Shear Capacity of Wood Structural Panels

The intent of this technical tip is to help clarify how wood structural panels (WSP) can be used as part of the lateral shear resistance system (shear wall) in a wall assembly. Panels used in applications other than wall assemblies are outside the scope of this document. This document defines rated sheathing panels and Structural 1 sheathing panels and compares the performance capacities of each panel category. Structural 1 rated panels have some unique benefits that are also discussed. There are other types of wall panels, but for context of this technical tip, only Oriented Strand Board (OSB) and plywood WSPs are covered.

Rated Sheathing Panels

The International Building Code and International Residential Code require that OSB and plywood sheathing panels satisfy minimum structural performance requirements set forth by the Department of Commerce (DOC) Voluntary Product Standard PS 1 or PS 2. Plywood panels can be classified under the DOC PS 1 or PS 2 standard, however OSB panels are only classified under the PS 2 standard. To verify structural performance, representative panels are tested at the manufacturing site and are audited by a third-party testing agency such as PFS-TECO or the APA. Panels passing internal and third-party testing must bear a PS 1 or PS 2 stamp along with a stamp of the testing agency, mill identification number and manufacturer's name. Huber Engineered Woods (HEW) products in this rated sheathing category are branded as **Huber Blue™ sheathing**.

Structural 1 Panels

Structural 1 panels are required to satisfy all the structural requirements from PS1 or PS2 but are also required to have higher performance in the areas of racking shear, cross-panel strength and stiffness. Shear walls constructed with Structural 1 rated sheathing panels can have up to 10% more allowable shear strength than sheathing panels of the same span rating, thickness and nailing pattern. The Structural 1 designation can also be used for Single Floor ratings. HEW Products in this category are **ZIP System® sheathing, AdvanTech® subflooring,** and **AdvanTech® sheathing**.

Published Shear Capacity

Sheathing panels and Structural 1 panels do not have proprietary shear capacities; however, values for these panels are sourced from the American Wood Council's Special Design Provisions for Wind and Seismic (SDPWS). Below is a comparison between sheathing WSPs and Structural 1 WSPs at a 6/12 (edge/field) fastening schedule. For more panel thickness, fastener spacing and fastener diameter options please visit Table 4.3a of the SDPWS.

Table 1: Allowable Shear Capacities (plf) for WSP Shear Walls for Seismic Loading[a]

	Panel Thickness (inch)	On Center Edge Fastener Spacing (inches)[c]			
		6	4	3	2[d]
Sheathing	7/16[b]	240[b]	350[b]	450[b]	585[b]
	15/32	260	380	490	640
Structural 1	7/16[b]	255[b]	395[b]	505[b]	670[b]
	15/32	280	430	550	730

a. Values sourced from Table 4.3a of the 2021 SDPWS. Visit Table 4.3a for a full list of seismic and wind shear values.
b. Allowable shear values permitted to be increased to values shown for 15/32" inch sheathing with same nailing provided (1) studs are spaced a maximum of 16 inches on center or (2) panels are applied with long dimension across studs.
c. Fasteners are 8d common and are spaced a maximum of 12 inches on center in field of panel.
d. Framing at adjoining panel edges shall be 3 inches nominal or wider and nails at the panel edges shall be staggered where panel edge nailing is specified at 2 inches on center or less.

Note: Unlike ZIP System sheathing panels, ZIP System® R-sheathing panels have proprietary shear values that can be sourced from ESR-3373 for projects in wind and low seismic areas and from ER-0482 for projects in high seismic areas.

Panel Orientation

Sheathing panels, Structural 1 panels and ZIP System R-sheathing panels may be installed in the vertical (parallel to framing) or horizontal (perpendicular to framing) orientation without effecting the allowable shear capacities of the panels*. Follow the Designer-of-Record's specification if published.

* For 3/8" and 7/16" sheathing panels and Structural 1 panels, unit shear capacities are permitted to be increased to values shown for 15/32" (nominal) sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs - footnote 2 from Table 4.3a of the SDPWS.

Blocking

Blocking between vertical framing members on the panel edge is only required when the panels are being used as a part the lateral shear force resistance system for wall sections designated within the structural plans. If the panels are not a part of the lateral shear force resistance system, then blocking is not required between the vertical framing members at the panel for the purpose of resisting shear loading. However, blocking may be required for other purposes so be sure to follow all requirements specified by the designer of record or authority having jurisdiction (AHJ).

Additional Structural 1 Benefits

In addition to the increase in shear capacity, Structural 1 rated panels have increased weak axis bending strength properties when compared to standard sheathing panels. Weak axis bending strength is important when the panel is installed lengthwise with the direction of the framing (vertically installed). Brittle wall coverings such as stucco benefit from the use of a Structural 1 panel because there is less deflection caused by a transverse wind load applied to the face of wall (i.e. wind blowing perpendicular to the wall face). Information regarding this subject is available in APA Form No. Q370. A transverse loading is a force that is applied perpendicularly to the longitudinal axis of a member (deflection between the framing members). Table 2 compares the allowable loading for OSB sheathing and Structural 1 sheathing installed in weak axis.

Table 2: Allowable Loading for OSB Sheathing Installed Parallel (Weak Axis) to Framing[e]

Span Rating	Load Governed by	Parallel To Supports (psf)					
		16 inch on center			24 inch on center		
		Sheathing	ZIP System	AdvanTech	Sheathing	ZIP System	AdvanTech
32/16 (1/2")	L/360	41	65	95	14	22	32
	L/240	61	98	142	21	33	48
	L/180	82	131	190	28	44	64
	Bending	77	116	188	28	41	67
	Shear	228	228	386	141	141	239

e. See Tables 2a and 2b of APA Form No. Q225G for a full list of allowable load capacites for plywood and OSB panels.