

# 2008 Special Design Provisions for Wind and Seismic

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The 2008 Edition of the *Special Design Provisions for Wind and Seismic* was approved as an American National Standard on August 4, 2008, with a designation *ANSI/AF&PA SDPWS-2008*. The 2008 SDPWS was developed by AF&PA's Wood Design Standards Committee (WDSC) and contains provisions for design of wood members, fasteners, and assemblies to resist wind and seismic forces. Several additions and revisions to the specification have been incorporated in this latest edition.

## High Load Diaphragms

Provisions for wood structural panel blocked diaphragms with multiple rows of fasteners, also known as "high load diaphragms", have been added consistent with provisions in the *2006 International Building Code (IBC)* and the *2003 National Earthquake Hazard Reduction Program (NEHRP) Provisions*. A distinguishing feature of high load diaphragms, relative to typical blocked wood structural panel diaphragms, is use of nominal 3x or 4x framing at adjoining panel edges and boundaries and presence of multiple rows of fasteners at these locations (*Figure 1*). Apparent shear stiffness values are tabulated for each combination of nailing and sheathing thickness as is done for typical blocked and unblocked diaphragms in the SDPWS to simplify calculation of diaphragm deflection.

## Shear Walls

### Wood Structural Panels Installed Over Gypsum Wallboard or Gypsum Sheathing Board

Provisions for wood structural panels applied over gypsum wallboard or gypsum sheathing have been added consistent with provisions in IBC and NEHRP.

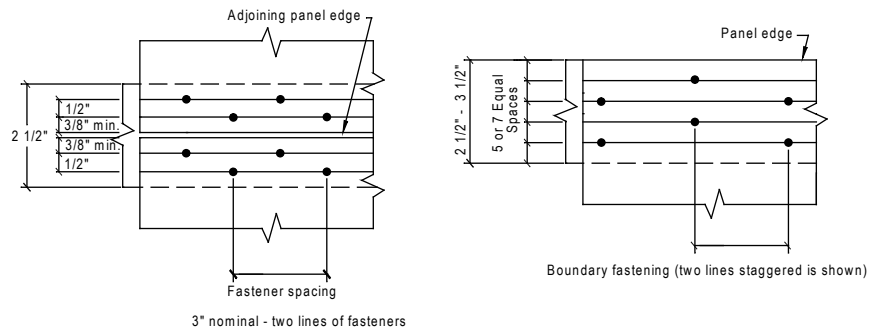


Figure 1: Excerpt from SDPWS Figure 4C – High load diaphragm.

Unit shear strength and apparent shear stiffness values are provided in Table 4.3B for each combination of nailing and sheathing thickness.

## Shear Strength Reduction Equation

### For Perforated Shear Wall

Equation 4.3-5 has been added to SDPWS to provide more accurate results for perforated shear walls having openings of different heights within the wall length. Equation 4.3-5 was the basis for tabulated shear capacity adjustment factors in the current SDPWS; however, for tabulation purposes, all openings in the perforated shear wall were assumed to have a height equal to the maximum opening height. Use of the equation will always provide values of the shear capacity adjustment factor that are equal to or greater than obtained from the table.

## Framing and Nailing

### For Shear Walls Sheathed On Two Sides

New provisions for staggering of adjoining panel edges and minimum nominal framing width for two-sided wood structural panel shear walls (*Figure 2*) with nail spacing less than 6 inches on

center are consistent with similar provisions in the 2006 IBC. Staggered nailing at adjoining panel edges where 3 inches nominal or wider framing is used is also added. This new provision appears under footnote 6 of Table 4.3A and footnote 5 of Table 4.3B.

## Shear Wall Construction

### Two 2x Members as an Alternative to a Single 3x Member

Use of two 2x framing members adequately fastened together in place of a single 3x member required at adjoining panel edges in shear wall construction is consistent with guidance in the 2005 SDPWS *Commentary*, as well as a similar provision in the 2006 IBC. To address proper fabrication where nail spacing in the "stitched" members at adjoining panel edges is close, staggered nailing is required where fastener spacing is closer than 4 inches on center.

## Unblocked Shear Walls

New provisions for unblocked wood structural panel shear walls are applicable only to wood structural panel shear walls 16 feet in height or less, aspect ratio of 2:1 or less, and panel edge nail spacing of 6 inches on center. Unblocked shear wall adjustment factors, ranging in value from 0.4 to 1.0, reduce the strength of the reference blocked shear wall with studs at 24 inches on center to account for presence of unblocked panel edges.

Unblocked shear walls exhibit load-deflection behavior similar to that of the blocked shear wall reference condition but with reduced values of strength based on application of  $C_{ub}$ . To account for reduction in unblocked shear wall

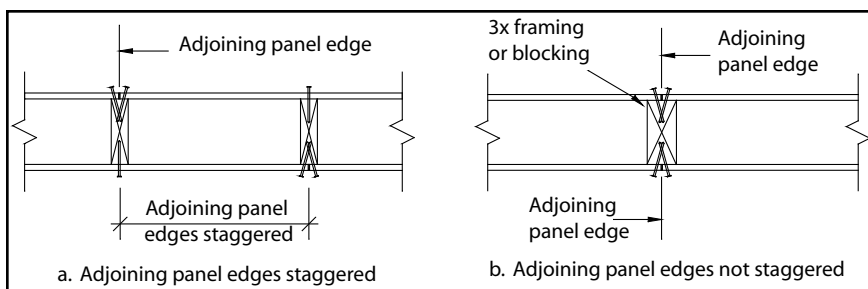


Figure 2: Wood structural panel sheathing on two-sides.

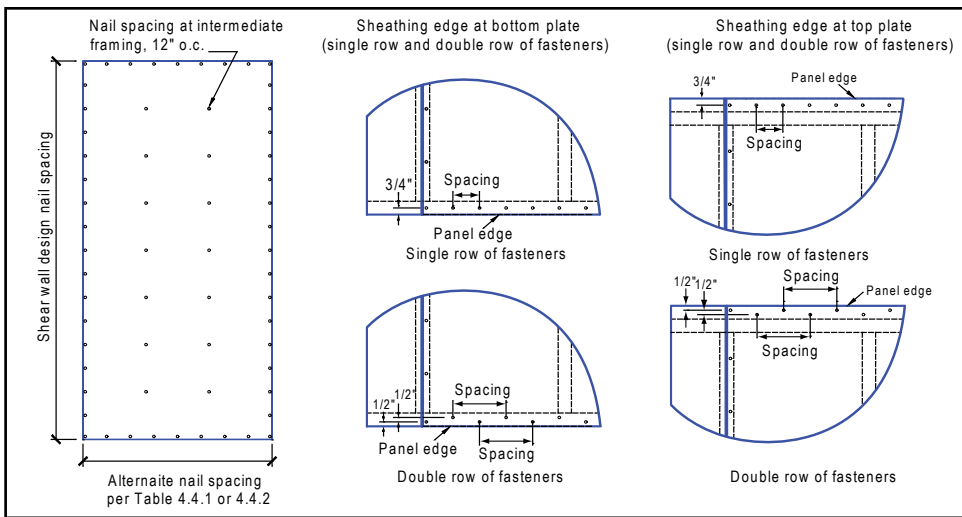


Figure 3: Excerpt from SDPWS Figure 4G – Panel Attachment.

stiffness, which is proportional to reduction in strength, SDPWS 4.3.2.2 specifies that deflection of unblocked shear walls is to be calculated from standard deflection equations using an amplified value of induced unit shear.

## Combined Uplift and Shear Resistance

### Wood Structural Panels Resisting Wind Loads

Provisions for wood structural panels designed to resist combined shear and uplift from wind have been added in Section 4.4 and update similar provisions first recognized in the *Standard for Hurricane Resistant Construction*, SSTD-10 in 1999. Tabulated values of nominal uplift capacity for various combinations of nailing schedules and panel type and thickness establish limits based on

calculations in accordance with the *National Design Specification® (NDS®) for Wood Construction, 2005* and conditions verified by full-scale testing. Allowable values of uplift capacity are determined by dividing the nominal values by the allowable stress design (ASD) reduction factor of 2.0.

Detailing options for use of wood structural panels to transfer tension forces within a story or between stories are provided. Figure 3 provides minimum distance from top and bottom edges of wood structural panels used to resist tension and spanning from the top plate to the bottom plate within a single story.

### Gypsum Lath and Plaster Walls

A new category of shear walls using gypsum lath, plain or perforated, has been added in Table 4.3C to recognize increased unit shear capacity and stiffness of this wall type

where vertical joints in the gypsum lath are staggered. Unit shear values are based on cyclic testing and consistent with a similar revision accepted in the *2007 Supplement to the 2006 IBC*.

## Foundation Anchorage

Revised provisions for plate washer size and location are specified for anchoring of wall bottom plates. Increase in washer size, from 2½-inch square in the 2005 SDPWS to 3-inch square in the 2008 SDPWS, makes washer size consistent with 2006 IBC and 2006 *International Residential Code (IRC)* and provides specific allowance for the slot to facilitate washer placement.

The ½-inch distance from the washer edge to the sheathed edge (Figure 4) limits potential for cross grain bending, but is not required for low strength sheathing materials because bottom plate failure is not the failure limit state. For low strength materials, failure mechanisms include tear-out and slotting (e.g. gypsum wallboard) of the sheathing, as well as fastener head pull-through. An exception to the plate washer requirement is provided based on testing and is applicable for walls having an aspect ratio less than 2:1, nominal shear for seismic not exceeding 980 plf (comparable to 7/16-inch OSB with 8d nails at 3 inches o.c. at panel edges) and where hold downs are sized to resist total overturning neglecting dead load stabilizing moment.

## Fiberboard Aspect Ratio

An increased aspect ratio for structural fiberboard shear walls has been incorporated in Table 4.3.4 based on strength and stiffness determined from cyclic testing. A maximum aspect ratio of 3.5:1 is permitted but adjustment factors accounting for reduced strength and stiffness are applicable where the aspect ratio is greater than 1.0. For seismic design, the aspect ratio reduction factor is based on analysis of reduced stiffness of high aspect ratio walls relative to the reference case (aspect ratio 1:1) and results in a maximum reduction factor of 0.36 at a 3.5:1 aspect ratio. For wind design, the strength reduction factor accounts for observed reduction in peak unit shear strength as aspect ratio increases relative to the reference case and results in a reduction factor of 0.78 at a 3.5:1 aspect ratio.

Related revisions based on the testing program include an increase in the required panel edge distance for nailing at top and bottom plates and removal of 8d common nails as a permitted fastener for attachment of structural fiberboard sheathing.

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## Format of Diaphragm and Shear Wall Tables

Wood Structural Panels  
(OSB and Plywood)

A revised format of diaphragm and shear wall tables incorporates apparent shear stiffness,  $G_a$ , for OSB and plywood in the same tables. Previously, Appendix tables were used to provide tabulated values of apparent shear stiffness for plywood.

## Reference Documents

References to product standards have been updated. Addition and update of product standards are as follows:

### Product standards added:

ANSI/CPA A135.6, *Hardboard Siding*, Composite Panel Association, Gaithersburg, MD, 2006. (Replaces AHA A135.4-95 and AHA A135.5-95)

ASTM C 1396/C 1396M-06a, *Standard Specification for Gypsum Board*, ASTM, West Conshohocken, PA, 2006. (Replaces ASTM C 36/C 36M-01, ASTM C 37/C 37M-01, ASTM C 79/C 79M-01, ASTM C 588/C 588M-01, ASTM C 630/C 630M-01)

### Product standards updated:

ANSI A208.1-99, *Particleboard*, ANSI, New York, NY, 1999.

PS 1-07 *Structural Plywood*, United States Department of Commerce, National Institute of Standards and Technology, Gaithersburg, MD, 2007.

PS 2-04 *Performance Standard for Wood-Based Structural Use Panels*, United States Department of Commerce, National Institute of Standards and Technology, Gaithersburg, MD, 2004.

## 2008 SDPWS Commentary

Updates to the *SDPWS Commentary* based on input from users and new information considered in development of the 2008 SDPWS are also incorporated in the document.

## Building Codes and Standards

The 2008 SDPWS has been approved as a reference document in the *2009 International Building Code* and has been submitted for adoption as a reference document in *ASCE 7-10 Minimum Design Loads for Buildings and Other Structures*.

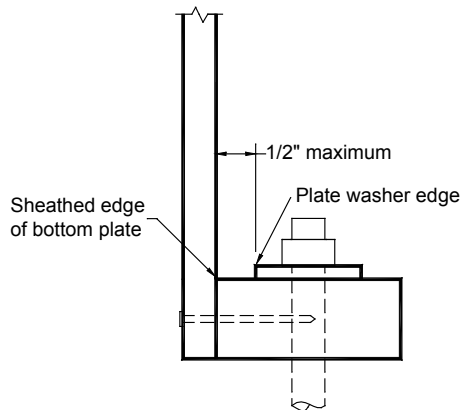


Figure 4: Distance for plate washer edge to sheathed edge.

## Conclusion

AWC's 2008 SDPWS was approved August 4, 2008 as an American National Standard. SDPWS covers materials, design, and construction of wood members, fasteners, and assemblies to resist wind and seismic forces.

As an update to the 2005 SDPWS standard, several notable new provisions of the 2008 SDPWS standard provide new design options for wood construction to resist forces from wind or seismic coupled with limitations on the use of new design options. Examples include new criteria for wood structural panels designed to resist combined shear and uplift from wind, addition of provisions for unblocked shear walls, and an increased aspect ratio for structural fiberboard shear walls.

The 2008 SDPWS standard is available to view free at [www.awc.org](http://www.awc.org).

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A more in-depth version of this article originally appeared in the Fall 2008 issue of *Wood Design Focus* (FPS).

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