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June 10, 2014

Mr. Brad Douglas
Mr. Phil Line
Mr. Buddy Showalter
American Wood Council (AWC)
222 Catoctin Circle SE, Suite 201
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Re: WDSC Ballot I for Special Design Provisions for Wind & Seismic (SDPWS) (04/2014) Finding of Non-Persuasive on Ballot I-1 Lawless Negative

Dear Brad, Phil and Buddy:

Thank you for working with our group of customers so well as we participate in the revision and balloting process for the Special Design Provisions for Wind & Seismic (SDPWS) version 04/2014. Although we understand "the WDSC's"[1] desire to move SDPWS forward, and we expected that our negative ballot would be overturned by the committee through a vote of our work being non-persuasive (see Attachment 1 -…Finding of Non-Persuasive.... Lawless Negative), we continue to sincerely believe this wood structural panel (WSP) standard has fundamental mechanics of materials issues to address that should be taken more seriously than they have by the WDSC and the WSP industry overall. As such, we are providing this written response to the "summary of comments and draft responses" (see Attachment 2 - AWC-WDSC…..Summary of Comments and Draft Response) sent to us by AWC staff and we reaffirm our negative vote.

We apologize in advance for our lengthy response, in case it may not be viewed as a serious conceptual response and/or is in some manner challenging to understand. This seems to be a fairly common response to some of our recent work by the industry AWC represents. However, we believe you three have the requisite expertise and background to comprehensively understand the concepts we bring forward, and we are thankful for that. These are challenging issues, and unfortunately dealing with challenging issues requires time to work through their depth, and is hard to do in an executive summary format (i.e. 30-second sound bites.)

Finally, we fully expect to have our reaffirmation dispensed with procedurally, and as such, the standard will move forward as currently revised. Again, it is our sincere desire to remain on record

[1] Taken from the ballot response "However, 'the group' encouraged Lawless", which then, for the purposes of this letter, 'the group' will become "the WDSC", and will also be used to include all Wood Design Standards Committee members and all Task Groups (TGs).

with our concerns, as we believe they are important positions for us to take from a technical, business, risk management and professional engineering point of view.

The key issues, and our thoughts with respect to our SDPWS negative and the committee finding of our vote being non-persuasive, are as follows:

1. As stated by a committee voter, "the performance basis of nominal design values is not well documented and needs more transparency as to actual safety margins (relative to minimum values or average values) and deflection limits represented. What is the deflection limit for WSP when the value is based on multiplying a design value that might be determined based on an E72 test at a 0.2" deflection limit?"

   This statement causes the following series of concepts to present themselves:

   a. There is a serious lack of understanding of the nominal unit shear capacities (NUSC) and computed allowable stress design values (NUSC divided by 2 per section 4.3.3 and per Mr. B.J Yeh of APA) provided in table 4.3A in the context of the use of ASTM E72 (E72) as the APA index test to create NUSC values, which states that;

      > "NOTE 2—If the test objective is to measure the performance of the complete wall, Method E 564 is recommended."[2]

      While it is not clear to us, or other professionals working with SDPWS, it is our understanding that each cell of Table 4.3A has been created from either:

      i. ASTM E72 testing, or

      ii. Analytical computations based on nail shear capacities using NDS equations.

         1. Presumably this is why a reduction factor is given for stud species in the footnotes of Table 4.3A and other similar tables in SDPWS.

      As stated above, transparency and clarity seems to be needed.

   b. The boundary conditions of E72 are generally intended to assess the sheathing attachments to the studs and the E72 test conditions force a rectangle into a parallelogram. This causes an unknown vertical load to be applied simultaneously to the lateral load to induce a shearing load on the wall where this load is applied to the corner of the test assembly. Due to all of this, the stress on the shear wall is more fastener-stud interface oriented. In other words, the stiff rectangular sheathing, which does not buckle easily, tries to stay in rectangular shape while the studs deform laterally under the top corner lateral load, causing the sheathing to slide up relative to the stud. This then causes most of the stress on the nail-sheathing interface. For comparative purposes, this looks similar to the following photos (See Attachment 3 – [page 15]……Weyerhaeuser Report 2379A - E72 Testing of WSP):

[2] ASTM E72 Designation: E 72 – 05 An American National Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, Section 14

Figure 8: Typical OSB sheathing edge tearout

Figure 9: Typical fastener head pull-through and withdrawal for an OSB sheathed assembly

c. What no one seems to understand well is how to translate E72 test data (see note 2 above) to the following ASTM E564 language to generate more actual building construction NUSC values, and from there, translate these into allowable stress design values through generally accepted engineering practice or analysis:

> "5.4 Test Setup—Provisions shall be made to resist rigidbody rotation in the plane of the wall where this reflects the use of the assembly in actual building constructions. This shall be done by application of relevant gravity or other loadings simultaneously with the racking loads. The bottom of the assembly shall be attached to the test base with anchorage connections simulating those that will be used in service. Load distribution along the top edge of the wall shall simulate floor or roof members that will be used in the actual building construction."[3]

It seems as though this process should also have a transparent and easily understood engineering logic path.

d. We believe that E72, which applies a vertical load through a threaded rod hold down, and a lateral load applying distribution beam (e.g., wood, steel, etc.), of which the applied vertical load and added stiffness to the top plates is of an unknown amount, does not reflect testing that can easily be used to establish allowable design values in actual building constructions. The following photos are good demonstrations of the differences between E72 and actual building construction ((Attachment 3 – [pages 8 and 9]……Weyerhaeuser Report 2379A - E72 Testing of WSP):

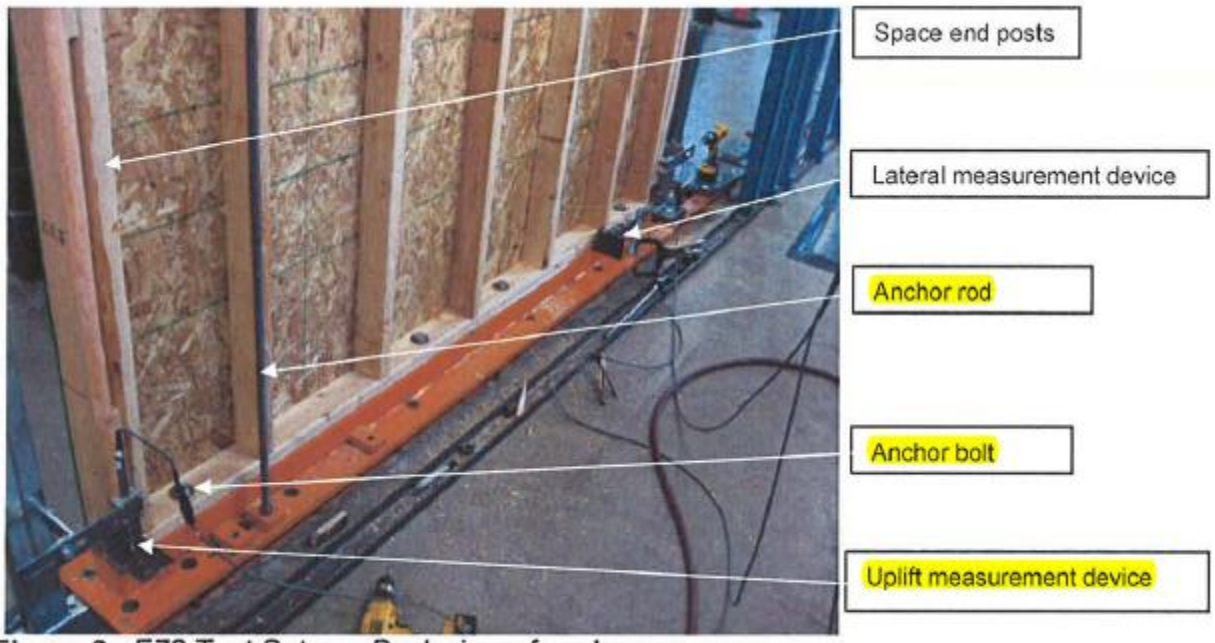

Figure 2: E72 Test Setup – Back view of anchorage

[3] Designation: E 564 – 00 An American National Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings, section 5.4

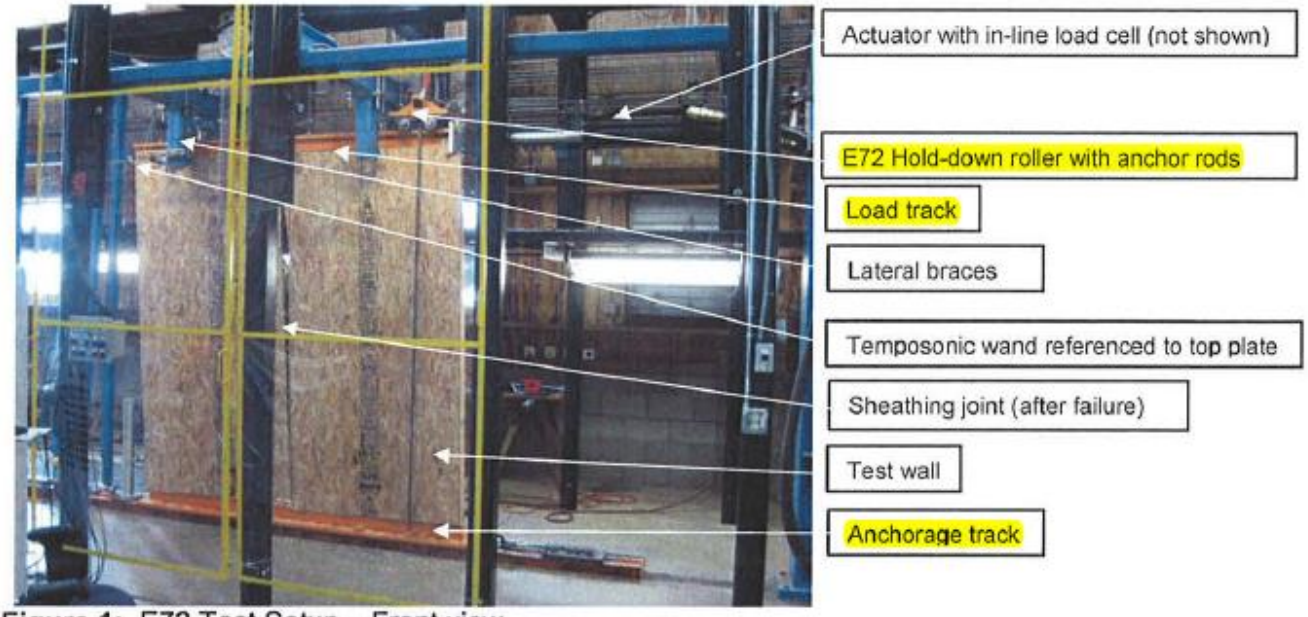

Figure 1: E72 Test Setup – Front view

Figure 5: Test Setup with wall in-place

Professor [Dan Dolan Test Setup per WSU Civil and Environmental Engineering, Report No. WMEL-2002-03,] which is a testing facility that AWC has used extensively, page 5.

Additionally, as described above, the NUSC values are not correlated to performance in actual building construction given the effect of the E72 test apparatus forcing a rectangle into a parallelogram (which is obvious when looking at the test apparatus pictured above). Non-correlation suggests the E72 test boundary condition effects do not change the load path through the wall in a way that is different than in actual building construction.

It seems to us a reasonable request to ensure everyone using SDPWS has access to a clear and transparent understanding of these concepts so design decisions can be made with more complete NUSC creation, test boundary condition effects, their impact on NUSC/ASD design values and the overall impact on the actual building construction safety margin, over and above the applied design loads.

e. We understand APA staff, and assume AWC staff as well, desire to use E72 as an index test, presumably due to all the historical test data using this test method. As stated above, we also presume that the E72 data is not calibrated to any actual building construction performance benchmark or standard. As E72 states:

> "[the test] 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."

Clearly, note 2 above is relevant, and should be addressed, but the ultimate responsibility for this decision rests with the wood structural panel (WSP) sheathing suppliers and the associations that represent them (APA-AWC). It is their scope of work, business prerogative, opportunity and risk.

f. Published testing that supports the position that we have taken on E72 follows:

   i. "Reliability and Effect of Partially Restrained Wood Shear Walls." Gruber, John Joseph, (2012).Wayne State University Dissertations. Paper 442.[4] (See Attachment 4 Wayne State University Reliability and Effect of Partially Restrained Wood Shear Walls)

   ii. "Performance of Perforated Light-frame Wood Shear Walls with Conventional Anchorage and High Aspect Ratio Segments." Lawless, Daniel. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science (Civil Engineering), University of Wisconsin – Madison, 2013 (See Attachment 5 UW-Madison Lawless Thesis)

2. As stated by another committee voter, it remains very important to, "Re-evaluate nominal design values based on newer information. For example, the attached PEI lab report shows

[4] http://digitalcommons.wayne.edu/cgi/viewcontent.cgi?article=1441&context=oa_dissertations

values for 3/8" WSP with SPF framing and 6d common nails at 6"/12" falling about 15% below the 515 plf value calculated using SPDWS nominal value and species adjustment factor. This implies safety margins could be 1.7, not 2.0 minimum. I don't believe this is an odd result. Maybe the problem is exacerbated by the species adjustment factor. For this same wall assembly, values in APA 154 report (appendix) show variation of about 100% (for DF/SP), yet minimum value is not used in SPDWS. This lends confusion as to the reliability of the design values as well as the real performance levels intended or achieved (proposal #2 above). On this note, using minimum values for APA 154 shows load factors of less than 2 in some cases. Given all this, should minimum values be used to define nominal values? How should variation in species density be handled with species adjustment factors? **Report will be distributed to the WDSC once permission to do so is obtained.*"

Please see Attachment 6 - Braced Wall Test Data Summary Appendix Bracing Test Data, Attachment 6a - Code Approved OSB 2005-0911_PEI Lab and Attachment 6b - NAHB RC Test Report Final on braced wall testing for additional background information. The wall test data summary does a good job of compiling all the public domain data available as of 2006. The PEI and NAHB RC data help as well.

These same concepts are confirmed by the Gruber and the Lawless research, and are also found in multiple public domain research reports when one does a complete literature search (i.e. WSU Dolan testing which confirms Gruber's anchor bolt work, as one example).

a. As stated in the AWC staff response to our negative ballot, maybe an extensive commentary is the answer, depending on what the commentary specifically says.

b. However, just to ensure our point of view is fully transparent, and then fully vetted by all involved in the WDSC voting process, we do not believe what is written in a commentary reduces the risk to WSP suppliers and the APA-AWC with respect to providing NUSC values that knowingly do not, necessarily, provide accurate and conservative resistance of loads in actual building construction. We believe users of SPDWS will use the NUSC values found in table 4.3A in the belief they are accurate, conservative and uniformly sufficient to resist all lateral loads applied to shear walls, and provide suitable wall bracing lateral load resistance in all cases.

c. We have repeatedly stated our negative ballot concerns in the public domain. Hence, WSP suppliers and the APA-AWC are fully aware of our point of view.

d. If the concerns presented are not valid, we should expect the suppliers of WSP and/or APA-AWC to provide a detailed set of reasons why these concerns are not valid supported by test data representing accurate resistance of lateral loads in actual building construction.

   This should take a form much like was undertaken by the southern pine industry when SBCA provided proprietary test data undertaken by SBCRI (an ANSI/ACLASS ISO 17025 certified testing facility) that showed similar concerns over lumber design

values. Here the southern pine industry tested lumber and found the same result found by SBCRI. Please see the following for public domain background information:

i. Attachment 7 - *You Don't Know What You Don't Know* by Kirk Grundahl, P.E.[5]

3. The AWC staff response to our negative vote includes the comment, "In general, the discussion highlighted the problems with using non-standard test procedures resulting in undefined levels of overturning restraint which is not the basis of reference nominal unit shear values in SDPWS. There were no specific changes proposed at that meeting. At TG meetings, participants were invited to provide specific changes for the TG to consider – all specific proposals for change were considered. Lawless disagreed that the tests were non-standard, but others point at particular issues. Lawless agreed to provide test reports so that the test procedures and test boundary conditions could be compared against reference conditions assumed for SDPWS nominal unit shear values. If the test reports are provided, this issue will be considered next cycle."

   a. Regarding the comment non-standard test procedures, please see the WSU testing photo above that AWC has referenced in the past, and apparently relied upon as providing information of value when the WDSC considers the use of the words "non-standard."

   b. SBCA has been providing proposed changes to Mr. Douglas of AWC, the International Code Council (ICC) and ICC Evaluation Service since August 2011. AWC staff, and all AWC task groups (TG), are very familiar with the position of SBCA and our recommended solutions, which have improved over time, given our increasing WSP performance knowledge, along with additional, more robust test data. An example of one of our first recommendation emails to Brad and others follows:

> **From:** Douglas, Brad
> **Sent:** Wednesday, August 31, 2011 3:30 PM
> **To:** Kirk Grundahl
> **Subject:** RE: Why Should I Care about Code Compliant Braced Wall Design Values? A final concise why statement and new web based library for details.
>
> We plan to present SBCA's shear wall test results to AWC's consensus committee, the Wood Design Standards Committee (WDSC) during the next revision cycle. The WDSC and its Wind & Seismic Task Committee maintain the *Special Design Provisions for Wind and Seismic* (*SDPWS*) standard referenced in the *IBC*. These committees, of which SBCA is a member, will have an opportunity to review any information that is made available to AWC and determine if there is a need for changes to *SDPWS* next cycle.
>
> My initial review of the information in SBCA's latest email (below) would suggest that much of the "confusion" can be explained by recognizing the context of various values in *SDPWS*. For example, it is stated that the range of values for the same wall configuration is 239 plf to 870 plf. The specific values being described are:
>
> 1. the lowest fully-restrained allowable stress design (ASD) value (239 plf), which corresponds to the seismic ASD value for a shear wall sheathed with 7/16" WSPs nailed with 8d nails at 6" o.c. on edge

[5] http://www.sbcmag.info/article/2013/you-dont-know-what-you-dont-know

2. the highest fully-restrained nominal strength value (870 plf) which corresponds to the ultimate capacity of a shear wall sheathed on the exterior side with 7/16” WSPs nailed with 8d nails at 6” o.c. on edge and 1/2" GWB nailed with 5d gypsum nails at 7” o.c. on edge

There is a large difference between ASD values and nominal strength values… as generally recognized and expected by the engineering community. To clarify: ASD values and Nominal Strength values are not on the same basis and should not be compared as suggested in the email. Nominal strength values are reduced to ASD values for purposes of producing safe designs when ASD loads are used.

I hope this helps clarify the issue. If you have any questions or are interested in participating in future WDSC review, please let me know.

Brad

c. Please see also the following public domain information:

   i. Attachment 8 - *You Don't Know What You Don't Know, Part II*, by Kirk Grundahl, P.E.[6]

   ii. While the argument here will be that this information does not apply directly to SDPWS, our past proposals have dealt with both segmented shear wall (i.e., IBC & SDPWS) and intermittent braced wall panel concepts (i.e., IRC Method WSP & WFCM).

   iii. All along, we have been transparent with our knowledge, persistent and specific with proposed solutions. This is well defined in the end notes of the article referenced directly above.

d. All SBCRI testing follows ASTM E564 techniques (for use in ASTM E564, E2126, etc. testing), as defined by the following statement where the test assembly types we have used are shown in Attachments 9, 9a and 9b:

   i. 5.4 Test Setup—Provisions shall be made to resist rigid body rotation in the plane of the wall where this reflects the use of the assembly in actual building constructions. This shall be done by application of relevant gravity or other loadings simultaneously with the racking loads. The bottom of the assembly shall be attached to the test base with anchorage connections simulating those that will be used in service. Load distribution along the top edge of the wall shall simulate floor or roof members that will be used in the actual building construction. When required to minimize distortion, reinforcement, such as a strong-back attached along the length of the top plate or a steel bearing plate attached to the end of the top plate shall be installed. The wall test assembly shall be laterally supported along its top with rollers or equivalent means so as to restrict assembly displacement outside the plane of loading. Lateral support rigidity shall not exceed that provided in the actual building construction. 5.5 Wall Size—Test wall size will vary with the study objectives. Tests conducted to assess the structural

[6] http://www.sbcmag.info/article/2013/you-dont-know-what-you-dont-know-part-ii

performance of actual building construction shall have dimensions commensurate with those of the shear walls being simulated.

ii. *Attachment 9* - *Calibration of LWS to Full Structure*, April 2013

iii. *Attachment 9a* - *Why Evaluate Braced Wall Panel Engineering?*, July 2011

iv. *Attachment 9b* - *Lawless Defense Presentation*, 2013

e. The test reports on the testing that Lawless referenced during the WDSC discussion are found in the thesis work previously mentioned in item 1.f. above, supported by public domain literature see Attachments 6, 6a and 6b.

f. SBCA and SBCRI have also provided summarized/analyzed data from proprietary sources that use ASTM E2126 and ASTM E564 test data generated by SBCRI. We have also performed an extensive literature search of all ASTM E72, E564 and E2126 public domain test data of which we are aware. Our analysis of that test data confirm the efficacy of SBCRI testing, data acquisition and test data analysis performed.

g. While we believe the lumber design value testing done by SBCRI is proof enough of SBCRI testing, test data and data analysis credibility, SBCA would be happy to further confirm SBCRI capabilities by hosting an event to "proof test SBCRI testing capabilities" for any WSP wall types that any WSP suppliers and the APA-AWC would like to see tested. The actual testing would be open for anyone (i.e. WDSC, etc.) and everyone that would like to be present to witness the testing, under the following conditions:

i. The WSP suppliers and/or the APA-AWC fund the testing at the SBCRI direct cost of undertaking the tests (i.e., the most favorable pricing that SBCA pays SBCRI for all of its testing).

ii. The WSP suppliers and/or the APA-AWC provide the test assemblies and test plan that they would like to see tested with all associated boundary conditions well defined.

iii. SBCA/SBCRI is allowed to provide comparison assemblies to those selected by the WSP suppliers and/or the APA-AWC to ensure that boundary condition considerations are fairly and accurately assessed in the context of E564 boundary conditions and account for the fact that SBCRI tests all assemblies on load cells to ascertain accurate load path information. This approach also ensures accurate load-in and load-out test data quality control. This testing, should it be needed, would also be part of the WSP test plan, and would be performed at expense of the WSP suppliers and/or the APA-AWC.

h. In addition, please see the following public domain website showing details on how testing has been performed at SBCRI over the years. Some of the content is now dated, but is still relevant with respect to showing the evolution of knowledge process:

i. *Attachment 10* - *Understanding E72-E564-E2126 Performance*, August 2011

ii. *Attachment 10a* - *Braced Wall Panel Engineering Considerations*, August 2011

iii. Please also refer to Attachments 9, 9a and 9b.

4. A recurring theme in the response to SBCA's negative is; "….the group encouraged Lawless to provide the full test reports of SBCA's shear wall tests if he felt they provided more information that needs to be considered. If the test reports are provided, this issue will be considered next cycle."

    a. As far as we are aware, SBCA has provided WDSC direction to get all the public domain testing that is available to use, and has offered to generate original test data if SBCA test data and analysis in the form provided is not sufficient. Please again see item 1.f, 3.c, 3.d, 3.g and 3.h above and all their associated references.

    b. Due to confidentiality agreements and professional responsibilities, SBCRI cannot provide any proprietary data to WDSC, but suppliers of WSP and/or APA-AWC can certainly undertake its own testing to confirm or deny the concerns that SBCA believes are accurate based on the proprietary testing it is privy to. This seems to be a key responsibility of the WSP industry, not the responsibility of SBCA or its members that purchase WSPs.

        i. Again, SBCA would be more than happy to facilitate SBCRI testing per the offer provided in 3.g. above.

    c. SBCA's role in all of this is merely to design shear walls using:

        i. The defined lateral resistance properties provided by the WSP industry, APA-AWC and WDSC.

        ii. The SDPWS and NDS defined analysis equations under the presumption of engineering accuracy with respect to both the standardized fundamental design properties and engineering mechanics equations.

    We believe it is highly likely a lay person reviewing all of this would agree it is the responsibility of WSP suppliers and APA-AWC to provide accurate information with respect to the use of their products. Any inaccuracy in their information presents a risk to WSP suppliers, APA-AWC and probably also members of WDSC. This risk increases for all involved as new knowledge is published in the public domain, and is confirmed by the lack of a full response by WSP suppliers and/or APA-AWC through providing like-kind test data that either confirms or denies the findings of SBCA. We are confident the test data and any associated engineering analysis we have provided are accurate.

    d. There is neither a burden of proof on SBCA or SBCRI, nor any end-user, as we represent users of information provided by SDPWS, NDS, the WSP industry and APA-AWC, under the presumption of design value and analysis methodology accuracy. Since these design values and analysis methods are also codified into law, we must rely upon these groups to provide transparent information about the design and use

of their products. SPDWS and WFCM are referenced often and there is always a duty to inform and warn with respect to conditions of use.

5. Based on the knowledge that we have, we believe we have done our due diligence and provided a recommended revision to table 4.3A as follows:

   Based on the minimum tested ultimate capacities, a very reasonable, extremely representative, and conservative NUSC value is 475 plf and 535 plf for WSP shear walls fastened with 6d (0.113" dia.) and 8d (0.131" dia.) nails, including 24" o.c. stud spacing. Table 1 below is an example of a possible revised version of SDPWS Table 4.3A.

Table 4.3A Nominal Unit Shear Capacities for Wood-Frame Shear Walls							
Wood-based Panels							
Sheathing Material	**Minimum Nominal Panel Thickness (in.)**	**Minimum Fastener Penetration in Framing Member or Blocking (in.)**	**Fastener Type & Size**	**Panel Edge Fastener Spacing (in.)**			
				6	**4**	**3**	**2**
				v_n (plf)	**v_n (plf)**	**v_n (plf)**	**v_n (plf)**
Wood Structural Panels - Structural I or Sheathing			**Nail**				
	5/16	1-1/4	6d (min. 0.113" dia.)	???	???	???	???
	3/8			475	???	???	???
	3/8	1-3/8	8d (min. 0.131" dia.)	535	???	???	???
	7/16				???	???	???
	15/32				???	???	???
	15/32	1-1/2	10d (min. 0.148" dia.)	???	???	???	???
	19/32			???	???	???	???

Table 1: Example of Revised SDPWS Table 4.3A

6. We have also brought forward the following concerns on numerous occasions:
   a. The nail specifications in SDPWS need to be clarified as follows:
      i. It is our recommendation that the substitution of box nails in the place of common nails be prohibited in SDPWS. The minimum nail diameter should be called out in Table 4.3A (and any other table as appropriate), and the use of the terms "common" and "box" nails should be removed. This would result in the design values for 6d, 8d, and 10d nails requiring a minimum nail

diameter of 0.113", 0.131", and 0.148", respectively. This would address some of the more pressing issues/inconsistencies with the current design values. Please see the public domain article entitled *Installation & Fastening of Wood Structural Panel Wall Bracing*, by Daniel Lawless, MSCE, Structures"

ii. The effect of the variation from the SDPWS required 3/8" edge distance for nails and the number of shiners allowed.

iii. The need for transparent nail specifications. Nail properties such as size (common, box, sinker, etc.), finish (smooth, ring shank, twisted, etc.), coatings (glue, vinyl, etc.), head shape (offset, clipped, etc.), fastener bending yield strength, etc. should be specified along with how the installers and building officials can determine that the proper nail has been used.

b. Justification needs to be provided for the use of E72 to generate NUSC and related allowable stress design values.

i. As we are seeing in the E72 consensus process, there is a strong desire by the WSP industry to use E72 for design values when the standard, through its history, has specifically said that this should not be done.

ii. SBCA comments on changes to E72 are in the public domain and can be found as Attachment 11 - Ballot Response - Submission to ASTM.

c. The test method and test boundary conditions used to establish Table 4.3A NUSC values and how the test data has been correlated to provide accurate resistance of lateral loads in actual building construction, needs to be clearly defined. The same concepts probably apply to diaphragms as well.

d. The effect of variability in WSP sheathing (i.e. variation of specific gravity, internal bond, etc.), edge density and framing material properties (i.e. specific gravity, etc.) needs to be clearly defined.

e. The more test data brought into the public domain by the WSP industry and APA-AWC, the more knowledge available to us. Additional knowledge may elicit further performance questions.

7. As stated above, there is no burden of proof on any end-user with respect to the issues that have been raised for all the reasons already provided. We believe our role is to encourage that accurate information is developed by WSP producers and APA-AWC. We also believe it is an important role to define the risks that may be present in a manner similar to SBCRI lumber testing. We have done so in as straightforward a manner as we can. From this point forward, any consideration or any action that the WSP industry deems appropriate is theirs and theirs alone (i.e. not within SBC industry or SBCA control).

As stated above, we fully expect to have the reaffirmation of our negative along with the foregoing response to the "WDSC finding of non-persuasive" to be dispensed with procedurally. Yet, we remain on record with our concerns. We are willing to spend time reviewing and commenting on any confirmation testing and/or analysis work WSP producers and APA-AWC bring to the table:

1. To confirm or deny any publically available information referenced here and elsewhere,

2. To justify all of the provisions that have question marks attached to them, as currently included in SDPWS.

As also stated above, an extensive commentary would certainly help to ensure that there is a good understanding of how the NUSC values of table 4.3A are derived along with all the specific factors, reductions, application conditions that must apply for those NUSC values to provide accurate resistance of lateral loads in actual building construction. We are willing to spend time reviewing and providing a detailed response to any commentary WSP manufacturers and APA-AWC create. At a minimum, we believe the commentary developed for SDPWS should define the basis of the NUSC values, including, but not limited to:

1. Reference boundary conditions used for the tests establishing the NUSC values.
2. Amount of overturning restraint provided for each of the tests used to develop the NUSC values.
3. Variability in the test results used to establish the NUSC values and the means used to account for this variability.
4. Minimum required factor of safety for allowable stress design values contained in SDPWS. We assume that the public domain comments that follow as written by APA's BJ Yeh are accurate:

   > "It is well known that when used as wall bracing resisting racking forces, the wood structural panel wall sheathing is required to have a factor of safety of at least 2.0."

5. Procedures used to calculate the "nominal" values from the test data.
6. Definition of the term "nominal unit shear capacity" in terms of how it relates to shear wall test data. It is currently unclear whether "nominal unit shear capacity" is the yield strength, ultimate strength, strength at a deflection limit, calculated from the NDS nail capacities, etc.

However, a commentary will not mitigate any risk of using the current NUSC values if they prove to be non-conservative or in some way inaccurate for use in actual building construction.

Beyond this, we believe a non-transparent, "prescriptive code" approach to engineering, where design values can easily be unknown, highly variable, merely judgments, or overstated in ways that artificially create competitive advantages or disadvantages, devalues the work of all professional engineers. We also strongly believe realistic raw material testing and analysis will lead to a better understanding of design values, and the ability to design buildings that have more predictable overall margins of safety.

Finally, we believe raw material suppliers to our industry are responsible to ensure their product has well known and well understood design properties, and buyers are placed in a position of having easy access to all design considerations and any relevant factors that should be considered during the design process. This includes providing all the considerations that are needed for successful application or installation by builders or framers/installers. (See Attachment 12 - SBCA Design Value Policy)

Our desire here is based on engineering common sense. At times, a forthright approach seems to be treated in an unfortunate manner. We believe it is in our industry's, the engineering community's, and the general public's best interest we persist in communicating this message as broadly as possible. This allows everyone to make their own judgment regarding SDPWS shearwall and diaphragm design efficacy. Thank you in advance for your consideration of this work, and for distributing this to WDSC and anyone else APA-AWC deems interested.

Respectfully Yours,

Kirk Grundahl, P.E.
Executive Director

Cc: APA - The Engineered Wood Association (APA), Mr. Ed Elias, Mr. BJ Yeh, Mr. Tom Skaggs, Mr. Ed Keith
Tolko: Hardy Wentzel and Kevin Blau
SBCA Membership, and broader Structural Building Components Industry via all publically available means.