MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

7220 Trade Street, Suite 295, San Diego, CA 92121 ▸ p 619-650-0010 ▸ *mulhernkulp.com*

CALCULATION PACKAGE

August 29, 2024

LNL Builds

27xx 62nd Ave
Mercer Island, WA

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Prepared By:

Matthew Mills, E.I.T. *Staff Engineer*

Nicholas J. Martignetti, P.E. *Associate Owner + San Diego Office Director*

Signature, Seal & Date

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

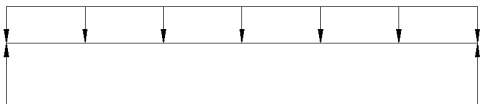
Beam & Header Calculations

Beam Description:

B1 - ROOF - PRIMARY BDR - HDR @ DECK

Parameters:

L =	3.33	ft
W =	0.620	klf
P =	-	k



Analysis:

R_{max} =	1.03 K	V_d =		K	< V_{all} =	3.50 K	X Adequate
M_{max} =	0.86 k-ft	< M_{all} =	3.40	k-ft			X Adequate
Δ_{tl} =	0.010 in.	L/	999+	< L/240			X Adequate

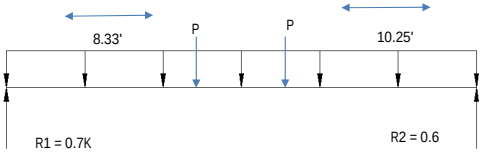
4x8 DFL #2

Beam Description:

B2 - ROOF - BM OVER PRIMARY BATH

Parameters:

L =	20.67	ft
W =	-	klf
P =	0.6	k



Analysis:

R_{max} =	0.70 K	V_d =		K	< V_{all} =	9.10 K	X Adequate
M_{max} =	6.20 k-ft	< M_{all} =	20.50	k-ft			X Adequate
Δ_{tl} =	0.510 in.	L/	486	< L/240			X Adequate

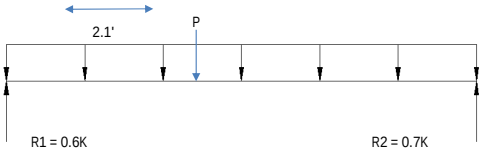
3-1/2"x11-7/8" LVL

Beam Description:

B3 - ROOF - HDR AT PRIMARY BATH

Parameters:

L =	3.00	ft
W =	0.240	klf
P =	0.7	k



Analysis:

R_{max} =	0.90 K	V_d =		K	< V_{all} =	3.50 K	X Adequate
M_{max} =	0.70 k-ft	< M_{all} =	3.40	k-ft			X Adequate
Δ_{tl} =	0.006 in.	L/	999+	< L/240			X Adequate

4x8 DFL #2

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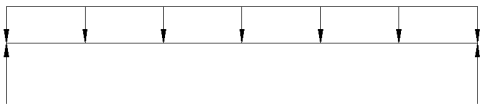
Project Name: 27xx 62nd Ave
LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

Beam & Header Calculations

Beam Description: B4 - ROOF - BM OVER BATHROOM

Parameters:

L =	4.50	ft
W =	0.280	klf
P =	-	k



Analysis:

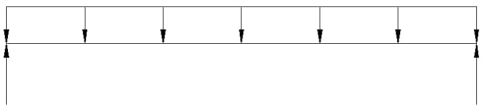
R_{max} =	0.63 K	V_d =		K	< V_{all} =	4.50 K	X Adequate
M_{max} =	0.71 k-ft	< M_{all} =	10.20	k-ft			X Adequate
Δ_{tl} =	0.006 in.	L/	999+	< L/240			X Adequate

1-3/4"x11-7/8" LVL

Beam Description: B5 - ROOF - INT HDR AT PRIMARY BEDROOM

Parameters:

L =	2.90	ft
W =	0.550	klf
P =	-	k



Analysis:

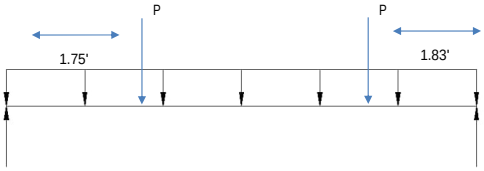
R_{max} =	0.80 K	V_d =		K	< V_{all} =	3.50 K	X Adequate
M_{max} =	0.58 k-ft	< M_{all} =	3.40	k-ft			X Adequate
Δ_{tl} =	0.005 in.	L/	999+	< L/240			X Adequate

4x8 DFL #2

Beam Description: B6 - ROOF - BM AT STAIRS

Parameters:

L =	7.75	ft
W =	0.380	klf
P =	0.3	k



Analysis:

R_{max} =	1.80 K	V_d =		K	< V_{all} =	9.10 K	X Adequate
M_{max} =	4.02 k-ft	< M_{all} =	20.50	k-ft			X Adequate
Δ_{tl} =	0.047 in.	L/	999+	< L/240			X Adequate

3-1/2"x11-7/8" LVL

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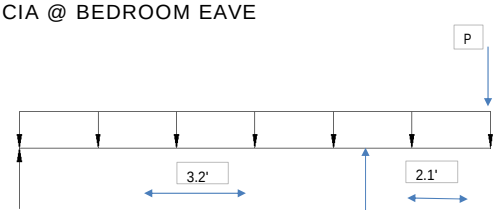
Date: 18-Aug-24

Beam & Header Calculations

Beam Description: B7 - ROOF - STRUCT. FASCIA @ BEDROOM EAVE

Parameters:

L =	4.50	ft
W =	0.065	klf
P =	0.3	k



Analysis:

R_{max} =	0.80	K	V_d =		K	< V_{all} = 4.50 K	X Adequate
M_{max} =	-0.80	k-ft	< M_{all} =	-10.20	k-ft		X Adequate
Δ_{tl} =	0.010	in.	L/	999+	< L/240		X Adequate

1-3/4"x11-7/8" LVL

Beam Description: B8 - ROOF - FLUSH HDR AT BEDROOM

Parameters:

L =	4.50	ft
W =	0.290	klf
P =	-	k

Analysis:

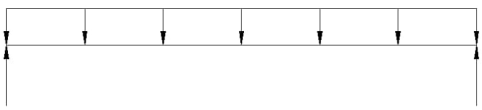
R_{max} =	0.70	K	V_d =		K	< V_{all} = 9.10 K	X Adequate
M_{max} =	0.70	k-ft	< M_{all} =	20.50	k-ft		X Adequate
Δ_{tl} =	0.003	in.	L/	999+	< L/240		X Adequate

3-1/2"x11-7/8" LVL

Beam Description: B9 - UPPER FLOOR - HDR AT GARAGE REAR DOOR

Parameters:

L =	3.33	ft
W =	0.770	klf
P =	-	k



Analysis:

R_{max} =	1.28	K	V_d =		K	< V_{all} = 3.00 K	X Adequate
M_{max} =	1.10	k-ft	< M_{all} =	3.00	k-ft		X Adequate
Δ_{tl} =	0.012	in.	L/	999+	< L/240		X Adequate

4x8 DFL #2

MULHERN+KULP
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M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

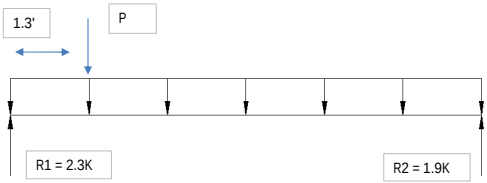
Beam & Header Calculations

Beam Description:

B10 - UPPER FLOOR - FLUSH BM AT REAR GARAGE EXIT

Parameters:

L =	4.50	ft
W =	0.750	klf
P =	0.8	k



Analysis:

R_{max} =	2.30	K	V_d =		K	< V_{all} =	12.80	K	X	Adequate
M_{max} =	2.60	k-ft	< M_{all} =	43.50	k-ft				X	Adequate
Δ_{tl} =	0.003	in.	L/	999+	< L/240				X	Adequate

3-1/2"x18" GLB

Beam Description:

B11 - UPPER FLOOR - BM AT REAR PATIO COVER

Parameters:

L =	3.70	ft
W =	0.155	klf
P =	-	k

Analysis:

R_{max} =	0.21	K	V_d =		K	< V_{all} =	4.50	K	X	Adequate
M_{max} =	0.20	k-ft	< M_{all} =	5.20	k-ft				X	Adequate
Δ_{tl} =	0.001	in.	L/	999+	< L/240				X	Adequate

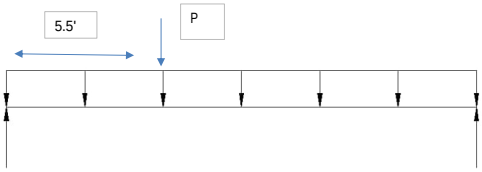
4x10 DFL #2

Beam Description:

B12 - UPPER FLOOR - BM AT REAR PATIO COVER

Parameters:

L =	19.00	ft
W =	0.070	klf
P =	0.2	k



Analysis:

R_{max} =	0.81	K	V_d =		K	< V_{all} =	7.50	K	X	Adequate
M_{max} =	0.73	k-ft	< M_{all} =	14.80	k-ft				X	Adequate
Δ_{tl} =	0.425	in.	L/	536	< L/240				X	Adequate

3-1/2"x10-1/2" GLB

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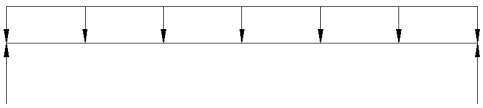
Beam & Header Calculations

Beam Description:

B13 - UPPER FLOOR - BM AT REAR PATIO COVER

Parameters:

L = 17.20 ft
W = 0.102 klf
P = - k



Analysis:

R_{max} =	0.90 K	V_d =		K	< V_{all} =	7.50 K	X Adequate
M_{max} =	3.80 k-ft	< M_{all} =	14.80	k-ft			X Adequate
Δ_{tl} =	0.330 in.	L/	625	< L/240			X Adequate

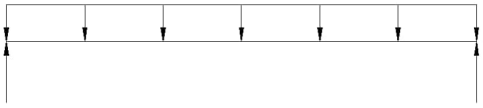
3-1/2"x10-1/2" GLB

Beam Description:

B14 - UPPER FLOOR - REAR FLUSH BM @ LIVING ROOM

Parameters: **SEE ENERCALC**

L = ft
W = klf
P = k



Analysis:

R_{max} =	K	V_d =		K	< V_{all} =	K	X Adequate
M_{max} =	k-ft	< M_{all} =		k-ft			X Adequate
Δ_{tl} =	in.	L/		< L/240			X Adequate

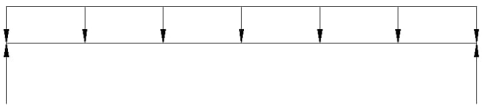
3-1/2"x18" GLB

Beam Description:

B15 - UPPER FLOOR - REAR FLUSH BM @ LIVING ROOM

Parameters:

L = 2.75 ft
W = 0.580 klf
P = - k



Analysis:

R_{max} =	0.80 K	V_d =		K	< V_{all} =	3.90 K	X Adequate
M_{max} =	0.55 k-ft	< M_{all} =	2.00	k-ft			X Adequate
Δ_{tl} =	0.008 in.	L/	999+	< L/240			X Adequate

6x6 DFL #2

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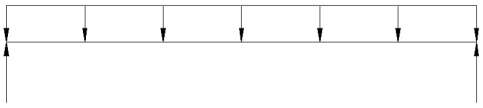
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

Beam & Header Calculations

Beam Description: B16 - UPPER FLOOR - BM AT FLUSH ENTRY SHOWER

Parameters:

L =	12.50	ft
W =	0.460	klf
P =	-	k



Analysis:

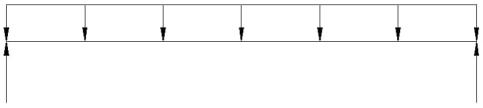
R_{max} =	2.90	K	V_d =		K	< V_{all} = 11.10 K	X Adequate
M_{max} =	9.00	k-ft	< M_{all} =	37.80	k-ft		X Adequate
Δ_{tl} =	0.083	in.	L/	999+	< L/240		X Adequate

3-1/2"x18" GLB

Beam Description: B17 - N/A

Parameters:

L =		ft
W =		klf
P =		k



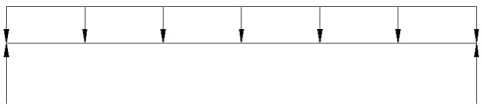
Analysis:

R_{max} =		K	V_d =		K	< V_{all} =	K Adequate
M_{max} =		k-ft	< M_{all} =		k-ft		Adequate
Δ_{tl} =		in.	L/		< L/240		Adequate

Beam Description: B18 - UPPER FLOOR - DECK REAR BEAM

Parameters:

L =	16.10	ft
W =	0.130	klf
P =	-	k



Analysis:

R_{max} =	1.05	K	V_d =		K	< V_{all} = 3.90 K	X Adequate
M_{max} =	4.21	k-ft	< M_{all} =	4.50	k-ft		X Adequate
Δ_{tl} =	0.530	in.	L/	363	< L/240		X Adequate

4x10 DFL #2

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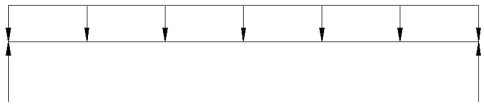
Beam & Header Calculations

Beam Description: B19 - UPPER FLOOR - DECK REAR BEAM

Parameters:

L = 6.10 ft
W = 0.250 klf
P = - k



Analysis:

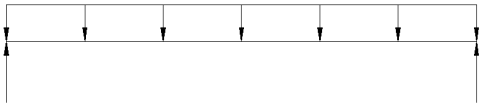
R_{max} =	0.76 K	V_d =		K	< V_{all} =	3.90 K	X Adequate
M_{max} =	1.16 k-ft	< M_{all} =	4.50	k-ft			X Adequate
Δ_{tl} =	0.021 in.	L/	999+	< L/240			X Adequate

4x10 DFL #2

Beam Description: B20 - UPPER FLOOR - REAR BEAM UNDER B.W.A. @ DECK

Parameters:

L = 16.00 ft
W = 1.020 klf
P = - k



Analysis:

R_{max} =	8.16 K	V_d =		K	< V_{all} =	17.50 K	X Adequate
M_{max} =	32.64 k-ft	< M_{all} =	59.40	k-ft			X Adequate
Δ_{tl} =	0.313 in.	L/	614	< L/240			X Adequate

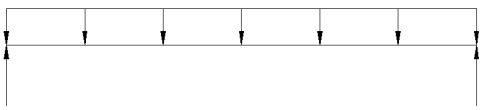
5-1/2"x18" GLB

Beam Description: B21 - UPPER FLOOR - CANTD BM AT REAR DECK

Parameters:

SEE ENERCALC

L = ft
W = klf
P = k



Analysis:

R_{max} =	K	V_d =		K	< V_{all} =	K	X Adequate
M_{max} =	k-ft	< M_{all} =		k-ft			X Adequate
Δ_{tl} =	in.	L/		< L/240			X Adequate

W14x30

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Beam & Header Calculations

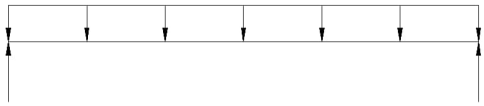
Beam Description:

B22 - UPPER FLOOR - BM ABOVE KITCHEN

Parameters:

SEE ENERCALC

L = ft
W = klf
P = k



Analysis:

R_{max} =	K	V_d =	K	< V_{all} =	K	X	Adequate
M_{max} =	k-ft	< M_{all} =	k-ft			X	Adequate
Δ_{tl} =	in.	L/		< L/240		X	Adequate

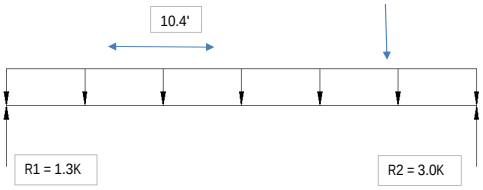
5-1/2"x18" GLB

Beam Description:

B23 - UPPER FLOOR - BM AT STAIRS

Parameters:

L = 13.00 ft
W = 0.110 klf
P = 2.8 k



Analysis:

R_{max} =	3.00 K	V_d =	K	< V_{all} =	11.10 K	X	Adequate
M_{max} =	8.15 k-ft	< M_{all} =	37.80 k-ft			X	Adequate
Δ_{tl} =	0.081 in.	L/	999+	< L/240		X	Adequate

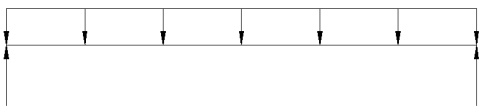
3-1/2"x18" GLB

Beam Description:

B24 - UPPER FLOOR - BM AT STAIRS

Parameters:

L = 7.25 ft
W = 0.400 klf
P = - k



Analysis:

R_{max} =	1.45 K	V_d =	K	< V_{all} =	11.10 K	X	Adequate
M_{max} =	2.63 k-ft	< M_{all} =	37.80 k-ft			X	Adequate
Δ_{tl} =	0.008 in.	L/	999+	< L/240		X	Adequate

3-1/2"x18" GLB

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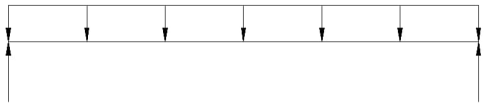
Beam & Header Calculations

Beam Description:

B25 - UPPER FLOOR - HDR AT FRONT COVERED PORCH

Parameters:

L = 4.33 ft
W = 0.480 klf
P = - k



Analysis:

R_{max} =	1.00 K	V_d =		K	< V_{all} =	3.00 K	X Adequate
M_{max} =	1.12 k-ft	< M_{all} =	3.00	k-ft			X Adequate
Δ_{tl} =	0.021 in.	L/	999+	< L/240			X Adequate

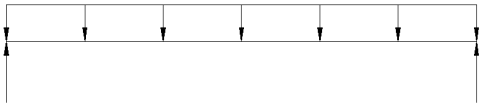
6x6 DFL #2

Beam Description:

B26 - UPPER FLOOR - EDGE BM @ B.W.A @ FRONT PORCH

Parameters:

L = 16.00 ft
W = 0.500 klf
P = - k



Analysis:

R_{max} =	4.00 K	V_d =		K	< V_{all} =	11.10 K	X Adequate
M_{max} =	16.00 k-ft	< M_{all} =	37.80	k-ft			X Adequate
Δ_{tl} =	0.241 in.	L/	797	< L/240			X Adequate

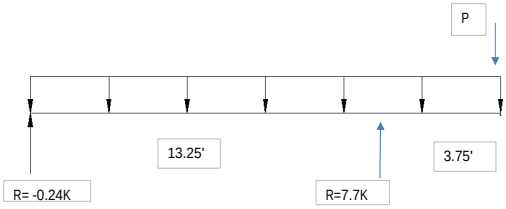
3-1/2"x18" GLB

Beam Description:

B27 - UPPER FLOOR - CANT'D BM @ FRONT PORCH

Parameters:

L = 17.00 ft
W = 0.170 klf
P = 4.5 k



Analysis:

R_{max} =	7.65 K	V_d =		K	< V_{all} =	12.80 K	X Adequate
M_{max} =	-18.07 k-ft	< M_{all} =	-33.50	k-ft			X Adequate
Δ_{tl} =	0.181 in.	2L/	497	< L/240			X Adequate

3-1/2"x18" GLB

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

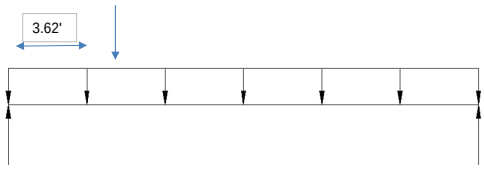
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

Beam & Header Calculations

Beam Description: B28 - UPPER FLOOR - GARAGE HDR

Parameters:

L =	16.33	ft
W =	0.810	klf
P =	1.4	k



Analysis:

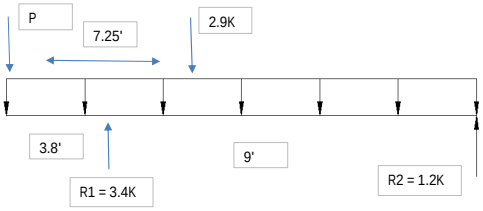
R_{max} =	7.70	K	V_d =		K	< V_{all} = 16.00 K	X Adequate
M_{max} =	31.04	k-ft	< M_{all} =	49.90	k-ft		X Adequate
Δ_{tl} =	0.402	in.	L/	487	< L/240		X Adequate

5-1/2"x16" GLB

Beam Description: B29 - UPPER FLOOR - CANT'D BM AT REAR PATIO

Parameters:

L =	20.10	ft
W =	0.155	klf
P =	0.6	k



Analysis:

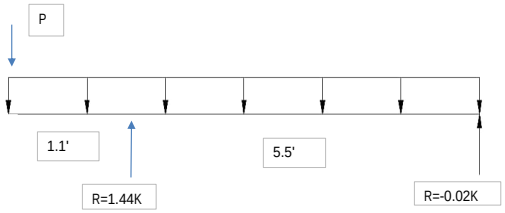
R_{max} =	2.40	K	V_d =		K	< V_{all} = 11.10 K	X Adequate
M_{max} =	4.92	k-ft	< M_{all} =	37.80	k-ft		X Adequate
Δ_{tl} =	0.019	in.	L/	999+	< L/240		X Adequate

3-1/2"x18" GLB

Beam Description: B30 - UPPER FLOOR - CANT'D BM AT REAR DECK

Parameters:

L =	6.60	ft
W =	0.047	klf
P =	1.1	k



Analysis:

R_{max} =	1.44	K	V_d =		K	< V_{all} = 3.90 K	X Adequate
M_{max} =	-1.18	k-ft	< M_{all} =	-4.50	k-ft		X Adequate
Δ_{tl} =	0.012	in.	2L/	999+	< L/240		X Adequate

3-1/2"x18" GLB

MULHERN+KULP
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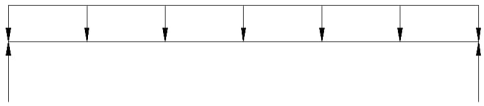
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

Beam & Header Calculations

Beam Description: B31 - MAIN FLOOR - TYP CRAWL SPACE BEAM

Parameters:

L =	6.50	ft
W =	0.744	klf
P =	-	k



Analysis:

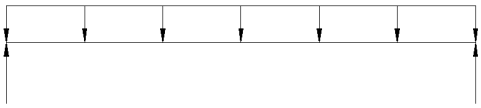
R_{max} =	2.40	K	V_d =		K	< V_{all} =	3.90	K	X	Adequate
M_{max} =	3.90	k-ft	< M_{all} =	4.50	k-ft				X	Adequate
Δ_{tl} =	0.081	in.	L/	964	< L/240				X	Adequate

4x10 DFL #2

Beam Description: B32 - CRAWL SPACE BM

Parameters:

L =	7.60	ft
W =	0.550	klf
P =	-	k



Analysis:

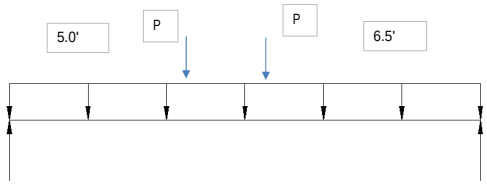
R_{max} =	2.10	K	V_d =		K	< V_{all} =	3.90	K	X	Adequate
M_{max} =	4.00	k-ft	< M_{all} =	4.50	k-ft				X	Adequate
Δ_{tl} =	0.112	in.	L/	816	< L/240				X	Adequate

4x10 DFL #2

Beam Description: B33 - ROOF - BM AST SKYLIGHT BY STAIRS

Parameters:

L =	14.30	ft
W =	-	klf
P =	0.2	k



Analysis:

R_{max} =	0.23	K	V_d =		K	< V_{all} =	4.50	K	X	Adequate
M_{max} =	1.40	k-ft	< M_{all} =	10.20	k-ft				X	Adequate
Δ_{tl} =	0.111	in.	2L/	999+	< L/240				X	Adequate

1-3/4"x11-7/8" LVL

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Project Name: 27xx 62nd Ave
LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

Beam & Header Calculations

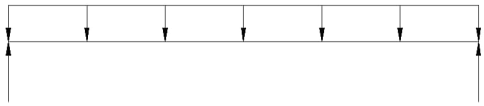
Beam Description:

B34 - UPPER FLOOR - BM ABOVE KITCHEN

Parameters:

SEE ENERCALC

L = ft
W = klf
P = k



Analysis:

R_{max} =	K	V_d =	K	< V_{all} =	K	X	Adequate
M_{max} =	k-ft	< M_{all} =	k-ft			X	Adequate
Δ_{tl} =	in.	L/		< L/240		X	Adequate

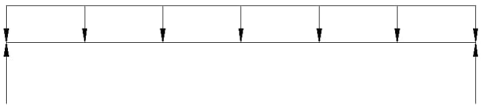
3-1/2"x18" GLB

Beam Description:

B35 - UPPER FLOOR - LOW ROOF RAFTERS

Parameters:

L = 5.50 ft
W = 0.070 klf
P = - k



Analysis:

R_{max} = 0.20	K	V_d =	K	< V_{all} = 1.90	K	X	Adequate
M_{max} = 0.30	k-ft	< M_{all} = 2.20	k-ft			X	Adequate
Δ_{tl} = 0.011	in.	L/ 999+		< L/240		X	Adequate

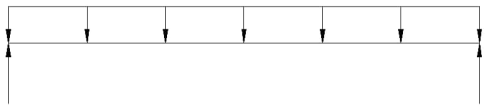
2x10 HF #2

Beam Description:

B36 - UPPER FLOOR - DECK JOIST

Parameters:

L = 4.50 ft
W = 0.140 klf
P = - k



Analysis:

R_{max} = 0.32	K	V_d =	K	< V_{all} = 1.40	K	X	Adequate
M_{max} = 0.35	k-ft	< M_{all} = 1.90	k-ft			X	Adequate
Δ_{tl} = 0.010	in.	2L/ 999+		< L/240		X	Adequate

2x10 HF #2 @ 16" o.c.

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 18-Aug-24

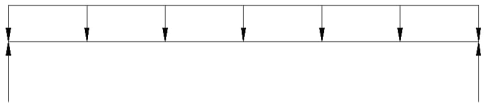
Beam & Header Calculations

Beam Description:

B37 - ROOF - CONT. FASCIA

Parameters:

L =	22.00	ft
W =	0.027	klf
P =	-	k



Analysis:

R_{max} =	0.28 K	V_d =		K	< V_{all} =	4.50 K	X Adequate
M_{max} =	1.42 k-ft	< M_{all} =	10.20	k-ft			X Adequate
Δ_{tl} =	0.231 in.	L/	999+	< L/240			X Adequate

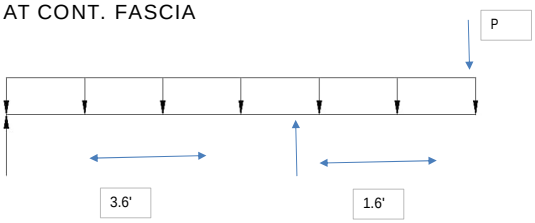
1-3/4"x11-7/8" LVL

Beam Description:

B38 - ROOF - CANTB BM AT CONT. FASCIA

Parameters:

L =	5.20	ft
W =	0.543	klf
P =	0.6	k



Analysis:

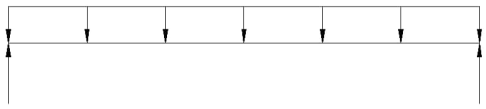
R_{max} =	2.91 K	V_d =		K	< V_{all} =	10.90 K	X Adequate
M_{max} =	-1.66 k-ft	< M_{all} =	-19.70	k-ft			X Adequate
Δ_{tl} =	0.005 in.	2L/	999+	< L/240			X Adequate

3-1/2"x11-7/8" LVL

Beam Description:

Parameters:

L =	4.50	ft
W =	0.140	klf
P =	-	k



Analysis:

R_{max} =	0.32 K	V_d =		K	< V_{all} =	1.40 K	X Adequate
M_{max} =	0.35 k-ft	< M_{all} =	1.90	k-ft			X Adequate
Δ_{tl} =	0.010 in.	2L/	999+	< L/240			X Adequate

2x10 HF #2 @ 16" o.c.

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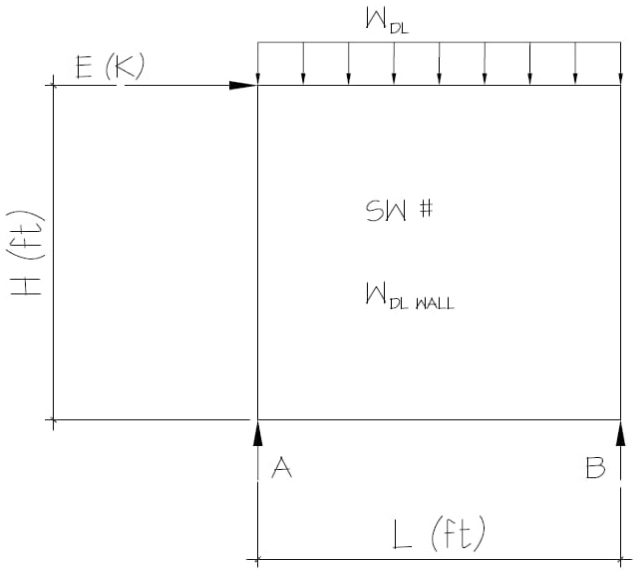
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 20-Aug-24

Overstrength Calculations

Wall Description/SW #: 201

Parameters:

L =	10.3	ft
H =	9.8	ft
E =	0.80	k
W_{DLWall} =	0.10	klf
W_{DL} =	0.030	klf
Ω_0 =	2.5	ASCE TABLE 12.2.1 FOOTNOTE
SDS =	1.122	



analysis:

E (unfactored) =	1.14			
$E_{mh} = \Omega 0 * E$ =	2.86	K	$E_v = 0.2*SDS*DL$ =	0.300 K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v$ =	3.158 K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v$ =	2.557 K

E_m (max) = $\sum M_A = 0$ =	3.16(9.8) + 0.13(10.3)(5.15) - Rb(10.3)	R_B =	0.7DL + 3.0E
		Ra =	0.7DL - 3.0E
E_m (min) = $\sum M_A = 0$ =	2.56(9.8) + 0.13(10.3)(5.15) - Rb(10.3)	R_B =	0.7DL + 2.4E
		Ra =	0.7DL - 2.4E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stess permitted to be increased by 1.2

see following beam calcs for load application

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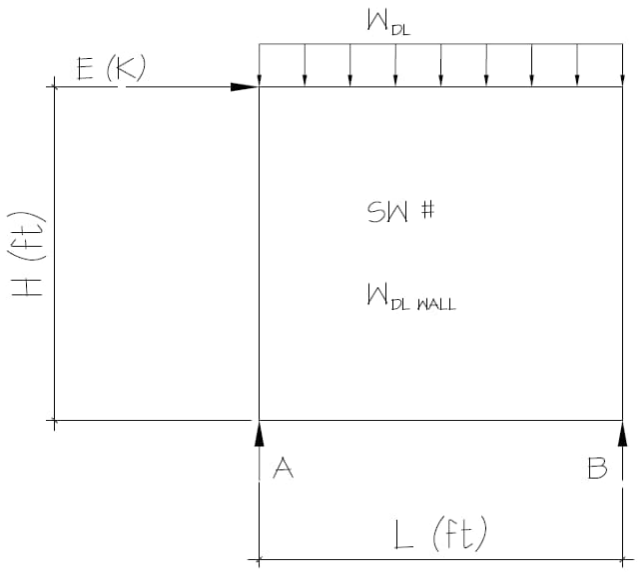
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 14-Aug-24

Overstrength Calculations

Wall Description/SW #: 203

Parameters:

L =	11.8	ft
H =	9.6	ft
E =	0.90	k
W_{DLWall} =	0.10	klf
W_{DL} =	0.030	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE
SDS =	1.122	



analysis:

E (unfactored) = 1.29

$E_{mh} = \Omega 0 * E$ = 3.21 K

$E_v = 0.2*SDS*DL$ = 0.344 K

$E_m = E_{mh} + E_v$

$E_m = E_{mh} - E_v$

$E_m = E_{mh} + E_v$ = 3.559 K

$E_m = E_{mh} - E_v$ = 2.870 K

E_m (max) = $\sum M_A = 0$ = 3.56(9.6) + 0.13(11.8)(5.9) - Rb(11.8)

R_B = 0.8DL + 2.9E

Ra = 0.8DL - 2.9E

E_m (min) = $\sum M_A = 0$ = 2.87(9.6) + 0.13(11.8)(5.9) - Rb(11.8)

R_B = 0.8DL + 2.3E

Ra = 0.8DL - 2.3E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stess permitted to be increased by 1.2

see following beam calcs for load application

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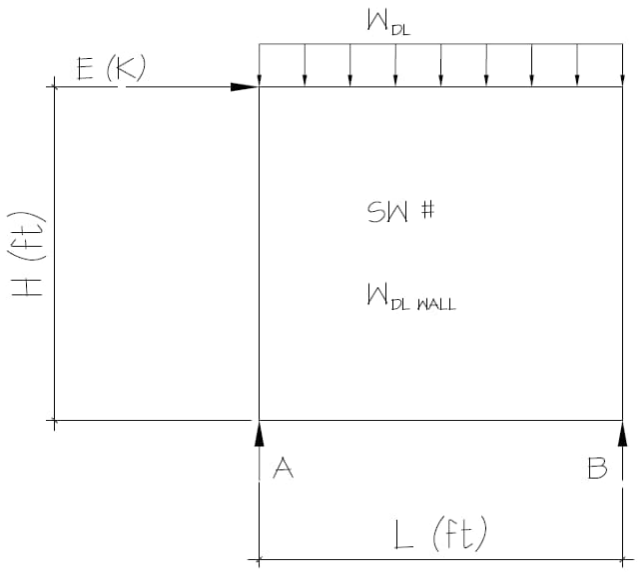
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 14-Aug-24

Overstrength Calculations

Wall Description/SW #: 205

Parameters:

L =	8.0	ft
H =	10.2	ft
E =	0.70	k
W_{DLWall} =	0.10	klf
W_{DL} =	0.153	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE
SDS =	1.122	



analysis:

E (unfactored) = 1.00

$E_{mh} = \Omega 0 * E$ =	2.50 K	$E_v = 0.2*SDS*DL$ =	0.454 K
$E_m = E_{mh} + E_v$		$E_m = E_{mh} + E_v$ =	2.954 K
$E_m = E_{mh} - E_v$		$E_m = E_{mh} - E_v$ =	2.046 K

E_m (max) = $\sum M_A = 0$ =	2.95(10.2) + 0.253(8)(4) - Rb(8)	R_B =	1.0DL + 3.8E
		Ra =	1.0DL - 3.8E
E_m (min) = $\sum M_A = 0$ =	2.05(10.2) + 0.253(8)(4) - Rb(8)	R_B =	1.0DL + 2.6E
		Ra =	1.0DL - 2.6E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stess permitted to be increased by 1.2

see following beam calcs for load application

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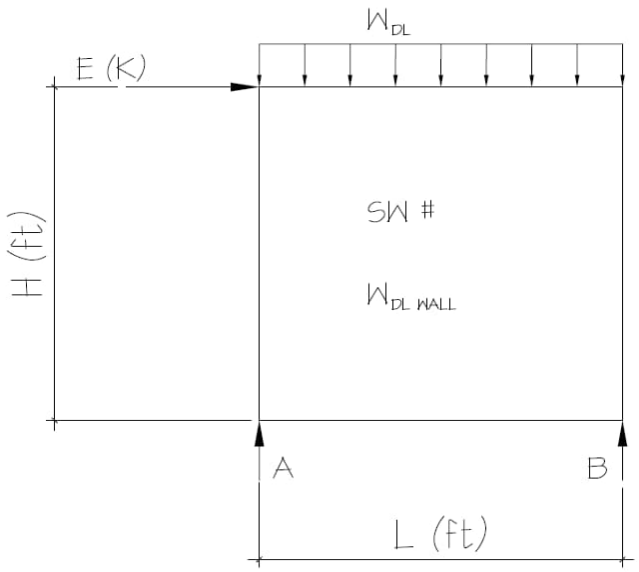
Project Name: 2740 61st Ave
LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 14-Aug-24

Overstrength Calculations

Wall Description/SW #: 206

Parameters:

L =	6.2	ft
H =	10.5	ft
E =	1.10	k
W_{DLWall} =	0.10	klf
W_{DL} =	0.120	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE
SDS =	1.122	



analysis:

E (unfactored) =	1.57		
$E_{mh} = \Omega 0 * E$ =	3.93 K	$E_v = 0.2*SDS*DL$ =	0.306 K
$E_m = E_{mh} + E_v$		$E_m = E_{mh} + E_v$ =	4.235 K
$E_m = E_{mh} - E_v$		$E_m = E_{mh} - E_v$ =	3.622 K

E_m (max) = $\sum M_A = 0$ =	4.23(10.5) + 0.22(6.2)(3.1) - Rb(6.2)	R_B =	0.7DL + 7.2E
		Ra =	0.7DL - 7.2E
E_m (min) = $\sum M_A = 0$ =	3.62(10.5) + 0.22(6.2)(3.1) - Rb(6.2)	R_B =	0.7DL + 6.1E
		Ra =	0.7DL - 6.1E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stess permitted to be increased by 1.2

see following beam calcs for load application

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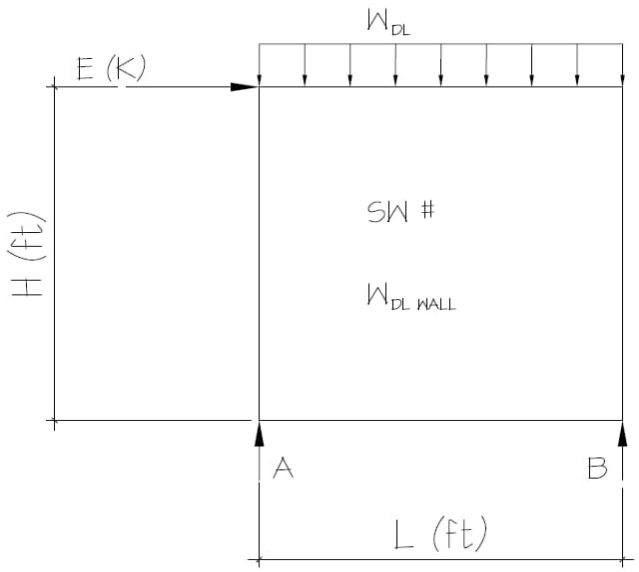
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 14-Aug-24

Overstrength Calculations

Wall Description/SW #: 207

Parameters:

L =	4.3	ft
H =	9.9	ft
E =	0.40	k
W_{DLWall} =	0.10	klf
W_{DL} =	0.110	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE
SDS =	1.122	



analysis:

E (unfactored) = 0.57

$E_{mh} = \Omega 0 * E$ = 1.43 K

$E_v = 0.2*SDS*DL$ = 0.203 K

$E_m = E_{mh} + E_v$

$E_m = E_{mh} - E_v$

$E_m = E_{mh} + E_v$ = 1.631 K

$E_m = E_{mh} - E_v$ = 1.226 K

E_m (max) = $\sum M_A = 0$ = 1.63(9.9) + 0.21(4.3)(2.15) - Rb(4.3)

R_B = 0.5DL + 3.8E

Ra = 0.5DL - 3.8E

E_m (min) = $\sum M_A = 0$ = 1.23(9.9) + 0.21(4.3)(2.15) - Rb(4.3)

R_B = 0.5DL + 2.8E

Ra = 0.5DL - 2.8E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stess permitted to be increased by 1.2

see following beam calcs for load application

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RESIDENTIAL STRUCTURAL ENGINEERING
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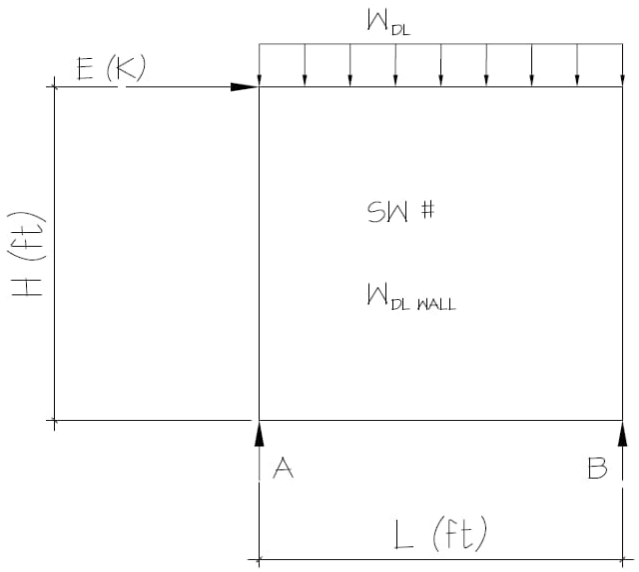
Project Name: 27xx 62nd Ave LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 14-Aug-24

Overstrength Calculations

Wall Description/SW #: 209

Parameters:

L =	12.4	ft
H =	9.0	ft
E =	1.50	k
W_{DLWall} =	0.10	klf
W_{DL} =	0.103	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE
SDS =	1.122	



analysis:

E (unfactored) = 2.14

$E_{mh} = \Omega 0 * E$ = 5.36 K

$E_v = 0.2*SDS*DL$ = 0.565 K

$E_m = E_{mh} + E_v$ = 5.922 K

$E_m = E_{mh} - E_v$ = 4.792 K

E_m (max) = $\sum M_A = 0$ = 5.92(9.0) + 0.203(12.4)(6.2) - Rb(12.4)

R_B = 1.3DL + 4.3E

Ra = 1.3DL - 4.3E

E_m (min) = $\sum M_A = 0$ = 4.79(9.0) + 0.203(12.4)(6.2) - Rb(12.4)

R_B = 1.3DL + 3.5E

Ra = 1.3DL - 3.5E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stess permitted to be increased by 1.2

see following beam calcs for load application

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B10 - UPPER FLOOR - FLUSH BM AT REAR GARAGE EXIT (OVERSTRENGTH)

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

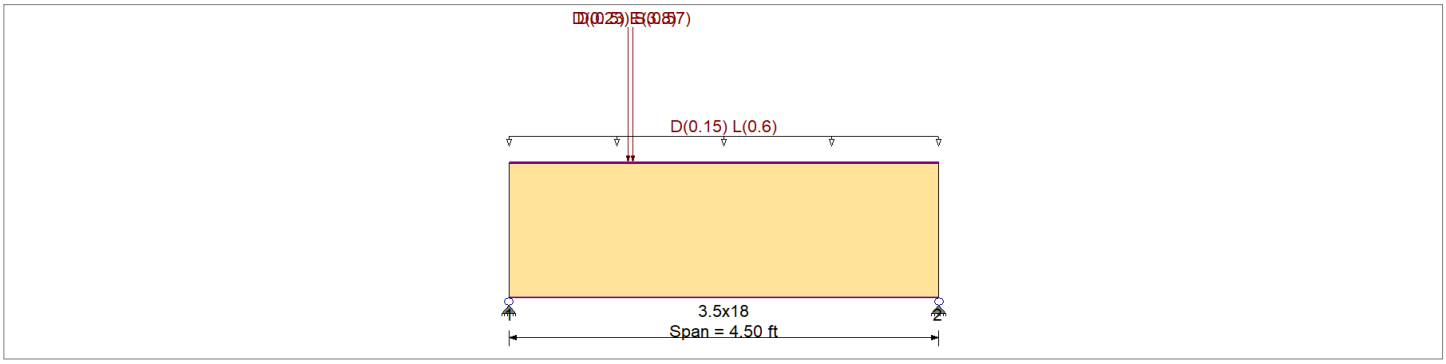
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



Applied Loads

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

Beam self weight NOT internally calculated and added
Point Load : D = 0.230, S = 0.570 k @ 1.30 ft
Uniform Load : D = 0.150, L = 0.60 , Tributary Width = 1.0 ft
Point Load : D = 0.50, E = 3.80 k @ 1.250 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.067 : 1	Maximum Shear Stress Ratio	=	0.075 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	258.59 psi	fv: Actual	=	31.82 psi
F'b	=	3,840.00 psi	F'v	=	424.00 psi
Load Combination		+D+0.750L+0.750S+0.5250E	Load Combination		+D+0.750L+0.750S+0.5250E
Location of maximum on span	=	1.297 ft	Location of maximum on span	=	3.005 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.003 in	Ratio =	17375 >=360	Span: 1 : E Only
Max Upward Transient Deflection	-0.003 in	Ratio =	17375 >=360	Span: 1 : E Only * -1.0
Max Downward Total Deflection	0.004 in	Ratio =	12279 >=240	Span: 1 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	-0.002 in	Ratio =	34935 >=240	Span: 1 : +0.60D-0.70E

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 4.50 ft	1	0.028	0.032	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.97	61.5	2,160.0	0.32	7.6	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.50 ft	1	0.063	0.069	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.39	151.7	2,400.0	0.77	18.4	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.50 ft	1	0.034	0.038	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.49	94.9	2,760.0	0.48	11.5	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.50 ft	1	0.043	0.047	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.02	128.0	3,000.0	0.66	15.7	331.3

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B14 - UPPER FLOOR - REAR FLUSH BM @ LIVING

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

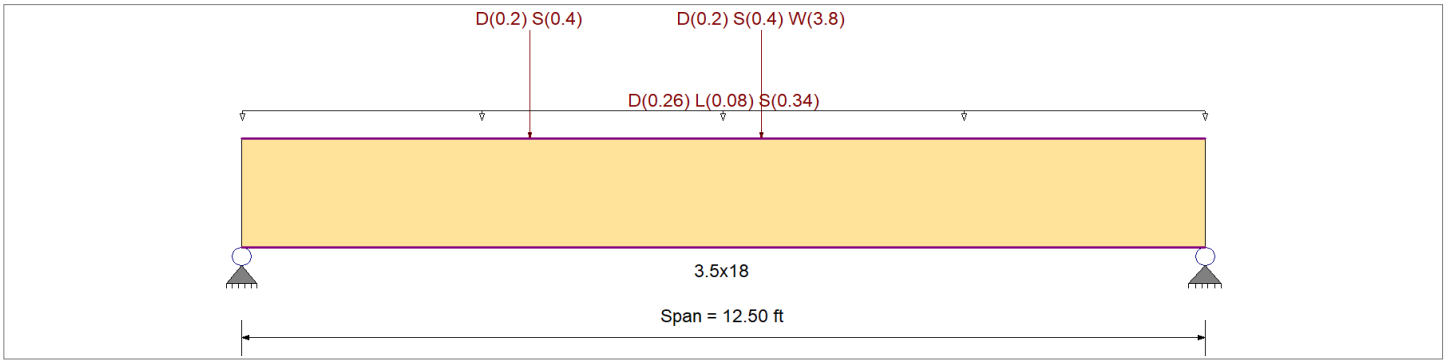
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.260, L = 0.080, S = 0.340 , Tributary Width = 1.0 ft
Point Load : D = 0.20, S = 0.40, W = 3.80 k @ 6.750 ft
Point Load : D = 0.20, S = 0.40 k @ 3.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.341 : 1	Maximum Shear Stress Ratio	=	0.284 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	942.40 psi	fv: Actual	=	86.56 psi
F'b	=	2,760.00 psi	F'v	=	304.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	6.387 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.087 in	Ratio =	1724 >=360	Span: 1 : W Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.166 in	Ratio =	903 >=240	Span: 1 : +D+0.750L+0.750S+0.450W
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.185	0.154	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	6.30	399.8	2,160.0	1.54	36.7	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.208	0.173	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.86	499.0	2,400.0	1.93	45.9	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.341	0.284	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	14.84	942.4	2,760.0	3.64	86.6	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.158	0.132	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.47	474.2	3,000.0	1.83	43.6	331.3
+D+0.750L+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B14 - UPPER FLOOR - REAR FLUSH BM @ LIVING (OVERSTRENGTH)

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

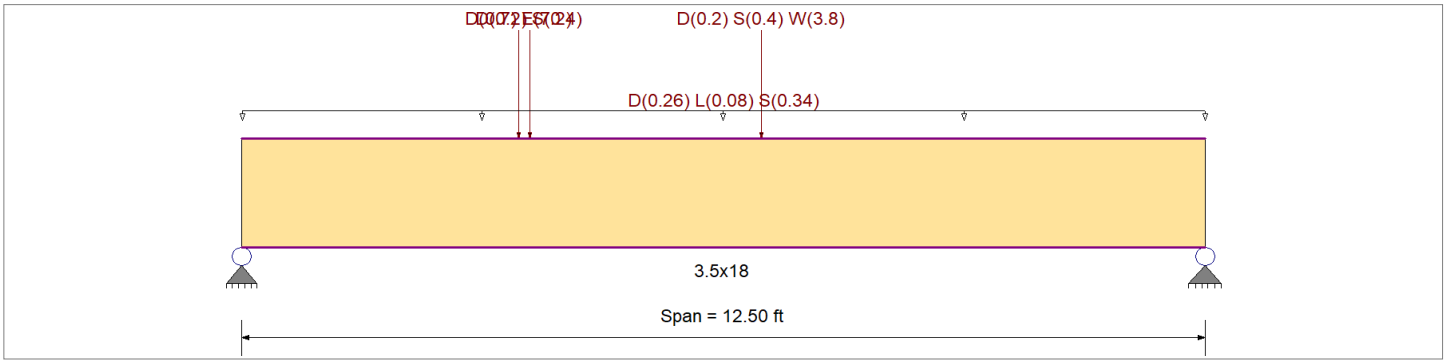
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination :	IBC 2021
Wood Species :	DF/DF
Wood Grade :	24F-V4
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.260, L = 0.080, S = 0.340 , Tributary Width = 1.0 ft
Point Load : D = 0.20, S = 0.40, W = 3.80 k @ 6.750 ft
Point Load : D = 0.20, S = 0.40 k @ 3.750 ft
Point Load : D = 0.70, E = 7.20 k @ 3.60 ft, (OVERSTRENGTH)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.383 : 1	Maximum Shear Stress Ratio	=	0.370 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,471.76 psi	fv: Actual	=	156.89 psi
F'b	=	3,840.00 psi	F'v	=	424.00 psi
Load Combination		+D+0.750L+0.750S+0.5250E	Load Combination		+D+0.750L+0.750S+0.5250E
Location of maximum on span	=	4.197 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.130 in	Ratio =	1157	>=360	Span: 1 : E Only
Max Upward Transient Deflection	-0.130 in	Ratio =	1157	>=360	Span: 1 : E Only * -1.0
Max Downward Total Deflection	0.207 in	Ratio =	725	>=240	Span: 1 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	-0.049 in	Ratio =	3041	>=240	Span: 1 : +0.60D-0.70E

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.224	0.204	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.61	483.0	2,160.0	2.04	48.6	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.242	0.218	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.16	581.5	2,400.0	2.42	57.7	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.370	0.323	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	16.10	1,022.5	2,760.0	4.13	98.4	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.186	0.167	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	8.77	556.8	3,000.0	2.33	55.4	331.3

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B20 - UPPER FLOOR - REAR BM UNDER B.W.A. @ DECK (OVERSTRENGTH)

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

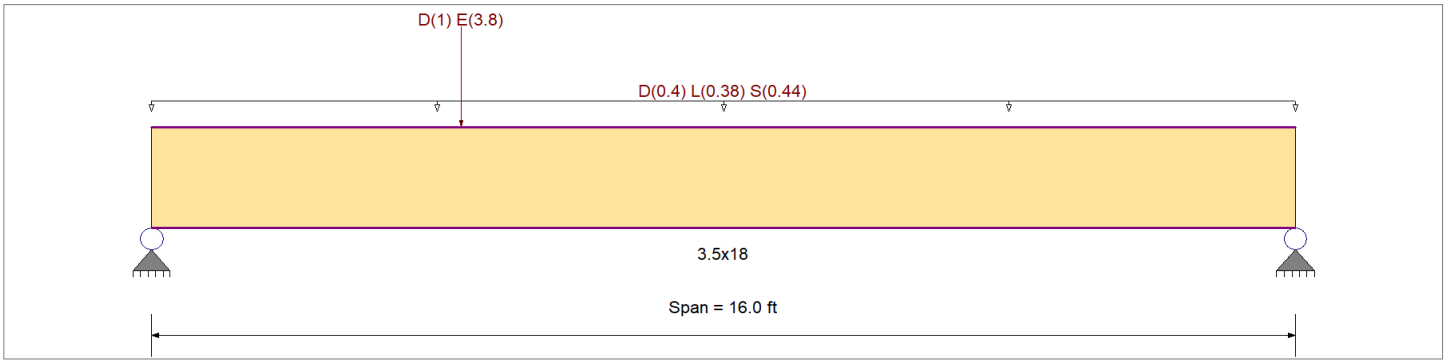
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.40, L = 0.380, S = 0.440 , Tributary Width = 1.0 ft
Point Load : D = 1.0, E = 3.80 k @ 4.330 ft, (OVERSTRENGTH)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.808 : 1	Maximum Shear Stress Ratio	=	0.583 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	2,229.66 psi	fv: Actual	=	177.55 psi
F'b	=	2,760.00 psi	F'v	=	304.75 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	7.708 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.213 in	Ratio =	900	>=360	Span: 1 : S Only
Max Upward Transient Deflection	-0.137 in	Ratio =	1401	>=360	Span: 1 : E Only * -1.0
Max Downward Total Deflection	0.605 in	Ratio =	317	>=240	Span: 1 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	0 in	Ratio =	0	<240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.455	0.343	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	15.49	983.5	2,160.0	3.43	81.8	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.730	0.532	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	27.61	1,752.9	2,400.0	5.92	141.0	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.679	0.493	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	29.52	1,874.6	2,760.0	6.31	150.3	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.520	0.381	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	24.57	1,560.3	3,000.0	5.30	126.2	331.3
+D+0.750L+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B20 - UPPER FLOOR - REAR BM UNDER B.W.A. @ DECK

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

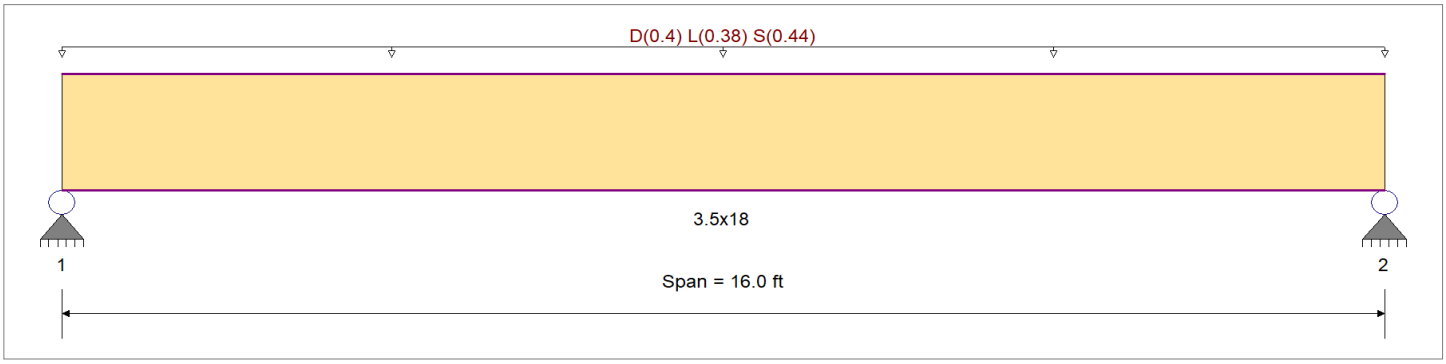
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.40, L = 0.380, S = 0.440 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.757 : 1	Maximum Shear Stress Ratio	=	0.526 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	2,089.96 psi	fv: Actual	=	160.18 psi
F'b	=	2,760.00 psi	F'v	=	304.75 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	8.000 ft	Location of maximum on span	=	14.540 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.213 in	Ratio =	900 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.498 in	Ratio =	385 >=240	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.389	0.270	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	13.24	840.4	2,160.0	2.71	64.4	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.672	0.466	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	25.40	1,612.5	2,400.0	5.19	123.6	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.628	0.436	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	27.32	1,734.4	2,760.0	5.58	132.9	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.473	0.328	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	22.36	1,419.5	3,000.0	4.57	108.8	331.3
+D+0.750L+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.757	0.526	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	32.92	2,090.0	2,760.0	6.73	160.2	304.8

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B21 - UPPER FLOOR - CANT'D BM AT REAR DECK

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

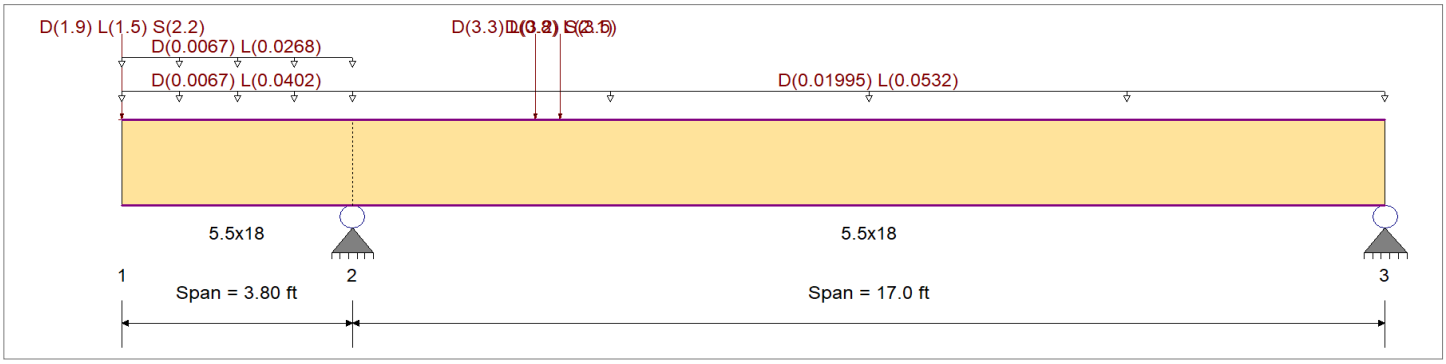
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Point Load : D = 1.90, L = 1.50, S = 2.20 k @ 0.0 ft, (B18)
Uniform Load : D = 0.010, L = 0.060 ksf, Tributary Width = 0.670 ft, (DECK)
Uniform Load : D = 0.010, L = 0.040 ksf, Tributary Width = 0.670 ft, (DECK)
Load for Span Number 2
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft, (FLOOR)
Point Load : D = 3.30, L = 3.20, S = 3.50 k @ 3.0 ft, (B20)
Point Load : D = 0.80, L = 2.10 k @ 3.410 ft, (B16)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.358 : 1	Maximum Shear Stress Ratio	=	0.523 : 1
Section used for this span		5.5x18	Section used for this span		5.5x18
fb: Actual	=	742.60 psi	fv: Actual	=	138.54 psi
F'b	=	2,071.91 psi	F'v	=	265.00 psi
Load Combination		+D+0.750L+0.750S+H, LL Comb Run (L*)	Load Combination		+D+L+H, LL Comb Run (LL)
Location of maximum on span	=	0.000 ft	Location of maximum on span	=	3.800 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.058 in	Ratio =	1562 >=360	Span: 1 : L Only, LL Comb Run (L*)
Max Upward Transient Deflection	-0.110 in	Ratio =	824 >=360	Span: 1 : L Only, LL Comb Run (*L)
Max Downward Total Deflection	0.174 in	Ratio =	1171 >=240	Span: 2 : +D+L+H, LL Comb Run (*L)
Max Upward Total Deflection	-0.124 in	Ratio =	734 >=240	Span: 1 : +D+L+H, LL Comb Run (*L)

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
+D+H														0.0	0.00	0.0	0.0
Length = 3.80 ft	1	0.181	0.260	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.47	301.9	1,665.0	4.09	62.0	238.5
Length = 17.0 ft	2	0.186	0.260	0.90	1.00	1.00	1.00	0.974	1.00	1.00	1.00	7.47	301.9	1,621.5	4.09	62.0	238.5
+D+L+H, LL Comb Run (*L)					1.00	1.00	1.00	0.974	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Steel Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.24.08.01 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC INC 1983-2023

DESCRIPTION: B21 - UPPER FLOOR - CANT'D BM AT REAR DECK - 2024-09-05 Rev

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16

Load Combination Set : IBC 2021

Material Properties

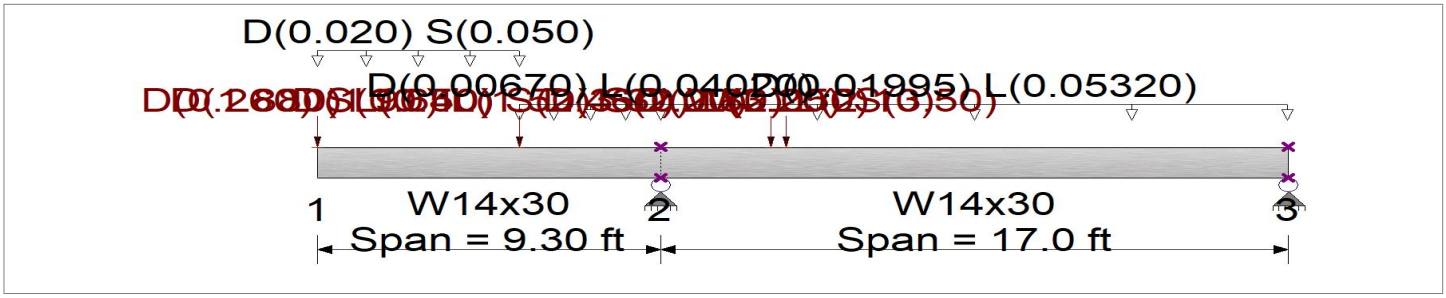
Analysis Method : Allowable Strength Design

Beam Bracing : Completely Unbraced

Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi

E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loading

Load(s) for Span Number 1

Point Load : D = 1.90, L = 1.50, S = 2.20 k @ 5.50 ft, (B18)

Uniform Load : D = 0.010, L = 0.060 ksf, Extent = 5.50 -->> 9.30 ft, Tributary Width = 0.670 ft, (DECK)

Point Load : D = 0.260, S = 0.640 k @ 0.0 ft, (B13)

Uniform Load : D = 0.010, S = 0.0250 ksf, Extent = 0.0 -->> 5.50 ft, Tributary Width = 2.0 ft, (LOW ROOF)

Point Load : D = 1.880, L = 0.50, S = 2.460, W = 2.050 k @ 5.50 ft, (B14)

Load for Span Number 2

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft, (FLOOR)

Point Load : D = 3.30, L = 3.20, S = 3.50 k @ 3.0 ft, (B20)

Point Load : D = 0.80, L = 2.10 k @ 3.410 ft, (B16)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.477 : 1	Maximum Shear Stress Ratio =	0.165 : 1
Section used for this span	W14x30	Section used for this span	W14x30
Ma : Applied	47.367 k-ft	Va : Applied	12.305 k
Mn / Omega : Allowable	99.242 k-ft	Vn/Omega : Allowable	74.520 k
Load Combination	+D+0.750L+0.750S+0.450W+H, LL Comb Run (L*)	Load Combination	+D+0.750L+0.750S+0.450W+H, LL Comb Run (LL)
		Location of maximum on span	9.300 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.289 in	Ratio =	771	>=360	Span: 2 : S Only
Max Upward Transient Deflection	-0.154 in	Ratio =	1,448	>=360	Span: 2 : L Only, LL Comb Run (*L)
Max Downward Total Deflection	0.499 in	Ratio =	447	>=240.	Span: 2 : +D+0.750L+0.750S+0.450W+H, LL Comb Run (
Max Upward Total Deflection	-0.096 in	Ratio =	2119	>=240.	Span: 2 : +D+0.750L+0.750S+0.450W+H, LL Comb Run (

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 9.30 ft	1	0.190	0.066		-18.85	18.85	165.73	99.24	1.00	1.00	4.89	111.78	74.52
Dsgn. L = 17.00 ft	2	0.160	0.066	0.03	-18.85	18.85	197.08	118.01	3.00	1.00	4.89	111.78	74.52
+D+L+H, LL Comb Run (*L)													
Dsgn. L = 9.30 ft	1	0.190	0.130		-18.85	18.85	165.73	99.24	1.00	1.00	9.66	111.78	74.52
Dsgn. L = 17.00 ft	2	0.179	0.130	10.81	-18.85	18.85	176.23	105.53	1.79	1.00	9.66	111.78	74.52
+D+L+H, LL Comb Run (L*)													
Dsgn. L = 9.30 ft	1	0.269	0.089		-26.74	26.74	165.73	99.24	1.00	1.00	6.61	111.78	74.52
Dsgn. L = 17.00 ft	2	0.227	0.072		-26.74	26.74	197.08	118.01	2.73	1.00	5.35	111.78	74.52
+D+L+H, LL Comb Run (LL)													
Dsgn. L = 9.30 ft	1	0.269	0.136		-26.74	26.74	165.73	99.24	1.00	1.00	10.12	111.78	74.52
Dsgn. L = 17.00 ft	2	0.227	0.136	5.17	-26.74	26.74	197.08	118.01	2.99	1.00	10.12	111.78	74.52
+D+Lr+H, LL Comb Run (*L)													
Dsgn. L = 9.30 ft	1	0.190	0.066		-18.85	18.85	165.73	99.24	1.00	1.00	4.89	111.78	74.52
Dsgn. L = 17.00 ft	2	0.160	0.066	0.03	-18.85	18.85	197.08	118.01	3.00	1.00	4.89	111.78	74.52

Steel Beam

Project File: Calcs.ec6

DESCRIPTION: B21 - UPPER FLOOR - CANT'D BM AT REAR DECK - 2024-09-05 Rev (OVERSTRENGTH)

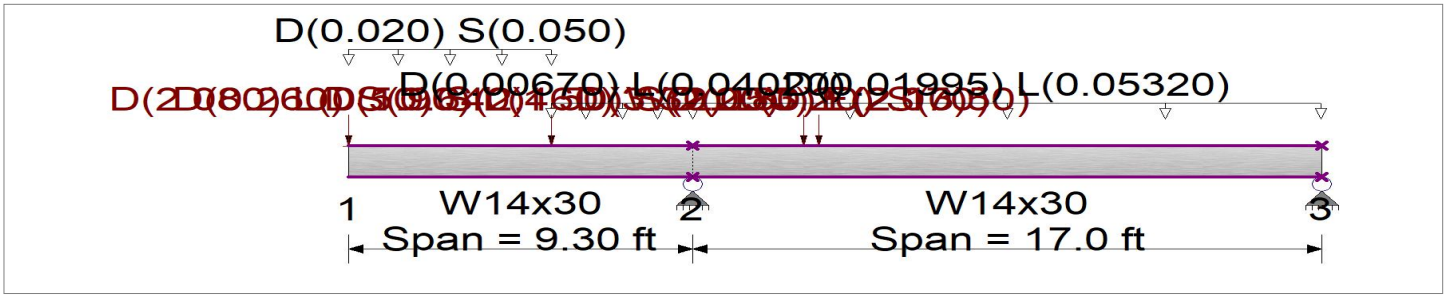
CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.90, L = 1.50, S = 2.20 k @ 5.50 ft, (B18)
Uniform Load : D = 0.010, L = 0.060 ksf, Extent = 5.50 -->> 9.30 ft, Tributary Width = 0.670 ft, (DECK)
Point Load : D = 0.260, S = 0.640 k @ 0.0 ft, (B13)
Uniform Load : D = 0.010, S = 0.0250 ksf, Extent = 0.0 -->> 5.50 ft, Tributary Width = 2.0 ft, (LOW ROOF)
Point Load : D = 2.080, L = 0.50, S = 2.460, W = 2.050, E = 2.070 k @ 5.50 ft, (B14)
Load for Span Number 2
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft, (FLOOR)
Point Load : D = 3.30, L = 3.20, S = 3.50 k @ 3.0 ft, (B20)
Point Load : D = 0.80, L = 2.10 k @ 3.410 ft, (B16)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.413 : 1	Maximum Shear Stress Ratio =	0.166 : 1
Section used for this span	W14x30	Section used for this span	W14x30
Ma : Applied	48.751 k-ft	Va : Applied	12.386 k
Mn / Omega : Allowable	118.014 k-ft	Vn/Omega : Allowable	74.520 k
Load Combination	+D+0.750L+0.750S+0.5250E+H, LL Comb Run (L*)	Load Combination	+D+0.750L+0.750S+0.5250E+H, LL Comb Run (LL)
		Location of maximum on span	9.300 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.289 in	Ratio =	771	>=360	Span: 2 : S Only
Max Upward Transient Deflection	-0.154 in	Ratio =	1,448	>=360	Span: 2 : L Only, LL Comb Run (*L)
Max Downward Total Deflection	0.518 in	Ratio =	431	>=180	Span: 2 : +D+0.750L+0.750S+0.5250E+H, LL Comb Run
Max Upward Total Deflection	-0.102 in	Ratio =	2008	>=180	Span: 2 : +D+0.750L+0.750S+0.5250E+H, LL Comb Run

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 9.30 ft	1	0.166	0.066		-19.61	19.61	197.08	118.01	1.00	1.00	4.94	111.78	74.52
Dsgn. L = 17.00 ft	2	0.166	0.066	0.00	-19.61	19.61	197.08	118.01	1.00	1.00	4.94	111.78	74.52
+D+L+H, LL Comb Run (*L)													
Dsgn. L = 9.30 ft	1	0.166	0.130		-19.61	19.61	197.08	118.01	1.00	1.00	9.70	111.78	74.52
Dsgn. L = 17.00 ft	2	0.166	0.130	10.21	-19.61	19.61	197.08	118.01	1.00	1.00	9.70	111.78	74.52
+D+L+H, LL Comb Run (L*)													
Dsgn. L = 9.30 ft	1	0.233	0.091		-27.50	27.50	197.08	118.01	1.00	1.00	6.81	111.78	74.52
Dsgn. L = 17.00 ft	2	0.233	0.072		-27.50	27.50	197.08	118.01	1.00	1.00	5.40	111.78	74.52
+D+L+H, LL Comb Run (LL)													
Dsgn. L = 9.30 ft	1	0.233	0.136		-27.50	27.50	197.08	118.01	1.00	1.00	10.17	111.78	74.52
Dsgn. L = 17.00 ft	2	0.233	0.136	4.73	-27.50	27.50	197.08	118.01	1.00	1.00	10.17	111.78	74.52
+D+Lr+H, LL Comb Run (*L)													
Dsgn. L = 9.30 ft	1	0.166	0.066		-19.61	19.61	197.08	118.01	1.00	1.00	4.94	111.78	74.52
Dsgn. L = 17.00 ft	2	0.166	0.066	0.00	-19.61	19.61	197.08	118.01	1.00	1.00	4.94	111.78	74.52

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B22 - UPPER FLOOR - BM ABOVE KITCHEN

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

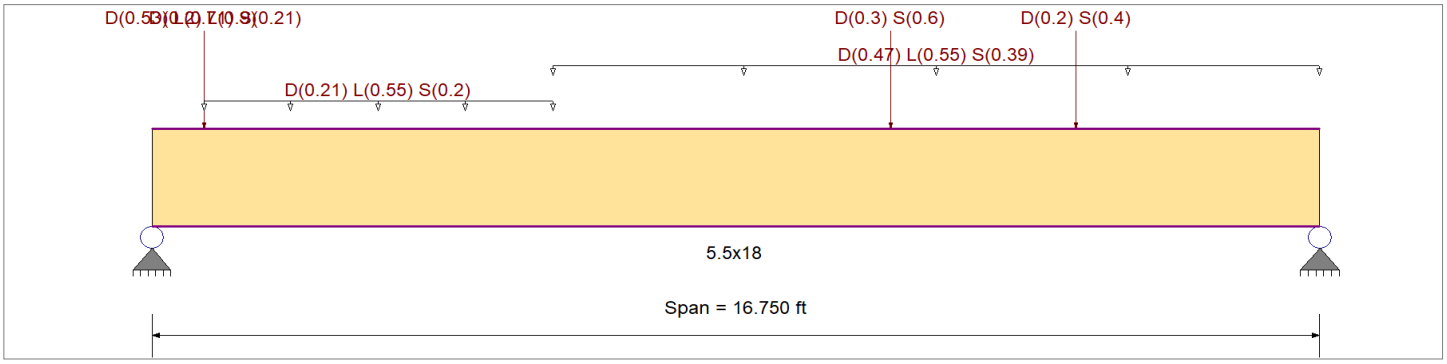
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Point Load : D = 0.530, L = 0.710, S = 0.210 k @ 0.750 ft, (B21)
Point Load : D = 0.20, L = 0.90, S = 0.50 k @ 0.750 ft, (BEAM)
Uniform Load : D = 0.210, L = 0.550, S = 0.20 k/ft, Extent = 0.750 -->> 5.750 ft, Tributary Width = 1.0 ft, (FLOOR)
Point Load : D = 0.30, S = 0.60 k @ 10.60 ft, (P.A.)
Point Load : D = 0.20, S = 0.40 k @ 13.250 ft, (P.A.)
Uniform Load : D = 0.470, L = 0.550, S = 0.390 k/ft, Extent = 5.750 -->> 16.750 ft, Tributary Width = 1.0 ft, (WALL ABOVE)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.643 : 1	Maximum Shear Stress Ratio	=	0.439 : 1
Section used for this span		5.5x18	Section used for this span		5.5x18
fb: Actual	=	1,730.30 psi	fv: Actual	=	133.87 psi
F'b	=	2,691.87 psi	F'v	=	304.75 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	8.925 ft	Location of maximum on span	=	15.283 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.210 in	Ratio =	955 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.449 in	Ratio =	447 >=240	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.321	0.223	0.90	1.00	1.00	1.00	0.975	1.00	1.00	1.00	16.75	676.7	2,106.7	3.52	53.3	238.5
+D+L					1.00	1.00	1.00	0.975	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.629	0.422	1.00	1.00	1.00	1.00	0.975	1.00	1.00	1.00	36.47	1,473.4	2,340.8	7.38	111.8	265.0
+D+S					1.00	1.00	1.00	0.975	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.479	0.335	1.15	1.00	1.00	1.00	0.975	1.00	1.00	1.00	31.90	1,288.7	2,691.9	6.75	102.2	304.8

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B26 - UPPER FLOOR - EDGE BEAM @ B.W.A. @ FRONT PORCH (OVERSTRENGTH)

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

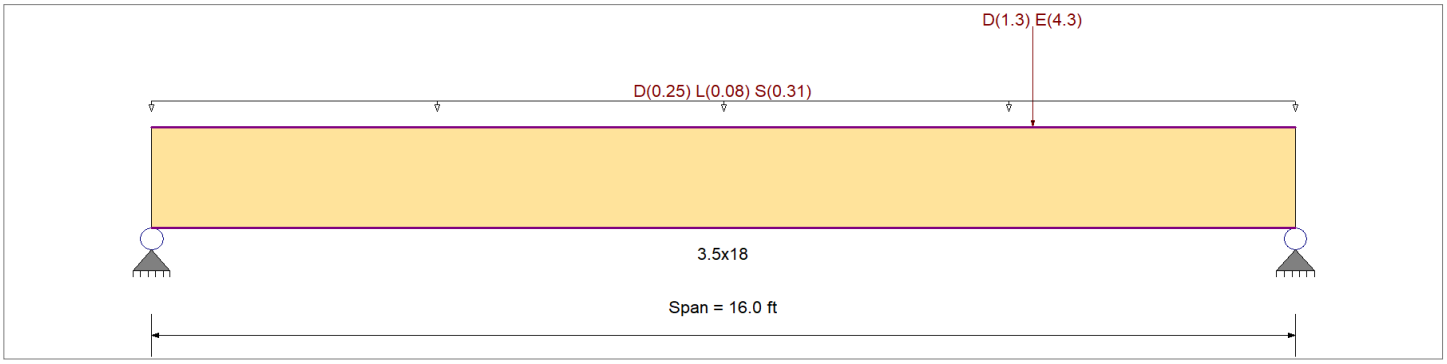
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.250, L = 0.080, S = 0.310 , Tributary Width = 1.0 ft
Point Load : D = 1.30, E = 4.30 k @ 12.330 ft, (OVERSTRENGTH)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.479 : 1	Maximum Shear Stress Ratio	=	0.371 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,321.90 psi	fv: Actual	=	113.18 psi
F'b	=	2,760.00 psi	F'v	=	304.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	8.526 ft	Location of maximum on span	=	14.540 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.150 in	Ratio =	1278	>=360	Span: 1 : S Only
Max Upward Transient Deflection	-0.136 in	Ratio =	1416	>=360	Span: 1 : E Only * -1.0
Max Downward Total Deflection	0.380 in	Ratio =	505	>=240	Span: 1 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	-0.003 in	Ratio =	60941	>=240	Span: 1 : +0.60D-0.70E

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.323	0.272	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.99	697.8	2,160.0	2.73	64.9	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.357	0.292	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	13.51	857.9	2,400.0	3.25	77.4	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.479	0.371	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	20.82	1,321.9	2,760.0	4.75	113.2	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.0 ft	1	0.273	0.224	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	12.88	817.8	3,000.0	3.12	74.3	331.3
+D+0.750L+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B34 - UPPER FLOOR - BM ABOVE KITCHEN

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

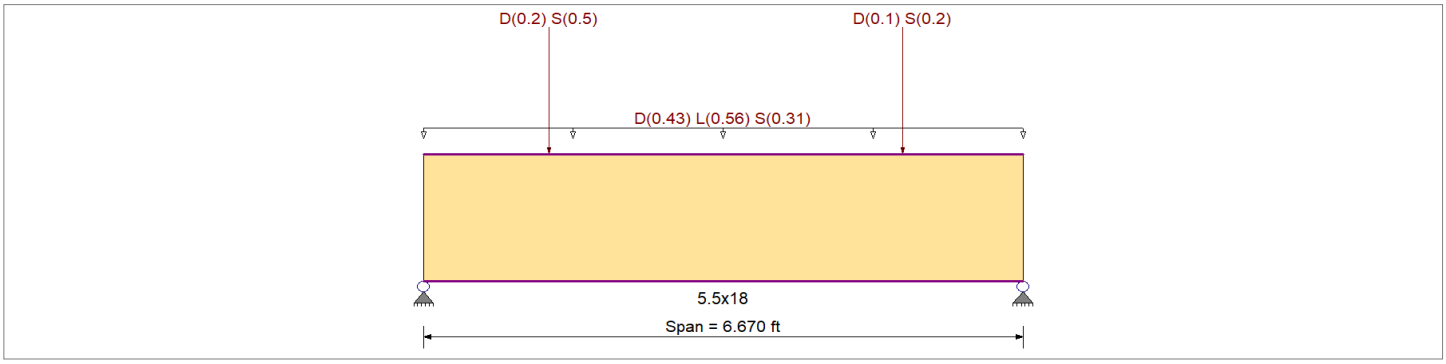
Wood Species : DF/DF
Wood Grade : 24F-V4

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.430, L = 0.560, S = 0.310 , Tributary Width = 1.0 ft
Point Load : D = 0.20, S = 0.50 k @ 1.40 ft
Point Load : D = 0.10, S = 0.20 k @ 5.330 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.098 : 1	Maximum Shear Stress Ratio	=	0.108 : 1
Section used for this span		5.5x18	Section used for this span		5.5x18
fb: Actual	=	271.17 psi	fv: Actual	=	28.68 psi
F'b	=	2,760.00 psi	F'v	=	265.00 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+L
Location of maximum on span	=	3.262 ft	Location of maximum on span	=	5.185 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.005 in	Ratio =	15352	>=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.011 in	Ratio =	7046	>=240	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0	<240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 6.670 ft	1	0.051	0.054	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.72	109.8	2,160.0	0.86	13.0	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.670 ft	1	0.098	0.108	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	5.83	235.6	2,400.0	1.89	28.7	265.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.670 ft	1	0.072	0.074	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.93	199.2	2,760.0	1.50	22.7	304.8
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.670 ft	1	0.068	0.075	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	5.05	204.2	3,000.0	1.63	24.8	331.3
+D+0.750L+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shear Wall Calculations

LNL Builds

27xx 62nd Ave

Mercer Island, Washington

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2018 IBC Ch. 1609, ASCE 7-16 Ch. 26-30

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

NJM

Matthew Mills, Staff Engineer

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Project Name: 27xx 62nd Ave
LNL Builds
M&K Project #: 300-24003
Engineer: MPM
Date: 15-Aug-24

SEISMIC CALCULATION - ASCE 7-16

Seismic Design Category:

User Inputs:

Site Class	D
Spectral Response Acceleration 0.2 sec, **Ss**	1.402
Spectral Response Acceleration 1.0 sec, **S1**	0.488
Occupancy Category	II

Variables:

Site coefficient, Fa	1.20
Site coefficient, Fv	1.81

Calculated Values:

Maximum spectral response acceleration, S_{ms}	1.682
Maximum spectral response acceleration, S_{m1}	0.884
Design spectral response acceleration, S_{ds}	1.122
Design spectral response acceleration, S_{d1}	0.590
Seismic Design Category (short term)	D
Seismic Design Category (1.0 second term)	D

Building period Determination:

User Inputs:

Building period coefficient, C_t	0.020
Long-Period Trans Period, T_L (sec)	6
Ht. abv base to highest level, h_n	23

Calculated Values:

Approximate Fundamental Period, T_a	0.211
T_0	0.105
T_s	0.526
Spectral Response Acc., S_a (g)	1.122

Site Class Assumption

Yes — Per ASCE 7-16 Section 11.4.3 the Site Class may be assumed to be D

Equivalent lateral force procedure

Dead Load Calculation:

Level	Story Ht. (ft.)	Area (ft^2)	Dead Load (psf)	DL of ext wall trib. to level (kips)	Total level DL
1	11.5	1553	15	15.7	39 k
2	11.7	1836	10	7.9	26 k
3	0.0	0	0	0.0	0 k
4	0.0	0	0	0.0	0 k
5	0.0	0	0	0.0	0 k
6	0.0	0	0	0.0	0 k
7	0.0	0	0	0.0	0 k
8	0.0	0	0	0.0	0 k
9	0.0	0	0	0.0	0 k
10	0.0	0	0	0.0	0 k
11	0.0	0	0	0.0	0 k
12	0.0	0	0	0.0	0 k
13	0.0	0	0	0.0	0 k
14	0.0	0	0	0.0	0 k
15	0.0	0	0	0.0	0 k
16	0.0	0	0	0.0	0 k
17	0.0	0	0	0.0	0 k
18	0.0	0	0	0.0	0 k
19	0.0	0	0	0.0	0 k
20	0.0	0	0	0.0	0 k

Total Dead Load Of Structure 65 Kips

Seismic Response Coefficient:

	Transverse	Longitudinal
Response modification factor, **R**	6.5	6.5
Occupancy Importance Factor, I_E	1.00	1.00
Seismic Response Coefficient, C_s	0.173	0.173

Base Shears:

Ultimate Loads				x 0.7 =	Allowable Loads			
Transverse		Longitudinal			Transverse		Longitudinal	
11	k	11	k		7.9	k	7.9	k

Story Shear Calculation:

Distribution exponent, 1.00

Level	Vert. Dist. Factor, C_{vx}	Ultimate Loads: Transverse *Story Shear, F_x*		Ultimate Loads: Longitudinal *Story Shear, F_x*		x 0.7 =	Allowable Loads: Transverse *Story Shear, F_x*		Allowable Loads: Transverse *Σ Story Shear*		Allowable Loads: Longitudinal *Story Shear, F_x*		Allowable Loads: Longitudinal *Σ Story Shear*	
1	0.424	4.8	k	4.8	k		3.3	k	7.9	k	3.3	k	7.9	k
2	0.576	6.5	k	6.5	k		4.5	k	4.5	k	4.5	k	4.5	k
3	0.000	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
4	0.000	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
5	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
6	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
7	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
8	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
9	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
10	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
11	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
12	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
13	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
14	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
15	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
16	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
17	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
18	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
19	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k
20	0.00	0.0	k	0.0	k		0.0	k	0.0	k	0.0	k	0.0	k

PLAN LEGEND

DOOR DESIGNATION 1.1 — DOOR WIDTH / DOOR HEIGHT

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH / 5'-0" WINDOW HEIGHT

XX / X.X — DETAIL NUMBER / SHEET NUMBER

XX / X.X — SECTION MARKER

FLOOR STEP DOWN

SOFFIT STEP DOWN

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D — WASHING/ DRYER MACHINE (COMBO)

HWH — ON-DEMAND HOT WATER HEATER

HD — HEAT DETECTOR/HEAT ALARM PER SRC R314.2.1

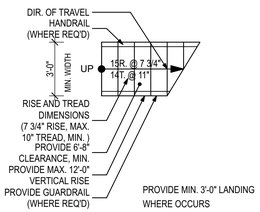
SD — SRC R314: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS:
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

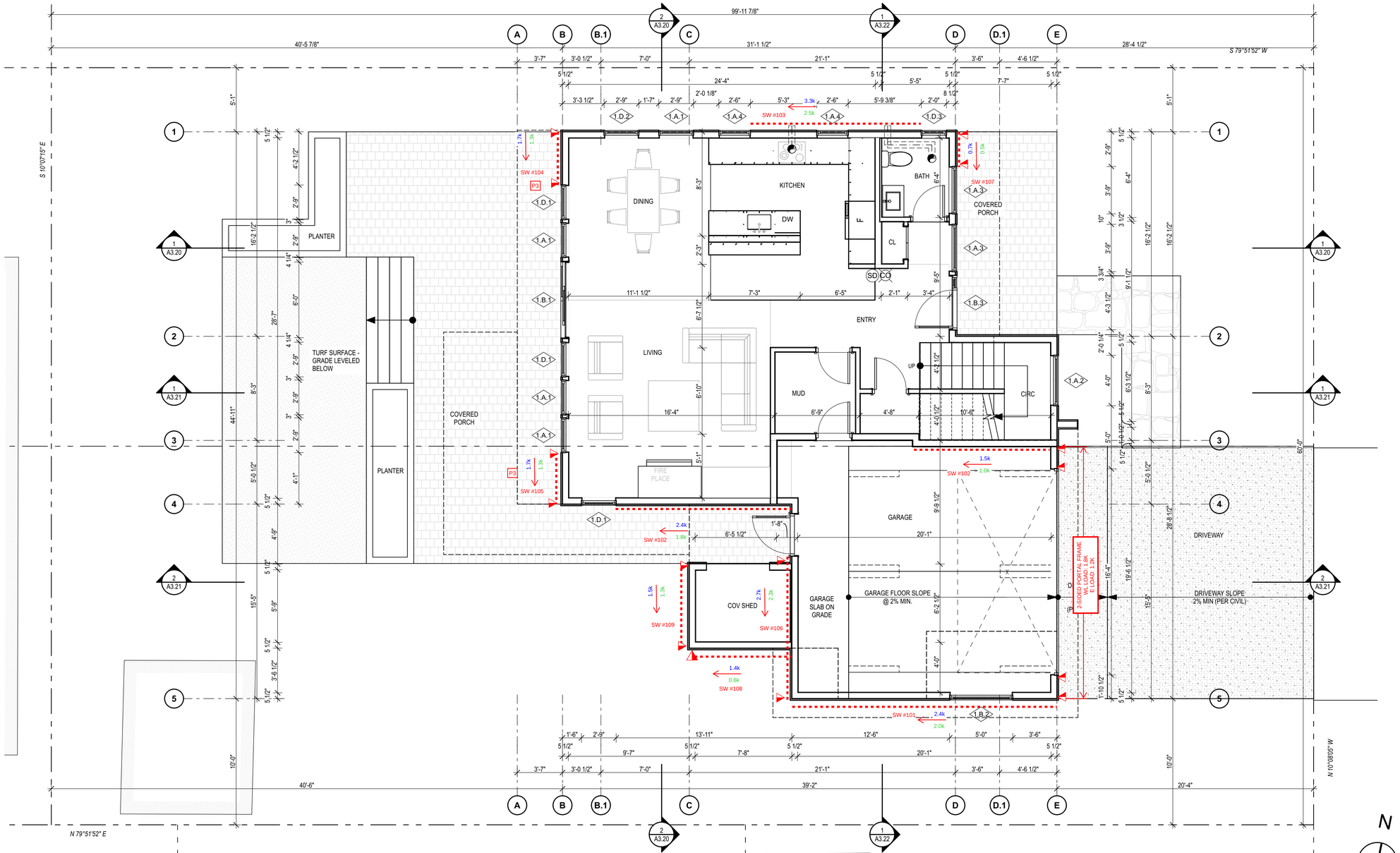
SD_{SW} — SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

FAN LOCATION (SRC TABLE M 1505.4.4(1))
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

CO — SRC R315 AND 2018 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5. CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

TYPICAL STAIR





1 FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"

0 2' 4' 8'

N

Architect of Record

b9 architects
610 2nd Avenue
Seattle, WA 98104
206.297.1284
www.b9architects.com

Project:
2740 61st Ave SE

Location:
2740 61ST AVE SE
MERCER ISLAND, WA 98040

SDCI Number:
#SDCI CN#

8814 REGISTERED ARCHITECT Brad Khouri BRADLEY G. KHOURI STATE OF WASHINGTON
Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

First Floor Plan

A2.01

PLAN LEGEND

DOOR DESIGNATION 1.1 — DOOR WIDTH / DOOR HEIGHT

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH / 5'-0" WINDOW HEIGHT

XX / X.X — DETAIL NUMBER / SHEET NUMBER

XX / X.X — SECTION MARKER

FLOOR STEP DOWN

SOFFIT STEP DOWN

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D — WASHING/ DRYER MACHINE (COMBO)

HWH — ON-DEMAND HOT WATER HEATER

HD — HEAT DETECTOR/HEAT ALARM PER SRC R314.2.1

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1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
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5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

SD_{SW} — SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

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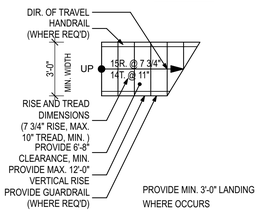
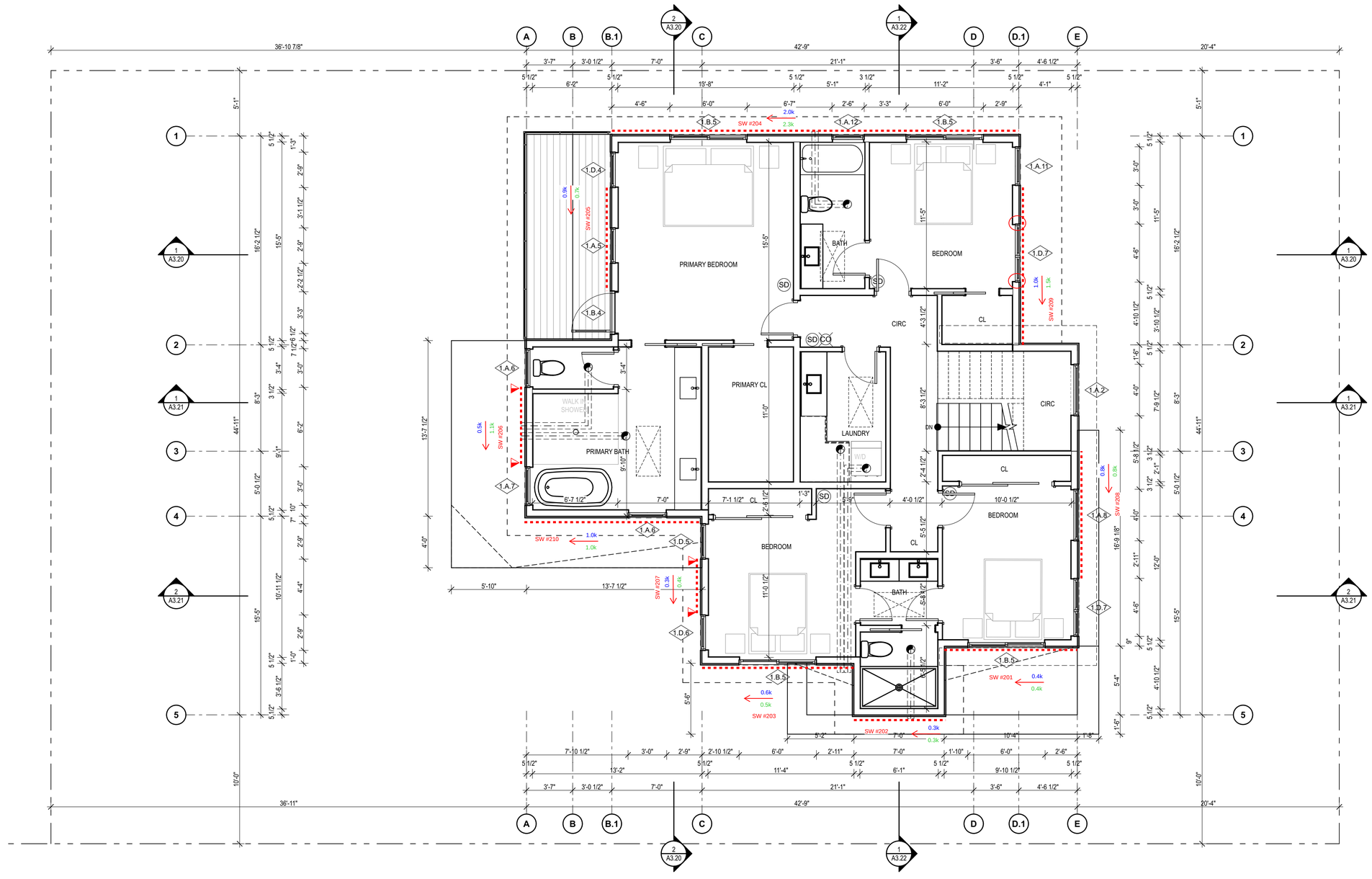
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

CO — SRC R315 AND 2018 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5. CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

TYPICAL STAIR





1 SECOND FLOOR PLAN
SCALE: 1/4" = 1'-0"

N

0 2' 4' 8'

Architect of Record

b9 architects
610 2nd Avenue
Seattle, WA 98104
206.297.1284
www.b9architects.com

Project:
2740 61st Ave SE

Location:
2740 61ST AVE SE
MERCER ISLAND, WA 98040

SDCI Number:
#SDCI CN#

8914 REGISTERED ARCHITECT BRADLEY G. KHOURI STATE OF WASHINGTON
Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

Second Floor Plan

A2.02

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 201: 2nd - South Bedroom Ext Wall

Shearwall Properties:

Wall height, H	9.8	ft.	Max wall opening ht, H_c	3.0	ft.		
Wall Length, L	10.3	ft.	Qualifying Wall Length, L	4.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	1039 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	3.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	8.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 202: 2nd - South Bathroom Ext Wall

Shearwall Properties:

Wall height, H	9.3	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	7.0	ft.	Qualifying Wall Length, L	7.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
300 lbs	<	1679 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	2.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	4.9	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 203: 2nd - South Bedroom Ext Wall

Shearwall Properties:

Wall height, H	9.6	ft.	Max wall opening ht, H_c	3.0	ft.		
Wall Length, L	11.8	ft.	Qualifying Wall Length, L	5.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
500 lbs	<	1391 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	4.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	10.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 204: 2nd - North Bedrooms Ext Wall

Shearwall Properties:

Wall height, H	9.5	ft.	Max wall opening ht, Hc	3.0	ft.		
Wall Length, L	31.6	ft.	Qualifying Wall Length, L	17.1	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	4102 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	21.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	873	lbs	Resistive Moment	61.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 205: 2nd - Deck Ext Wall

Shearwall Properties:

Wall height, H	10.2	ft.	Max wall opening ht, H_c	6.5	ft.		
Wall Length, L	8.0	ft.	Qualifying Wall Length, L	5.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	1109 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	253	plf	Overturning Moment	7.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	7.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 206: 2nd - Primary Bath Ext Wall

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	6.2	ft.	Qualifying Wall Length, L	6.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	1487 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	220	plf	Overturning Moment	11.6	k-ft	Hold Down Design Load	1144	lbs
DL at ends of wall	400	lbs	Resistive Moment	4.5	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 207: 2nd - South Bedroom Rear Ext Wall

Shearwall Properties:

Wall height, H	9.9	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	4.3	ft.	Qualifying Wall Length, L	4.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	1001 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	210	plf	Overturning Moment	4.0	k-ft	Hold Down Design Load	347	lbs
DL at ends of wall	400	lbs	Resistive Moment	2.5	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 208: 2nd - South Bedroom Front Ext Wall

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, Hc	6.0	ft.		
Wall Length, L	9.9	ft.	Qualifying Wall Length, L	5.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	1391 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	170	plf	Overturning Moment	8.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	520	lbs	Resistive Moment	9.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 209: 2nd - North Bedroom Front Ext Wall

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_c	6.0	ft.		
Wall Length, L	12.4	ft.	Qualifying Wall Length, L	7.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	1895 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	203	plf	Overturning Moment	13.5	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	13.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 101: 1st - Garage South Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	3.0	ft.		
Wall Length, L	21.0	ft.	Qualifying Wall Length, L	16.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	3838 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	245	plf	Overturning Moment	20.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	52.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 102: 1st - Living Room South Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	13.9	ft.	Qualifying Wall Length, L	13.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1800 lbs	<	3334 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	200	plf	Overturning Moment	18.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	23.9	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 103: 1st - North Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	6.0	ft.		
Wall Length, L	13.5	ft.	Qualifying Wall Length, L	11.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2500 lbs	<	2638 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	245	plf	Overturning Moment	25.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1135	lbs	Resistive Moment	25.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 104: 1st - Dining Rear Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	4.2	ft.	Qualifying Wall Length, L	4.2	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	1801 lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	13.0	k-ft	Hold Down Design Load	2648	lbs
DL at ends of wall	400	lbs	Resistive Moment	1.9	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 105: 1st - Dining Rear Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	4.1	ft.	Qualifying Wall Length, L	4.1	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	1744 lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	465	plf	Overturning Moment	13.0	k-ft	Hold Down Design Load	2272	lbs
DL at ends of wall	400	lbs	Resistive Moment	3.7	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 106: 1st - Garage Rear Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	11.3	ft.	Qualifying Wall Length, L	11.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	2710 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	310	plf	Overturning Moment	23.0	k-ft	Hold Down Design Load	606	lbs
DL at ends of wall	400	lbs	Resistive Moment	16.2	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 107: 1st - Bath Front Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	2.8	ft.	Qualifying Wall Length, L	2.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
500 lbs	<	546 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	438	plf	Overturning Moment	5.0	k-ft	Hold Down Design Load	1113	lbs
DL at ends of wall	400	lbs	Resistive Moment	1.9	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 210: 2nd - Primary Bath Side Ext Wall

Shearwall Properties:

Wall height, H	10.1	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	13.6	ft.	Qualifying Wall Length, L	10.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	2519 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	10.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	11.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 108: 1st - Outdoor Shed Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	8.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	1919 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	230	plf	Overturning Moment	6.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	7.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 109: 1st - Outdoor Shed Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	6.7	ft.	Qualifying Wall Length, L	6.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	1607 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	260	plf	Overturning Moment	13.0	k-ft	Hold Down Design Load	1096	lbs
DL at ends of wall	400	lbs	Resistive Moment	5.7	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 110: 1st - Int. Garage Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	10.9	ft.	Qualifying Wall Length, L	10.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	2614 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	210	plf	Overturning Moment	10.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	11.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shear Wall Calculations

LNL Builds

27xx 62nd Ave

Mercer Island, Washington

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2018 IBC Ch. 1609, ASCE 7-16 Ch. 26-30

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

NJM

Matthew Mills, Staff Engineer

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Project Name: 27xx 62nd Ave
M&K Project #: 300-24003
Engineer: MPM
date: 20-Aug-24

Wind Design Summary per ASCE 7-16

Parameters:

Wind Speed	100
Exposure Category	C
Risk Category	II
Wind Directionality Factor, K_d	0.85
Topographic Factor, K_{zt}	1.00
Gust Factor, G	0.85
Ground Elev. Above Sea Level [ft]	0
Design Type	ASD

0.60

Roof Geometry:

Trans. Roof Pitch	0.3	:12
Long. Roof Pitch	0.3	:12
Mean Roof Height, H	23.67	ft

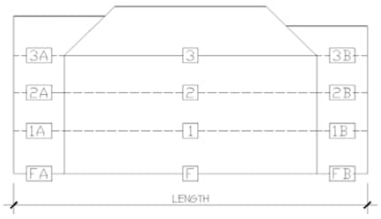
Building Geometry:

length	45	ft
Width	41	ft
Number of stories	2	

Transverse Direction (Perpendicular to Main Ridge Line)

Tributary Design Areas:

Diaphragm Level	Floor-to-Floor Height		Section A	Section O	Section B	
2	11.67 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	263	0	sq ft
1	11.5 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	512	0	sq ft
FND		Roof Surface	0	0	0	sq ft
		Wall surface	0	0	0	sq ft



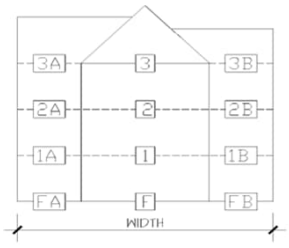
Tributary Design Loads: (0.6W)

	Section A	Section O	Section B	
Story Shear	0.00	3.54	0.00	kips
Total Shear	0.00	3.54	0.00	kips
		3.54		kips
Story Shear	0.00	6.51	0.00	kips
Total Shear	0.00	10.05	0.00	kips
		10.05		kips
Story Shear	0.00	0.00	0.00	kips
Total Shear	0.00	10.05	0.00	kips
		10.05		kips

Longitudinal Direction (Parallel to Main Ridge Line)

Tributary Design Areas:

Diaphragm Level	Floor-to-Floor Height		Section A	Section O	Section B	
2	11.67 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	324	0	sq ft
1	11.5 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	530	0	sq ft
FND		Roof Surface	0	0	0	sq ft
		Wall surface	0	0	0	sq ft



Tributary Design Loads: (0.6W)

	Section A	Section O	Section B	
Story Shear	0.00	4.29	0.00	kips
Total Shear	0.00	4.29	0.00	kips
		4.29		kips
Story Shear	0.00	6.64	0.00	kips
Total Shear	0.00	10.93	0.00	kips
		10.93		kips
Story Shear	0.00	0.00	0.00	kips
Total Shear	0.00	10.93	0.00	kips
		10.93		kips

PLAN LEGEND

DOOR DESIGNATION 1.1 — DOOR WIDTH / DOOR HEIGHT

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH / 5'-0" WINDOW HEIGHT

XX / X.X — DETAIL NUMBER / SHEET NUMBER

XX / X.X — SECTION MARKER

FLOOR STEP DOWN

SOFFIT STEP DOWN

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D — WASHING/ DRYER MACHINE (COMBO)

HWH — ON-DEMAND HOT WATER HEATER

HD — HEAT DETECTOR/HEAT ALARM PER SRC R314.2.1

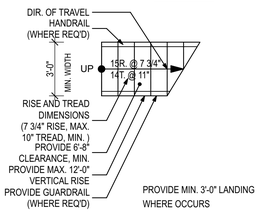
SD — SRC R314: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS:
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

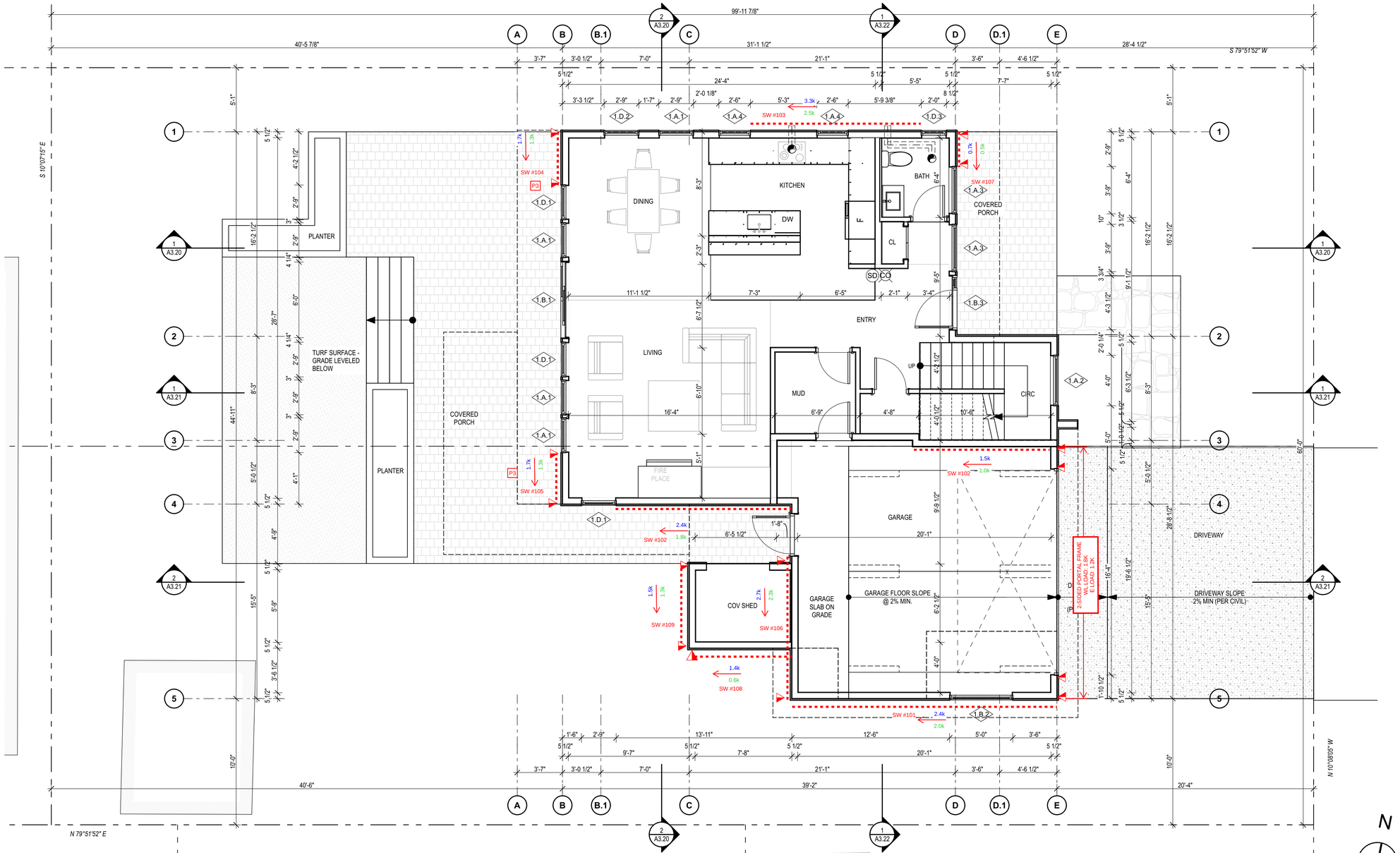
SD_{SW} — SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

FAN LOCATION (SRC TABLE M 1505.4.4(1))
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

CO — SRC R315 AND 2018 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5. CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

TYPICAL STAIR





1 FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"

0 2' 4' 8'

N

Architect of Record

b9 architects
610 2nd Avenue
Seattle, WA 98104
206.297.1284
www.b9architects.com

Project:
2740 61st Ave SE

Location:
2740 61ST AVE SE
MERCER ISLAND, WA 98040

SDCI Number:
#SDCI CN#

8814 REGISTERED ARCHITECT Brad Khouri BRADLEY G. KHOURI STATE OF WASHINGTON
Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

First Floor Plan

A2.01

PLAN LEGEND

DOOR DESIGNATION 1.1 — DOOR WIDTH / DOOR HEIGHT

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH / 5'-0" WINDOW HEIGHT

XX / X.X — DETAIL NUMBER / SHEET NUMBER

XX / X.X — SECTION MARKER

FLOOR STEP DOWN

SOFFIT STEP DOWN

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D — WASHING/ DRYER MACHINE (COMBO)

HWH — ON-DEMAND HOT WATER HEATER

HD — HEAT DETECTOR/HEAT ALARM PER SRC R314.2.1

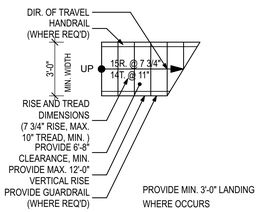
SD — SRC R314: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS:
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

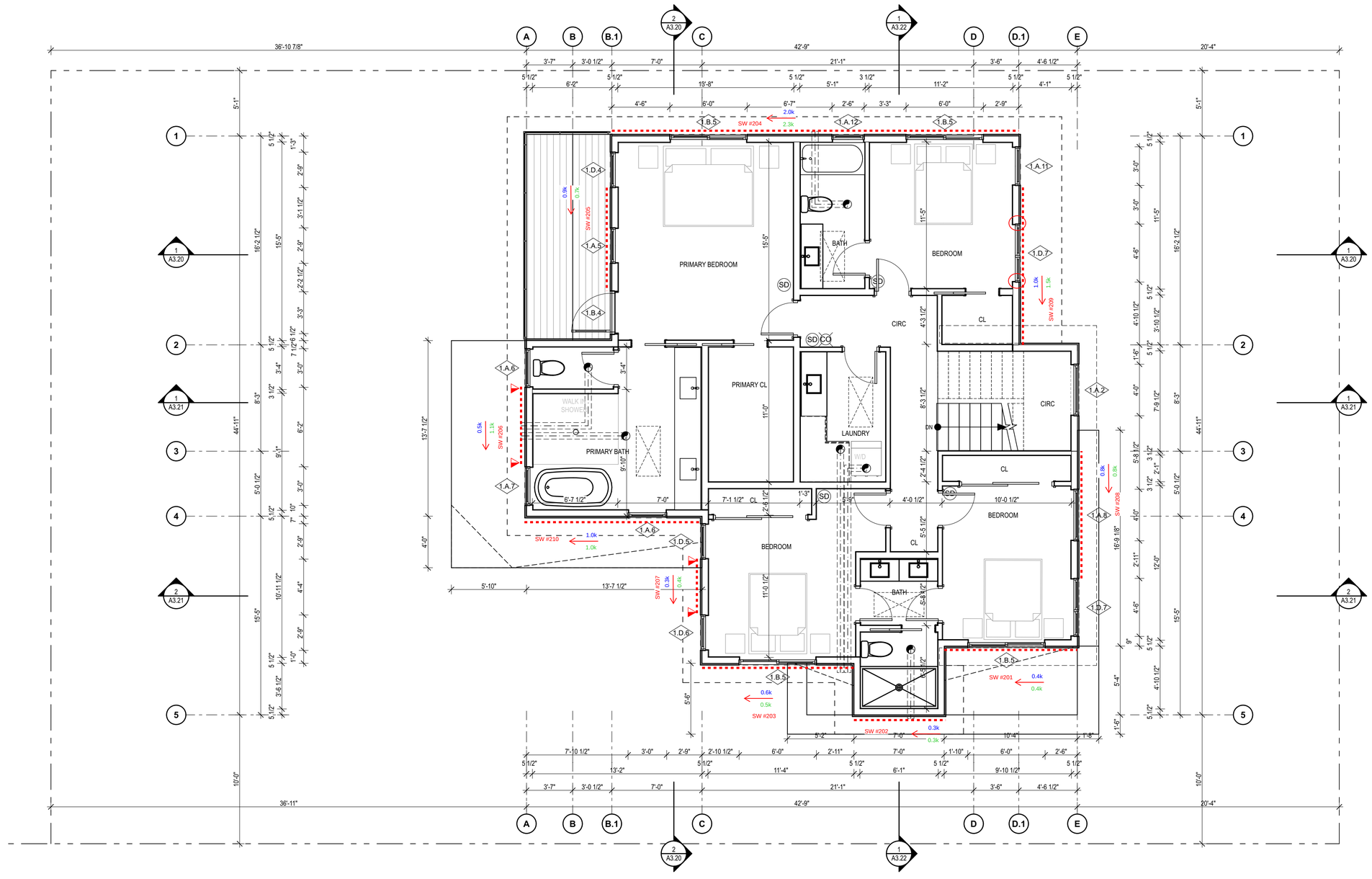
SD_{SW} — SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

FAN LOCATION (SRC TABLE M 1505.4.4(1))
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

CO — SRC R315 AND 2018 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5. CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

TYPICAL STAIR





1 SECOND FLOOR PLAN
SCALE: 1/4" = 1'-0"

N

0 2' 4' 8'

Architect of Record

b9 architects
610 2nd Avenue
Seattle, WA 98104
206.297.1284
www.b9architects.com

Project:
2740 61st Ave SE

Location:
2740 61ST AVE SE
MERCER ISLAND, WA 98040

SDCI Number:
#SDCI CN#

8914 REGISTERED ARCHITECT BRADLEY G. KHOURI STATE OF WASHINGTON
Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

Second Floor Plan

A2.02

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 201: 2nd - South Bedroom Ext Wall

Shearwall Properties:

Wall height, H	9.8	ft.	Max wall opening ht, H_c	3.0	ft.		
Wall Length, L	10.3	ft.	Qualifying Wall Length, L	4.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	1454 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	3.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	11.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 202: 2nd - South Bathroom Ext Wall

Shearwall Properties:

Wall height, H	9.3	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	7.0	ft.	Qualifying Wall Length, L	7.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
300 lbs	<	2351 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	2.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	6.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 203: 2nd - South Bedroom Ext Wall

Shearwall Properties:

Wall height, H	9.6	ft.	Max wall opening ht, H_c	3.0	ft.		
Wall Length, L	11.8	ft.	Qualifying Wall Length, L	5.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	1948 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	5.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	14.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 204: 2nd - North Bedrooms Ext Wall

Shearwall Properties:

Wall height, H	9.5	ft.	Max wall opening ht, Hc	3.0	ft.		
Wall Length, L	31.6	ft.	Qualifying Wall Length, L	17.1	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	5742 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	19.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	873	lbs	Resistive Moment	83.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 205: 2nd - Deck Ext Wall

Shearwall Properties:

Wall height, H	10.2	ft.	Max wall opening ht, H_c	6.5	ft.		
Wall Length, L	8.0	ft.	Qualifying Wall Length, L	5.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
900 lbs	<	1552 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	253	plf	Overturning Moment	9.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	10.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 206: 2nd - Primary Bath Ext Wall

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	6.2	ft.	Qualifying Wall Length, L	6.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
500 lbs	<	2082 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	220	plf	Overturning Moment	5.3	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	6.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 207: 2nd - South Bedroom Rear Ext Wall

Shearwall Properties:

Wall height, H	9.9	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	4.3	ft.	Qualifying Wall Length, L	4.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
300 lbs	<	1402 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	210	plf	Overturning Moment	3.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	3.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 208: 2nd - South Bedroom Front Ext Wall

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, Hc	6.0	ft.		
Wall Length, L	9.9	ft.	Qualifying Wall Length, L	5.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	1948 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	170	plf	Overturning Moment	8.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	520	lbs	Resistive Moment	12.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 209: 2nd - North Bedroom Front Ext Wall

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_c	6.0	ft.		
Wall Length, L	12.4	ft.	Qualifying Wall Length, L	7.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	2653 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	203	plf	Overturning Moment	9.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	18.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 101: 1st - Garage South Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	3.0	ft.		
Wall Length, L	21.0	ft.	Qualifying Wall Length, L	16.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2400 lbs	<	5373 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	245	plf	Overturning Moment	24.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	71.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 102: 1st - Living Room South Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	13.9	ft.	Qualifying Wall Length, L	13.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2400 lbs	<	4668 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	200	plf	Overturning Moment	24.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	32.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 103: 1st - North Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	6.0	ft.		
Wall Length, L	13.5	ft.	Qualifying Wall Length, L	11.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3300 lbs	<	3694 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	245	plf	Overturning Moment	33.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1120	lbs	Resistive Moment	33.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 104: 1st - Dining Rear Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	4.2	ft.	Qualifying Wall Length, L	4.2	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1700 lbs	<	2521 lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	17.0	k-ft	Hold Down Design Load	3442	lbs
DL at ends of wall	400	lbs	Resistive Moment	2.5	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 105: 1st - Dining Rear Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	4.1	ft.	Qualifying Wall Length, L	4.1	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1700 lbs	<	2442 lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	465	plf	Overturning Moment	17.0	k-ft	Hold Down Design Load	2928	lbs
DL at ends of wall	400	lbs	Resistive Moment	5.0	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 106: 1st - Garage Rear Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	11.3	ft.	Qualifying Wall Length, L	11.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2700 lbs	<	3795 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	310	plf	Overturning Moment	27.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	30.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 107: 1st - Bath Front Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	2.8	ft.	Qualifying Wall Length, L	2.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	764 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	438	plf	Overturning Moment	7.0	k-ft	Hold Down Design Load	1588	lbs
DL at ends of wall	400	lbs	Resistive Moment	2.6	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 210: 2nd - Primary Bath Side Ext Wall

Shearwall Properties:

Wall height, H	10.1	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	13.6	ft.	Qualifying Wall Length, L	10.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	3526 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	130	plf	Overturning Moment	10.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	15.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 108: 1st - Outdoor Shed Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	8.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1400 lbs	<	2686 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	230	plf	Overturning Moment	14.0	k-ft	Hold Down Design Load	562	lbs
DL at ends of wall	400	lbs	Resistive Moment	9.5	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-24003
Engineer: MPM

Shearwall 109: 1st - Outdoor Shed Ext Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	6.7	ft.	Qualifying Wall Length, L	6.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	2250 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	260	plf	Overturning Moment	15.0	k-ft	Hold Down Design Load	1095	lbs
DL at ends of wall	400	lbs	Resistive Moment	7.7	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 110: 1st - Int. Garage Wall

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	10.9	ft.	Qualifying Wall Length, L	10.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	3660 lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL	210	plf	Overturning Moment	15.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	15.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required