MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

300 Brookside Avenue, Building 4, Ambler, PA 19002 ▸ p 215-646-8001 ▸ *mulhernkulp.com*

CALCULATION PACKAGE

March 8, 2019

REV. February 28, 2020

J Designs

3440 97th Ave

Mercer Island
Washington

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Prepared By:

Nicholas J. Dastalfo *Staff Engineer*

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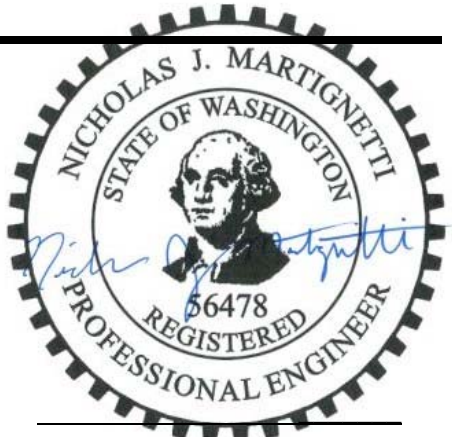


Signature, Seal & Date

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

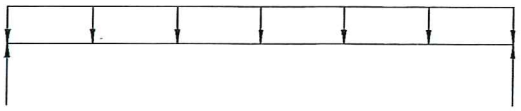
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: TYP. EXT. HDR – WORST CASE LOAD

B1

PARAMETERS:

L = 5 FT
W = 0.5 KLF
P = – K



ANALYSIS:

R_{MAX} = 1.25 K V_D = – K < V_{ALL} = 3.89 K ✓ ADEQUATE
M_{MAX} = 1.56 K-FT < M_{ALL} = 4.11 K-FT ✓ ADEQUATE
Δ_{TL} = 0.02 IN. L/ 1000+ < L/240 ✓ ADEQUATE

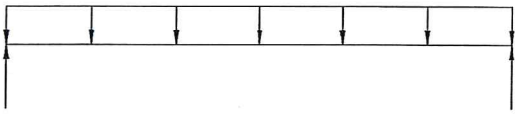
4 x 10

BEAM DESCRIPTION: TYP. EXT. HDR – WORST CASE SPAN

B1

PARAMETERS:

L = 6 FT
W = .46 KLF
P = – K



ANALYSIS:

R_{MAX} = 1.38 K V_D = – K < V_{ALL} = 3.89 K ✓ ADEQUATE
M_{MAX} = 2.07 K-FT < M_{ALL} = 4.11 K-FT ✓ ADEQUATE
Δ_{TL} = 0.04 IN. L/ 1000+ < L/240 ✓ ADEQUATE

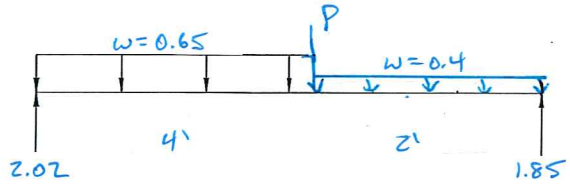
4 x 10

BEAM DESCRIPTION: ROOF FRMG – HDR @ HIGH WINDOW @ OPEN TO BELOW

B2

PARAMETERS:

L = 6 FT
W = SHOWN KLF
P = 0.47 K



ANALYSIS:

R_{MAX} = 2.02 K V_D = – K < V_{ALL} = 4.47 K ✓ ADEQUATE
M_{MAX} = 3.14 K-FT < M_{ALL} = 4.74 K-FT ✓ ADEQUATE
Δ_{TL} = 0.055 IN. L/ 1000+ < L/240 ✓ ADEQUATE

4 x 10

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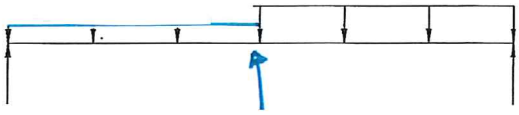
BEAM & HEADER CALCULATIONS

B3

BEAM DESCRIPTION:

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

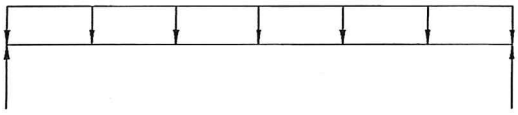
[ ]

B4

BEAM DESCRIPTION:

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

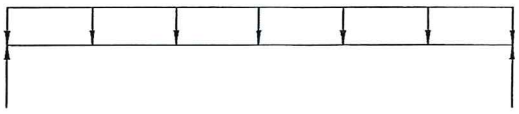
[ ]

B5

BEAM DESCRIPTION:

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

[ ]

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BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: B6

PARAMETERS:

L = FT
W = KLF
P = K

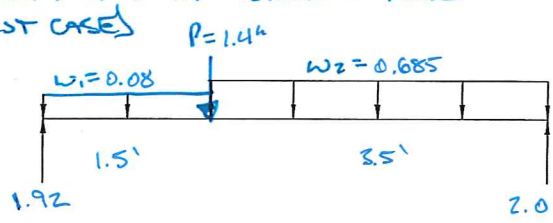
ANALYSIS:

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: ROOF FRMG - REAR MUST BE WINDOW HDR (WORST CASE) B7

PARAMETERS:

L = 5 FT
W = SHOWN KLF
P = 1.4 K



ANALYSIS:

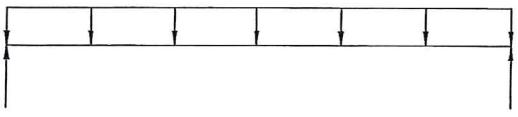
R_{MAX} =	2.0 K	V_D =	– K	< V_{ALL} =	4.47 K	✓ ADEQUATE
M_{MAX} =	2.92 K-FT	< M_{ALL} =	4.74 K-FT			✓ ADEQUATE
Δ_{TL} =	0.036 IN.	L/	1000+ < L/240			✓ ADEQUATE

4 x 10

BEAM DESCRIPTION: 2nd FLR FRMG - GARAGE DOOR HDR B8

PARAMETERS:

L = 16 FT
W = 0.44 KLF
P = – K



ANALYSIS:

R_{MAX} =	3.52 K	V_D =	– K	< V_{ALL} =	13.41 K	✓ ADEQUATE
M_{MAX} =	14.08 K-FT	< M_{ALL} =	30.36 K-FT			✓ ADEQUATE
Δ_{TL} = $\frac{360.5}{I}$	0.455 IN.	L/	422 < L/240			✓ ADEQUATE

5 1/2" x 12" GLB

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BEAM & HEADER CALCULATIONS

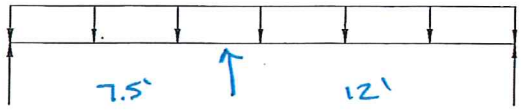
BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ GARAGE

B9

PARAMETERS:

350
45
350

L = SHOWN FT
W = 0.7 KLF
P = - K



ANALYSIS:

R_{MAX} = 6.83 K V_D = - K < V_{ALL} = 7.9 K ✓ ADEQUATE
M_{MAX} = 12.6 K-FT < M_{ALL} = 17.85 K-FT ✓ ADEQUATE
Δ_{TL} = 0.335 IN. L/ 430 < L/240 ✓ ADEQUATE

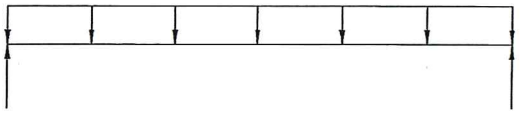
3 1/2" x 11 7/8" LVL

BEAM DESCRIPTION: 2nd FLR FRMG - HDR @ INT. BRG WALL @ GARAGE

B10

PARAMETERS:

L = 3 FT
W = 0.33 KLF
P = - K



ANALYSIS:

R_{MAX} = 0.5 K V_D = - K < V_{ALL} = 2.31 K ✓ ADEQUATE
M_{MAX} = 0.37 K-FT < M_{ALL} = 1.72 K-FT ✓ ADEQUATE
Δ_{TL} = 0.01 IN. L/ 1000+ < L/240 ✓ ADEQUATE

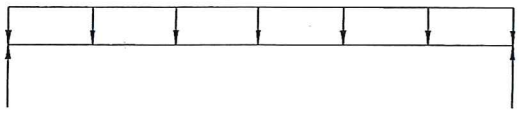
4 x 6

BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ KITCHEN / DINING

B11

PARAMETERS:

L = 20 FT
W = 0.49 KLF
P = - K



ANALYSIS:

R_{MAX} = 4.9 K V_D = - K < V_{ALL} = 49 K ✓ ADEQUATE
M_{MAX} = 24.5 K-FT < M_{ALL} = 64.9 K-FT ✓ ADEQUATE
$\Delta_{TL} = \frac{60.8}{I}$ 0.515 IN. L/ 466 < L/240 ✓ ADEQUATE

W10 x 22

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BEAM & HEADER CALCULATIONS

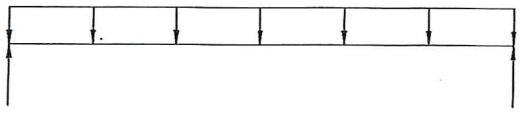
BEAM DESCRIPTION: 2nd FLR FRMG - DINING RM. REAR DOOR HDR

B12

PARAMETERS:

485
165
480

L = 8 FT
W = 0.97 KLF
P = – K



ANALYSIS:

R_{MAX} = 3.88 K V_D = – K < V_{ALL} = 8.73 K ☑ ADEQUATE
M_{MAX} = 7.76 K-FT < M_{ALL} = 10.17 K-FT ☑ ADEQUATE
Δ_{TL} = 0.099 IN. L/ 973 < L/240 ☑ ADEQUATE

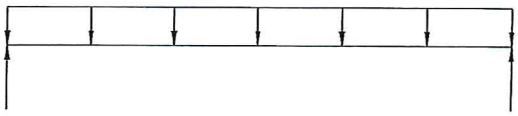
6 x 12

BEAM DESCRIPTION: 2nd FLR FRMG - COV. PATIO BM @ REAR

B13

PARAMETERS:

L = 14.5 FT
W = 0.22 KLF
P = – K



ANALYSIS:

R_{MAX} = 1.6 K V_D = – K < V_{ALL} = 7.21 K ☑ ADEQUATE
M_{MAX} = 5.78 K-FT < M_{ALL} = 6.94 K-FT ☑ ADEQUATE
Δ_{TL} = 0.428 IN. L/ 406 < L/240 ☑ ADEQUATE

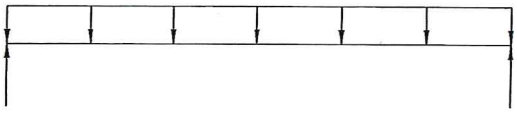
6 x 10

BEAM DESCRIPTION: 2nd FLR FRMG - COV. PATIO BM. @ SIDE

B14

PARAMETERS:

L = 10.5 FT
W = 0.1 KLF
P = – K



ANALYSIS:

R_{MAX} = 0.525 K V_D = – K < V_{ALL} = 7.21 K ☑ ADEQUATE
M_{MAX} = 1.38 K-FT < M_{ALL} = 6.94 K-FT ☑ ADEQUATE
Δ_{TL} = 0.05 IN. L/ 1000+ < L/240 ☑ ADEQUATE

6 x 10

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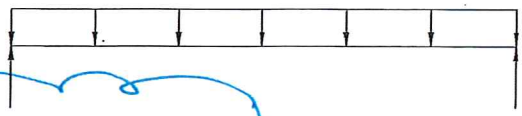
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ LIVING RM. B15

PARAMETERS:

L = 23.5 FT
W = KLF
P = K



SEE OVERSTRENGTH CALCS

ANALYSIS:

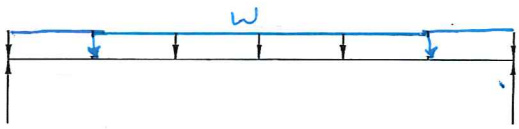
R_{MAX} =	K	V_D =	K	< V_{ALL} =	K	✓ ADEQUATE
M_{MAX} =	K-FT	< M_{ALL} =	K-FT			✓ ADEQUATE
Δ_{TL} =	IN.	L/	< L/240			✓ ADEQUATE

W10 x 45

BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ STAIRS B16

PARAMETERS:

L = 8.5 FT
W = 0.23 KLF
P = K



ANALYSIS:

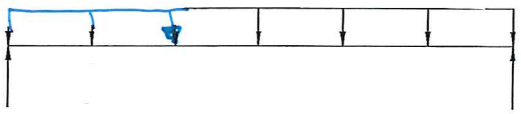
R_{MAX} =	0.98 K	V_D =	- K	< V_{ALL} =	3.95 K	✓ ADEQUATE
M_{MAX} =	2.08 K-FT	< M_{ALL} =	8.925 K-FT			✓ ADEQUATE
Δ_{TL} =	0.055 IN.	L/	< L/240			✓ ADEQUATE

1 3/4" x 11 7/8" LVL

BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ OPEN TO ABOVE B17

PARAMETERS:

L = 9 FT
W = 0.325 KLF
P = - K



ANALYSIS:

R_{MAX} =	1.46 K	V_D =	- K	< V_{ALL} =	3.95 K	✓ ADEQUATE
M_{MAX} =	3.29 K-FT	< M_{ALL} =	8.925 K-FT			✓ ADEQUATE
Δ_{TL} =	0.098 IN.	L/	1000+ < L/240			✓ ADEQUATE

1 3/4" x 11 7/8" LVL

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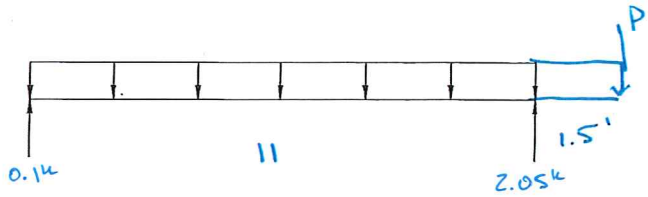
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 2nd FLR FRMG - CANT'D FLUSH BM BY STAIRS

B18

PARAMETERS:

L = SHOWN FT
W = 0.055 KLF
P = 1.46 K



ANALYSIS:

R_{MAX} = 2.05 K V_D = - K < V_{ALL} = 7.9 K ☑ ADEQUATE
M_{MAX} = 2.25 K-FT < M_{ALL} = 17.85 K-FT ☑ ADEQUATE
Δ_{TL} = 0.05 IN. L/ 1980+ < L/240 ☑ ADEQUATE

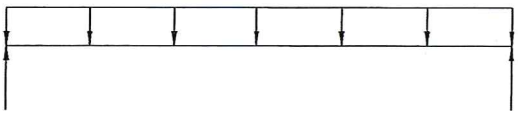
1 3/4" x 11 7/8" LVL

BEAM DESCRIPTION: 2nd FLR FRMG - HDR @ INT. GUEST RM. BRG. WALL

B19

PARAMETERS:

L = 3 FT
W = 0.5 KLF
P = - K



ANALYSIS:

R_{MAX} = 0.75 K V_D = - K < V_{ALL} = 2.31 K ☑ ADEQUATE
M_{MAX} = 0.56 K-FT < M_{ALL} = 1.72 K-FT ☑ ADEQUATE
Δ_{TL} = 0.01 IN. L/ 1980+ < L/240 ☑ ADEQUATE

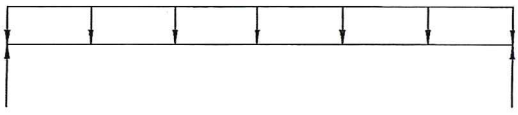
4 x 6

BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ LOW ROOF (WORST CASE)

B20

PARAMETERS:

L = 17 FT
W = 0.04 KLF
P = - K



ANALYSIS:

R_{MAX} = .34 K V_D = - K < V_{ALL} = 3.95 K ☑ ADEQUATE
M_{MAX} = 1.45 K-FT < M_{ALL} = 8.925 K-FT ☑ ADEQUATE
Δ_{TL} = 0.155 IN. L/ 1200+ < L/240 ☑ ADEQUATE

1 3/4" x 11 7/8" LVL

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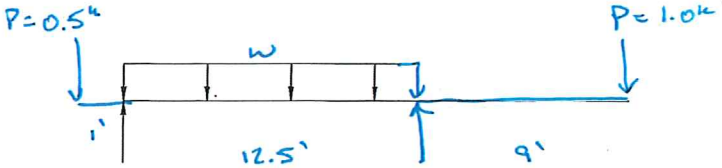
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 2nd FLR FRMG - PLANT FLUSH BM @ ENTRY ROOF

B21

PARAMETERS:

L = SHOWN FT
W = 0.04 KLF
P = SHOWN K



ANALYSIS:

R_{MAX} = 4.64 K V_D = - K < V_{ALL} = 83.43 K ☑ ADEQUATE
M_{MAX} = 10.01 K-FT < M_{ALL} = 73.55 K-FT ☑ ADEQUATE
Δ_{TL} = 0.215 IN. L/ 1000+ < L/240 ☑ ADEQUATE

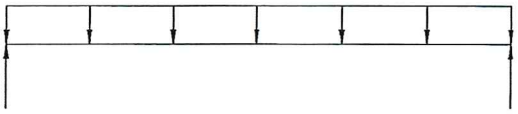
C12 x 25

BEAM DESCRIPTION: 2nd FLR FRMG -

B22

PARAMETERS:

L = FT
W = KLF
P = - K



ANALYSIS:

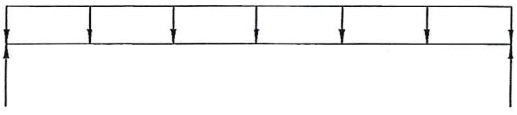
R_{MAX} = K V_D = - K < V_{ALL} = K ☑ ADEQUATE
M_{MAX} = K-FT < M_{ALL} = K-FT ☑ ADEQUATE
Δ_{TL} = IN. L/ < L/240 ☑ ADEQUATE

BEAM DESCRIPTION: 1ST FLR FRMG - FLUSH BM @ REC RM.

B23

PARAMETERS:

L = 23.33 FT
W = .55 KLF
P = - K



ANALYSIS:

R_{MAX} = 6.42 K V_D = - K < V_{ALL} = 70.7 K ☑ ADEQUATE
M_{MAX} = 37.42 K-FT < M_{ALL} = 137 K-FT ☑ ADEQUATE
$\Delta_{TL} = \frac{126.4}{I}$ 0.51 IN. L/ 549 < L/240 ☑ ADEQUATE

W10 x 45

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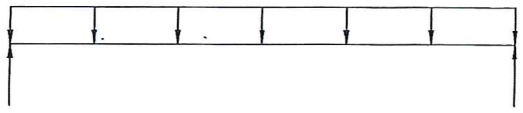
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 1ST FLR FRMG - CRAWL BM

B24

PARAMETERS:

L = 6.67 FT
W = .72 KLF
P = – K



ANALYSIS:

R_{MAX} =	2.4 K	V_D =	– K	< V_{ALL} =	3.89 K	☑ ADEQUATE
M_{MAX} =	4.0 K-FT	< M_{ALL} =	4.12 K-FT			☑ ADEQUATE
Δ_{TL} =	0.087 IN.	L/	923	< L/240		☑ ADEQUATE

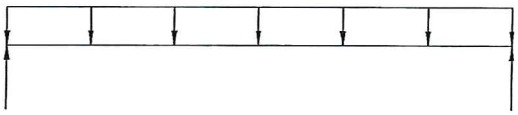
4 x 10

BEAM DESCRIPTION: 1ST FLR FRMG - FLUSH BM @ STAIRS

B25

PARAMETERS:

L = 8.5 FT
W = .28 KLF
P = – K



ANALYSIS:

R_{MAX} =	1.19 K	V_D =	– K	< V_{ALL} =	3.95 K	☑ ADEQUATE
M_{MAX} =	2.53 K-FT	< M_{ALL} =	8.93 K-FT			☑ ADEQUATE
Δ_{TL} =	0.067 IN.	L/	1000+	< L/240		☑ ADEQUATE

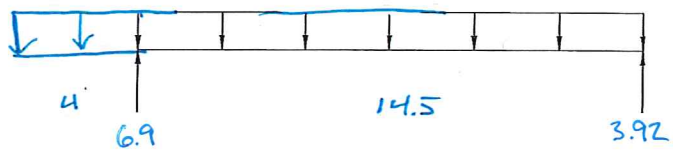
1 3/4" x 11 7/8" LVL

BEAM DESCRIPTION: 1ST FLR FRMG - DECK BM.

B26

PARAMETERS:

L = 14.5 FT W/ 4' CANT.
W = .585 KLF
P = – K



ANALYSIS:

R_{MAX} =	6.9 K	V_D =	– K	< V_{ALL} =	8.35 K	☑ ADEQUATE
M_{MAX} =	16.04 K-FT	< M_{ALL} =	21.26 K-FT			☑ ADEQUATE
Δ_{TL} =	0.312 IN.	L/	558	< L/240		☑ ADEQUATE

5 1/2" x 13 1/2" GLB

MULHERN+KULP
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PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

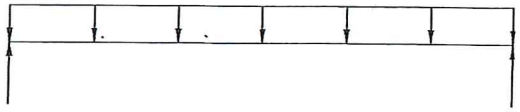
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 1ST FLR FRMG - HDR @ INT. BRG. WALL

B27

PARAMETERS:

L = 3 FT
W = 0.55 KLF
P = - K



ANALYSIS:

R_{MAX} = 0.83 K V_D = - K < V_{ALL} = 2.31 K ☑ ADEQUATE
M_{MAX} = 0.62 K-FT < M_{ALL} = 1.72 K-FT ☑ ADEQUATE
Δ_{TL} = 0.01 IN. L/ 1000+ < L/240 ☑ ADEQUATE

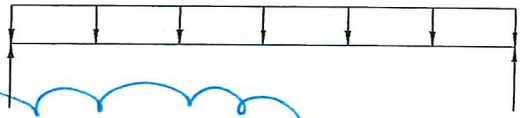
4 x 6

BEAM DESCRIPTION: 1ST FLR FRMG - FLUSH BM @ STORAGE/UTILITY W/SWA

B28

PARAMETERS:

L =
W =
P =



SEE OVERSTRENGTH CALCS

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

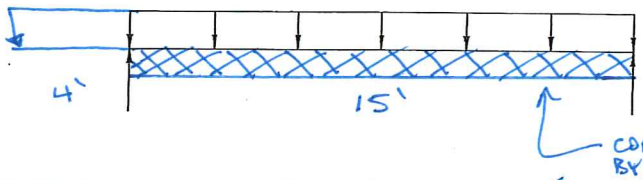
13/4" x 11 7/8" LVL

BEAM DESCRIPTION: 1ST FLR FRMG - FLUSH CANT BM @ REAR DECK

B29

PARAMETERS:

L = SHOWN FT
W = .37 KLF
P = - K



ANALYSIS:

R_{MAX} = 1.48 K V_D = - K < V_{ALL} = 7.9 K ☑ ADEQUATE
M_{MAX} = 2.96 K-FT < M_{ALL} = 17.85 K-FT ☑ ADEQUATE
Δ_{TL} = 0.05 IN. L/ 960 < L/240 ☑ ADEQUATE

3 1/2" x 11 7/8" LVL

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RESIDENTIAL STRUCTURAL ENGINEERING

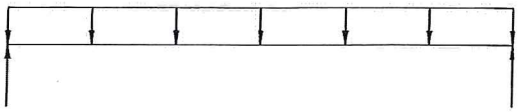
PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19
REV. 2/28/2020

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 2nd FLR FRMG - FLUSH BM @ LOW ROOF BY GUEST RM. B30

PARAMETERS:

L = 25 FT
W = 0.04 KLF
P = – K



ANALYSIS:

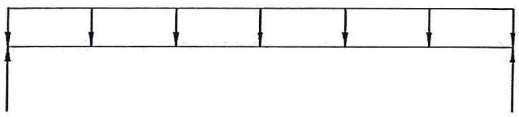
R_{MAX} =	0.5 K	V_D =	– K	< V_{ALL} =	7.9 K	☑ ADEQUATE
M_{MAX} =	3.125 K-FT	< M_{ALL} =	17.85 K-FT			☑ ADEQUATE
Δ_{TL} =	0.36 IN.	L/	833	< L/240		☑ ADEQUATE

3 1/2" x 11 7/8" LVL

BEAM DESCRIPTION: FLUSH @ CRAWL ENTRY B31

PARAMETERS:

L = 5 FT
W = 0.5 KLF
P = – K



ANALYSIS:

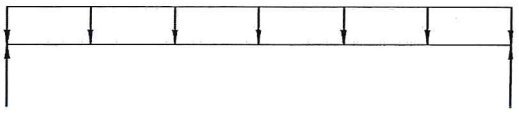
R_{MAX} =	1.25 K	V_D =	1.25 K	< V_{ALL} =	7.9 K	☑ ADEQUATE
M_{MAX} =	1.56 K-FT	< M_{ALL} =	17.85 K-FT			☑ ADEQUATE
Δ_{TL} =	0.007 IN.	L/	8300	< L/240		☑ ADEQUATE

3 1/2" x 11 7/8" LVL

BEAM DESCRIPTION:

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

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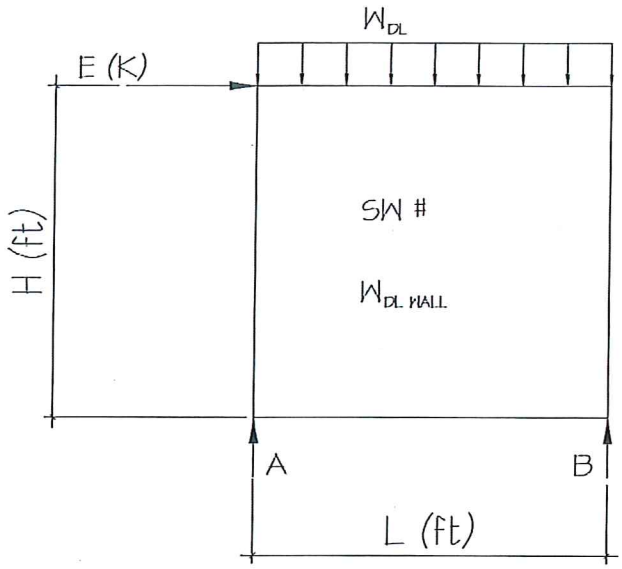
PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: 206

PARAMETERS:

L =	17	FT
H =	8	FT
E =	7.225	K
W_{DLWALL} =	0.1	KLF
W_{DL} =	0.24	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE 6)
SDS =	0.922	



ANALYSIS:

$E_{MH} = \Omega_0 * E$ = 5.56 K

$E_V = 0.2*SDS*DL$ = 1.06 K

$E_M = E_{MH} + E_V$ = 6.62 K

$E_M = E_{MH} - E_V$ = 4.5 K

E_M (MAX) $= \sum M_A = 0 =$ $-(6.62)(8) - .34(17)(8.5) + 17 R_B$

R_B = 2.89D + 3.11E

R_A = 2.89D − 3.11E

E_M (MIN) $= \sum M_A = 0 =$ $-(4.5)(8) - .34(17)(8.5) + 17 R_B$

R_B = 2.89D + 2.12E

R_A = 2.89D − 2.12E

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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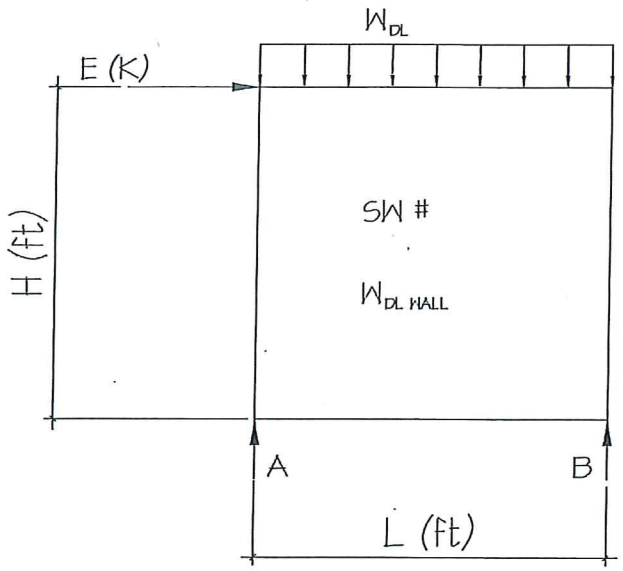
PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: 103

PARAMETERS:

L =	18	FT
H =	10	FT
E =	2	K
W_{DLWALL} =	0.1	KLF
W_{DL} =	0.134	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE 8)
SDS =	0.922	



ANALYSIS:

$E_{MH} = \Omega 0 * E =$ 5 K

$E_V = 0.2*SDS*DL =$ 0.77 K

$E_M = E_{MH} + E_V$ $E_M = E_{MH} + E_V =$ 5.77 K

$E_M = E_{MH} - E_V$ $E_M = E_{MH} - E_V =$ 4.23 K

E_M (MAX) $= \sum M_A = 0 = -(5.77)(10) - .234(18)(9) + 18R_B$

$R_B =$ 2.1D + 3.21E

$R_A =$ 2.1D − 3.21E

E_M (MIN) $= \sum M_A = 0 = -(4.23)(10) - .234(18)(9) + 18R_B$

$R_B =$ 2.1D + 7.35

$R_A =$ 2.1D − 7.35

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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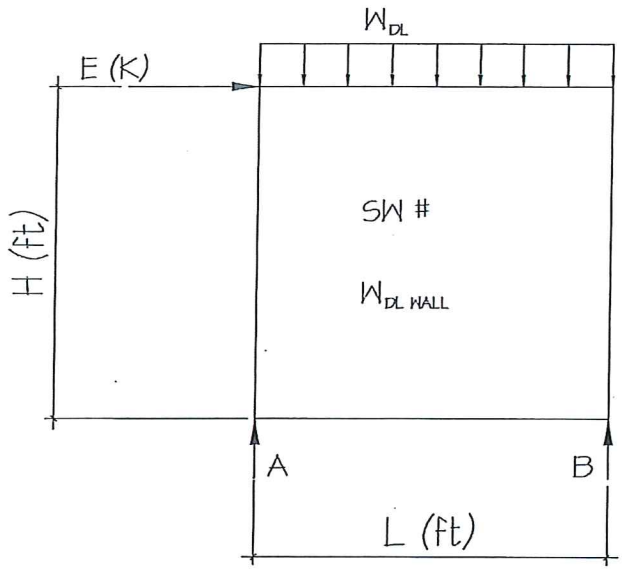
PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: 112

PARAMETERS:

L = 13.16 FT
H = 10 FT
E = 1.0 K
W_{DLWALL} = 0.1 KLF
W_{DL} = 0.134 KLF
Ω_0 = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE 6)
SDS = 0.922



ANALYSIS:

$E_{MH} = \Omega 0 * E =$ 2.5 K

$E_V = 0.2*SDS*DL =$ 0.57 K

$E_M = E_{MH} + E_V$ $E_M = E_{MH} + E_V =$ 3.07 K

$E_M = E_{MH} - E_V$ $E_M = E_{MH} - E_V =$ 1.93 K

E_M (MAX) $= \sum M_A = 0 = -(3.07)(10) - .254(13.16)\left(\frac{13.16}{2}\right) + 13.16R_B$

$R_B =$ 1.54D + 2.33E
$R_A =$ 1.54D − 2.33E

E_M (MIN) $= \sum M_A = 0 = -(1.93)(10) - .234(13.16)\left(\frac{13.16}{2}\right) + 13.16R_B$

$R_B =$ 1.54D + 1.47E
$R_A =$ 1.54D − 1.47E

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

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

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Description : B15 - Flush Beam at Living Room

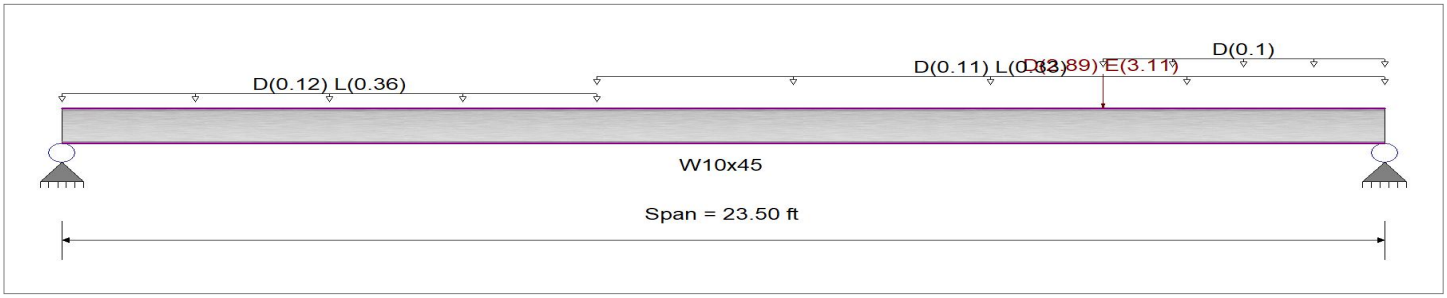
CODE REFERENCES

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : ASCE 7-10

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 for Span Number 1
Uniform Load : D = 0.120, L = 0.360 k/ft, Extent = 0.0 -->> 9.50 ft, Tributary Width = 1.0 ft

Point Load : D = 2.890, E = 3.110 k @ 18.50 ft

Uniform Load : D = 0.110, L = 0.330 k/ft, Extent = 9.50 -->> 23.50 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.10 k/ft, Extent = 18.50 -->> 23.50 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.317 : 1	Maximum Shear Stress Ratio =	0.130 : 1
Section used for this span	W10x45	Section used for this span	W10x45
Ma : Applied	43.388 k-ft	Va : Applied	9.213 k
Mn / Omega : Allowable	136.976 k-ft	Vn/Omega : Allowable	70.70 k
Load Combination	+1.090D+0.750L+0.750S+0.5250E	Load Combination	+1.090D+0.750L+0.750S+0.5250E
Location of maximum on span	14.167 ft	Location of maximum on span	23.500 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.326 in	Ratio =	864 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.610 in	Ratio =	462 >=300
Max Upward Total Deflection	0.000 in	Ratio =	0 <300

Vertical Reactions

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	6.673	9.213
Overall MINimum	0.662	2.448
D Only	2.568	4.566
+D+L	6.673	8.501
+D+Lr	2.568	4.566
+D+S	2.568	4.566
+D+0.750Lr+0.750L	5.647	7.517
+D+0.750L+0.750S	5.647	7.517
+D+0.60W	2.568	4.566
+1.126D+0.70E	3.355	6.855
+D+0.750Lr+0.750L+0.450W	5.647	7.517
+D+0.750L+0.750S+0.450W	5.647	7.517
+1.090D+0.750L+0.750S+0.5250E	6.226	9.213
+0.60D+0.60W	1.541	2.739

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Description : B15 - Flush Beam at Living Room

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
+0.470D+0.70E	1.670	3.860
D Only	2.568	4.566
Lr Only		
L Only	4.105	3.935
S Only		
W Only		
E Only	0.662	2.448
H Only		

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

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Description : B28 - Flush Beam at Storage/Utility

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-10

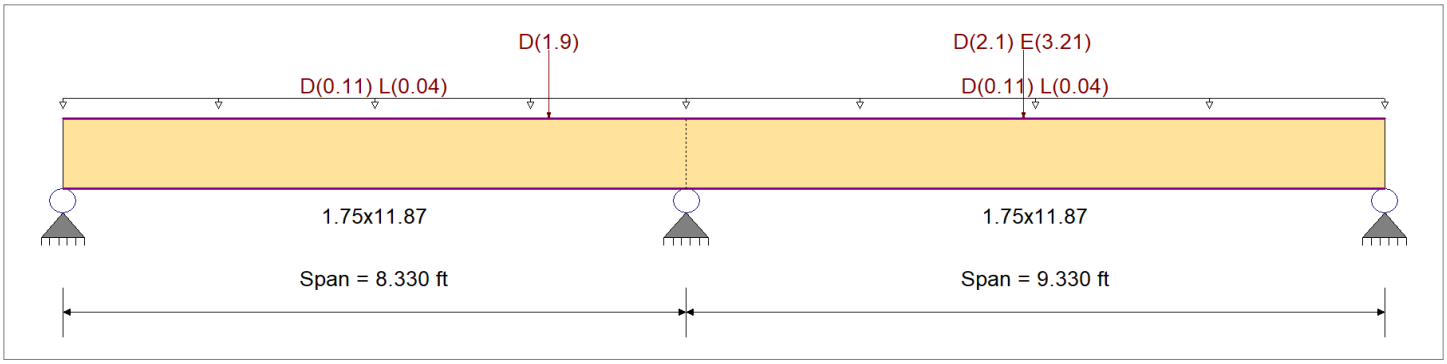
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

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

Fb +	3,120.0 psi
Fb -	3,120.0 psi
Fc - Prll	3,012.0 psi
Fc - Perp	900.0 psi
Fv	342.0 psi
Ft	1,866.0 psi

E : Modulus of Elasticity

Ebend- xx	2,000.0 ksi
Eminbend - xx	965.71 ksi
Density	32.210 pcf



Applied Loads

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

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.110, L = 0.040 , Tributary Width = 1.0 ft
Point Load : D = 1.90 k @ 6.50 ft
Load for Span Number 2
Uniform Load : D = 0.110, L = 0.040 , Tributary Width = 1.0 ft
Point Load : D = 2.10, E = 3.210 k @ 4.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.499 : 1	Maximum Shear Stress Ratio	=	0.552 : 1
Section used for this span		1.75x11.87	Section used for this span		1.75x11.87
fb : Actual	=	2,492.73 psi	fv : Actual	=	170.04 psi
FB : Allowable	=	4,992.00 psi	Fv : Allowable	=	307.80 psi
Load Combination		+1.126D+0.70E	Load Combination		D Only
Location of maximum on span	=	4.535 ft	Location of maximum on span	=	7.353 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.135 in	Ratio =	829 >=360
Max Upward Transient Deflection	-0.048 in	Ratio =	2101 >=360
Max Downward Total Deflection	0.190 in	Ratio =	588 >=300
Max Upward Total Deflection	-0.029 in	Ratio =	3406 >=300

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
D Only													0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.439	0.552	0.90	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	2808.00	2.36	170.04	307.80
Length = 9.330 ft	2	0.439	0.552	0.90	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	2808.00	1.97	170.04	307.80
+D+L, LL Comb Run (*L)					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.417	0.503	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.46	1,300.83	3120.00	2.38	172.03	342.00

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

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Description : B28 - Flush Beam at Storage/Utility

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 9.330 ft	2	0.417	0.503	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.46	1,300.83	3120.00	2.14	172.03	342.00
+D+L, LL Comb Run (L*)					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.411	0.528	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.39	1,281.48	3120.00	2.50	180.66	342.00
Length = 9.330 ft	2	0.411	0.528	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.39	1,281.48	3120.00	1.99	180.66	342.00
+D+L, LL Comb Run (LL)					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.432	0.534	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.62	1,348.57	3120.00	2.53	182.65	342.00
Length = 9.330 ft	2	0.432	0.534	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.62	1,348.57	3120.00	2.16	182.65	342.00
+D+Lr, LL Comb Run (*L)					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.316	0.398	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3900.00	2.36	170.04	427.50
Length = 9.330 ft	2	0.316	0.398	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3900.00	1.97	170.04	427.50
+D+Lr, LL Comb Run (L*)					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.316	0.398	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3900.00	2.36	170.04	427.50
Length = 9.330 ft	2	0.316	0.398	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3900.00	1.97	170.04	427.50
+D+Lr, LL Comb Run (LL)					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.316	0.398	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3900.00	2.36	170.04	427.50
Length = 9.330 ft	2	0.316	0.398	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3900.00	1.97	170.04	427.50
+D+S					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.344	0.432	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3588.00	2.36	170.04	393.30
Length = 9.330 ft	2	0.344	0.432	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	3588.00	1.97	170.04	393.30
+D+0.750Lr+0.750L, LL Comb Run					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.329	0.401	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	3900.00	2.38	171.53	427.50
Length = 9.330 ft	2	0.329	0.401	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	3900.00	2.10	171.53	427.50
+D+0.750Lr+0.750L, LL Comb Run					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.326	0.416	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	3900.00	2.47	178.00	427.50
Length = 9.330 ft	2	0.326	0.416	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	3900.00	1.98	178.00	427.50
+D+0.750Lr+0.750L, LL Comb Run					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.338	0.420	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	3900.00	2.49	179.50	427.50
Length = 9.330 ft	2	0.338	0.420	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	3900.00	2.11	179.50	427.50
+D+0.750L+0.750S, LL Comb Run (					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.358	0.436	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	3588.00	2.38	171.53	393.30
Length = 9.330 ft	2	0.358	0.436	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	3588.00	2.10	171.53	393.30
+D+0.750L+0.750S, LL Comb Run (					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.354	0.453	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	3588.00	2.47	178.00	393.30
Length = 9.330 ft	2	0.354	0.453	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	3588.00	1.98	178.00	393.30
+D+0.750L+0.750S, LL Comb Run (					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.368	0.456	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	3588.00	2.49	179.50	393.30
Length = 9.330 ft	2	0.368	0.456	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	3588.00	2.11	179.50	393.30
+D+0.60W					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.247	0.311	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	4992.00	2.36	170.04	547.20
Length = 9.330 ft	2	0.247	0.311	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.23	1,233.74	4992.00	1.97	170.04	547.20
+1.126D+0.70E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.401	0.475	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.86	2,001.47	4992.00	3.60	260.12	547.20
Length = 9.330 ft	2	0.499	0.475	1.60	1.000	1.00	1.00	1.00	1.00	1.00	8.54	2,492.73	4992.00	3.60	260.12	547.20
+1.126D-0.70E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.156	0.317	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.66	776.91	4992.00	2.40	173.28	547.20
Length = 9.330 ft	2	0.156	0.317	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.66	776.91	4992.00	0.83	173.28	547.20
+D+0.750Lr+0.750L+0.450W, LL Cc					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.257	0.313	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	4992.00	2.38	171.53	547.20
Length = 9.330 ft	2	0.257	0.313	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	4992.00	2.10	171.53	547.20
+D+0.750Lr+0.750L+0.450W, LL Cc					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.254	0.325	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	4992.00	2.47	178.00	547.20
Length = 9.330 ft	2	0.254	0.325	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	4992.00	1.98	178.00	547.20
+D+0.750Lr+0.750L+0.450W, LL Cc					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.264	0.328	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	4992.00	2.49	179.50	547.20
Length = 9.330 ft	2	0.264	0.328	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	4992.00	2.11	179.50	547.20
+D+0.750L+0.750S+0.450W, LL Co					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.257	0.313	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	4992.00	2.38	171.53	547.20
Length = 9.330 ft	2	0.257	0.313	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.40	1,284.05	4992.00	2.10	171.53	547.20
+D+0.750L+0.750S+0.450W, LL Co					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.254	0.325	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	4992.00	2.47	178.00	547.20

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

File = P:\CYJ7GB~P\0G6KEP~3\2018\19OFZT~V\Design\Gravity\Overstrength.ec6 .

Lic. # : KW-06004787 — Licensee : MULHERN & KULP STRUCTURAL ENGINEERING INC

Description : B28 - Flush Beam at Storage/Utility

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 9.330 ft	2	0.254	0.325	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.35	1,269.55	4992.00	1.98	178.00	547.20
+D+0.750L+0.750S+0.450W, LL Co					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.264	0.328	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	4992.00	2.49	179.50	547.20
Length = 9.330 ft	2	0.264	0.328	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.52	1,319.86	4992.00	2.11	179.50	547.20
+1.090D+0.750L+0.750S+0.5250E,					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.371	0.437	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.36	1,854.30	4992.00	3.32	239.36	547.20
Length = 9.330 ft	2	0.445	0.437	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.61	2,220.36	4992.00	3.32	239.36	547.20
+1.090D+0.750L+0.750S+0.5250E,					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.369	0.422	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.31	1,839.79	4992.00	3.20	230.91	547.20
Length = 9.330 ft	2	0.427	0.422	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.31	2,132.65	4992.00	3.20	230.91	547.20
+1.090D+0.750L+0.750S+0.5250E,					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.379	0.439	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.48	1,890.11	4992.00	3.33	240.31	547.20
Length = 9.330 ft	2	0.441	0.439	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.55	2,201.95	4992.00	3.33	240.31	547.20
+1.090D+0.750L+0.750S-0.5250E,					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.187	0.317	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.21	935.88	4992.00	2.40	173.19	547.20
Length = 9.330 ft	2	0.187	0.317	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.21	935.88	4992.00	1.23	173.19	547.20
+1.090D+0.750L+0.750S-0.5250E,					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.185	0.328	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.16	921.37	4992.00	2.49	179.67	547.20
Length = 9.330 ft	2	0.185	0.328	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.16	921.37	4992.00	1.12	179.67	547.20
+1.090D+0.750L+0.750S-0.5250E,					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.195	0.331	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.33	971.69	4992.00	2.51	181.16	547.20
Length = 9.330 ft	2	0.195	0.331	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.33	971.69	4992.00	1.25	181.16	547.20
+0.60D+0.60W					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.148	0.186	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.54	740.24	4992.00	1.41	102.02	547.20
Length = 9.330 ft	2	0.148	0.186	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.54	740.24	4992.00	1.18	102.02	547.20
+0.470D+0.70E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.239	0.305	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.09	1,192.14	4992.00	2.31	166.95	547.20
Length = 9.330 ft	2	0.349	0.305	1.60	1.000	1.00	1.00	1.00	1.00	1.00	5.97	1,741.00	4992.00	2.31	166.95	547.20
+0.470D-0.70E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.330 ft	1	0.098	0.113	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.68	490.08	4992.00	0.86	61.73	547.20
Length = 9.330 ft	2	0.133	0.113	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.28	665.43	4992.00	0.65	61.73	547.20

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	E Only	-0.0476	4.840
+1.126D+0.70E	2	0.1903	4.952		0.0000	4.840

Vertical Reactions

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.534	6.755	2.091
Overall MINimum	0.119	2.343	1.227
D Only	0.387	4.543	1.094
+D+L, LL Comb Run (*L)	0.360	4.782	1.256
+D+L, LL Comb Run (L*)	0.534	4.747	1.077
+D+L, LL Comb Run (LL)	0.507	4.986	1.239
+D+Lr, LL Comb Run (*L)	0.387	4.543	1.094
+D+Lr, LL Comb Run (L*)	0.387	4.543	1.094
+D+Lr, LL Comb Run (LL)	0.387	4.543	1.094
+D+S	0.387	4.543	1.094
+D+0.750Lr+0.750L, LL Comb Run (*L)	0.367	4.722	1.216
+D+0.750Lr+0.750L, LL Comb Run (L*)	0.497	4.696	1.081
+D+0.750Lr+0.750L, LL Comb Run (LL)	0.477	4.875	1.203
+D+0.750L+0.750S, LL Comb Run (*L)	0.367	4.722	1.216
+D+0.750L+0.750S, LL Comb Run (L*)	0.497	4.696	1.081
+D+0.750L+0.750S, LL Comb Run (LL)	0.477	4.875	1.203
+D+0.60W	0.387	4.543	1.094
+1.126D+0.70E	0.184	6.755	2.091
+D+0.750Lr+0.750L+0.450W, LL Comb R	0.367	4.722	1.216
+D+0.750Lr+0.750L+0.450W, LL Comb R	0.497	4.696	1.081
+D+0.750Lr+0.750L+0.450W, LL Comb R	0.477	4.875	1.203

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Lic. # : KW-06004787 Licensee : MULHERN & KULP STRUCTURAL ENGINEERING INC

Description : B28 - Flush Beam at Storage/Utility

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+D+0.750L+0.750S+0.450W, LL Comb Ru	0.367	4.722	1.216
+D+0.750L+0.750S+0.450W, LL Comb Ru	0.497	4.696	1.081
+D+0.750L+0.750S+0.450W, LL Comb Ru	0.477	4.875	1.203
+1.090D+0.750L+0.750S+0.5250E, LL C	0.212	6.361	1.959
+1.090D+0.750L+0.750S+0.5250E, LL C	0.343	6.335	1.824
+1.090D+0.750L+0.750S+0.5250E, LL C	0.323	6.514	1.945
+0.60D+0.60W	0.232	2.726	0.657
+0.470D+0.70E	-0.070	3.775	1.373
D Only	0.387	4.543	1.094
Lr Only, LL Comb Run (*L)			
Lr Only, LL Comb Run (L*)			
Lr Only, LL Comb Run (LL)			
L Only, LL Comb Run (*L)	-0.028	0.239	0.162
L Only, LL Comb Run (L*)	0.147	0.204	-0.018
L Only, LL Comb Run (LL)	0.119	0.443	0.144
S Only			
W Only			
E Only	-0.360	2.343	1.227
H Only			

This Wall in File: P:\Client Files\250 - JDesigns\2018\18002 - 3440 97th Ave - Mercer Island, WA\Des

Cantilevered Retaining Wall

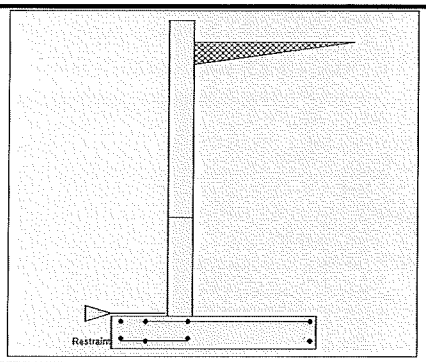
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	8.33 ft
Wall height above soil	=	0.67 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.10 OK
Slab Resists All Sliding !		
Total Bearing Load	=	4,779 lbs
...resultant ecc.	=	12.46 in
Soil Pressure @ Toe	=	1,861 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,606 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	17.3 psi OK
Footing Shear @ Heel	=	17.8 psi OK
Allowable	=	82.2 psi

Sliding Calcs

Lateral Sliding Force	=	2,393.8 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		2nd	Bottom
		Stem OK	Stem OK
Design Height Above Ftg	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	LRFD	LRFD
Thickness	=	8.00	8.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	16.00	8.00
Rebar Placed at	=	6.5 in	6.5 in
Design Data			
fb/FB + fa/Fa	=	**0.337**	**0.669**
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	1,250.0	3,053.1
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	2,220.8	8,477.5
Moment.....Allowable	ft-# =	6,561.4	12,644.5
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	16.0	39.1
Shear.....Allowable	psi =	82.2	82.2
Anet (Masonry)	in2 =		
Rebar Depth 'd'	in =	6.50	6.50
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Modular Ratio 'n'	=		
Wall Weight	psf =	100.0	100.0
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type	=	Medium Weight	
Masonry Design Method	=	ASD	
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0798 in2/ft	
(4/3) * As :	0.1065 in2/ft	Min Stem T&S Reinf Area 1.152 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in #6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.3048 in2/ft	
(4/3) * As :	0.4064 in2/ft	Min Stem T&S Reinf Area 0.576 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.3048 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	4.00
Total Footing Width	=	5.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,606	0 psf
Mu' : Upward	=	31,751	2,214 ft-#
Mu' : Downward	=	2,430	7,109 ft-#
Mu: Design	=	1,166	4,895 ft-#
Actual 1-Way Shear	=	17.27	17.80 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 4 @ 8.00 in
Heel Reinforcing = # 4 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Heel: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area 1.43 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		2,393.8	3.11	7,444.9	Soil Over HL (ab. water tbl)	3,054.3	3.83	11,708.3
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		3.83	11,708.3
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=		
	=				Surcharge Over Toe	=		
					Stem Weight(s)	=	900.0	1.83	1,650.0
					Earth @ Stem Transitions	=		
Total	=	2,393.8	**O.T.M.** =	7,444.9	Footing Weight	=	825.0	2.75	2,268.8
					Key Weight	=			
					Vert. Component	=			
					Total =		4,779.3 lbs	**R.M.**=	15,627.0

Resisting/Overturning Ratio = **2.10**
Vertical Loads used for Soil Pressure = 4,779.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.085	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

This Wall in File: P:\Client Files\250 - JDesigns\2018\18002 - 3440 97th Ave - Mercer Island, WA\Des

Cantilevered Retaining Wall

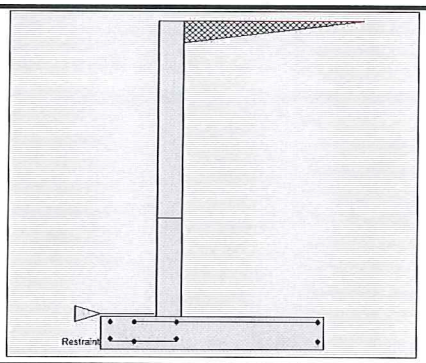
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.17 OK
Slab Resists All Sliding !		
Total Bearing Load	=	5,595 lbs
...resultant ecc.	=	13.09 in
Soil Pressure @ Toe	=	1,954 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,736 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	18.4 psi OK
Footing Shear @ Heel	=	19.4 psi OK
Allowable	=	82.2 psi

Sliding Calcs

Lateral Sliding Force	=	2,750.0 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		2nd Stem OK	Bottom Stem OK
Design Height Above Ftg	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	LRFD	LRFD
Thickness	=	8.00	8.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	16.00	8.00
Rebar Placed at	=	6.5 in	6.5 in
Design Data			
fb/FB + fa/Fa	=	**0.482**	**0.845**
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	1,584.0	3,564.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	3,168.0	10,692.0
Moment.....Allowable	ft-# =	6,561.4	12,644.5
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	20.3	45.7
Shear.....Allowable	psi =	82.2	82.2
Anet (Masonry)	in2 =		
Rebar Depth 'd'	in =	6.50	6.50
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Modular Ratio 'n'	=		
Wall Weight	psf =	100.0	100.0
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type	=	Medium Weight	
Masonry Design Method	=	ASD	
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1139 in2/ft		
(4/3) * As :	0.1519 in2/ft	Min Stem T&S Reinf Area 1.152 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3844 in2/ft		
(4/3) * As :	0.5125 in2/ft	Min Stem T&S Reinf Area 0.576 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.3844 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	4.50
Total Footing Width	=	6.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,736	0 psf
Mu' : Upward	=	33,708	3,592 ft-#
Mu' : Downward	=	2,430	10,051 ft-#
Mu: Design	=	1,266	6,459 ft-#
Actual 1-Way Shear	=	18.37	19.45 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 4 @ 8.00 in
Heel Reinforcing = # 4 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Heel: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area 1.56 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		2,750.0	3.33	9,166.7	Soil Over HL (ab. water tbl)	3,795.0	4.08	15,496.3
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.08	15,496.3
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=		
	=				Surcharge Over Toe	=		
					Stem Weight(s)	=	900.0	1.83	1,650.0
					Earth @ Stem Transitions	=		
Total	=	2,750.0	**O.T.M.** =	9,166.7	Footing Weight	=	900.0	3.00	2,700.0
					Key Weight	=			
					Vert. Component	=			
					Total =		5,595.0 lbs	**R.M.**=	19,846.3

Resisting/Overturning Ratio = **2.17**
Vertical Loads used for Soil Pressure = 5,595.0 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.081	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

This Wall in File: P:\Client Files\250 - JDesigns\2018\18002 - 3440 97th Ave - Mercer Island, WA\Des

Restrained Retaining Wall

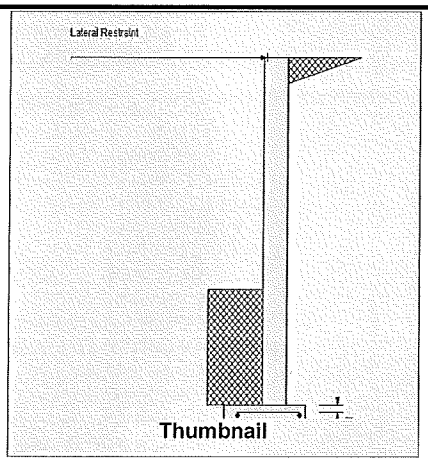
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Total Wall Height	=	9.00 ft
Top Support Height	=	9.00 ft
Slope Behind Wal	=	0.00
Height of Soil over Toe	=	36.00 in

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
At-Rest Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
>>>Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

K_h Soil Density Multiplier = 0.200 g Added seismic per unit area = 0.0 psf

Design Summary

Total Bearing Load	=	2,265 lbs	
...resultant ecc.	=	0.00 in	
Soil Pressure @ Toe	=	906 psf	OK
Soil Pressure @ Heel	=	906 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,087 psf	
ACI Factored @ Heel	=	1,087 psf	
Footing Shear @ Toe	=	2.7 psi	OK
Footing Shear @ Heel	=	1.4 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	282.5 lbs	
Reaction at Bottom	=	1,466.5 lbs	
Sliding Stability Ratio	=	1.90	OK

Sliding Calcs

Lateral Sliding Force	=	1,466.5 lbs	
less 100% Passive Force	= -	1,875.0 lbs	
less 100% Friction Force	= -	906.0 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in Fy = 60,000 psi
Wall Weight = 100.0 psf f'c = 3,000 psi
Stem is FIXED to top of footing

		@ Top Support	Mmax Between Top & Base	@ Base of Wall
		Stem OK	Stem OK	Stem OK
Design Height Above Ftg	=	9.00 ft	5.02 ft	0.00 ft
Rebar Size	=	# 5	# 5	# 4
Rebar Spacing	=	16.00 in	16.00 in	12.00 in
Rebar Placed at	=	Edge	Edge	Edge
Rebar Depth 'd'	=	5.50 in	6.00 in	5.50 in
Design Data				
fb/FB + fa/Fa	=	0.000	0.202	0.570
Mu....Actual	=	0.0 ft-#	1,217.1 ft-#	2,721.7 ft-#
Mn * Phi.....Allowable	=	5,515.2 ft-#	6,038.3 ft-#	4,773.0 ft-#
Shear Force @ this height	=	453.6 lbs		1,814.4 lbs
Shear.....Actual	=	6.87 psi		27.49 psi
Shear.....Allowable	=	82.16 psi		82.16 psi

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 1.728 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0476 in2/ft		
(4/3) * As :	0.0635 in2/ft	Min Stem T&S Reinf Area 0.763 in2	
200bd/fy : 200(12)(6)/60000 :	0.24 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.9754 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1167 in2/ft		
(4/3) * As :	0.1556 in2/ft	Min Stem T&S Reinf Area 0.965 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	1.25 ft
Heel Width	=	1.25
Total Footing Width	=	2.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,087	1,087 psf
Mu' : Upward	=	849	185 ft-#
Mu' : Downward	=	450	233 ft-#
Mu: Design	=	399	48 ft-#
Actual 1-Way Shear	=	2.71	1.44 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Other Acceptable Sizes & Spacings:

Toe: # 4 @ 18.00 in -or- Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel:# 4 @ 18.00 in -or- Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined -or- No key defined

Min footing T&S reinf Area 0.65 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Restrained Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Forces on Footing : Slab is NOT providing sliding, stem is FIXED at footing

Forces acting on footing for sliding & soil pressure....

Sliding Forces		
Stem Shear @ Top of Footing	=	-1,134.0 lbs
Heel Active Pressure	=	-332.5
Sliding Force	=	**1,466.5 lbs**

Net Moment User For Soil Pressure Calculations **0.0 ft-#**

Load & Moment Summary For Footing : For Soil Pressure Calcs

Moment @ Top of Footing Applied from Stem			=	-1,701.0ft-#
Surcharge Over Heel				
Adjacent Footing Load	=	lbs	ft	ft-#
Axial Dead Load on Stem	=	lbs	ft	ft-#
Soil Over Toe	=	412.5 lbs	0.63 ft	257.8ft-#
Surcharge Over Toe	=	lbs	ft	ft-#
Stem Weight	=	900.0 lbs	1.58 ft	1,425.0ft-#
Soil Over Heel	=	577.5 lbs	2.21 ft	1,275.3ft-#
Footing Weight	=	375.0 lbs	1.25 ft	468.8ft-#
Total Vertical Force	=	2,265.0 lbs	Base Moment =	1,725.8ft-#

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

This Wall in File: P:\Client Files\250 - JDesigns\2018\18002 - 3440 97th Ave - Mercer Island, WA\Des

Cantilevered Retaining Wall

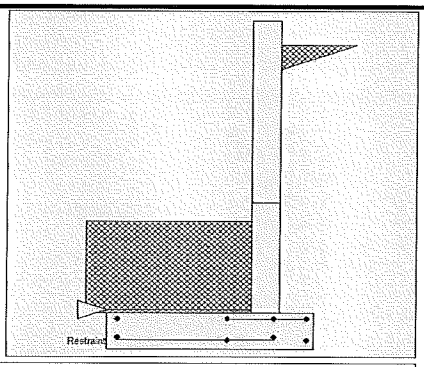
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	7.33 ft
Wall height above soil	=	0.67 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	30.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	30.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.60 OK
Slab Resists All Sliding !		
Total Bearing Load	=	2,484 lbs
...resultant ecc.	=	14.63 in
Soil Pressure @ Toe	=	1,293 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,810 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	14.6 psi OK
Footing Shear @ Heel	=	8.4 psi OK
Allowable	=	82.2 psi

Sliding Calcs

Lateral Sliding Force	=	1,908.2 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		2nd Stem OK	Bottom Stem OK
Design Height Above Ftg	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	LRFD	LRFD
Thickness	=	8.00	8.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	16.00	8.00
Rebar Placed at	=	6.5 in	6.5 in
Design Data			
fb/FB + fa/Fa	=	**0.180**	**0.456**
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	825.0	2,364.1
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	1,190.7	5,776.2
Moment.....Allowable	ft-# =	6,561.4	12,644.5
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	10.6	30.3
Shear.....Allowable	psi =	82.2	82.2
Anet (Masonry)	in2 =		
Rebar Depth 'd'	in =	6.50	6.50
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Modular Ratio 'n'	=		
Wall Weight	psf =	100.0	100.0
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type	=	Medium Weight	
Masonry Design Method	=	ASD	
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0428 in2/ft	
(4/3) * As :	0.0571 in2/ft	Min Stem T&S Reinf Area 0.960 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in #6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.2077 in2/ft	
(4/3) * As :	0.2769 in2/ft	Min Stem T&S Reinf Area 0.576 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.26 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	3.50 ft
Heel Width	=	1.50
Total Footing Width	=	5.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,810	0 psf
Mu' : Upward	=	92,660	0 ft-#
Mu' : Downward	=	37,485	398 ft-#
Mu: Design	=	1,137	398 ft-#
Actual 1-Way Shear	=	14.58	8.39 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 4 @ 8.00 in
Heel Reinforcing = # 4 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Heel: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area 1.30 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		1,908.2	2.78	5,298.4	Soil Over HL (ab. water tbl)	671.9	4.58	3,079.6
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.58	3,079.6
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	262.5	1.75	459.4
	=				Surcharge Over Toe	=		
					Stem Weight(s)	=	800.0	3.83	3,066.7
					Earth @ Stem Transitions	=		
					Footing Weight	=	750.0	2.50	1,875.0
					Key Weight	=		
					Vert. Component	=			
Total	=	1,908.2	**O.T.M.** =	5,298.4	**Total** =	2,484.4 lbs	**R.M.=**	8,480.7

Resisting/Overturning Ratio = **1.60**
Vertical Loads used for Soil Pressure = 2,484.4 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.057	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : foundation wa
Title 3440 97th Ave
Dsgnr: NJD
Description....
DTL 20

Date: 28 FEB 2020

This Wall in File: P:\Client Files\250 - JDesigns\2018\18002 - 3440 97th Ave - Mercer Island, WA\Des

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Cantilevered Retaining Wall

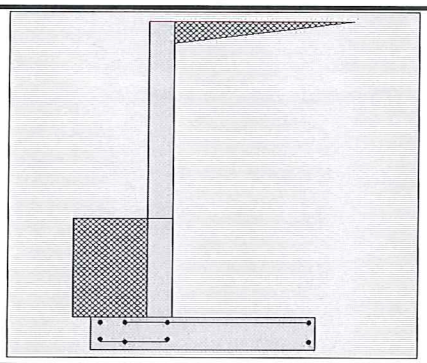
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	36.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.17 OK
Sliding	=	1.54 OK
Total Bearing Load	=	5,595 lbs
...resultant ecc.	=	13.09 in
Soil Pressure @ Toe	=	1,954 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,736 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	14.3 psi OK
Footing Shear @ Heel	=	19.4 psi OK
Allowable	=	82.2 psi

Sliding Calcs

Lateral Sliding Force	=	2,750.0 lbs
less 100% Passive Force	= -	2,000.0 lbs
less 100% Friction Force	= -	2,238.0 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		2nd Stem OK	Bottom Stem OK
Design Height Above Ftg	ft =	3.00	0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	LRFD	LRFD
Thickness	=	8.00	8.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	16.00	8.00
Rebar Placed at	=	6.5 in	6.5 in
Design Data			
fb/FB + fa/Fa	=	**0.482**	**0.845**
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	1,584.0	3,564.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	3,168.0	10,692.0
Moment.....Allowable	ft-# =	6,561.4	12,644.5
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	20.3	45.7
Shear.....Allowable	psi =	82.2	82.2
Anet (Masonry)	in2 =		
Rebar Depth 'd'	in =	6.50	6.50
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Modular Ratio 'n'	=		
Wall Weight	psf =	100.0	100.0
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type	=	Medium Weight	
Masonry Design Method	=	ASD	
Concrete Data			
f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1139 in2/ft		
(4/3) * As :	0.1519 in2/ft	Min Stem T&S Reinf Area 1.152 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3844 in2/ft		
(4/3) * As :	0.5125 in2/ft	Min Stem T&S Reinf Area 0.576 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.3844 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.0567 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	4.50
Total Footing Width	=	6.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,736	0 psf
Mu' : Upward	=	33,708	3,592 ft-#
Mu' : Downward	=	7,776	10,051 ft-#
Mu: Design	=	821	6,459 ft-#
Actual 1-Way Shear	=	14.27	19.45 psi
Allow 1-Way Shear	=	82.16	82.16 psi
Toe Reinforcing	=	# 4 @ 8.00 in	
Heel Reinforcing	=	# 4 @ 8.00 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=	0.00	ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00	ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Heel: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area 1.56 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		2,750.0	3.33	9,166.7	Soil Over HL (ab. water tbl)	3,795.0	4.08	15,496.3
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.08	15,496.3
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	0.75	
	=				Surcharge Over Toe	=		
					Stem Weight(s)	=	900.0	1.83	1,650.0
					Earth @ Stem Transitions	=			
Total	=	2,750.0	**O.T.M.** =	9,166.7	Footing Weight	=	900.0	3.00	2,700.0
					Key Weight	=			
					Vert. Component	=			
					Total =		5,595.0 lbs	**R.M.=**	19,846.3

Resisting/Overturning Ratio = **2.17**
Vertical Loads used for Soil Pressure = 5,595.0 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.081	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

J Designs

3440 97th Ave

Mercer Island, WA

Shear Wall Calculations - wind

Reviewed By:

March 8, 2019

Parameters:

Single Family Home

Design Wind Speed: 110 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2015 IBC Ch. 1609, ASCE 7-10 Ch. 26-30

MULHERN+KULP
residential structural engineering

MULHERN & KULP
STRUCTURAL ENGINEERING

PROJECT NAME: 3440 97TH AVE
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

WIND DESIGN SUMMARY PER ASCE 7-10

PARAMETERS:

WIND SPEED	110
EXPOSURE CATEGORY	C
RISK CATEGORY	II
WIND DIRECTIONALITY FACTOR, K_D	0.85
TOPOGRAPHIC FACTOR, K_{ZT}	1.00
GUST FACTOR, G	0.85
DESIGN TYPE	ASD

ROOF GEOMETRY:

TRANS. ROOF PITCH	3	:12
LONG. ROOF PITCH	3	:12
MEAN ROOF HEIGHT, H	31.00	FT

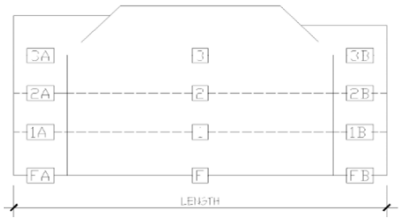
BUILDING GEOMETRY:

LENGTH	52	FT
WIDTH	64	FT
NUMBER OF STORIES	3	

TRANSVERSE DIRECTION (PERPENDICULAR TO MAIN RIDGE LINE)

TRIBUTARY DESIGN AREAS

DIAPHRAGM LEVEL	FLOOR-TO-FLOOR HEIGHT		SECTION A	SECTION O	SECTION B	
3	8 FT	Roof Surface	0	94	0	sq ft
		Wall surface	0	271	0	sq ft
2	10 FT	Roof Surface	0	49	0	sq ft
		Wall surface	0	473	0	sq ft
1	8 FT	Roof Surface	0	0	0	sq ft
		Wall surface	0	463	0	sq ft
FND		Roof Surface	0	0	0	sq ft
		Wall surface	0	0	0	sq ft



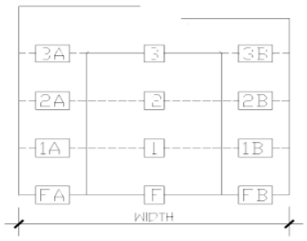
TRIBUTARY DESIGN LOADS: (0.6W)

	SECTION A	SECTION O	SECTION B	
Story Shear	0.00	5.04	0.00	kips
Total Shear	0.00	5.04	0.00	kips
		5.04		kips
Story Shear	0.00	7.67	0.00	kips
Total Shear	0.00	12.71	0.00	kips
		12.71		kips
Story Shear	0.00	7.02	0.00	kips
Total Shear	0.00	19.73	0.00	kips
		19.73		kips
Story Shear	0.00	0.00	0.00	kips
Total Shear	0.00	19.73	0.00	kips
		19.73		kips

LONGITUDINAL DIRECTION (PARALLEL TO MAIN RIDGE LINE)

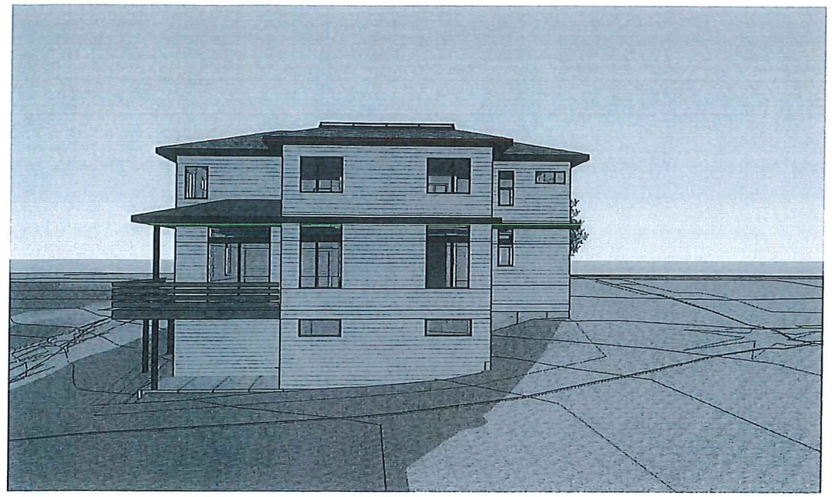
TRIBUTARY DESIGN AREAS

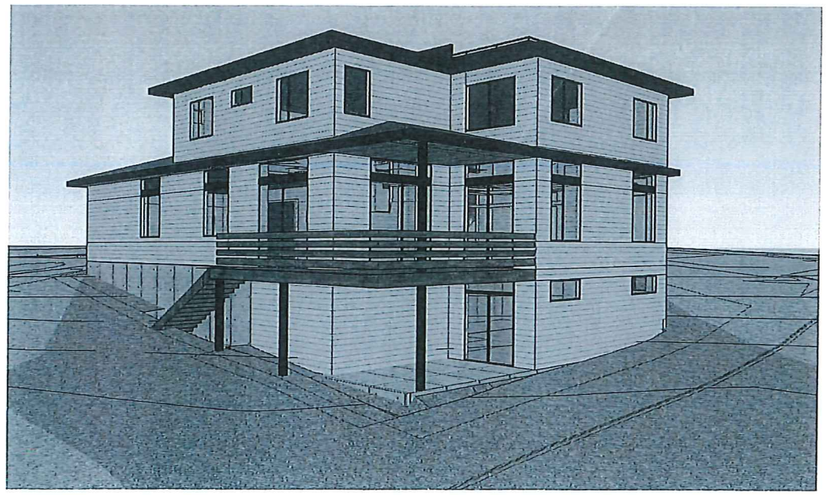
DIAPHRAGM LEVEL	FLOOR-TO-FLOOR HEIGHT		SECTION A	SECTION O	SECTION B	
3	8 FT	Roof Surface	0	118	0	sq ft
		Wall surface	0	180	0	sq ft
2	10 FT	Roof Surface	0	151	0	sq ft
		Wall surface	0	438	0	sq ft
1	8 FT	Roof Surface	0	0	0	sq ft
		Wall surface	0	364	0	sq ft
FND		Roof Surface	0	0	0	sq ft
		Wall surface	0	0	0	sq ft



TRIBUTARY DESIGN LOADS: (0.6W)

	SECTION A	SECTION O	SECTION B	
Story Shear	0.00	3.86	0.00	kips
Total Shear	0.00	3.86	0.00	kips
		3.86		kips
Story Shear	0.00	8.11	0.00	kips
Total Shear	0.00	11.97	0.00	kips
		11.97		kips
Story Shear	0.00	5.74	0.00	kips
Total Shear	0.00	17.70	0.00	kips
		17.70		kips
Story Shear	0.00	0.00	0.00	kips
Total Shear	0.00	17.70	0.00	kips
		17.70		kips





= LOAD REQ'D PER FLEXIBLE DIAPHRAGM

= PROVIDED

5050#/52' = 97 PLF

12'-6" | 22'-6" | 17'

0.61k 0.65k 12.9%

1.7k 1.75k 34.6%

1.92k 1.7k 33.7%

0.82k 0.95k 18.8%

#204 0.8k 0.95k

#203 78 PLF* 0.95k 0.77k

#202 47 PLF** 0.7k 0.175k

#205 139 PLF* 0.8k 0.65k

#206 1.5k 2.225k 135 PLF**

#201 0.65k 1.0k

#207 0.95k 1.35k

#209 0.45k 0.6k

#208 0.95k 1.25k

#211 0.8k 0.15k 73 PLF*

#210 0.9k 0.7k 150 PLF*

0.9k 0.8k 20.5%

1.8k 2.1k 47.6%

1.44k 1.1k 55.9%

3960#/39.5' = 99 PLF

12'-0" | 9'2" | 1'-5"

23'-2"

FP

MASTER BEDROOM

ROOF OVER DECK BELOW

W.I.C.

BEDROOM 2

MASTER BATHROOM

80CFM

SKYLIGHT ABOVE

LAUNDRY 100CFM

SECOND FLOOR 1,435 SF

UP

DN

OPEN TO BELOW

KIDS DESK AREA

BATH 2

MASTER W.I.C.

FRONT AWNING BELOW

BEDROOM 3

GARAGE ROOF BELOW

4'-6" | 5'-0" | 5'-0½" | 2'-0" | 9'-6¼" | 7'-5" | 7'-0" | 12'-9" | 18'-3¼" | 15'-9" | 5'-0" | 10'-10" | 10'-9" | 19'-2" | 24'-0" | 63'-5" | 6'-0" | 4'-0" | 2'-0" | 2'-0" | 3'-0" | 3'-0" | 9'-0½" | 12'-0½" | 5'-8½" | 7'-0" | 12'-9"

TRIB. LOAD CALCS:

- ALL RESULTANT LOCATIONS WERE DETERMINED BASED ON DISTANCE + MAGNITUDE OF LOAD FOR ER. SHEARWALL
- SOME RESULTANT FORCES ARE LESS THAN THE REQUIRED SUPPORT REACTIONS BASED ON A FLEXIBLE DIAPHRAGM. IT IS OUR PROFESSIONAL OPINION THAT THE MAGNITUDE OF THE PROVIDED LOADS ARE WITHIN AN ACCEPTABLE RANGE OF THESE REQ'D LOADS + THE TOTAL LOAD IS RESISTED BY THE SHEARWALLS SHOWN.

DIAPHRAGM CAPACITIES:

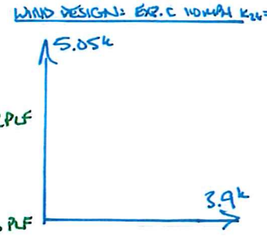
- UNBLOCKED DIAPHRAGM w 8d COMMON NAILS @ 6"o.c. EDGE NAILING + 2" MIN. NOMINAL FRAMING w/ 7/16" MIN. SHEATHING THICKNESS.
- MAX CAPACITY (CASE #1):

$\frac{645\ PLF\ (0.92)}{2} = 297\ PLF$ $\frac{460\ PLF\ (.92)}{2} = 212\ PLF$

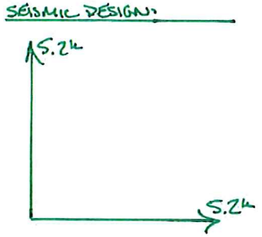
- MAX CAPACITY (CASE #2):

$\frac{475\ PLF\ (0.92)}{2} = 218\ PLF$ $\frac{340\ PLF\ (.92)}{2} = 156\ PLF$

WIND DESIGN: ER.C NOMAL K_{zt}=1.0



SEISMIC DESIGN:



* SW#203 (78 PLF) + SW#211 (73 PLF) AS WELL AS SW#205 (139 PLF) + SW#210 (150 PLF) ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL ALONG THEIR RESPECTIVE WALL LINES *

** SW#202 + SW#206 UNIT SHEARS COMPARED BASED ON SHEAR WALL CAPACITY:

$\frac{P_1}{P_3} = \frac{336}{650} = 0.533$

88 (0.533) = 46 PLF

47 PLF + 46 PLF ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL. **

1 UPPER FLOOR PLAN

SCALE: 1/4" = 1'-0"

N

J DESIG

2425 SW ROXBU
SEATTLE, WA 98
206.234.44
JACQUELINE
JDESIGNSSEATTL

SUBMITTAL	D
SD	9
DD	1

3440 97TH AVE
MERCER ISLAND, WA

DRAWING INFORMA

OWNER:
MY BACKYARD, LLC

PROJECT#

DRAWING NAME:
ROOF PLA

A2.

WIND DESIGN: EXP. C 110MPH

12.7k

7.6k THIS FLOOR

8.1k THIS FLOOR

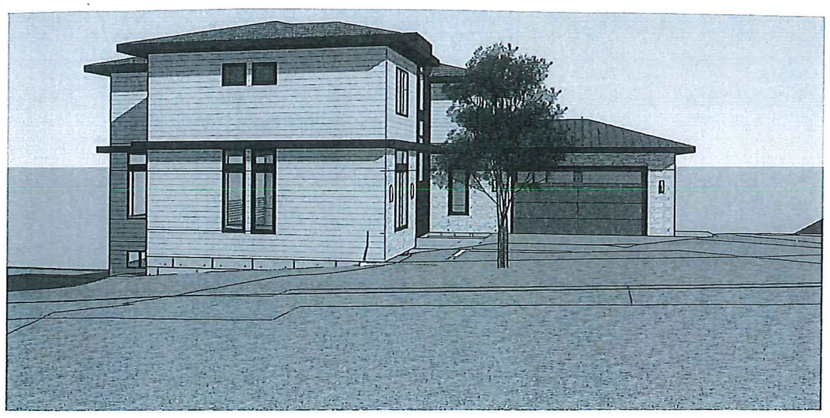
12k

SEISMIC DESIGN:

19.4k

4.2k THIS FLOOR

9.4k



= LOAD REQUIRED PER FLEXIBLE DIAPHRAGM

= PROVIDED

7650#/52' = 147 PLF

12'-6" | 22' | 17'-6"

0.92k 0.95k 12%

2.54k 2.55k

2.9k 2.95k

1.29k 1.3k 17%

24'-6"

2'-6" | 5'-0" | #104 1.65k 1.2k | 5'-0" | 2'-6"

53% 38%

0.77k 0.85k 10.5%

2.27k 1.9k 23.5%

25'-6"

#103 187PLF 2.8k 2.6k

#102 187 PLF 1.7k 1.55k

#105 1.05k 0.8k

#106 126PLF 1.89k 1.55k

#101 1.6k 1.3k

#104 1.2k 1.15k 42 PLF

#107 45PLF

#109 1.0k 0.6k

#108 1.2k 1.15k 42 PLF

#112 1.5k 1.0k 114 PLF

#111 1.5k 1.25k 115 PLF

#113 3.55k 2.75k 212 PLF

#110 1.9k 1.3k

3.28k 3.45k 42.5%

1.78k 1.9k 23.5%

BLW 29' / 63.5 = 127.6 PLF

29'

30'-0"

63'-5"

52'-8"

24'-0"

22'-3"

19'-2"

10'-9"

1'-6½"

2'-0" | 2'-0" | 4'-0"

GAS FP
TV ABOVE

LIVING RM

COVERED DECK

BBQ

DINING

ROOF

BATH 3

4'-3½"

CT CL
4'-0"

W.I.C.

4'-6½"

GUEST ROOM /OFFICE

12'-8½"

12'-0½"

ENTRY
OPEN TO ABOVE

UP | DN

18RISERS @ 7.33" I.D.
W/36" H.R.

4'-0" | 2½" | 4'-0"
LANDING

6'-0" | 1'-6½"

2'-10½" | 3'-0"

8'-3" | 4'-3" | 2'-0"

5'-0"

48" FRIDGE

18" TRASH PO

KITCHEN

125CFM

DW

42" PANTRY

36" GAS RANGE

MUD RM

5'-5½"

5'-9"

2'-11½"

22'-2½" GARAGE

21'-0"

SW #102 (137 PLF) + SW #106 (126 PLF) AS WELL AS SW #108 (142 PLF) + SW #109 (145 PLF) ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL ALONG THEIR WALL LINES.

SW #103 + SW #112 AS WELL AS SW #111 + SW #113 UNIT SHEARS HAVE BEEN COMPARED BASED ON SHEAR WALL CAPACITY:

$\frac{P1}{P3} = 0.533$

0.533(187) = 100PLF

0.533(212) = 113 PLF

100 PLF + 114 PLF AS WELL AS 113 PLF + 115 PLF ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL.

APA PE 3.6k 2.55k

N

1 MAIN FLOOR PLAN

SCALE: 1/4" = 1'-0"

J DESIG

2425 SW ROXBU
SEATTLE, WA 98
206.234.44
JACQUELINE
JDESIGNSSEATTL

SUBMITTAL	D
SD	9
DD	1

3440 97TH AVE
MERCER ISLAND, WA

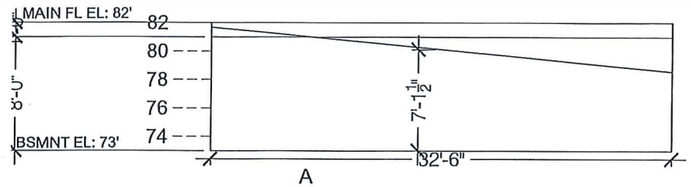
DRAWING INFORMA

OWNER:
MY BACKYARD, LLC

PROJECT#

DRAWING NAME:
FLOOR PL

A2.



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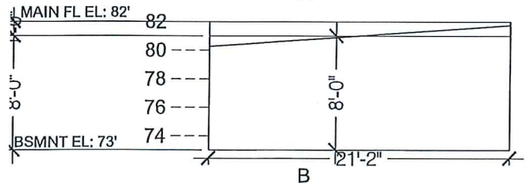

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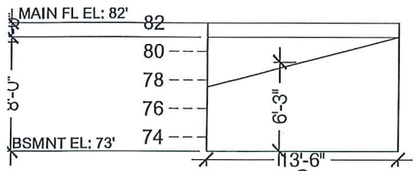

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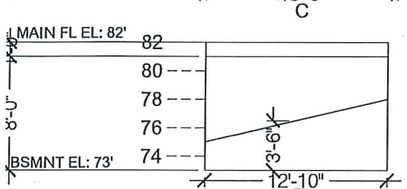

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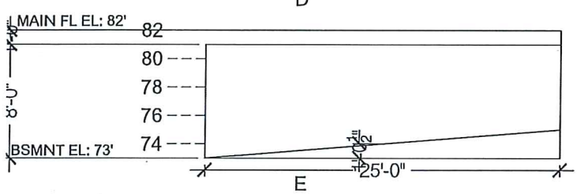

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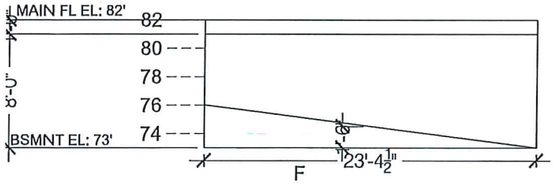

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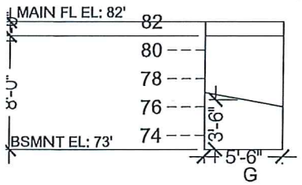

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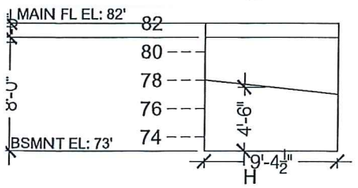

H

BASEMENT COVERAGE CALCS:
A 32.5' 89% = 29'
B 21' X 100% = 21'
C 13.5' X 78% = 10.5'
D 12.8' X 44% = 5.5'
E 25' X 13% = 3'
F 23' X 19% = 4.4'
G 5.5' X 44% = 2.4'
H 9.5' X 56% = 5.3'
TOTALS 142.8', N/A, 81.1'

901 SF * 81.1' / 142.8' = 511.7 SF
EXCLUDED BASEMENT FLOOR AREA

= LOAD REQUIRED PER FLEXIBLE DIAPHRAGM

= PROVIDED

7050#/52 = 135.6 PLF

12'-6" | 22' | 17'-6"

0.85k 1.1k | 2.34k 1.95k | 2.67k 2.33k | 1.19k 1.65k

#002 2.7k 1.65k

#003 1.125k 0.8k 237 PLF*

#004 4k 2.3k

#001 4.15k 2.6k

#006 1.025k 0.4k 85 PLF*

#005 2.85k 1.45k

#007 0.725k 0.2k 75 PLF*

2.65k 1.5k

2.7k 1.6k

5.6k 2.55k

3.7k 3k

1.0k 0.6k

1.65k 1.3k

0.5k

2k 1k | 1k 0.5k

2k 1k

5720#/36' = 158.9 PLF

0.92k 1.05k

12'-3"

2.87k 3.05k

25'-6"

1.38k 1.46k

31'-0½"

A

B

C

D

E

F

G

H

WET BAR

30" FRIDGE

REC ROOM

BATHROOM

STORAGE / UTILITY

BASEMENT 901 SF (389 SF GROSS FLOOR AREA)

UP

15R@7.21" W/36" H RR

CRAWL SPACE ACCESS

CRAWL SPACE

DO NOT BLOCK THESE KNEEWALLS

S.O.G. ABOVE

24'-6"

23'-2"

10'-9"

11'-6½"

19'-2"

10'-5½"

5'-11½"

3'-1¼" | 3'-6½"

5'-0"

2'-3"

63'-5"

21'-0" | 2'-0"

4'-0"

24'-0"

*SW#003, SW#006, + SW#007 UNIT SHEARS COMPARED BASED ON SHEAR WALL CAPACITY:

$\frac{PO}{P3} = \frac{201}{650} = 0.319$ $0.319(237) = 76$ PLF

76PLF, 85 PLF + 73 PLF ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL.

WIND DESIGN: EXP. C HOWARD

19.75k

7.05k THIS FLOOR

5.7k THIS FLR

17.7k

SEISMIC DESIGN:

11.2k

1.8k THIS FLOOR

11.2k

1 BASEMENT PLAN

SCALE: 1/4" = 1'-0"

N

J DESIG

2425 SW ROXBU
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206.234.44
JACQUELINE
JDESIGNSSEATTL

SUBMITTAL
SD
DD

3440 97TH AVE
MERCER ISLAND, WA

DRAWING INFORMA

OWNER:
MY BACKYARD, LLC

PROJECT#

DRAWING NAME:
FLOOR PL

A2.

MULHERN+KULP
residential structural engineering

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 201: 2nd - Side Ext. Wall of Master WIC/Mast BD

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	1.5	ft.		
Wall Length, L	23.2	ft.	Qualifying Wall Length, L	18.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
650 lbs	<	6102 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	134	plf	Overturning Moment	5.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	100	lbs	Resistive Moment	23.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 202: 2nd - Rear Ext. Wall of Master Bath

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	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
200 lbs	<	1428 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	1.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	195	lbs	Resistive Moment	1.9	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 203: 2nd - Side Ext. Wall of Master BD by Bath

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	12.3	ft.	Qualifying Wall Length, L	12.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
950 lbs	<	4116 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	134	plf	Overturning Moment	7.6	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	250	lbs	Resistive Moment	7.9	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 204: 2nd - Rear Ext. Wall of Master BD

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	4.2	ft.		
Wall Length, L	24.5	ft.	Qualifying Wall Length, L	14.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	3951 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	355	plf	Overturning Moment	6.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	69.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 205: 2nd - Side Ext. Wall of Mast BD by WIC

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	4.2	ft.		
Wall Length, L	10.8	ft.	Qualifying Wall Length, L	5.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	1734 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	134	plf	Overturning Moment	6.4	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	335	lbs	Resistive Moment	6.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 206: 2nd - Rear Ext. Wall of BD#2

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	17.0	ft.	Qualifying Wall Length, L	17.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	10710 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	340	plf	Overturning Moment	12.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	29.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 207: 2nd - Side Ext. Wall of BD#2 / BD#3

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	4.2	ft.		
Wall Length, L	28.7	ft.	Qualifying Wall Length, L	14.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
950 lbs	<	4624 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	134	plf	Overturning Moment	7.6	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	200	lbs	Resistive Moment	36.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 208: 2nd - Front Ext. Wall of BD#3

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	1.5	ft.		
Wall Length, L	21.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
950 lbs	<	5040 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	340	plf	Overturning Moment	7.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	200	lbs	Resistive Moment	47.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 209: 2nd - Front Ext. Wall of Master WIC

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	3.7	ft.		
Wall Length, L	13.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
450 lbs	<	2364 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	3.6	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	535	lbs	Resistive Moment	17.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 210: 2nd - Side Ext. Wall of BD#3 WIC

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	6.0	ft.	Qualifying Wall Length, L	6.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
900 lbs	<	2016 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	134	plf	Overturning Moment	7.2	k-ft	Hold Down Design Load	798	lbs
DL at ends of wall	268	lbs	Resistive Moment	2.4	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)
fastened w/ 26-8d nails

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Shearwall Design Summary

Shearwall 211: 2nd - Side Ext. Wall of Mast WIC by Entry

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	11.0	ft.	Qualifying Wall Length, L	11.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	3696 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	134	plf	Overturning Moment	6.4	k-ft	Uplift Connector 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 XXX: - Not Used

Shearwall Properties:

Wall height, H	0.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	0.0	ft.	Qualifying Wall Length, L	0.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	#DIV/0!	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 101: 1st - Side Ext. Wall of Guest Room/Bath #3

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	4.5	ft.		
Wall Length, L	23.2	ft.	Qualifying Wall Length, L	18.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1600 lbs	<	4280 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	234	plf	Overturning Moment	16.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	370	lbs	Resistive Moment	42.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 102: 1st - Rear Ext. Wall of Bath #3

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	4.2	ft.		
Wall Length, L	12.5	ft.	Qualifying Wall Length, L	10.5	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1710 lbs	<	4599 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	410	plf	Overturning Moment	17.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	250	lbs	Resistive Moment	21.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 103: 1st - Side Ext. Wall of Living Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	5.5	ft.		
Wall Length, L	18.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2800 lbs	<	5103 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	234	plf	Overturning Moment	28.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	700	lbs	Resistive Moment	30.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 104: 1st - Rear Ext. Wall of Living Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	5.5	ft.		
Wall Length, L	24.5	ft.	Qualifying Wall Length, L	14.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1650 lbs	<	3704 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	365	plf	Overturning Moment	16.5	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	71.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Date: 08-Mar-19

Shearwall Design Summary

Shearwall 105: 1st - Side Ext. Wall of Living Room by Cov Deck

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	10.8	ft.	Qualifying Wall Length, L	10.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1050 lbs	<	3612 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	234	plf	Overturning Moment	10.5	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	1700	lbs	Resistive Moment	19.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 106: 1st - Rear Ext. Wall of Dining Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	8.0	ft.		
Wall Length, L	15.0	ft.	Qualifying Wall Length, L	7.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1890 lbs	=	1890 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	495	plf	Overturning Moment	18.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	38.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall XXX: - Not Used

Shearwall Properties:

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

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! 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
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	#DIV/0!	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 108: 1st - Side Ext. Wall of Kitchen

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	5.5	ft.		
Wall Length, L	28.7	ft.	Qualifying Wall Length, L	17.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	4335 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	234	plf	Overturning Moment	12.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	64.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 109: 1st - Side Ext. Wall of Garage

Shearwall Properties:

Wall height, H	11.0	ft.	Max wall opening ht, H_o	5.0	ft.		
Wall Length, L	27.3	ft.	Qualifying Wall Length, L	22.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	4994 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	275	plf	Overturning Moment	11.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	67.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 110: 1st - Front Ext. Wall of Garage

Shearwall Properties:

Wall height, H	11.0	ft.	Max wall opening ht, Hc	8.0	ft.		
Wall Length, L	21.0	ft.	Qualifying Wall Length, L	18.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1900 lbs	<	1924 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	100	plf	Overturning Moment	20.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	23.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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3440 97th Ave
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Date: 08-Mar-19

Shearwall Design Summary

Shearwall 111: 1st - Front Ext. Wall of Guest Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	5.5	ft.		
Wall Length, L	13.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	1966 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	425	plf	Overturning Moment	15.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	935	lbs	Resistive Moment	28.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 112: 1st - Side Ext. Wall of Guest Rm by Entry

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	13.2	ft.	Qualifying Wall Length, L	13.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	4422 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	234	plf	Overturning Moment	15.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	834	lbs	Resistive Moment	18.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 113: 1st - Rear Int. Wall of Garage

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	15.8	ft.	Qualifying Wall Length, L	15.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3350 lbs	<	9973 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	180	plf	Overturning Moment	33.5	k-ft	Uplift Connector Design Load	1186	lbs
DL at ends of wall	125	lbs	Resistive Moment	14.7	k-ft	Holdown Capacity	3105	lbs

Hold-down Specification

SIMPSON HTT4 HOLDOWN
fastened w/ 18-10d nails w/ 5/8" dia. all-thread rod

Shearwall XXX: - Not Used

Shearwall Properties:

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

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! 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
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	#DIV/0!	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 1: Basement - Side Ext. Kneewall of Rec Rm Wet Bar

Shearwall Properties:

Wall height, H	2.8	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	6.8	ft.	Qualifying Wall Length, L	6.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
4250 lbs	<	4253 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	334	plf	Overturning Moment	11.7	k-ft	Uplift Connector Design Load	815	lbs
DL at ends of wall	400	lbs	Resistive Moment	6.2	k-ft	Holdown Capacity	3105	lbs

Hold-down Specification

SIMPSON HTT4 HOLDOWN
fastened w/ 18-10d nails w/ 5/8" dia. all-thread rod

Shearwall 2: Basement - Rear Ext. Wall of Rec Room

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	4.2	ft.		
Wall Length, L	17.0	ft.	Qualifying Wall Length, L	12.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2700 lbs	<	2742 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	520	plf	Overturning Moment	21.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	53.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 3: Basement - Side Ext. Wall of Rec Room

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	6.7	ft.		
Wall Length, L	10.8	ft.	Qualifying Wall Length, L	4.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1125 lbs	<	1126 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	334	plf	Overturning Moment	9.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	2000	lbs	Resistive Moment	24.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 4: Basement - Rear Ext. Wall of Crawlspace

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	15.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
4000 lbs	<	5040 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	505	plf	Overturning Moment	32.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1000	lbs	Resistive Moment	43.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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Shearwall Design Summary

Shearwall 5: Basement - Side Ext. Wall of Crawlspace

Shearwall Properties:

Wall height, H	5.3	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	25.5	ft.	Qualifying Wall Length, L	25.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2850 lbs	<	8568 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	334	plf	Overturning Moment	15.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	77.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 6: Basement - Kneewall at Crawlspace by Rec Rm

Shearwall Properties:

Wall height, H	4.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	12.0	ft.	Qualifying Wall Length, L	12.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1025 lbs	<	2412 lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
ADEQUATE

Overturning Evaluation:

Resistive DL	100	plf	Overturning Moment	4.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	150	lbs	Resistive Moment	5.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
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Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 7: Basement - Kneewall at Crawlspace by Staris

Shearwall Properties:

Wall height, H	4.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	10.0	ft.	Qualifying Wall Length, L	10.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
725 lbs	<	2010 lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
ADEQUATE

Overturning Evaluation:

Resistive DL	100	plf	Overturning Moment	2.9	k-ft	Uplift Connector Design Load	0 lbs
DL at ends of wall	150	lbs	Resistive Moment	3.9	k-ft	Holdown Capacity	0 lbs

Hold-down Specification

No Holdown Required

Shearwall XXX: - Not Used

Shearwall Properties:

Wall height, H	0.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	0.0	ft.	Qualifying Wall Length, L	0.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	#DIV/0!	k-ft	Hold Down Design Load	0 lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0 lbs

Hold-down Specification

No Holdown Required

J Designs

3440 97th Ave

Mercer Island, WA

Shear Wall Calculations - Seismic

Reviewed By:

March 8, 2019

Parameters:

Single Family Home

Design Wind Speed: 110 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2015 IBC Ch. 1609, ASCE 7-10 Ch. 26-30

MULHERN+KULP
residential structural engineering

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residential structural engineering

PROJECT NAME: 3440 97TH AVE
J DESIGNS
M&K PROJECT #: 01A-18094
ENGINEER: NJD
DATE: 14-JAN-19

SEISMIC CALCULATION - ASCE 7-10

SEISMIC DESIGN CATEGORY:

USER INPUTS:

SITE CLASS	D
SPECTRAL RESPONSE ACCELERATION 0.2 SEC, S_S	1.384
SPECTRAL RESPONSE ACCELERATION 1.0 SEC, S_1	0.532
OCCUPANCY CATEGORY	II

VARIABLES:

SITE COEFFICIENT, Fa	1.00
SITE COEFFICIENT, Fv	1.50

CALCULATED VALUES:

MAXIMUM SPECTRAL RESPONSE ACCELERATION, S_{MS}	1.384
MAXIMUM SPECTRAL RESPONSE ACCELERATION, S_{M1}	0.798
DESIGN SPECTRAL RESPONSE ACCELERATION, S_{DS}	0.923
DESIGN SPECTRAL RESPONSE ACCELERATION, S_{D1}	0.532
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	26

CALCULATED VALUES:

APPROXIMATE FUNDAMENTAL PERIOD, T_A, T	0.230
T_0	0.115
T_S	0.577
SPECTRAL RESPONSE ACCELERATION, S_A (g)	0.923

EQUIVALENT LATERAL FORCE PROCEDURE

DEAD LOAD CALCULATION:

LEVEL	STORY HT. (FT.)	AREA (FT^2)	DEAD LOAD (PSF)	DL OF EXT WALL TRIBUTARY TO LEVEL (KIPS)	TOTAL LEVEL DL
1	8.0	932	10	28.9	38 K
2	10.0	2046	10	19.6	40 K
3	8.0	1566	17	7.6	34 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

TOTAL DEAD LOAD OF STRUCTURE 113 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	0.142	0.142

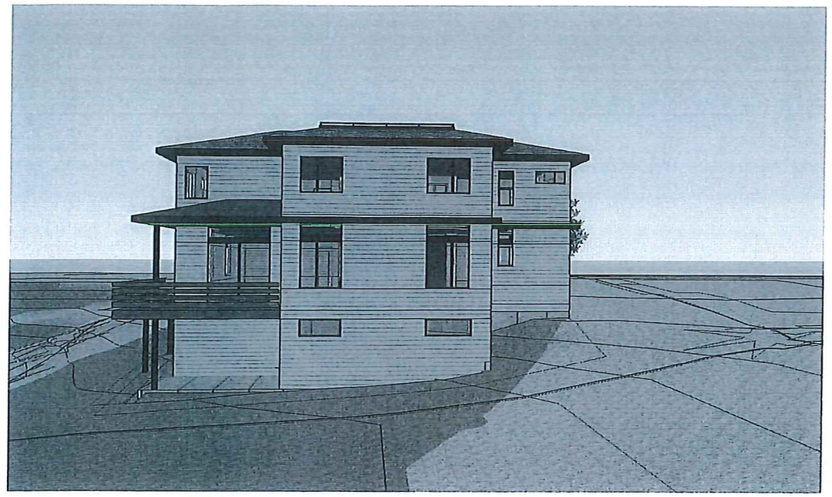
BASE SHEARS:

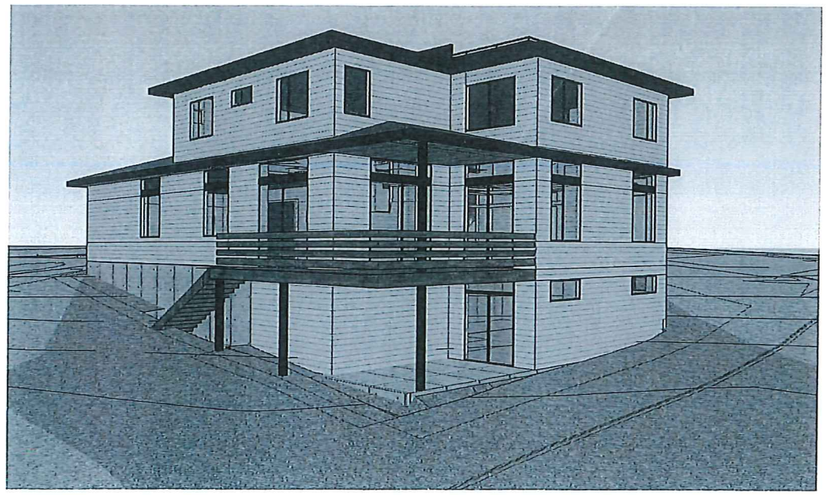
ULTIMATE LOADS				x 0.7 =	ALLOWABLE LOADS			
TRANSVERSE		LONGITUDINAL			TRANSVERSE		LONGITUDINAL	
16	K	16	K		11	K	11	K

STORY SHEAR CALCULATION:

DISTRIBUTION EXPONEN 1.00

	ULTIMATE LOADS				x 0.7 =	ALLOWABLE LOADS					
		TRANSVERSE		LONGITUDINAL		TRANSVERSE			LONGITUDINAL		
LEVEL	VERT. DIST. FACTOR, C_{VX}	STORY SHEAR, F_x		STORY SHEAR, F_x		STORY SHEAR, F_x	Σ STORY SHEAR		STORY SHEAR, F_x	Σ STORY SHEAR	
1	0.159	2.5	K	2.5	K	1.8 K	11.2	K	1.8 K	11.2	K
2	0.376	6.0	K	6.0	K	4.2 K	9.4	K	4.2 K	9.4	K
3	0.465	7.4	K	7.4	K	5.2 K	5.2	K	5.2 K	5.2	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





= LOAD REQ'D PER FLEXIBLE DIAPHRAGM

= PROVIDED

5050#/52' = 97 PLF

12'-6" | 22'-6" | 17'

0.61k 0.65k 12.9%

1.7k 1.75k 34.6%

1.92k 1.7k 33.7%

0.82k 0.95k 18.8%

#204 0.8k 0.95k

#203 78 PLF* 0.95k 0.77k

#202 47 PLF** 0.7k 0.175k

#205 139 PLF* 0.8k 0.65k

#206 1.5k 2.225k 135 PLF**

#201 0.65k 1.0k

#207 0.95k 1.35k

#209 0.45k 0.6k

#208 0.95k 1.25k

#211 0.8k 0.15k 73 PLF*

#210 0.9k 0.7k 150 PLF*

0.9k 0.8k 20.5%

1.8k 2.1k 47.6%

1.44k 1.1k 55.9%

3960#/39.5' = 99 PLF

12'-0" | 9'2" | 1'-5"

23'-2"

FP

MASTER BEDROOM

ROOF OVER DECK BELOW

W.I.C.

BEDROOM 2

MASTER BATHROOM

80CFM

SKYLIGHT ABOVE

LAUNDRY 100CFM

SECOND FLOOR 1,435 SF

UP

DN

OPEN TO BELOW

KIDS DESK AREA

BATH 2

MASTER W.I.C.

FRONT AWNING BELOW

BEDROOM 3

GARAGE ROOF BELOW

4'-6" | 5'-0" | 5'-0½" | 2'-0" | 9'-6¼" | 7'-5" | 7'-0" | 12'-9" | 18'-3¼" | 15'-9" | 5'-0" | 10'-10" | 10'-9" | 19'-2" | 24'-0" | 63'-5" | 6'-0" | 4'-0" | 2'-0" | 2'-0" | 3'-0" | 3'-0" | 9'-0½" | 12'-0½" | 5'-8½" | 7'-0" | 12'-9"

TRIB. LOAD CALCS:

- ALL RESULTANT LOCATIONS WERE DETERMINED BASED ON DISTANCE + MAGNITUDE OF LOAD FOR ER. SHEARWALL
- SOME RESULTANT FORCES ARE LESS THAN THE REQUIRED SUPPORT REACTIONS BASED ON A FLEXIBLE DIAPHRAGM. IT IS OUR PROFESSIONAL OPINION THAT THE MAGNITUDE OF THE PROVIDED LOADS ARE WITHIN AN ACCEPTABLE RANGE OF THESE REQ'D LOADS + THE TOTAL LOAD IS RESISTED BY THE SHEARWALLS SHOWN.

DIAPHRAGM CAPACITIES:

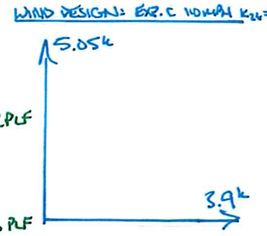
- UNBLOCKED DIAPHRAGM w 8d COMMON NAILS @ 6"o.c. EDGE NAILING + 2" MIN. NOMINAL FRAMING w/ 7/16" MIN. SHEATHING THICKNESS.
- MAX CAPACITY (CASE #1):

$\frac{645\ PLF\ (0.92)}{2} = 297\ PLF$ $\frac{460\ PLF\ (.92)}{2} = 212\ PLF$

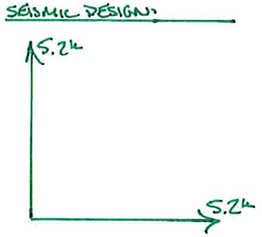
- MAX CAPACITY (CASE #2):

$\frac{475\ PLF\ (0.92)}{2} = 218\ PLF$ $\frac{340\ PLF\ (.92)}{2} = 156\ PLF$

WIND DESIGN: ER.C NOMAL K_{zt}=1.0



SEISMIC DESIGN:



* SW#203 (78 PLF) + SW#211 (73 PLF) AS WELL AS SW#205 (139 PLF) + SW#210 (150 PLF) ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL ALONG THEIR RESPECTIVE WALL LINES *

** SW#202 + SW#206 UNIT SHEARS COMPARED BASED ON SHEAR WALL CAPACITY:

$\frac{P_1}{P_3} = \frac{336}{650} = 0.533$

88 (0.533) = 46 PLF

47 PLF + 46 PLF ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL. **

1 UPPER FLOOR PLAN

SCALE: 1/4" = 1'-0"

N

J DESIG

2425 SW ROXBU
SEATTLE, WA 98
206.234.44
JACQUELINE
JDESIGNSSEATTL

SUBMITTAL	D
SD	9
DD	1

3440 97TH AVE
MERCER ISLAND, WA

DRAWING INFORMA

OWNER:
MY BACKYARD, LLC

PROJECT#

DRAWING NAME:
ROOF PLA

A2.

WIND DESIGN: EXP. C 110MPH

12.7k

7.6k THIS FLOOR

8.1k THIS FLOOR

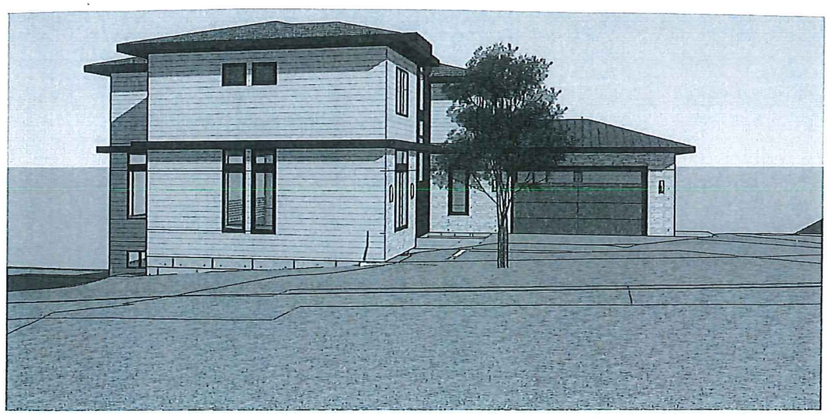
12k

SEISMIC DESIGN:

19.4k

4.2k THIS FLOOR

9.4k



= LOAD REQUIRED PER FLEXIBLE DIAPHRAGM

= PROVIDED

7650#/52' = 147 PLF

12'-6" | 22' | 17'-6"

0.92k 0.95k 12%

2.54k 2.55k

2.9k 2.95k

1.29k 1.3k 17%

24'-6"

2'-6" | 5'-0" | #104 1.65k 1.2k | 5'-0" | 2'-6"

53% 38%

0.77k 0.85k 10.5%

2.27k 1.9k 23.5%

25'-6"

#103 187PLF 2.8k 2.6k

#102 187 PLF 1.7k 1.55k

#105 1.05k 0.8k

#106 126PLF 1.89k 1.55k

#101 1.6k 1.3k

#104 1.2k 1.15k 42 PLF

#107 45PLF

#109 1.0k 0.6k

#108 1.2k 1.15k 42 PLF

#112 1.5k 1.0k 114 PLF

#111 1.5k 1.25k 115 PLF

#113 3.55k 2.75k 212 PLF

#110 1.9k 1.3k

3.28k 3.45k 42.5%

1.78k 1.9k 23.5%

BLW 29' / 63.5 = 127.6 PLF

29'

30'-0"

63'-5"

52'-8"

24'-0"

22'-3"

19'-2"

10'-9"

1'-6½"

2'-0" | 2'-0" | 4'-0"

GAS FP
TV ABOVE

LIVING RM

COVERED DECK

BBQ

DINING

ROOF

BATH 3

4'-3½"

CT CL
4'-0"

W.I.C.

4'-6½"

GUEST ROOM /OFFICE

12'-8½"

12'-0½"

ENTRY
OPEN TO ABOVE

UP | DN

18RISERS @ 7.33" I.D.
W/36" H.R.

4'-0" | 2½" | 4'-0"
LANDING

6'-0" | 1'-6½"

2'-10½" | 3'-0"

8'-3" | 4'-3" | 2'-0"

5'-0"

48" FRIDGE

18" TRASH PO

KITCHEN

125CFM

DW

42" PANTRY

36" GAS RANGE

MUD RM

5'-5½"

5'-9"

2'-11½"

22'-2½" GARAGE

21'-0"

SW #102 (137 PLF) + SW #106 (126 PLF) AS WELL AS SW #108 (142 PLF) + SW #109 (145 PLF) ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL ALONG THEIR WALL LINES.

SW #103 + SW #112 AS WELL AS SW #111 + SW #113 UNIT SHEARS HAVE BEEN COMPARED BASED ON SHEAR WALL CAPACITY:

$\frac{P1}{P3} = 0.533$

0.533(187) = 100PLF

0.533(212) = 113 PLF

100 PLF + 114 PLF AS WELL AS 113 PLF + 115 PLF ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL.

APA PE 3.6k 2.55k

N

1 MAIN FLOOR PLAN

SCALE: 1/4" = 1'-0"

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JACQUELINE
JDESIGNSSEATTL

SUBMITTAL	D
SD	9
DD	1

3440 97TH AVE
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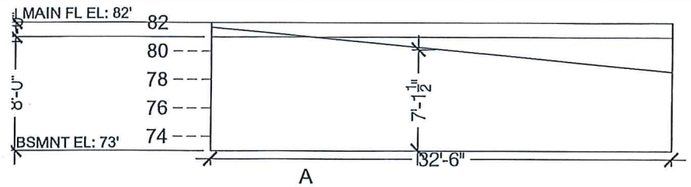
DRAWING INFORMA

OWNER:
MY BACKYARD, LLC

PROJECT#

DRAWING NAME:
FLOOR PL

A2.



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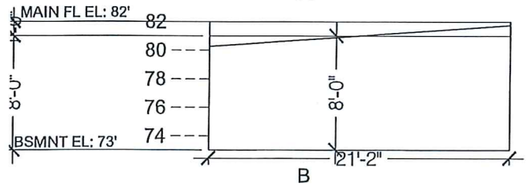

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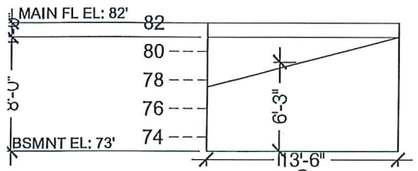

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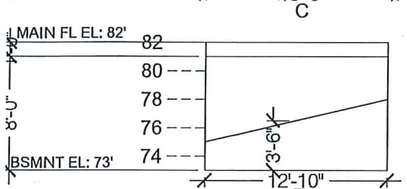

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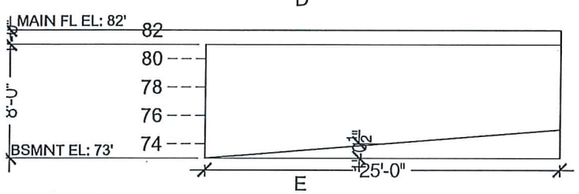

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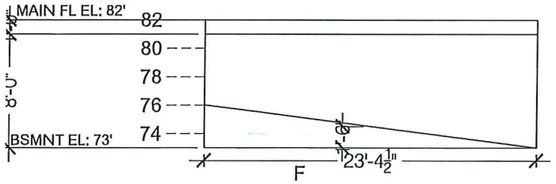

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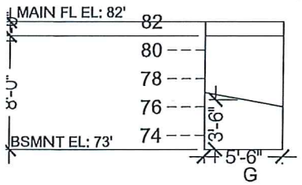

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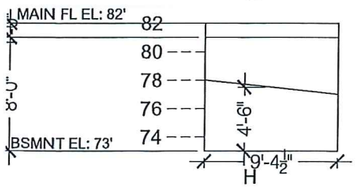

H

BASEMENT COVERAGE CALCS:
A 32.5' 89% = 29'
B 21' X 100% = 21'
C 13.5' X 78% = 10.5'
D 12.8' X 44% = 5.5'
E 25' X 13% = 3'
F 23' X 19% = 4.4'
G 5.5' X 44% = 2.4'
H 9.5' X 56% = 5.3'
TOTALS 142.8', N/A, 81.1'

901 SF * 81.1' / 142.8' = 511.7 SF
EXCLUDED BASEMENT FLOOR AREA

= LOAD REQUIRED PER FLEXIBLE DIAPHRAGM

= PROVIDED

7050#/52 = 135.6 PLF

12'-6" | 22' | 17'-6"

0.85k 1.1k | 2.34k 1.95k | 2.67k 2.33k | 1.19k 1.65k

#002 2.7k 1.65k

#003 1.125k 0.8k 237 PLF*

#004 4k 2.3k

#001 4.15k 2.6k

#006 1.025k 0.4k 85 PLF*

#005 2.85k 1.45k

#007 0.725k 0.2k 75 PLF*

2.65k 1.5k

2.7k 1.6k

5.6k 2.55k

3.7k 3k

1.0k 0.6k

1.65k 1.3k

0.5k

2k 1k | 1k 0.5k

2k 1k

5720#/36' = 158.9 PLF

0.92k 1.05k

12'-3"

2.87k 3.05k

25'-6"

1.38k 1.46k

31'-0½"

A

B

C

D

E

F

G

H

WET BAR

30" FRIDGE

REC ROOM

BATHROOM

STORAGE / UTILITY

BASEMENT 901 SF (389 SF GROSS FLOOR AREA)

UP

15R@7.21" W/36" H RR

CRAWL SPACE ACCESS

CRAWL SPACE

DO NOT BLOCK THESE KNEEWALLS

S.O.G. ABOVE

24'-6"

23'-2"

10'-9"

11'-6½"

19'-2"

10'-5½"

5'-11½"

3'-1¼" | 3'-6½"

5'-0"

2'-3"

63'-5"

21'-0" | 2'-0"

4'-0"

24'-0"

*SW#003, SW#006, + SW#007 UNIT SHEARS COMPARED BASED ON SHEAR WALL CAPACITY:

$\frac{PO}{P3} = \frac{201}{650} = 0.319$ $0.319(237) = 76$ PLF

76PLF, 85 PLF + 73 PLF ARE WITHIN AN ACCEPTABLE TOLERANCE TO BE CONSIDERED PROPORTIONAL.

WIND DESIGN: EXP. C HOWARD

19.75k

7.05k THIS FLOOR

5.7k THIS FLR

17.7k

SEISMIC DESIGN:

11.2k

1.8k THIS FLOOR

11.2k

1 BASEMENT PLAN

SCALE: 1/4" = 1'-0"

N

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DD

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DRAWING INFORMA

OWNER:
MY BACKYARD, LLC

PROJECT#

DRAWING NAME:
FLOOR PL

A2.

MULHERN+KULP
residential structural engineering

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 201: 2nd - Side Ext. Wall of Master WIC/Mast BD

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	1.5	ft.		
Wall Length, L	23.2	ft.	Qualifying Wall Length, L	18.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	4340 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	134	plf	Overturning Moment	8.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	100	lbs	Resistive Moment	18.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 202: 2nd - Rear Ext. Wall of Master Bath

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	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
175 lbs	<	1016 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	1.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	195	lbs	Resistive Moment	1.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 203: 2nd - Side Ext. Wall of Master BD by Bath

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	12.3	ft.	Qualifying Wall Length, L	12.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
770 lbs	<	2928 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	134	plf	Overturning Moment	6.2	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	250	lbs	Resistive Moment	6.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 204: 2nd - Rear Ext. Wall of Master BD

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	4.2	ft.		
Wall Length, L	24.5	ft.	Qualifying Wall Length, L	14.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
950 lbs	<	2811 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	355	plf	Overturning Moment	7.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	54.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 205: 2nd - Side Ext. Wall of Mast BD by WIC

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	4.2	ft.		
Wall Length, L	10.8	ft.	Qualifying Wall Length, L	5.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
650 lbs	<	1233 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	134	plf	Overturning Moment	5.2	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	335	lbs	Resistive Moment	5.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 206: 2nd - Rear Ext. Wall of BD#2

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	17.0	ft.	Qualifying Wall Length, L	17.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2225 lbs	<	7667 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	340	plf	Overturning Moment	17.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	23.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 207: 2nd - Side Ext. Wall of BD#2 / BD#3

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	4.2	ft.		
Wall Length, L	28.7	ft.	Qualifying Wall Length, L	14.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1350 lbs	<	3289 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	134	plf	Overturning Moment	10.8	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	200	lbs	Resistive Moment	28.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 208: 2nd - Front Ext. Wall of BD#3

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	1.5	ft.		
Wall Length, L	21.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1250 lbs	<	3585 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	340	plf	Overturning Moment	10.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	200	lbs	Resistive Moment	37.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 209: 2nd - Front Ext. Wall of Master WIC

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	3.7	ft.		
Wall Length, L	13.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	1682 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	4.8	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	535	lbs	Resistive Moment	13.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 210: 2nd - Side Ext. Wall of BD#3 WIC

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	6.0	ft.	Qualifying Wall Length, L	6.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	1434 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	134	plf	Overturning Moment	5.6	k-ft	Hold Down Design Load	618	lbs
DL at ends of wall	268	lbs	Resistive Moment	1.9	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)
fastened w/ 26-8d nails

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 211: 2nd - Side Ext. Wall of Mast WIC by Entry

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	11.0	ft.	Qualifying Wall Length, L	11.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
730 lbs	<	2629 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	134	plf	Overturning Moment	5.8	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	5.9	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall XXX: - Not Used

Shearwall Properties:

Wall height, H	0.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	0.0	ft.	Qualifying Wall Length, L	0.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	0.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 101: 1st - Side Ext. Wall of Guest Room/Bath #3

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	4.5	ft.		
Wall Length, L	23.2	ft.	Qualifying Wall Length, L	18.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1550 lbs	<	3044 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	234	plf	Overturning Moment	15.5	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	370	lbs	Resistive Moment	33.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 102: 1st - Rear Ext. Wall of Bath #3

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	4.2	ft.		
Wall Length, L	12.5	ft.	Qualifying Wall Length, L	10.5	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1400 lbs	<	3292 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	410	plf	Overturning Moment	14.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	250	lbs	Resistive Moment	16.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 103: 1st - Side Ext. Wall of Living Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	5.5	ft.		
Wall Length, L	18.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	3653 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	234	plf	Overturning Moment	20.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	700	lbs	Resistive Moment	23.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 104: 1st - Rear Ext. Wall of Living Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	5.5	ft.		
Wall Length, L	24.5	ft.	Qualifying Wall Length, L	14.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	2635 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	365	plf	Overturning Moment	12.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	56.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 105: 1st - Side Ext. Wall of Living Room by Cov Deck

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	10.8	ft.	Qualifying Wall Length, L	10.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	2569 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	234	plf	Overturning Moment	8.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	1700	lbs	Resistive Moment	15.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 106: 1st - Rear Ext. Wall of Dining Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	8.0	ft.		
Wall Length, L	15.0	ft.	Qualifying Wall Length, L	7.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1350 lbs	<	1353 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	495	plf	Overturning Moment	13.5	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	30.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall XXX: - Not Used

Shearwall Properties:

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

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! 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
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	0.0	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 108: 1st - Side Ext. Wall of Kitchen

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	5.5	ft.		
Wall Length, L	28.7	ft.	Qualifying Wall Length, L	17.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1150 lbs	<	3083 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	234	plf	Overturning Moment	11.5	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	50.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

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STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 109: 1st - Side Ext. Wall of Garage

Shearwall Properties:

Wall height, H	11.0	ft.	Max wall opening ht, H_o	5.0	ft.		
Wall Length, L	27.3	ft.	Qualifying Wall Length, L	22.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	3552 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	275	plf	Overturning Moment	6.6	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	53.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 110: 1st - Front Ext. Wall of Garage

Shearwall Properties:

Wall height, H	11.0	ft.	Max wall opening ht, Hc	8.0	ft.		
Wall Length, L	21.0	ft.	Qualifying Wall Length, L	18.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	1369 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	100	plf	Overturning Moment	14.3	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	18.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 111: 1st - Front Ext. Wall of Guest Room

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	5.5	ft.		
Wall Length, L	13.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1250 lbs	<	1398 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	425	plf	Overturning Moment	12.5	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	935	lbs	Resistive Moment	22.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 112: 1st - Side Ext. Wall of Guest Rm by Entry

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	13.2	ft.	Qualifying Wall Length, L	13.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	3145 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	234	plf	Overturning Moment	10.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	834	lbs	Resistive Moment	14.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 113: 1st - Rear Int. Wall of Garage

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	15.8	ft.	Qualifying Wall Length, L	15.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2750 lbs	<	7139 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	180	plf	Overturning Moment	27.5	k-ft	Uplift Connector Design Load	1008	lbs
DL at ends of wall	125	lbs	Resistive Moment	11.5	k-ft	Holdown Capacity	3105	lbs

Hold-down Specification

SIMPSON HTT4 HOLDOWN
fastened w/ 18-10d nails w/ 5/8" dia. all-thread rod

Shearwall XXX: - Not Used

Shearwall Properties:

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

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! 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
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	0.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 1: Basement - Side Ext. Kneewall of Rec Rm Wet Bar

Shearwall Properties:

Wall height, H	2.8	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	6.8	ft.	Qualifying Wall Length, L	6.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2600 lbs	<	3044 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	334	plf	Overturning Moment	7.2	k-ft	Uplift Connector Design Load	340	lbs
DL at ends of wall	400	lbs	Resistive Moment	4.9	k-ft	Holdown Capacity	3105	lbs

Hold-down Specification

SIMPSON HTT4 HOLDOWN
fastened w/ 18-10d nails w/ 5/8" dia. all-thread rod

Shearwall 2: Basement - Rear Ext. Wall of Rec Room

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	4.2	ft.		
Wall Length, L	17.0	ft.	Qualifying Wall Length, L	12.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1650 lbs	<	1950 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	520	plf	Overturning Moment	13.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	41.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 3: Basement - Side Ext. Wall of Rec Room

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, H_o	6.7	ft.		
Wall Length, L	10.8	ft.	Qualifying Wall Length, L	4.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	806 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	334	plf	Overturning Moment	6.4	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	2000	lbs	Resistive Moment	19.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 4: Basement - Rear Ext. Wall of Crawlspace

Shearwall Properties:

Wall height, H	8.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	15.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	3585 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	505	plf	Overturning Moment	18.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1000	lbs	Resistive Moment	33.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 5: Basement - Side Ext. Wall of Crawlspace

Shearwall Properties:

Wall height, H	5.3	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	25.5	ft.	Qualifying Wall Length, L	25.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1450 lbs	<	6095 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	334	plf	Overturning Moment	7.6	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	60.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 6: Basement - Kneewall at Crawlspace by Rec Rm

Shearwall Properties:

Wall height, H	4.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	12.0	ft.	Qualifying Wall Length, L	12.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	1728 lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
ADEQUATE

Overturning Evaluation:

Resistive DL	100	plf	Overturning Moment	1.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	150	lbs	Resistive Moment	4.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN & KULP
STRUCTURAL ENGINEERING

Project Name: J Designs
3440 97th Ave
M&K Project #: 01A-18094
Engineer: NJD
Date: 08-Mar-19

Shearwall Design Summary

Shearwall 7: Basement - Kneewall at Crawlspace by Staris

Shearwall Properties:

Wall height, H	4.0	ft.	Max wall opening ht, H_o	0.0	ft.		
Wall Length, L	10.0	ft.	Qualifying Wall Length, L	10.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
200 lbs	<	1440 lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
ADEQUATE

Overturning Evaluation:

Resistive DL	100	plf	Overturning Moment	0.8	k-ft	Uplift Connector Design Load	0	lbs
DL at ends of wall	150	lbs	Resistive Moment	3.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall XXX: - Not Used

Shearwall Properties:

Wall height, H	0.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	0.0	ft.	Qualifying Wall Length, L	0.0	ft.	Shearwall Assembly	P0

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
0 lbs	#####	#DIV/0! lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/0!

Overturning Evaluation:

Resistive DL	0	plf	Overturning Moment	0.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required