



**To:** ICC-ES Evaluation Committee  
**From:** Elyse G. Levy, S.E., Senior Staff Engineer  
**Date:** October 2, 2020  
**Subject:** Proposed revisions to the ICC-ES Acceptance Criteria for Dowel-type Threaded Fasteners Used in Wood, Subject AC233-1020-R2

**MEMO**

In response to the proposed revisions to the ICC-ES Acceptance Criteria for Dowel-type Threaded Fasteners Used in Wood (AC233), posted with our staff letter of August 18, 2020, we received comments from the American Wood Council (AWC) and from Simpson Strong-Tie Company Inc. (SST). We have considered this input and would like to respond to the comments, as follows:

1. Regarding the comment pertaining to the Section 3.1.2, we agree that using wood test members with low specific gravity will be conservative. However, as guidance for applicants and testing laboratories we want it to be understood that meaningful results will depend on selection of appropriate wood test members. This is the purpose of including a lower bound on acceptable specific gravity. That being said, we propose increasing the downward tolerance from the assigned specific gravity to 10 percent.

2. We would like to modify the proposal for Section 3.2.1 to read as follows:

**Fastener Strength:** Shear tests (optional for fasteners used in wood-to-wood connections only) and tensile tests shall be performed on each combination of fastener root diameter and fastener steel type in accordance with Section 4.1.1 of this criteria. The allowable tensile or shear design load of a fastener for use in ASD shall be taken as the average maximum load from the tests divided by a safety factor of 3.0. The design tensile or shear strength of a fastener for use in LRFD shall be taken as the average maximum load from the tests multiplied by a resistance factor of 0.50.

For fasteners subject to lateral loads, bending yield strength shall be determined by tests in accordance with Section 4.1.2. At a minimum, one length for each combination of fastener root diameter and fastener steel type shall be tested to confirm compliance with the manufacturer's specification.

3. In association with the modification to the proposal for Section 3.2.1 described above, we would like to add the following to the listed items in Section 4.2.4:
  5. Bending yield strength shall be determined for fasteners from the same lots as those used in lateral connection testing. The average bending yield strength of these fasteners shall not exceed the specified minimum bending yield strength by more than 10 percent.

4. We have considered the comment received on Section 3.3.2 and wish to point out that the proposed requirements are based on recommendations from AWC. We will not recommend any reduction in the testing requirements from what has been proposed unless this is supported by AWC at the hearing.
5. We have considered the comment on Section 3.4.1. We would like to modify the proposal for the first paragraph of Section 3.4.1 to read as follows:

**Reference Lateral Design Values Determined in Accordance with the NDS:**

At least two wood-to-wood connection configurations for each fastener class shall be tested in accordance with Section 3.4, one with screws having the smallest diameter within the fastener class and one with screws have the largest diameter within the fastener class. At least two steel-to-wood connection configurations shall be tested for each fastener head style within a fastener class, when the fasteners are intended to be used with steel side members, one with screws having the smallest diameter within the fastener class and one with screws have the largest diameter within the fastener class. The fastener penetration into the main member must be a minimum of 6 times the outside (major) thread diameter. The calculated reference lateral design value shall be compared to the tested reference lateral design value. If the tested reference lateral design value is equal to or greater than the calculated reference lateral design value, and the failure mode seen in testing is the same as the governing yield mode predicted by the calculations, the NDS provisions may be used to determine reference lateral design values for all conditions addressed in the NDS. If the tested reference lateral design value is less than the calculated reference lateral design value, the reported reference lateral design value shall be determined in accordance with Section 3.4.2. For purposes of comparison, the tested reference lateral design value shall be the average ultimate test value divided by 3.2 and reduced by  $R_s$  (defined in Section 3.4.3), as applicable.

6. We have considered the suggestion regarding language for Section 3.7. We would like to modify the first paragraph of the proposal for Section 3.7 to read as follows:

For fasteners installed perpendicular to the face of the wood members (in wood-to-wood and steel-to-wood connections), minimum spacing, end and edge distances in multiples of outside thread diameter,  $D$ , shall be in accordance with Table 6. For fasteners installed into SCL, geometry limitations in the applicable evaluation report on the SCL must be considered.

Exceptions:

1. Lesser dimensions may be qualified for use in all connections addressed in the evaluation report (including those calculated in accordance with the NDS) based on comparative testing. These tests shall be performed in accordance with Sections 3.3 and 3.4, as applicable, using four fasteners in each test specimen. Connection configurations shall represent the maximum fastener diameter within the fastener class, the minimum applicable side member thickness, the minimum applicable main member thickness, and minimum and maximum specific gravity. A comparison of the capacity results from the confirmatory tests (with minimum spacing, end and edge distances) to those with connection geometry as prescribed in Table 6 shall indicate no reduction in capacity.

2. Lesser dimensions for specific conditions shall be based directly on testing in accordance with Sections 3.3 and 3.4, as applicable.
  
7. We have considered the comments regarding the proposal for Table 6. The comments state that the values in Table 6 should not differ from those in the NDS. It is important to note that there are no connection geometry values in the NDS for use with proprietary self-drilling screws. In the past, we have relied upon Table C12.1.5.7 of the NDS Commentary for screws less than  $\frac{1}{4}$  inch in diameter, but this is not mandated by the standard. For fasteners  $\frac{1}{4}$  inch or greater in diameter, we consider the provisions in Section 12.5.1 of the NDS to be applicable when prebored holes are used, as is required for bolts and lag screws, but not to the self-drilling screws which we evaluate under AC233. Neither Table C12.1.5.7 nor Section 12.5.1 of the NDS address all applicable conditions, such as screws subject to axial load.

The proposed Table 6 is intended to provide necessary guidance on connection geometry requirements since this is lacking in the code. The proposed values are based on consideration of Table C12.1.5.7 of the NDS Commentary, Section 12.5.1 of the NDS and provisions in Eurocode 5 (EN 1995-1-1). We have typically selected the most conservative values from amongst these sources. This includes separate requirements for higher density wood, following the Eurocode 5. For conditions in the table that are not directly addressed by any of the referenced sources, we have proposed logical factors based on the outside thread diameter D.

We are open to considering adjustments to the factors in Table 6, when they are supported by appropriate references or data. These can be considered at the hearing and/or in the future through another revision to AC233.

8. We are in agreement with the suggestion to modify the first sentence of Section 4.2.4 of the criteria to read as follows:  

Lateral resistance and movement shall be tested in accordance with ASTM D1761, and the following:
  
9. We have considered the comments on Sub-Annex CB. While it is appropriate to address requirements for specific connection assemblies through the annexes to AC233, to support evaluation requests from our clients, we would like to withdraw our proposal for Sub-Annex CB (and the associated revision to Section C1.0), to allow for further study.