 separate topics in the series. Pulled from the **FrameSAFE** Manual, Toolbox Talks cover framing topics, which framing supervisors can discuss in a short, concise manner on the jobsite.

Retention of training is paramount in jobsite safety; you must have continuous training in order to have a training system work. The documents are only one page long with a second page for employee documentation and all are graphically oriented with descriptions underneath to summarize main points. We've also included Spanish translations on each topic, to accommodate crews in the southern regions of the country. Every subscriber to **FrameSAFE** has access to pdf versions of the series to use at their disposal.

We've decided to take things one step further with Toolbox Talks, however, and we will release **FrameSAFE** Safety Posters in early 2015. These posters will correspond with Toolbox Talk topics and can be printed out and displayed on the jobsite for daily reminders. Posters will have plenty of pictures and feature English and Spanish descriptions.

Our goal is to cover 52 separate topics in the Toolbox Talk series with supporting Safety Posters, so framers can have access to weekly training. **FrameSAFE** is more than just a safety manual; we've created it to be a training tool that workers and employers can use to find everything they need in one product.

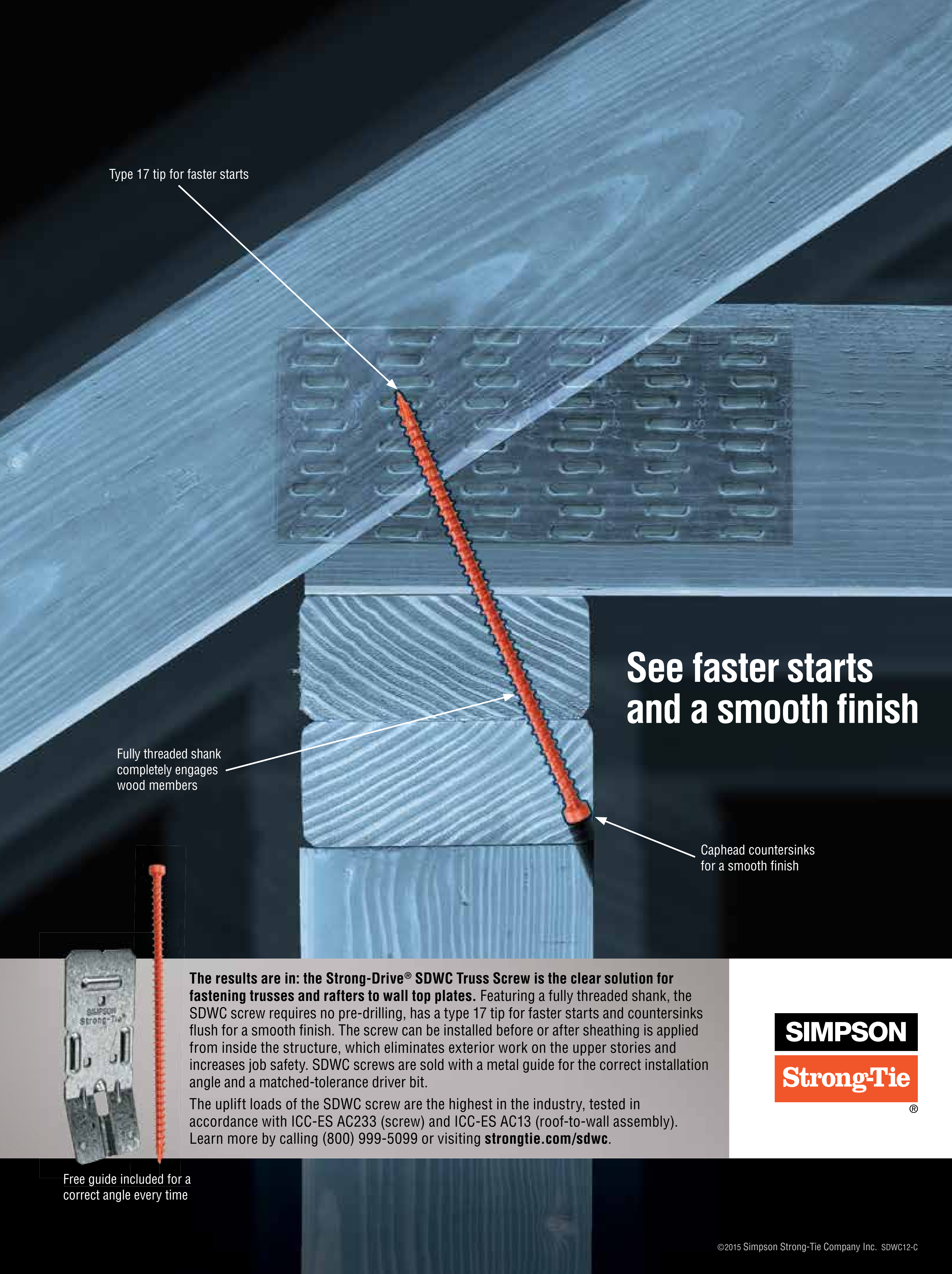
I had the opportunity to deliver a presentation on behalf of NFC that focused on the **FrameSAFE** program at this year's International Builders' Show® (IBS). The presentation was well-attended and sparked numerous questions, many of which led to small breakout discussions between builders and framers afterward.

In its first 18 months, **FrameSAFE** has clearly drawn the attention of framers around the nation and proved the industry needs this program. We're listening to the needs of framers, builders, general contractors and suppliers. It doesn't matter what part of the country we work in; we all have to deal with a lot of the same problems. Together, we can bring standards to our industry, and I can assure you, we've just begun providing support to the framing community. **SBC**

Kenny Shifflett owns Ace Carpentry in Manassas, VA, and has been in the framing industry for more than 40 years. He serves on NFC's Steering Committee and chairs the Council's Safety Subcommittee. For more information about the National Framers Council and the FrameSAFE program, visit framerscouncil.org. Samples of all available Toolbox Talks and Safety Posters are also available to view on the FrameSAFE page of the website.

at a glance

- ❑ You must have continuous training in order to have a training system work.
- ❑ In addition to FrameSAFE and Toolbox Talks, NFC will release FrameSAFE Safety Posters in early 2015.
- ❑ FrameSAFE is more than just a safety manual; we've created it to be a training tool that workers and employers can use to find everything they need in one product.



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TRUSSES WITH A twist

by Emily Patterson

> "We do a lot of crazy designs, but we try to take a systematic approach by looking at what [the customer is] trying to accomplish."
>
> —Keith Myers, Truss & Panel General Manager, Woodhaven Lumber

Over the years, Woodhaven Lumber has built a reputation as a truss manufacturer that can accomplish unusual designs that work in the real world for customers and installers. "We do a lot of crazy designs, but we try to take a systematic approach by looking at what they're trying to accomplish," said Keith Myers, Truss and Panel General Manager at Woodhaven Lumber. "We work with the architect and engineer and try to make it a simpler install for the builder."

Naturally, the more complicated and intricate a design, the more time required, but Woodhaven has found that investing the time upfront can lead to better projects and happy customers. "We cater to the smaller guys that require additional attention," said Myers.

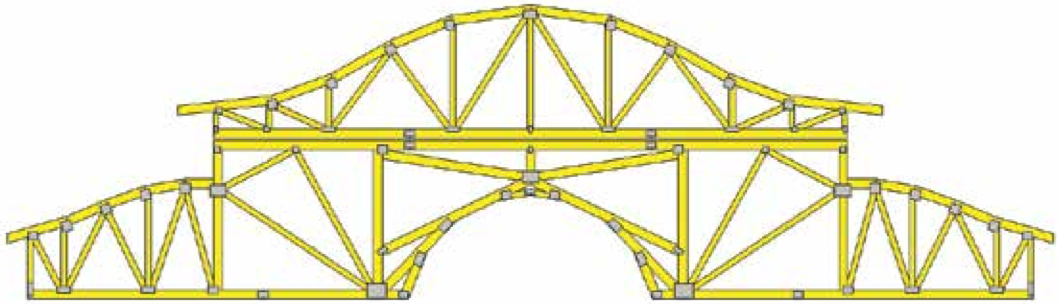

Figure 1. Woodhaven Lumber's truss design incorporated the curved ceiling of the main hall along with a detailed parapet with three arches and two radiuses.

By taking the time and giving customers that extra attention, Woodhaven can offer something different than simple truss design. Jesus Betanzos, Truss Designer at Woodhaven, said he likes to tell customers, "You'd be surprised what we can do with wood." Of course, customers can turn the tables and offer some surprises of their own, or as Betanzos puts it, "They always add a twist."

Photo Above: Woodhaven designed and built the roof and floor trusses for the Spruce Street Shul. Woodhaven also supplied the lumber and hardware for the project.

"I Bet You Can't Do This"

If not a twist, customers certainly have looked to Woodhaven to add some curves to their buildings. Such was the case with a builder, Regency Development, planning to construct a shul, or synagogue, in Lakewood, NJ, called the Spruce Street Shul. Per Jewish religious customs, electricity, and therefore speaker systems, cannot be

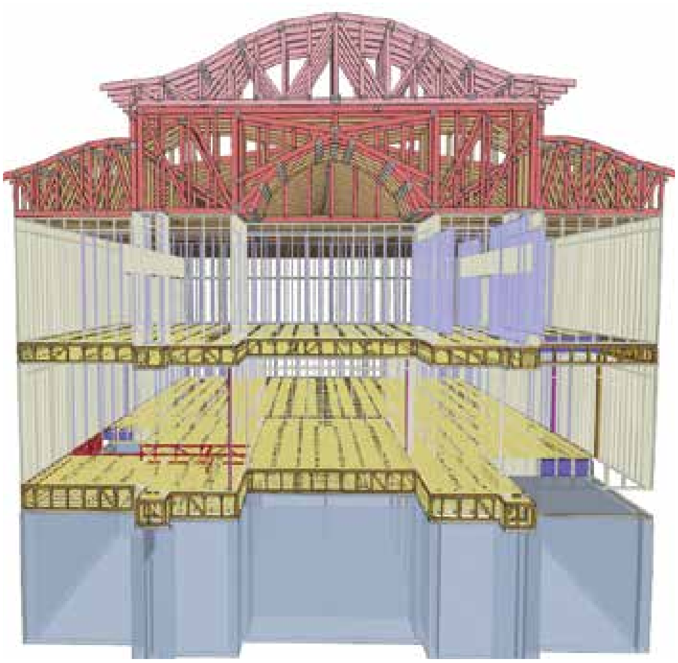

Figure 2. Design of the Spruce Street Shul in 3D.

used at given times, so the building needed to have especially good acoustics. Initial plans for the 4,680 sq. ft. shul included a 49 ft. x 48 ft. main hall with no intermediate supports. The design incorporated a curved ceiling, to help sound travel, but the roof above had to support large mechanical units. In addition, the customer wanted the building to have added curb appeal, so the front of the Spruce Street Shul called for a detailed parapet.

The customer approached Woodhaven Lumber with the project and a bit of a challenge. "With a straight face, the customer said, 'Put a truss there [in the main hall]. I bet you can't do this,'" said Betanzos.

That challenge got the ball rolling. The team at Woodhaven knew that designing the building with wood trusses presented a more affordable option compared to constructing the building with steel. First, Betanzos tackled the design. Fortunately, Woodhaven Lumber already had a good relationship with the architect, who supplied CAD files of the design. Betanzos took the CAD files and transposed them into the truss design software. He designed the curved ceiling of the main hall so it could withstand the additional load from mechanical units overhead, and included the parapet in the truss design using three arches and two radiuses (see Figure 1). While he could achieve the desired look in the design software, Betanzos admits he had some doubts. "It looked great in 3D, but I wasn't sure how it would look in real life," he said. He ran his truss designs by the builder and the architect.

From 3D Design to the Jobsite

"Jesus takes the time to go over every detail of the project to see where the trusses he designs can facilitate the overall project,"

Continued on page 12

Figure 3. Installation of the roof trusses at the Spruce Street Shul. The curved peak of the building was manufactured in two segments that were piggybacked at the jobsite.

Trusses with a Twist

Continued from page 11

said Yossi Wagner, Project Manager with Regency Development (see Figure 2). "Each and every detail is reviewed with us in 3D to make sure that we utilize the trusses to the fullest extent of their capabilities as well as know what to expect when it comes to the installation."

After talking through the design and installation issues, Regency Development and the architect agreed that the truss designs would work and gave the green light for Woodhaven to proceed.

Next, the truss plant had to make those truss designs a reality. "Everyone in the shop was mad at me that week," joked Betanzos. At the time, Woodhaven didn't have automated tables, which made the job especially challenging, but the staff in the truss plant were up to the demanding set-ups for the roof and floor trusses for the project, which included 51 ft. span curved trusses for the main hall. "I couldn't have done it with without the guys in the shop. They really came through," said Betanzos. The curved peak of the building was manufactured in two segments that were piggybacked at the jobsite (see Figure 2 and and photo on page 10).

To help ensure that the trusses were installed correctly and safely, Woodhaven provided a SBCA/TPI Jobsite Package for the project, as it does with every truss delivery. Woodhaven documents that customers received this best practice installation and bracing information by requiring customers to sign both a delivery ticket and a print out from the plate supplier that lists the Jobsite Package has been included with the components.

Woodhaven's reputation for going the extra mile is well deserved, but Betanzos also credits the builder, who Woodhaven has worked with on other

jobs, for letting him try something different for the Spruce Street Shul. "He let me be creative. They're always looking for outside-the-box ideas and ways to achieve cost savings," he said. "Hopefully, this project is one of many more to come." **SBC**

Plugged in & Connected

In addition to catering to the smaller guys on unusual projects, Woodhaven also makes a point to reach out to the community of building professionals who are likely to come into contact with its products. Woodhaven is a member of the Mid Atlantic Structural Building Components Association (MASBCA) and takes part with the chapter in an annual education presentation for PENNBOC, the NJ Department of Community Affairs (DCA) and Rutgers University Center for Government Services. The chapter's three-hour continuing education course is followed by a tour of Woodhaven's plant.

Myers believes good dialogue develops during these courses, and the community outreach definitely pays off, even if it occasionally results in extra work for Woodhaven. "An inspector will call me up and say, 'Yup, I saw your presentation, and now I know I need a repair detail,'" he said, noting it just goes to show the inspector got something useful out of the course.

TRUSS INDUSTRY STANDARD OF CARE ISSUES

by Scott D. Coffman, P.E., SECB & Jim Vogt, P.E.

PART 3

The first two Standard of Care articles discussed deferred submittals and truss-to-truss connections. This article explores truss minimum required bearing width issues from the perspective of the design community.

Prior to delving into this subject, it should be noted that, within the context of this article, the terms "bearing length" and "bearing width" are one and the same. "Bearing length" answers the question from a truss viewpoint—what length of truss must be supported for a calculated reaction? "Bearing width" answers the question from the building perspective—how wide must a supporting member be to adequately resist the truss reaction? "Bearing width" is used within this article for consistency with model building codes and the *National Design Standard for Metal Plate Connected Wood Truss Construction* (*TPI 1*).[1]

Section 107 of the *2012 International Building Code* (*IBC*®)[2] and Section R106 of the *2012 International Residential Code* (*IRC*®)[3] establish minimum requirements for construction documents. *TPI 1* Sections 2.3.2.4 and 2.4.2.4 expand on the model code requirements and detail specific items the construction document must include to adequately develop each truss design.

2.3.2.4 Required Information in the Construction Documents. The Registered Design Professional for the Building, through the Construction Documents, shall provide information sufficiently accurate and reliable to be used for facilitating the supply of the Structural Elements and other information for developing the design of the Trusses for the Building, and shall provide the following:

(a) All Truss and Structural Element orientations and locations.

(b) Information to fully determine all Truss profiles.

(c) All Structural Element and Truss support locations and bearing conditions (including the allowable bearing stress).

(d) The location, direction, and magnitude of all dead, live, and lateral loads applicable to each Truss including, but not limited to, loads attributable to: roof, floor, partition, mechanical, fire sprinkler, attic storage, rain and ponding, wind, snow (including snow drift and unbalanced snow), seismic; and any other loads on the Truss;

(e) All anchorage designs required to resist uplift, gravity, and lateral loads.

(f) Truss-to-Structural Element connections, but not Truss-to-Truss connections.

(g) Permanent Building Stability Bracing; including Truss anchorage connections to the Permanent Building Stability Bracing.

(h) Criteria related to serviceability issues including:

- (1) Allowable vertical, horizontal or other required deflection criteria.
- (2) Any dead load, live load, and in-service creep deflection criteria for flat roofs subject to ponding loads.
- (3) Any Truss camber requirements.
- (4) Any differential deflection criteria from Truss-to-Truss or Truss-to-adjacent Structural Element.
- (5) Any deflection and vibration criteria for floor Trusses including:
  - (a) Any strongback bridging requirements.
  - (b) Any dead load, live load, and in-service creep deflection criteria for floor Trusses supporting stone or ceramic tile finishes.

Editor's Note:

The purpose of this article series is to identify truss-related structural issues sometimes missed due to the day-in and day-out demands of truss design/production and the fragmented building design review and approval process. This series will explore issues in the building market that are not normally focused upon, and provide recommended best-practice guidance. As with the previous two articles (November 2014 and December 2014), the objective is to raise awareness of these issues and, ultimately, improve overall quality of truss roof and floor system construction.

(6) Moisture, temperature, corrosive chemicals and gases expected to result in:

(a) Wood moisture content exceeding 19 percent,

(b) Sustained temperatures exceeding 150 degrees F, and/or

(c) Corrosion potential from wood preservatives or other sources that may be detrimental to Trusses.

2.4.2.4 Required Information in the Construction Documents. The Building Designer, through the Construction Documents, shall provide information sufficiently accurate and reliable to be used for facilitating the supply of the Structural Elements and other information for developing the design of the Trusses for the Building, and shall provide the following:

(a) All Truss and Structural Element orientations and locations.

(b) Information to fully determine all Truss profiles.

(c) All Structural Element and Truss support locations and bearing conditions (including the allowable bearing stress).

(d) The location, direction, and magnitude of all dead, live, and lateral loads applicable to each Truss including, but not limited to, loads attributable to: roof, floor, partition, mechanical, fire sprinkler, attic storage, rain and ponding, wind, snow (including snow drift and unbalanced snow), seismic; and any other loads on the Truss.

(e) All anchorage designs required to resist uplift, gravity, and lateral loads.

(f) Adequate Truss-to-Structural Element connections, but not Truss-to-Truss connections.

(g) Permanent Building Stability Bracing; including Truss anchorage connections to the Permanent Building Stability Bracing.

(h) Criteria related to serviceability issues including:

(1) Allowable vertical, horizontal or other required deflection criteria.

(2) Any dead load, live load, and in-service creep deflection criteria for flat roofs subject to ponding loads.

(3) Any Truss camber requirements.

(4) Any differential deflection criteria from Truss-to-Truss or Truss-to-adjacent Structural Element.

(5) Any deflection and vibration criteria for floor Trusses including:

(a) Any strongback bridging requirements.

(b) Any dead load, live load, and in-service creep deflection criteria for floor Trusses supporting stone or ceramic tile finishes.

(6) Moisture, temperature, corrosive chemicals and gases expected to result in:

(a) Wood moisture content exceeding 19 percent,

(b) Sustained temperatures exceeding 150 degrees F, and/or

(c) Corrosion potential from wood preservatives or other sources that may be detrimental to Trusses.

One specific item requires the building designer to specify the allowable bearing stress of the support material for all structural element and truss bearing locations. The majority of construction drawings prepared by design professionals identify the support material(s) and bearing width(s) in sufficient detail to determine the allowable bearing stress of the support material. For example, a 2x4 wood bearing wall is specified with No. 2 or better Spruce-Pine-Fir (SPF) studs and plates. The maximum bearing width this wall can provide is 3½ inches (2x4). The allowable bearing stress for the wall plates is equal to the compression perpendicular-to-grain value of 425 psi as listed in Table 4A of the *National Design Specification® NDS® Supplement*[4] for visually graded (No. 2) SPF dimension lumber (see online version to view this table). This information meets the intent of *TPI 1*.

There are occasions in residential construction when the wood wall size is indicated and lumber species is missing. In such cases, truss designers are encouraged to communicate with the building designer and/or contractor to verify the material to use.

Design professionals and/or building designers expect truss designers to be aware of the support material bearing width with respect to the truss reactions. Additionally, *TPI 1* Section 2.3.5.1 and 2.4.5.1 assign responsibility to the truss designer to design trusses, based on criteria contained in the construction documents or provided in writing from the building designer as supplied to the truss designer by the truss manufacturer.

2.3.5.1 Preparation of Truss Design Drawings. The Truss Design Engineer shall supervise the preparation of the Truss Design Drawings based on the Truss design criteria and requirements set forth in the Construction Documents or as otherwise set forth in writing by the Registered Design Professional for the Building as supplied to the Truss Design Engineer by the Contractor through the Truss Manufacturer.

2.4.5.1 Preparation of Truss Design Drawings. The Truss Designer is responsible for the preparation of the Truss Design Drawings based on the Truss design criteria and requirements set forth in the Construction Documents or as otherwise set forth in writing by the Building Designer as supplied to the Truss Designer by the Truss Manufacturer.

Truss designers typically have a variety of tools available to them (e.g., truss design software and reference tables, see Table 1 on page 20) to evaluate truss reactions for a specified bearing width, wood species and grade (in the case of wood plates). Truss technicians should use these tools to calculate and evaluate in-service truss bearing conditions.

IRC Section R502.11.4[5] and R802.10.1,[6] *IBC* Section 2303.4.1.1[7] and *TPI 1* Section 2.3.5.5 and 2.4.5.4 specify the minimum information each truss design drawing must contain, including the required bearing width at each support location.

2.3.5.5 Information on Truss Design Drawings. Truss Design Drawings shall include, at a minimum, the information specified below:

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[1] References to *ANSI/TPI 1-2007*

[2] publicecodes.cyberregs.com/icod/ibc/2012/icod_ibc_2012_1_sec009.htm

[3] publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_1_sec008.htm

[4] *National Design Specification for Wood Construction Supplement,* 2012

[5] publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_5_par034.htm

[6] publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_8_par039.htm

[7] publicecodes.cyberregs.com/icod/ibc/2012/icod_ibc_2012_23_par041.htm

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Truss Industry Standard of Care Issues

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(a) Building Code used for design, unless specified on Cover/ Truss Index Sheet.
(b) Slope or depth, span and spacing.
(c) Location of all joints and support locations.
(d) Number of plies if greater than one.
(e) Required bearing widths.
(f) Design loads as applicable, including:
  (1) Top Chord live load (for roof Trusses, this shall be the controlling case of live load or snow load);
  (2) Top Chord dead load;
  (3) Bottom Chord live load;
  (4) Bottom Chord dead load;
  (5) Additional loads and locations;
  (6) Environmental load design criteria (wind speed, snow, seismic, and all applicable factors as required to calculate the Truss loads); and
  (7) Other lateral loads, including drag strut loads.
(g) Adjustments to Wood Member and Metal Connector Plate design values for conditions of use.
(h) Maximum reaction force and direction, including maximum uplift reaction forces where applicable.
(i) Metal Connector Plate type, manufacturer, size, and thickness or gauge, and the dimensioned location of each Metal Connector Plate except where symmetrically located relative to the joint interface.
(j) Size, species and grade for each Wood Member.
(k) Truss-to-Truss connection and Truss field assembly requirements.
(l) Calculated span to deflection ratio and/or maximum vertical and horizontal deflection for live and total load and KCR as applicable.
(m) Maximum axial tension and compression forces in the Truss members.
(n) Fabrication tolerance per Section 6.4.10.
(o) Required Permanent Individual Truss Member Restraint location and the method of Restraint/Bracing to be used per Section 2.3.3.

2.4.5.4 Information on Truss Design Drawings. Truss Design Drawings shall include, at a minimum, the information specified below:

(a) Building Code used for Design, unless specified on Cover/ Truss Index Sheet.
(b) Slope or depth, span and spacing.
(c) Location of all joints and support locations.
(d) Number of plies if greater than one.
(e) Required bearing widths.
(f) Design loads as applicable, including:
  (1) Top Chord live load (for roof Trusses, this shall be the controlling case of live load or snow load);
  (2) Top Chord dead load;
  (3) Bottom Chord live load;
  (4) Bottom Chord dead load;
  (5) Additional loads and locations;
  (6) Environmental load design criteria (wind speed, snow, seismic, and all applicable factors as required to calculate the Truss loads); and
  (7) Other lateral loads, including drag strut loads.
(g) Adjustments to Wood Member and Metal Connector Plate design values for conditions of use.

Figure 1. A wood bearing failure is not catastrophic; however, finish damage, cracks, and sagging result from local wood crushing

(h) Maximum reaction force and direction, including maximum uplift reaction forces where applicable.
(i) Metal Connector Plate type, manufacturer, size, and thickness or gauge, and the dimensioned location of each Metal Connector Plate except where symmetrically located relative to the joint interface.
(j) Size, species and grade for each Wood Member.
(k) Truss-to-Truss connection and Truss field assembly requirements.
(l) Calculated span to deflection ratio and/or maximum vertical and horizontal deflection for live and total load and KCR as applicable.
(m) Maximum axial tension and compression forces in the Truss members.
(n) Fabrication tolerance per Section 6.4.10.
(o) Required Permanent Individual Truss Member Restraint location and the method of Restraint/Bracing to be used per Section 2.4.3.

It is imperative a truss designer understand the design parameters input into truss design software and the resulting output. When an excessive bearing width is calculated and displayed on a truss design drawing (TDD), the truss designer or truss engineer needs to explore solutions that meet the bearing parameters specified by the building designer. A wood bearing failure is not catastrophic; however, finish damage, cracks and sagging result from local wood crushing (see Figure 1).

Two primary items determine the minimum required truss bearing width—truss lumber species and the building material supporting the truss. Lumber grade also has an effect if Southern Pine or machine-graded lumber (i.e., machine stress rated, MSR, or machine evaluated lumber, MEL) is used. Truss bearing widths included on a TDD are generally calculated using properties of the lumber in the truss. However, these values will be insufficient if the bearing capacity of the supporting member is less than the bearing capacity of the wood in the truss. Most truss design software compares the calculated minimum bearing width to an available bearing width input by the truss designer. The minimum required bearing width and available bearing width is typically shown on each TDD. When the minimum required bearing width exceeds the input available width, a warning note is typically displayed. An example of one such note is:

WARNING: Required bearing size at joint(s) greater than input bearing size.

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Standard of Care Issues

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A bearing size warning or caution note displayed on a TDD may sometimes be neglected or marginalized by a truss designer. However, the truss designer should try to be proactive in resolving bearing width issues. It is the truss designer who knows if the warning note pertains to the truss or the support structure. Dependence solely on TDD notes to communicate minimum bearing width requirements can contribute to review oversights and/or insufficient installation, as critical information can easily be overlooked or misunderstood given the large number of TDDs for a given project. Two preemptive methods are direct communication with the building designer and/or placing a highly visible note on the truss placement diagram (TPD) when the truss approval process is used.

Truss designers must be extremely cautious with large truss reactions, especially reactions associated with girder trusses. The authors have seen girder truss reactions in excess of 30,000 lbs. and required bearing lengths exceeding 17 inches. Large reactions and inadequate bearing lengths can cause severe plate crushing and wall covering damage, as shown in Figure 1. A table was publsihed in the April 2007 issue of ***SBC*** to assist truss designers with evaluating truss reactions. Truss designers are encouraged to reference Table 1 for maximum allowable reactions associated with specific species and sizes of wood wall plate material.

Large reactions present three additional areas of concern that are beyond the scope of this article: column capacity, foundation size, and associated large uplift reactions in high wind areas. Regarding large uplift reactions, published pre-manufactured tie-down connectors rarely exceed 10,000 lbs., with a majority less than 3000 lbs. Therefore, the truss designer has a responsibility to discuss large reactions with the building designer and help find a solution.

The truss industry has an opportunity to assist building designers when bearing width issues arise. Supplemental prefabricated metal bearing hardware for single-ply trusses is one option. Manufacturers' literature contains published values for design, and the installation can be easily verified. Trusses with large gravity load reactions may require a column cap to obtain sufficient bearing area. Additionally, increasing the number of plies may be a solution. The additional cost of an extra ply may be at least partially offset with smaller chord sizes, lower lumber grade, fewer webs and/or eliminating special hardware. If these solutions are unacceptable, the truss designer can discuss building changes with the building designer.

Species ($F_{c\perp}$)	Plate Size	Bearing Area Factor, C_b	No. of Truss Plys (assumes each ply is 1-1/2" thick)			
			1	2	3	4
Southern Pine[3] (565 psi)	2x4	Yes[4]	3,708	6,674	9,640	11,865
		No	2,966	5,933	8,899	11,865
	2x6	Yes[4]	5,827	10,488	15,149	18,645
		No	4,661	9,323	13,984	18,645
Douglas Fir-Larch (625 psi)	2x4	Yes[4]	4,102	7,383	10,664	13,125
		No	3,281	6,563	9,844	13,125
	2x6	Yes[4]	6,445	11,602	16,758	20,625
		No	5,156	10,313	15,469	20,625
Spruce-Pine-Fir (425 psi)	2x4	Yes[4]	2,789	5,020	7,252	8,925
		No	2,231	4,463	6,694	8,925
	2x6	Yes[4]	4,383	7,889	11,395	14,025
		No	3,506	7,013	10,519	14,025
Hem-Fir (405 psi)	2x4	Yes[4]	2,658	4,784	6,910	8,505
		No	2,126	4,253	6,379	8,505
	2x6	Yes[4]	4,177	7,518	10,859	13,365
		No	3,341	6,683	10,024	13,365
Spruce-Pine-Fir South (335 psi)	2x4	Yes[4]	2,198	3,957	5,716	7,035
		No	1,759	3,518	5,276	7,035
	2x6	Yes[4]	3,455	6,218	8,982	11,055
		No	2,764	5,528	8,291	11,055

Table 1. Maximum Truss Reaction (lbs.) Based on Allowable Compression Stress Perpendicular to Grain ($F_{c\perp}$) of the Lumber Plate.[1,2]

[1] Reaction values are based on C_M, C_t and $C_i = 1.0$.
[2] Reaction values assume that the truss bears on the full width of the lumber plate.
[3] Reaction values may be increased by 1.168 if the lumber plate is Dense Select Structural, Dense No. 1 or Dense No. 2.
[4] Use the reaction value in this row if the truss is located at least 3" from the end of the lumber plate.

Some solutions proposed by the truss industry to remedy truss bearing issues only succeed in addressing part of the problem. For instance, one method is to extend a web member through the truss bottom chord allowing the truss to bear directly on the end grain of the web. This greatly increases the bearing capacity for the truss, since compression parallel to grain stress is typically 2-3 times greater than compression perpendicular to grain values. However, the bearing issue most likely still exists for the support material, unless this material is steel. Another method recommends replacing the very top plate of the wood stud bearing wall with a species and grade that is the same as the truss chord. The problem with this suggestion is that the reaction from the truss is transferred into the wall stud(s) through the wall plates in contact with the stud. In order for this solution to be acceptable, both top plates and the sole plate need to be replaced with a wood species and grade that is the same or better as the truss to perform as anticipated.

Field installation of truss bearing blocks is one option that can be used successfully to increase the bearing area and reduce the required bearing stress on both the truss chord and support material. However, a sealed TDD should be obtained from the truss design engineer indicating the size, species, grade, orientation, location(s) and connection of the block(s) to the truss, and manufacturing facilities should provide all required materials. Otherwise, it has been the authors' experience that bearing blocks are not installed or improper materials and/or fasteners are used.

The building code and *ANSI/TPI 1* require construction documents to contain specific information that allows truss designers to investigate minimum bearing widths. Checking required truss and support material bearing width and communicating potential problems to the contractor and building designer helps ensure satisfactory performance, improves the quality of truss construction, minimizes downstream construction defects, and helps make the truss designer/truss manufacturer an important member of the design and construction team. **SBC**

GOOD information

leads to

GOOD decision-making

SBCRI Testing & SBCA Research Reports Can Transform Your Market

by Sean D. Shields & Kirk Grundahl, P.E.

Over the past year, you may have noticed a significant increase in the frequency of articles in ***SBC*** that provide an overview of structural test data and engineering concepts. There are several reasons behind this effort, the most important of which is to publicly share our knowledge and understanding of real-world structural performance of various aspects of the building envelope.

Why is this so important? First, because the structural building components (SBC) industry is, at its core, about providing engineered framing solutions. Second, effective engineered framing solutions rely on accurate design values for the raw materials and fasteners that are utilized. Third, initial empirical data collected through the SBC Research Institute (SBCRI) indicates the prescriptive building code can undervalue engineering by overstating the performance of certain conventional framing methods and materials.

The code accomplishes this by incorporating into the design values an unknown amount of systems effects, or by reducing the building's overall factor of safety. Neither of these adjustments are quantified or well defined in prescriptive code provisions. This results in prescriptive materials having design values higher than what real empirical test data suggests they are. This can make it very difficult for engineered framing solutions to compete, because the prescriptive solutions supported through the code appear to be more efficient.

Conversely, the goal of generating SBCRI empirical data is to fully understand real performance and place this information in the hands of the SBC industry's engineering community. Ultimately, this knowledge will enable significant innovation to occur, with the goal of growing SBC industry market share.

This article will briefly explore each of these concepts and then outline how SBCA and ***SBC Magazine*** plan to serve the SBC industry by broadly communicating what we have learned, and what we anticipate to learn in the future, through SBCRI testing.

SBC Industry Is Engineering Based

One of the greatest strengths of the SBC industry is its ability to provide builders an engineered solution to any load path and framing challenge. Whether the builder wants to achieve large, open room layouts, multi-planed roofs or significant improvements in the energy efficiency of the building envelope, component manufacturers (CM) most often can design and produce what their customers want and need.

The SBC industry's engineering community creates considerable value to its customers by providing these types of value-added products. Within that community, each company's team of designers can differentiate themselves through creativity, engineering acumen and superior production techniques. Just like snowflakes, no two component solutions need be alike, and that ultimate flexibility is the reason why components are a superior framing method.

The proprietary design software used by CMs is an incredibly powerful tool. In the hands of the SBC industry's engineering community, this software allows for even more creative, efficient design work than what was possible in the past. Further, it allows CMs to tackle building material challenges in all three dimensions by providing the building's coordinate geometry (i.e., enabling a building information management, or BIM, approach).

This gives CMs the ability to collaboratively solve design issues with a builder, architect and/or engineer of record much more quickly than the days or weeks it took in even the recent past.

Engineering Relies on Accurate Design Values

At the heart of the SBC industry's design software are fundamental engineering equations and assumptions based on generally accepted engineering practice.

Within those equations, industry-published raw material design values are input based on the assumption that the design values formulated by their providers are accurate and consistent. For a thorough understanding of this topic, read the article "Design Values Matter: Make Sure You Fully Understand Why" (April 2013).

As the Southern Pine design value change process illustrated, the SBC industry's ability to gather its own empirical data on these raw material design values through SBCRI is invaluable. This issue was also discussed in great depth by a couple of CMs in the article "Knowledge Is Power: Quantifying the Value of SBCRI through SP Design Value Changes" (Sep/Oct 2014).

What both of these articles explain in different ways is that everyone in the building industry purchasing raw materials, such as lumber, for conventional framing or structural component applications is actually buying design values and related properties that are then incorporated into *National Design Specification* (*NDS*) engineering equations. These equations are used by engineers, and their design software programs, to accurately estimate the raw material's ability to resist applied loads, and consequently a reliable and safe load path. If the producers and suppliers of those raw materials aren't willing to stand behind the design values they ascribe to their product, it becomes exceedingly difficult for anyone to accurately engineer a structure.

The *International Residential Code* (*IRC*) is a good example of the dilemma faced by the SBC industry. Often, engineers default to using the *IRC* over an engineered solution because, as pointed out earlier in this article, the *IRC* through the means by which it is put together, provides a more economically efficient solution. This may sound amazing, but it's true. Further, the unsupported assumptions that make up some of the *IRC* solutions have been brought repeatedly and publically to the attention of the International Code Council (ICC), which develops the *IRC* and other model building codes. It remains unclear what action, if any, the ICC will take to begin correcting this obvious flaw.

One of the primary goals of SBCRI is to help the SBC industry fully understand fundamental raw material design values and their single-element engineering performance. With this knowledge, it is possible to gain an even better understanding of the performance of those raw materials when testing them in a real-world assembly. At the end of the day, reliable and safe building performance is completely dependent upon accurate design properties, engineering precision and a complete understanding of all the design assumptions and engineering considerations needed for successful application or installation. Said another way, unreliable or inconsistent lumber and wood structural panel (WSP) design values lead to unreliable or inconsistent load path resistance or an unknown factor of safety.

Building Code Undervalues Engineering

One of the most important reasons to broadly communicate the empirical data collected through industry-related testing at SBCRI is to more accurately define what it means to provide reliable engineering in the context of meeting the mission of the building code (i.e., to establish minimum requirements to safeguard the public safety). Unfortunately, the building code development process has become a more relational and political exercise, versus relying on hard science and engineering. This fact further undermines the value of good engineering. Raw material design values and building material performance characteristics can easily be written into the building code, whether they are scientifically correct or not, and become law when states and local jurisdictions adopt them.

Over the past several months, ***SBC Magazine*** has begun the process of exploring some of the ways in which this presents a significant challenge to the SBC industry. For example, the articles "You Don't Know What You Don't Know, Part II" (Sep/Oct 2013) and "Installation of Interior Gypsum Board Finish" (November 2014), examine the way that the prescriptive provisions of the building codes provides a significant competitive advantage to WSP braced wall panels. While APA testing performed for their Building Seismic Safety Committee (BSSC) indicates the real lateral resistance of an isolated WSP braced wall panel without interior ½" regular gypsum wallboard applied has a lateral resistance design value of 351 plf, the *IRC* provides a value of 600 plf. Similarly, the same wall panel with interior ½" regular gypsum wallboard has a lateral resistance design value of 383 plf, but the *IRC* assigns it a value of 840 plf.

A similar situation exists in the code with respect to the development of WSP seismic design coefficients in *ASCE 7* Chapter 12 Table 12.2-2. The articles "Seismic Design Coefficients, Part I" (May 2014) and "Seismic Design Coefficients, Part II" (August 2014) explore the unfair advantage WSP performance is granted through the code. As a consequence, newly developed alternative products may fail to meet the subjective equivalency parameters created and placed into *ASCE 7*, and thus be considered not equivalent even when they have equivalent or better performance than WSP shear walls.

This situation is compounded by the fact there is no rational seismic design parameter (SDP) development solution in the building code. As a consequence, SBCA developed a closed-form, mechanics of materials approach to SDP creation. This new approach is simple and rational, particularly when compared to some of the other approaches currently used in the market (see the sidebar on page 25, which includes statements from an AC130 task group that appear to indicate it is acceptable to make up engineering mechanics to fit a given WSP marketplace outcome). This is significant for CMs in high seismic areas who are attempting to design innovative components.

Empirical Data Allows Innovative Engineering

How does the SBC industry know these competitive advantages exist within the prescriptive provisions of the building code? It didn't, at least it didn't have proof, until these issues were revealed through structural testing conducted at SBCRI. The good news is that, through the data SBCRI is

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Good Information…

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able to collect, the SBC industry is not only able to expose the inequalities, it can actively do something about it. Professional engineers can provide significant value because they have the ability to assess the empirical test data, do comparative analysis and make value judgments based on their expertise. In other words, they have the ability to innovate.

In his article, "Innovative Framing: A Concept for Today & Tomorrow" (August 2014), SBCA Past President Scott Ward made the following observations that bring this concept to its logical conclusion: "… the building code clearly gives us the flexibility to find a better way to frame a building. We do this as a matter of course by reducing material usage to save cost and/or make production and installation easier. The process we use to design and manufacture a structural component lends itself well to finding an innovative framing solution that meets or exceeds our customers' expectations. In fact, we have to do this on every job; otherwise, our customers look elsewhere.

"Further, our industry is set up to facilitate innovative framing by bringing together material suppliers, building designers, builders and framers. We are driving innovation through communication and collaboration, allowing everyone in the chain to reap the benefits of the tools and capabilities we have to design a building where the complete load path required by the code can be constructed in the most efficient and cost-effective way."

Ultimately, the more detailed understanding of actual building performance possible through SBCRI testing data should lead the SBC industry to more accurate and cost-effective roof truss, wall and floor truss/I-joist designs because the correct loads get placed in the proper location, and design is based on actual loading conditions, not tradition-based assumptions.

The Power of Communication

Testing at SBCRI has just begun to prove that what everyone thinks they can count on, and are getting from a variety of standardized test methods or building code requirements, may be wrong. The SBC industry's engineering community is regularly competing against prescriptive code perceptions as opposed to real-world building performance. The real question is how individual CMs can overcome this challenge.

As stated earlier, the best and most effective approach is with science. In 2013, SBCA and the Truss Plate Institute (TPI) entered into an industry testing cooperative agreement to jointly fund testing at SBCRI to address fundamental engineering issues facing the industry. An Industry Testing Subcommittee made up of CMs was formed to compile and prioritize a list of structural issues to create test plans. Those test plans are then reviewed by members of SBCA's Engineering and Technical Committee and TPI's Technical Advisory Committee (TPI TAC), who review and provide feedback both on the initial test plans and analysis of the resulting data.

The AC130 task group created a prescriptive process for the development of seismic design parameters (SDP) that were primarily intended to justify WSP performance and are not based on consensus standard development.

AC130 is a proprietary Acceptance Criteria (AC) entitled "Acceptance Criteria for Prefabricated Wood Shear Panels" and are established by an ICC-ES committee to provide a basis for issuing ICC-ES evaluation reports on products and systems under the codes referenced. Acceptance criteria are copyrighted publications of ICC-ES and are developed for use solely for purposes of issuing ICC-ES evaluation reports to applicants. Acceptance criteria are available to the public for purchase, but they are not for use outside of the ICC-ES system

Statements from the AC130 task group illustrate this as follows:

- Since the limits on the three parameters are not based on the minimum tested parameter, some of the WSP tests in the database will fail to be equivalent.
- This was determined to be acceptable by the Task Group as seen by the following quote:

> "The Task Group consensus was that whenever possible, the upper and lower bounds for a parameter would be established to encompass a reasonable range of the benchmark data. This was accomplished using the concept of average plus or minus one standard deviation. This technique provides data-driven limits tied directly to the expected range of the code-defined system, yet also supplies some leeway based on known variability in the target benchmark system. The alternatives, either targeting the absolute extremes from the database or using some form of mean basis were rejected. The former was judged to be too 'loose' a criteria and the latter was judged to be too restrictive given that half the benchmark database would fail to qualify any given criterion."

- Of the 48 tests in the AC130 database, 14 (or 29%) are not equivalent.
- This means that a product that is truly equivalent to one of the walls in the AC130 database may be rendered to be NOT equivalent inappropriately by AC130.
- This was recognized by the Task Group as seen in the following statement:

> "Given the large variation in performance expected with all possible building code-permitted permutations of the benchmark (i.e., wood structural panel) system, the Task Group judged that it was not appropriate for the proponent of a prefabricated shear panel to simply select test data from a single (WSP) shear wall configuration to prove equivalency. Performance criteria established using this single data point may or may not be representative of the level of performance commonly associated with the population of walls (i.e., the 48 walls of which 14 failed the task group criteria) that conform to the code-defined benchmark system."

In other words, the level of performance and acceptance criteria of the WSP walls was set in such a way that WSP walls that failed to meet the acceptance criteria were deemed to comply, and a different set of rules apply to alternative competing products.

- The Task Group further states that: "It was acknowledged that the cyclic shear wall test data sets available to serve as a benchmark for any code-defined lateral force resisting systems would be limited and not provide a comprehensive and statistically valid representation of all possible permutations of the code-defined system."
- Therefore, the rules were set to favor one class of products over all other competing products. Further, it was fully recognized that it is possible to test WSP shear wall configurations that do not meet the AC130 equivalency parameter limits but will still use the same seismic design coefficients regardless of their failure to meet the AC130 equivalency criteria.

Once the SBCRI testing is complete, the data is shared with SBCA members through the ***SBC Magazine*** website. SBCA members will be alerted to this information through member-only ***SBC* Industry News–Special Edition** emails. The membership invested in SBCRI and, as a consequence, is the first to benefit from the knowledge gained through testing.

Exposure to this information can lead to several outcomes. One of the most promising is the idea that individual SBCA members may take this information and find ways to use the data to innovate on their own through generally accepted engineering practices. The data will also be provided to TPI TAC, which then is charged with using the data and engineering analysis to provide SBC industry-wide solutions.

Online Source for Test Data & Analysis

The end goal of this work is for test data, data analysis, engineering mechanics concepts and generally accepted engineering considerations to eventually be published on the ***SBC Magazine*** website, where it can easily be reviewed, revised and updated, and always be available for public review. Much like the past articles referenced here, ***SBC*** will continue to publish and provide the entire market with the knowledge gained through testing. This public forum will give the broader engineering community the opportunity to evaluate and comment on the analysis, either confirming the conclusions reached or providing additional opportunities to refine the data and analysis.

Our assumption is there is sufficient interest in the engineering and code development community at large to get the science right. If we publish something that is incorrect, we will get the feedback needed to correct it (or, at least, point out where we need to do further testing and/or analysis).

Once the public vetting process has run its course, the data and analysis will be published in SBCA Research Reports and made available to the market in a well-organized online database on SBCA's website. SBCA Research Reports can then be referenced in a wide variety of ways to serve the best interests of SBCA members and to advance sound science, engineering, code development and market education. **SBC**

TOP 10 Employee Training Tools

by Sean D. Shields & Ben Hershey

A company's sales and design teams put significant time into winning a job and designing the project's structural components. The production team has also invested a good deal of sweat equity into manufacturing each quality component per its individual design. The last thing anyone wants is for all that time and effort to be wasted, or an injury to occur, when an avoidable accident, improper movement or bending, or poor storage compromises the structural integrity of the component and forces the production team to have to manufacture replacements.

This entire article series has been looking at various aspects of the component manufacturing process and identifying areas where simple training and straightforward company policies can make a significant impact on the overall efficiency of an operation and the quality of the product produced. This installment will look at the issue of material handling and focus on the reasons for minimizing handling, tips for forklift operation, storage basics and best practices for cargo loading.

Properly defined, material handling is the field concerned with pragmatic solutions to problems involving the movement, storage in a plant, control and protection of materials, goods and products throughout the processes of cleaning, preparation, manufacturing, distribution, consumption and disposal of all related materials, goods and their packaging. For simplicity, this article will break material handling down into three areas: safe handling, proper handling and proper storage.

Safe Handling

Similar to this article series' guidance with regard to the use of personal protection equipment (PPE) for production employees (see May 2014 article), employees handling raw materials and finished products need to be up to speed on your company's safety program and all the PPE they need to wear to protect themselves from injury. Gloves should be worn at all times, and have good grips. Back braces should be available and it's not a bad idea to provide instruction on how to properly fit and wear one. PPE not only protects employees from injury; it can also make them more efficient.

For example, gloves with a good grip will allow employees to grab boards without slipping, while also minimizing the chance of getting a splinter (a minor, yet distracting injury). Gloves are even more important when handling gusset plates. Their sharp edges and teeth can cause a multitude of minor to more serious skin lacerations, particularly when handling heavy, awkward components. It's also important to remind employees that backbraces are not a tool to help employee to lift more weight as much as they are a guide to help

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them have correct posture and technique when lifting heavy boxes, boards or stacks.

The training of employees on safe material handling should not only focus on their personal safety, but also on the safety of those around them. A good example of this is moving a bunk of lumber from one location to another using a forklift. It's a good practice to have the forklift driver beep their horn several times as they move to alert those around them. Finished components can be challenging to maneuver; having a company policy that employees not engaged in the handling are clear of the area is a good way to avoid injuries in the event a component moves in an unexpected manner.

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Proper Handling

When handling material, there are several areas that need to be taken into consideration. There are three different ways of handling material in the component operation: through automation, which this article will not cover, through mechanical means by way of a forklift, and by manual means using a cart and by hand. By far, the most common method for handling in the components industry is the forklift due to the weight involved in the raw materials and finished products. For that reason, this article will focus primarily on forklift use.

Suffice it to say that thorough forklift instruction and mentoring should be a critical part of a company's employee training program. Not only should the forklift training regimen include OSHA compliance information, it should also include industry best practices. Many of those best practices can be found in one place: the SBCA Forklift Certification program, a part of SBCA's Operation Safety (wtcatko.com/forklift). This program integrates online training with hands-on exercises to provide a diversified course for the industry's forklift operators. For new or experienced operators, this program helps CMs train, evaluate and monitor operations on a continual basis.

The most important area to focus on with forklift operator training is in handling component packages from the production area to storage and from storage to transport. Similar to the issues covered in the Driver Training article (see Jan/Feb 2015 article in this series), the odd-sized loads that result from banded component packages require special considerations when it comes to positioning and movement. First and foremost is for the forklift operator to always be aware and cautious of the load limit of the forklift, as well as the size and spacing of the tines. With only two lift points at the tines, load balance and positioning are critical.

Further, it's a good practice for the operator to ensure that, when lifting multiple components, they are secured with banding before lifting. Lifting multiple loose components can be a recipe for disaster as it is so easy for portions of the load to shift and become unbalanced during movement. In some cases, a load may be too large or heavy for a single forklift, and may need to have two (and sometimes three) forklifts to lift and move. In these instances, it's vital every operator is aware of their path and who is coordinating the lift. A third person should supervise the lift and alert other employees during movement to ensure a clear path since sightlines for the operators can be limited due to the size and position of the load relative to their vantage point in the driver's seat.

One additional best practice to consider: In the article on housekeeping (see August 2014 article), it was suggested that attaching a collection can to the forklift for collecting trash, banding, etc. can make clean-up more efficient. Taking that idea a step further, it may also be a good idea to attach to the back of the lift an area where loose boards, cutoffs, stickers, etc. can be collected that the operator can use to place under bunks to keep them off the ground.

Proper Storage

When storing raw materials and finished product, it's a good practice to keep material as dry as possible. This starts with keeping all materials off the ground, which can be accomplished

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When storing raw materials and finished product, it's a good practice to keep material as dry as possible. There are a variety of methods for doing so.

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through a wide variety of methods. Using old cutoffs, boards and pallets can allow for flexibility in designating storage areas, moving storage to wherever is convenient in a given situation. Of course, if operations and throughput tend to be more static, building permanent racks out of steel can provide the advantage of more consistent material tracking (i.e., everyone knows where something is because there's a permanent place for it).

Keeping lumber bunks off the ground with inventory labels to the front can also ensure quick location and identification. Another good tip is to have a system for raw material inventory rotation, using the oldest inventory first. If lumber cannot be stored in an area protected from the elements, check with your lumber supplier on whether it's possible to get the lumber bunks delivered in a wrap to protect it. Protection from the elements is about keeping the moisture content of the lumber low and mold to a minimum. Keeping the lumber off the ground also prevents the forklift operator from damaging any of the boards when lifting the bunk.

For forklift operators, taking care of finished goods is as important as carefully handling raw materials. Just as with raw materials, it's a good idea to keep finished components off the ground. Forklift operators need to be able to get the forklift tines under the load of finished goods without the potential of damaging chords and webs.

Conclusion

Raw materials are a significant investment. The finished product represents the culmination of effort on behalf of multiple employees over time. That's why it is so important to ensure that material is stored, moved and loaded onto transport in a safe and cautious manner to ensure no one gets hurt and the final product doesn't get damaged. Putting time into training on the front end, ensuring employees have proper PPE and good working equipment, and committing to continual retraining as issues arise or handling procedures change, is well worth the time and effort. SBC

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parting shots

Share your stories and photos with us! Send submissions to partingshots@sbcmag.info.

Usually, a picture is worth a thousand words, except when it is worth a million "ooohs" and "aaahs." ***SBC Magazine*** is pleased to share that Steven Spradlin (Capital Structures, Fort Smith, AR) and his wife, Brooke, had an especially delightful Christmas last year. On December 25, the couple brought home Harper Ann and Winston Opie. Born on December 23, Harper weighed in at 6 lbs., 1 oz., and Winston was 5 lbs. 5 oz. Many congratulations to the Spradlin family! **SBC**

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