

DETAILING REQUIREMENTS FOR SHEATHING DESIGNED TO RESIST COMBINED SHEAR AND UPLIFT FROM WIND



Building codes require a continuous load path from the roof to the foundation to resist wind induced uplift, overturning, and sliding forces.

A continuous wind uplift load path consists of the following connections:

1. Rafter or truss to top plate
2. Top plate to stud below
3. Stud-to-stud connection between stories (if multi-story)
4. Stud to sill plate
5. Sill plate to foundation

A continuous lateral load path consists of the following connections:

1. Roof diaphragm to top of wall
2. Top plate to sill plate through sheathing and fasteners
3. Sill plate to foundation
4. Shearwall ends anchored to foundation for overturning

In wood framing, these load paths have traditionally been provided by using metal connectors and framing for the uplift load path, and by using shearwalls built with wood structural panels and holdowns for the lateral load path.

Two standards referenced in recent codes, the ICC 600-2008 and the 2008 AF&PA Special Design Provisions for Wind and Seismic (SDPWS), include requirements for using wood structural panels to resist combined uplift and lateral loads from wind.

The ICC 600 and SDPWS contain specific design and installation detailing requirements for using this technique. Since a single system is being used to provide two important load paths, it is critical that these detailing requirements be strictly followed. These non-traditional detailing requirements will require more time on the part of both the installer and the inspector.

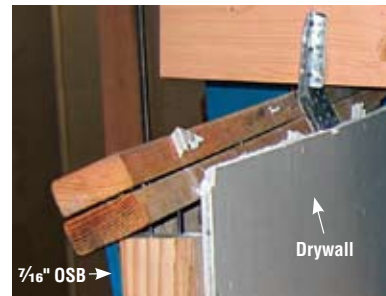


Sheathing Installed To Resist Combined Shear and Uplift

Four key detailing issues for sheathing designed to resist combined shear and uplift from wind:

• Eccentric Loading of Top Plates

When roof-framing-to-top-plate connectors are installed on the inside of the wall opposite the sheathing, the eccentric load results in the top plate rotating and the system failing prematurely.



• Failure of Horizontal Members such as Sill Plates and Band Joists

Full-scale testing has demonstrated that brittle failure of the sill plate can occur if sill plate anchors are spaced more than 16" apart and are not restrained with plate washers or other means to prevent cross-grain bending.



• Wood Structural Panel Selection

Sheathing panels resisting uplift must overlap the top member of the double top plate and the sill plate by 1 1/2". Standard precut stud lengths do not allow a standard-height panel to provide adequate overlap, so specially-sized panels must be used, longer panels must be shortened or splice blocking must be installed. In addition, when 10d nails are used to achieve higher uplift and shear capacities, a thicker panel (1 5/32" thick) is required.

• Wood Structural Panel Installation

Specific nail patterns and locations are required. Only configurations that have been verified by testing are shown. Overdriven fasteners, incorrectly-sized fasteners, or mis-placed fasteners will have a negative effect on the uplift and lateral resistance.

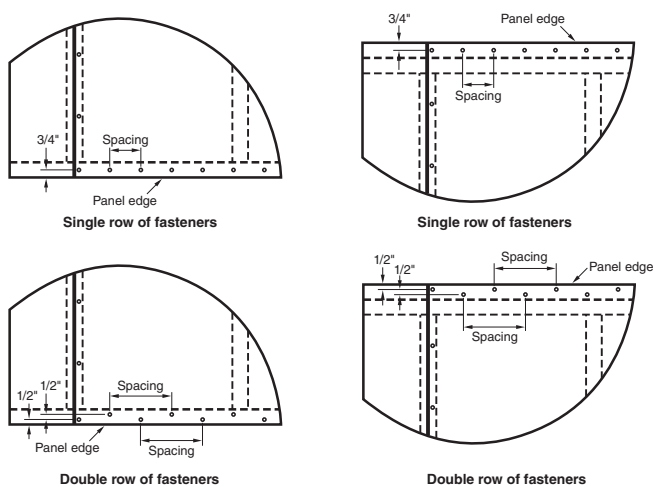


FIG. 4G, 2008 SDPWS, courtesy American Forest and Paper Association (ICC 600 similar)



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SPECIFIC DETAILING REQUIREMENTS

The following requirements are from the 2008 AF&PA Special Design Provisions for Wind and Seismic and the ICC 600-2008. Section numbers are listed in the right-hand column.

REQUIREMENT	2008 SDPWS SECTION	ICC 600-2008 SECTION
<p>Top plate rotation must be prevented. This is accomplished by one of two methods:</p> <ol style="list-style-type: none"> 1. Install the roof-to-top-plate connectors on the same side of the wall as the sheathing. This may require the use of longer fasteners. Check with Simpson Strong-Tie on the specific connector being used. 2. If roof-to-plate connectors are on the inside of the wall, install top-plate-to-stud connectors on the inside of the wall, or use a single roof-to-stud connector. 	4.4.1.5(2)	304.1
Connectors are required at window and door openings to transfer the uplift load from the header to the foundation. This would include the header-to-stud, stud-to-plate, and plate-to-foundation connections.	4.4.1.4	307.1.5, e
Sill plate anchors spaced a maximum of 16" o.c. are required. Where anchor bolts are used, square plate washers having a minimum size of 0.229"x3"x3" must be used at each bolt and located so that the edge of the washer extends to within 1/2" of the edge of the sill plate on the sheathed side of the wall. Where other anchoring methods are used, such as mudsill anchors, they must be installed on the same side of the wall as the sheathing. (ICC 600 – anchor bolts required to be minimum 5/8" diameter.)	4.4.1.6	307.1, 307.1.5
Wood structural panels must overlap the top member of the double top plate and the bottom plate by 1 1/2".	4.4.1.5(1), 4.4.1.6(1), Table 4.4.1	Table 307(1) Note d
Nails installed in a single row must be placed 3/4" from the top of the top plate and bottom of the bottom plate. Nails installed in a double row must have the upper row installed 1/2" from the top of the plate and the lower row installed 1/2" from the bottom of the plate.	Table 4.4.1 Figure 4G	Figure 307
Sheathing panels must be installed vertically.	4.4.1.2	307.1.5, a
If the upper and lower story panel splice occurs over a common horizontal framing member (i.e., band joist), nail spacing is limited to 3" o.c. for a single row and 6" o.c. for a double row, reducing uplift capacity, unless the member is reinforced to prevent cross-grain tension.	4.4.1.7(1)	N/A
The building designer must choose the nail size, spacing, and number of rows of nails based on the required uplift and shear resistance.	Table 4.4.1	307.1.1 through 307.1.4
Where 6d or 8d common nails are used, 7/16" minimum OSB or 15/32" minimum plywood is required. Where 10d common nails are used, 15/32" minimum OSB or plywood is required. (ICC 600 – 7/16" panels permitted for all nail sizes when studs are spaced 16" o.c.)	4.4.1.2 Table 4.4.1, Note 3	Table 307(1) Note a
Values listed in Table 4.4.1 of the SDPWS are nominal capacities, which must be divided by a safety factor of 2.0 for use in allowable stress design.	4.4.1	N/A
If a perforated shearwall is used to resist combined shear and uplift from wind, anchorage of the bottom plate must be designed to resist the sum of the roof wind uplift and the perforated shearwall sill plate uplift. Perforated shearwall sill plate uplift is equal to the induced unit shear in the wall, calculated in accordance with 4.3.6.4.1.1.	4.3.6.4.2.1	N/A
The ends of each shearwall segment must be anchored to resist overturning, and all horizontal panel edges must occur over framing or blocking.	4.3.6.4.2, 4.3.7.1(1)	307.1.5, b

This technical bulletin is effective until ~~January 31, 2012~~, and reflects information available as of January 1, 2010. This information is updated periodically and should not be relied upon after ~~January 31, 2012~~; contact Simpson Strong-Tie for current information and limited warranty or see www.strongtie.com.

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