

Roof Diaphragm and Sheathing Calculations

By inspection the highest stressed diaphragm is the main roof diaphragm. The transverse and longitudinal loads are obtained from the woodworks shearwall software. We consider both cases and conservatively design for the worst load case.

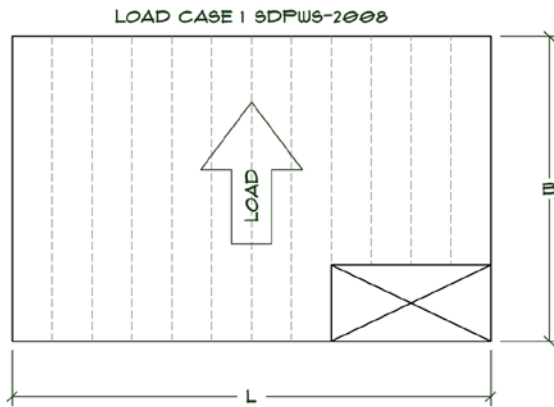
1.) Transverse Load Case:

$W_D = 275 \text{ plf}$
 $M_{max} = 85,938 \text{ ft-lbs}$
 $T=C=M/b = 3,125 \text{ lbs}$

$L = 50 \text{ ft}$
 $b = 27.5 \text{ ft}$

$V = 6875 \text{ lbs}$
 $v = V/b = 250 \text{ plf}$

Load Case 1
SDPWS-2008



L/B Ratio = 1.82 → OK
 *Max. AR for WSP, unblocked = 3:1

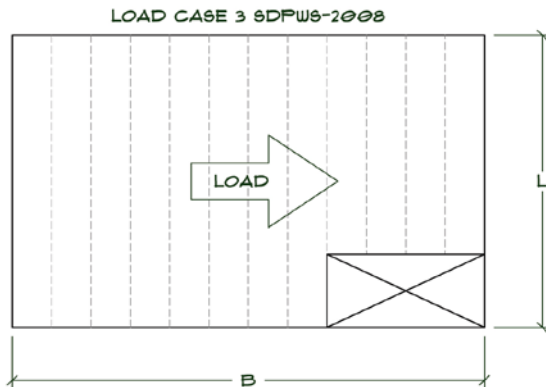
2.) Longitudinal Load Case:

$W_D = 300 \text{ plf}$
 $M_{max} = 28,359 \text{ ft-lbs}$
 $T=C=M/b = 567 \text{ lbs}$

$L = 27.5 \text{ ft}$
 $b = 50 \text{ ft}$

$V = 4125 \text{ lbs}$
 $v = V/b = 83 \text{ plf}$

Load Case 3
SDPWS-2008



L/B Ratio = 0.55 → OK
 *Max. AR for WSP, unblocked = 3:1

Roof Sheathing Specifications

(Initially assume APA rated sheathing with nails @ 6" o/c edges, 12" o/c field.)

Sheathing Thickness:	15/32 in.	APA Rating:	Grade 32/16
Nails:	8d	Sheathing Type:	PLY
Rafter/Truss Spacing:	24 in. o/c	Roof Framing Species:	HF
(Unblocked Diaphragm)		SGAF:	0.93

Load Case 1: (transverse)

v = 250 plf < vw = 312 plf → OK

Load Case 3: (longitudinal)

v = 83 plf < vw = 235 plf → OK

Note: Nominal unit shear capacities for unblocked diaphragms from Table 4.2C, SDPWS-2008.

Sheath roof with 15/32 APA rated PLY (Grade 32/16) w/ 8d nails @ 6" o/c edges, 12" o/c field. Blocking not required at panel edges.

Chord Splices

From previous, transverse load case governs with largest chord force:

T = C = 3,125 lbs

Assume a min. 48" chord splice at top plate connected with two or three rows of 16d nails (.162" x 3.5").

From NDS 2012 Table 11N: CD = 1.6 (wind/seismic)
 Z = 141 lbs
 Z' = Z(CD) = 225.6 lbs
 N = T/Z' = 13.9 nails

This number is too low, revert to prescriptive method: [Table 3.21 WFCM 2012]

Use (14) - 16d nails on each side of splice joint in wall top chords. Position splice joint over studs.

Where top chord is discontinuous, apply an MSTC40 strap to complete the tensile load path. (ie. Where a beam ties into a top plate)

Roof Panel Sheathing Loads

Highest loading on roof sheathing panels is at roof overhangs in Zone 3 (C&C Wind Loads) with negative pressure/uplift.

P_{3OH} = 145 psf (unfactored) Terrain Exp. Category C
 Basic Wind Speed (ultimate) 155.00 MPH

Convert to ASD value by multiplying by 0.6:

P_{3OH_ASD} : 87 psf

Roof Sheathing Nailing

	Edges (in.)	Field (in.)
Interior (Zone 1)	6	12
Perimeter (Zone 2)	4	4
Gable Endwall & Overhangs	4	4

Also consider highest gravity loads:

D + S (ice dam at overhangs)

P_s = 7.8 psf + 38.5 psf = 46.3 psf

*Based on WFCM 2012 Table 3.10, Rafter/Truss spacing @ 24" o/c.

Wind Load Governs: C_D = 1.6

From SDPWS-2008 Table 3.2.2 (Load Capacities for Roof Sheathing Resisting Out-of-Plane Loads):

P_{max} = 87.0 psf < P_{allow} = 96.9 psf → OK

Also from APA publication Q225G Table 1a (Plywood Sheathing):

Sheathing Perpendicular to Rafters/Trusses

L/240	→	81 psf	>	60.9 psf ²	→	OK
L/180	→	108 psf	>	60.9 psf ²	→	OK
Bending	→	123 psf	>	87.0 psf	→	OK
Shear	→	285 psf	>	87.0 psf	→	OK

*Note: L/240 is (live load) deflection, L/180 is (total load) deflection.

Install "h" clips at panel edges @ 24" o/c for all roof sheathing.

Nail all sheathing at gable and eave roof overhangs w/ 8d nails @ 4" o/c edges, 4" o/c field.
 Nail all sheathing at perimeter and peak of roof w/ 8d nails @ 4" o/c edges, 4" o/c field.

General Notes:

- 1.) For roof sheathing within 4 feet of the perimeter edge of the roof, including 4 feet on each side of the roof peak, the 4 foot perimeter edge zone attachment requirements shall be used.
- 2.) The wind loading is permitted to be taken as 0.42 times the C&C loads for the purpose of determining deflection limits per footnote f. of Table 1604.3 IBC 2015.

Wall Sheathing Specifications (Initially assume APA rated sheathing with nails @ 6" o/c edges, 12" o/c field.)

Sheathing Thickness: 7/16 in. APA Rating: Grade 24/16
 Nails: 8d Sheathing Type: OSB
 Stud Spacing: 16 in. o/c
 Terrain Exp. Category: C
 Basic Wind Speed (ultimate): 155.00 MPH

Wall Panel Sheathing Loads

Highest loading of wall sheathing panels is at building corners in Zone 5 (C&C Wind Loads) with negative pressure/suction.

Wall Sheathing Nailing

P5 = 61.9 psf (unfactored)

	Edges (in.)	Field (in.)
Interior (Zone 4)	6	12
Edge (Zone 5)	6	6

Convert to ASD value by multiplying by 0.6:

*Based on WFCM 2012 Table 3.11, Stud spacing @ 16" o/c.

P5_ASD = 37.14 psf

From SDPWS-2008 Table 3.2.1 (Load Capacities for Wall Sheathing Resisting Out-of-Plane Loads):

Sheathing Parallel to Studs

P5_ASD = 37.1 psf < Pallow = 37.5 psf → OK

Sheathing Perpendicular to Studs

P5_ASD = 37.1 psf < Pallow = 190.6 psf → OK

Also from APA publication Q225G Table 2a (OSB Sheathing):

Sheathing Parallel to Studs

L/360 → 26 psf > 26.0 psf² → OK
 Bending → 86 psf > 37.1 psf → OK
 Shear → 331 psf > 37.1 psf → OK

Sheathing Perpendicular to Studs

L/360 → 128 psf > 26.0 psf² → OK
 Bending → 288 psf > 37.1 psf → OK
 Shear → 331 psf > 37.1 psf → OK

Sheath walls with 7/16 APA rated OSB (Grade 24/16) w/ 8d nails @ 6" o/c edges, 12" o/c field.

Nail all sheathing within 4 feet of wall corners w/ 8d nails @ 6" o/c edges, 6" o/c field.

General Notes:

- 1.) For wall sheathing within 4 feet of the corners, the 4 foot edge zone attachment requirements shall be used.
- 2.) The wind loading is permitted to be taken as 0.42 times the C&C loads for the purpose of determining deflection limits per footnote f. of Table 1604.3 IBC 2015.