STRUCTURAL BUILDING

COMPONENTS™

THE FUTURE OF FRAMING

November 2014

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Installation of Interior Gypsum Board Finish

EXPLORING TRUSS INDUSTRY STANDARD OF CARE ISSUES

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Publisher
Truss Publications, Inc.
6300 Enterprise Lane • Suite 200
Madison, WI 53719
Phone: 608-310-6706 • Fax: 608-271-7006
trusspubs@sbcmag.info • www.sbcmag.info

Editor
Rick Parrino
Plum Building Systems • editor@sbcmag.info

Managing Editor
Sean Shields
608-310-6728 • sshields@sbcmag.info

Art Director
Melinda Caldwell
608-310-6729 • mcaldwell@sbcmag.info

Editorial Review
Kirk Grundahl
608-274-2345 • kgrundahl@sbcmag.info

Suzi Grundahl
608-310-6710 • sgrundahl@sbcmag.info

Advertising Sales & Marketing
Melinda Caldwell
608-310-6729 • mcaldwell@sbcmag.info

Sean Shields
608-310-6728 • sshields@sbcmag.info

Staff Writers for November
Daniel Lawless, E.I.T.

Accountant
Mike Younglove
608-310-6714 • myounglove@sbcmag.info

Computer Systems Administrator
Jay Edgar
608-310-6712 • jedgar@sbcmag.info

Send all ad materials, insertion orders, contracts & payments to:
Truss Publications, Inc.
6300 Enterprise Lane • Suite 200
Madison, WI 53719
Phone: 608-310-6706 • Fax: 608-271-7006
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contents

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.

editor's message

by Rick Parrino

The Four-Letter Word that Helped My Business

Building relationships is so important!

I have to say, BCMC was a lot of fun to attend this year. The BCMC Build charity project is hard work, but it's always a great way to kick off a week dedicated to bringing the industry together. The show floor was full of people, and from my conversations with other component manufacturers (CMs) and our supplier exhibitors, it was clear there is real confidence about the future of our industry. I see a lot of opportunity for our industry to grow and further change the way homes are framed. Having said that, I strongly believe our success will be dependent on our ability to forge stronger working relationships with those outside the industry, including building officials, members of the fire service, specifiers, framers and lawmakers.

I started to understand the importance and power of relationship building with individuals outside our industry back in 2003, when I attended my first SBC Legislative Conference in Washington, DC. I had never been there before and was a little anxious about what to say and do. At the time, our big policy issue was the softwood lumber dispute between the U.S. and Canada, and the hefty tariffs added by our government onto imported dimensional lumber. This was a significant problem for CMs in the states bordering Canada, as Canadian CMs could purchase lumber without the tariff, then produce and ship components cheaper than their U.S. counterparts.

While both countries appeared to be working toward a longer-term solution to this issue (it still remains the longest standing trade dispute between the U.S. and Canada), there was a significant obstacle barring forward progress: the Byrd Amendment. Passed in October 2000, this law directed the federal government to give the money collected through tariffs like those attached to Canadian lumber directly to the U.S. producers protected by the tariff. When I traveled to DC, the tariffs were being disputed, so instead of the money being distributed, it was collected and held by the U.S. government.

In other words, a huge pot of money had been collected that was creating a barrier to reforms. U.S. lumber producers wanted that money given to them as was law under the Byrd Amendment, the Canadian government wanted the money back to give to their lumber producers who had originally paid it (giving them a huge financial windfall in the process), and the U.S. government was stuck in the middle without a clear solution. I went into my meeting with Senator Chuck Grassley's (R-IA) Legal Counsel Everett Eissenstat, and I remember being pretty nervous.

Fortunately, we were not the only industry negatively impacted by the Byrd Amendment. While its impact on our industry was new information to Everett, Sen. Grassley was already on board in the effort to repeal the law. By the end of the meeting, I was convinced I had made the right decision to come to DC to bring our industry's struggles to their attention. While I was leaving, I thanked Everett for taking the time to meet with me. I'll never forget when he said, "Rick, you said the four-letter word." It took me a second before I realized he meant, "Iowa."

Over the next two years, my relationship with Everett grew. Sen. Grassley came to visit my production facility, I went back to DC two more times to talk about the lumber dispute and get behind-the-scenes information. In December 2005, the Byrd Amendment was repealed, and in April 2006, the U.S. and Canada entered into the

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at a glance

- Incoming SBCA President Rick Parrino sees a lot of opportunity for the industry to grow and further change the way homes are framed.
- Parrino shares his experiences getting to know local building officials, giving educational presentations and trying to be a good resource for builders, framers, specifiers, firefighters and code officials.
- Parrino's goal is to encourage CMs to begin building more relationships with the individuals inside our local markets that can have a big impact on our business.

Editor's Message

Continued from page 5

current softwood lumber trade agreement that eliminated most of the tariffs placed on imports. Even after Everett left Sen. Grassley's office for an appointment to the U.S. Trade Representative's Office, my relationship with him continued to be very beneficial.

Since the light bulb first went on, I have remained committed to building stronger relationships with people like Everett. Most of the time, I concentrate on getting to know my local building officials (which I have a new found respect for), giving educational presentations to firefighters and specifiers, and trying to be a good resource for builders, framers and code officials. I'll admit, it's a slow process. Any good relationship takes time. However, I can easily say the time I have put into it over the last decade has paid me back many times over.

In addition to lawmakers in Washington, DC, I have also had success building bridges with local lawmakers in Iowa. Each year our local chapter, the Iowa Truss Manufacturers Association (ITMA), hosts a breakfast at the state capitol building in Des Moines. It's a really valuable opportunity to meet with legislators from across the state, learn about their legislative priorities, get the inside scoop on the chances of various bills being passed, and increase awareness of our industry and the role it plays in Iowa's economy.

I've also had success inviting my local politicians into our production facility and showing them how we manufacture our products. Those one-hour tours are the most effective way to capture their attention and raise awareness on how various laws and regulations affect our business, from OSHA oversight and tax burdens to potentially harmful building code changes. If there is one thing I would encourage every component manufacturer to do, it would be to open up your doors and invite individuals from outside our industry to come into your plant and learn more about what we do.

I am honored to have the opportunity to serve as President of SBCA this coming year. I want to sincerely thank Scott Ward for his dedicated leadership of this organization; he left me big shoes to fill. I want to also congratulate Scott on winning this year's SBCA Leadership Award—he certainly deserves it.

My goal this coming year is to encourage CMs to follow a path similar to mine and begin building more relationships with the individuals in our market that can have a big impact on our business. SBCA has created a number of resources to help us give educational presentations and share best practices with everyone from code officials to framers. There is so much potential for our industry to grow, and I believe these relationships are necessary for that to happen. We will be stronger working together than working against each other! 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.

framer viewpoint

by Kenny Shifflett, NFC Steering Committee

Unifying the Framing Industry Through Safety

FRAMESAFE™

Learn how FrameSAFE™ is a game changer.

The construction industry is a fragmented lot. This isn't always a bad thing. However, when it comes to jobsite safety, fragmentation creates obstacles that shouldn't be there (and don't have to be). That is why, when a few of us first came together last fall to create SBCA's National Framers Council (NFC), we decided to begin by focusing all of our efforts on creating a standardized safety program for framers. If there is one thing that will dramatically improve the framing process, and make it a more attractive occupation for young people, it's making the jobsite a safer place to work.

One year later, I'm proud to announce that our safety program, FrameSAFE™, is finally complete and available to framers. Our first goal with FrameSAFE is to raise awareness of the importance of safety on the jobsite. NFC's mission is "to help ensure framers leave the jobsite each day in the same health as they arrived." Just as in your manufacturing facilities, establishing a culture of safety begins with thorough and effective communication of potential injury risks and expectations for safe behavior.

Our second goal with FrameSAFE is to provide a standardized approach to safety communication. A standardized approach allows for more universal adoption across the country. One of the greatest hindrances, due to fragmentation, is that each framing crew needs to have its safety plan approved by the general contractor (GC) on each job. In practice, this has led large framing companies like mine to develop our own safety program. Other large framers have done likewise, creating programs that are essentially the same, but different in one way or another. On the other end of the spectrum, many small framers do not develop a safety program at all, but rather follow the GC's overall safety program as a guide.

It's very difficult to develop a good culture of safety when your safety plan changes from jobsite to jobsite. It's also hard to develop a high level of expectation about safe behavior when requirements and enforcement aren't consistent. Through FrameSAFE, every framer, regardless of size, has the opportunity to adopt the same safety protocols and standardized procedures.

Our third goal with FrameSAFE is to share universal best practices when it comes to safe behavior and jobsite hazard mitigation. Framing can be a dangerous occupation. The more we can take the guesswork out of the best way to address injury risks, the better off our framers and our industry will be. At the same time, FrameSAFE establishes a higher expectation for every framer to meet. This program makes it clear you can't shortchange safety; the consequences are too serious.

Hopefully, FrameSAFE will be successful at achieving these goals through a well-developed training approach. At its foundation, the program is based on established best practices and good information. While the program binder is full of text, which can be very valuable for safety coordinators and foremen to get all the background information, a large part of the program is dependent on images. Just like yours, our industry is multilingual.

Even English/Spanish translations can only go so far communicating important safety information. That's why FrameSAFE has hundreds of photos to visually show

at a glance

- ❑ When it comes to jobsite safety, fragmentation within the construction industry creates obstacles that shouldn't be there (and don't have to be).
- ❑ It's very difficult for framing companies to develop a consistent culture of safety when the jobsite-specific safety plan changes from jobsite to jobsite.
- ❑ FrameSAFE provides a standardized approach to safety communication and shares universal best practices when it comes to safe behavior and jobsite hazard mitigation.

correct behavior or point out potential injury hazards. Pictures are very important. In addition to the core safety information, training is also broken up into bite-sized pieces called Toolbox Talks. These single-page training sessions give jobsite foremen a structured way to provide quick refresher training on the jobsite whenever it's convenient.

Finally, in the event of an accident that results in an injury or property damage, FrameSAFE provides standardized reporting guidance and forms to complete. Standardized reporting will have several advantages. Not only will complete information be collected at the time of an accident, but it will also be standardized in a way that will allow us to create a national database to track trends and identify areas to provide additional training.

Why am I telling you all of this? FrameSAFE presents a few major benefits to component manufacturers. First, standardizing jobsite safety for framers and raising the expectations for safe behavior is a good thing for the components industry. For instance, when my company looks at constructing a building from a safety and cost-effective standpoint, we componentize as much as possible. Components limit my framers exposure to fall risks at the leading edge.

For example, with panelized walls, my framers don't have to spend time building rough openings at the building's exterior. The same goes for roofs; installing roof trusses exposes my framers to fall risks a fraction of the time compared to conventional framing. In this day and age, with OSHA visiting jobsites and frequently issuing citations related to improper or inadequate fall protection, components are the best solution.

Second, as we improve the level of safety on the jobsite and push safe behavior as the norm, more people will choose framing as a career. The more framers in the field, the more individuals to install your products and the more jobs will get done. SBC

Kenny Shifflett owns Ace Carpentry in Manassas, VA, and has been in the framing industry for more than 30 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.

TRUSS INDUSTRY STANDARD OF CARE ISSUES

by Kirk Grundahl, P.E.

PART 1

Explore the fragmented building design review and approval process, and the issues it can create for component manufacturers.

Metal plate connected wood trusses are manufactured specialty structural components designed using proprietary software by technicians and engineers who specialize in the design of these products. As with any specialty product, good communication and coordination between the truss designer/manufacturer, the truss buyer (general contractor, builder, framer, etc.) and building designer are paramount to ensure trusses are designed, installed and used correctly.

Misunderstandings and breakdowns in communication and coordination are inevitable, in part due to construction traditions, the building code, and business concepts and models beyond the control of the truss manufacturer and truss industry. *ANSI/TPI 1* states very clearly that the truss manufacturer is responsible for the following key scopes of work (note, *ANSI/TPI* 1 has been adopted into the building code and is, therefore, the law):[1]

1. "The Truss Manufacturer shall obtain the Truss design criteria and requirements from the Construction Documents."
2. "The Truss Manufacturer shall communicate the Truss design criteria and requirements to the Truss Design Engineer."
3. "Where required by the Construction Documents or Contract, the Truss Manufacturer shall prepare the Truss Placement Diagram that identifies the assumed location for each individually designated Truss and references the corresponding Truss Design Drawing."
4. "Where required by the Construction Documents or Contract, Legal Requirements or the Building Official, the Truss Manufacturer shall provide the appropriate Truss Submittal Package to one or more of the following: Building Official; Registered Design Professional for the Building and/or Contractor for review and/or approval per Section 2.3.4.2," which says:
   a. "The Contractor, after reviewing and/or approving the Truss Submittal Package, shall forward the Truss Submittal Package for review by the Registered Design Professional for the Building."
5. "The Truss Manufacturer shall be permitted to rely on the accuracy and completeness of information furnished in the Construction Documents or otherwise furnished in writing by the Registered Design Professional for the Building and/or Contractor."

The building code then complicates matters by writing the concept of deferred submittals into law as follows.

2012 IBC Section [A] 107.3.4.1 Deferred submittals.
For the purposes of this section, deferred submittals are defined as those portions of the design that are not submitted at the time of the application and that are to be submitted to the *building official* within a specified period.

Deferral of any submittal items shall have the prior approval of the *building official.* The *registered design professional in responsible charge* shall list the deferred submittals on the *construction documents* for review by the *building official.*

Documents for deferred submittal items shall be submitted to the *registered design professional in responsible charge* who shall review them and forward them to the *building official* with a notation indicating that the deferred submittal documents have been reviewed and found to be in general conformance to the design of the building. The deferred submittal items shall not be installed until the deferred submittal documents have been *approved* by the *building official.*

[1] All references to ANSI/TPI 1-2007 can be viewed at sbcindustry.com/content/1/design-responsibilities.

This allows trusses to be designed and reviewed by the registered design professional "in responsible charge," noting such review has been performed and submitted to the building official within a specified time after building permit application.

This process seems backward, and contributes to the fragmentation and/or scope of work silos that we see in the construction market.

Building design originates at the top of the structure, where gravity loads are applied and then, in combination with other loads, accumulate into load paths to the ground, so that the foundation supporting the structure can be designed. Accurate resistance of the load path "works best" when the building engineering and installation detailing processes take all the various structural components into account and integrate them into the design of the overall structural framework prior to designing the foundation. This leads to a more optimal design of the roof, walls, floors and foundation from the onset of the project.

Additionally, the contract to obtain trusses is also generally deferred. Therefore, a critical building component may remain undetermined after construction documents are completed and construction of the foundation and the walls has begun.

In the *2010 Florida Building Code,* the definition for a Registered Design Professional in Responsible Charge follows:

> REGISTERED DESIGN PROFESSIONAL (RDP) IN RESPONSIBLE CHARGE. A registered design professional engaged by the owner to review and coordinate certain aspects of the project, as determined by the building official, for compatibility with the design of the building or structure, including submittal documents prepared by others, deferred submittal documents and phased submittal documents.

This definition contemplates and resolves the issue of deferred or phased submittal documents. It states directly that the role of a registered design professional and/or a building designer is to coordinate and review certain aspects of the project for compatibility with the design of the building or structure. This includes the coordination and review of submittal documents prepared by others, deferred submittal documents and phased submittal documents. This is because only the building designer has an overall understanding of the design concepts and anticipated load paths for which design is needed.

A key issue that is often misunderstood is that a Truss Designer[2] designs and Component Manufacturer (CM) produces a single truss[3] to resist loads defined in the Building Designer's[4] plans and specifications. The CM does not gather information to create and design a truss system.

This environment does not yield great building engineering solutions or create value for great engineering because the process is fragmented on purpose, the motivation of which is to generally drive down costs. This fragmentation causes silos of work that most of the time do not interact or, when they do, the interaction is very inefficient. The result is often professional and business expectation mismatches (i.e., I thought the truss manufacturer was doing the truss roof system design), errors in truss application with respect to expected load path, unanticipated load paths, and resulting framing issues with the potential for construction defects that later appear in unexpected ways.

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key definitions:

from *ANSI/TPI 1*

1. **Building Designer:** Owner of the Building or the Person that Contracts with the Owner for the design of the Framing Structural System and/or who is responsible for the preparation of the Construction Documents. When mandated by the Legal Requirements, the Building Designer shall be a Registered Design Professional.
2. **Contractor:** Owner of a Building, or the Person who Contracts with the Owner, who constructs the Building in accordance with the Construction Documents and the Truss Submittal Package. The term "Contractor" shall include those subcontractors who have a direct Contract with the Contractor to construct all or a portion of the construction.
3. **Owner:** Person having a legal or equitable interest in the property upon which a Building is to be constructed, and: (1) either prepares, or retains the Building Designer or Registered Design Professional to prepare the Construction Documents; and (2) either constructs, or retains the Contractor to construct the Building.
4. **Registered Design Professional:** Architect or engineer, who is licensed to practice their respective design profession as defined by the Legal Requirements of the Jurisdiction in which the Building is to be constructed.
5. **Truss Design Engineer:** Person who is licensed to practice engineering as defined by the Legal Requirements of the Jurisdiction in which the Building is to be constructed and who supervises the preparation of the Truss Design Drawings.
6. **Truss Designer:** Person responsible for the preparation of the Truss Design Drawings.
7. **Truss Manufacturer:** Person engaged in the fabrication of Trusses.
8. **Truss Submittal Package:** Package consisting of each individual Truss Design Drawing, and, as applicable, the Truss Placement Diagram, the Cover/Truss Index Sheet, Lateral Restraint and Diagonal Bracing details designed in accordance with generally accepted engineering practice, applicable BCSI-defined Lateral Restraint and Diagonal Bracing details, and any other structural details germane to the Trusses.

[2] **Truss Designer:** Person responsible for the preparation of the Truss Design Drawings.

[3] The Truss Design Engineer shall be responsible for the single Truss component design depicted on the Truss Design Drawing.

[4] Owner of the Building or the Person that Contracts with the Owner for the design of the Framing Structural System and/or who is responsible for the preparation of the Construction Documents. When mandated by the Legal Requirements, the Building Designer shall be a Registered Design Professional.

Truss Industry Standard of Care - Part 1

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Key truss industry considerations that can lead to misunderstandings, misperceptions and potential litigation include:

1. Typically, professional architecture/engineering laws and residential building codes do not require a registered design professional to undertake a complete building design. In exempt areas of the law, the building designer, per *ANSI/TPI 1,* is then the home owner, builder, contractor or framer.

2. CMs have to be extremely careful not to represent themselves as the building designer or the engineering company for the project. The latter can easily be a violation of professional engineering law.

3. Because there are not clearly defined roles and responsibilities in residential construction, the CM is often viewed as selling truss solutions that are thought to be providing an engineered truss "system." This is due to the fact that CMs provide a key set of "engineered" components for the structural framework, including headers, beams, I-joists, trusses, etc. It must be remembered CMs only provide single element structural resistance components. They are really just like sliding glass and/or garage door components, which provide resistance to specifically defined design loads.

4. When building design professionals are involved in a project, they usually undertake the design up front and then the truss layout and truss design are done by others. This is a challenge because the walls, headers, beams and foundation are then set by the load path in the design. This may not be the ideal situation for designing an optimal truss layout or individual truss design.

   a. Given the contracts involved in the construction process and the code-allowed deferred submission process, it is rare that upfront truss design-oriented relationships are forged with architects or engineers that would enable a more streamlined process where component design can be accomplished in concert with their building design concepts.

   b. This is a serious deficiency in the code. The law and the code devalue the collaborative benefits of building design/truss design and the intellectual property of the CM.

5. There is no doubt the fragmented nature of the engineered truss market helps to create a "commodity" sales mindset. This again devalues a CM's intellectual property and technical creativity.

6. Truss design software is a very valuable tool. As with any software, it can become very easy for users, engineers and technicians alike, to view the software results as "always right" and wonder why field and serviceability issues occur. The CM's IP then is in understanding the software and using it creatively and robustly in the context of the take-off and subsequent component manufacturing operations. Using the software is like using a very powerful calculator and not "the answer" to all engineering problems.

7. *ANSI/TPI 1* states:

   "The Contractor, after reviewing and/or approving the Truss Submittal Package, shall forward the Truss Submittal Package for review by the Building Designer [or the Registered Design Professional for the Building] and the Contractor shall not proceed with the truss installation until the Truss Submittal Package has been reviewed by the Building Designer [or Registered Design Professional for the Building]."

   The CM generally provides a significant number of 8½" x 11" sheets of paper, and the law expects the Contractor or the Contractor's personnel to review and approve the information these documents contain. To the extent the CM can help the contractor with implementation, it provides the opportunity to develop a strong working relationship. Obviously, the CM should get paid for any IP utilized.

8. Many times, the foregoing challenges cause many in the industry to remain perplexed why some construction professionals have a negative perception of light-frame and residential construction practice.

In short, the fragmentation and commodity attitudes that exist in the marketplace need to change in order to solve the problems caused by some of these legally-based construction practices.

Where it is in the truss industry's control to do so, it must begin the process of ensuring truss design and installation information is conveyed to the contractor and building designer in a clear and concise manner. Obviously, the best way to do this is to eliminate the fragmented silo process encouraged by deferred submittals and contracts. However, this is a paradigm shift that will not change in the short-term, given current traditions and challenges related to exempt structures.

This article initiates a series that will identify truss-related structural items sometimes missed due to the day-in and day-out demands of truss design and production and the fragmented building design review and approval process. Each article is intended to hone in on items that may be issues in the building market that are not heavily focused upon, provide recommended solutions the truss industry can control, and encourage other options to improve the flow of critical information. The objective is to improve overall quality of truss roof and floor system construction. The next article will focus on resolving and effectively communicating truss design drawing warning notes for truss-to-truss connections. SBC

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Installation of Interior Gypsum Board Finish

by Daniel Lawless, E.I.T. &
Kirk Grundahl, P.E.

Gypsum wallboard provides an excellent example as to why accurate design values are so vital to structural design.

Introduction: Why the Interior Finish Installation Is Important

For the most part, the interior finishes of a building are considered non-structural and are left to the owner's/architect's discretion. However, gypsum wallboard (GWB), the most commonly used interior finish, has a significant effect on the lateral load resistance of a building and is often included in the structural design. For example, the required braced wall lengths in the *2012 International Residential Code (IRC)*[1,2] account for the effect of interior GWB finish and must be adjusted, if it is omitted.

Also, a designer can use interior partitions of a structure that are finished with GWB to resist the wind or seismic loads and may call out a specific fastening pattern for these walls. Due to their role in the structural performance of the building, care must be taken to insure that the interior GWB finishes are properly fastened.

Prescriptive Code Requirements

For buildings braced in accordance with Method Wood Structural Panel (WSP) or Continuous Sheathed Wood Structural Panel (CS-WSP), the *2012 IRC* requires that GWB be installed on the side of the wall opposite to the bracing material. Table R602.10.4[3] of the *IRC* states that the fastening of the interior sheathing for Methods WSP and CS-WSP shall be in accordance with Table R602.3(1)[4]. In Table R602.3(1), the only gypsum product is ½" and ⅝" gypsum sheathing, which is typically used in exterior steel or wood-framed construction as a backup for siding, brick veneer and other similar cladding on single-family housing, apartments and light commercial buildings. Gypsum sheathing is required to be installed vertically and fastened with 1½" galvanized roofing nails, 1½" galvanized staples, or 1¼" Type W or S screws spaced 7" o.c. along panel edges and intermediate supports.

**TABLE R602.3(1)-continued—
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS**

ITEM	DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER	SPACING OF FASTENERS	
			Edges (inches)	Intermediate Supports (inches)
Other wall sheathing				
37	1/2" gypsum sheathing	1-1/2" galvanized roofing nails; staple galvanized, 1-1/2" long; 1-1/4" screws, Type W or S	7	7
38	5/8" gypsum sheathing	1-3/4" galvanized roofing nails; staple galvanized, 1-5/8" long; 1-5/8" screws, Type W or S	7	7

Table 1. Table R602.3(1)-continued—Fastener Schedule for Structural Members.

In the *IRC,* GWB and gypsum sheathing are two different things. The former is typically an interior finish, while the latter is typically an exterior product. (Method GB is defined as gypsum board, which is ambiguous. It could be either GWB or sheathing.) However, Section R602.10.4.3[5] clarifies that the fastening requirements in Table R602.3(1) are for exterior sheathing. Interior gypsum board may be installed as a wall covering in accordance with the less stringent requirements of Table R702.3.5.[6] The commentary for Section R602.10.4.3[7] adds the following information:

[1] http://publicecodes.cyberregs.com/icod/irc/index.htm

[2] *International Residential Code for One- and Two-Family Dwellings (IRC)*; International Code Council; 2012.

[3] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_6_par038.htm

[4] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_6_par010.htm

In the 2009 code, a requirement was added that, for intermittent braced wall panels, regular gypsum wall board must be installed as an interior finish material on the side of the wall opposite the bracing material.

> Note that this requirement is for the use of standard gypsum wall board, not Method GB bracing. Interior finish gypsum wall board can be attached in accordance with Section R702.3.5 (7 inches (178 mm) on center attachment required for Method GB does not apply)…. Although the other bracing methods permit the gypsum board to be installed as a wall covering rather than a Method GB bracing material; when gypsum board is installed as Method GB bracing, the fasteners must be spaced 7 inches (178 mm) on center at all panel ends, edges and intermediate supports. The fastener schedule for gypsum board installed as a wall covering (see Section R702.3.5) is less stringent than when it is installed as a bracing material.

This makes it clear that, despite the incorrect reference in Table R602.10.4[8], GWB may be installed as an interior finish even though it is considered to contribute to the wall bracing.

From Table R702.3.5, it can be seen that the GWB can be installed either parallel or perpendicular to the framing members and that the maximum fastener spacing for studs spaced 16" o.c. is 8" o.c. for nails and 16" o.c. for screws. For studs spaced 24" o.c., the fastener spacing for nails remains at 8" o.c. but decreases to 12" o.c. for screws.

The above fastening schedules are for applications without adhesive attachment. For applications with adhesives, the maximum fastening spacing is 16" o.c. for nails and 24" o.c. for screws, regardless of the stud spacing.

For braced wall lines located in the interior of the building, Method GB may be used as bracing. As noted earlier, this method requires that the sheathing be fastened 7" o.c. along panel edges and intermediate supports. Method GB does not require that an interior finish material be installed on the opposite side of the wall, but the braced wall lengths must be doubled in accordance with Table R602.10.5 if the wall is single sided.

METHOD (See Table R602.10.4)	MINIMUM LENGTH[a] (inches)					CONTRIBUTING LENGTH (inches)
	Wall Height					
	8 feet	9 feet	10 feet	11 feet	12 feet	
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP	48	48	48	53	58	Actual[b]
GB	48	48	48	53	58	Double sided = Actual Single sided = 0.5 × Actual

Table 2. Table R602.10.5 Minimum Length of Braced Wall Panels.

If the fastener spacing is decreased to 4" o.c. along the panel edges and all horizontal joints are blocked, the required length of bracing can be reduced by a factor of 0.7 in accordance with Table R602.10.3(2).

Continued on page 18

THICKNESS OF GYPSUM BOARD (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBERS (inches o.c.)	MAXIMUM SPACING OF FASTENERS (inches)		SIZE OF NAILS FOR APPLICATION TO WOOD FRAMING[c]
				Nails[a]	Screws[b]	
Application without adhesive						
$3/8$	Ceiling[d]	Perpendicular	16	7	12	13 gage, $1\frac{1}{4}$″ long, $\frac{19}{64}$″ head; 0.098″ diameter, $1\frac{1}{4}$″ long, annular-ringed; or 4d cooler nail, 0.080″ diameter, $1\frac{3}{8}$″ long, $\frac{7}{32}$″ head.
	Wall	Either direction	16	8	16	
$1/2$	Ceiling	Either direction	16	7	12	13 gage, $1\frac{3}{8}$″ long, $\frac{19}{64}$″ head; 0.098″ diameter, $1\frac{1}{4}$″ long, annular-ringed; 5d cooler nail, 0.086″ diameter, $1\frac{5}{8}$″ long, $\frac{15}{64}$″ head; or gypsum board nail, 0.086″ diameter, $1\frac{5}{8}$″ long, $\frac{9}{32}$″ head.
	Ceiling[d]	Perpendicular	24	7	12	
	Wall	Either direction	24	8	12	
	Wall	Either direction	16	8	16	
$5/8$	Ceiling	Either direction	16	7	12	13 gage, $1\frac{5}{8}$″ long, $\frac{19}{64}$″ head; 0.098″ diameter, $1\frac{3}{8}$″ long, annular-ringed; 6d cooler nail, 0.092″ diameter, $1\frac{7}{8}$″ long, $\frac{1}{4}$″ head; or gypsum board nail, 0.0915″ diameter, $1\frac{7}{8}$″ long, $\frac{19}{64}$″ head.
	Ceiling[e]	Perpendicular	24	7	12	
	Wall	Either direction	24	8	12	
	Wall	Either direction	16	8	16	
Application with adhesive						
$3/8$	Ceiling[d]	Perpendicular	16	16	16	Same as above for $3/8$″ gypsum board
	Wall	Either direction	16	16	24	
$1/2$ or $5/8$	Ceiling	Either direction	16	16	16	Same as above for $1/2$″ and $5/8$″ gypsum board, respectively
	Ceiling[d]	Perpendicular	24	12	16	
	Wall	Either direction	24	16	24	
Two $3/8$ layers	Ceiling	Perpendicular	16	16	16	Base ply nailed as above for $1/2$″ gypsum board; face ply installed with adhesive
	Wall	Either direction	24	24	24	

Table 3. Table R702.3.5 Minimum Thickness and Application of Gypsum Board.

[5] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_6_par041.htm?bu2=undefined

[6] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_7_par015.htm

[7] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_6_par041.htm

[8] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_6_par038.htm

ADJUSTMENT BASED ON	STORY/ SUPPORTING	CONDITION	ADJUSTMENT FACTOR[a,b] [multiply length from Table R602.10.3(1) by this factor]	APPLICABLE METHODS
Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.40	DWB, WSP, SFB,PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
Gypsum board fastening	Any story	4 inches o.c. at panel edges, including top and bottom plates, and all horizontal joints blocked	0.7	GB

Table 4. Table R602.10.3(2) Wind Ajustment Factors to the Required Length of Wall Bracing.

Installation of Interior Gypsum Board Finish

Continued from page 17

In the IRC, the contribution of the interior finish to the braced wall nominal unit shear capacity (NUSC) was considered to be 200 plf (ultimate strength). This is the same NUSC used to calculate the braced wall lengths for Method GB with sheathing on one side. However, for interior finishes fastened with screws, the fastener spacing can be more than double the fastener spacing for Method GB. For example:

> 7" o.c. fastener spacing per Table R602.3(1) = 200 plf = 16" o.c. fastener spacing per Table R702.3.5

This raises the question: Why is the same NUSC used for both applications?

According to Crandell and Martin,[9] the "nominal unit shear strength of 200 plf is assigned to the interior finish based in part on interior finish performance in whole building tests." The NUSC of 200 plf came from the design values in the *Special Design Provisions for Wind and Seismic*[10] for ½" GWB with 16" o.c. studs and 5d cooler nails spaced 7" o.c.

The Ad Hoc Wall Bracing Committee, led by Washington State Professor Dan Dolan, allowed this design value to be used for ½" GWB with 24" o.c. studs and #6 screws spaced 16" o.c. Thus, the NUSC of 200 plf used for interior GWB finish is not based on the results of individual shear wall tests; rather, it is a committee judgment of the expected performance.

Table 6 compares the different fastening requirements of IRC Table R602.3(1) and R702.3.5. The NUSC for all of the fastening patterns in Table 6 is 200 plf according to the IRC.

Gypsum Shear Wall Tests

The SBC Research Institute (SBCRI) has performed cyclic tests for a proprietary customer who has allowed this work to be published, in accordance with ASTM E2126 on ten (10) 23' long shear walls sheathed with ½" GWB. Photos of the test fixture and test specimen are shown in Figure 1.

The walls were constructed of 2x4 SPF Stud grade vertical framing members and 2x4 SPF No.2 top and bottom plates.

Figure 1: Photos of ASTM E2126 Test Setup with Gypsum Shear Wall.

Sheathing Material	Material Thickness	Fastener Type & Size[2]	Max. Fastener Edge Spacing (in.)[3]	Max. Stud Spacing (in.)		SEISMIC v_s (plf)	SEISMIC G_a (kips/in)	WIND v_w (plf)
Gypsum wallboard, gypsum base for veneer plaster, or water-resistant gypsum backing board	1/2"	5d cooler (0.086" x 1-5/8" long, 15/64" head) or wallboard nail (0.086" x 1-5/8" long, 9/32" head) or 0.120" nail x 1-1/2" long, min 3/8" head	7	24	unblocked	150	4.0	150
			4	24	unblocked	220	6.0	220
			7	16	unblocked	200	5.5	200
			4	16	unblocked	250	6.5	250
			7	16	blocked	250	6.5	250
			4	16	blocked	300	7.5	300
		No. 6 Type S or W drywall screws 1-1/4" long	8/12	16	unblocked	120	3.5	120
			4/16	16	blocked	320	8.0	320
			4/12	24	blocked	310	8.0	310
			8/12	16	blocked	140	4.0	140
			6/12	16	blocked	180	5.0	180
	5/8"	6d cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head	7	24	unblocked	230	6.0	230
			4	24	unblocked	290	7.5	290
			7	16	blocked	290	7.5	290
			4	16	blocked	350	8.5	350
		No. 6 Type S or W drywall screws 1-1/4" long	8/12	16	unblocked	140	4.0	140
			8/12	16	blocked	180	5.0	180
	5/8" (Two-Ply)	Base ply--6d cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head Face ply--8d cooler (0.113" x 2-3/8" long, 0.281" head) or wallboard nail (0.113" x 2-3/8" long, 3/8" head) or 0.120" nail x 2-3/8" long, min 3/8" head	Base: 9 Face: 7	16	blocked	500	11	500

Table 5. Special Design Provisions for Wind and Seismic.

[9] "The Story Behind the 2009 IRC Wall Bracing Provisions (Part 2: New Wind Bracing Provisions)"; Jay Crandell and Zeno Martin; *Wood Design Focus,* Spring 2009.

[10] http://www.awc.org/standards/sdpws.php

Comparison of Fastening Patterns Allowed in the IRC							
IRC Table 602.3(1)				*IRC Table R702.3.5*			
Fastener	Stud Spacing (in o.c.)	Fastener Spacing (in o.c.)	Orientation of Panels	Fastener	Stud Spacing (in o.c.)	Fastener Spacing (in o.c.)	Orientation of Panels
#6 Screw	16 or 24	7	Vertical	#6 Screw	16	16	Either Direction
					24	12	Either Direction
1-1/2” Roofing Nail	16 or 24	7	Vertical	6d Cooler Nail	16 or 24	8	Either Direction
16 ga. 7/16” Crown Galvanized Staple	16 or 24	7	Vertical	--	--	--	--

Table 6. Comparison of Fastening Patterns Allowed in the *IRC*.

Average Ultimate Shear Capacity of 1/2" Gypsum Board (plf)			
Fastener Type	**Fastener Spacing (in)**	**Stud Spacing**	
		16" o.c.	**24" o.c.**
#6 Type W Screw	16:16	138	--
#6 Type W Screw	8:8	275	241
#6 Type W Screw	4:16	411	401

Table 7. Average Ultimate Shear Capacity of 1/2" Gypsum Board Walls.

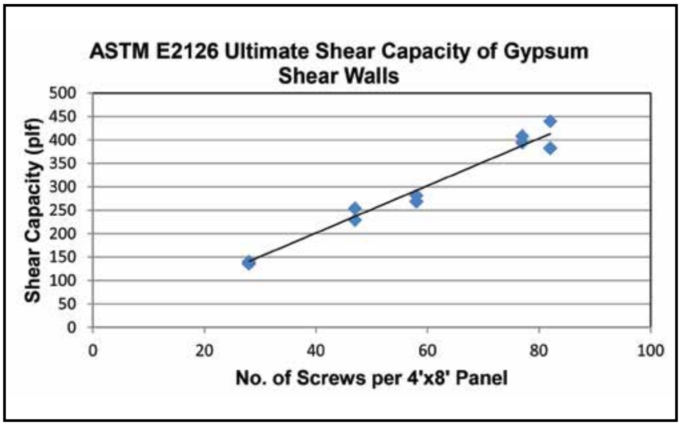


Figure 2. Plot of Shear Capacity vs. Number of Fasteners per Gypsum Panel.

The joints between panels were taped and finished with joint compound.

The ultimate shear capacities for the tested walls are given in Table 7. Each ultimate shear value is the average of two shear wall tests.

As could be expected, the shear wall with fasteners spaced 16" o.c. had an ultimate capacity significantly less than the 200 plf used by the *IRC* for interior finishes. The shear walls with fasteners spaced 8" o.c. had an ultimate capacity somewhat greater than the 200 plf NUSC used for Method GB. Also, the shear walls with fasteners spaced 4" o.c. at panel edges had an ultimate capacity that was significantly greater than the 285 plf (200 plf/0.7 = 285 plf) NUSC allowed in the IRC for Method GB with this fastening pattern.

By comparing the number of fasteners in each 4' x 8' gypsum board panel for the different fastening patterns and stud spacings to the ultimate shear capacity, SBCRI’s customer used generally accepted engineering to determine that the shear strength is a function of the number of fasteners. As shown in Figure 2, there is a linear relationship between the number of fasteners in a shear wall and its shear capacity.

Conclusion

As can be seen above, the *IRC* and *SDPWS* in combination lead to a great deal of confusion over the NUSC for shear walls that use the GWB capacity addition of 200 plf. With current field applications of GWB, it should be clear the expected shear resistance capacity of a typical exterior sheathed wall with an interior GWB applied does not meet the capacity expected by the IRC or SDPWS. In order to do so, galvanized roofing nails or Type W or S screws per Table R602.3(1)[11] must be used.

SBCRI’s proprietary customer wanted to know what the typical GWB application was in the field and did the research needed to set a good typical installation foundation. In all the work that this proprietary customer undertakes, the baseline shear wall testing performed uses a 16:16 screw fastening pattern. The reason this is done is so that design values used in the market are accurate from a generally accepted engineering practice point of view. Further, more accurate and reliable engineered design can be performed along with a solid understanding of the engineering boundary conditions that may lead to unintended performance consequences in the field.

Given all of this, and since GWB is included as part of the wall bracing design, even when used only as an interior finish, it is important to verify that it is installed properly per the construction documents, the building code or *SDPWS*.

Interior finishes should be installed in accordance with *IRC* Table R702.3.5. Walls that are used as braced wall lines with Method GB bracing should be installed in accordance with Table R602.3(1). Research conducted by SBCRI shows that the fastening pattern is critical to providing adequate bracing

Continued on page 20

[11] http://publicecodes.cyberregs.com/icod/irc/2012/icod_irc_2012_6_par010.htm

Installation of Interior Gypsum Board Finish

Continued from page 19

strength and can be used to predict the capacity of a gypsum shear wall.

As has been stated frequently in the pages of ***SBC,*** many people rely on the derivation of design values, which have been codified into law through the codes and standards (e.g., *IRC, WFCM, IBC, SDPWS,* etc.), whether they are technically accurate or not. If the values are prescribed in the code it is the law and, as such, is relied upon in the market as accurate. As a consequence, it is reasonable to assume the law developers would seek to fix any inaccurate values. This is particularly true if empirical evidence shows the law is nonconservative in nature, which then generally leads to a lower than otherwise expected factor of safety. This is not necessarily bad, it merely should be transparently known so good performance and engineering judgments can be made.

No one other than the purveyors of the products, the product associations and/or the International Code Council (ICC) can assume responsibility for the accuracy of any code-adopted design values. All others must rely upon the law's accuracy for engineering evaluation. Additionally, all users of the code and documents like *SDPWS* rely on the fact that manufacturers of code-adopted products stand behind the legally established design values that have been created by the associations that publish code-defined design values for a given commodity product. All equivalency testing and related engineering analysis use this code-defined engineering foundation rightly or wrongly. This is why SBCA has published its Design Value Policy.[12]

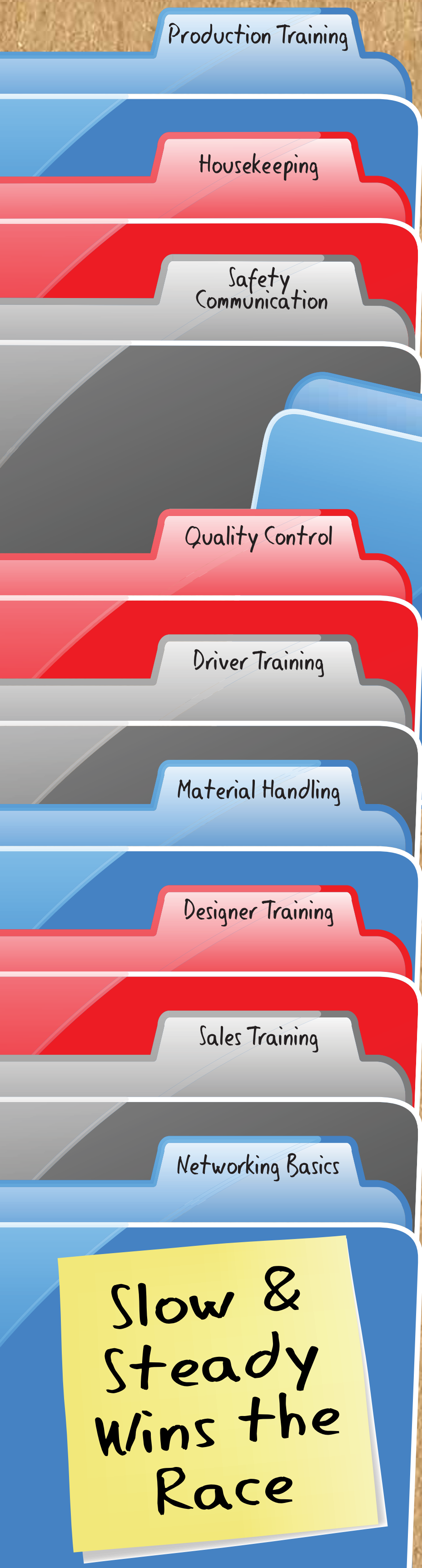
It has been a strong desire of both SBCA and SBCRI to fully understand fundamental material properties and their single-element engineering performance, and then take that to the next level in developing a much better understanding of the performance of those raw materials in a real-world assembly. It is increasingly clear to us that reliable and safe building performance is predicated upon accurate design properties, engineering precision and a complete understanding of raw material engineering considerations needed for successful application or installation. The suppliers of these products are responsible to ensure that there is easy access to this understanding, along with any relevant factors that should be considered in that design process.

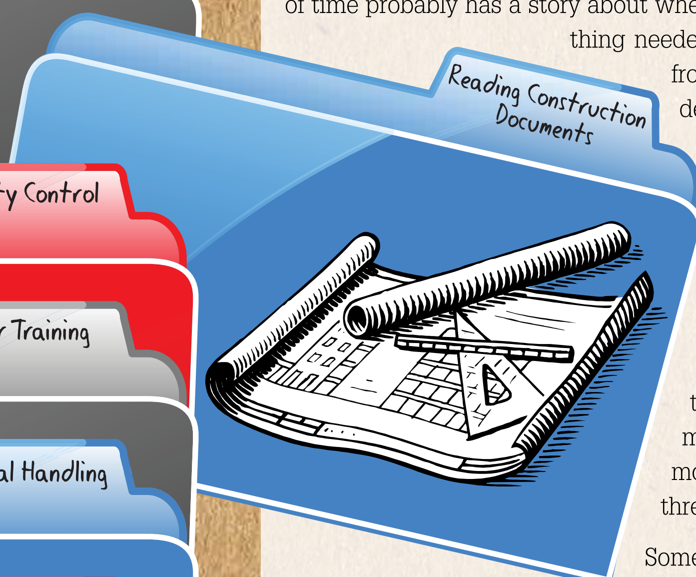
It clearly is in the best interests of the construction industry at large, as well as the truss and component manufacturing industry in particular, that engineering, and thus, construction, be entirely based on tested and accurate raw material load resistance data. This will not only improve construction performance that is based on engineering and is therefore safe, but will further allow for much better engineering-based judgments and certainly future engineering innovation. **SBC**

[12] http://www.sbcmag.info/dvp

TOP 10 Employee Training Tools

by Ben Hershey & Sean D. Shields





The component industry is full of complex documentation, from blueprints and truss design drawings to bids and contracts. Reading these documents effectively and knowing what to look for can make the difference between a profitable job and a huge headache. This article will discuss some of the easy mistakes that can be made and advise on processes that can help reduce the chance they occur.

Most people probably find reading through a set of blueprints for a commercial project daunting, but sometimes looking at a sketch given to you by a home builder can be just as challenging. The first step for anyone to have confidence is methodically making good decisions during review. Everyone who has been in this industry any length of time probably has a story about when a detail was missed, a note indicating something needed to be provided wasn't read, a plan changed from the bid set wasn't caught, or an elevation detail wasn't incorporated. The list of mistakes is endless, and most can be avoided if the plans are reviewed methodically.

Set Aside Time & Tools

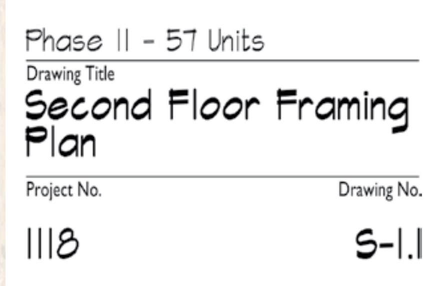
The first step is setting aside sufficient time to review all the documents. Each blueprint or set of bid documents can differ in the amount of detail provided or excluded. However, taking the same approach to reviewing every document will eliminate many of the errors that commonly occur. Plans and bid documents always threaten to give users information overload.

Some helpful tools to have on hand while reviewing documents include: a pad of paper to make notes, highlighters to define pertinent details and a scaled ruler for when the architect scaled the drawing. For those of us getting older, it's probably also a good idea to have a pair of glasses or a magnifying glass for that set of plans that went from D scale to 8½" x 11". Fortunately, many of the new computerized takeoff programs allow the user to zoom in and out. Regardless of whether you go the pen and paper or the computerized route, have a consistent approach. Start in the top left corner of the document and work across the page left to right until you reach the bottom of the page.

Understand the Nomenclature of Plans

It's vital for anyone who reviews plans to understand how they are labelled, and in the case of blueprints, organized by discipline. For instance, if a sheet/page number states "S1.07," the reader should know that "S" indicates it is a structural drawing, usually provided by the Engineer of Record. The "1" is the sheet type or plan (2 is elevations, 3 is sections, etc.), and the ".07" is the sequence, in this case, the seventh page in the section. One good resource that covers all of this in detail can be found at http://nationalcadstandard.org/ncs5/pdfs/ncs5_uds1.pdf, which can also be used as a helpful toolbox talk with design technicians.

In instances where only the "A" (architectural) set of plans or the "S" (structural) set is received and the customer indicates it is the only set they have, there are two options: call the Architect of Record and ask for the additional set, or be very specific in the bid proposal that the bid is based solely on the set of plans received (see the online version of this article for more information on why this is a good idea). In some cases, it may even be a good idea to list out the pages provided in generating the bid.



Read Through Everything

After initial review of the plans, read the Project Specifications, General Conditions, Special Conditions and Construction Contracts. Each one of these sections of the bid documents or blueprints are not only critical, but provide essential information on what a bid/proposal needs to include. During review of these documents, highlight the sections pertinent to component manufacturing operations. Many times, hidden details like the requirement for 2x6 top chords, SFI/FSC lumber, a minimum grade of material, or a special loading requirement can be found here.

Unfortunately, these important details are not always found on a plan page that applies to the roof, floor or wall. Consequently, headaches can be avoided by reading these notes and sections of the plan documents. For further information, a source for reading construction documents is provided by the Construction Specifications Institute: csinet.org/masterformat.

Just like a book, the cover page(s) contains a lot of vital information, including the project name, location and owner; the name of the architect and architectural firm (if applicable); the name of the structural engineers (if applicable); and in a separate box, the design criteria, building data and symbol legend. It's important to note that all the design criteria are not always presented in this box. Often information on the cover page is boilerplate information. More detailed information is typically found within the plan or on specific pages. What is important is to be thorough and highlight everything that is pertinent to your scope of work.

Think Plan, Elevation & Section

It may sound simple, but when looking at a set of blueprints, it is good to know specifically what is being shown in a particular illustration. For instance, a "plan view" is a downward look at the object or section of a building. In contrast, an "elevation view" looks sideways at the object, usually from each cardinal direction. Finally, a "section view" is a cut-through view of the object that shows how something should be built. One way to keep them straight during review is to use different colored highlighters. Use a yellow highlighter for details related to the layout or profile of a component, and a green highlighter for items related to the design of the truss, EWP or wall. This approach to plan review can give a good idea what the architect or engineer was trying to convey. It's also possible to uncover information gaps that need to be answered through a subsequent request for information (RFI).

Review All Call Outs

There are times when the architect or engineer will use a symbol to call out a detail from the other set of drawings, or refer to a specific page where more detailed information can be found. It can be helpful to highlight these symbols and then go to that page to review what has been called out. Many times, this is where hidden items that apply to components can be found. For example, the architect or engineer might refer to the mechanical pages where HVAC is called out to run through the floor trusses, and it specifies where a chase run needs to be placed for the ductwork. In commercial buildings, for instance, it may call out for a sprinkler run that is going to hang off the bottom chord of a truss.

In the absence of complete information, don't make assumptions. Don't assume that an architect's called out dimensions are going to close the building. It is not unheard of that, when inputting the dimensions of a building into the layout software, it becomes clear the architect did not close the walls. Fortunately, newer software versions used by architects no longer allow this, particularly when they move a wall or change a dimension for the owner, but it still happens on occasion. Generally, a phone call or RFI can resolve the discrepancy. After the phone call, document on the plan the date, time and who you talked to, as well as a summary of the information gathered. Finally, don't forget to let the customer (the framer, the general contractor, the builder, etc.) know of any necessary changes, so that everyone makes the same change to the building plan.

Truss Design Drawings

When it comes to reading truss design drawings and/or truss placement diagrams, everyone uses the same general format, with each plate company providing a boilerplate that calls out the various pieces of information on a drawing. One idea to consider is that, when you send out your jobsite package, send these call outs as well. This can have two advantages: one, it adds an extra layer of protection to the company; and two, it provides good training information for the customer. Just as an architect and engineer may provide critical information on their blueprints and documents, our industry can do the same for our customers. By highlighting the information, we help ensure they know that what was designed was based on a given set of drawings.

Again, this can be a daunting task for someone who doesn't do this often, or hasn't done it in the past. However, by following these best practices, it is not difficult to be successful. Unroll those plans, take a breath and be methodical! **SBC**

Ben Hershey is Past President of SBCA and a Lean Management & Manufacturing Expert with 4Ward Consulting Group. The topic of Quality Control will be covered in the December issue.

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L-R: Joe Hikel, Scott Ward and Carl Schoening.

At this year's SBCA Annual meeting, held in conjunction with BCMC in Charlotte, NC, the industry's annual awards were announced:

The **SBCA Hall of Fame Award** honors an individual who has contributed significantly to the advancement of both SBCA and the component industry in a meaningful and beneficial manner. This year's winner is Joe Hikel, COO of Shelter Systems Limited in Westminster, MD.

The **SBCA Leadership Award** honors an individual who has helped nurture, support and grow the structural components industry. This year's winner is Scott Ward, Secretary-Treasurer of Southern Components, Inc. in Shreveport, LA.

The **Dick Bowman Industry Enthusiast Award** honors an individual who, over the years, has supported BCMC and the structural building components industry with enthusiasm and integrity in an unselfish and positive manner. This year's winner is Carl Schoening, Vice President of Sales for Eagle Metal Products in Dallas, TX.

Congratulations to these three men and thank you for your great service to SBCA and the entire structural building components industry! SBC

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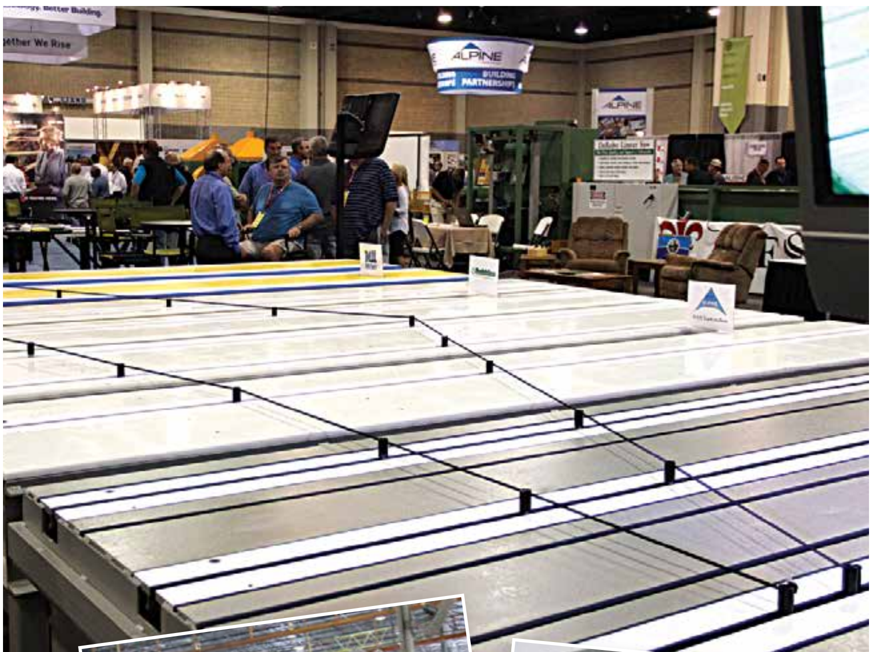

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