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exec's message

by Kirk Grundahl,
SBCA Executive Director

You Don't Know What You Don't Know, Part II

As has been stated previously in this magazine, it is very difficult (if not impossible) for component manufacturers to compete effectively when design resistance is overstated by law, and even engineers find that the best economic solution is an IRC-based prescriptive solution. This means that, when the model code is adopted into law by a state, county or municipality, in effect, it provides a monopoly-like solution to an engineering problem.

Here are a few examples:

1. IRC-based braced wall panel applications that meet the requirements of Section R602.10 should have the following values, based on SBCRI testing. As you can see, when the IRC provides a solution that cannot be supported by testing of real buildings in a code-compliant application of braced walls, more accurate and technically correct engineered solutions will never be able to compete. For more information about this table and the facts behind it please contact Larry Wainright at lwainright@sbcmag.com and see the SBCA IRC code change proposal referenced in the online version of this article.

R602.10.4.4 Design Values. For the purpose of braced wall design, the capacity of wood structural panels to resist lateral loads, as found in Table R 602.10.3(1) are found in Table R602.10.4.4.

TABLE R602.10.4.4 SIMPLIFIED SHEAR VALUES FOR WIND LOADING OF BRACED WALL LINES

Sheathing Material	Bottom plate connection to foundation	Fastener	Fastener Spacing	Any Species Stud Framing		
				Tested capacity	System Effects Factor	IRC Lateral Design Capacity
3/8", 7/16" or 15/32" WSP @16" and 24" o.c. framing	Anchor bolts per code requirements	6d (2" x 0.113" nails) or 8d (2 1/2 x 0.131"	6:12	350	1.8	600
3/8", 7/16" or 15/32" WSP @16" and 24" o.c. framing (with 1/2" gypsum on interior face of wall.	Anchor bolts per code requirements	6d (2" x 0.113") or 8d (2 1/2 x 0.131"nails and Types S or W drywall screws.	6:12 WSP & 16:16 for GWB	450	1.8	840

The lateral design capacity of braced wall panels is based on full scale wall assembly tests using the minimum restraint provisions of the IRC, further adjusted by the partial restraint/systems effect factor.

at a glance

- When the IRC provides a solution that cannot be supported by testing of real buildings in a code-compliant application of braced walls, more accurate and technically correct engineered solutions will never be able to compete.
- There is some resistance in the market to establishing standard factors for product equivalency or system performance because it may result in non-wood products graining an advantage over traditional OSB market share.
- A top testing priority for SBCA is "Framing the American Dream III," which seeks to test a typical stick framed roof and compare its performance to an identical engineered truss roof.

2. Lateral wall panel testing through ASTM E72 has been used to justify the traditional OSB braced wall design values, which has become the "index test" by APA-The Engineered Wood Association and the American Wood Council (AWC). The ASTM E72 test results have been used as the basis, with factoring/modification, to arrive at the 600 plf and 840 plf unless listed in Table R602.10.4.4. (See the Zeno Martin and Jay Crandell paper referenced in the online version of this article for further details). This test standard states the following: **Section 14 Racking Load—Evaluation of Sheathing Materials on a Standard Wood Frame**

   NOTE 2—This standard has been used to evaluate design shear resistance of wall assemblies without the involvement of anchorage details. If the test objective is to measure the performance of the complete wall, Practice E564 is recommended.

   14.1 *Scope*—This test method measures the resistance of panels, having a standard wood frame, and sheathed with sheet materials such as structural insulating board, plywood, gypsum board, transite, and so forth, to a racking load such as would be imposed by winds blowing on a wall oriented at 90° to the panel. It is intended to provide a reliable, uniform procedure for determining the resistance to racking load provided by these sheet materials as commonly employed in building construction. Since a standard frame is employed, the relative performance of the sheathing is the test objective.

   14.1.1 This test is conducted with standardized framing, loading procedures, and method of measuring deflection, as detailed in the method to ensure reproducibility. Provision is made for following the sheathing manufacturers' recommendations for attaching the sheathing to the frame, and for reporting the behavior of the specimen over its entire range of use.

   14.1.2 In applying the results, due allowance shall be made for any variation in construction details or test conditions from those in actual service.

3. A 1985 article published by the American Society of Civil Engineers (ASCE) entitled "Light-Frame Shear Wall Length and Opening Effects" had this to say about ASTM E72 testing (the full paper and related information can be found in the online version of this article]:

   Standard methods of testing the racking capacity of light-frame walls are inefficient and may give erroneous estimates of shear wall performance. This study is concerned with improving the data base for racking resistance of light frame walls with plywood and gypsum sheathings…

   The current ASTM E 72 test does not represent a shear wall in a structure. This study shows smaller, less expensive tests could be used instead of ASTM E 72 to predict relative ultimate racking strengths of different sheathing materials. The alternative test method, ASTM E 564 produces results that cannot easily be compared between researchers. However, ASTM E 564 may be a better indicator of shear wall performance in a structure.

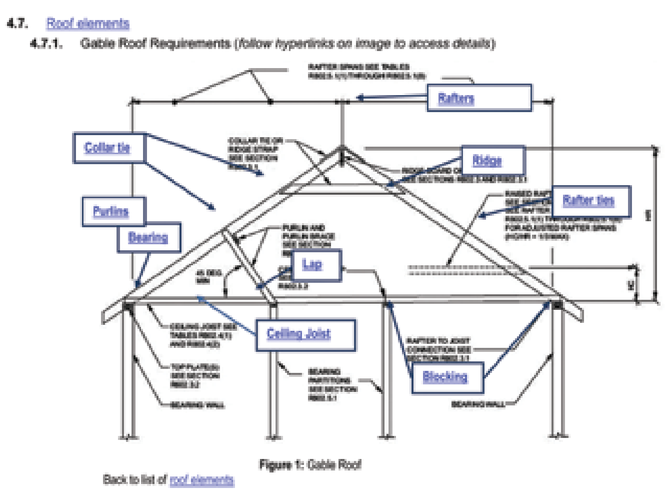
4. Ed Elias, Corporate Secretary of APA (now APA President) had this to say in a key section of his letter to us regarding a meeting we in January, 2013, where we specifically discussed the 1.8 IRC factor in the SBCA proposed IRC Table R602.10.4.4:

   "APA staff has reviewed the information that was shared with us and we have the following comments and concerns:

   - We believe that a major goal for the SBCA position is to provide a cost-effective engineering solution to their membership and as such this goal serves the SBCA membership well. However, by establishing standard factors in which product equivalency or system performance are applied generically, an unintended consequence may be that non-wood products (e.g. foam sheathing) gain an advantage and supplant traditional OSB market share. This is not in our Association member's best interests..."

The foregoing is just the tip of the iceberg in terms of examples where the IRC effevtively legislates competitive advantage to forest products that SBCRI has uncovered through its real-world assembly testing. This recently revealed disparity in the market is one reason why SBCA recently approved the policy, *Raw Material and Construction Product Purchasers, Resellers and Users Depend on Design Properties in the Raw Materials and Construction Products to be Accurate and Reliable*.

This is also a top testing priority for SBCA in what we are calling "Framing the American Dream III." This testing program seeks to test a typical stick framed roof as it is installed by framers today, and compare its performance to an identical engineered truss roof. Can you imagine what we will find if the IRC has done the same thing to roofs as they have to walls? Just look at the typical code requirements for roof stick framing.



As stated in our 2009 TPI/SBCA joint testing agreement, our industry believes in the following guiding principles:

Section C – SBCA/TPI Guiding Principles (from the December 3, 2009 signed agreement)

1. Metal Plate Connected Wood Truss (MPCWT) components perform in unique ways as installed in assemblies.

Continued on page 10

Exec's Message • Continued from page 9

2. Further studying of MPCWT components, through testing of as-built assemblies and analysis of the results may provide the industry with additional information and knowledge. The goal of this testing is to enable greater understanding and continued advancement of MPCWT design while continuing to maintain truss analysis and design founded on sound engineering principles.
3. Pursuing testing and analysis of MPCWT components in as built assemblies will present unique opportunities that may challenge current thinking and practices which is viewed as healthy and a worthwhile step in advancing the industry.
4. While assembly testing is desirable, integrating this new knowledge with individual MPCWT component testing is also desirable so that future advancements can also be made using empirical correlation and modeling.
5. SBCA has a state of the art testing facility (SBCRI) capable of testing individual members in components, individual components as designed today and individual components in actual as-built assemblies making greater understanding of both testing modes and their interrelationship very robust.

We have a strong suspicion that we may likely find again that we do not know what we do not know about stick frame roof performance. If it is anything like lumber—where there was a factor of 1.3 design value competitive advantage over engineered solutions since at least 1984, and wood structural panel shear walls, where we have found a factor of 1.8 design value competitive advantage over engineered solutions since at least the 2000 IRC--roof trusses may also be at a code-compliant, competitive disadvantage. Our goal is to expose these types of inequities in the marketplace so that the engineering we perform every day has the value it rightly deserves. The devaluation of engineering through prescriptive engineering should have everyone that makes a living through the structural building component industry passionate about changing this circumstance sooner than later. SBC