



June 6, 2010

Mr. Woods McRoy, P.E.  
ICC-ES  
900 Montclair Road, Suite A  
Birmingham, AL 35213

Re: Acceptance Criteria for Metal Roof Coverings; Subject AC166-0610-R1

Dear Woods:

Mr. Gary Walker has been very kind in keeping me informed of his diaphragm tests conducted at WSU. I also have had a chance to discuss the test results with Dr. Dan Dolan. Overall, this helps me understand the proposed revisions to AC166 and the basis of Table 4.11 and the intent of Appendix A.

While I am in support of the approach taken by Gary, there are a couple of issues as discussed below that should be addressed before the proposed AC revisions are approved.

- a) The first issue is the low stiffness of the diaphragm made of metal roof coverings. As shown in the WSU test report, the stiffness of the metal roof diaphragm is only about 1/2 of wood diaphragm. This means, for the same applied load, the steel shingle sheathed diaphragm will deflect twice as much as the wood diaphragm. The higher diaphragm deflection for steel shingle sheathed diaphragm at a given load may be unexpected by the designer when the ESR report proclaims equivalency to wood diaphragms. This has a potential of creating serviceability issues for the building constructed with steel shingle sheathed roof.
- b) I am not comfortable with the allowance for the small (12' x 12') diaphragm tests in Section 4.11 and Table 4.11 based on the test results. In recent years, the ES has taken the position that all wood diaphragms are required to be evaluated at the size of 24' x 24'. We (APA) is currently engaged in a diaphragm test series for engineered wood products and we have been told by ES that the diaphragm size has to be 24' x 24'. Given the much higher contribution from the framing materials when the diaphragm is getting smaller, it can be reasonably anticipated that the reliability of test results from smaller diaphragm tests is less than the 24' x 24' tests. The WSU test report emphasized this point. With this, it is questionable if the small (12' x 12') diaphragm tests should be permitted in Section 4.11 and Table 4.11.

With these considerations, I propose the following changes to the draft AC:

4.11 Metal Roof Shear Design Test: ~~Either 12 foot by 12 foot (3658 mm by 3658 mm) or 24 foot by 24 foot (7315 mm by 7315 mm)~~ metal roof covering specimens

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shall be tested in accordance with Appendix A. The number of test specimens in a test set shall be in accordance with Section 8.1 of ASTM E 455. A set of specimens shall be tested with the load applied parallel to the framing and a second set of specimens shall be tested with the load applied perpendicular to the framing. The performance of the metal roof covering shall be determined as equivalent to the performance of the prescriptive wood structural diaphragm in the IRC when the average strength values noted in Table 4.11 are achieved for the specimen size tested. The average stiffness of the diaphragm tests in each loading configuration shall be reported and included in the evaluation report.

TABLE 4.11 — MINIMUM METAL ROOF COVERING DIAPHRAGM TEST RESULTS

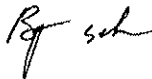
SPECIMEN SIZE	LOADING	AVERAGE STRENGTH (lbf/ft)
24 ft x 24 ft	Parallel to framing	478
	Perpendicular to framing	470
42 ft x 12 ft	Parallel to framing	748
	Perpendicular to framing	854

In addition, Appendix A is added to facilitate the evaluation of metal roof covering diaphragms within the scope of this AC (i.e., linked to Table 4.11), but not intended to be the only test method for all wood diaphragm tests. Therefore, I suggest Section A1.1 be revised as follows:

A1.1 Purpose: The purpose of this appendix is to test metal roof covering to determine if the metal roof covering is equivalent to the prescriptive wood structural panel diaphragms in the IRC with a specific configuration. This Appendix is not intended for use as a standard diaphragm test method for all wood diaphragms.

Thanks for your consideration.

Sincerely,



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