MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

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

CALCULATION PACKAGE

April 24, 2024

MacPherson Construction

5330 Butterworth Rd
House 1

Mercer Island,
Washington

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Prepared By:

Riley J. Denis, E.I.T. *Project Engineer*

Richard J. Zabel, P.E. *Project Manager + Director of Engineering*

Signature, Seal & Date

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

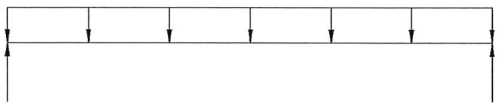
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: ROOF FRAMING - TYP. HDR — B1

PARAMETERS:

L = 5.5 FT
W = 0.4 KLF
P = - K



ANALYSIS:

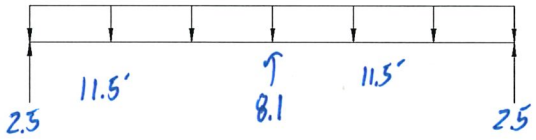
R_{MAX} =	1.1 K	V_D =	- K	< V_{ALL} =	3.5 K	☑ ADEQUATE
M_{MAX} =	1.5 K-FT	< M_{ALL} =	3.9 K-FT			☑ ADEQUATE
Δ_{TL} =	0.05 IN.	L/	1000+	< L/240		☑ ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: ROOF FRAMING - MASTER BED/BATH BM — B2

PARAMETERS:

L = 23 FT
W = 0.5 KLF
P = - K



ANALYSIS:

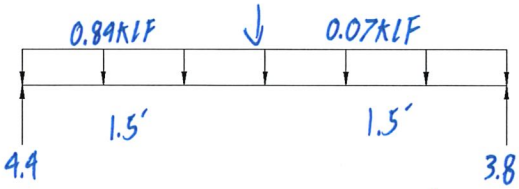
R_{MAX} =	8.1 K	V_D =	4.1 K	< V_{ALL} =	K	☑ ADEQUATE
M_{MAX} =	-9.3 K-FT	< M_{ALL} =	-23.4 K-FT			☑ ADEQUATE
Δ_{TL} =	0.11 IN.	L/	1000+	< L/240		☑ ADEQUATE

5½" x 12" GLB

BEAM DESCRIPTION: ROOF FRAMING - MASTER CLOSET HDR @ G.T. — B3

PARAMETERS:

L = 3 FT
W = -> KLF
P = 6.8 K



ANALYSIS:

R_{MAX} =	4.4 K	V_D =	- K	< V_{ALL} =	10.1 K	☑ ADEQUATE
M_{MAX} =	3.8 K-FT	< M_{ALL} =	17.1 K-FT			☑ ADEQUATE
Δ_{TL} =	0.01 IN.	L/	1000+	< L/240		☑ ADEQUATE

5½" x 9" GLB

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PROJECT NAME: 5330 BUTTERWORT MACPHERSON CONST.
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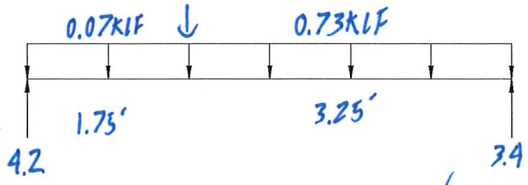
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: ROOF FRAMING - EXERCISE HDR @ G.T. B4

PARAMETERS:

L =	5	FT
W =	7	KLF
P =	5.1	K



ANALYSIS:

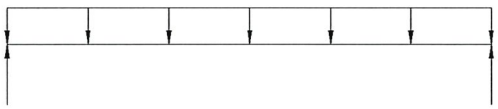
R_{MAX} =	4.2	K	V_D =	-	K	< V_{ALL} = 10.1 K	✓ ADEQUATE
M_{MAX} =	7.2	K-FT	< M_{ALL} =	17.1	K-FT		✓ ADEQUATE
Δ_{TL} =	0.04	IN.	L/	1000+	< L/240		✓ ADEQUATE

5½" x 9" GLB

BEAM DESCRIPTION: ROOF FRAMING - HDR @ STAIRS B5

PARAMETERS:

L =	7.5	FT
W =	0.5	KLF
P =	-	K



ANALYSIS:

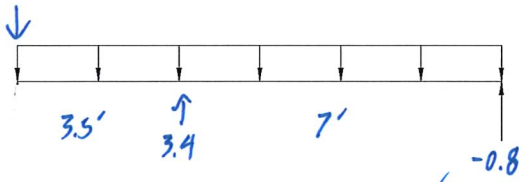
R_{MAX} =	1.9	K	V_D =	-	K	< V_{ALL} = 4.3 K	✓ ADEQUATE
M_{MAX} =	3.5	K-FT	< M_{ALL} =	5.2	K-FT		✓ ADEQUATE
Δ_{TL} =	0.1	IN.	L/	900	< L/240		✓ ADEQUATE

4x10 DF#2

BEAM DESCRIPTION: ROOF FRAMING - CANT'D HDR @ STAIR B6

PARAMETERS:

L =	10.5	FT
W =	0.07	KLF
P =	1.9	K



ANALYSIS:

R_{MAX} =	3.4	K	V_D =	2.2	K	< V_{ALL} = 13.9 K	✓ ADEQUATE
M_{MAX} =	-7.1	K-FT	< M_{ALL} =	-23.9	K-FT		✓ ADEQUATE
Δ_{TL} =	0.1	IN.	2 L/	840	< L/240		✓ ADEQUATE

5½" x 12" GLB

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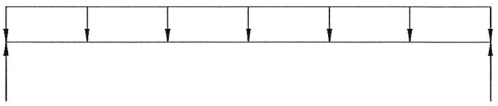
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: ROOF FRAMING - EXERCISE/BED2/BED1 HDRS — B7

PARAMETERS:

L = 8 FT
W = 0.73 KLF
P = - K



ANALYSIS:

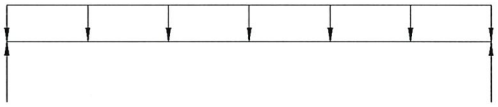
R_{MAX} =	2.9 K	V_D =	- K	< V_{ALL} =	6.9 K	✓	ADEQUATE
M_{MAX} =	5.8 K-FT	< M_{ALL} =	10.9 K-FT			✓	ADEQUATE
Δ_{TL} =	0.17 IN.	L/	565	< L/240		✓	ADEQUATE

3½" x 9" GLB

BEAM DESCRIPTION: ROOF FRAMING - BED 3 HDR — B8

PARAMETERS:

L = 10 FT
W = 0.37 KLF
P = - K



ANALYSIS:

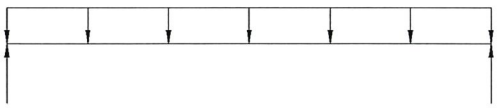
R_{MAX} =	1.9 K	V_D =	- K	< V_{ALL} =	6.9 K	✓	ADEQUATE
M_{MAX} =	4.6 K-FT	< M_{ALL} =	10.9 K-FT			✓	ADEQUATE
Δ_{TL} =	0.2 IN.	L/	600	< L/240		✓	ADEQUATE

3½" x 9" GLB

BEAM DESCRIPTION: ROOF FRAMING - MASTER BATH HDR — B9

PARAMETERS:

L = 10 FT
W = 0.16 KLF
P = - K



ANALYSIS:

R_{MAX} =	0.8 K	V_D =	- K	< V_{ALL} =	3.5 K	✓	ADEQUATE
M_{MAX} =	2.0 K-FT	< M_{ALL} =	3.4 K-FT			✓	ADEQUATE
Δ_{TL} =	0.2 IN.	L/	600	< L/240		✓	ADEQUATE

4x8 DF#2

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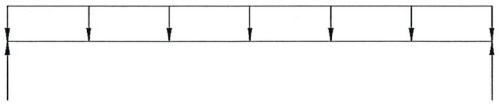
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: ROOF FRAMING - FOYER HDR (HIGH) — B10

PARAMETERS:

L =	9.75	FT
W =	0.3	KLF
P =	-	K



ANALYSIS:

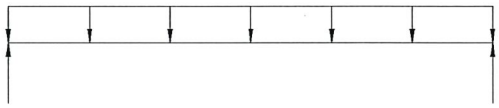
R_{MAX} =	1.5	K	V_D =	-	K	< V_{ALL} = 4.3 K	✓ ADEQUATE
M_{MAX} =	3.6	K-FT	< M_{ALL} =	5.2	K-FT		✓ ADEQUATE
Δ_{TL} =	0.17	IN.	L/	688	< L/240		✓ ADEQUATE

4x10 DF #2

BEAM DESCRIPTION: ROOF FRAMING - GREAT HDR (HIGH) — B11

PARAMETERS:

L =	18	FT
W =	0.5	KLF
P =	-	K



ANALYSIS:

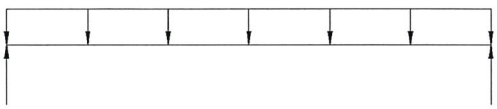
R_{MAX} =	4.5	K	V_D =	-	K	< V_{ALL} = 70.5 K	✓ ADEQUATE
M_{MAX} =	20.3	K-FT	< M_{ALL} =	110	K-FT		✓ ADEQUATE
Δ_{TL} =	0.14	IN.	L/	1000+	< L/240		✓ ADEQUATE

W16 x 26

BEAM DESCRIPTION: UPPER FLOOR FRAMING - GREAT HDR (LOW) — B12

PARAMETERS:

L =	18	FT
W =	0.18	KLF
P =	-	K



ANALYSIS:

R_{MAX} =	1.6	K	V_D =	-	K	< V_{ALL} = 64.0 K	✓ ADEQUATE
M_{MAX} =	7.3	K-FT	< M_{ALL} =	73.1	K-FT		✓ ADEQUATE
Δ_{TL} =	0.09	IN.	L/	1000+	< L/240		✓ ADEQUATE

W12 x 22

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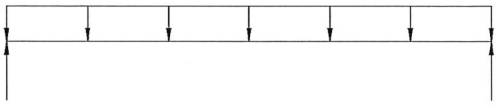
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - GARAGE DOOR HDR — B13

PARAMETERS:

L =	17	FT
W =	0.58	KLF
P =	-	K



ANALYSIS:

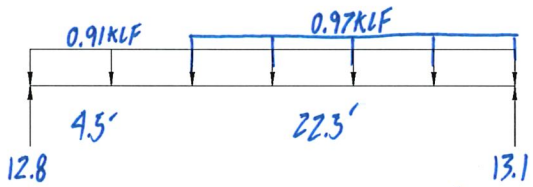
R_{MAX} =	4.9	K	V_D =	-	K	< V_{ALL} = 16.8 K	✓ ADEQUATE
M_{MAX} =	21.0	K-FT	< M_{ALL} =	47.4	K-FT		✓ ADEQUATE
Δ_{TL} =	0.39	IN.	L/	523	< L/240		✓ ADEQUATE

5½" x 15" GLB

BEAM DESCRIPTION: UPPER FLOOR FRAMING - GARAGE BM — B14

PARAMETERS:

L =	27	FT
W =	-7	KLF
P =	-	K



ANALYSIS:

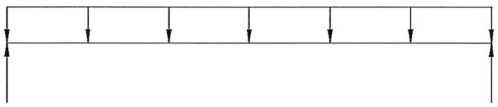
R_{MAX} =	13.1	K	V_D =	-	K	< V_{ALL} = 36.9 K	✓ ADEQUATE
M_{MAX} =	88.6	K-FT	< M_{ALL} =	229.6	K-FT		✓ ADEQUATE
Δ_{TL} =	0.39	IN.	L/	831	< L/240		✓ ADEQUATE

5½" x 33" GLB

BEAM DESCRIPTION: UPPER FLOOR FRAMING - FRONT GARAGE HDR — B15

PARAMETERS:

L =	15	FT
W =	0.07	KLF
P =	-	K



ANALYSIS:

R_{MAX} =	0.5	K	V_D =	-	K	< V_{ALL} = 4.5 K	✓ ADEQUATE
M_{MAX} =	2.0	K-FT	< M_{ALL} =	5.2	K-FT		✓ ADEQUATE
Δ_{TL} =	0.22	IN.	L/	818	< L/240		✓ ADEQUATE

4x10 DF#2

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PROJECT NAME: 5330 BUTTERWORT MACPHERSON CONST.
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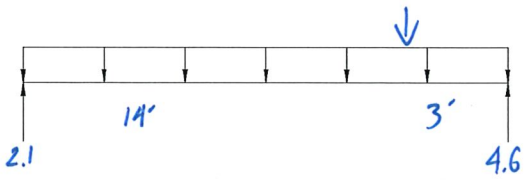
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - GARAGE HDR — B16

PARAMETERS:

L =	17	FT
W =	0.17	KLF
P =	3.8	K



ANALYSIS:

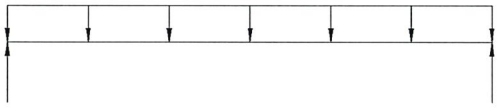
R_{MAX} =	4.6	K	V_D =	-	K	< V_{ALL} = 13.4 K	✓ ADEQUATE
M_{MAX} =	13.0	K-FT	< M_{ALL} =	30.4	K-FT		✓ ADEQUATE
Δ_{TL} =	0.38	IN.	L/	537	< L/240		✓ ADEQUATE

5½" x 12" GLB

BEAM DESCRIPTION: UPPER FLOOR FRAMING - FRONT PORCH BM — B17

PARAMETERS:

L =	13	FT
W =	0.13	KLF
P =	-	K



ANALYSIS:

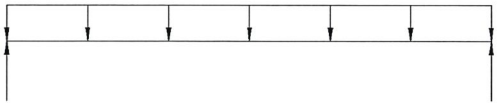
R_{MAX} =	0.8	K	V_D =	-	K	< V_{ALL} = 8.5 K	✓ ADEQUATE
M_{MAX} =	2.7	K-FT	< M_{ALL} =	19.3	K-FT		✓ ADEQUATE
Δ_{TL} =	0.09	IN.	L/	1000+	< L/240		✓ ADEQUATE

3½" x 12" GLB

BEAM DESCRIPTION: UPPER FLOOR FRAMING - REAR GREAT PATIO BM — B18

PARAMETERS:

L =	21	FT
W =	0.18	KLF
P =	-	K



ANALYSIS:

R_{MAX} =	1.9	K	V_D =	-	K	< V_{ALL} = 13.4 K	✓ ADEQUATE
M_{MAX} =	9.9	K-FT	< M_{ALL} =	30.4	K-FT		✓ ADEQUATE
Δ_{TL} =	0.55	IN.	L/	458	< L/240		✓ ADEQUATE

5½" x 12" GLB

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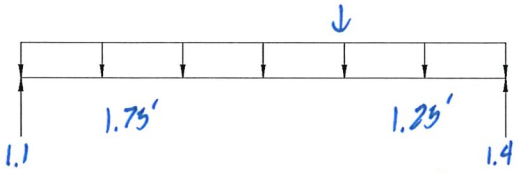
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - SIDE DINING HDR @ BM ABOVE — B19

PARAMETERS:

L =	3	FT
W =	0.2	KLF
P =	1.9	K



ANALYSIS:

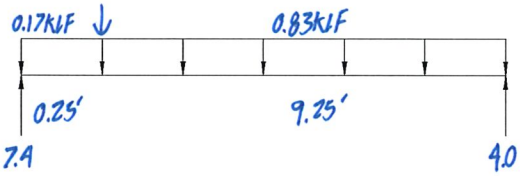
R_{MAX} =	1.4	K	V_D =	-	K	< V_{ALL} = 3.5 K	✓ ADEQUATE
M_{MAX} =	1.6	K-FT	< M_{ALL} =	3.4	K-FT		✓ ADEQUATE
Δ_{TL} =	0.01	IN.	L/	1000+	< L/240		✓ ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: UPPER FLOOR FRAMING - FLUSH BM @ EXT. STAIR — B20

PARAMETERS:

L =	9.5	FT
W =	-7	KLF
P =	3.7	K



ANALYSIS:

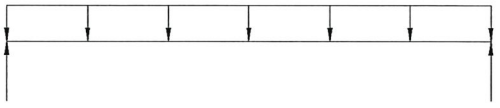
R_{MAX} =	7.4	K	V_D =	-	K	< V_{ALL} = 9.1 K	✓ ADEQUATE
M_{MAX} =	9.6	K-FT	< M_{ALL} =	20.5	K-FT		✓ ADEQUATE
Δ_{TL} =	0.17	IN.	L/	671	< L/240		✓ ADEQUATE

(2) 1¾" x 11⅞" LVL

BEAM DESCRIPTION: UPPER FLOOR FRAMING - FOYER/STAIR BM — B21

PARAMETERS:

L =	13.5	FT
W =	0.14	KLF
P =	-	K



ANALYSIS:

R_{MAX} =	0.9	K	V_D =	-	K	< V_{ALL} = 6.8 K	✓ ADEQUATE
M_{MAX} =	3.2	K-FT	< M_{ALL} =	6.9	K-FT		✓ ADEQUATE
Δ_{TL} =	0.21	IN.	L/	771	< L/240		✓ ADEQUATE

6x10 DF #2

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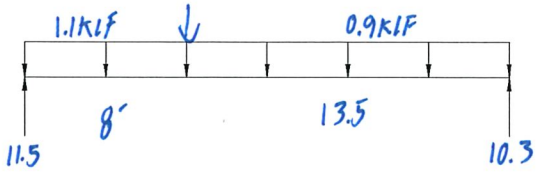
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING- FOYER/GREAT BM — B22

PARAMETERS:

L =	21.5	FT
W =	-7	KLF
P =	0.9	K



ANALYSIS:

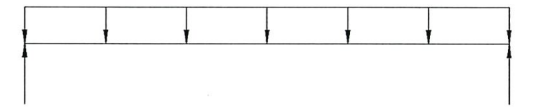
R_{MAX} =	11.5	K	V_D =	-	K	< V_{ALL} = 26.8 K	✓ ADEQUATE
M_{MAX} =	58.9	K-FT	< M_{ALL} =	121.9	K-FT		✓ ADEQUATE
Δ_{TL} =	0.43	IN.	L/	600	< L/240		✓ ADEQUATE

5½" x 24" GLB

BEAM DESCRIPTION: UPPER FLOOR FRAMING- TYP. HDR — B23

PARAMETERS:

L =	3	FT
W =	0.53	KLF
P =	-	K



ANALYSIS:

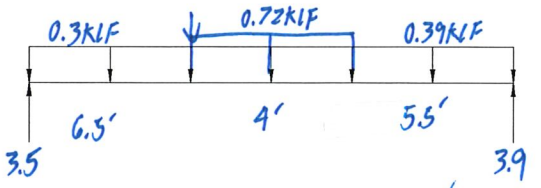
R_{MAX} =	0.8	K	V_D =	-	K	< V_{ALL} = 3.0 K	✓ ADEQUATE
M_{MAX} =	0.6	K-FT	< M_{ALL} =	3.0	K-FT		✓ ADEQUATE
Δ_{TL} =	0.005	IN.	L/	1000+	< L/240		✓ ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: UPPER FLOOR FRAMING - UTILITY/HALL BM — B24

PARAMETERS:

L =	16	FT
W =	-7	KLF
P =	0.4	K



ANALYSIS:

R_{MAX} =	3.9	K	V_D =	-	K	< V_{ALL} = 15.8 K	✓ ADEQUATE
M_{MAX} =	17.7	K-FT	< M_{ALL} =	35.7	K-FT		✓ ADEQUATE
Δ_{TL} =	0.44	IN.	L/	436	< L/240		✓ ADEQUATE

(4) 1¾" x 11⅞" LVL

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

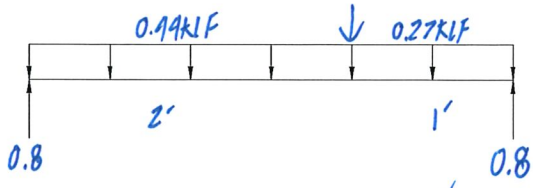
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - THEATER HDR — B25

PARAMETERS:

L =	3	FT
W =	-7	KLF
P =	0.9	K



ANALYSIS:

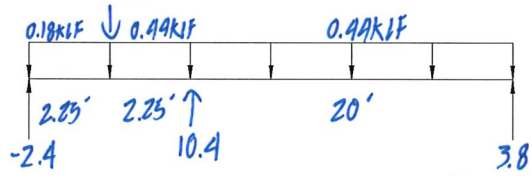
R_{MAX} =	0.8	K	V_D =	-	K	< V_{ALL} = 3.0 K	✓ ADEQUATE
M_{MAX} =	0.6	K-FT	< M_{ALL} =	3.0	K-FT		✓ ADEQUATE
Δ_{TL} =	0.003	IN.	L/	1000+	< L/240		✓ ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: UPPER FLOOR FRAMING - THEATER/MEDIA BM — B26

PARAMETERS:

L =	25.5	FT
W =	-7	KLF
P =	0.3	K



ANALYSIS:

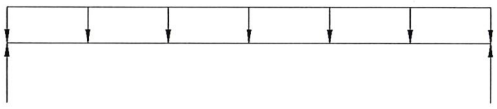
R_{MAX} =	10.4	K	V_D =	5.4	K	< V_{ALL} = 15.8 K	✓ ADEQUATE
M_{MAX} =	18.7	K-FT	< M_{ALL} =	35.7	K-FT		✓ ADEQUATE
Δ_{TL} =	0.47	IN.	L/	511	< L/240		✓ ADEQUATE

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

BEAM DESCRIPTION: UPPER FLOOR FRAMING - KITCHEN BM — B27

PARAMETERS:

L =	17	FT
W =	0.54	KLF
P =	-	K



ANALYSIS:

R_{MAX} =	4.6	K	V_D =	-	K	< V_{ALL} = 15.8 K	✓ ADEQUATE
M_{MAX} =	19.5	K-FT	< M_{ALL} =	35.7	K-FT		✓ ADEQUATE
Δ_{TL} =	0.5	IN.	L/	408	< L/240		✓ ADEQUATE

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

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

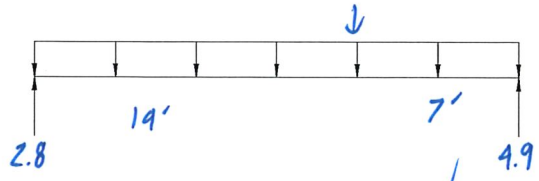
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - KITCHEN/DINING BM — B28

PARAMETERS:

L = 21 FT
W = 0.07 KLF
P = 6.2 K



ANALYSIS:

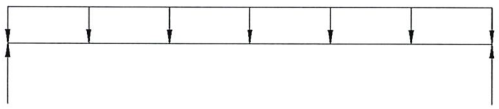
R_{MAX} =	4.9 K	V_D =	- K	< V_{ALL} =	53.6 K	✓	ADEQUATE
M_{MAX} =	31.9 K-FT	< M_{ALL} =	78.1 K-FT			✓	ADEQUATE
Δ_{TL} =	0.49 IN.	L/	514	< L/240		✓	ADEQUATE

W10 x 26

BEAM DESCRIPTION: UPPER FLOOR FRAMING - BUTLERS PANTRY HDR — B29

PARAMETERS:

L = 6.25 FT
W = 0.54 KLF
P = - K



ANALYSIS:

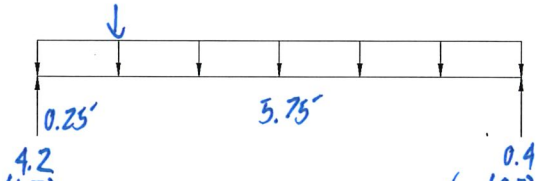
R_{MAX} =	1.7 K	V_D =	- K	< V_{ALL} =	3.0 K	✓	ADEQUATE
M_{MAX} =	2.6 K-FT	< M_{ALL} =	3.0 K-FT			✓	ADEQUATE
Δ_{TL} =	0.1 IN.	L/	750	< L/240		✓	ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: UPPER FLOOR FRAMING - OFFICE/HALL HDR — B30

PARAMETERS:

L = 6 FT
W = 0.07 KLF
P = 4.2 K (1.6)



ANALYSIS:

R_{MAX} =	4.2 K	V_D =	1.7 K	< V_{ALL} =	3.0 K	✓	ADEQUATE
M_{MAX} =	1.1 K-FT	< M_{ALL} =	3.0 K-FT			✓	ADEQUATE
Δ_{TL} =	0.04 IN.	L/	1000+	< L/240		✓	ADEQUATE

4x8 DF#2

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

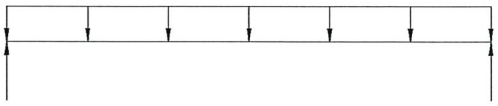
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - LOW FOYER HDR — B31

PARAMETERS:

L =	9.5	FT
W =	0.13	KLF
P =	-	K



ANALYSIS:

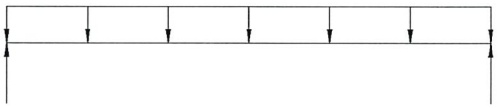
R_{MAX} =	0.6	K	V_D =	-	K	< V_{ALL} =	3.5	K	✓ ADEQUATE
M_{MAX} =	1.5	K-FT	< M_{ALL} =	3.4	K-FT				✓ ADEQUATE
Δ_{TL} =	0.19	IN.	L/	814	< L/240				✓ ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: UPPER FLOOR FRAMING - FIREPLACE HDR — B32

PARAMETERS:

L =	8.5	FT
W =	0.17	KLF
P =	-	K



ANALYSIS:

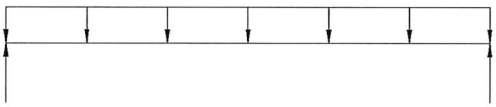
R_{MAX} =	0.7	K	V_D =	-	K	< V_{ALL} =	3.5	K	✓ ADEQUATE
M_{MAX} =	1.5	K-FT	< M_{ALL} =	3.4	K-FT				✓ ADEQUATE
Δ_{TL} =	0.11	IN.	L/	927	< L/240				✓ ADEQUATE

4x8 DF#2

BEAM DESCRIPTION: UPPER FLOOR FRAMING - BAR BM — B33

PARAMETERS:

L =	11	FT
W =	0.38	KLF
P =	-	K



ANALYSIS:

R_{MAX} =	3.2	K	V_D =	-	K	< V_{ALL} =	7.9	K	✓ ADEQUATE
M_{MAX} =	8.8	K-FT	< M_{ALL} =	17.9	K-FT				✓ ADEQUATE
Δ_{TL} =	0.21	IN.	L/	629	< L/240				✓ ADEQUATE

(2) 1 3/4" x 11 7/8" LVL

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

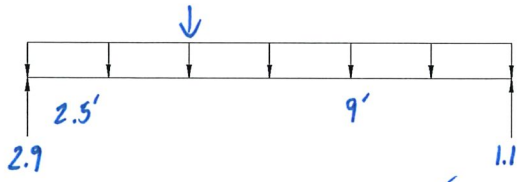
PROJECT NAME: 5330 BUTTERWORT MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - BAR/HALL BM — B34

PARAMETERS:

L =	11.5	FT
W =	0.07	KLF
P =	3.2	K



ANALYSIS:

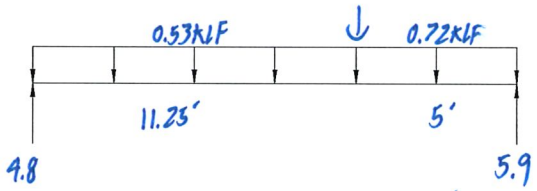
R_{MAX} =	2.9	K	V_D =	-	K	< V_{ALL} = 7.9 K	✓ ADEQUATE
M_{MAX} =	7.1	K-FT	< M_{ALL} =	17.9	K-FT		✓ ADEQUATE
Δ_{TL} =	0.15	IN.	L/	920	< L/240		✓ ADEQUATE

(2) 1 3/4" x 11 7/8" LVL

BEAM DESCRIPTION: UPPER FLOOR FRAMING - DINING BM — B35

PARAMETERS:

L =	16.25	FT
W =	-7	KLF
P =	1.1	K



ANALYSIS:

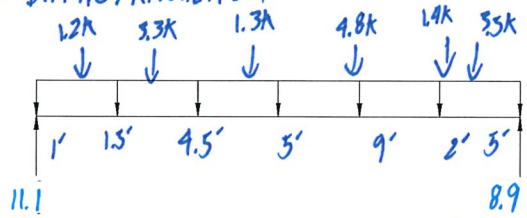
R_{MAX} =	5.9	K	V_D =	-	K	< V_{ALL} = 15.8 K	✓ ADEQUATE
M_{MAX} =	21.7	K-FT	< M_{ALL} =	35.7	K-FT		✓ ADEQUATE
Δ_{TL} =	0.5	IN.	L/	390	< L/240		✓ ADEQUATE

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

BEAM DESCRIPTION: UPPER FLOOR FRAMING - DINING/KITCHEN BM — B36

PARAMETERS:

L =	28	FT
W =	0.07	KLF
P =	-7	K



ANALYSIS:

R_{MAX} =	11.1	K	V_D =	-	K	< V_{ALL} = 130.7 K	✓ ADEQUATE
M_{MAX} =	70.4	K-FT	< M_{ALL} =	281.9	K-FT		✓ ADEQUATE
Δ_{TL} =	0.62	IN.	L/	542	< L/240		✓ ADEQUATE

W10x88

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

PROJECT NAME: 5330 BUTTERWORT MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - BM @ STAIR — B37

PARAMETERS:

L = 5.25 FT
W = 0.9 KLF
P = - K

ANALYSIS:

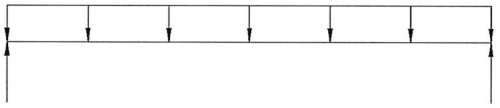
R_{MAX} =	1.0 K	V_D =	- K	< V_{ALL} =	7.9 K	✓	ADEQUATE
M_{MAX} =	1.9 K-FT	< M_{ALL} =	17.9 K-FT			✓	ADEQUATE
Δ_{TL} =	0.01 IN.	L/	1000+	< L/240		✓	ADEQUATE

(2) 1 3/4" x 11 7/8" LVL

BEAM DESCRIPTION: UPPER FLOOR FRAMING - HALL BM — B38

PARAMETERS:

L = 5 FT
W = 0.62 KLF
P = - K



ANALYSIS:

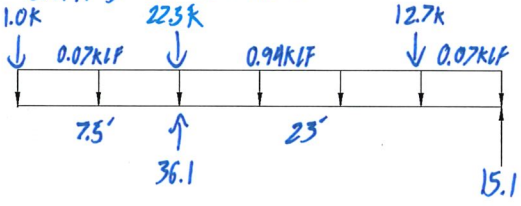
R_{MAX} =	1.6 K	V_D =	- K	< V_{ALL} =	7.9 K	✓	ADEQUATE
M_{MAX} =	1.9 K-FT	< M_{ALL} =	17.9 K-FT			✓	ADEQUATE
Δ_{TL} =	0.01 IN.	L/	1000+	< L/240		✓	ADEQUATE

(2) 1 3/4" x 11 7/8" LVL

BEAM DESCRIPTION: UPPER FLOOR FRAMING - CANT'D BM @ STAIR — B39

PARAMETERS:

L = 30.5 FT
W = -? KLF
P = -? K



ANALYSIS:

R_{MAX} =	36.1 K	V_D =	15.1 K	< V_{ALL} =	130.7 K	✓	ADEQUATE
M_{MAX} =	89.3 K-FT	< M_{ALL} =	282 K-FT			✓	ADEQUATE
Δ_{TL} =	0.5 IN.	L/	512	< L/240		✓	ADEQUATE

W10x88

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

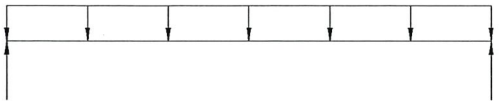
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - PATIO BM @ WALL ABOVE — B40

PARAMETERS:

L = 23 FT
W = 1.0 KLF
P = - K



ANALYSIS:

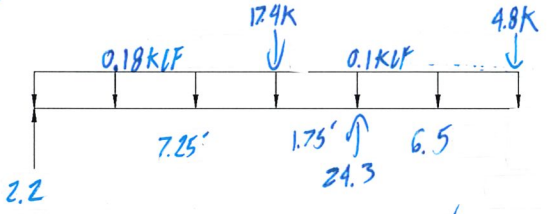
R_{MAX} =	11.5 K	V_D =	- K	< V_{ALL} =	131 K	✓ ADEQUATE
M_{MAX} =	72.0 K-FT	< M_{ALL} =	282 K-FT			✓ ADEQUATE
Δ_{TL} =	0.44 IN.	L/	621	< L/240		✓ ADEQUATE

W10x88

BEAM DESCRIPTION: UPPER FLOOR FRAMING - SIDE PATIO BMS @ WALLS ABOVE — B41

PARAMETERS:

L = 15.5 FT
W = -7 KLF
P = -7 K



ANALYSIS:

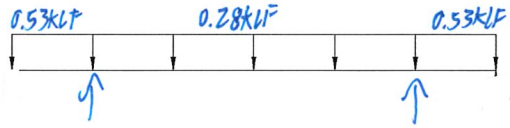
R_{MAX} =	24.3 K	V_D =	18.6 K	< V_{ALL} =	59.4 K	✓ ADEQUATE
M_{MAX} =	34.1 K-FT	< M_{ALL} =	99.3 K-FT			✓ ADEQUATE
Δ_{TL} =	0.27 IN.	2 L/	578	< L/240		✓ ADEQUATE

W8x40

BEAM DESCRIPTION: UPPER FLOOR FRAMING - EDGE DECK BM — B42

PARAMETERS:

L = 27 FT
W = -7 KLF
P = - K



ANALYSIS:

R_{MAX} =	4.8 K	V_D =	- K	< V_{ALL} =	59.4 K	✓ ADEQUATE
M_{MAX} =	20.0 K-FT	< M_{ALL} =	99.3 K-FT			✓ ADEQUATE
Δ_{TL} =	0.45 IN.	L/	614	< L/240		✓ ADEQUATE

W8x40

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

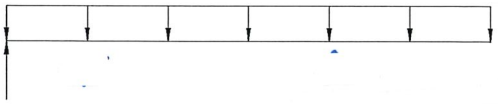
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: NOT USED — B43

PARAMETERS:

L = FT
W = KLF
P = K



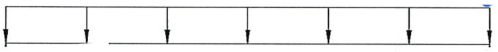
ANALYSIS:

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: NOT USED — B44

PARAMETERS:

L = FT
W = KLF
P = K



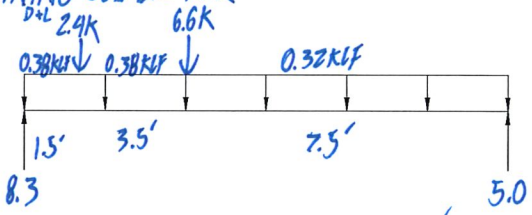
ANALYSIS:

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: UPPER FLOOR FRAMING - DINING SLIDER HDR — B45

PARAMETERS:

L = 12.5 FT
W = -? KLF
P = -? K



ANALYSIS:

R_{MAX} = 8.3 K V_D = - K < V_{ALL} = 14.6 K ☑ ADEQUATE
M_{MAX} = 28.5 K-FT < M_{ALL} = 41.3 K-FT ☑ ADEQUATE
Δ_{TL} = 0.25 IN. L/ 600 < L/240 ☑ ADEQUATE

5½" x 15" GLB

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

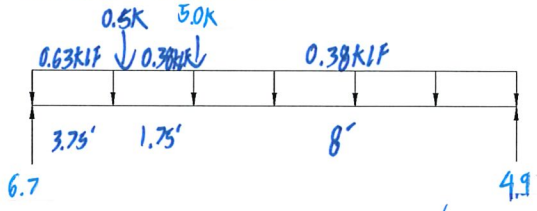
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRAMING - KITCHEN SLIDER HDR — B46

PARAMETERS:

L =	13.5	FT
W =	-7	KLF
P =	-7	K



ANALYSIS:

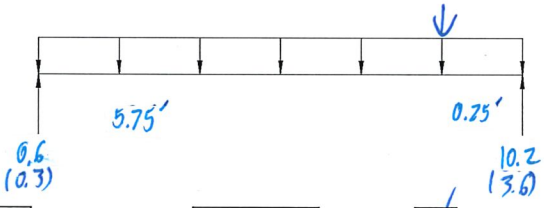
R_{MAX} =	6.7 K	V_D =	- K	< V_{ALL} =	14.6 K	✓	ADEQUATE
M_{MAX} =	27.0 K-FT	< M_{ALL} =	41.3 K-FT			✓	ADEQUATE
Δ_{TL} =	0.25 IN.	L/	648	< L/240		✓	ADEQUATE

5½" x 13" GLB

BEAM DESCRIPTION: MAIN FLOOR FRAMING - BM @ P.A. @ MEDIA — B47

PARAMETERS:

L =	6	FT
W =	0.07	KLF
P =	10.4 (3.3)	K



ANALYSIS:

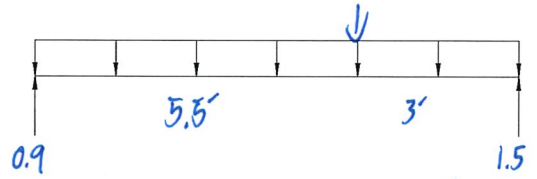
R_{MAX} =	10.2 K	V_D =	3.6 K	< V_{ALL} =	6.3 K	✓	ADEQUATE
M_{MAX} =	2.3 K-FT	< M_{ALL} =	11.8 K-FT			✓	ADEQUATE
Δ_{TL} =	0.03 IN.	L/	1000+	< L/240		✓	ADEQUATE

(2) 1¾" x 9½" LVL

BEAM DESCRIPTION: MAIN FLOOR FRAMING - BM @ P.A. @ MUD — B48

PARAMETERS:

L =	8.3	FT
W =	0.07	KLF
P =	1.8	K



ANALYSIS:

R_{MAX} =	1.5 K	V_D =	- K	< V_{ALL} =	3.2 K	✓	ADEQUATE
M_{MAX} =	3.9 K-FT	< M_{ALL} =	5.9 K-FT			✓	ADEQUATE
Δ_{TL} =	0.17 IN.	L/	600	< L/240		✓	ADEQUATE

1¾" x 9½" LVL

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

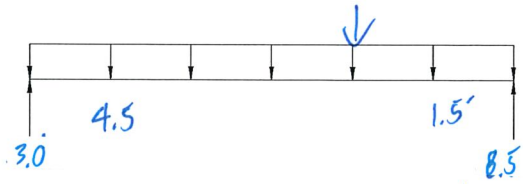
PROJECT NAME: 5330 BUTTERWORT
MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: MAIN FLOOR FRAMING - BM @ P.A. @ HALL — B49

PARAMETERS:

L =	6	FT
W =	0.07	KLF
P =	11.1	K



ANALYSIS:

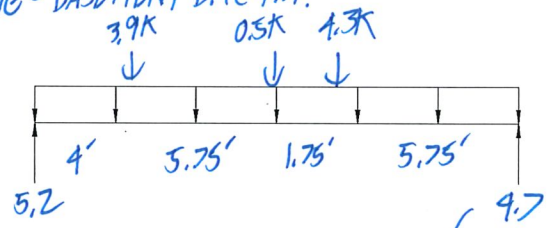
R_{MAX} =	8.5	K	V_D =	-	K	< V_{ALL} = 9.5 K	✓ ADEQUATE
M_{MAX} =	12.8	K-FT	< M_{ALL} =	17.7	K-FT		✓ ADEQUATE
Δ_{TL} =	0.09	IN.	L/	800	< L/240		✓ ADEQUATE

(3) 1 3/4" x 9 1/2" LVL

BEAM DESCRIPTION: MAIN FLOOR FRAMING - BASEMENT BM @ P.A. — B50

PARAMETERS:

L =	17.25	FT
W =	0.07	KLF
P =	7	K



ANALYSIS:

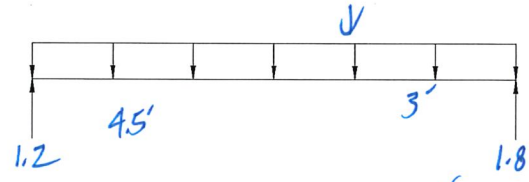
R_{MAX} =	5.2	K	V_D =	-	K	< V_{ALL} = 45.6 K	✓ ADEQUATE
M_{MAX} =	25.9	K-FT	< M_{ALL} =	75.8	K-FT		✓ ADEQUATE
Δ_{TL} =	0.45	IN.	L/	458	< L/240		✓ ADEQUATE

W8x31

BEAM DESCRIPTION: MAIN FLOOR FRAMING - HALL BM @ P.A. — B51

PARAMETERS:

L =	7.5	FT
W =	0.07	KLF
P =	2.5	K



ANALYSIS:

R_{MAX} =	1.8	K	V_D =	-	K	< V_{ALL} = 3.2 K	✓ ADEQUATE
M_{MAX} =	4.7	K-FT	< M_{ALL} =	5.9	K-FT		✓ ADEQUATE
Δ_{TL} =	0.16	IN.	L/	563	< L/240		✓ ADEQUATE

1 3/4" x 9 1/2" LVL

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

PROJECT NAME: 5330 BUTTERWORT MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

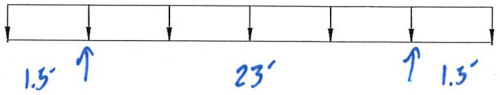
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: ROOF FRAMING - REAR AWNING BM

B52

PARAMETERS:

L = 26 FT
W = 0.08 KLF
P = - K



ANALYSIS:

R_{MAX} =	1.0 K	V_D =	- K	< V_{ALL} =	40.8 K	✓ ADEQUATE
M_{MAX} =	5.3 K-FT	< M_{ALL} =	47.2 K-FT			✓ ADEQUATE
Δ_{TL} =	0.33 IN.	L/	836	< L/240		✓ ADEQUATE

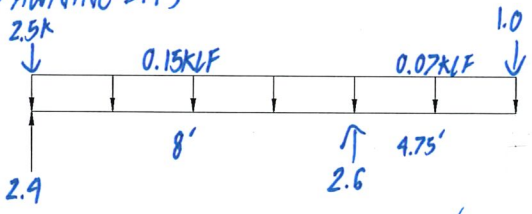
W6x25

BEAM DESCRIPTION: ROOF FRAMING - CANT'D AWNING BMS

B53

PARAMETERS:

L = 12.75 FT
W = -7 KLF
P = -7 K



ANALYSIS:

R_{MAX} =	2.6 K	V_D =	- K	< V_{ALL} =	32.7 K	✓ ADEQUATE
M_{MAX} =	5.5 K-FT	< M_{ALL} =	29.2 K-FT			✓ ADEQUATE
Δ_{TL} =	0.18 IN.	2 L/	633	< L/240		✓ ADEQUATE

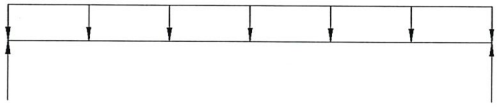
W6x16

BEAM DESCRIPTION: STAIR FRAMING - STRINGERS

B54

PARAMETERS:

L = 12 FT
W = 0.28 KLF
P = - K



ANALYSIS:

R_{MAX} =	1.7 K	V_D =	- K	< V_{ALL} =	110.3 K	✓ ADEQUATE
M_{MAX} =	5.0 K-FT	< M_{ALL} =	76.1 K-FT			✓ ADEQUATE
Δ_{TL} =	0.05 IN.	L/	1000+	< L/240		✓ ADEQUATE

HSS 8x6x1/2

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

PROJECT NAME: 5330 BUTTERWORT MACPHERSON CONST.
M&K PROJECT #: 306-24003
ENGINEER: RJD
DATE: 19-MAR-24

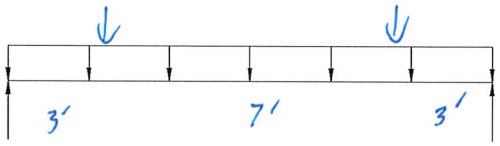
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: STAIR FRAMING - LANDING BM

B55

PARAMETERS:

L = 13 FT
W = 0.1 KLF
P = 2.6 K



ANALYSIS:

R_{MAX} = 3.23 K V_D = – K < V_{ALL} = 110.3 K ✓ ADEQUATE
M_{MAX} = 9.9 K-FT < M_{ALL} = 76.1 K-FT ✓ ADEQUATE
Δ_{TL} = 0.13 IN. L/ 1000+ < L/240 ✓ ADEQUATE

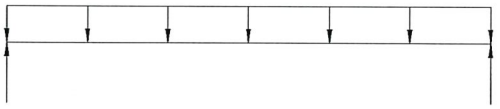
HSS 8x6x½"

BEAM DESCRIPTION: MAIN FLOOR FRAMING - (E) BM @ BRG

B56

PARAMETERS:

L = 5 FT
W = 0.9 KLF
P = – K



ANALYSIS:

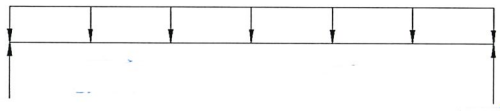
R_{MAX} = 2.3 K V_D = – K < V_{ALL} = 3.9 K ✓ ADEQUATE
M_{MAX} = 2.8 K-FT < M_{ALL} = 4.5 K-FT ✓ ADEQUATE
Δ_{TL} = 0.03 IN. L/ 1000+ < L/240 ✓ ADEQUATE

4x10 DF #2 (E)

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

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shear Wall Calculations - Wind

MacPherson Construction

5330 Butterworth - House 1

Mercer Island, WA

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2021 IBC Ch. 1609, ASCE 7-16 Ch. 26-30

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Richard J. Zabel, P.E., Project Manager + Director of Engineering

Riley J. Denis, E.I.T., Project Engineer

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

WIND DESIGN SUMMARY PER ASCE 7-16

M+K Project #: 306-24003
Engineer: RJD

Parameters:

Wind Speed	100
Exposure Category	C
Risk Category	II
Wind Directionality Factor, K_d	0.85
Topographic Factor, K_{zt}	1.00
Gust Factor, G	0.85
Ground Elev. Above Sea Level [ft]	0
Design Type	ASD 0.60

Roof Geometry:

Trans. Roof Pitch	2.0	:12
Long. Roof Pitch	2.0	:12
Mean Roof Height, H	24.00	ft

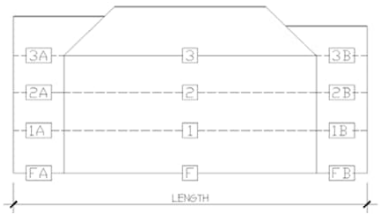
Building Geometry:

length	108	ft
Width	62	ft
Number of stories	2	

Transverse Direction (Perpendicular to Main Ridge Line)

Tributary Design Areas:

Diaphragm Level	Floor-to-Floor Height		Section A	Section O	Section B	
2	9 ft	Roof Surface	0	185	0	sq ft
		Wall surface	0	600	0	sq ft
1	10 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	995	0	sq ft
FND		Roof Surface	0	0	0	sq ft
		Wall surface	0	0	0	sq ft



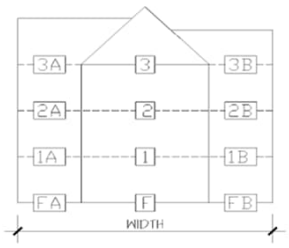
Tributary Design Loads: (0.6W)

	Section A	Section O	Section B	
Story Shear	0.00	7.87	0.00	kips
Total Shear	0.00	7.87	0.00	kips
		7.87		kips
Story Shear	0.00	12.67	0.00	kips
Total Shear	0.00	20.55	0.00	kips
		20.55		kips
Story Shear	0.00	0.00	0.00	kips
Total Shear	0.00	20.55	0.00	kips
		20.55		kips

Longitudinal Direction (Parallel to Main Ridge Line)

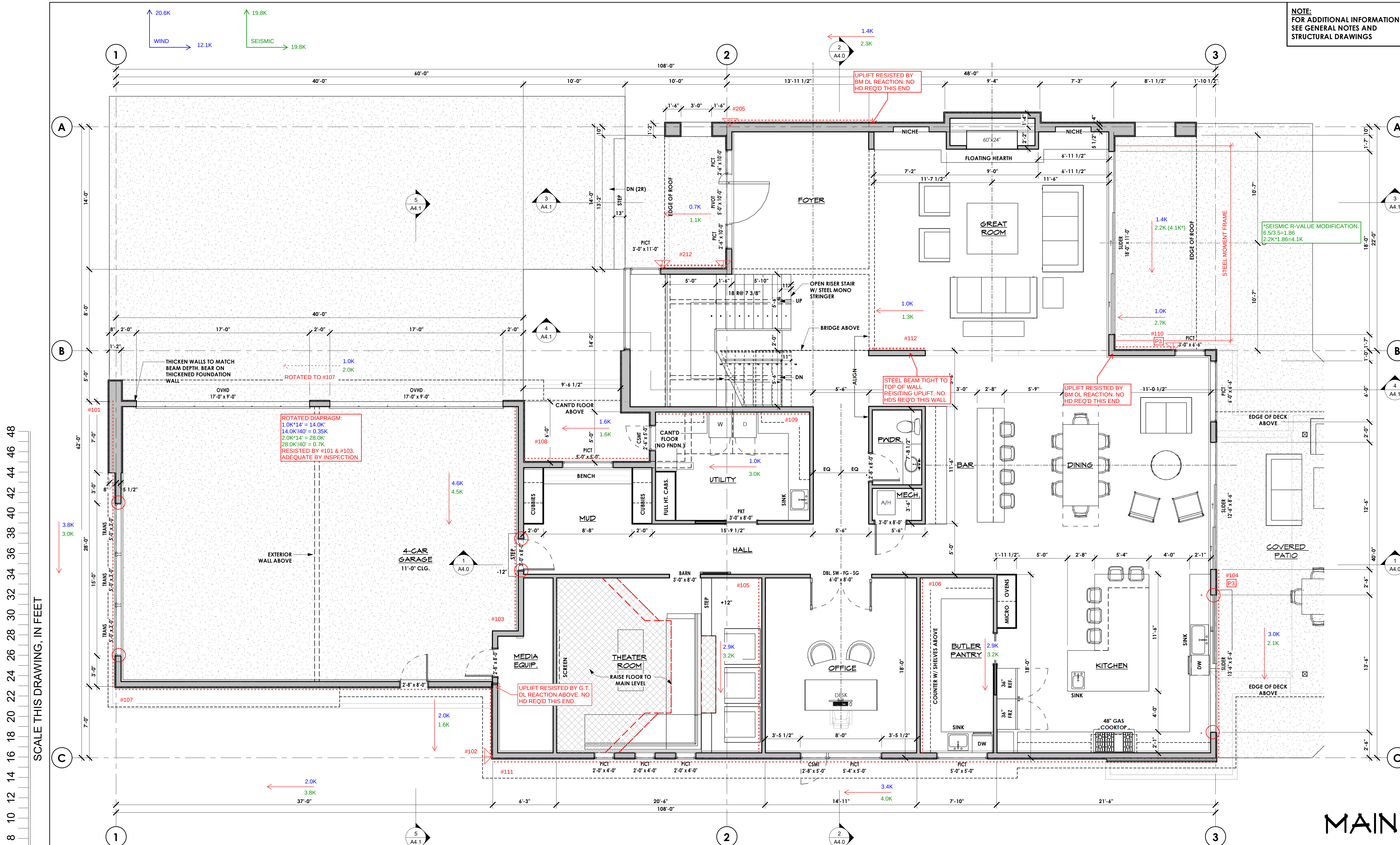
Tributary Design Areas:

Diaphragm Level	Floor-to-Floor Height		Section A	Section O	Section B	
2	9 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	660	0	sq ft
1	10 ft	Roof Surface	0	0	0	sq ft
		Wall surface	0	400	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	7.64	0.00	kips
Total Shear	0.00	7.64	0.00	kips
		7.64		kips
Story Shear	0.00	4.48	0.00	kips
Total Shear	0.00	12.12	0.00	kips
		12.12		kips
Story Shear	0.00	0.00	0.00	kips
Total Shear	0.00	12.12	0.00	kips
		12.12		kips



MacPherson Construction & Design

21626 SE 28 ST. SAMMAMISH, WA 98075-7125
PH. 425.391.3333 FAX 425.557.2841

BUTTERWORTH - HOUSE 1

5330 BUTTERWORTH RD.
MERCER ISLAND, WA 98040
PARCEL #: 866140-0040

FLOOR PLAN - MAIN

DATE	REV.	BY	DESCRIPTION
02/16/24		XXX	CONCEPT DESIGN

DRAWING NUMBER:

A2.1

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NOTE:
FOR ADDITIONAL INFORMATION, SEE GENERAL NOTES AND STRUCTURAL DRAWINGS

WIND 7.6K / 7.9K

SEISMIC 12.8K / 12.8K

FLAT ROOF ASSEMBLY (UNVENTED)
TAPERED INSULATION OVER PVC MEMMBRANE
12" PARALLEL CHORD ROOF TRUSSES
NO OVERHANGS.
R-38 MIN. COMBINED
2" CLOSED CELL SPRAY FOAM (R-12)
FILL CAVITY W/ BATT INSULATION (R-26)

RIDGE +4.75"

OPEN TO BELOW

STEEL MOMENT FRAME

*SEISMIC R-VALUE MODIFICATION.
6.5/3.5=1.86
2.2K*1.86=4.1K

ROTATED DIAPRAGM:
0.5K*12' = 6.0K'
6.0K'/40' = 0.15K
1.0K*12' = 12.0K'
12.0K'/40' = 0.3K
RESISTED BY #206 & #211.
ADEQUATE BY INSPECTION

ROTATED TO #210

UPLIFT RESISTED BY G.T. DL REACTION. NO HD REQ'D THIS END.

9'-0" CEILINGS TYPICAL, UON

EXISTING STRUCTURE

SCALE THIS DRAWING, IN FEET

UPPER

MacPherson
Construction & Design
21626 SE 28 ST. SAMMAMISH, WA 98075-7125
PH. 425.391.3333 FAX 425.557.2841

BUTTERWORTH - HOUSE 1

5330 BUTTERWORTH RD.
MERCER ISLAND, WA 98040
PARCEL #: 866140-0040

FLOOR PLAN - UPPER

DATE	REV.	BY	DESCRIPTION
02/16/24		XXX	CONCEPT DESIGN

DRAWING NUMBER:
A2.2

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MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 201: 2nd - Front Exterior Bed/Bath 3

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_o	3.0	ft.		
Wall Length, L	28.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1800 lbs	<	5037 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	190	plf	Overturning Moment	16.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	77.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 202: 2nd - Front Exteiorr Bed 2

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	7.0	ft.	Qualifying Wall Length, L	7.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	2351 lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL	135	plf	Overturning Moment	9.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	10.5	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 203: 2nd - Rear Interior Bed 1

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	17.2	ft.	Qualifying Wall Length, L	17.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1600 lbs	<	5766 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	135	plf	Overturning Moment	14.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	30.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 204: 2nd - Rear Inteiror Bath 2

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	17.2	ft.	Qualifying Wall Length, L	17.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1600 lbs	<	5766 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	135	plf	Overturning Moment	14.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	30.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 205: 2nd - Side Exteiror Foyer/Great

Shearwall Properties:

Wall height, H	16.3	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	14.5	ft.	Qualifying Wall Length, L	14.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1400 lbs	<	4869 lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL	200	plf	Overturning Moment	22.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	600	lbs	Resistive Moment	26.8	k-ft	Holdown Capacity	4015	lbs

Hold-down Specification

No Holdown Required

Shearwall 206: 2nd - Side Exterior Playroom

Shearwall Properties:

Wall height, H	12.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	17.0	ft.	Qualifying Wall Length, L	17.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	5709 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	440	plf	Overturning Moment	25.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	63.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 207: 2nd - Side Exteiror Bath 3 to Bed 4

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, H_c	3.0	ft.		
Wall Length, L	15.7	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	3274 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	135	plf	Overturning Moment	7.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	250	lbs	Resistive Moment	18.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 208: 2nd - Side Exterior Bed 3

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, Hc	5.5	ft.		
Wall Length, L	17.5	ft.	Qualifying Wall Length, L	9.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	3190 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	135	plf	Overturning Moment	8.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	31.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 209: 2ND - SIDE EXTEIROR BED 2 TO MASTER BATH

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	5.5	FT.		
WALL LENGTH, L	53.0	FT.	QUALIFYING WALL LENGTH, L	31.1	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1200 LBS	<	10437 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	440	PLF	OVERTURNING MOMENT	12.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	575.3	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 210: 2ND - FRONT INTERIOR MASTER BED

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.0	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
500 LBS	<	5037 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	4.5	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	15.5	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 211: 2ND - SIDE EXTEIROR MASTER BATH/WIC

SHEARWALL PROPERTIES:

WALL HEIGHT, H	11.0	FT.	MAX WALL OPENING HT, H_c	3.0	FT.		
WALL LENGTH, L	15.0	FT.	QUALIFYING WALL LENGTH, L	12.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
500 LBS	<	4030 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	135	PLF	OVERTURNING MOMENT	5.5	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	19.1	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 212: 2ND - SIDE EXTEIROR STAIR

SHEARWALL PROPERTIES:

WALL HEIGHT, H	20.0	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	<	1679 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	235	PLF	OVERTURNING MOMENT	14.0	K-FT	HOLD DOWN DESIGN LOAD	979	LBS
DL AT ENDS OF WALL	800	LBS	RESISTIVE MOMENT	8.1	K-FT	HOLDOWN CAPACITY	4015	LBS

HOLD-DOWN SPECIFICATION

SIMPSON HTT5 TENSION TIE

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 213: 2ND - SIDE EXTEIROR MASTER BED

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.5	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	16.5	FT.	QUALIFYING WALL LENGTH, L	16.5	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1000 LBS	<	5541 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	135	PLF	OVERTURNING MOMENT	10.5	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	22.5	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 101: 1ST - FRONT EXTEIROR GARAGE

SHEARWALL PROPERTIES:

WALL HEIGHT, H	11.0	FT.	MAX WALL OPENING HT, Hc	3.0	FT.		
WALL LENGTH, L	28.0	FT.	QUALIFYING WALL LENGTH, L	13.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3800 LBS	<	4365 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	135	PLF	OVERTURNING MOMENT	41.8	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	77.9	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 102: 1ST - FRONT EXTEIROR MEDIA

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	7.0	FT.	QUALIFYING WALL LENGTH, L	7.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2000 LBS	<	2351 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	260	PLF	OVERTURNING MOMENT	20.0	K-FT	HOLD DOWN DESIGN LOAD	958	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	13.3	K-FT	HOLDOWN CAPACITY	4015	LBS

HOLD-DOWN SPECIFICATION

SIMPSON HTT5 TENSION TIE

SHEARWALL 103: 1ST - REAR INTEIROR GARAGE

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, Hc	8.0	FT.		
WALL LENGTH, L	22.6	FT.	QUALIFYING WALL LENGTH, L	19.3	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
4600 LBS	<	6464 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	200	PLF	OVERTURNING MOMENT	46.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	70.3	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 104: 1ST - REAR EXTERIOR KITCHEN

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	5.5	FT.		
WALL LENGTH, L	18.5	FT.	QUALIFYING WALL LENGTH, L	5.0	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3000 LBS	<	3072 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	250	PLF	OVERTURNING MOMENT	30.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	800	LBS	RESISTIVE MOMENT	51.8	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 105: 1ST - REAR INTERIOR THEATER

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	17.2	FT.	QUALIFYING WALL LENGTH, L	17.2	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2900 LBS	<	5766 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	215	PLF	OVERTURNING MOMENT	29.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	47.1	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 106: 1st - Front Interior Butlers

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	17.2	ft.	Qualifying Wall Length, L	17.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2900 lbs	<	5766 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	215	plf	Overturning Moment	29.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	47.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 107: 1st - Side Exterior Garage

Shearwall Properties:

Wall height, H	11.0	ft.	Max wall opening ht, Hc	8.0	ft.		
Wall Length, L	37.0	ft.	Qualifying Wall Length, L	34.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	11417 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	300	plf	Overturning Moment	22.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	198.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 108: 1ST - SIDE EXTERIOR MUD

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	5.0	FT.		
WALL LENGTH, L	12.5	FT.	QUALIFYING WALL LENGTH, L	7.5	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1600 LBS	<	2519 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	120	PLF	OVERTURNING MOMENT	16.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	21.9	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 109: 1ST - SIDE INTERIOR UTILITY

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	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
1000 LBS	<	5037 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	250	PLF	OVERTURNING MOMENT	10.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	41.5	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

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SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 110: 1ST - SIDE EXTERIOR DINING

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	6.0	FT.	QUALIFYING WALL LENGTH, L	6.0	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1000 LBS	<	3781 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	250	PLF	OVERTURNING MOMENT	10.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	10.5	K-FT	HOLDOWN CAPACITY	4015	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 111: 1ST - SIDE EXTERIORMEDIA TO KITCHEN

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, Hc	5.0	FT.		
WALL LENGTH, L	71.0	FT.	QUALIFYING WALL LENGTH, L	47.9	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3400 LBS	<	16092 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	560	PLF	OVERTURNING MOMENT	50.1	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	800	LBS	RESISTIVE MOMENT	1321.5	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

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SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 112: 1ST - SIDE INTERIOR GREAT

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	5.5	FT.	QUALIFYING WALL LENGTH, L	5.5	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1000 LBS	<	1847 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	200	PLF	OVERTURNING MOMENT	10.0	K-FT	HOLD DOWN DESIGN LOAD	243	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	8.7	K-FT	HOLDOWN CAPACITY	4015	LBS

HOLD-DOWN SPECIFICATION

SIMPSON HTT5 TENSION TIE

SHEARWALL : BASEMENT - 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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Shear Wall Calculations - Seismic

MacPherson Construction

5330 Butterworth - House 1

Mercer Island, WA

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2021 IBC Ch. 1609, ASCE 7-16 Ch. 26-30

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Richard J. Zabel, P.E., Project Manager + Director of Engineering

Riley J. Denis, E.I.T., Project Engineer

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SEISMIC CALCULATION - ASCE 7-16

M+K Project #: 306-24003
Engineer: RJD

Seismic Design Category:

User Inputs:

Site Class	D
Spectral Response Acceleration 0.2 sec, **Ss**	1.437
Spectral Response Acceleration 1.0 sec, **S1**	0.499
Occupancy Category	II

Variables:

Site coefficient, Fa	1.20
Site coefficient, Fv	1.80

Calculated Values:

Maximum spectral response acceleration, S_{ms}	1.724
Maximum spectral response acceleration, S_{m1}	0.899
Design spectral response acceleration, S_{ds}	1.150
Design spectral response acceleration, S_{d1}	0.599
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)	8
Ht. abv base to highest level, h_n	19

Calculated Values:

Approximate Fundamental Period, T_a	0.182
T_0	0.104
T_s	0.521
Spectral Response Acc., S_a (g)	1.150

Site Class Assumption

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

Equivalent lateral force procedure

Dead Load Calculation:

Level	Story Ht. (ft.)	Area (ft^2)	Dead Load (psf)	DL of ext wall trib. to level (kips)	Total level DL
1	10.0	5270	12	18.4	82 k
2	9.0	4045	17	9.6	78 k
3	0.0	0	0	0.0	0 k
4	0.0	0	0	0.0	0 k
5	0.0	0	0	0.0	0 k
6	0.0	0	0	0.0	0 k
7	0.0	0	0	0.0	0 k
8	0.0	0	0	0.0	0 k
9	0.0	0	0	0.0	0 k
10	0.0	0	0	0.0	0 k
11	0.0	0	0	0.0	0 k
12	0.0	0	0	0.0	0 k
13	0.0	0	0	0.0	0 k
14	0.0	0	0	0.0	0 k
15	0.0	0	0	0.0	0 k

Total Dead Load Of Structure 160 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	0.177	0.177

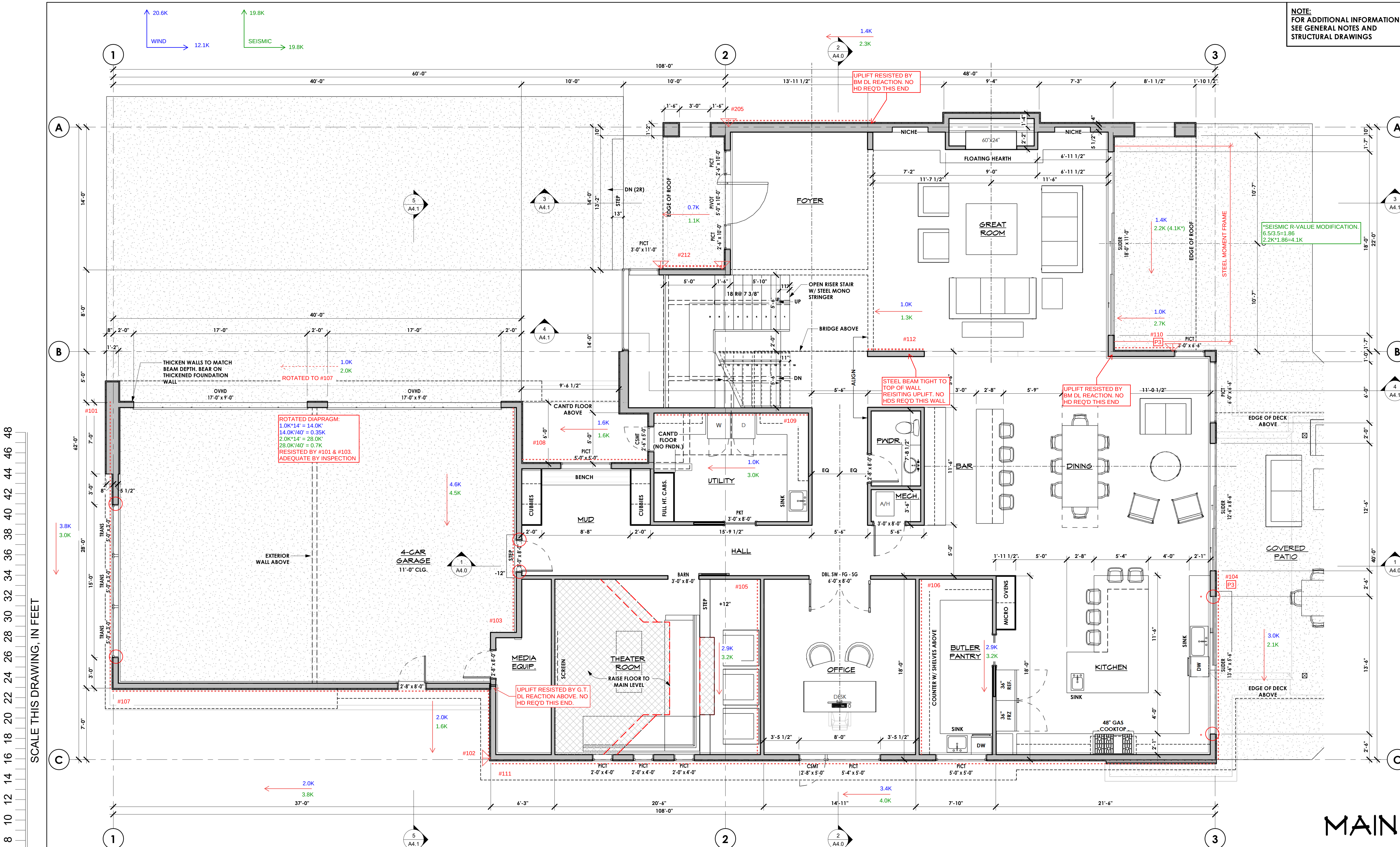
Base Shears:

Ultimate Loads				x 0.7 =	Allowable Loads			
Transverse		Longitudinal			Transverse		Longitudinal	
28	k	28	k		19.8	k	19.8	k

Story Shear Calculation:

Distribution exponent, k: 1.00

Level	Vert. Dist. Factor, C_{vx}	Ultimate Loads: Transverse *Story Shear, F_x*		Ultimate Loads: Longitudinal *Story Shear, F_x*		x 0.7 = Allowable Loads: Transverse *Story Shear, F_x*		Allowable Loads: Transverse *Σ Story Shear*		Allowable Loads: Longitudinal *Story Shear, F_x*		Allowable Loads: Longitudinal *Σ Story Shear*	
1	0.354	10.0	k	10.0	k	7.0	k	19.8	k	7.0	k	19.8	k
2	0.646	18.3	k	18.3	k	12.8	k	12.8	k	12.8	k	12.8	k
3	0.000	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
4	0.000	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
5	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
6	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
7	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
8	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
9	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
10	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
11	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
12	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
13	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
14	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k
15	0.00	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k	0.0	k



NOTE:
FOR ADDITIONAL INFORMATION, SEE GENERAL NOTES AND STRUCTURAL DRAWINGS
WIND
SEISMIC
FOYER
GREAT ROOM
FLOATING HEARTH
NICHE
OPEN RISER STAIR W/ STEEL MONO STRINGER
BRIDGE ABOVE
4-CAR GARAGE
11'-0" CLG.
EXTERIOR WALL ABOVE
THICKEN WALLS TO MATCH BEAM DEPTH. BEAR ON THICKENED FOUNDATION WALL
ROTATED TO #107
ROTATED DIAPRAGM:
1.0K*14' = 14.0K'
14.0K'/40' = 0.35K
2.0K*14' = 28.0K'
28.0K'/40' = 0.7K
RESISTED BY #101 & #103.
ADEQUATE BY INSPECTION
CANT'D FLOOR ABOVE
MUD
BENCH
CUBBIES
FULL HT. CABS.
UTILITY
CANT'D FLOOR (NO FNDN.)
HALL
PWDR.
MECH.
BAR
DINING
KITCHEN
BUTLER PANTRY
OVENS
MICRO
OFFICE
DESK
THEATER ROOM
RAISE FLOOR TO MAIN LEVEL
SCREEN
MEDIA EQUIP.
COVERED PATIO
EDGE OF DECK ABOVE
EDGE OF ROOF
STEEL MOMENT FRAME
*SEISMIC R-VALUE MODIFICATION
6.5/3.5=1.86
2.2K*1.86=4.1K
UPLIFT RESISTED BY BM DL REACTION. NO HD REQ'D THIS END
STEEL BEAM TIGHT TO TOP OF WALL RESISTING UPLIFT. NO HDS REQ'D THIS WALL
UPLIFT RESISTED BY G.T. DL REACTION ABOVE. NO HD REQ'D THIS END.
48" GAS COOKTOP
SCALE THIS DRAWING, IN FEET
MAIN

MacPherson Construction & Design

21626 SE 28 ST. SAMMAMISH, WA 98075-7125
PH. 425.391.3333 FAX 425.557.2841

BUTTERWORTH - HOUSE 1

5330 BUTTERWORTH RD.
MERCER ISLAND, WA 98040
PARCEL #: 866140-0040

FLOOR PLAN - MAIN

DATE	REV.	BY	DESCRIPTION
02/16/24		XXX	CONCEPT DESIGN

DRAWING NUMBER:
A2.1

3/19/2024 1:57:43 PM

NOTE:
FOR ADDITIONAL INFORMATION, SEE GENERAL NOTES AND STRUCTURAL DRAWINGS

WIND 7.6K / 7.9K

SEISMIC 12.8K / 12.8K

FLAT ROOF ASSEMBLY (UNVENTED)
TAPERED INSULATION OVER PVC MEMMBRANE
12" PARALLEL CHORD ROOF TRUSSES
NO OVERHANGS.
R-38 MIN. COMBINED
2" CLOSED CELL SPRAY FOAM (R-12)
FILL CAVITY W/ BATT INSULATION (R-26)

RIDGE +4.75"

OPEN TO BELOW

STEEL MOMENT FRAME

*SEISMIC R-VALUE MODIFICATION.
6.5/3.5=1.86
2.2K*1.86=4.1K

ROTATED DIAPRAGM:
0.5K*12' = 6.0K'
6.0K'/40' = 0.15K
1.0K*12' = 12.0K'
12.0K'/40' = 0.3K
RESISTED BY #206 & #211.
ADEQUATE BY INSPECTION

ROTATED TO #210

UPLIFT RESISTED BY G.T. DL REACTION. NO HD REQ'D THIS END.

9'-0" CEILINGS TYPICAL, UON

EXISTING STRUCTURE

SCALE THIS DRAWING, IN FEET

UPPER

MacPherson
Construction & Design
21626 SE 28 ST. SAMMAMISH, WA 98075-7125
PH. 425.391.3333 FAX 425.557.2841

BUTTERWORTH - HOUSE 1

5330 BUTTERWORTH RD.
MERCER ISLAND, WA 98040
PARCEL #: 866140-0040

FLOOR PLAN - UPPER

DATE	REV.	BY	DESCRIPTION
02/16/24		XXX	CONCEPT DESIGN

DRAWING NUMBER:
A2.2

3/19/2024 1:57:45 PM

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 201: 2nd - Front Exterior Bed/Bath 3

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_o	3.0	ft.		
Wall Length, L	28.0	ft.	Qualifying Wall Length, L	15.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3200 lbs	<	3598 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	190	plf	Overturning Moment	28.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	56.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 202: 2nd - Front Exteiorr Bed 2

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	7.0	ft.	Qualifying Wall Length, L	7.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1600 lbs	<	1679 lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL	135	plf	Overturning Moment	14.4	k-ft	Hold Down Design Load	956	lbs
DL at ends of wall	1200	lbs	Resistive Moment	7.7	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 203: 2nd - Rear Interior Bed 1

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	17.2	ft.	Qualifying Wall Length, L	17.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2400 lbs	<	4118 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	135	plf	Overturning Moment	21.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	22.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 204: 2nd - Rear Inteiror Bath 2

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	17.2	ft.	Qualifying Wall Length, L	17.2	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2400 lbs	<	4118 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	135	plf	Overturning Moment	21.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	22.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 205: 2nd - Side Exteiror Foyer/Great

Shearwall Properties:

Wall height, H	16.3	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	14.5	ft.	Qualifying Wall Length, L	14.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	3478 lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL	200	plf	Overturning Moment	37.4	k-ft	Hold Down Design Load	1228	lbs
DL at ends of wall	600	lbs	Resistive Moment	19.6	k-ft	Holdown Capacity	4015	lbs

Hold-down Specification

Simpson HTT5 tension tie

Shearwall 206: 2nd - Side Exterior Playroom

Shearwall Properties:

Wall height, H	12.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	17.0	ft.	Qualifying Wall Length, L	17.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3300 lbs	<	4078 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	440	plf	Overturning Moment	41.3	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	46.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 207: 2nd - Side Exteiror Bath 3 to Bed 4

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, H_c	3.0	ft.		
Wall Length, L	15.7	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	2339 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	135	plf	Overturning Moment	12.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	250	lbs	Resistive Moment	13.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 208: 2nd - Side Exterior Bed 3

Shearwall Properties:

Wall height, H	10.5	ft.	Max wall opening ht, Hc	5.5	ft.		
Wall Length, L	17.5	ft.	Qualifying Wall Length, L	9.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1400 lbs	<	2279 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	135	plf	Overturning Moment	14.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	22.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 209: 2ND - SIDE EXTEIROR BED 2 TO MASTER BATH

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	5.5	FT.		
WALL LENGTH, L	53.0	FT.	QUALIFYING WALL LENGTH, L	31.1	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2400 LBS	<	7455 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	440	PLF	OVERTURNING MOMENT	24.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	420.9	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 210: 2ND - FRONT INTERIOR MASTER BED

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.0	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
1000 LBS	<	3598 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	9.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	11.4	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 211: 2ND - SIDE EXTEIROR MASTER BATH/WIC

SHEARWALL PROPERTIES:

WALL HEIGHT, H	11.0	FT.	MAX WALL OPENING HT, H_c	3.0	FT.		
WALL LENGTH, L	15.0	FT.	QUALIFYING WALL LENGTH, L	12.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
500 LBS	<	2878 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	135	PLF	OVERTURNING MOMENT	5.5	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	14.0	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 212: 2ND - SIDE EXTEIROR STAIR

SHEARWALL PROPERTIES:

WALL HEIGHT, H	20.0	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
1100 LBS	<	1199 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	235	PLF	OVERTURNING MOMENT	22.0	K-FT	HOLD DOWN DESIGN LOAD	2676	LBS
DL AT ENDS OF WALL	800	LBS	RESISTIVE MOMENT	5.9	K-FT	HOLDOWN CAPACITY	4015	LBS

HOLD-DOWN SPECIFICATION

SIMPSON HTT5 TENSION TIE

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 213: 2ND - SIDE EXTEIROR MASTER BED

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.5	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	16.5	FT.	QUALIFYING WALL LENGTH, L	16.5	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1500 LBS	<	3958 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	135	PLF	OVERTURNING MOMENT	15.8	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	16.4	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 101: 1ST - FRONT EXTEIROR GARAGE

SHEARWALL PROPERTIES:

WALL HEIGHT, H	11.0	FT.	MAX WALL OPENING HT, Hc	3.0	FT.		
WALL LENGTH, L	28.0	FT.	QUALIFYING WALL LENGTH, L	13.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3000 LBS	<	3118 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	135	PLF	OVERTURNING MOMENT	33.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	57.0	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 102: 1ST - FRONT EXTEIROR MEDIA

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	7.0	FT.	QUALIFYING WALL LENGTH, L	7.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1600 LBS	<	1679 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	260	PLF	OVERTURNING MOMENT	16.0	K-FT	HOLD DOWN DESIGN LOAD	896	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	9.7	K-FT	HOLDOWN CAPACITY	4015	LBS

HOLD-DOWN SPECIFICATION

SIMPSON HTT5 TENSION TIE

SHEARWALL 103: 1ST - REAR INTEIROR GARAGE

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, Hc	8.0	FT.		
WALL LENGTH, L	22.6	FT.	QUALIFYING WALL LENGTH, L	19.3	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
4500 LBS	<	4617 LBS

SHEARWALL ASSEMBLY SPECIFICATION

P1 - 1-SIDE 7/16" OSB
FASTENED W/ 8D NAILS AT 6"O.C. PANEL EDGES & 12"O.C. PANEL FIELD - EDGES BLOCKED
ADEQUATE

OVERTURNING EVALUATION:

RESISTIVE DL	200	PLF	OVERTURNING MOMENT	45.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	51.4	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 104: 1ST - REAR EXTERIOR KITCHEN

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	5.5	FT.		
WALL LENGTH, L	18.5	FT.	QUALIFYING WALL LENGTH, L	5.0	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2100 LBS	<	2194 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	250	PLF	OVERTURNING MOMENT	21.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	800	LBS	RESISTIVE MOMENT	37.9	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 105: 1ST - REAR INTERIOR THEATER

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	17.2	FT.	QUALIFYING WALL LENGTH, L	17.2	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3200 LBS	<	4118 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	215	PLF	OVERTURNING MOMENT	32.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	34.4	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 306-24003
ENGINEER: RJD

SHEARWALL 106: 1ST - FRONT INTERIOR BUTLERS

SHEARWALL PROPERTIES:

WALL HEIGHT, H	10.0	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	17.2	FT.	QUALIFYING WALL LENGTH, L	17.2	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3200 LBS	<	4118 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	215	PLF	OVERTURNING MOMENT	32.0	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	1200	LBS	RESISTIVE MOMENT	34.4	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 107: 1ST - SIDE EXTERIOR GARAGE

SHEARWALL PROPERTIES:

WALL HEIGHT, H	11.0	FT.	MAX WALL OPENING HT, Hc	8.0	FT.		
WALL LENGTH, L	37.0	FT.	QUALIFYING WALL LENGTH, L	34.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
3800 LBS	<	8155 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	300	PLF	OVERTURNING MOMENT	41.8	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	145.0	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 108: 1st - Side Exterior Mud

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	5.0	ft.		
Wall Length, L	12.5	ft.	Qualifying Wall Length, L	7.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1600 lbs	<	1799 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	120	plf	Overturning Moment	16.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	16.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 109: 1st - Side Interior Utility

Shearwall Properties:

Wall height, H	10.0	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
3000 lbs	<	3598 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	250	plf	Overturning Moment	30.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	1200	lbs	Resistive Moment	30.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 110: 1st - Side Exterior Dining

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	6.0	ft.	Qualifying Wall Length, L	6.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2700 lbs	<	2701 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	250	plf	Overturning Moment	27.0	k-ft	Hold Down Design Load	3216	lbs
DL at ends of wall	1200	lbs	Resistive Moment	7.7	k-ft	Holdown Capacity	4015	lbs

Hold-down Specification

Simpson HTT5 tension tie

Shearwall 111: 1st - Side ExteriorMedia to Kitchen

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, Hc	5.0	ft.		
Wall Length, L	71.0	ft.	Qualifying Wall Length, L	47.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
4000 lbs	<	11494 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	560	plf	Overturning Moment	72.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	800	lbs	Resistive Moment	966.9	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 306-24003
Engineer: RJD

Shearwall 112: 1st - Side Interior Great

Shearwall Properties:

Wall height, H	10.0	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	5.5	ft.	Qualifying Wall Length, L	5.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	1319 lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL	200	plf	Overturning Moment	13.0	k-ft	Hold Down Design Load	1211	lbs
DL at ends of wall	1200	lbs	Resistive Moment	6.3	k-ft	Holdown Capacity	4015	lbs

Hold-down Specification

SIMPSON HTT5 TENSION TIE

Shearwall : Basement - 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