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**To:** ICC-ES Evaluation Committee  
**From:** Jason Smart, ICC-ES Staff  
**Date:** June 10, 2010  
**Subject:** Proposed Revisions to the ICC-ES Acceptance Criteria for Hold-downs (Tie-downs) Attached to Wood Members, Subject AC155-0610-R1 (JS/BG)

**MEMO**

In response to the request for public comments noted in the May 13, 2010, staff letter on the subject, the following correspondence was received:

- Letter dated June 1, 2010, from Alfred D. Commins, President, Commins Manufacturing, Inc.
- Letter dated June 1, 2010, from Steve Pryor, SE, Internal Director of Building Systems, Simpson Strong-Tie Co., Inc.

In the Simpson letter dated June 1, 2010, the response provided to Comment 1 of the May 13, 2010, staff letter indicates that AC155 was never intended to permit the derivation of *strength-based* allowable loads,  $P_{all}$ , and corresponding strength-level-factored resistances,  $P_s$ , for *bolted* hold-down assemblies through testing on a wood post. Thus, the strength-based  $P_{all}$  and  $P_s$  for bolted hold-down assemblies *must* be derived through testing the bolted hold-down devices on a steel jig. In order to more accurately reflect this, ICC-ES staff believes that the following additional revisions should be made to the draft of AC391 proposed under cover of the May 13, 2010, staff letter:

- **Revise Section 1.2.1(a) as follows:**

Derivation of allowable loads and strength-level-factored resistances,  $P_{all}$  and  $P_s$ , and corresponding displacements,  $\Delta_{all}$  and  $\Delta_s$ , for nailed ~~and~~ screwed ~~and~~ bolted hold-down (tie-down) assemblies based on a combination of calculated strength characteristics and tests performed on a wood post.

- **Revise Section 1.2.1(b) as follows:**

~~(Optional):~~ Derivation of allowable loads and strength-level-factored resistances,  $P_{all}$  and  $P_s$ , for bolted hold-down (tie-down) assemblies based on a combination of calculated strength characteristics and testing performed on both a steel jig and a wood post; and derivation of corresponding assembly displacements,  $\Delta_{all}$  and  $\Delta_s$ , based on testing on a wood post only.

- **Revise the Exception to Section 3.1.1.2 as follows:**

**Exception:** Strength-based allowable loads,  $P_{all}$ , and corresponding strength-level-factored resistances,  $P_s$ , for bolted hold-down (tie-down) assemblies ~~may alternatively shall~~ be derived through testing on a steel jig in accordance with Sections 4.1, 4.2.1, 4.3.1, 4.3.2 and 4.4, and evaluation in accordance with Section 3.5.2. ~~Regardless of whether these loads are derived through testing on a steel jig or on a wood post, the~~ bolted hold-downs (tie-downs) must also be tested on a wood post, in order to derive values in accordance with Sections 3.5.3 and 3.5.5.

- **Revise the Exception to Section 3.5 as follows:**

**Exception:** ~~Where tested strength-based allowable loads for bolted hold-down (tie-down) assemblies are derived through testing on a steel jig in accordance with Sections 4.1, 4.2.1, 4.3.1, 4.3.2 and 4.4, For~~ *bolted* hold-down assemblies, the criterion of Section 3.5.2 shall be used in lieu of the criterion of Section 3.5.1, for the purpose of determining the lowest allowable load,

$P_{all}$ , and corresponding strength-level-factored resistance,  $P_s$ . The tested displacement criterion of Section 3.5.3 and the calculated strength criterion of Section 3.5.4 shall also be taken into consideration in determining the lowest allowable load,  $P_{all}$ , and corresponding strength-level-factored resistance,  $P_s$ . The corresponding displacement values for the bolted hold-down (tie-down) assemblies shall be based on the criterion of Section 3.5.5, ~~regardless of whether the strength-based allowable loads are derived through testing on a steel jig or on a wood post.~~

- Revise the title of Section 3.5.1 as follows:

**Tested Strength Criterion for Derivation of Allowable Loads and Strength-level-factored Resistances for Nailed and Screwed Hold-down (Tie-down) Assemblies ~~Through Testing on a Wood Post:~~**

- Revise Section 3.5.1.1 as follows:

For nailed and screwed hold-down (tie-down) assemblies, ~~and bolted hold-down (tie-down) assemblies for which tested strength-based allowable loads are derived through testing on a wood post,~~ the tested strength-based allowable load,  $P_{all}$ , shall be derived from tests performed on a wood post as follows: The lowest maximum tension (mandatory) or compression (optional) test load when the test sample size consists of three hold-down (tie-down) assemblies, or the average maximum tension or compression test load when the test sample size consists of six hold-down (tie-down) assemblies, shall be multiplied by the steel-strength reduction factor,  $R_{s(assembly)}$  (when applicable), or the wood specific gravity ratio reduction factor,  $R_{sg}$  (when applicable), whichever results in the greatest reduction; and divided by a safety factor equal to 3.0:

- Revise the title of Section 3.5.2 as follows:

**Tested Strength Criterion for Derivation of Allowable Loads and Strength-level-factored Resistances for Bolted Hold-down (Tie-down) Assemblies ~~Through Testing on a Steel Jig:~~**

- Revise Section 3.5.2.1 as follows:

For bolted hold-downs (tie-downs) ~~for which tested strength-based allowable assembly loads are derived through testing on a steel jig,~~ a tested strength-based allowable assembly load,  $P_{all}$ , shall be derived from tests performed on a steel jig as follows: The lowest maximum tension (mandatory) or compression (optional) test load when the test sample size consists of three hold-downs (tie-downs), or the average maximum tension or compression test load when the test sample size consists of six hold-downs (tie-downs), shall be multiplied by the strength reduction factor,  $R_{s(device)}$  (when applicable), and divided by a safety factor equal to 2.5:

Staff has the following comments regarding the revisions proposed in the Simpson letter dated June 1, 2010:

- It should be noted that the proposed revision to Section 3.5 in the Simpson letter is very similar to the revision shown in the first sentence of Section 3.5 of the AC391 draft proposed under cover of the May 13, 2010, staff letter. The staff believes the statements given within the AC391 draft proposed under cover of the May 13, 2010, staff letter are more detailed than the Simpson proposal regarding the variables under discussion, and therefore prefers to use the more explicit language shown in the proposed draft.
- Regarding the revision to the title of Section 3.5.1 and deletion of Section 3.5.2 proposed within the Simpson letter, staff believes it is best to handle the tested strength-based criterion for bolted hold-down assemblies in a separate section from that on nailed and screwed hold-downs. It is important to keep this separation, due to the fact that the tested strength-based criterion for bolted hold-down assemblies is completely different from that of nailed and screwed hold-down assemblies (i.e., different test setups, different safety factors and different reduction factors). The AC391 draft proposed under cover of the May 13, 2010, staff letter maintains this clear delineation by placing the tested strength-based criterion for bolted hold-down assemblies (Section 3.5.2) in a separate section from that of nailed and screwed hold-downs (Section 3.5.1).

- Regarding the new Section 3.5.1.2 proposed within in the Simpson letter, it should be noted that these proposed revisions only address the derivation of displacements corresponding to strength-based allowable loads. The derivation of displacements corresponding to other limit states would be left unaddressed. In order to provide clarity, and to ensure that all limit states are covered, staff believes it is best to have a separate section addressing the derivation of corresponding hold-down assembly displacements for all limit states. The new Section 3.5.5 of the AC391 draft proposed under cover of the May 13, 2010, staff letter covers the derivation of corresponding hold-down assembly displacements for all limit states.

In order to address the comment regarding the displacement of stacked hold-downs within the Commins Manufacturing letter dated June 1, 2010, staff proposes that a new Section 6.2.6.3 be added, with the following language:

A statement alerting the report user to the fact that design of hold-downs used in series shall account for the cumulative deformation of all hold-downs (tie-downs) within said series.

Staff thanks the committee for consideration of these comments.