Gravity and Lateral Analysis

for

NHD #1392-F-A
Multi-Use
Limited License

for

Nisqually Building
112500 25th Ave SE
Olympia, WA 98513

by

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Port Orchard, WA 98366
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NLO#13261-24

N.L. Olson & Associates, INC.

May-25

Scope of Work:

Vertical and Lateral Engineering for New 2-story Deplex by Northwest Home Design

Analysis was done based off the 2021 International Building Code

Materials:

Framing: HF #2 or better
Beams: DF #2 or better
Glulam: Douglas Fir 24F-V4 for simple supported and 24F-V8 for continuous or cantilevered beams

Reinforcing Steel: ASTM A615 Grade 60
Concrete: f'c = 2500 psi

Design Assumptions:

Foundation Bearing: 1500 psf

Design Wind: 110 MPH 3 sec gust Exp B

Seismic Zone D2 S_s = 140%
S_1 = 50.0%

Site Class: D

Snow Load: 25 psf Ground

CONTENTS:

Basic Design Criteria

Basic Wind Speed = 110 mph
Seismic design category = D
Site Class = D

S_s = 140%
S_1 = 50.0%

Ground Snow Load = 25 psf

Importance Factor, Seismic I_E = 1.0
Importance Factor, Snow I_S = 1.0
Importance Factor, Wind I_W = 1.0

Dead Loads

2nd Floor = 12 psf (2.5 joist, 3 subfloor, 2.5 ceiling, 5 finish)
Wall = 12 psf (12 sheathing, studs, gypboard, insulation, siding)
Roof = 15 psf (2.5 psf truss, 3 insulation, 2.2 gypboard, 1.5 sheathing, 2.5 felt, 2 shingles)

Live Loads

Floor Live Load, L_f = 40 psf
Roof Live Load, L_r = 25 psf

Snow Loads

C_e = 1.0 for Partially exposed roof in exposure B (ASCE 7-16 Table 7-2)
C_t = 1.1 (ASCE 7-16 Table 7-3)

$p_f = 0.7C_eC_tI_sp_g$ = 19.25 psf (ASCE 7-16 Eq 7-1)

C_s = 1.0 (ASCE 7-16 Figure 7-2)

$p_s = C_sp_f$ = 19.25 psf

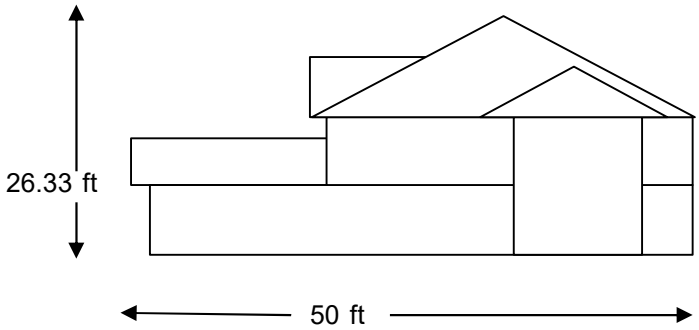
Use 25 psf

Check Footing Load

Trib Floor = 7.5 ft
Trib Roof = 20 ft

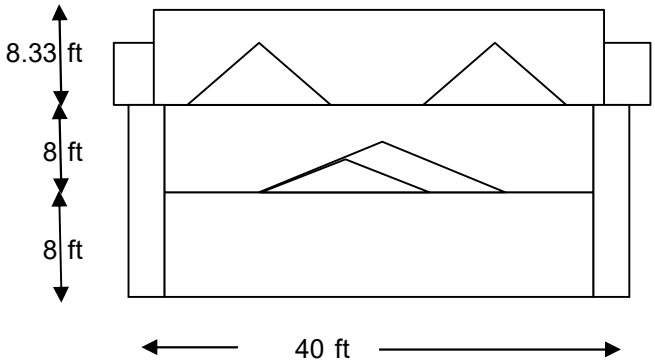
Total Load (D+L+S) = 1382 plf
Foooting Width = 16 inches
Bearing Pressure = 1037 psf

Basic Dimensions

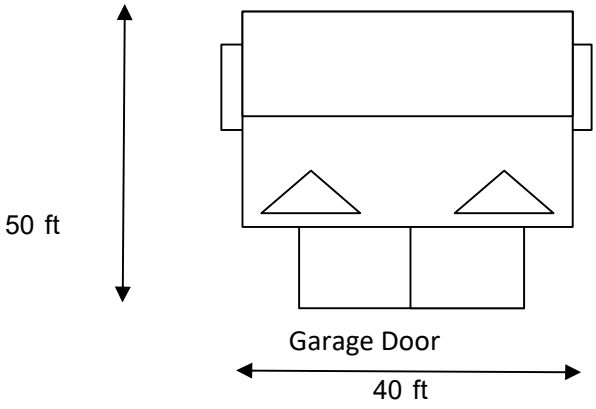


Main Roof Slope is 5:12
or 22.6 degrees

Side Elevation



Front Elevation



Plan View

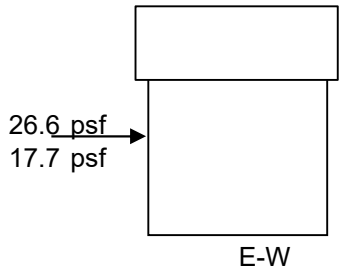
Assumed N

Wind Loads

Main Force resisting System - ASCE7-16 Simplified Method

Basic Wind Speed, V =	110	mph
Exposure Category =	B	
Building is Enclosed		
2a =	6	(ASCE 7-16 Table 26.6-1)
Topographic, K_{zt} =	1.00	(ASCE 7-16 26.8.2)
Adjustment Factor Lambda =	1.00	psf (EQ 16-35)
a=	3	

P_{net} values shown below are based P_{s30} Design Wind Pressures ASCE 7-16 Figure 28.5-1



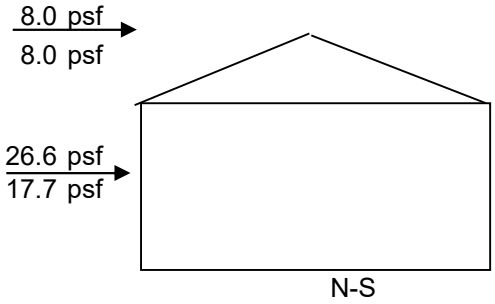
E-W

Diaphragm Design Forces

Roof Shear =	6242	lbs
Main Floor Shear =	7381	lbs
Base Shear =	3896	lbs

Shearwall Design Forces (ASD)

Upper Floor Shear =	3745	lbs
Main Floor Shear =	8174	lbs



N-S

Diaphragm Design Forces

Roof Shear =	5805	lbs
Main Floor Shear =	7519	lbs
Base Shear =	3117	lbs

Shearwall Design Forces (ASD)

Upper Floor Shear =	3483	lbs
Main Floor Shear =	7994	lbs

Resisting Moment, M_r =	2007	k-ft
Overturning Moment, M_o =	153	k-ft
Safety Factor, F_o = 0.9D/W =	11.8	

Equivalent lateral force method per ASCE 7-16

Base shear, $V = C_s W$ (ASCE 7-16 Eqn 12.8-1)

S_S =	140%		C_t =	0.02
F_a =	1.200	(ASCE 7-16 Table 11.4-1)	x =	0.75
$S_{DS} = 2/3S_{MS} = 2/3F_aS_S$ =	1.120		$T_a = C_t h_n^x$ =	0.19 sec
S_1 =	50.0%			
F_v =	1.700	(ASCE 7-16 Table 11.4-2)		
$S_{D1} = 2/3S_{M1} = 2/3F_vS_1$ =	0.567		Seismic Design Category =	D
R =	6.5	(ASCE 7-16 Table 12.2-1)	$C_s = S_{DS} / (RI)$ =	0.172
K=	1			
Max $C_s = S_{D1} /(T\ R/I)$ =	0.458		Min $C_s = 0.044S_{DS}\ I$ =	0.049

W_2 = 34677 lbs (dead load of roof + 1/2 walls only)

W_1 = 45612 lbs (dead load of 1/2 walls + floor + garage roof)

W_{total} = 80.289 kips

Lateral Forces $F_x = C_{vx} V$

F_2 = 8346 lbs

F_1 = 5489 lbs

Base Shear, V = 13.83 kips

Stability coefficient, $\theta = P_x\Delta/V_xh_{sx}C_d$ = 0.021 <0.1 threrefore no Pdelta calculated

Resisting Moment, M_r = 2007 k-ft

Overturning Moment, M_o = 177.4 k-ft

Safety Factor, $F_o = 0.6D/0.7E$ = 9.7

Diaphragm Design Forces (ASD)

$E = F_2$ = 5842 lbs

$E = F_1$ = 3842 lbs

Shearwall Design Forces (ASD)

$E = F_2$ = 5842 lbs

$E = F_1$ = 9684 lbs

Seismic forces govern design of the lateral force resisting system in both directions due to base shear

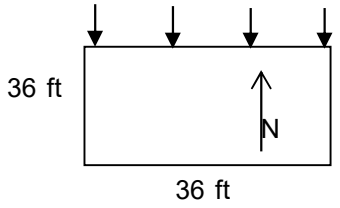
Redundancy - 1st Floor Shear walls

USE ρ = 1.3

Roof Diaphragm

Max diaphragm force per ASCE7 12.10.1.1 = $0.4S_{DS}Iw_x$ = 15535 lbs

Min diaphragm force per ASCE7 12.10.1.1 = $0.2S_{DS}Iw_x$ = 7768 lbs



N-S Total Shear Force= 8346 lbs (Seismic)

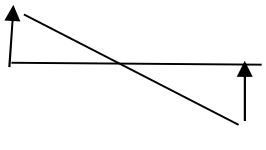
N-S Shear Load = 232 plf

Mmax = $WL^2/8$ = 37555.7 lb-ft

Max Tension in Chord = 1043 lbs

2021 SDPWS Table 4.2C Load Case #1

7/16" OSB unblocked w/ 8d@6" gives 322.5 plf



OK for 7/16 unblocked w/ 8d nails at 6" edge

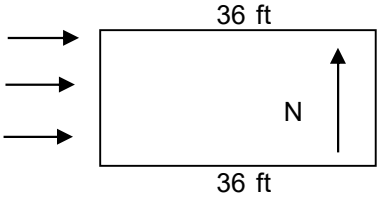
Diaphragm Deflection check

$$\Delta = \frac{5vL^3}{8EAW} + \frac{0.25vL}{1000G_a} + \frac{E(\Delta_c X)}{2W}$$

Use double 2x6 DF top plate w/ 4 splices and 8d nails loaded to 120 lbs each

Δ = 0.009 + 0.099 + 0.4 = 0.51 in

unblocked diaphrams = 2.5 Δ = 1.27 in



E-W Total Shear Force= 8346 lbs (Seismic)

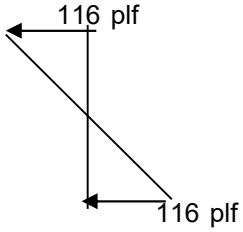
E-W Shear Load = 232 plf

Mmax = $WL^2/8$ = 37556 lb-ft

Max Tension in Chord = 1043 lbs

2021 SDPWS Table 4.2C Load Case #3

7/16 OSB unblocked w/ 8d nail @6" gives 237.5 plf



OK for 7/16 unblocked w/ 8d nails at 6" edge

Diaphragm Deflection check

$$\Delta = \frac{5vL^3}{8EAW} + \frac{0.25vL}{1000G_a} + \frac{E(\Delta_c X)}{2W}$$

Use double 2x6 DF top plate w/ 4 splices and 8d nails loaded to 120 lbs each

Δ = 0.009 + 0.245 + 0.4 = 0.65 in

unblocked diaphrams = 2.5 Δ = 1.64 in

Use Segmented Shearwall design for South Exterior Upper Wall

Full length = 12 ft Wall Height = 8 ft
Length of Full height wall = 12 ft Max Height of opening =
% of full height walls = 100%
Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 3797 lbs (from Seismic load)
Uplift Anchorage, T = Vh / $C_o E L_i$ = 2532 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, v = V/$C_o E L_i$ = 316 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @4" edge spacing = 380 plf (2021 SDPWS Table 4.3A)
for HF framing multiply capacity (1-(0.5-SG)) = **353** plf (2021 SDPWS Table 4.3A)

dead load on walls = 396 plf
Net uplift is 0.7E-0.6D = 1106 lbs
Use MSTC48B3 Straps

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 153.4 psi
OK for single 2x6 at ends of walls

Allowable load on 16d sole plate nails in 2x sill = 163.2 lbs shear (NDS Table 11N)
Min Spacing of nails req'd = 6.2 inches
OK For Prescriptive Base Plate Nailing

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi
A (2-2x6 Stud) = 16.5 in^2
G_a (2021 SPDWS 4.3A) = 22 kip/in
Δa (assumed) = 0.25 in

Δ = 5E-04 + 0.1151 + 0.167 = 0.282 in

Allowable Deflection = 0.02H = 1.92

Use Segmented Shearwall design for North Exterior Upper Wall

Full length = 28 ft Wall Height = 8 ft
Length of Full height wall = 28 ft Max Height of opening =
% of full height walls = 100%

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 3797 lbs (from Seismic load)
Uplift Anchorage, $T = Vh / C_o E L_i$ = 1085 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 136 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @6" edge spacing = 260 plf (2021 SDPWS Table 4.3A)
for HF framing multiply capacity (1-(0.5-SG)) = **242** plf (2021 SDPWS Table 4.3A)

dead load on walls = 396 plf
Net uplift is 0.7E-0.6D = -2241 lbs
No Hold Downs Required

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 65.75 psi
OK for dbl 2x6 studs at end of wall

Allowable load on 16d sole plate nails in 2x sill = 163.2 lbs shear (NDS Table 11N)
Min Spacing of nails req'd = 14.4 inches
OK For Prescriptive Base Plate Nailing

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi
A (2-2x6 Stud) = 16.5 in^2
G_a (2021 SPDWS 4.3A) = 15 kip/in
Δa (assumed) = 0.25 in

Δ = 9E-05 + 0.0723 + 0.071 = 0.144 in

Allowable Deflection = 0.02H = 1.92

Use Segmented Shearwall design for West Exterior Upper Wall (East is Same)

Full length =	21.25 ft	Wall Height =	8 ft
Length of Full height wall =	21.25 ft	Max Height of opening =	ft
% of full height walls =	100%		

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 1899 lbs (from Seismic load)

Uplift Anchorage, $T = Vh / C_o E L_i$ = 714.8 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 89 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @6" edge spacing = 260 plf (2021 SDPWS Table 4.3A)

for HF framing multiply capacity (1-(0.5-SG)) = **242** plf (2021 SDPWS Table 4.3A)

dead load on walls = 126 plf

Net uplift is 0.7E-0.6D = -88 lbs

No Hold Downs Required

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 43.32 psi

OK for single 2x6 at ends of walls

Allowable load on 16d sole plate nails in 2x sill = 163.2 lbs shear (NDS Table 11N)

Min Spacing of nails req'd = 21.9 inches

OK For Prescriptive Base Plate Nailing

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

					E =	1E+07	psi
					A (2-2x6 Stud) =	16.5	in^2
					G_a (2021 SPDWS 4.3A) =	15	kip/in
					Δa (assumed) =	0.25	in
Δ =	8E-05	+ 0.0477	+ 0.094	=	0.142	in	

Allowable Deflection = 0.02H = 1.92

Use Segmented Shearwall design for Middle Interior Upper Wall (Party Wall) (Both Sides Similar)

Full length =	35 ft	Wall Height =	8 ft
Length of Full height wall =	35 ft	Max Height of opening =	ft
% of full height walls =	100%		

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 1899 lbs (from Seismic load)

Uplift Anchorage, $T = Vh / C_o E L_i$ = 434 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 54 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @6" edge spacing = 260 plf (2021 SDPWS Table 4.3A)

for HF framing multiply capacity (1-(0.5-SG)) = **242** plf (2021 SDPWS Table 4.3A)

dead load on walls = 126 plf

Net uplift is 0.7E-0.6D = -889 lbs

No Hold Downs Required

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 26.3 psi

OK for single 2x6 at ends of walls

Allowable load on 16d sole plate nails in 2x sill = 163.2 lbs shear (NDS Table 11N)

Min Spacing of nails req'd = 36.1 inches

OK For Prescriptive Base Plate Nailing

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi

A (2-2x6 Stud) = 16.5 in^2

G_a (2021 SPDWS 4.3A) = 15 kip/in

Δa (assumed) = 0.25 in

Δ = 3E-05 + 0.0289 + 0.057 = 0.086 in

Allowable Deflection = 0.02H = 1.92

Use Segmented Shearwall design for West Exterior Lower Wall (East is Same)

Full length =	21.25 ft	Wall Height =	8 ft
Length of Full height wall =	21.25 ft	Max Height of opening =	-
% of full height walls =	100%		

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 3147 lbs (from Seismic load)

Uplift Anchorage, $T = Vh / C_o E L_i$ = 1185 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 148 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @6" edge spacing = 260 plf (2021 SDPWS Table 4.3A)

for HF framing multiply capacity (1-(0.5-SG)) = **242** plf (2021 SDPWS Table 4.3A)

dead load on walls = 222 plf

Net uplift is 0.7E-0.6D = -230 lbs

No Hold Downs Required

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 71.81 psi

OK for dbl 2x6 studs at end of wall

Allowable load on 5/8 anchors bolt in 2x sill = 1376 lbs shear (NDS Table 11E)

Min Spacing of anchor bolts req'd = 9.3 ft

Use 5/8 anchors @ 4' o.c.

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi

A (2-2x6 Stud) = 16.5 in^2

G_a (2021 SPDWS 4.3A) = 15 kip/in

Δa (assumed) = 0.25 in

Δ = 1E-04 + 0.079 + 0.094 = 0.173 in

Allowable Deflection = 0.02H = 1.92

Use Segmented Shearwall design for North Exterior Lower Wall

Full length = 12 ft Wall Height = 9 ft
Length of Full height wall = 12 ft Max Height of opening =
% of full height walls = 100%

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 5196 lbs (from Seismic load)
Uplift Anchorage, $T = Vh / C_o E L_i$ = 3897 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 433 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @3" edge spacing = 490 plf (2021 SDPWS Table 4.3A)
for HF framing multiply capacity (1-(0.5-SG)) = **456** plf (2021 SDPWS Table 4.3A)

dead load on walls = 564 plf
Net uplift is 0.7E-0.6D = 1866 lbs
Use STHD14 Hold Downs

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 236.2 psi
OK for dbl 2x6 studs at end of wall

Allowable load on 5/8 anchors bolt in 2x sill = 1376 lbs shear (NDS Table 11E)
Min Spacing of anchor bolts req'd = 3.2 ft
Use 5/8 anchors @ 3' o.c.

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi
A (2-2x6 Stud) = 16.5 in^2
G_a (2021 SPDWS 4.3A) = 28 kip/in
Δa (assumed) = 0.25 in

Δ = 1E-03 + 0.1392 + 0.188 = 0.328 in

Allowable Deflection = 0.02H = 2.16

Use Segmented Shearwall design for South Lower Exterior Wall

Full length =	6	ft (total)	Wall Height =	8	ft
Length of Full height wall =	6	ft	Max Height of opening =		
% of full height walls =	100%				

V = 3747 lbs (from Seismic load) (25% Overstrength Added)

16.5" Portal Frame Capacity =	900	lbs (17") (APA TT-100)
18.5" Portal Frame Capacity =	1105	lbs (18") (APA TT-100)

Total Portal Frame Capacity = **4010** lbs

Use (2) 16.5" & (2) 18.5" Portal Frames

Use Segmented Shearwall design for Middle Interior Lower Wall (Party Wall) (Both Sides Similar)

Full length = 48.25 ft Wall Height = 8 ft
Length of Full height wall = 48.25 ft Max Height of opening =
% of full height walls = 100%

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 3147 lbs (from Seismic load)
Uplift Anchorage, $T = Vh / C_o E L_i$ = 521.8 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 65 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @6" edge spacing = 260 plf (2021 SDPWS Table 4.3A)
for HF framing multiply capacity (1-(0.5-SG)) = **242** plf (2021 SDPWS Table 4.3A)

dead load on walls = 222 plf
Net uplift is 0.7E-0.6D = -2692 lbs
No Hold Downs Required

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 31.63 psi
OK for dbl 2x6 studs at end of wall

Allowable load on 5/8 anchors bolt in 2x sill = 1376 lbs shear (NDS Table 11E)
Min Spacing of anchor bolts req'd = 21.1 ft
Use 5/8 anchors @ 4' o.c.

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi
A (2-2x6 Stud) = 16.5 in^2
G_a (2021 SPDWS 4.3A) = 15 kip/in
Δa (assumed) = 0.25 in

Δ = 3E-05 + 0.0348 + 0.041 = 0.076 in

Allowable Deflection = 0.02H = 1.92

Use Segmented Shearwall design for Middle Interior Lower Wall (Back of Garage Wall)

Full length = 10 ft Wall Height = 8 ft
Length of Full height wall = 10 ft Max Height of opening =
% of full height walls = 100%

Shear Resistance Adjustment Factor , Co = 1 (2021 NDS SDPWS Table 4.3.5.6)

V = 4396 lbs (from Seismic load)
Uplift Anchorage, $T = Vh / C_o E L_i$ = 3517 lbs (2021 NDS SDPWS Eqn 4.3-8)

Unit shear force, $v = V/C_o E L_i$ = 440 plf (2021 NDS SDPWS Eqn 4.3-9)

7/16 sheathing w/ 8d Nails @3" edge spacing = 490 plf (2021 SDPWS Table 4.3A)
for HF framing multiply capacity (1-(0.5-SG)) = **456** plf (2021 SDPWS Table 4.3A)

dead load on walls = 177 plf
Net uplift is 0.7E-0.6D = 2986 lbs
Use HDU4 Hold Downs

Area of (2) 2x6 studs is 16.5 in^2; tension/compression stress is 213.1 psi
OK for dbl 2x6 studs at end of wall

Allowable load on 5/8 anchors bolt in 2x sill = 1376 lbs shear (NDS Table 11E)
Min Spacing of anchor bolts req'd = 3.1 ft
Use 5/8 anchors @ 3' o.c.

Shear Wall Deflection

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b}$$

E = 1E+07 psi
A (2-2x6 Stud) = 16.5 in^2
G_a (2021 SPDWS 4.3A) = 28 kip/in
Δa (assumed) = 0.25 in

Δ = 8E-04 + 0.1256 + 0.2 = 0.326 in

Allowable Deflection = 0.02H = 1.92

Project Title:
Engineer:
Project ID:
Project Descr:

Multiple Simple Beam

Project File: NHD #1392-F.ec6

LIC# : KW-06015858, Build:20.24.08.01 OLSON & ASSOCIATES (c) ENERCALC INC 1983-2023

Description :

Wood Beam Design : Critical upper floor hdr

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **4x8, Sawn, Fully Braced**
Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

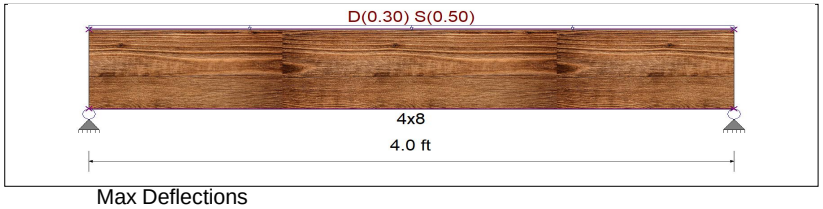
Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 20.0 ft

Design Summary

Max fb/Fb Ratio = **0.493** : 1
fb : Actual : 626.19 psi at 2.000 ft in Span # 1
Fb : Allowable : 1,270.75 psi
Load Comb : +D+S

Max fv/FvRatio = **0.384** : 1
fv : Actual : 66.21 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.60			1.00			
Right Support	0.60			1.00			



Max Deflections

Transient Downward	0.020 in	Total Downward	0.032 in
Ratio	2395	Ratio	1497
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Critical main floor hdr

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **4x12, Sawn, Fully Braced**
Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

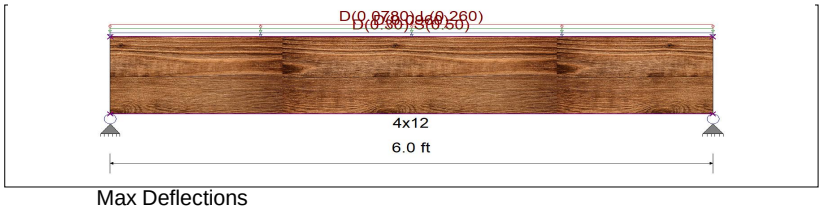
Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 20.0 ft
Unif Load: D = 0.0120 k/ft, Trib= 8.0 ft
Unif Load: D = 0.0120, L = 0.040 k/ft, Trib= 6.50 ft

Design Summary

Max fb/Fb Ratio = **0.710** : 1
fb : Actual : 763.61 psi at 3.000 ft in Span # 1
Fb : Allowable : 1,075.25 psi
Load Comb : +D+0.750L+0.750S

Max fv/FvRatio = **0.480** : 1
fv : Actual : 82.72 psi at 5.080 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+0.750L+0.750S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.42		0.78	1.50			
Right Support	1.42		0.78	1.50			



Max Deflections

Transient Downward	0.027 in	Total Downward	0.057 in
Ratio	2651	Ratio	1270
	LC: S Only		LC: +D+0.750L+0.750S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Project Title:
Engineer:
Project ID:
Project Descr:

Multiple Simple Beam

Project File: NHD #1392-F.ec6

LIC# : KW-06015858, Build:20.24.08.01 OLSON & ASSOCIATES (c) ENERCALC INC 1983-2023

Wood Beam Design : Flush beam over living rm

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **5.5x12, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species : DF/DF Wood Grade : 24F-V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

Unif Load: D = 0.0120, L = 0.040 k/ft, 0.0 to 6.750 ft, Trib= 9.0 ft

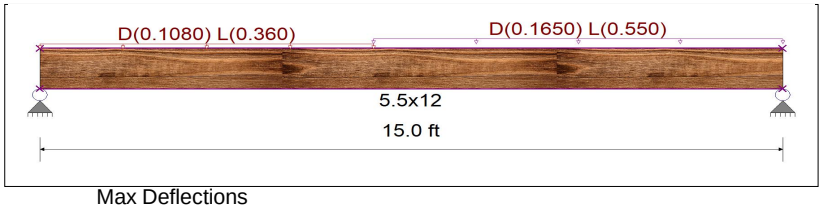
Unif Load: D = 0.0120, L = 0.040 k/ft, 6.750 to 15.0 ft, Trib= 13.750 ft

Design Summary

Max fb/Fb Ratio = **0.659** : 1
fb : Actual : 1,581.28 psi at 8.000 ft in Span # 1
Fb : Allowable : 2,400.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.369** : 1
fv : Actual : 97.91 psi at 14.050 ft in Span # 1
Fv : Allowable : 265.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.94		3.13				
Right Support	1.15		3.84				



Max Deflections

Transient Downward	0.378 in	Total Downward	0.491 in
Ratio	476	Ratio	366
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Flush beam @ stairwell

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **4x12, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

Unif Load: D = 0.0120, L = 0.040 k/ft, 0.0 to 3.50 ft, Trib= 6.750 ft

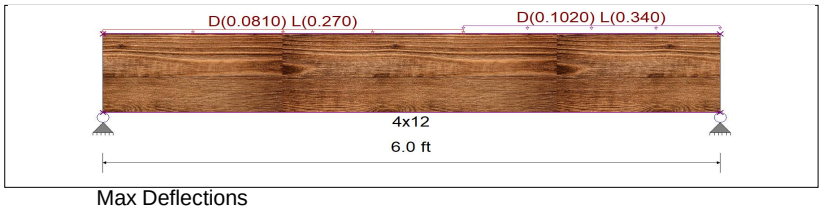
Unif Load: D = 0.0120, L = 0.040 k/ft, 3.50 to 6.0 ft, Trib= 8.50 ft

Design Summary

Max fb/Fb Ratio = **0.300** : 1
fb : Actual : 280.36 psi at 3.140 ft in Span # 1
Fb : Allowable : 935.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.210** : 1
fv : Actual : 31.48 psi at 5.080 ft in Span # 1
Fv : Allowable : 150.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.25		0.85				
Right Support	0.28		0.95				



Max Deflections

Transient Downward	0.016 in	Total Downward	0.021 in
Ratio	4482	Ratio	3448
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Project Title:
Engineer:
Project ID:
Project Descr:

Multiple Simple Beam

Project File: NHD #1392-F.ec6

LIC# : KW-06015858, Build:20.24.08.01 OLSON & ASSOCIATES (c) ENERCALC INC 1983-2023

Wood Beam Design : Flush beam over garage

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **5.5x12, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species :	DF/DF					Wood Grade :	24F-V4				
Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf		
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi				

Applied Loads

Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 20.0 ft

Unif Load: D = 0.0120 k/ft, Trib= 8.0 ft

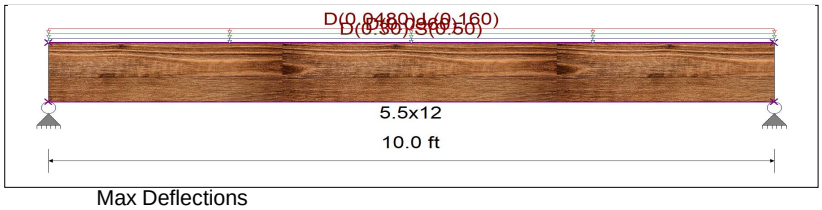
Unif Load: D = 0.0120, L = 0.040 k/ft, Trib= 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.389** : 1
fb : Actual : 1,072.73 psi at 5.000 ft in Span # 1
Fb : Allowable : 2,760.00 psi
Load Comb : +D+S

Max fv/FvRatio = **0.284** : 1
fv : Actual : 86.53 psi at 9.033 ft in Span # 1
Fv : Allowable : 304.75 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	2.22		0.80	2.50			
Right Support	2.22		0.80	2.50			



Max Deflections

Transient Downward	0.079 in	Total Downward	0.150 in
Ratio	1512	Ratio	801
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Critical main floor hdr w/ FB pt load

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **6x12, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species :	Hem-Fir					Wood Grade :	No.2				
Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf		
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi				

Applied Loads

Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 2.0 ft

Unif Load: D = 0.0120 k/ft, Trib= 8.0 ft

Unif Load: D = 0.0120, L = 0.040 k/ft, Trib= 1.0 ft

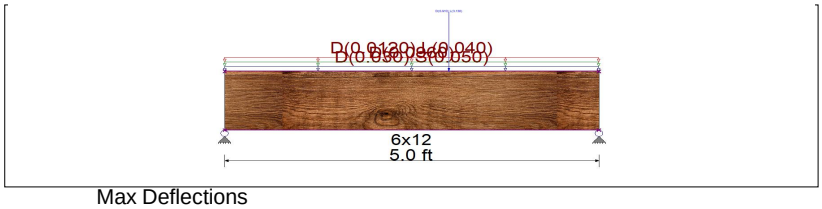
1Point: D = 0.910, L = 3.130 k @ 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.627** : 1
fb : Actual : 532.74 psi at 3.000 ft in Span # 1
Fb : Allowable : 850.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.427** : 1
fv : Actual : 64.03 psi at 4.050 ft in Span # 1
Fv : Allowable : 150.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.71		1.35	0.13			
Right Support	0.89		1.98	0.13			



Max Deflections

Transient Downward	0.015 in	Total Downward	0.022 in
Ratio	3888	Ratio	2742
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Project Title:
Engineer:
Project ID:
Project Descr:

Multiple Simple Beam

Project File: NHD #1392-F.ec6

LIC# : KW-06015858, Build:20.24.08.01 OLSON & ASSOCIATES (c) ENERCALC INC 1983-2023

Wood Beam Design : Garage door hdr

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **4x12, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

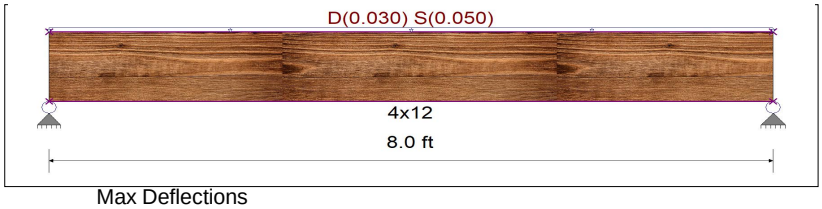
Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.097** : 1
fb : Actual : 104.03 psi at 4.000 ft in Span # 1
Fb : Allowable : 1,075.25 psi
Load Comb : +D+S

Max fv/FvRatio = **0.054** : 1
fv : Actual : 9.35 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.12			0.20			
Right Support	0.12			0.20			



Max Deflections

Transient Downward	0.009 in	Total Downward	0.014 in
Ratio	9999	Ratio	6992
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Front porch roof hdr

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **6x8, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

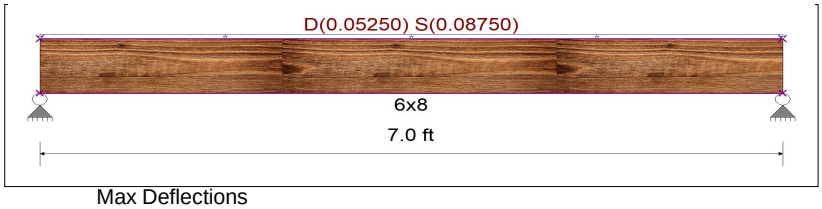
Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 3.50 ft

Design Summary

Max fb/Fb Ratio = **0.204** : 1
fb : Actual : 199.56 psi at 3.500 ft in Span # 1
Fb : Allowable : 977.50 psi
Load Comb : +D+S

Max fv/FvRatio = **0.085** : 1
fv : Actual : 14.73 psi at 6.393 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.18			0.31			
Right Support	0.18			0.31			



Max Deflections

Transient Downward	0.019 in	Total Downward	0.030 in
Ratio	4443	Ratio	2776
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Project Title:
Engineer:
Project ID:
Project Descr:

Multiple Simple Beam

Project File: NHD #1392-F.ec6

LIC# : KW-06015858, Build:20.24.08.01 OLSON & ASSOCIATES (c) ENERCALC INC 1983-2023

Wood Beam Design : Crawlspace joist collector

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **4x8, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

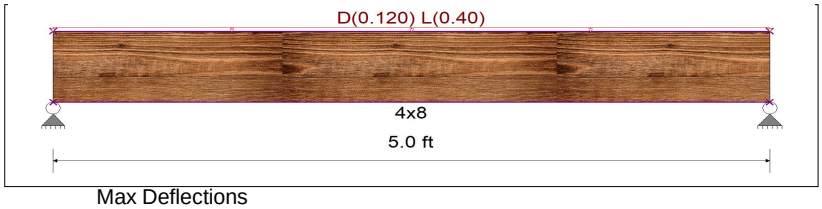
Unif Load: D = 0.0120, L = 0.040 k/ft, Trib= 10.0 ft

Design Summary

Max fb/Fb Ratio = **0.576** : 1
fb : Actual : 635.98 psi at 2.500 ft in Span # 1
Fb : Allowable : 1,105.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.389** : 1
fv : Actual : 58.40 psi at 4.400 ft in Span # 1
Fv : Allowable : 150.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.30		1.00				
Right Support	0.30		1.00				



Max Deflections

Transient Downward	0.039 in	Total Downward	0.051 in
Ratio	1533	Ratio	1179
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Multi-jst under flush 4x12

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **3-2x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-16 Load Combinations, Major Axis Bending

Wood Species : Hem-Fir Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

Unif Load: D = 0.0120, L = 0.040 k/ft, Trib= 1.330 ft

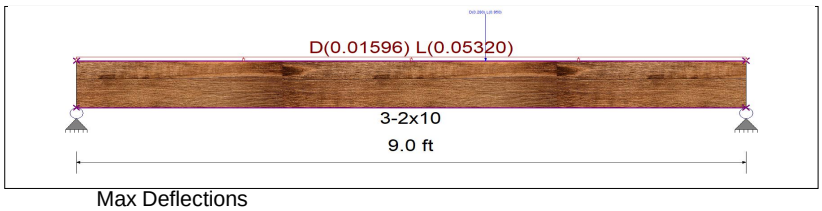
1Point: D = 0.280, L = 0.950 k @ 5.50 ft

Design Summary

Max fb/Fb Ratio = **0.658** : 1
fb : Actual : 615.67 psi at 5.490 ft in Span # 1
Fb : Allowable : 935.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.243** : 1
fv : Actual : 36.43 psi at 8.250 ft in Span # 1
Fv : Allowable : 150.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.18		0.61				
Right Support	0.24		0.82				



Max Deflections

Transient Downward	0.081 in	Total Downward	0.105 in
Ratio	1330	Ratio	1026
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Column

Project File: NHD #1392-F.ec6

DESCRIPTION: Critical floor beam post

Code References

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Analysis Method	Allowable Stress Design		
End Fixities	Top & Bottom Pinned		
Overall Column Height	8 ft		
(Used for non-slender calculations)			
Wood Species	Hem-Fir		
Wood Grade	No.2		
Fb +	850 psi	Fv	150 psi
Fb -	850 psi	Ft	525 psi
Fc - Prll	1300 psi	Density	26.84 pcf
Fc - Perp	405 psi		

E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
Basic	1300	1300	1300 ksi
Minimum	470	470	

Wood Section Name	**6x6**		
Wood Grading/Manuf.	Graded Lumber		
Wood Member Type	Sawn		
Exact Width	**5.50** in	Allow Stress Modification Factors	
Exact Depth	**5.50** in	Cf or Cv for Bending	1.0
Area	30.250 in^2	Cf or Cv for Compressio	1.0
Ix	76.255 in^4	Cf or Cv for Tension	1.0
Iy	76.255 in^4	Cm : Wet Use Factor	1.0
		Ct : Temperature Fact	1.0
		Cfu : Flat Use Factor	1.0
		Kf : Built-up columns	1.0
		Use Cr : Repetitive ?	No

Column Buckling Condition:
ABOUT X-X Axis: Lux = 8 ft, Kx = 1.0
ABOUT Y-Y Axis: Luy = 8 ft, Ky = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 45.106 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 8.0 ft, D = 1.150, L = 3.840 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.1876 : 1**

Load Combination	+D+L
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	5.035 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	887.03 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	8.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	240.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a

Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	0.718	0.04703	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+L	1.000	0.682	0.1876	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750L	1.250	0.600	0.1381	PASS	0.0 ft	0.0	PASS	8.0 ft
+0.60D	1.600	0.506	0.02252	PASS	0.0 ft	0.0	PASS	8.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments k-ft @ Base	@ Top	Mx - End Moments @ Base	@ Top
D Only					1.195				
+D+L					5.035				
+D+0.750L					4.075				

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Column

Project File: NHD #1392-F.ec6

DESCRIPTION: Critical floor beam post

Maximum Reactions

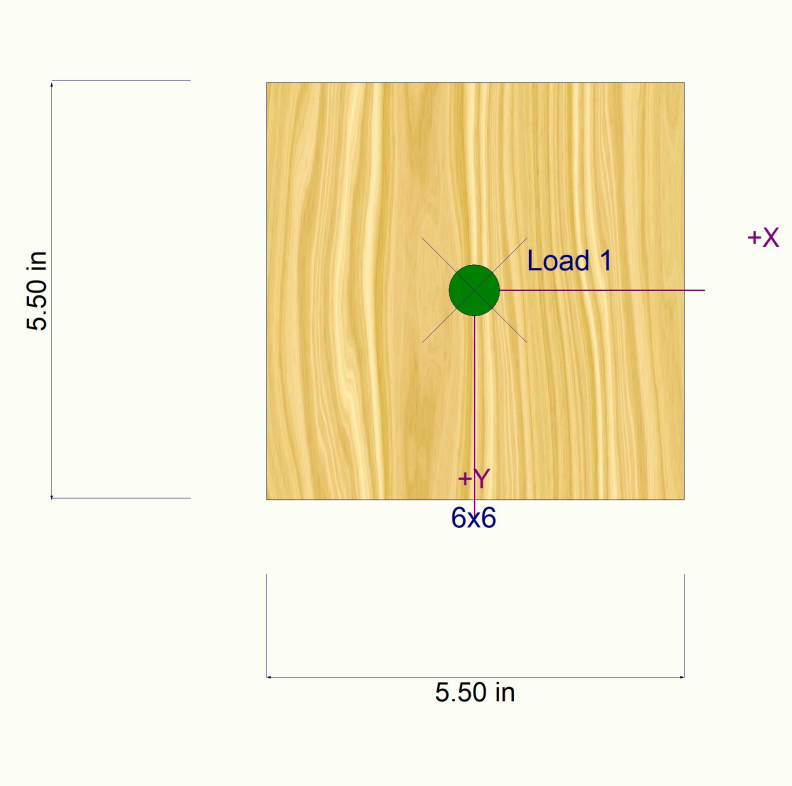
Note: Only non-zero reactions are listed.

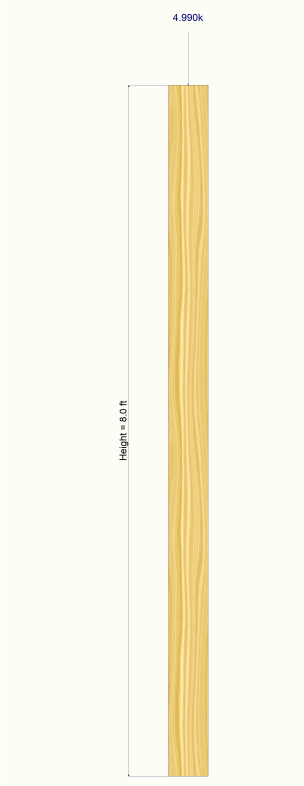
Load Combination	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments @ Base	@ Top	k-ft	Mx - End Moments @ Base	@ Top
+0.60D						0.717					
L Only						3.840					

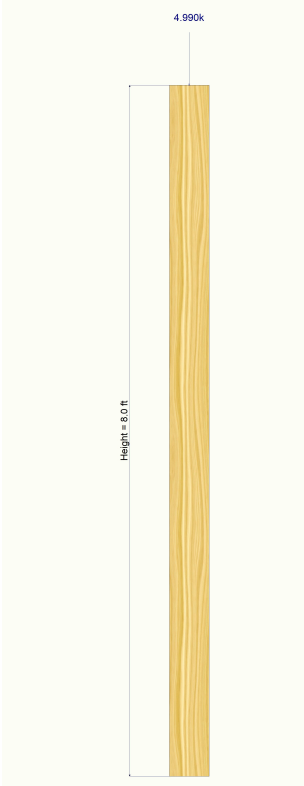
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000ft	0.000 in	0.000 ft

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: NHD #1392-F.ec6

DESCRIPTION: Flush beam over living room ftg pad

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth	=	ksf
when footing base is below	=	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

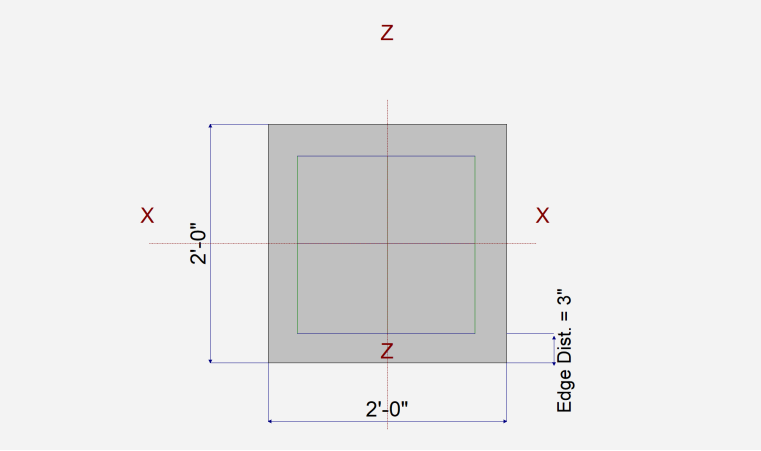
Width parallel to X-X Axis	=	2.0 ft
Length parallel to Z-Z Axis	=	2.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		3
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		3
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	1.150		3.840	0.0				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
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General Footing

Project File: NHD #1392-F.ec6

DESCRIPTION: Flush beam over living room ftg pad

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9287	Soil Bearing	1.393 ksf	1.50 ksf	+D+L about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.08002	Z Flexure (+X)	0.9405 k-ft/ft	11.753 k-ft/ft	+1.20D+1.60L
PASS	0.08002	Z Flexure (-X)	0.9405 k-ft/ft	11.753 k-ft/ft	+1.20D+1.60L
PASS	0.08002	X Flexure (+Z)	0.9405 k-ft/ft	11.753 k-ft/ft	+1.20D+1.60L
PASS	0.08002	X Flexure (-Z)	0.9405 k-ft/ft	11.753 k-ft/ft	+1.20D+1.60L
PASS	0.09048	1-way Shear (+X)	4.180 psi	46.197 psi	+1.20D+1.60L
PASS	0.09048	1-way Shear (-X)	4.180 psi	46.197 psi	+1.20D+1.60L
PASS	0.09048	1-way Shear (+Z)	4.180 psi	46.197 psi	+1.20D+1.60L
PASS	0.09048	1-way Shear (-Z)	4.180 psi	46.197 psi	+1.20D+1.60L
PASS	0.1209	2-way Punching	19.869 psi	164.317 psi	+1.20D+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.50	n/a	0.0	0.4325	0.4325	n/a	n/a	0.288
X-X, +D+L	1.50	n/a	0.0	1.393	1.393	n/a	n/a	0.929
X-X, +D+0.750L	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
X-X, +0.60D	1.50	n/a	0.0	0.2595	0.2595	n/a	n/a	0.173
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.4325	0.4325	0.288
Z-Z, +D+L	1.50	0.0	n/a	n/a	n/a	1.393	1.393	0.929
Z-Z, +D+0.750L	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.2595	0.2595	0.173

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.2013	+Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.40D	0.2013	-Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.20D+1.60L	0.9405	+Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.20D+1.60L	0.9405	-Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.20D+L	0.6525	+Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.20D+L	0.6525	-Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.20D	0.1725	+Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +1.20D	0.1725	-Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +0.90D	0.1294	+Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
X-X, +0.90D	0.1294	-Z	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.40D	0.2013	-X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.40D	0.2013	+X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.20D+1.60L	0.9405	-X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.20D+1.60L	0.9405	+X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.20D+L	0.6525	-X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.20D+L	0.6525	+X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +1.20D	0.1725	-X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK

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General Footing

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DESCRIPTION: Flush beam over living room ftg pad

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D	0.1725	+X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +0.90D	0.1294	-X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK
Z-Z, +0.90D	0.1294	+X	Bottom	0.2592	ACI 7.6.1.1	0.30	11.753	OK

One Way Shear X

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.89 psi	0.89 psi	0.89 psi	46.20 psi	0.02	OK
+1.20D+1.60L	4.18 psi	4.18 psi	4.18 psi	46.20 psi	0.09	OK
+1.20D+L	2.90 psi	2.90 psi	2.90 psi	46.20 psi	0.06	OK
+1.20D	0.77 psi	0.77 psi	0.77 psi	46.20 psi	0.02	OK
+0.90D	0.58 psi	0.58 psi	0.58 psi	46.20 psi	0.01	OK

One Way Shear Z

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.89 psi	0.89 psi	0.89 psi	46.20 psi	0.02	OK
+1.20D+1.60L	4.18 psi	4.18 psi	4.18 psi	46.20 psi	0.09	OK
+1.20D+L	2.90 psi	2.90 psi	2.90 psi	46.20 psi	0.06	OK
+1.20D	0.77 psi	0.77 psi	0.77 psi	46.20 psi	0.02	OK
+0.90D	0.58 psi	0.58 psi	0.58 psi	46.20 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	4.25 psi	164.32 psi	0.02587	OK
+1.20D+1.60L	19.87 psi	164.32 psi	0.1209	OK
+1.20D+L	13.79 psi	164.32 psi	0.08389	OK
+1.20D	3.64 psi	164.32 psi	0.02218	OK
+0.90D	2.73 psi	164.32 psi	0.01663	OK