

Deflection of Unblocked Wood Structural Panel Diaphragms

APA has reviewed the historical load-deflection data for blocked and unblocked diaphragms for full-scale diaphragm tests. The following guidance is offered regarding methods for determining the stiffness of unblocked diaphragms (Ref. SEAOC Blue Book, 1999, §805.3.2):

“Limited testing of diaphragms [APA, 1952, 1954, 1955, 1967] suggests that the deflection of an unblocked diaphragm at its tabulated allowable shear capacity will be about 2.5 times the calculated deflection of a blocked diaphragm of similar construction and dimensions, at the same shear capacity. If diaphragm framing is spaced more than 24" o.c., testing indicates a further increase in deflection of about 20% for unblocked diaphragms (e.g., to 3 times the deflection of a comparable blocked diaphragm). This relationship can be used to develop an estimate of the deflection of unblocked diaphragms.”

A further review of the data in APA Laboratory Report 106 (1967) indicates that the aforementioned amplification factors are valid for diaphragms with aspect ratios (width:depth) of approximately 3:1. However, for diaphragms with aspect ratios closer to 1:1, data in APA Laboratory Report 63 (1955) indicate that the deflections of blocked and unblocked diaphragms are approximately the same. It is theorized that this finding is due to the relatively small bending deflection component for diaphragms with aspect ratios close to 1:1. Based on this historical test data, the aforementioned amplification factor is very conservative for diaphragms with an aspect ratio near 1:1.

It should be noted that *ANSI/AF&PA SDPWS – 2008 Special Design Provisions for Wind and Seismic* provides slightly different recommendations for the estimation of unblocked diaphragm deflections, which are based on the same data set as the above recommendations. Since the estimated deflection may differ from the two methodologies, engineering judgment is still required in applying these recommendations.

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Revised June 2013

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