



MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

7220 Trade Street, Suite 350, San Diego, CA 92121 ▶ p 619-650-0010 ▶ mulhernkulp.com

CALCULATION PACKAGE

March 28, 2022

JayMarc Homes

Liao Residence
4541 88th Ave SE

Mercer Island, Washington

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

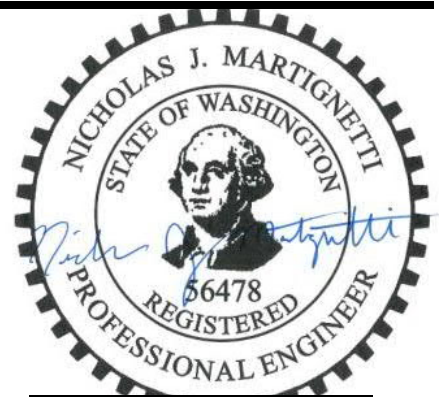
Prepared By:

Lillian G. Heng, P.E.

Staff Engineer

Nick J. Martignetti, P.E.

Associate Owner + San Diego Office Director



Signature, Seal & Date



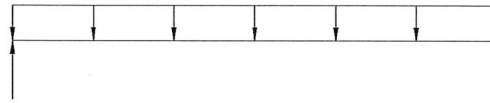
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: TYP. HEADER @ 2ND FLOOR

B1

PARAMETERS:

L = 5 FT
W = 0.254 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 0.635$ K $V_D =$ [] K < $V_{ALL} = 4.468$ K ADEQUATE
 $M_{MAX} = 0.80$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.009$ IN. $L/6203 < L/240$ ADEQUATE

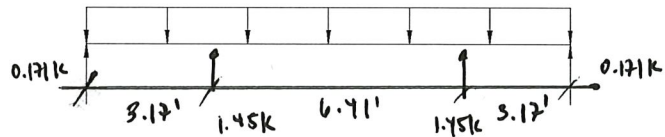
DF-L NO.2 4x10 HDR

BEAM DESCRIPTION: CONT. HEADER C MST. BDRM

B2

PARAMETERS:

L = 12.75 FT
W = 0.254 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.45$ K $V_D =$ [] K < $V_{ALL} = 4.468$ K ADEQUATE
 $M_{MAX} = 0.73$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.009$ IN. $L/8988 < L/240$ ADEQUATE

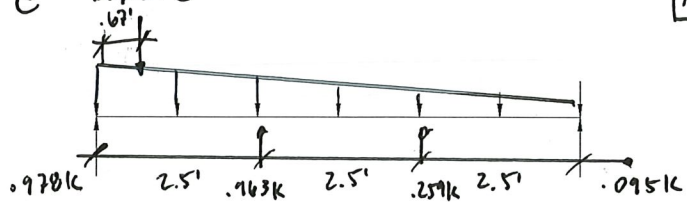
DF-L NO.2 4x10 HDR

BEAM DESCRIPTION: CONT. HEADER @ BDRM 3

B3

PARAMETERS:

L = 8.25 FT
W = 0.2625 KLF
P = 1.103 K



ANALYSIS:

$R_{MAX} = 0.978$ K $V_D =$ [] K < $V_{ALL} = 4.468$ K ADEQUATE
 $M_{MAX} = 0.6$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = .001$ IN. $L/23924 < L/240$ ADEQUATE

DF-L NO.2 4x10 HDR



BEAM & HEADER CALCULATIONS

VOID

VOID

BEAM DESCRIPTION:

HEADER @ BONDY SLIPPER

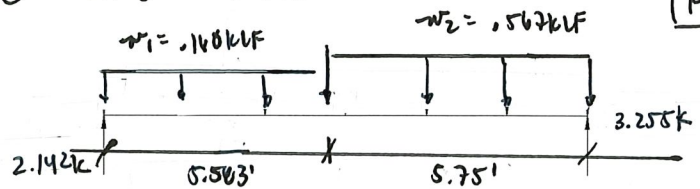
(B6)

PARAMETERS:

L = 11.33 FT

W = VARIOUS KLF

P = 1.2 K



ANALYSIS:

R_{MAX} = 3.258 K

V_D = [] K < V_{ALL} = 10.06 K

ADEQUATE

M_{MAX} = 9.34 K-FT

< M_{ALL} = 17.08 K-FT

ADEQUATE

Δ_{TL} = 0.336 IN.

L/ 404 < L/240

ADEQUATE

DF/DF 24F-V4 5 1/2" x 9" GLK



BEAM & HEADER CALCULATIONS

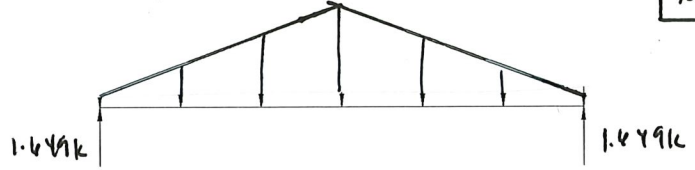
BEAM DESCRIPTION:

COVERED DECK FRONT BM .301 KLF

B7

PARAMETERS:

L = 20 FT
W = .301 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.649$ K $V_D =$ [] K $< V_{ALL} = 13.409$ K ADEQUATE
 $M_{MAX} = 10.75$ K-FT $< M_{ALL} = 30.36$ K-FT ADEQUATE
 $\Delta_{TL} = 0.526$ IN. $L/456 < L/240$ ADEQUATE

DF-DF 24F-V4 5 1/2" x 12" GLB

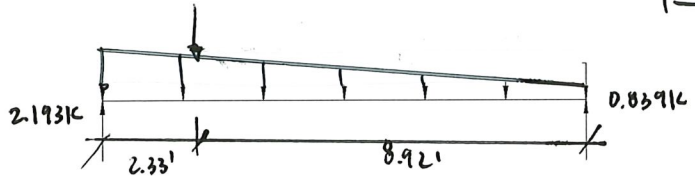
BEAM DESCRIPTION:

COVERED DECK SIDE BM

B8

PARAMETERS:

L = 11.25 FT
W = .297 KLF
P = 1.36 K



ANALYSIS:

$R_{MAX} = 2.193$ K $V_D =$ [] K $< V_{ALL} = 8.244$ K ADEQUATE
 $M_{MAX} = 4.46$ K-FT $< M_{ALL} = 10.17$ K-FT ADEQUATE
 $\Delta_{TL} = 0.108$ IN. $L/1278 < L/240$ ADEQUATE

DF-L NO.2 6x12

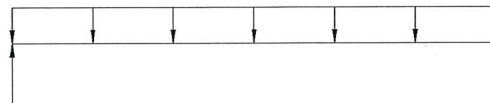
BEAM DESCRIPTION:

SLIDER HEADER @ KITCHEN

B9

PARAMETERS:

L = 8 FT
W = .004 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 0.334$ K $V_D =$ [] K $< V_{ALL} = 4.47$ K ADEQUATE
 $M_{MAX} = 0.472$ K-FT $< M_{ALL} = 5.167$ K-FT ADEQUATE
 $\Delta_{TL} = 0.021$ IN. $L/4506 < L/240$ ADEQUATE

DF-L NO.2 4x10 HDR



BEAM & HEADER CALCULATIONS

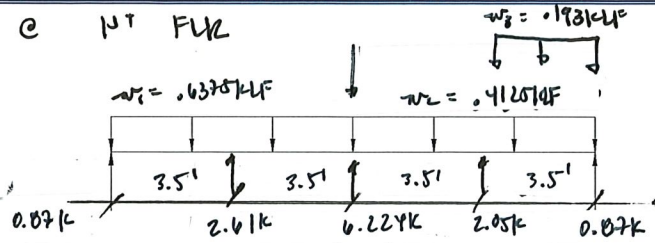
BEAM DESCRIPTION: TYP. HDR @ 1ST FLR

PARAMETERS:

L = 14 FT

W = VARIES KLF

P = 4.59 K



ANALYSIS:

R_{MAX} = 6.224 K V_D = 0.00 K < V_{ALL} = 3.885 K ADEQUATE

M_{MAX} = -0.07 K-FT < M_{ALL} = 7.492 K-FT ADEQUATE

Δ_{TL} = 0.001 IN. L/39100 < L/240 ADEQUATE

DF-L NO.2 4x10 HDR

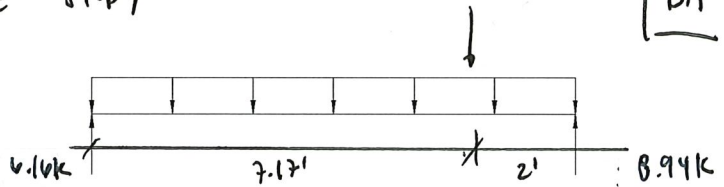
BEAM DESCRIPTION: HEADER @ STUDY

PARAMETERS:

L = 9.12 FT

W = 1.11 KLF

P = 4.93 K



ANALYSIS:

R_{MAX} = 8.94 K V_D = K < V_{ALL} = 12.0 K ADEQUATE

M_{MAX} = 15.67 K-FT < M_{ALL} = 43.47 K-FT ADEQUATE

Δ_{TL} = 0.077 IN. L/1424 < L/240 ADEQUATE

DF-DF 24F-V4 3 1/2" x 18" GUB

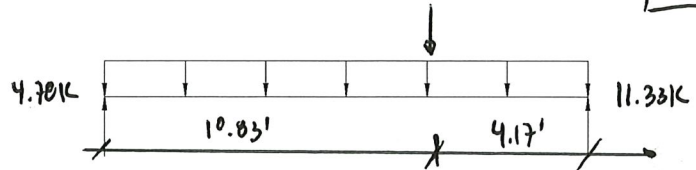
BEAM DESCRIPTION: BM BEWN EX. WALL @ GREAT ROOM

PARAMETERS:

L = 15 FT

W = 0.91 KLF

P = 14.756 K



ANALYSIS:

R_{MAX} = 4.70 K V_D = K < V_{ALL} = 20.114 K ADEQUATE

M_{MAX} = 44.48 K-FT < M_{ALL} = 68.31 K-FT ADEQUATE

Δ_{TL} = 0.26 IN. L/701 < L/240 ADEQUATE

DF-PF 24F-V4 5 1/2" x 10" GUB

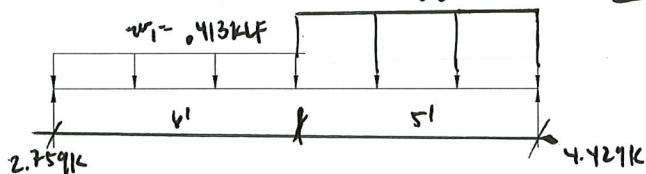


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: 2ND FLOOR BM @ NOOK / GREAT ROOM w₁ = 1.086 KLF | B13

PARAMETERS:

L = 11 FT
W = VARYING KLF
P = N/A K



ANALYSIS:

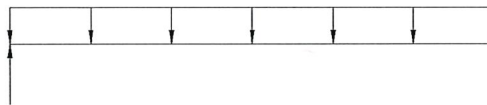
R_{MAX} = 4.429 K V_D = [] K < V_{ALL} = 11.13 K ADEQUATE
M_{MAX} = 9.93 K-FT < M_{ALL} = 37.8 K-FT ADEQUATE
Δ_{TL} = 0.069 IN. L/1912 < L/240 ADEQUATE

PF-DF 24F-V4 3 1/2" x 10" 6 LB

BEAM DESCRIPTION: INT. HDR @ PANTHY B14

PARAMETERS:

L = 3.83 FT
W = 1.23 KLF
P = N/A K



ANALYSIS:

R_{MAX} = 2.35 K V_D = [] K < V_{ALL} = 3.085 K ADEQUATE
M_{MAX} = 2.26 K-FT < M_{ALL} = 4.492 K-FT ADEQUATE
Δ_{TL} = 0.016 IN. L/2850 < L/240 ADEQUATE

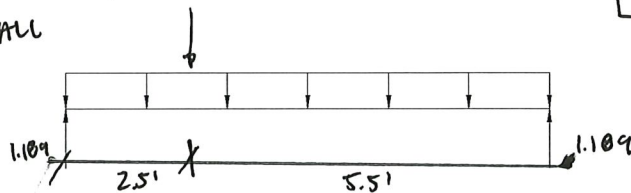
PF-L NO.2 4x10 HDR

BEAM DESCRIPTION: SLIDER HDR @ STUDY B15

PARAMETERS:

L = 8 FT
W = .290 KLF
P = .131 K

* JEE EMERCALL OUTPUT



ANALYSIS:

R_{MAX} = 1.109 K V_D = [] K < V_{ALL} = 4.440 K ADEQUATE
M_{MAX} = 2.30 K-FT < M_{ALL} = 5.148 K-FT ADEQUATE
Δ_{TL} = 0.075 IN. L/1206 < L/240 ADEQUATE

PF-L NO.2 4x10 HDR

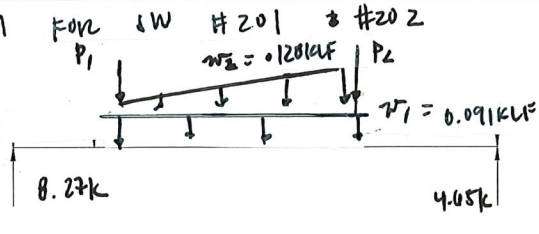


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: OVER STRENGTH BM FOR SW #201 & #202 B16

PARAMETERS:

L = 18.17 FT SEE EMERCALL OUTPUT
W = .151 KLF
P = VARIES K → OVERSTRENGTH HOLDOWN



ANALYSIS:

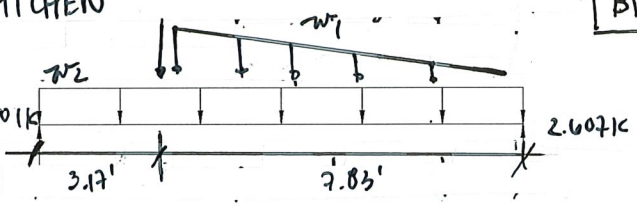
R_{MAX} = [] K V_D = [] K < V_{ALL} = [] K ADEQUATE
M_{MAX} = [] K-FT < M_{ALL} = [] K-FT ADEQUATE
Δ_{TL} = [] IN. L/ [] < L/240 ADEQUATE

DF-DF 24F-V4 5 1/2" x 18" 6LB

BEAM DESCRIPTION: FUR BM @ KITCHEN B17

PARAMETERS:

L = 11 FT w₁ = .203KLF
W = VARIES KLF w₂ = .331KLF 3.001K
P = 1.025 K



ANALYSIS:

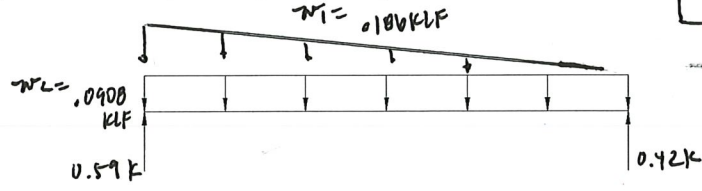
R_{MAX} = 3.001 K V_D = [] K < V_{ALL} = 12.8 K ADEQUATE
M_{MAX} = 8.52 K-FT < M_{ALL} = 43.47 K-FT ADEQUATE
Δ_{TL} = 0.060 IN. L/ 2183 < L/240 ADEQUATE

DF-DF 24F-V4 3 1/2" x 18" 6LB

BEAM DESCRIPTION: 2ND FLOOR BM IN BDKM 4 B18

PARAMETERS:

L = 5.5 FT
W = VARIES KLF
P = N/A K



ANALYSIS:

R_{MAX} = 0.59 K V_D = [] K < V_{ALL} = 12.8 K ADEQUATE
M_{MAX} = 0.70 K-FT < M_{ALL} = 43.47 K-FT ADEQUATE
Δ_{TL} = 0.001 IN. L/ 53097 < L/240 ADEQUATE

DF-DF 24F-V4 3 1/2" x 18" 6LB



BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION:

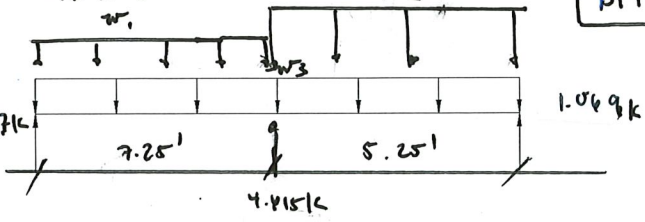
FLOOR BM @ GARAGE & ENTRY

B19

PARAMETERS:

L = 12.5 FT
W = VARIES KLF
P = N/A K

$w_1 = .274 \text{ KLF}$
 $w_2 = .349 \text{ KLF}$
 $w_3 = .270 \text{ KLF}$



ANALYSIS:

$R_{MAX} = 4.615 \text{ K}$ $V_D = \text{ } \text{K}$ $< V_{ALL} = 12.6 \text{ K}$ ADEQUATE
 $M_{MAX} = -3 \text{ K-FT}$ $< M_{ALL} = 43.42 \text{ K-FT}$ ADEQUATE
 $\Delta_{TL} = 0.006 \text{ IN.}$ $L/15104 < L/240$ ADEQUATE

DF-DF 24F-V4 3 1/2" x 10" 6 LBS

BEAM DESCRIPTION:

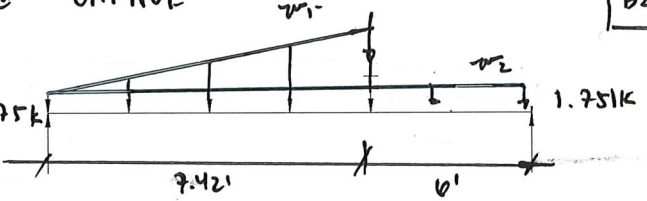
FLOOR BM @ GARAGE

B20

PARAMETERS:

L = 13.42 FT
W = VARIES KLF
P = 1.577 K

$w_1 = 0.197 \text{ KLF}$
 $w_2 = .09083 \text{ KLF}$
+ JEE FURNACE OUTPUT



ANALYSIS:

$R_{MAX} = 1.775 \text{ K}$ $V_D = \text{ } \text{K}$ $< V_{ALL} = 12.6 \text{ K}$ ADEQUATE
 $M_{MAX} = 8.86 \text{ K-FT}$ $< M_{ALL} = 43.42 \text{ K-FT}$ ADEQUATE
 $\Delta_{TL} = 0.084 \text{ IN.}$ $L/1927 < L/240$ ADEQUATE

DF-DF 24F-V4 3 1/2" x 10" 6 LBS

BEAM DESCRIPTION:

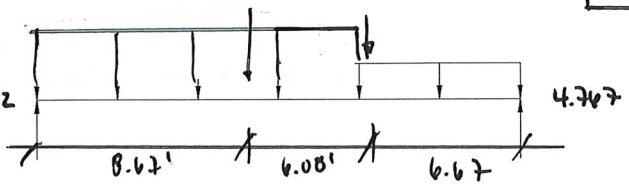
FLOOR BM @ GARAGE

B21

PARAMETERS:

L = 21.42 FT
W = VARIES KLF
P = VARIES K

+ JEE FURNACE OUTPUT 6.192



ANALYSIS:

$R_{MAX} = 6.192 \text{ K}$ $V_D = \text{ } \text{K}$ $< V_{ALL} = 17.5 \text{ K}$ ADEQUATE
 $M_{MAX} = 33.22 \text{ K-FT}$ $< M_{ALL} = 56.53 \text{ K-FT}$ ADEQUATE
 $\Delta_{TL} = 0.654 \text{ IN.}$ $L/393 < L/240$ ADEQUATE

DF-DF 24F-V4 5 1/2" x 10" 6 LBS



BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: HEADER @ GARAGE

HEADER @ GARAGE

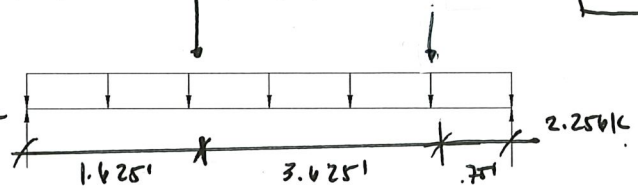
$P_1 = 6.241K$

B22

PARAMETERS:

L = 6 FT
W = .084 KLF
P = VARIES K

JOE EMERALL
OUTPUT 5.49K



ANALYSIS:

$R_{MAX} = 5.49$ K $V_D =$ [] K < $V_{ALL} = 7.17$ K ADEQUATE
 $M_{MAX} = 7.57$ K-FT < $M_{ALL} = 8.84$ K-FT ADEQUATE
 $\Delta_{TL} = 0.049$ IN. L/1470 < L/240 ADEQUATE

DF-L NO.2 6x12 HDR

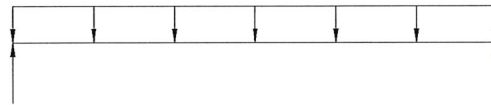
BEAM DESCRIPTION: GARAGE POOR HEADER

GARAGE POOR HEADER

B23

PARAMETERS:

L = 10 FT
W = .200 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.6$ K $V_D =$ [] K < $V_{ALL} = 8.24$ K ADEQUATE
 $M_{MAX} = 6.4$ K-FT < $M_{ALL} = 10.17$ K-FT ADEQUATE
 $\Delta_{TL} = 0.325$ IN. L/590 < L/240 ADEQUATE

DF-L NO.2 6x12 HDR

BEAM DESCRIPTION: FUR BM @ BDRM 4

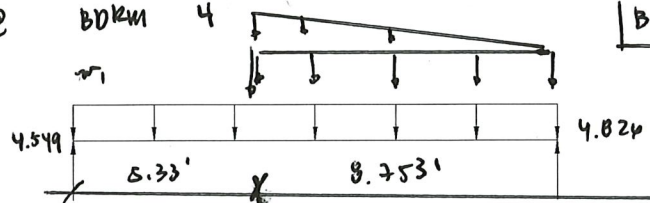
FUR BM @ BDRM 4

BDRM 4

B24

PARAMETERS:

L = 14.003 FT $w_1 =$
W = VARIES KLF $w_2 =$
P = .308 K



ANALYSIS:

$R_{MAX} = 4.824$ K $V_D =$ [] K < $V_{ALL} = 11.13$ K ADEQUATE
 $M_{MAX} = 17.41$ K-FT < $M_{ALL} = 37.8$ K-FT ADEQUATE
 $\Delta_{TL} = 0.202$ IN. L/835 < L/240 ADEQUATE

DF-DF 24F-V 4 3 1/2" x 10" 6LB

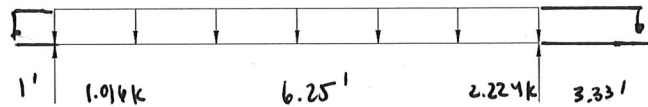


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: PORCH FASCH BEAM B25

PARAMETERS:

L = 6.25 FT
W = .307 KLF
P = M/A K



ANALYSIS:

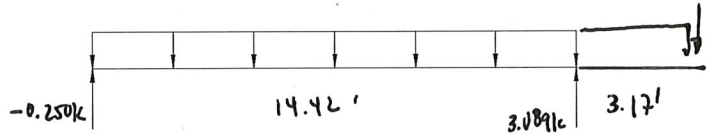
$R_{MAX} = 2.224$ K $V_D =$ [] K $< V_{ALL} = 1.94$ K ADEQUATE
 $M_{MAX} = -1.70$ K-FT $< M_{ALL} = 2.57$ K-FT ADEQUATE
 $\Delta_{TL} = 0.049$ IN. $L/1616 < L/240$ ADEQUATE

H.F. NO. 2 2x12

BEAM DESCRIPTION: CANTILEVER PORCH RAFTER B26

PARAMETERS:

L = 14.42 FT
W = .035 KLF
P = 2.224 K



ANALYSIS:

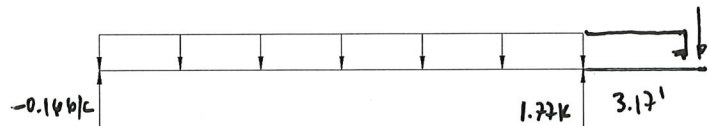
$R_{MAX} = 3.081$ K $V_D =$ [] K $< V_{ALL} = 10.81$ K ADEQUATE
 $M_{MAX} = -7.23$ K-FT $< M_{ALL} = 18.65$ K-FT ADEQUATE
 $\Delta_{TL} = 0.3$ IN. $L/252 < L/240$ ADEQUATE

TO MICHAELAM 20E (3)-1 1/4" x 9 1/4" LVL

BEAM DESCRIPTION: CANTILEVER BM IN GARAGE WALL B27

PARAMETERS:

L = 7 FT
W = .004 KLF
P = 1.016 K



ANALYSIS:

$R_{MAX} = 1.77$ K $V_D =$ [] K $< V_{ALL} = 8.73$ K ADEQUATE
 $M_{MAX} = -3.22$ K-FT $< M_{ALL} = 10.46$ K-FT ADEQUATE
 $\Delta_{TL} = 0.048$ IN. $L/1594 < L/240$ ADEQUATE

DF-L NO. 2 6x12



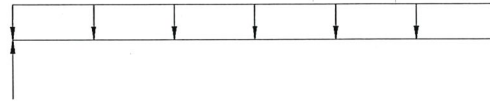
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: TYP. FLOOR GIRDER

B20

PARAMETERS:

L = 8.5 FT
W = 2.80 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 2.04$ K $V_D =$ [] K $< V_{ALL} = 3.005$ K ADEQUATE
 $M_{MAX} = 4.335$ K-FT $< M_{ALL} = 4.492$ K-FT ADEQUATE
 $\Delta_{TL} = 0.152$ IN. $L/660 < L/240$ ADEQUATE

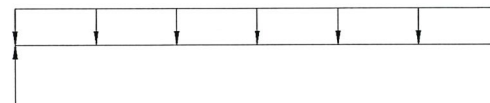
DF-L NO.2 4X10 GIRDER

BEAM DESCRIPTION: FLOOR GIRDER BLW BR6 WALL

B29

PARAMETERS:

L = 4.12 FT
W = 1.63 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 3.4$ K $V_D =$ [] K $< V_{ALL} = 3.005$ K ADEQUATE
 $M_{MAX} = 3.54$ K-FT $< M_{ALL} = 4.492$ K-FT ADEQUATE
 $\Delta_{TL} = 0.03$ IN. $L/1680 < L/240$ ADEQUATE

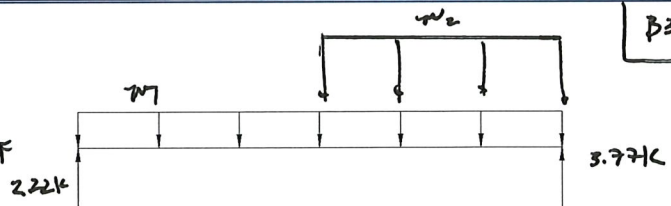
DF-L NO.2 4X10

BEAM DESCRIPTION:

B30

PARAMETERS:

L = 5.88 FT $w_1 = 1.514$ KLF
W = Varies KLF $w_2 = 1.115$ KLF
P = Varies K



ANALYSIS:

$R_{MAX} = 3.777$ K $V_D =$ [] K $< V_{ALL} = 3.005$ K ADEQUATE
 $M_{MAX} = 4.37$ K-FT $< M_{ALL} = 4.492$ K-FT ADEQUATE
 $\Delta_{TL} = 0.064$ IN. $L/1045 < L/240$ ADEQUATE

DF-L NO.2 4X10



BEAM & HEADER CALCULATIONS

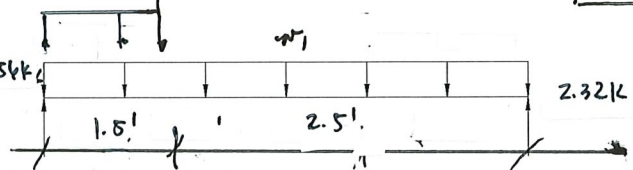
BEAM DESCRIPTION: GIRDER w/ P.L. & BRG

B31

PARAMETERS:

L = 4 FT
W = VARIES KLF
P = 2.759 K

$w_1 = .471 \text{ KLF}$
 $w_2 = 1.221 \text{ KLF}$



ANALYSIS:

$R_{MAX} = 4.156$ K
 $M_{MAX} = 4.32$ K-FT
 $\Delta_{TL} = 0.029$ IN.

$V_D =$ [] K < $V_{ALL} = 3.885$ K
 $M_{ALL} = 4.492$ K-FT
 $L/1042 < L/240$

ADEQUATE
 ADEQUATE
 ADEQUATE

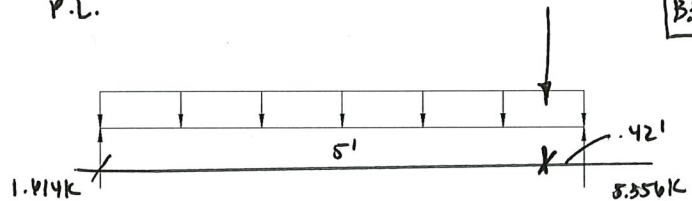
DF-L NO. 2 4x10

BEAM DESCRIPTION: GIRDER w/ P.L.

B32

PARAMETERS:

L = 5.42 FT
W = .46 KLF
P = 4.43 K



ANALYSIS:

$R_{MAX} = 5.356$ K
 $M_{MAX} = 2.70$ K-FT
 $\Delta_{TL} = 0.041$ IN.

$V_D =$ [] K < $V_{ALL} = 3.885$ K
 $M_{ALL} = 4.492$ K-FT
 $L/1591 < L/240$

ADEQUATE
 ADEQUATE
 ADEQUATE

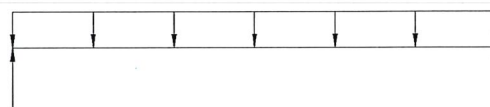
DF-L NO. 2 4x10

BEAM DESCRIPTION: GIRDER C BDRM 4

B33

PARAMETERS:

L = 7 FT
W = .603 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 2.39$ K
 $M_{MAX} = 4.2$ K-FT
 $\Delta_{TL} = 0.1$ IN.

$V_D =$ [] K < $V_{ALL} = 3.885$ K
 $M_{ALL} = 4.492$ K-FT
 $L/840 < L/240$

ADEQUATE
 ADEQUATE
 ADEQUATE

DF-L NO. 2 4x10



BEAM & HEADER CALCULATIONS

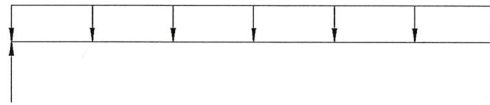
VOID

BEAM DESCRIPTION: FUR BM c NOOK

B35

PARAMETERS:

L = 9.42 FT
W = .601 KLF
P = N/A K



ANALYSIS:

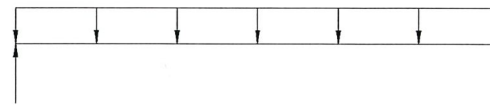
$R_{MAX} = 2.83$ K $V_D =$ [] K < $V_{ALL} = 11.13$ K ADEQUATE
 $M_{MAX} = 6.67$ K-FT < $M_{ALL} = 37.8$ K-FT ADEQUATE
 $\Delta_{TL} = 0.035$ IN. $L/3250 < L/240$ ADEQUATE

DF-DF 24F-V4 3 1/2" x 10" 6US

BEAM DESCRIPTION:

PARAMETERS:

L = [] FT
W = [] KLF
P = [] K

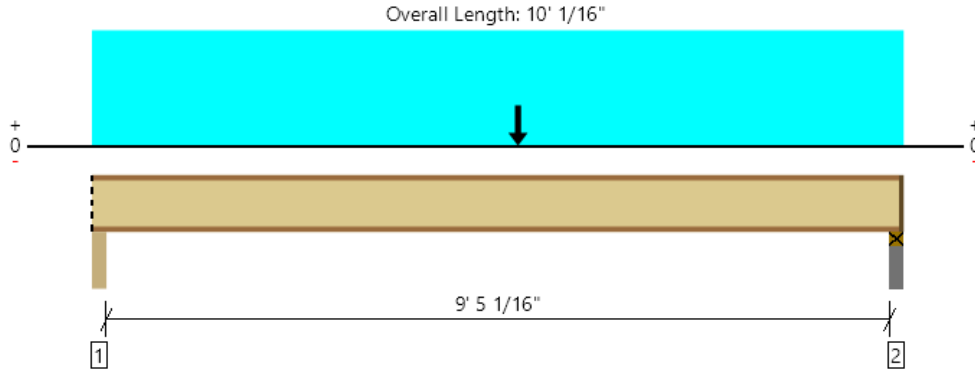


ANALYSIS:

$R_{MAX} =$ [] K $V_D =$ [] K < $V_{ALL} =$ [] K ADEQUATE
 $M_{MAX} =$ [] K-FT < $M_{ALL} =$ [] K-FT ADEQUATE
 $\Delta_{TL} =$ [] IN. $L/$ [] < $L/240$ ADEQUATE

[]

Level, Floor: Joist w/ Brg Wall
 1 piece(s) 11 7/8" TJI @ 210 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	419 @ 9' 9 9/16"	1166 (2.38")	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	406 @ 9' 8 9/16"	1655	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1180 @ 5' 3"	3795	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.053 @ 5' 3"	0.240	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.068 @ 5' 3"	0.479	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	62	40	Passed	--	--

System : Floor
 Member Type : Joist
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - DF	3.50"	3.50"	1.75"	89	326	415	Blocking
2 - Plate on concrete - HF	3.50"	2.38"	1.75"	92	333	425	1 1/8" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 10" o/c	
Bottom Edge (Lu)	9' 11" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10' 1/16"	16"	10.0	40.0	Default Load
2 - Point (lb)	5' 3"	N/A	48	126	

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Lillian Heng Mulhern + Kulp (619) 650-0010 lheng@mulhernkulp.com	





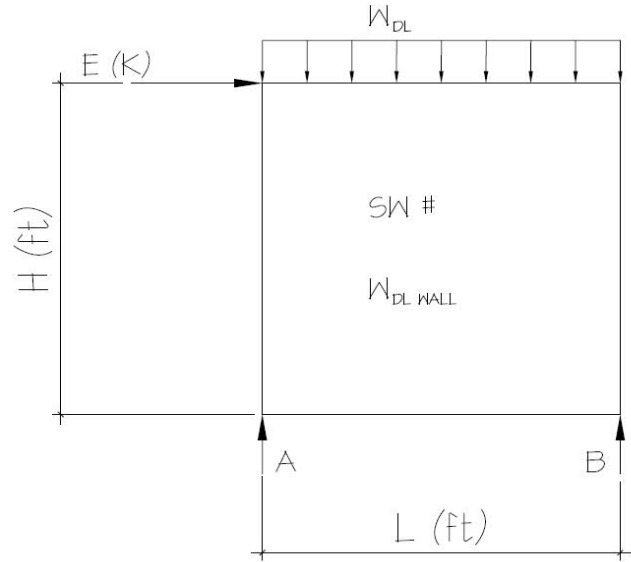
Overstrength Calculations

Wall Description/SW #:

201

Parameters:

L =	18.5	ft
H =	9.1	ft
E =	0.31	k
W_{DLWall} =	0.09	klf
W_{DL} =	0.102	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE G)
SDS =	1.124	



analysis:

$E_{mh} = \Omega_0 * E =$	0.78	K	$E_v = 0.2 * SDS * DL =$	0.803	K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v =$	1.578	K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v =$	-0.028	K

$E_m (max) = \sum M_A = 0 =$	$1.58(9.1) + 0.193(18.5)(9.25) - R_b(18.5)$	$R_b =$	$1.8DL + 0.8E$
		$R_a =$	$1.8DL - 0.8E$
$E_m (min) = \sum M_A = 0 =$	$-0.03(9.1) + 0.193(18.5)(9.25) - R_b(18.5)$	$R_b =$	$1.8DL + 0.0E$
		$R_a =$	$1.8DL - 0.0E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application



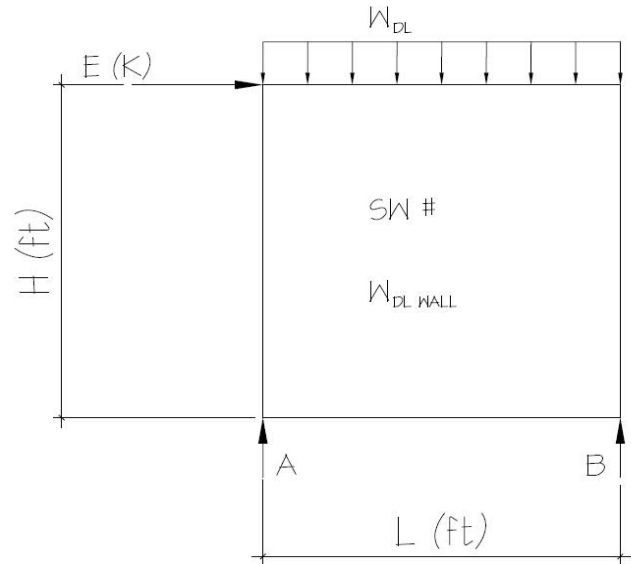
Overstrength Calculations

Wall Description/SW #:

202

Parameters:

L = 11.3 ft
H = 9.1 ft
E = 2.80 k
 W_{DLWall} = 0.09 kl f
 W_{DL} = 0.068 kl f
 Ω_0 = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
SDS = 1.124



analysis:

$E_{mh} = \Omega_0 * E = 7.00$ K $E_v = 0.2 * SDS * DL = 0.402$ K
 $E_m = E_{mh} + E_v = 7.402$ K
 $E_m = E_{mh} - E_v = 6.598$ K

E_m (max) = $\sum M_A = 0 = 7.40(9.1) + 0.159(11.25)(5.625) - R_b(11.25)$ $R_B = 0.9DL + 6.0E$
 $R_A = 0.9DL - 6.0E$
 E_m (min) = $\sum M_A = 0 = 6.60(9.1) + 0.159(11.25)(5.625) - R_b(11.25)$ $R_B = 0.9DL + 5.3E$
 $R_A = 0.9DL - 5.3E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application



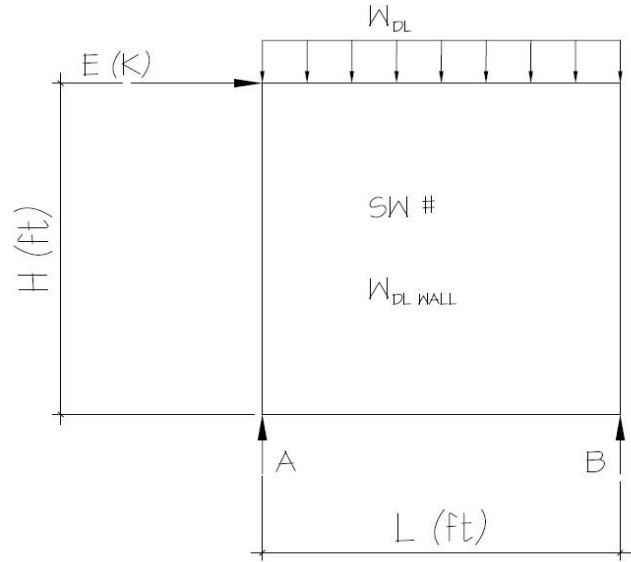
Overstrength Calculations

Wall Description/SW #:

203

Parameters:

L =	6.3	ft
H =	9.1	ft
E =	0.94	k
W_{DLWall} =	0.09	klf
W_{DL} =	0.076	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE G)
SDS =	1.124	



analysis:

$E_{mh} = \Omega_0 * E =$	2.35	K	$E_v = 0.2 * SDS * DL =$	0.235	K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v =$	2.585	K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v =$	2.115	K

$E_m (max) = \sum M_A = 0 =$	$2.58(9.1) + 0.16703(6.25)(3.125) - R_b(6.25)$	$R_b =$	$0.5DL + 3.8E$
		$R_a =$	$0.5DL - 3.8E$
$E_m (min) = \sum M_A = 0 =$	$2.12(9.1) + 0.16703(6.25)(3.125) - R_b(6.25)$	$R_b =$	$0.5DL + 3.1E$
		$R_a =$	$0.5DL - 3.1E$

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

allowable stress permitted to be increased by 1.2

see following beam
calcs for load
application



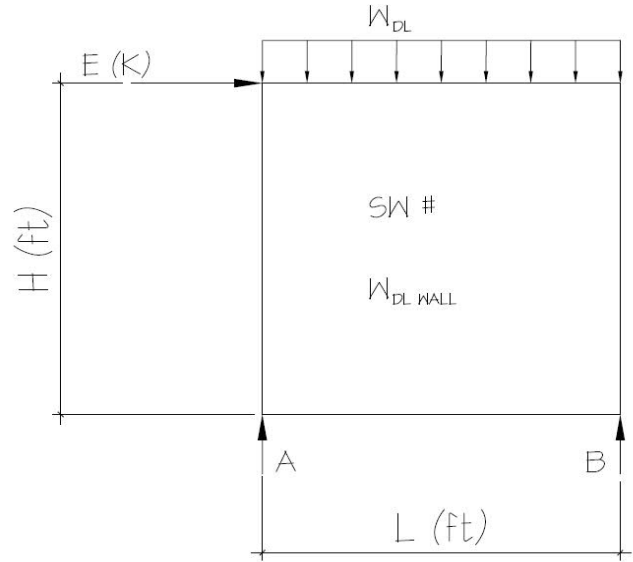
Overstrength Calculations

Wall Description/SW #:

204

Parameters:

L =	17.1	ft
H =	9.1	ft
E =	2.10	k
W_{DLWall} =	0.09	klf
W_{DL} =	0.089	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE G)
SDS =	1.124	



analysis:

$E_{mh} = \Omega_0 * E =$	5.25	K	$E_v = 0.2 * SDS * DL =$	0.691	K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v =$	5.941	K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v =$	4.559	K

$E_m (max) = \sum M_A = 0 =$	$5.94(9.1) + 0.18(17.083)(8.5415) - R_b(17.083)$	$R_b =$	$1.5DL + 3.2E$
		$R_a =$	$1.5DL - 3.2E$
$E_m (min) = \sum M_A = 0 =$	$4.56(9.1) + 0.18(17.083)(8.5415) - R_b(17.083)$	$R_b =$	$1.5DL + 2.4E$
		$R_a =$	$1.5DL - 2.4E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 29 OCT 2021, 12:35PM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

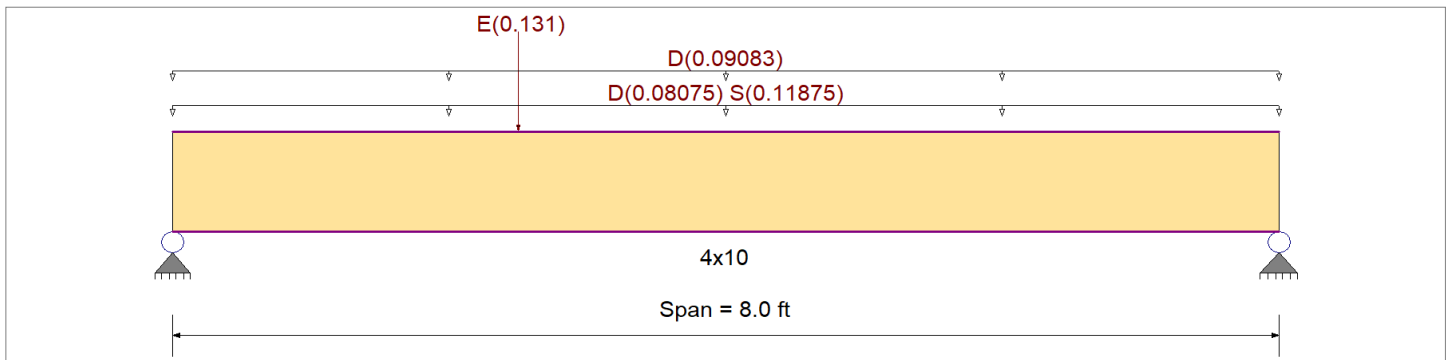
DESCRIPTION: B15 w/ Holddown

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	900 psi	Ebend- xx	1600ksi
	Fc - Prll	1350 psi	Eminbend - xx	580ksi
Wood Species : Douglas Fir - Larch	Fc - Perp	625 psi		
Wood Grade : No.2	Fv	180 psi		
	Ft	575 psi	Density	31.21pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 4.750 ft, (Roof)

Point Load : E = 0.1310 k @ 2.50 ft, (SW #205 Holddown)

Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Ext. Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.460	1	Maximum Shear Stress Ratio	=	0.216	: 1
Section used for this span		4x10		Section used for this span		4x10	
fb: Actual	=	571.92	psi	fv: Actual	=	44.65	psi
Fb: Allowable	=	1,242.00	psi	Fv: Allowable	=	207.00	psi
Load Combination		+D+S		Load Combination		+D+S	
Location of maximum on span	=	4.000	ft	Location of maximum on span	=	7.241	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.030	in	Ratio =		3221	>=360
Max Upward Transient Deflection		-0.005	in	Ratio =		17690	>=360
Max Downward Total Deflection		0.075	in	Ratio =		1286	>=300
Max Upward Total Deflection		0.000	in	Ratio =		0	<300

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0746	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.189	1.189
Overall MINimum	0.366	0.400
D Only	0.714	0.714
+D+S	1.189	1.189
+D+0.750S	1.071	1.071
+0.60D	0.429	0.429
+D+0.70E	0.777	0.743
+D-0.70E	0.651	0.686



7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: JayMarc Homes
Engineer: LGH
Project ID: 154-21030
Project Descr: Liao Residence

Printed: 29 OCT 2021, 12:35PM

Wood Beam

File: Beams.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. # : KW-06004787

DESCRIPTION: B15 w/ Holdown

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750S+0.5250E	1.118	1.092
+D+0.750S-0.5250E	1.023	1.049
+0.60D+0.70E	0.492	0.457
+0.60D-0.70E	0.366	0.400



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 10 NOV 2021, 9:00AM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

DESCRIPTION: B16 w/ Holddown

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

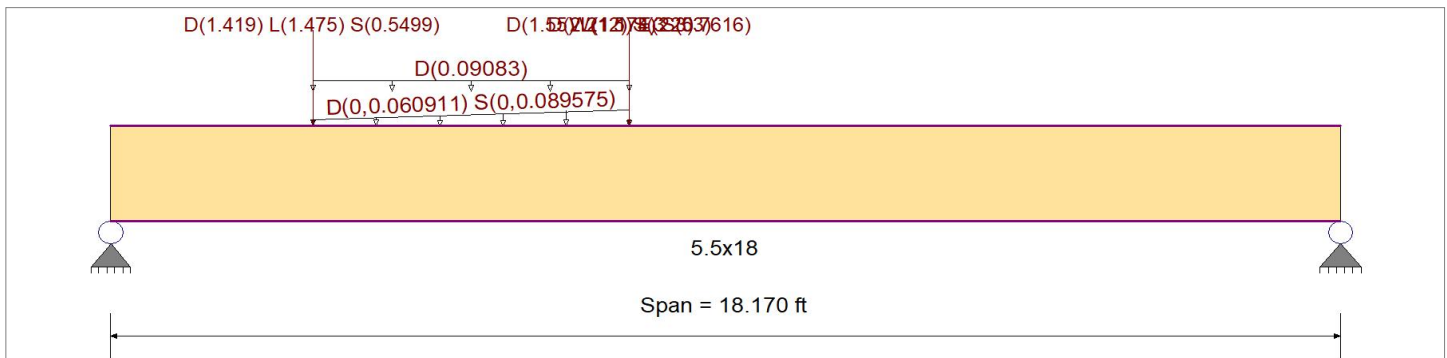
Material Properties

Analysis Method : Allowable Stress Design
 Load Combination ASCE 7-16

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

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

Fb + 2,400.0 psi
 Fb - 1,850.0 psi
 Fc - Prll 1,650.0 psi
 Fc - Perp 650.0 psi
 Fv 265.0 psi
 Ft 1,100.0 psi
 E : Modulus of Elasticity
 Ebend- xx 1,800.0 ksi
 Eminbend - xx 930.0 ksi
 Ebend- yy 1,600.0 ksi
 Eminbend - yy 830.0 ksi
 Density 31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Varying Uniform Load : D= 0.0->0.0170, S= 0.0->0.0250 ksf, Extent = 3.0 -->> 7.670 ft, Trib Width = 3.583 ft, (Roof)

Point Load : W = 1.50, E = 2.30 k @ 7.670 ft, (SW #202 Holddown)

Uniform Load : D = 0.010 ksf, Extent = 3.0 -->> 7.670 ft, Tributary Width = 9.083 ft, (Wall)

Point Load : D = 2.212, S = 3.253 k @ 7.670 ft, (G.T.)

Point Load : D = 1.419, L = 1.475, S = 0.5499 k @ 3.0 ft, (B35)

Point Load : D = 1.550, L = 1.174, S = 0.7616 k @ 7.670 ft, (B17)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.638 : 1	Maximum Shear Stress Ratio	=	0.375 : 1
Section used for this span		5.5x18	Section used for this span		5.5x18
fb: Actual	=	1,703.27 psi	fv: Actual	=	114.20 psi
Fb: Allowable	=	2,670.05 psi	Fv: Allowable	=	304.75 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	7.692ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.196 in	Ratio =		1115 >=360
Max Upward Transient Deflection		-0.101 in	Ratio =		2168 >=360
Max Downward Total Deflection		0.489 in	Ratio =		446 >=300
Max Upward Total Deflection		0.000 in	Ratio =		0 <300

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.4888	8.621		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	8.266	4.646
Overall MINimum	2.918	1.856



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 10 NOV 2021, 9:00AM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

DESCRIPTION: B16 w/ Holddown

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
D Only	3.948	2.190
+D+L	5.858	2.929
+D+S	6.865	4.045
+D+0.750L	5.380	2.744
+D+0.750L+0.750S	7.568	4.136
+D+0.60W	4.468	2.570
+D+0.750L+0.450W	5.770	3.029
+D+0.750L+0.750S+0.450W	7.958	4.421
+0.60D+0.60W	2.889	1.694
+D+0.70E	4.878	2.869
+D-0.70E	3.017	1.510
+D+0.750L+0.750S+0.5250E	8.266	4.646
+D+0.750L+0.750S-0.5250E	6.871	3.626
+0.60D+0.70E	3.299	1.993
+0.60D-0.70E	1.438	0.634
L Only	1.910	0.739
S Only	2.918	1.856



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 10 NOV 2021, 9:03AM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

DESCRIPTION: B16 w/ Overstrength

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

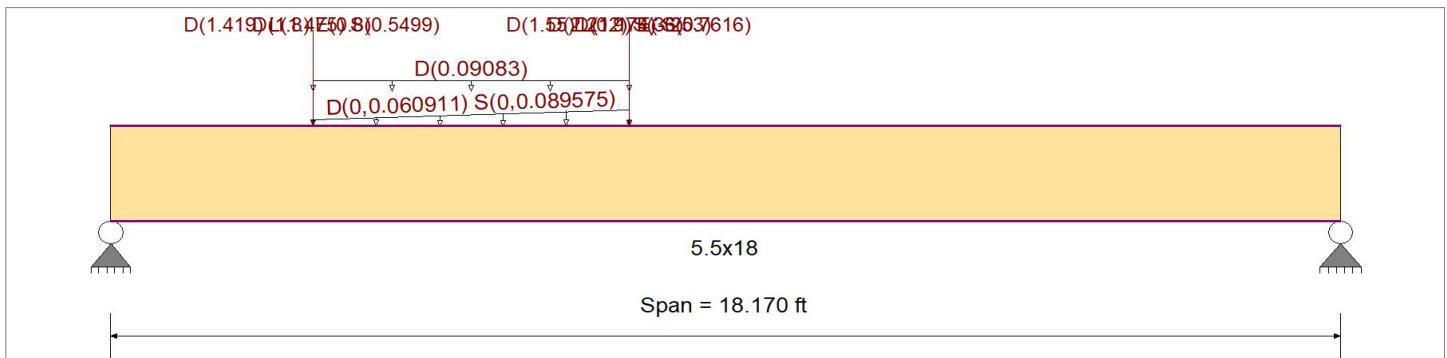
Analysis Method : Allowable Stress Design
 Load Combination ASCE 7-16

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

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

Fb + 2,880.0 psi
 Fb - 2,220.0 psi
 Fc - Prll 1,980.0 psi
 Fc - Perp 780.0 psi
 Fv 318.0 psi
 Ft 1,320.0 psi

E : Modulus of Elasticity
 Ebend- xx 1,800.0 ksi
 Eminbend - xx 930.0 ksi
 Ebend- yy 1,600.0 ksi
 Eminbend - yy 830.0 ksi
 Density 31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Varying Uniform Load : D= 0.0->0.0170, S= 0.0->0.0250 ksf, Extent = 3.0 -->> 7.670 ft, Trib Width = 3.583 ft, (Roof)

Point Load : D = 0.90, E = -6.0 k @ 7.670 ft, (SW #202)
 Uniform Load : D = 0.010 ksf, Extent = 3.0 -->> 7.670 ft, Tributary Width = 9.083 ft, (Wall)
 Point Load : D = 2.212, S = 3.253 k @ 7.670 ft, (G.T.)
 Point Load : D = 1.419, L = 1.475, S = 0.5499 k @ 3.0 ft, (B35)
 Point Load : D = 1.550, L = 1.174, S = 0.7616 k @ 7.670 ft, (B17)
 Point Load : D = 1.80, E = 0.80 k @ 3.0 ft, (SW #201)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.776	1	Maximum Shear Stress Ratio	=	0.415	1
Section used for this span		5.5x18		Section used for this span		5.5x18	
fb: Actual	=	3,461.41	psi	fv: Actual	=	211.14	psi
Fb: Allowable	=	4,457.82	psi	Fv: Allowable	=	508.80	psi
Load Combination		+1.118D+0.750L+0.750S-1.313E		Load Combination		+1.118D+0.750L+0.750S-1.313E	
Location of maximum on span	=	7.692	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.245	in	Ratio =		890	>=360
Max Upward Transient Deflection		-0.245	in	Ratio =		890	>=360
Max Downward Total Deflection		0.643	in	Ratio =		338	>=300
Max Upward Total Deflection		0.000	in	Ratio =		0	<300

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S-0.5250E	1	0.6432	8.554		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.061	6.073



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 10 NOV 2021, 9:03AM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

DESCRIPTION: B16 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MINimum	2.918	1.856
D Only	5.971	2.867
+D+L	7.880	3.606
+D+S	8.888	4.723
+D+0.750L	7.403	3.421
+D+0.750L+0.750S	9.591	4.813
+0.60D	3.582	1.720
+D+0.70E	4.011	1.186
+D-0.70E	7.930	4.547
+D+0.750L+0.750S+0.5250E	8.122	3.553
+D+0.750L+0.750S-0.5250E	11.061	6.073
+0.60D+0.70E	1.623	0.040
+0.60D-0.70E	5.542	3.401
L Only	1.910	0.739
S Only	2.918	1.856



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 4 NOV 2021, 8:24AM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

DESCRIPTION: B20 w/ Overstrength

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-16

Material Properties

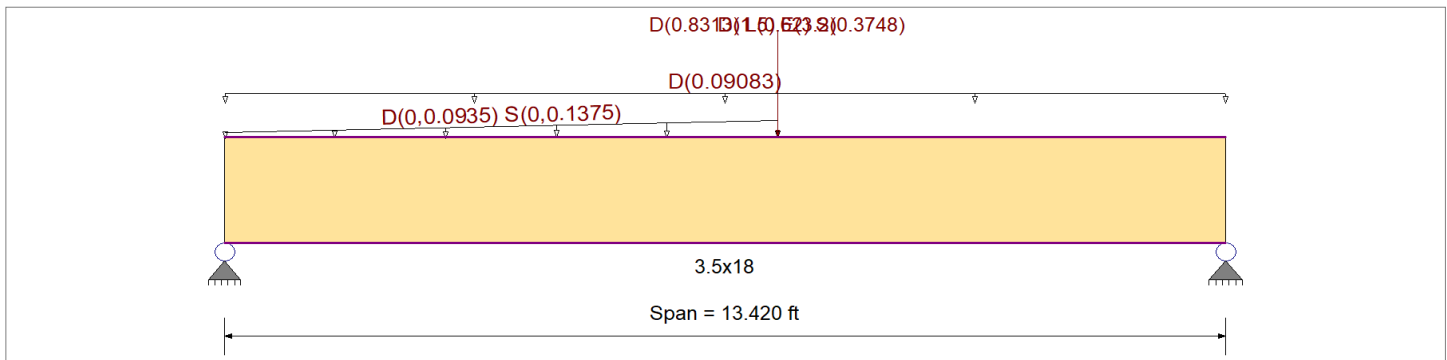
Analysis Method : Allowable Stress Design
 Load Combination : ASCE 7-16

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

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

Fb + : 2,880.0 psi
 Fb - : 2,220.0 psi
 Fc - Prll : 1,980.0 psi
 Fc - Perp : 780.0 psi
 Fv : 318.0 psi
 Ft : 1,320.0 psi

E : Modulus of Elasticity
 Ebend- xx : 1,800.0 ksi
 Eminbend - xx : 930.0 ksi
 Ebend- yy : 1,600.0 ksi
 Eminbend - yy : 830.0 ksi
 Density : 31.210 pcf



Applied Loads

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

Load for Span Number 1

Varying Uniform Load : D = 0.0->0.0170, S = 0.0->0.0250 ksf, Extent = 0.0 --> 7.420 ft, Trib Width = 5.50 ft, (Roof)

Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)
 Point Load : D = 0.8313, L = 0.620, S = 0.3748 k @ 7.420 ft, (B19)
 Point Load : D = 1.50, E = 3.20 k @ 7.420 ft, (SW #204)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.423	1	Maximum Shear Stress Ratio	=	0.247	1
Section used for this span		3.5x18		Section used for this span		3.5x18	
fb: Actual	=	1,947.41	psi	fv: Actual	=	125.88	psi
Fb: Allowable	=	4,608.00	psi	Fv: Allowable	=	508.80	psi
Load Combination		+1.157D+1.750E		Load Combination		+1.157D+1.750E	
Location of maximum on span	=	7.396	ft	Location of maximum on span	=	11.951	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.090	in	Ratio =		1787	>=360
Max Upward Transient Deflection		-0.090	in	Ratio =		1787	>=360
Max Downward Total Deflection		0.173	in	Ratio =		930	>=300
Max Upward Total Deflection		-0.006	in	Ratio =		27918	>=300

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.1730	6.857		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.197	3.509
Overall MINimum	-1.431	-1.769
D Only	1.871	2.026
+D+L	2.148	2.369
+D+S	2.360	2.422
+D+0.750L	2.079	2.283



7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: JayMarc Homes
Engineer: LGH
Project ID: 154-21030
Project Descr: Liao Residence

Printed: 4 NOV 2021, 8:24AM

Wood Beam

File: Beams.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. # : KW-06004787

DESCRIPTION: B20 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	2.446	2.580
+0.60D	1.122	1.216
+D+0.70E	2.872	3.265
+D-0.70E	0.869	0.788
+D+0.750L+0.750S+0.5250E	3.197	3.509
+D+0.750L+0.750S-0.5250E	1.695	1.651
+0.60D+0.70E	2.124	2.454
+0.60D-0.70E	0.121	-0.023
L Only	0.277	0.343
S Only	0.490	0.395
E Only	1.431	1.769
E Only * -1.0	-1.431	-1.769



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 4 NOV 2021, 8:54AM

Wood Beam

File: Beams.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

DESCRIPTION: B21 w/ Overstrength

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

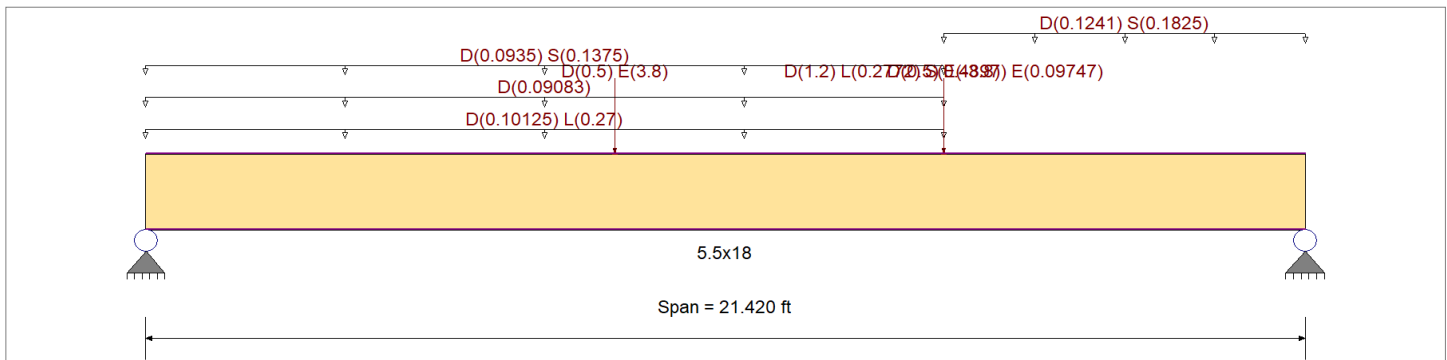
Material Properties

Analysis Method : Allowable Stress Design
 Load Combination : ASCE 7-16

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

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

Fb + : 2,880.0 psi
 Fb - : 2,220.0 psi
 Fc - Prll : 1,980.0 psi
 Fc - Perp : 780.0 psi
 Fv : 318.0 psi
 Ft : 1,320.0 psi
 E : Modulus of Elasticity
 Ebend- xx : 1,800.0 ksi
 Eminbend - xx : 930.0 ksi
 Ebend- yy : 1,600.0 ksi
 Eminbend - yy : 830.0 ksi
 Density : 31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.0150, L = 0.040 ksf, Extent = 0.0 --> 14.750 ft, Tributary Width = 6.750 ft, (Floor)
 Uniform Load : D = 0.010 ksf, Extent = 0.0 --> 14.750 ft, Tributary Width = 9.083 ft, (Wall)
 Uniform Load : D = 0.0170, S = 0.0250 ksf, Extent = 0.0 --> 14.750 ft, Tributary Width = 5.50 ft, (Roof)
 Uniform Load : D = 0.0170, S = 0.0250 ksf, Extent = 14.750 --> 21.420 ft, Tributary Width = 7.30 ft, (Roof)
 Point Load : D = 1.20, L = 0.2772, S = 0.4897, E = 0.09747 k @ 14.750 ft, (B20)
 Point Load : D = 0.50, E = 3.80 k @ 8.670 ft, (SW #203)
 Point Load : D = 0.50, E = -3.80 k @ 14.750 ft, (SW #203)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.546	1	Maximum Shear Stress Ratio	=	0.276	: 1
Section used for this span		5.5x18		Section used for this span		5.5x18	
fb: Actual	=	1,497.28	psi	fv: Actual	=	87.70	psi
Fb: Allowable	=	2,740.67	psi	Fv: Allowable	=	318.00	psi
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	10.632	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.226	in	Ratio =		1137	>=360
Max Upward Transient Deflection		-0.059	in	Ratio =		4368	>=360
Max Downward Total Deflection		0.731	in	Ratio =		351	>=300
Max Upward Total Deflection		0.000	in	Ratio =		0	<300

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.7311	10.475		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	7.807	7.002
Overall MINimum	-1.109	1.011
D Only	3.948	3.752



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: JayMarc Homes
 Engineer: LGH
 Project ID: 154-21030
 Project Descr: Liao Residence

Printed: 4 NOV 2021, 8:54AM

Wood Beam

File: Beams.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

MULHERN & KULP STRUCTURAL ENGINEERING INC

Lic. #: KW-06004787

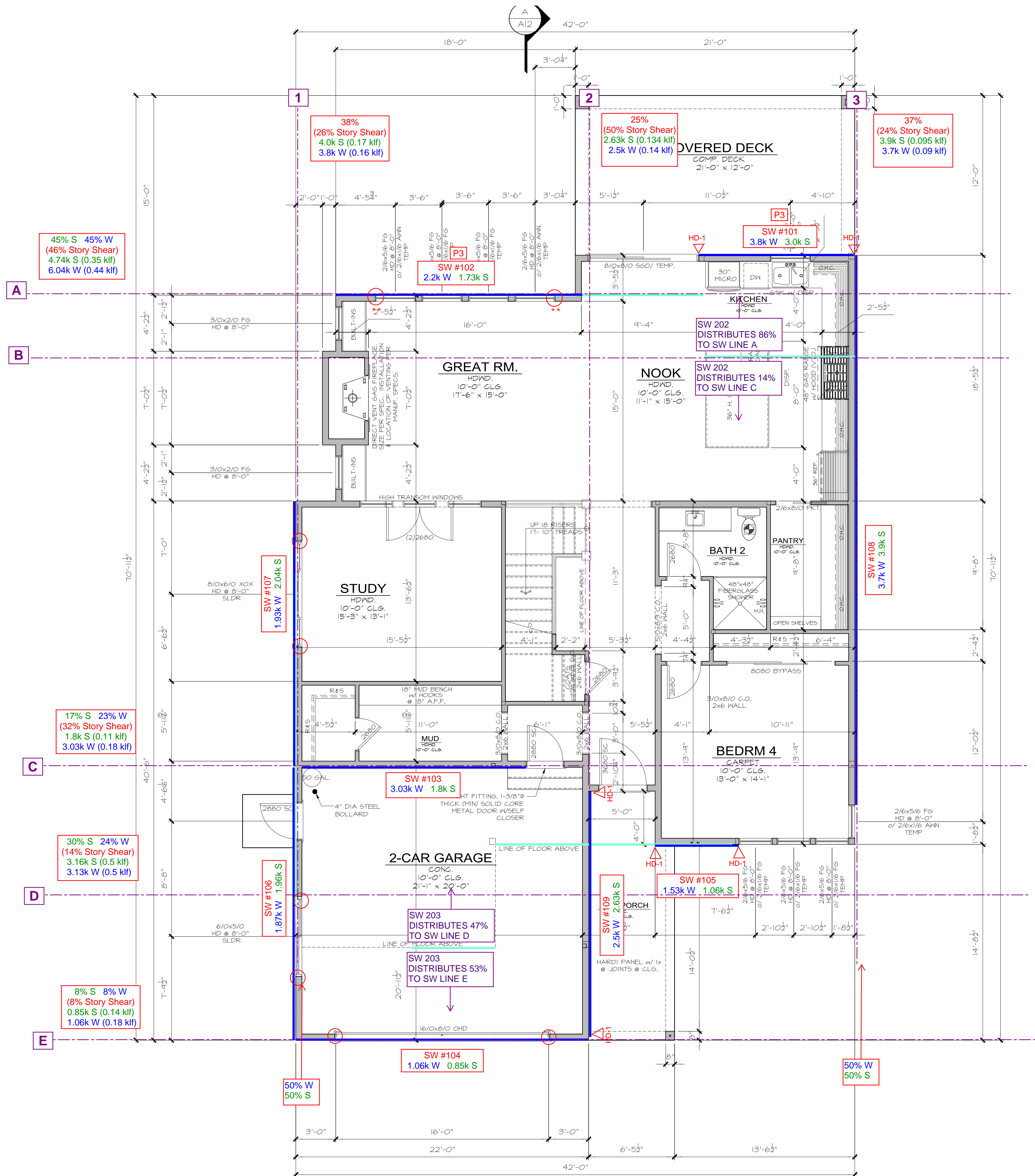
DESCRIPTION: B21 w/ Overstrength

Vertical Reactions

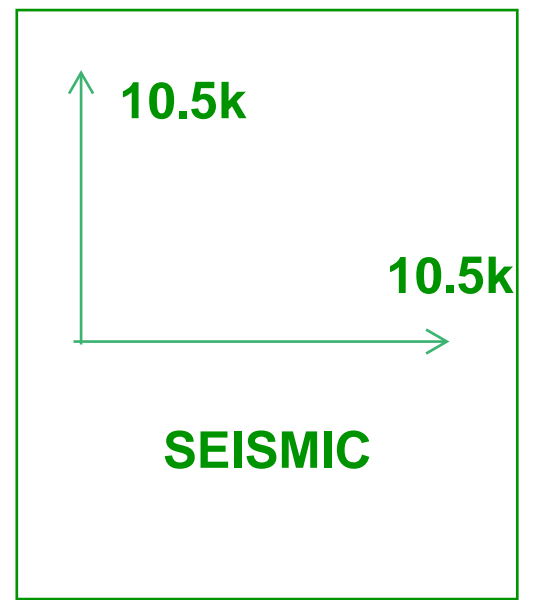
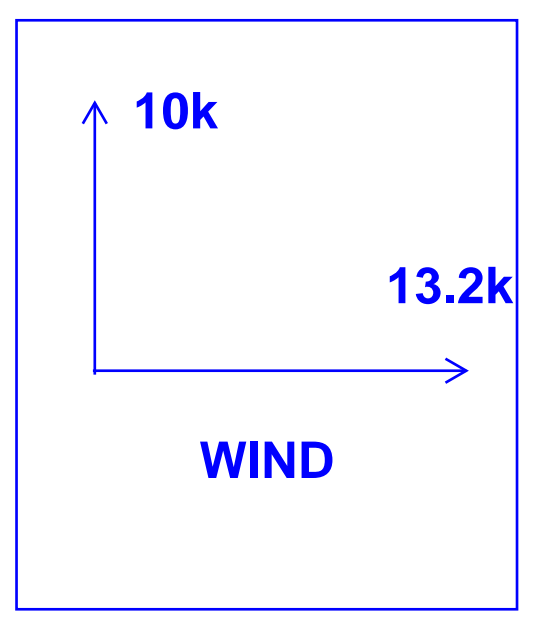
Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+L	6.645	5.314
+D+S	5.619	5.815
+D+0.750L	5.971	4.924
+D+0.750L+0.750S	7.225	6.471
+0.60D	2.369	2.251
+D+0.70E	4.724	3.044
+D-0.70E	3.171	4.460
+D+0.750L+0.750S+0.5250E	7.807	5.940
+D+0.750L+0.750S-0.5250E	6.643	7.002
+0.60D+0.70E	3.145	1.543
+0.60D-0.70E	1.592	2.959
L Only	2.698	1.562
S Only	1.672	2.063
E Only	1.109	-1.011
E Only * -1.0	-1.109	1.011



INDICATES SHEAR WALL FROM ABOVE



MAIN FLOOR PLAN NOTES

PLAN SPECIFIC 2015 WSEC. SECTION R06
 R406.2 ADDITIONAL ENERGY EFFICIENCY REQUIREMENTS (MANDATORY). THIS RESIDENTIAL DWELLING SHALL COMPLY WITH SUFFICIENT OPTIONS FROM TABLE R406.2 TO ACHIEVE THE FOLLOWING MIN. NUMBER OF CREDITS: 3.5 FOR A 1501sf to 4,999sf HOME.
 CREDITS PROVIDED IN THIS HOME AS FOLLOWS:
 EFFICIENT BUILDING ENVELOPE Iq: 0.5 CREDITS
 PRESCRIPTIVE COMPLIANCE IS BASED ON TABLE R402.11 WITH FOLLOWING MODIFICATIONS:
 VERTICAL FENESTRATION U = 0.28 WINDOWS
 FLOORS TO BE R-39 and SLAB ON GRADE TO BE R-10 PERIMETER and UNDER ENTIRE SLAB BELOW GRADE.
 HIGH EFFICIENCY HVAC EQUIPMENT 3a: 1.0 CREDITS
 GAS FURNACE WITH MINIMUM AFUE OF 94%
 EFFICIENT WATER HEATING 5a: 0.5 CREDITS
 ALL SHOWERHEAD and KITCHEN SINK FAUCETS INSTALLED IN THE HOUSE SHALL BE RATED AT 1.75 GPM or LESS.
 ALL OTHER LAVATORY FAUCETS SHALL BE RATED AT 1.0 GPM or LESS.
 EFFICIENT WATER HEATING 5c: 1.5 CREDITS
 WATER HEATING SYSTEM SHALL BE GAS WATER HEATER WITH A MINIMUM EF OF 0.91

JAYMARC HOMES
 7525 SE 24th St., 487
 Mercer Island, WA 98040
 425.266.9100

Issue	Issue Date	By	Description

Liao Residence
 4541 88th Ave SE
 Job Number: _____

plan name: _____
 marketing name: PATAGONIA
 plan number: _____
 mark sys. number: _____

Conditions not specifically represented graphically or in writing or which conflict with the current International Residential Code (IRC) or those of the local municipality then the current standards and requirements of each respectively shall govern.
 The drawings in this set are instruments of service and shall remain the property of JayMarc Homes, LLC.
 © 2017 JayMarc Homes, LLC; All rights reserved.

Submittal Date _____

Sheet Title/Description _____

Design Firm _____

Drawn by: _____

R.R./S.K.
 Checked by: _____

Primary Scale _____

A5
 of: _____

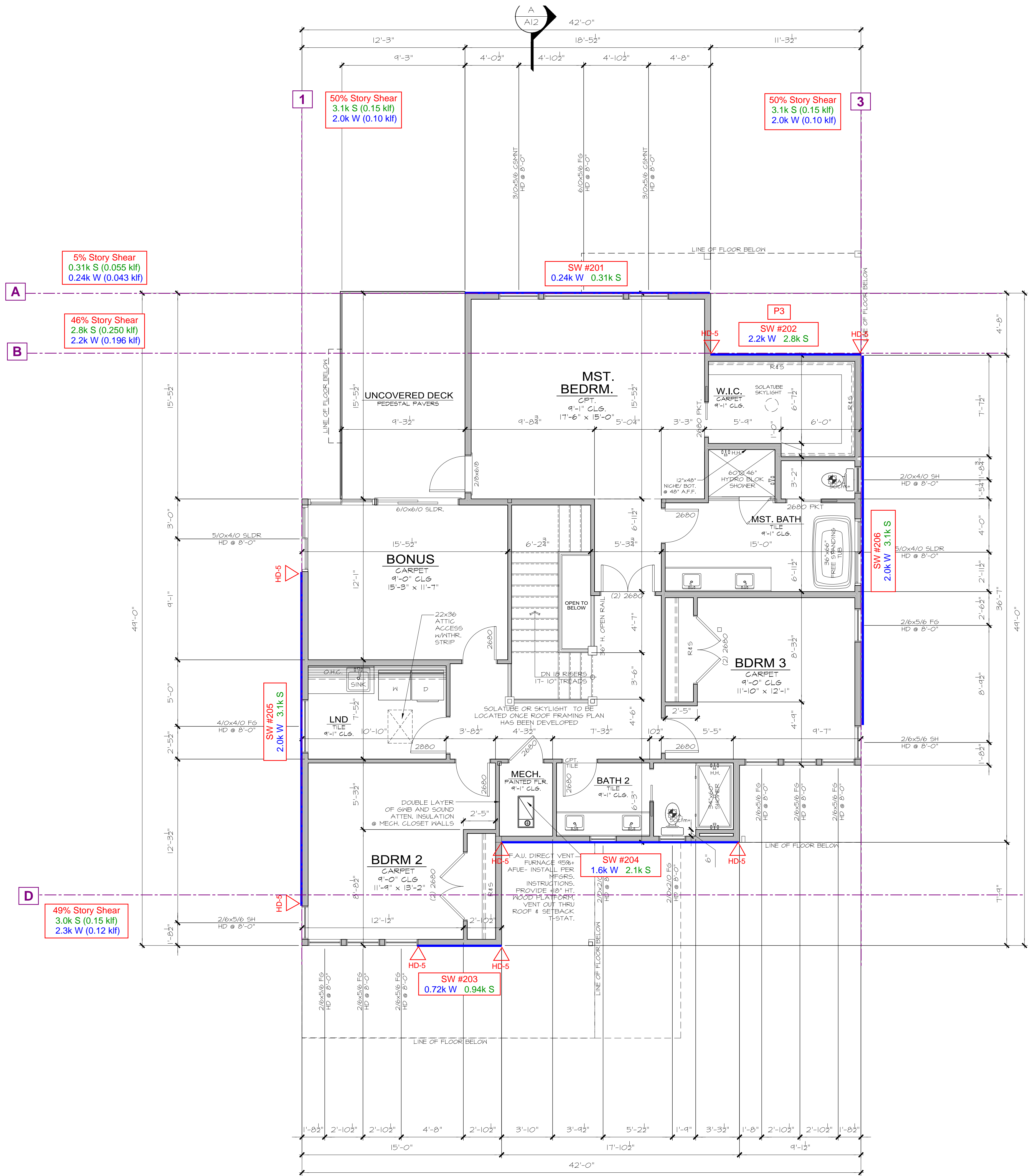
MAIN FLOOR PLAN

1/4" = 1'-0"

MAIN FLOOR AREA	1,604 S.F.
UPPER FLOOR AREA	1,463 S.F.
TOTAL CONDITIONED AREA	3,067 S.F.
2 CAR GARAGE	453 S.F.
COVID PATIO	0 S.F.
COVID ENTRY PORCH	41 S.F.
TOTAL AREA UNDER ROOF	3,611 S.F.

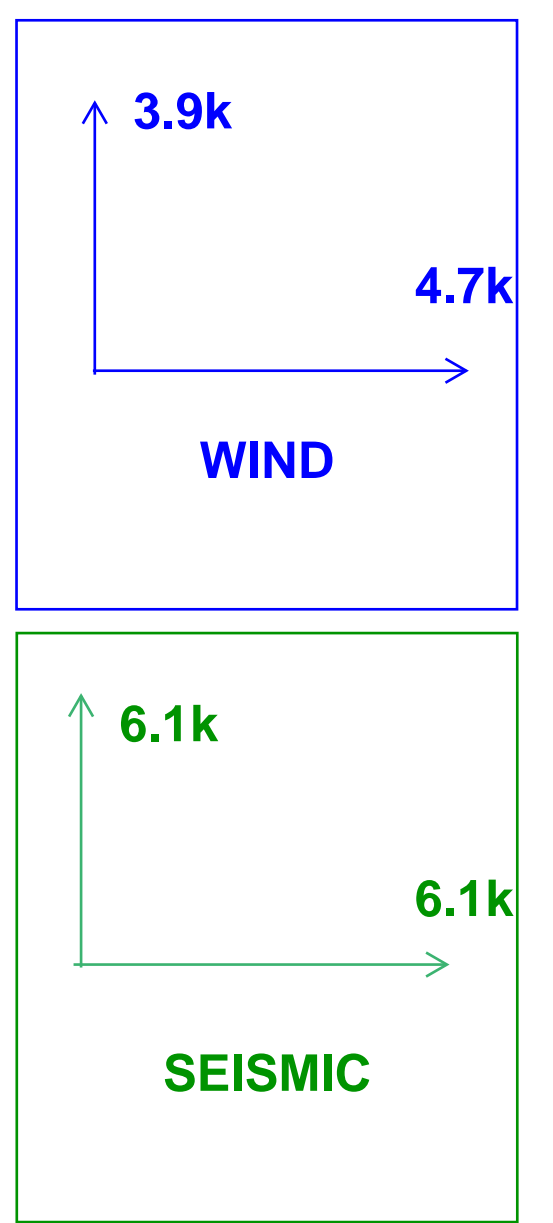
OVERALL WIDTH 43'-0"
 OVERALL DEPTH 58'-6"
 Updated: 1/12/2018
 Method for Calculating Square Footage - ANSI Z765-2013 except, no separate distinction of above-grade or below-grade areas and each level is measured to the outside of studs not the exterior finished surface.
 Square Footage Calculated by the above information based on the drawings submitted.

Sheet Title/Description



UPPER FLOOR PLAN NOTES

PLAN SPECIFIC 2015 NSEC, SECTION R06
 R406.2 ADDITIONAL ENERGY EFFICIENCY REQUIREMENTS (MANDATORY). THIS RESIDENTIAL DWELLING SHALL COMPLY w/SUFFICIENT OPTIONS FROM TABLE R406.2 TO ACHIEVE THE FOLLOWING MIN. NUMBER OF CREDITS: 3.5 FOR a 1501sf to 4,999sf HOME.
 CREDITS PROVIDED IN THIS HOME AS FOLLOWS:
 EFFICIENT BUILDING ENVELOPE Ia: 0.5 CREDITS
 PRESCRIPTIVE COMPLIANCE IS BASED ON TABLE R402.1.1 WITH FOLLOWING MODIFICATIONS:
 VERTICAL FENESTRATION U - 0.28 WINDOWS
 FLOORS TO BE R-38 and SLAB ON GRADE TO BE R-10 PERIMETER and UNDER ENTIRE SLAB BELOW GRADE.
 HIGH EFFICIENCY HVAC EQUIPMENT 3a: 1.0 CREDITS
 GAS FURNACE WITH MINIMUM AFUE OF 94%
 EFFICIENT WATER HEATING 5a: 0.5 CREDITS
 ALL SHOWERHEAD and KITCHEN SINK FAUCETS INSTALLED IN THE HOUSE SHALL BE RATED AT 1.75 GPM or LESS.
 ALL OTHER LAVATORY FAUCETS SHALL BE RATED AT 1.0 GPM or LESS.
 EFFICIENT WATER HEATING 5c: 1.5 CREDITS
 WATER HEATING SYSTEM SHALL BE:
 GAS WATER HEATER WITH A MINIMUM EF OF 0.91



7525 SE 24th St., 487
 Mercer Island, WA
 98040
 425.266.9100

Issue	Issue Date	By	Description
△			

Liao Residence
 4541 88th Ave SE

Job Number:

plan name: PATAGONIA
 marketing name: PATAGONIA
 plan number:
 mark sys. number:

Conditions not specifically represented graphically or in writing or which conflict with the current international Residential Code (IRC.) or those of the local municipality then the current standards and requirements of each respectively shall govern.

The drawings in this set are instruments of service and shall remain the property of JayMarc Homes, LLC.

© 2017 JayMarc Homes, LLC; All rights reserved.

UPPER FLOOR PLAN

1/4" = 1'-0"

SQUARE FOOTAGE SUMMARY

MAIN FLOOR AREA	1,604 S.F.
UPPER FLOOR AREA	1,463 S.F.
TOTAL CONDITIONED AREA	3,067 S.F.
2 CAR GARAGE	453 S.F.
COV'D PATIO	0 S.F.
COV'D ENTRY PORCH	41 S.F.
TOTAL AREA UNDER ROOF	3,611 S.F.

OVERALL WIDTH 43'-0"
 OVERALL DEPTH 58'-6"
 Updated: 1/2/2018

Method for Calculating Square Footage - ANSI Z165-2013 except, no separate distinction of 'above-grade or below-grade' areas and each level is measured to the outside of studs not the exterior finished surface.
 Square Footage calculations for this house were made based on plan dimensions only and may vary from the finished square footage of the house as built.
 See Sheet "CODES" for additional Zoning required Area Calculations

Submittal Date

Sheet Title/Description

Design Firm

Drawn by:

R.R./S.K.

Checked by:

Primary Scale

A7
 of .

Sheet Title/Description

JayMarc Homes

Liao Residence

Mercer Island, WA

Wind Shear Wall Calculations

Reviewed By: NJM

November 10, 2021

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: B

Seismic Design Category: D

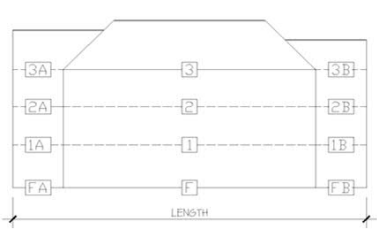
Code & Design Standard: 2018 IBC Ch. 1609, ASCE 7-16 Ch. 26-30




Wind Design Summary per ASCE 7-16

Parameters:		Roof Geometry:		Building Geometry:	
Wind Speed	100	Trans. Roof Pitch	4.0 :12	length	49 ft
Exposure Category	B	Long. Roof Pitch	4.0 :12	Width	42 ft
Risk Category	II	Mean Roof Height, H	25.75 ft	Number of stories	2
Wind Directionality Factor, K_d	0.85				
Topographic Factor, K_{zt}	1.60				
Gust Factor, G	0.85				
Ground El ev. Above Sea Level [ft]	0				
Design Type	ASD				
	0.60				

Transverse Direction (Perpendicular to Main Ridge Line)											
<u>Diaphragm Level</u>	<u>Floor-to-Floor Height</u>		<u>Tributary Design Areas:</u>				<u>Tributary Design Loads: (0.6W)</u>				
			<u>Section</u>				<u>Section</u>				
			A	O	B		A	O	B		
2	9.083 ft	Roof Surface	0	211.22	0	sq ft	Story Shear	0.00	4.64	0.00	kips
		Wall surface	0	215.3	0	sq ft	Total Shear	0.00	4.64	0.00	kips
			4.64								
1	11.5625 ft	Roof Surface	0	64.75	0	sq ft	Story Shear	0.00	8.54	0.00	kips
		Wall surface	0	574.15	0	sq ft	Total Shear	0.00	13.18	0.00	kips
			13.18								
FND		Roof Surface	0	0	0	sq ft	Story Shear	0.00	0.00	0.00	kips
		Wall surface	0	0	0	sq ft	Total Shear	0.00	13.18	0.00	kips
			13.18								



Longitudinal Direction (Parallel to Main Ridge Line)											
<u>Diaphragm Level</u>	<u>Floor-to-Floor Height</u>		<u>Tributary Design Areas:</u>				<u>Tributary Design Loads: (0.6W)</u>				
			<u>Section</u>				<u>Section</u>				
			A	O	B		A	O	B		
2	9.083 ft	Roof Surface	0	185.8	0	sq ft	Story Shear	0.00	3.87	0.00	kips
		Wall surface	0	181	0	sq ft	Total Shear	0.00	3.87	0.00	kips
			3.87								
1	11.5625 ft	Roof Surface	0	55.3	0	sq ft	Story Shear	0.00	6.09	0.00	kips
		Wall surface	0	417.13	0	sq ft	Total Shear	0.00	9.96	0.00	kips
			9.96								
FND		Roof Surface	0	0	0	sq ft	Story Shear	0.00	0.00	0.00	kips
		Wall surface	0	0	0	sq ft	Total Shear	0.00	9.96	0.00	kips
			9.96								





Shearwall Design Summary

Shearwall 201: 2nd - Back Ext. @ Mst. Bdrm

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 202: 2nd - Back Ext. @ Mst. WIC

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 203: 2nd - Front Ext. @ Bdrm 2

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 204: 2nd - Front Ext @ Mech/Bath 2

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 205: 2nd - Side Ext @ Bdrm 2/Bonus

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 206: 2nd - Side Ext @ Bdrm 3/Mst Bath

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 101: 1st - Back Ext. @ Kitchen

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 102: 1st - Back Ext. @ Great Rm

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 103: 1st - Int. @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 104: 1st - Front Ext. @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 105: 1st - Front Ext. @ Bdrm 4

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 106: 1st - Side Ext. @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 107: 1st - Side Ext @ Study

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 108: 1st - Side Ext. @ Bdrm 4/Kitchen

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 109: 1st - Side Ext @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall xxx: - Not Used

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs ####! Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

JayMarc Homes

Liao Residence

Mercer Island, WA

Seismic Shear Wall Calculations

Reviewed By: NJM

November 10, 2021

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: B

Seismic Design Category: D

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



MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SEISMIC CALCULATION - ASCE 7-16

Seismic Design Category:

User Inputs:

Site Class	D
Spectral Response Acceleration 0.2 sec, S_s	1.429
Spectral Response Acceleration 1.0 sec, S₁	0.497
Occupancy Category	II

Variables:

Site coefficient, F _a	1.20
Site coefficient, F _v	1.80

Calculated Values:

Maximum spectral response acceleration, S_{ms}	1.715
Maximum spectral response acceleration, S_{m1}	0.896
Design spectral response acceleration, S_{ds}	1.143
Design spectral response acceleration, S_{d1}	0.597
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	21

Calculated Values:

Approximate Fundamental Period, T _a	0.194
T ₀	0.105
T _s	0.523
Spectral Response Acc., S _a (g)	1.143

Site Class Assumption

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

Equivalent lateral force procedure

Dead Load Calculation:

Level	Story Ht. (ft.)	Area (ft ²)	Dead Load (psf)	DL of ext wall trib. to level (kips)	Total Level DL
1	11.6	2725	16	5.2	48 k
2	9.1	2076	17	2.2	38 k
3	0.0	0	0	0.0	0 k
4	0.0	0	0	0.0	0 k
5	0.0	0	0	0.0	0 k
6	0.0	0	0	0.0	0 k
7	0.0	0	0	0.0	0 k
8	0.0	0	0	0.0	0 k
9	0.0	0	0	0.0	0 k
10	0.0	0	0	0.0	0 k
11	0.0	0	0	0.0	0 k
12	0.0	0	0	0.0	0 k
13	0.0	0	0	0.0	0 k
14	0.0	0	0	0.0	0 k
15	0.0	0	0	0.0	0 k
16	0.0	0	0	0.0	0 k
17	0.0	0	0	0.0	0 k
18	0.0	0	0	0.0	0 k
19	0.0	0	0	0.0	0 k
20	0.0	0	0	0.0	0 k

Total Dead Load Of Structure = 85 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	0.176	0.176

Base Shears:

Ultimate Loads		Allowable Loads	
Transverse	Longitudinal	Transverse	Longitudinal
15 k	15 k	10.5 k	10.5 k

Story Shear Calculation:

Level	Vert. Dist. Factor, C_{vk}	Ultimate Loads		Allowable Loads			
		Transverse Story Shear, F _x	Longitudinal Story Shear, F _y	Transverse Story Shear, F _x	Σ Story Shear	Longitudinal Story Shear, F _y	Σ Story Shear
1	0.417	6.3 k	6.3 k	4.4 k	10.5 k	4.4 k	10.5 k
2	0.583	8.8 k	8.8 k	6.1 k	6.1 k	6.1 k	6.1 k
3	0.000	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
4	0.000	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
5	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
6	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
7	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
8	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
9	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
10	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
11	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
12	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
13	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
14	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
15	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
16	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
17	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
18	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
19	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
20	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k



Shearwall Design Summary

Shearwall 201: 2nd - Back Ext. @ Mst. Bdrm

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 202: 2nd - Back Ext. @ Mst. WIC

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14' END LENGTH)



Shearwall Design Summary

Shearwall 203: 2nd - Front Ext. @ Bdrm 2

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 204: 2nd - Front Ext @ Mech/Bath 2

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 205: 2nd - Side Ext @ Bdrm 2/Bonus

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 206: 2nd - Side Ext @ Bdrm 3/Mst Bath

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 101: 1st - Back Ext. @ Kitchen

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 102: 1st - Back Ext. @ Great Rm

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 103: 1st - Int. @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 104: 1st - Front Ext. @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 105: 1st - Front Ext. @ Bdrm 4

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 106: 1st - Side Ext. @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 107: 1st - Side Ext @ Study

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 108: 1st - Side Ext. @ Bdrm 4/Kitchen

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 109: 1st - Side Ext @ Garage

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity 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 pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall xxx: - Not Used

Shearwall Properties:

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

Capacity Evaluation:

Total Shear Load on Wall lbs ####! Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

Resistive DL pl f Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required