

## Longer Wood Structural Panels to Resist Uplift and Shear

This document discusses the general design provisions for wood shear walls, which are outlined in section 2305.3 of the 2006 International Building Code (IBC), and in section 4.3 of the ANSI/ AF&PA SDPWS-2005 Standard, *Special Design Provisions for Wind and Seismic*.

In general, shear walls sheathed with wood structural panels shall be permitted to be used to resist wind and seismic forces. The shear wall shall be constructed as follows:

**Wood Structural Panel Wall Sheathing.** Section 2305.3.3 in the 2006 IBC and section 4.3.7 of SDPWS state that *wood shear walls shall be constructed of wood structural panels manufactured with exterior glue and not less than 4 feet by 8 feet, except at boundaries and at changes in framing. All edges of all panels shall be supported by and fastened to framing members or blocking.*

Minimum panel thickness and minimum wall stud spacing is outlined in Table 2304.6, which references Table 2308.9.3(3) – see below.

TABLE 2308.9.3(3)  
WOOD STRUCTURAL PANEL WALL SHEATHING<sup>b</sup>  
(Not Exposed to the Weather, Strength Axis Parallel or Perpendicular to Studs Except as Indicated Below)

MINIMUM THICKNESS (inch)	PANEL SPAN RATING	STUD SPACING (inches)		
		Siding nailed to studs	Nailable sheathing	
			Sheathing parallel to studs	Sheathing perpendicular to studs
5/16	12/0, 16/0, 20/0 Wall-16" o.c.	16	—	16
3/8, 15/32, 1/2	16/0, 20/0, 24/0, 32/16 Wall-24" o.c.	24	16	24
7/16, 15/32, 1/2	24/0, 24/16, 32/16 Wall-24" o.c.	24	24 <sup>a</sup>	24

For SI: 1 inch = 25.4 mm.

a. Plywood shall consist of four or more plies.

b. Blocking of horizontal joints shall not be required except as specified in Sections 2306.4 and 2308.12.4.

All performance-rated wood structural panels that meet PS-1 or PS-2 requirements, such as those having the TECO TESTED<sup>®</sup> gradestamp; qualify for use in wood shear wall construction.

**Fasteners.** According to section 4.3.6.3 of the SDPWS, *sheathing shall be attached to framing using approved fasteners. Nails or other approved sheathing fasteners shall be driven with the head of the fastener flush with the surface of the sheathing.*

*SDPWS states that nails should be located at least 3/8" from edges and ends of panels. Maximum nail spacing of 6" on center at panel edges. Maximum nail spacing of 6" on center along intermediate framing members for 3/8" and 7/16" panels installed on studs spaced 24" on center. Maximum nail spacing along intermediate framing of 12" for thicker panels or closer stud spacing.*

**Framing Lumber.** According to section 4.3.6.1 of the SDPWS, *all framing used for shear wall construction shall be 2" nominal or wider framing thickness at adjoining panel edges except that 3" nominal or wider framing thickness and staggered nailing are required where:*

- Nails are spaced 2" on center or less at adjoining panel edges, or
- 10d nails having penetration into framing of more than 1-1/2" are spaced 3" on center, or less at adjoining panel edges, or
- Required nominal unit shear capacity exceeds 700 plf in seismic Design Category D, E, or F.

**Stud Spacing.** Maximum stud spacing of 24" on center.

### **Special Design Considerations**

**Nailing pattern.** The strength and stiffness of the wood shear wall is achieved by selecting the appropriate nailing pattern along panel edges. Table 2306.4.1 in the IBC, and Table 4.3A in SDPWS provide nominal unit shear capacities for wood-frame shear walls, based on the panel edge fastener spacing. Closer nail spacing along the edges of the panel results in higher shear capacities.

**Uplift Forces.** Wood shear walls develop overturning moments, thus creating uplift forces. These uplift forces must be calculated, and an adequate anchorage system must be provided for the shear wall. There are several types of anchoring systems available, which provide a continuous load path from the wall to the foundation.

A common type of anchoring system is the use of metal strap tie-downs. Uplift loads are calculated for the shear wall system, and an appropriate number of tie-down straps are installed. These tie-downs are applied after the wood structural panel sheathing is installed.

An alternative to the use of metal strap tie-downs is the addition of nails to the nailing pattern, which provide additional uplift resistance. These uplift nails are added to the top and bottom of the panel, to provide continuous load path: from top plate to the panel, and from the panel to the sole plate.

Manufacturers of performance-rated structural wood panels, such as those qualified to use the TECO TESTED<sup>®</sup> gradestamp, provide panels having longer lengths. The longer panel lengths extend from the bottom of the sole plate, to the top of the double top plate, thus allowing additional space for the inclusion of specialty nailing patterns specifically for providing uplift resistance.

Current design specifications for the Uplift Capacity of Wood Structural Panel Sheathing when used for both Shear Wall and Uplift Simultaneously are provided in section 305.6 of the Standard for Hurricane Resistant Residential Construction (SSTD 10-99).

### **Summary**

Wood Structural Panels meeting the requirements of PS-1 or PS-2 specifications, such as those having the TECO TESTED<sup>®</sup> gradestamp, are allowed for use in the construction of wood shear walls in residential construction. Design considerations must be made on the framing members, panel thickness, and fastener types and spacing, to assure that the required shear capacities are reached.

Uplift forces that result from overturning moments must be resisted, and the use of metal strap tie downs has been a common practice for providing a continuous load path down to the foundation. Panels having longer length and special nailing patterns for increased uplift resistance is also allowed. These longer panels must meet the requirements of PS-1 or PS-2 specifications, such as panels having the TECO TESTED<sup>®</sup> gradestamp.