

Double-Sheathed Shear Walls

The International Building Code (IBC) and the ANSI/AWC Special Design Provisions for Wind and Seismic (SDPWS) have long permitted double-sided wood structural panel (WSP) shear walls to be fabricated with the same grade and thickness of sheathing and fastened with the same nailing schedule on both sides of the wall. Walls built this way are permitted to double the shear capacity provided for single-sided shear walls using the same sheathing and attachment schedule. Based on these provisions, the question often arises as to whether the same methodology can be permitted for wood structural panel shear walls with both layers of sheathing attached to the same side of the framing. For the purposes of this discussion, this will be called a double-sheathed shear wall, as opposed to a double-sided shear wall.

Full-scale testing was conducted at APA's Research Center in Tacoma, Washington, to check the efficacy of double-sheathed shear walls and to investigate if their performance would match that of double-sided shear walls. The results of this testing indicated that, within certain guidelines, double-sheathed shear walls can develop twice the capacity of a single sided shear wall with the same sheathing and attachment schedule.

The restrictions placed on the double-sheathed shear walls are based on the capacity of the lumber framing system to which the panels are attached. For the purposes of this testing, APA opted to use conventional 2x4 framing (Douglas-fir, #2) with a single bottom plate, two top plates, and double 2x4 studs at the ends of each shear wall. Where adjacent panel edges occurred over common framing, 3x4 studs were used.

DOUBLE-SHEATHED SHEAR WALL CONSTRUCTION AND DESIGN

Double-sheathed shear walls sheathed with two layers of wood structural panels of the same construction, thickness, and attachment schedule fastened to the same side of framing can be assigned twice the shear capacity of the same wall with a single layer of the same sheathing and attachment schedule, provided the following limitations are met:

1. Panel joints between layers shall be staggered so panel joints do not occur over the same stud.
2. Framing members located where two panels abut shall be a minimum of 3x framing.
3. The nailing schedule for either or both panel layers shall not be less than 4 inches on center in each layer. For a double-sheathed wall with both layers of 15/32 Performance Category rated sheathing, the maximum allowable design shear shall be limited to 760 plf under seismic loads, which is twice the design shear capacity of 380 plf for a single-sided 15/32 Performance Category panel attached with 8d nails at 4 inches on center.
4. Each layer shall be fastened separately to the framing. The base layer shall have a 1-inch edge distance and the face layer shall have a 3/8-inch edge distance.

Note: In retrofit construction, where the base layer is nailed to the framing at 3/8-inch edge distance, the face layer shall be attached with the panel perimeter nailing at 1 inch from the panel edge. Note that for new construction, the order of placement of the edge distances is reversed from retrofit construction to place the 3/8-inch edge distance on the face layer. This is to minimize any potential edge curling of the panels that can sometimes occur when panel edge distances are greater than 3/8 inch.

5. Plate washers of 3 inches x 3 inches x 0.229 inch shall be used at all anchor bolt locations.

Note: In retrofit construction, the additional capacity of the double-sheathed wall will often require the use of additional anchor bolts to accommodate the increased base shear. The new anchor bolts will be grouted or epoxied in place and plate washers of 3 inches x 3 inches x 0.229 inch are to be used at all anchor bolt locations, both the new and the existing anchor bolt locations. In addition, the hold-down capacity must also be increased proportionally to the increased double-sheathed shear wall capacity.

6. The double 2x end studs, if used, shall be stitch-nailed together based on the uplift capacity of the double-sheathed shear wall.

Note: The designer is urged to use caution when designing the stitch-nailing for the end studs. The location of the hold-down with respect to the end stud receiving the panel nailing may have an impact on the load distribution and the stitch-nailing requirements.

The ASD allowable stress for double-sheathed shear walls constructed in accordance with these recommendations shall be as shown in Table 1.

Table 1. ASD design capacities for double-sheathed shear walls (shear walls with two layers of wood structural panels on the same side of the wall framing)

Wood Structural Panel Sheathing	Minimum Nominal Panel Thickness (in.)	Minimum Fastener Penetration in Framing Member or Blocking (in.)	Fastener Size and Type (Nail, Common or Galvanized Box)	Seismic ^a	
				Panel Edge Fastener Spacing (in.)	
				6	4
				Vs (plf)	Vs (plf)
	3/8			440	640
	7/16	1-3/8	8d	480	700
	15/32			520	760

a. For wind loads, the tabulated values shall be permitted to be increased by a factor of 1.4.

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