

SHEAR WALL CALCULATOR

SWL2

Vs = 2649 lbs
(seismic)

Vw = 4294 lbs
(wind)

Job#: 2015-002

SWL Name	Shear (lbs)	Wall Length (ft)	SWL Length	Unit Shear (plf)	Wall Hgt. (ft)	Uplift (lbs)	Holddown	Anchor Bolt	Embedment	Studs	Panels
SWL2	4,294	24.5	7.8	554.1	9.0	4,987	HDU5	SB5/8X24	18	(2) 2x6	2

Wind Load Governs DF No. 2

Shearwall Sheathing Specification:

Nominal unit shear capacities from SDPWS Table 4.3A (Wood Frame Shear Walls)

Vs = 342 plf <
Vw = 554 plf <

Vallow = 418 plf → OK (seismic)
Vallow = 670 plf → OK (wind)

Edge Nail Spacing = 6 in
Sheathing both sides = YES
Sht. Panel Thickness = 7/16 in
Fastener Type = 8d
Min. Panel Length: bs = 3 ft
Max. AR: h/bs = 3.00 → OK
Max. AR Seismic Reduction: 2bs/h = 0.67

Sheath both sides of shearwall. Use 7/16 OSB/PLY (APA Grade 24/16) w/ 8d nails @ 6" o/c edges, 12" o/c field, blocking required.

Anchor Bolt Spacing

Since we cannot control species of pressure treated sill plate assume weakest species from NDS 2012 Table 11E for anchor bolts (Northern Species G = 0.35):

Sill Plate: (1)-2x
AB DIA = 0.5 in
Zpara = 530 lbs
Zperp = 290 lbs
Applying adjustment factors:
CD = 1.6 (wind or seismic)
Zpara = 848 lbs
Zperp = 464 lbs

Out-of-Plane Seismic

WDL = 12 psf
SDS = 0.978 g
le = 1.0
ka = 1.0 (concrete is rigid)
Wall Hgt. = 9.0 ft
ρ = 1.0 (out-of-plane)
Vsperp is given as the seismic force of half the dead weight of the wall.
Vsperp = 362 lbs

$$F_p = 0.4 S_{DS} k_a I_e W_p$$

ASCE 7-10 Sec. 12.11.2

Out-of-Plane Wind (MWFRS)

Ww = 38.17 psf
Ltrib = 4.5 ft
Wwperp is given as the max. MWFRS wind force on the bottom half of an exterior wall.
Vwperp = 2,525 lbs
Wind Load Governs:
Vperp = 2,525 lbs

AB Spacing	V (lbs)	# of Bolts	Spacing (ft)
Perp. Load	2,525	5.4	4.5
Para. Load	4,294	5.1	4.8

La = 24.5 ft La = available wall length for anchor bolts

Use 1/2" DIA anchor bolts, 7" min. embedment /w 3"x3"x1/4" washers @ 48" o/c spacing all of Wall 2.

A35 Framing Angle Spacing

Provide full depth blocking with A35 clips to top plt. per plan.

Lac = 24.5 ft (available collector length)
Fallow = 600 lbs (F1 direction)
Unit Shear = 175.3 plf
Spacing = 3.4 ft

Use A35 clips for top plt./blocking connection @ 24" o/c spacing.

Deflection

(based on strength-level seismic forces)
vu = 478.5 plf
E = 1,600,000 psi
A = 16.5 in²
Gt = 83,500 plf (Table C4.2.2A)
da = 0.115 in (Simpson Holddown)
en = 0.0085 in (Table C4.2.2D)
nail spacing = 6 in
Sht. both sides = YES

Panel #	b (ft)	Δs
1	3	0.46 in
2	4.75	0.32 in
3	0	-- in
4	0	-- in
5	0	-- in
Max. Defl.		0.46 in

General Notes:

- For unblocked shearwalls w/ studs @ 16" o/c capacity is reduced by 0.6.
- All stemwall foundations walls with HDU8 or greater holddown (anchor bolt ≥ 7/8" DIA) shall be 8" min. thickness.
- Uplift on holddowns calculated with dead load counter action neglected (conservative).
- Where the required nominal unit shear capacity on either side of a shear wall exceeds 700 plf in SDC D framing members at panel edges and sill plate shall be 3X or double 2X.
- All holddowns over TJI floor, use CNW coupler nut and threaded rod for extension. Solid squash blocks beneath all shearwall chords equal to chord cross section.

ASCE 7-10
(Table 12.12-1)

Cd = 4
Δ = 1.85 in
Δlimit = 2.16 in → OK

Bearing on Wall Plates

Top/Sill Plt. Species	HF
Fc _L	405 psi
Ct _{cL}	1.00
CM _{cL}	1.00
Cb	1.00 (1.125)
Fc _L '	405.00 psi
Ab	16.50 in ²
Pc	5335 lbs
fc _L	323 psi
CSI (bearing)	0.80 → OK

Chord in Tension

	(DF No. 2)
Ft	575 psi
CM _t	1.00
Ct _t	1.00
Ci _t	1.00
CD	1.60 (wind)
CF _t	1.30
Ft'	1196 psi
An	16.50 in ²
ft	302 psi
CSI (tension)	0.25 → OK

Chord in Compression

	(DF No. 2)
Fc	1350 psi
CM _c	1.00
Ct _c	1.00
Ci _c	1.00
CD	1.60 (wind)
CF _c	1.10
(le/d)x	18.82
E'min	580,000 psi
FcE	1346 psi
Fc*	2376 psi
c	0.80 sawn lumber
FcE/Fc*	0.567
1 + FcE/Fc*/2c	0.979
Cp	0.479
Fc'	1137 psi
fc	323 psi
CSI (compression)	0.28 → OK

Shearwall Gravity Loads

(Point loads are assumed to bear directly above SWL chord)

	(plf)	WDL	WLL	W _{SL} /W _{LrL}
Wall Loads		261	0	303
	(lbs)	WDL	WLL	W _{SL} /W _{LrL}
Point loads		0	0	0

Wind ASD Load Cases from ASCE 7-10:

5.) D + W =	5,335 plf (governs)
6a.) D + .75L + .75W + 75(Lr or S) =	4,391 plf

Seismic ASD Load Cases from ASCE 7-10:

5.) D + E =	3,424 plf
6b.) D + .75L + .75E + 75S =	2,958 plf

Bottom Plate (Sole Plt.) Attachment to Floor

This section is only applicable when shearwall is framed on top of a wood joist or TJI floor.

Z =	141 lbs	(NDS 2012 Table 11Q for 16d nail, DF G = 0.5)
CD =	1.6	(wind or seismic)
Z' =	226 lbs	
Unit Shear =	554.1 plf	
Spacing =	4.9 in	

Nail 2x bottom plate to rim joist below w/ 16d nails @ 4" o/c spacing.

Sill Plate at Foundation

Use (1)-2x HF No. 2 pressure treated plate at foundation.

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Pw =	4,987 lbs
Ps =	3,076 lbs
Stud Spacing =	16 in
SWL Chord Tension =	4,987 lbs
SWL Chord Comp. =	5,335 lbs
Chord Studs =	(2) 2x6
Chord Depth (dx) =	5.5 in
lb =	3.00 in
Emin =	580,000 psi
CM _e =	1.00
Ct _e =	1.00
Ct _e =	1.00