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September 15, 2009

Peter Bahlo  
ICC Evaluation Service, Inc.  
Los Angeles Business/Regional Office  
5360 Workman Mill Road  
Whittier, CA 90601

Dear Mr. Bahlo,

I am writing in support of the "Proposed Revisions to the Acceptance Criteria for Sandwich Panels, Subject AC04-1009-R1 (PB/RK)" dated September 1, 2009. The proposed revisions are an important step forward for ICC-ES in recognizing some Structural Insulated Panels (SIPs) assemblies in Seismic Design Categories D, E, and F.

The staff memo very clearly describes the Code provisions necessary as an alternate material. The proposed revisions have been well thought out to address these Code requirements. Most importantly, the proposed revisions follow similar ICC-ES Acceptance Criteria for seismic recognition.

AFM has conducted some cyclical seismic testing of SIP assemblies as described in the proposed revision in comparison to similar dimensional lumber assemblies and we have observed that the performance is nearly identical. Therefore, AFM strongly supports the proposed revisions despite the limits imposed by the proposal. AFM will support necessary revisions to the proposal to move the proposal forward at the ICC-ES Committee hearing.

The proposed revisions do not provide a method for recognition of SIP assemblies with limited framing lumber and our hope is that ICC-ES will work with SIP manufacturers in the future to establish requirements for these types of assemblies.

Sincerely,

A handwritten signature in black ink that reads "Todd Bergstrom".

Todd Bergstrom, Ph.D.  
V.P. Technology



September 20, 2009

Mr. Peter Bahlo, P.E.  
ICC-ES  
5360 Workman Mill Road  
Whittier, CA 90601

Re: Acceptance Criteria for Sandwich Panels; Subject AC04-1009-R1

Dear Peter:

I am in support of the draft AC04 revisions. Your cover letter dated September 1, 2009 explains clearly the concerns from the code perspective and the effort made by the SIP industry to address those concerns. You also raised 4 technical issues based on the proposed changes, which can be addressed as follows:

1. Definition of sealant: For the purpose of an ESR report, Section A1.3.6 requires the application of sealants be included in the end-use recommendation. A sealant specification could be readily included in this section as part of the end-use requirements.
2. Fasteners: I am in agreement that the fasteners need to be either a code-compliant type of a proprietary type with a specification recognized in the ESR.
3. Shearwall boundary: Since the intent of the proposed appendix is to follow the conventional light-frame wall, I am in agreement with adding those suggested changes as requirements specified in your cover letter.
4. Seismic equivalencies: Your suggested changes by adding the evaluation of seismic coefficients in accordance with A3.2 for SIP Assemblies B and C are conservative, especially for SIP Assembly B, which is essentially a recognized system in the code today except for the addition of the prefabricated foam.

If these changes can be incorporated into the staff letter before the October hearing, I would support the approval of this AC revision. Otherwise, I am sure the SIP industry can provide a new draft for approval at the February 2010 hearing.

Thanks for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "Borjen Yeh".

Borjen ("B.J.") Yeh, Ph.D., P.E.  
Director  
Technical Services Division  
E-mail: [borjen.yeh@apawood.org](mailto:borjen.yeh@apawood.org)

*REPRESENTING THE ENGINEERED WOOD INDUSTRY*



September 17, 2009

Peter Bahlo, P.E.  
Senior Staff Engineer  
ICC Evaluation Service  
5360 Workman Mill Road  
Whittier, CA 90601

**RE: Proposed Revisions to Acceptance Criteria for Sandwich Panels, Subject AC04-1009-R1**

Dear Mr. Bahlo:

Thank you for the opportunity to comment on the proposed revisions to AC 04. Our staff has reviewed the criteria and we have some concerns relative to the proposed methodology.

We fundamentally agree with the expansion of AC04 to include high-seismic applications provided that the SIP systems prove equivalence to wood structural panel shearwalls using all four AC130/AC322 equivalency parameters:

- ductility,
- drift capacity,
- overstrength, and
- vertical load integrity.

However, as pointed out in your cover letter, there are some significant details that need to be addressed with the current AC04 proposal. In addition to your list of four technical concerns, we suggest consideration of the following:

1. **Type “A” and “D” Specifications:** It seems like the Type “A” and Type “D” wall assemblies are essentially intended to provide a wall configuration similar to a traditional wood structural panel/wood stud shearwall with stud framing to carry vertical loads and sheathing to provide lateral resistance. If that is the case, then all of the material, fastener, design, and detailing requirements for a traditional wood structural panel shearwall need to be part of the system. For example, the design of the wood components should comply with 2006 IBC Section 2301, the materials should comply with Section 2302 and 2303, the general construction and design requirements should comply with the requirements addressed by Section 2304, and the lateral force resisting system should be designed and detailed in compliance with Sections 2305 and 2306. As suggested by Items 2 and 3 on Page 5 of your cover letter, each of these sections contain relevant details that help define the performance associated with a wood structural panel shearwall. The current descriptions for these SIP panel types in the AC04 proposal are vague and provide no assurance that wood structural panel shearwall performance will be achieved. What performance level would be achieved if a proposed system drops fastener type and spacing

requirements, rules for aspect ratio, rules for boundary member sizes to prevent splitting, etc? We suggest the following new definitions for these systems:

*A.2.1.1 (or Section A.2.2.1) SIP Shearwall System A (or D) consists of a wood structural panel shearwall designed and detailed in compliance with Chapter 23 of the IBC. The wall cavity shall be filled with rigid insulation that may be adhered to the sheathing and framing. The sheathing and framing are fastened together using mechanical connections without adhesive and/or sealant.*

2. **Type “A” and “D” Panels as “Deemed to Comply”:** We disagree with the Section A3.0.1 assertion that the Type “A” and “D” SIP systems do not need to be tested to verify their performance. While these systems will not have the sheathing directly glued to the framing, they are still adhered systems. They will typically have both the sheathing and the framing adhered to rigid insulation. In addition, the sheathing panels will be permitted to bear directly upon the surrounding construction. These details have the potential to change the system performance significantly from the benchmark wood structural panel shearwall system. For example, can the sheathing still rotate relative to studs if it is adhered to rigid insulation and bears on the surrounding construction? Can the stud framing still deform like a parallelogram if it is adhered to the rigid insulation between studs? Or are new movement mechanisms and failure modes introduced? Even if the SIP walls are designed per IBC Chapter 23, representative assemblies should be tested to verify their performance with these deviations. Provisions similar to Section 4.3 of AC 230 should be adopted as a means to confirm that the Type “A” and “D” assemblies perform in a manner consistent with a traditional wood structural panel shearwall.
3. **Representative Systems:** The proposal needs more detail to describe what wall configurations should be tested. For example, what aspect ratios should be tested? Do they need to include horizontal and/or vertical panel joints? We suggest that provisions similar to those included in Section 3.5 of AC230 be adopted. Additionally, since the geometry of these systems are less defined than a traditional shearwall, it should be specifically required that the test specimens include any panel joint details that are to be recognized. They should also include representative adhesion between the insulation, the sheathing, and framing.
4. **Design Load Derivation:** It is not clear what the intent is behind the Section 3.2 “Panel Analysis.” Is it to empirically derive allowable unit shear design loads that do not comply with IBC Table 2306.4.1 or other code-accepted means? If so, then additional details are needed to govern the development of a unit shear design table. We suggest that something similar to Section 4.2.1 of AC230 be adopted to specify the relevant details related to sheathing thickness, fastener spacing, fastener type, etc. The framing species should also represent the lower bounds of what may be used in application for the empirical establishment of design loads.
5. **Deformation Prediction:** The proposal lacks a means for the empirical wall stiffness measured in the test to be applied in application. It also lacks a requirement to validate any stiffness prediction for an analytically designed wall. There will be a wide range of aspect ratios, anchorages, boundary conditions, and loadings used in application that differ from the tested conditions. This necessitates some sort of analytical means to either predict system deformation or adjust from the measured stiffness of the tested configurations. AC04 should include a requirement similar to Section 4.4 of AC230 to evaluate the ability of a model to predict system deformation.

6. **Assembly “E” Axial Capacity:** We do not understand the concept behind the axial load bearing “Type E” wall configuration that pairs 2x plates with studs spaced at 48 in. on center. A 2x plate spanning 48 inches has very little capacity in flatwise bending. The only way this system works as a load bearing system is if the sheathing-to-plate nails and/or rigid insulation carry the load. There is no assurance that these load paths will remain after a seismic event. The insulation may be damaged. The sheathing may have split free from the insulation during racking. The nailed connection between the sheathing and the plates will be degraded. Without assurance that these load paths remain, this system cannot be expected to prove equivalency to a wood structural panel shearwall that does not rely upon them. It is suggested that Section A3.3.2 be modified as follows:

*A.3.3.2 SIP Shearwall Assembly E axial loading capacity is in accordance with engineering mechanics for framed walls. Only the capacity of the wood plates and framing may be considered for this analysis. The insulation and sheathing may not be considered to carry axial load.*

It is also important to remember that these systems don’t necessarily need to prove equivalency to wood structural panel shearwall systems. AC04 systems always have the alternative of proving equivalency to a different lateral force resisting system.

Thank you for consideration of these comments. If you have any questions regarding these comments please don’t hesitate to contact me at 208-429-3715 or at Daniel.Cheney2@Weyerhaeuser.com

Sincerely,

***Daniel W. Cheney (sent via e-mail)***

Daniel W. Cheney, P.E.  
Director of Codes and Product Acceptance



September 17, 2009

Peter Bahlo, P.E.  
Senior Staff Engineer  
ICC Evaluation Service, Inc.  
5360 Workman Mill Road  
Whittier, CA 90601 United States

**Re: Proposed Revisions to the Acceptance Criteria for Sandwich Panels**  
**Subject AC04-1009-R1 (PB/RK)**

Mr. Bahlo,

As a current ICC-ES evaluation report holder for structural insulated panels (SIPs), Insulspan Incorporated confirm our support for the proposed revisions to AC04, Acceptance Criteria for Sandwich Panels.

The importance of having the use of SIPs as components of a building's seismic-force-resisting system in Seismic Design Categories D, E, and F addressed in our ICC-ES evaluation report has been emphasized repeatedly to Insulspan by code officials and designers who look to ICC-ES evaluation reports for guidance. We appreciate the effort by ICC-ES to work with industry to address this requirement in a timely manner.

The current AC04 revisions provide clear acceptance criteria for establishing equivalency of performance for SIP shear wall assemblies relative to code-recognized light-frame walls sheathed with wood-based structural panels. The SIP shear wall assemblies proposed for inclusion in these criteria are recognized as an appropriate starting point and we understand that additional research will be required to expand the scope of SIP assemblies in the acceptance criteria in the future.

Insulspan appreciates the opportunity to provide comment on the proposed revisions. We offer our assistance to address the areas in the AC04 criteria you have identified in your cover letter where additional work is required to finalize the proposed revisions.

Should you have any questions regarding my comments, please contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Jim Whalen", is written over a circular stamp.

Jim Whalen, P. Eng.  
Technical Marketing Manager  
Insulspan Incorporated

Cc – Russ Krivchuk, PE – ICC Evaluation Service, Inc., Senior Staff Engineer



September 15, 2009

Peter Bahlo, P.E.  
ICC Evaluation Services, Inc.  
Los Angeles Business/Regional Office  
5360 Workman Mill Road  
Whittier, CA 90601

Dear Mr. Bahlo:

This letter is in response to ICC-ES's "Proposed Revision to the Acceptance Criteria for Sandwich Panels, Subject AC04-1009-R1". Thank you for the opportunity to comment on the proposed revision to AC04.

Premier Building Systems, a manufacturer of Structural Insulated Panels, supports the intent of the subject document as well as the revisions outlined by ICC-ES staff. The subject document not only addresses each of the three restrictions for the use of SIPs as shear walls in Seismic Design Categories D, E and F in a logical manner, it uses existing acceptance criteria as the basis to prove equivalency between structural insulated panels used as shear walls and code recognized lateral force resisting systems.

Premier Building Systems also supports ICC-ES staff recommendations for revisions to the subject document outlined in your letter. ICC-ES staff recommendations for revisions will add clarity and consistency to the subject document.

We look forward to ICC-ES's working version of the subject document.

Sincerely,



Joseph G. Pasma, PE  
PBS Technical Manager

16 September 2009

Mr. Peter Bahlo, P.E.  
Senior Staff Engineer  
ICC Evaluation Service, Inc.  
Los Angeles Business/Regional Office  
5360 Workman Mill Road  
Whittier, CA 90601

Re: Proposed Revisions to the Acceptance Criteria for Sandwich Panels Subject AC04-1009-R1

Dear Peter:

This letter is offered in response to your 1 September 2009 memorandum to interested parties on the proposed acceptance criteria revision. My interest in these issues extends from more than 30 years of professional practice as a structural engineer in California, where my designs were nearly always controlled by considerations of earthquake resistance; my participation on the SEAOC Seismology Committee (during the period 1988-1997), my participation and leadership in the Building Seismic Safety Council's Provisions Update Committee (1994-present), my participation on FEMA's Code Resource Support Committee, my involvement as a consultant on various Applied Technology Council projects that relate to the development of the building codes and standards, my service as a member of the ASCE-7 Standards Committee and its Seismic Task Committee (1998-present), my role as present chair of the NCSEA Code Advisory Committee and also as a consultant to Weyerhaeuser and other parties who offer proprietary products intended for use in seismic resistance.

In general, I support update of the AC04 acceptance criteria and the extension of the qualification of structural insulated panels (SIPs) to seismic design categories D, E and F, provided that these products are subjected to appropriate standards of testing and derivation of suitable design coefficients based on these tests and rational principals of seismic design. I do wish to offer the following comments, however:

1. My understanding is that the attachment of adjacent SIPs to form a multi-panel wall may be accomplished by means other than nailing of the face sheets of sheathing of the adjacent panels to a common wood stud, block or spline. The attachment of adjacent panels can be critical to the seismic performance of a wall, particularly if overturning and anchorage requirements are calculated based on an assumed integral behavior of a series of adjacent panels. We recommend modification of the AC to require that:
  - a. Adjacent panels considered to form a single shear wall be connected using nailing and blocking that has rated seismic shear strength in accordance with the AF&PA Wind and Seismic Supplement that is equivalent to or greater than the design strength of the panel product, or

- b. that qualification testing of panels be conducted on multi-panel assemblies connected as proposed for use in actual field applications.
2. I concur with ICC-ES staff review comments that SIPs identified as "Assembly B," "Assembly C," and "Assembly E" should be required to comply with Section A3.3 as well as Section A3.2 and that the Axial Load Evaluation Criteria presently assigned a second section number A3.3 should be renumbered as 3.4. We believe it is essential that the ductility/deformability and overstrength criteria of section A3.3 be included in the qualification criteria for any shear panel assembly rated for seismic load resistance.
3. Section A3.2.1 refers to ASTM E2126 for the required seismic shear testing protocol. ASTM E2126 permits use of either the SPD test protocol or CUREe test protocol. The ad hoc committee that assisted ICC-ES to develop the AC 322 criteria determined that for wood panel sheathed systems, it is more appropriate to use the CUREe test protocol than the SPD protocol. Since SIPs are wood panel sheathed systems, this AC should limit testing to the CUREe protocol.
4. I do wish to express concern that SIPs classified as "Assembly A" and "Assembly D" may not have the seismic performance capability as conventional field-built wood shear walls having the same framing, sheathing and nailing. We believe it is possible that the foam fill between vertical studs could adversely affect the deformation behavior of the wall and cause failures of different types and at different excitation levels than would occur if the foam were not present and bonded to the face sheets. Qualification of these assembly types by testing should be required to demonstrate that acceptable behavior can be attained.

I regret that it will not be possible for me to offer oral testimony at the October hearings, however, I appreciate the opportunity to provide this comment. Please feel free to contact me, should you have any questions on the above.

Sincerely yours,  
Simpson Gumpertz & Heger Inc.



Ronald O Hamburger, SE  
Senior Principal  
CA License S-2951 (Structural)

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RECEIVED

SEP 18 2009

ICC-ES Los Angeles

Peter Bahlo, P E  
ICC Evaluation Services, Inc  
Los Angeles Business/Regional Office  
5360 Workman Mill Road  
Whittier, CA 90601

September 15, 2009

Dear Mr. Bahlo:

This letter is in support to ICC-ES's "Proposed Revision to the Acceptance Criteria for Sandwich Panels, Subject AC04-1009-R1" that is scheduled for hearings in October 2009

The Structural Insulated Panel Association (SIPA) whose members are either SIP manufacturers or support SIP production or end use applications would like this letter to act as our endorsement of the proposed changes to AC04 so that SIPs may be considered for use in seismic zones D, E and F. The proposed language as well as the revisions by staff will allow our manufacturers a means to have their code recognition reports included in seismic zones D, E and F.

SIPA appreciates ICC-ES efforts to offer a means for SIP recognition in all seismic zones.

Sincerely,

A handwritten signature in cursive script that reads "Bill Wachtler".

Bill Wachtler  
Executive Director  
Structural Insulated Panel Association  
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Gig Harbor, WA 98335  
Ph 253 858 7472  
Fax 253 858 0272