



**Exforma Design**  
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THESE ATTACHMENTS ARE PART  
OF THE APPROVED PLANS.

**\* DO NOT REMOVE THEM \***

04/22/2022

PERMIT AND RESOURCE  
MANAGEMENT DEPARTMENT  
BUILDING PLAN CHECK

PERMIT # BLD22-0591 - BLD22-0606

**March 18, 2022**

## **CALCULATIONS**

**Prepared for**

**HOMELSS ACTION SONOMA**  
**18820 HIGHWAY 12**  
**SONOMA, CA 95476**

## **Gravity & Lateral Analysis**

Exforma Job #2223



(E) ROOF FRAMING

Asphalt Shingles	5.0		
2x's @ 16" o.c.	2.3		
1/2" ply	1.8		
Gyp Bd	2.5		
Insulation	1.5		
Miscellaneous	<u>1.9</u>		
<b>DL =</b>	<b>15.0 psf</b>	<b>LL = 20.0 psf</b>	<b>TL = 35 psf</b>

(E) CEILING FRAMING

2x6 @ 16" o.c.	1.7		
type 'x' sheetrock	1.8		
Insulation	2.5		
Miscellaneous	<u>2</u>		
<b>DL =</b>	<b>8.0 psf</b>	<b>LL = 10.0 psf</b>	<b>TL = 18 psf</b>

(E) EXTERIOR WALL

Wood Siding	2.5		
1/2" Ply	1.5		
2x's @ 16" o.c.	1.6		
Insulation	1.0		
1/2" Gypboard	2.2		
Miscellaneous	<u>1.2</u>		
<b>DL =</b>	<b>10.0 psf</b>	<b>LL = 00.0 psf</b>	<b>TL = 10 psf</b>

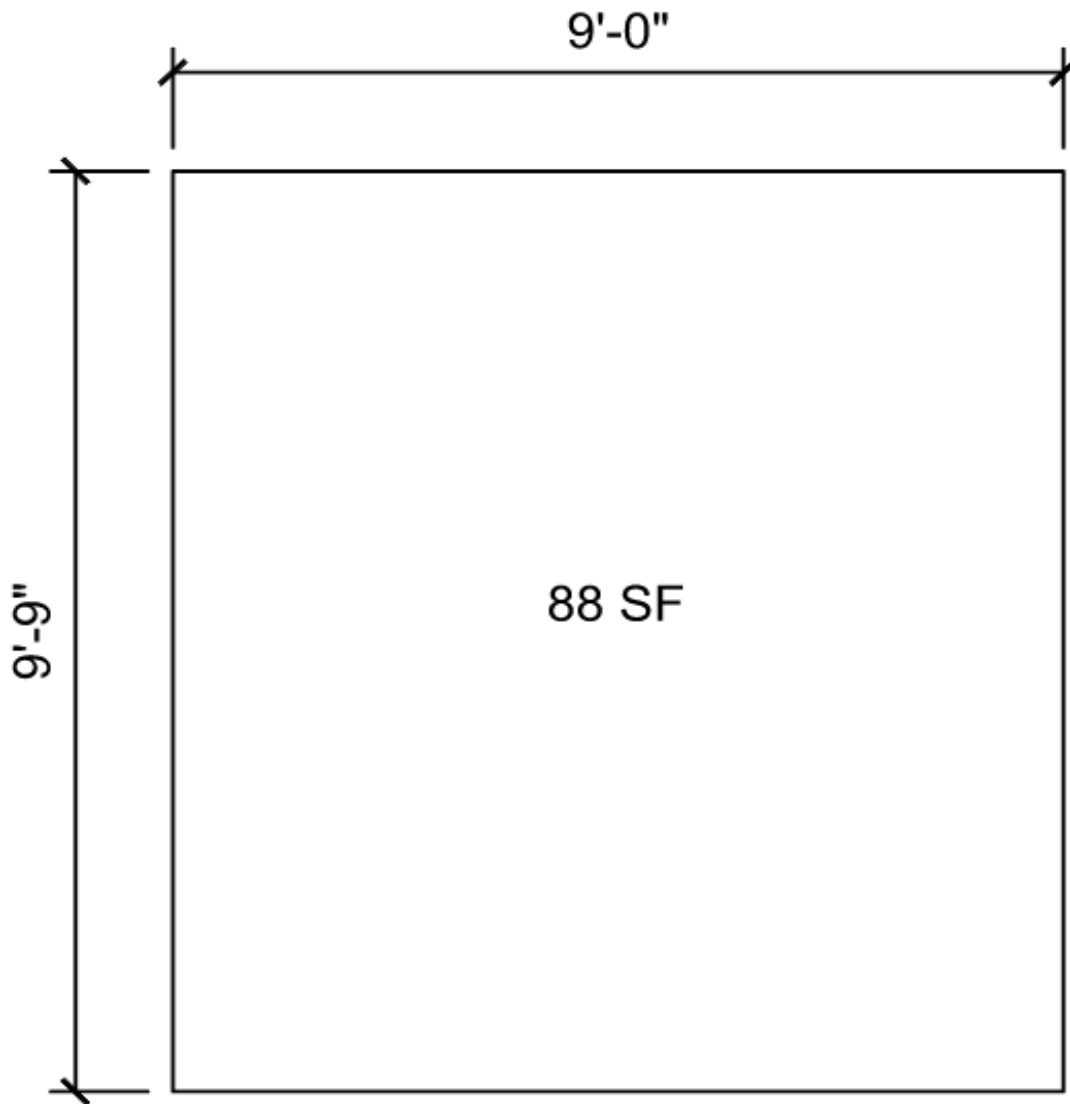
(E) INTERIOR WALL

1/2" Gypboard	2.2		
2x's @ 16" o.c.	1.1		
1/2" Gypboard	2.2		
Miscellaneous	<u>0.5</u>		
<b>DL =</b>	<b>6.0 psf</b>	<b>LL = 00.0 psf</b>	<b>TL = 6 psf</b>

(E) INTERIOR FLOOR

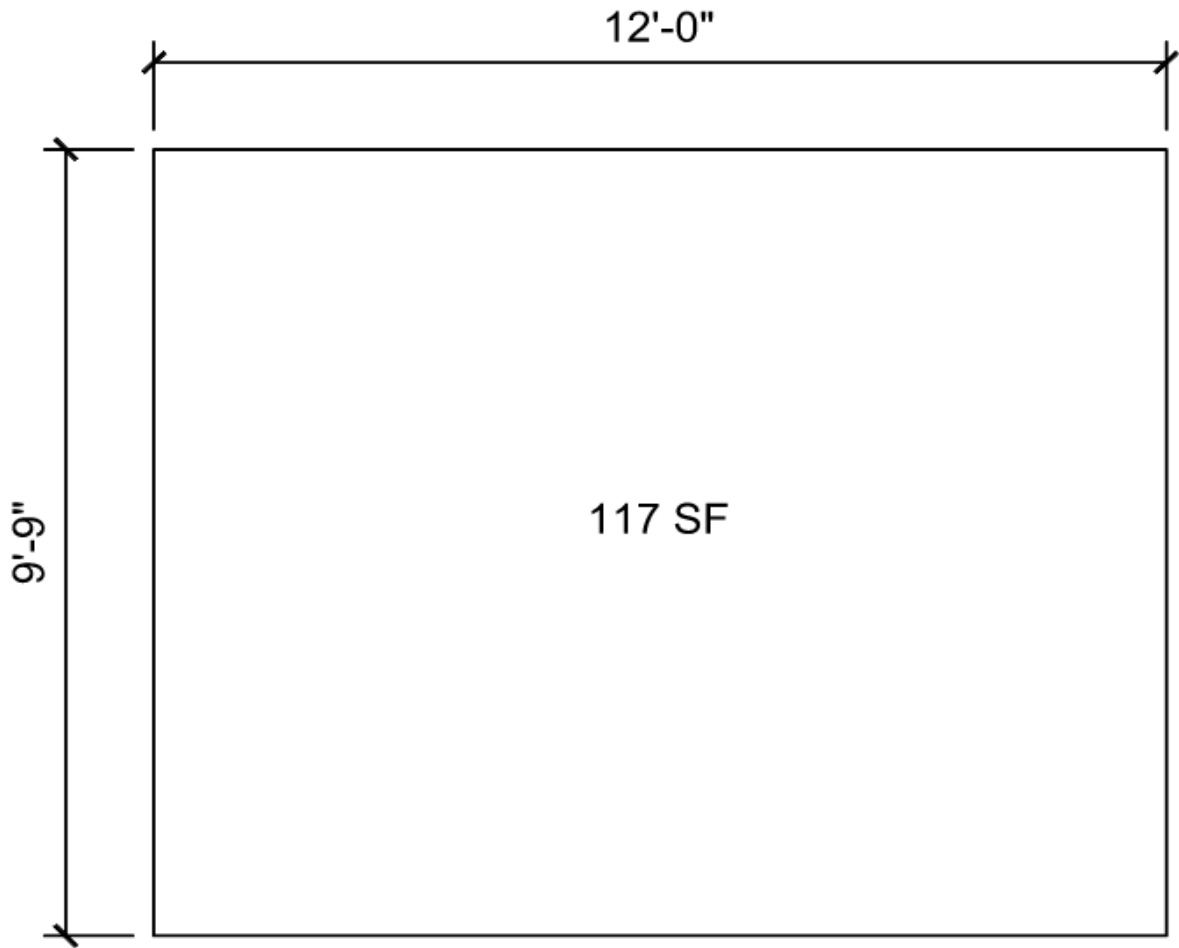
Finish Flooring	7		
3/4" Plywood	2.3		
2x Joists @ 16" o.c.	2.2		
Ceiling	2.8		
Miscellaneous	<u>0.7</u>		
<b>DL =</b>	<b>15.0 psf</b>	<b>LL = 40.0 psf</b>	<b>TL = 55 psf</b>

Per ASCE 7-16, section 27.1.5, wind load was designed with code minimum 16 psf applied to surface area



WIND AREA 9'x9' UNIT  
WORST CASE ELEVATION

Per ASCE 7-16, section 27.1.5, wind load was designed with code minimum  
16 psf applied to surface area



WIND AREA 9'x12' UNIT  
WORST CASE ELEVATION



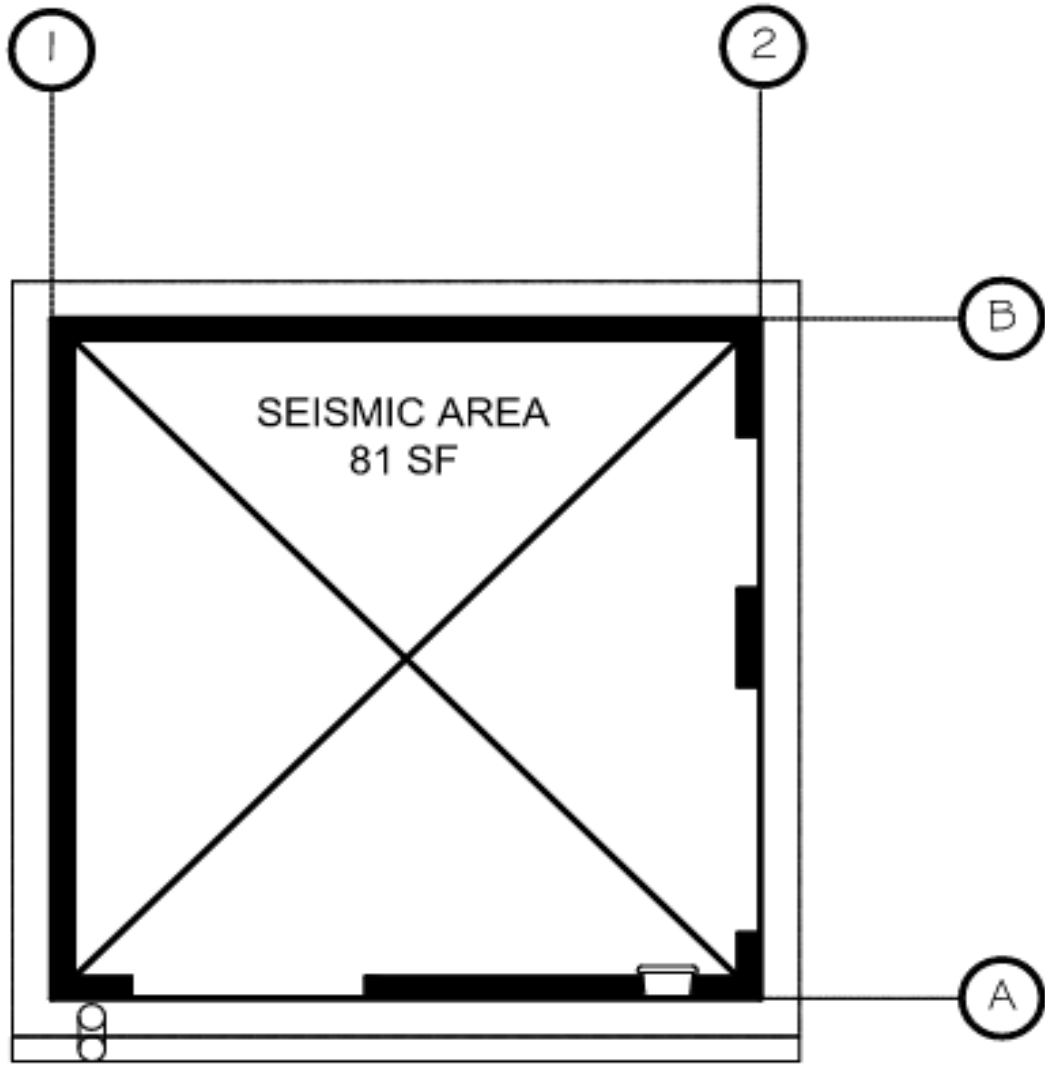
## GEOTECHNICAL STUDY REPORT

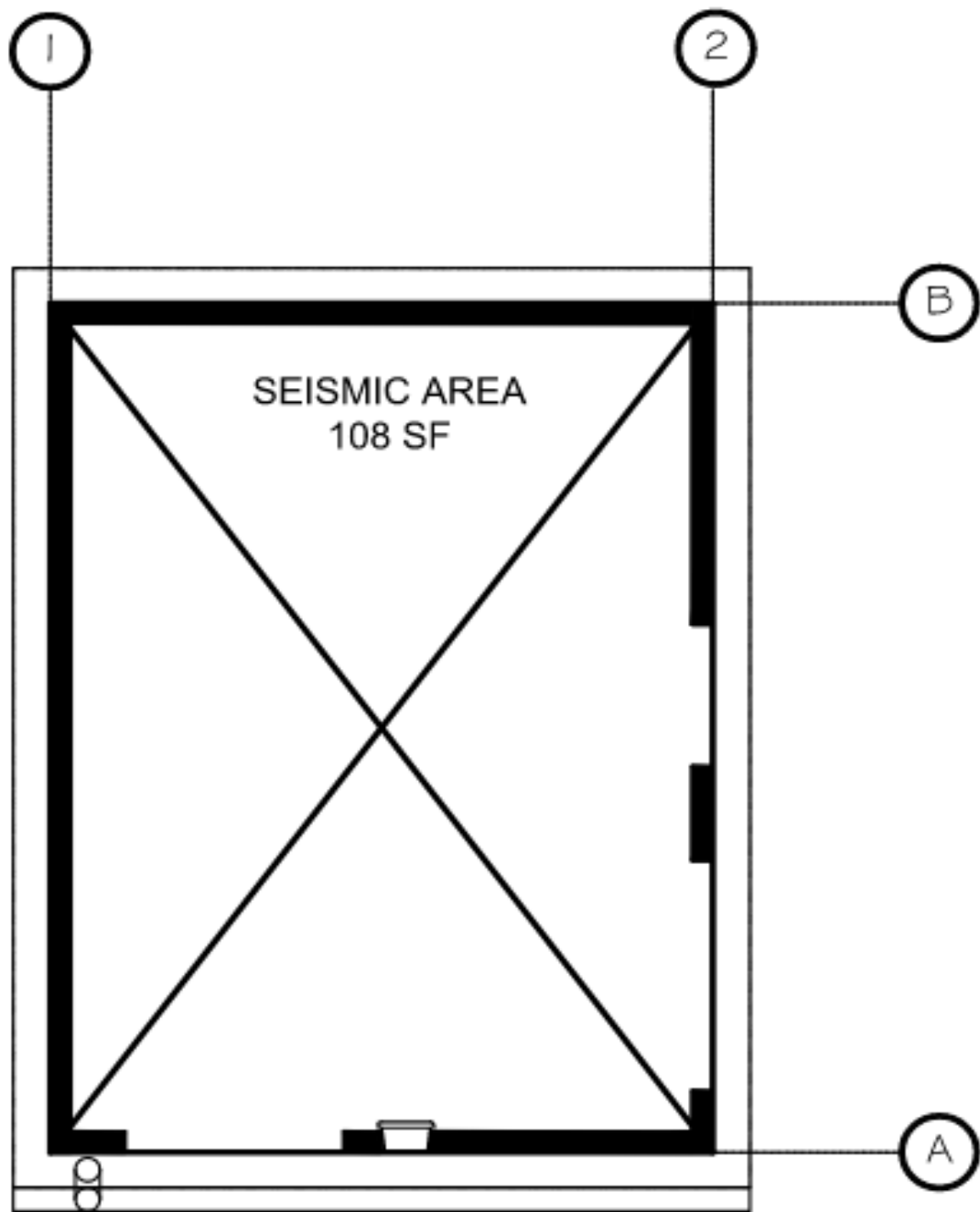
HOMELESS ACTION SONOMA  
18820 HIGHWAY 12  
SONOMA, CALIFORNIA

### Seismic Design

Seismic design parameters presented below are based on Section 1613 titled “Earthquake Loads” of the 2019 California Building Code (CBC). Based on Table 20.3-1 of American Society of Civil Engineers (ASCE) Standard 7-16, titled “Minimum Design Loads and Associated Criteria for Buildings and Other Structures” (2017), we have determined a Site Class of D should be used for the site. Using a site latitude and longitude of 38.3059°N and 122.4784°W, respectively, and the procedures outlined in Chapter 21 of ASCE Standard 7-16, we recommend that the following site-specific seismic design criteria be used for applicable structures at the site.

2019 CBC Seismic Criteria	
Spectral Response Parameter	Acceleration (g)
$S_5$ (0.2 second period)	1.803
$S_1$ (1 second period)	0.680
$S_{M5}$ (0.2 second period)	1.818
$S_{M1}$ (1 second period)	1.835
$S_{D5}$ (0.2 second period)	1.212
$S_{D1}$ (1 second period)	1.223





## Seismic vs Wind Comparison for 9'x9' Unit

**SEISMIC DESIGN PER ASCE 7-16:**

Soils Report Performed: **Yes**  
 Risk Category: **II**  
 Site Class: **D**  
 $S_{DS} =$  **1.212**  
 USGS  $S_{D1} =$  **1.22**  
 $S_1 =$  **0.68**

**Note:**

If  $T \leq 1.5 * T_s$ , use Eqn. 12.8-2  
 If  $T_L \geq T > 1.5 * T_s$ , use Eqn. 12.8-3  
 If  $T > T_L$ , use Eqn. 12.8-4

**Per 12.8.21:**

$T = T_a = C_t * (h_n)^x$   $T_a =$  0.10  
 $h_n =$  height of building at mean roof height  $h_n =$  8 ft  
 $C_t =$  per table 12.8-2  $C_t =$  0.02  
 $x =$  per table 12.8-2  $x =$  0.75

$F_v =$  1.7 at  $S_1 = 0.68$  per table 11.4-2  
 $S_{M1} =$  1.156 Eqn. 11.4-2  
 $S_{D1} =$  1.223 Eqn. 11.4-4  
 $T_s =$  1.01 Eqn. 11.4-7

$C_s = \frac{SDS}{(R/le)} = 0.186$
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(Eqn. 12.8-2)  $I=1$   
 $R=6.5$

**SEISMIC LOADS:**

[1ST FLOOR]

Roof DL (15psf) 100 SF	=	1.50		
1/2 Ext. Wall DL (10psf) 4' (36')	=	1.44		
1/2 Int. Wall DL (6psf) 4' (0')	=	0.00		
	<hr style="width: 100%;"/>			
$V = 0.186$	x	2.94	=	<b>0.55<sup>k</sup></b>
		Total	=	<b>0.55<sup>k</sup></b>

**SEISMIC FORCES AFTER LOAD COMBINATION:**

Per ASCE 7-16, section 2.4.5

$0.7 * F_{1st\ Story} =$  **0.38<sup>k</sup>**

**SUMMARY OF GOVERNING LATERAL FORCES**

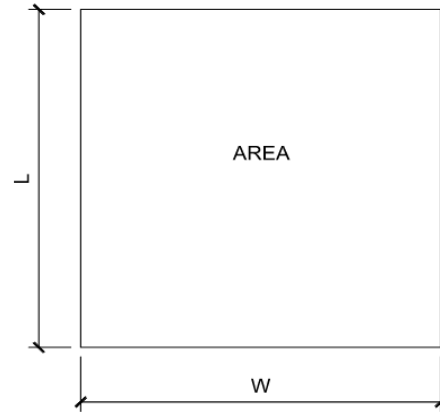
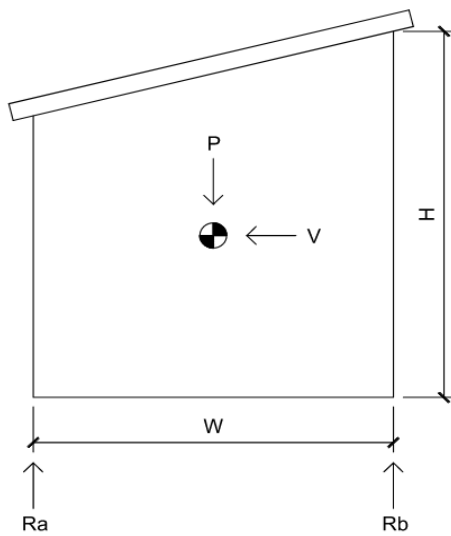
NORTH/SOUTH DIRECTION

Seismic	Wind (N/S)	
0.38	0.42	<b>Wind Governs</b>

EAST/WEST DIRECTION

Seismic	Wind (E/W)	
0.38	0.42	<b>Wind Governs</b>

# 9'x9' OVERTURNING CALCULATION



Structure Weight, P= 5595 lbs  
Lateral Force, V= 842 lbs

Width, W= 9 ft  
Length, L= 9 ft  
Height, H= 9.75 ft

$$\Sigma M_a = 0$$

$$\Sigma M_a = (-5595 \text{ lbs} \times 4.5 \text{ ft}) + (842.4 \text{ lbs} \times 4.875 \text{ ft}) + (R_b \times 9 \text{ ft})$$

$$R_b = 2341.2 \text{ lbs}$$

$$\Sigma Y = 0$$

$$\Sigma Y = R_a + (-5595 \text{ lbs}) + 2341.2 \text{ lbs}$$

$$R_a = 3253.8 \text{ lbs}$$

**Note:**

Lateral force does not cause structure to overturn, therefore no anchorage required.

## Seismic vs Wind Comparison for 9'x12' Unit

**SEISMIC DESIGN PER ASCE 7-16:**

Soils Report Performed: **Yes**  
 Risk Category: **II**  
 Site Class: **D**  
 $S_{DS} =$  **1.212**  
 USGS  $S_{D1} =$  **1.22**  
 $S_1 =$  **0.68**

**Note:**

If  $T \leq 1.5 * T_s$ , use Eqn. 12.8-2  
 If  $T_L \geq T > 1.5 * T_s$ , use Eqn. 12.8-3  
 If  $T > T_L$ , use Eqn. 12.8-4

**Per 12.8.21:**

$T = T_a = C_t * (h_n)^x$	$T_a =$ 0.10
$h_n =$ height of building at mean roof height	$h_n =$ 8 ft
$C_t =$ per table 12.8-2	$C_t =$ 0.02
$x =$ per table 12.8-2	$x =$ 0.75

$F_v =$	<b>1.7</b>	at $S_1 = 0.68$	per table 11.4-2
$S_{M1} =$	1.156	Eqn. 11.4-2	
$S_{D1} =$	1.223	Eqn. 11.4-4	
$T_s =$	1.01	Eqn. 11.4-7	

$C_s = \frac{SDS}{(R/1e)} = 0.186$	(Eqn. 12.8-2)	$I=1$ $R=6.5$
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**SEISMIC LOADS:**

[1ST FLOOR]

Roof DL (15psf) 130 SF	=	1.95	
1/2 Ext. Wall DL (10psf) 4' (42')	=	1.68	
1/2 Int. Wall DL (6psf) 4' (0')	=	0.00	
$V = 0.186$	x	3.63	= <b>0.68<sup>k</sup></b>
Total			= <b>0.68<sup>k</sup></b>

**SEISMIC FORCES AFTER LOAD COMBINATION:**

Per ASCE 7-16, section 2.4.5

$0.7 * F_{1st\ Story} =$  **0.47<sup>k</sup>**

**SUMMARY OF GOVERNING LATERAL FORCES**

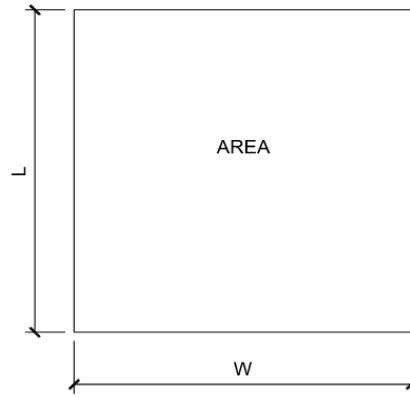
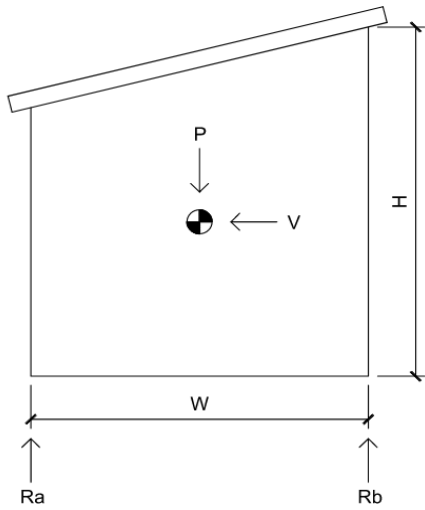
NORTH/SOUTH DIRECTION

Seismic	Wind (N/S)	
0.47	<b>0.56</b>	<b>Wind Governs</b>

EAST/WEST DIRECTION

Seismic	Wind (E/W)	
0.47	0.56	<b>Wind Governs</b>

# 9'x12' OVERTURNING CALCULATION



Structure Weight, P= 6930 lbs  
Lateral Force, V= 1123 lbs

Width, W= 9 ft  
Length, L= 12 ft  
Height, H= 9.75 ft

$$\Sigma Ma = 0$$

$$\Sigma Ma = (-6930\text{lbs} \times 4.5\text{ft}) + (1123.2\text{lbs} \times 4.875\text{ft}) + (Rb \times 9\text{ft})$$

$$Rb = 2856.6 \text{ lbs}$$

$$\Sigma Y = 0$$

$$\Sigma Y = Ra + -6930\text{lbs} + 2856.6\text{lbs}$$

$$Ra = 4073.4 \text{ lbs}$$

**Note:**

Lateral force does not cause structure to overturn, therefore no anchorage required.

**Total Seismic Load= 421 lbs**

**SHEARWALLS**

**NORTH/SOUTH DIRECTION - Seismic Governs**

**EAST/WEST DIRECTION - Seismic Governs**

BUILDING FOOTPRINT AREA	81 SF	Percent Shear Acting Upon Area
AREA 1	81 sf	100%
<b>TOTALS</b>	<b>81 SF</b>	<b>100%</b>

LINE	V (lbs)	L (ft.)	v (lbs/ft.)	RESISTIVE SHEAR
<b>NORTH/SOUTH</b>				
1	421	9	= 47	A-Wall
2	-	0	= 0	ENTER CALCS

**Total Shear: 421 lbs**

LINE	V (lbs)	L (ft.)	v (lbs/ft.)	RESISTIVE SHEAR
<b>EAST/WEST</b>				
A	211	5	= 42	A-Wall
B	211	9	= 23	A-Wall

**Total Shear: 421 lbs**

- A-Wall capacity of 15/32" plywd, blkd w/ 10d @ 6"/12" = 310 lbs/ft
- B-Wall capacity of 15/32" plywd, blkd w/ 10d @ 4"/12" = 460 lbs/ft
- C-Wall capacity of 15/32" plywd, blkd w/ 10d @ 3"/12" = 600 lbs/ft
- AA-Wall capacity of 15/32" plywd on 2 sides, blkd w/ 10d @ 6"/12" = 620 lbs/ft
- D-Wall capacity of 19/32" plywd, blkd w/ 10d @ 2"/12" = 870 lbs/ft
- BB-Wall capacity of 15/32" plywd on 2 sides, blkd w/ 10d @ 4"/12" = 920 lbs/ft
- CC-Wall capacity of 15/32" plywd on 2 sides, blkd w/ 10d @ 3"/12" = 1200 lbs/ft
- DD-Wall capacity of 19/32" plywd on 2 sides, blkd w/ 10d @ 2"/12" = 1740 lbs/ft

**SHEAR PANEL UPLIFT 1ST FLOOR**

**Line (1) V=421(9/9)**

	V, lbs	Length (L), ft	height (h), ft
P=	421	<b>9</b>	<b>8</b>
wD=	$(15\text{psf}\cdot 4.5')+(10\text{psf}\cdot 8')$		148 lbs/ft.
OTM=	$V\cdot h-(0.43)(wD)(L^2)/2=$		799 ft-lbs
T=C=	799 / (L-0.5')=		94 lbs
Foundation Type=	<b>NEW</b>	$\Omega = \text{N/A}$	94 lbs

**No Holddown Required**

**Line (A) V=211(5/5)**

	V, lbs	Length (L), ft	height (h), ft
P=	211	<b>5</b>	<b>8</b>
wD=	$(15\text{psf}\cdot 1')+(10\text{psf}\cdot 8')$		95 lbs/ft.
OTM=	$V\cdot h-(0.43)(wD)(L^2)/2=$		1174 ft-lbs
T=C=	1174 / (L-0.5')=		261 lbs
Foundation Type=	<b>NEW</b>	$\Omega = \text{N/A}$	261 lbs

**No Holddown Required**

**Line (B) V=211(9/9)**

	V, lbs	Length (L), ft	height (h), ft
P=	211	<b>9</b>	<b>8</b>
wD=	$(15\text{psf}\cdot 1')+(10\text{psf}\cdot 8')$		95 lbs/ft.
OTM=	$V\cdot h-(0.43)(wD)(L^2)/2=$		29 ft-lbs
T=C=	29 / (L-0.5')=		3 lbs
Foundation Type=	<b>NEW</b>	$\Omega = \text{N/A}$	3 lbs

**No Holddown Required**

**Total Seismic Load= 562 lbs**

**SHEARWALLS**

**NORTH/SOUTH DIRECTION - Seismic Governs**

**EAST/WEST DIRECTION - Seismic Governs**

BUILDING FOOTPRINT AREA	108 SF	Percent Shear Acting Upon Area	
AREA 1	108 sf	100%	562 lbs
<b>TOTALS</b>	<b>108 SF</b>	<b>100%</b>	<b>562 lbs</b>

LINE		V (lbs)	L (ft.)	=	v (lbs/ft.)	RESISTIVE SHEAR
<b>NORTH/SOUTH</b>						
1	0.5(A1)	281	12	=	23	A-Wall
2	0.5(A1)	281	4.5	=	62	A-Wall
<b>Total Shear:</b>		<b>562 lbs</b>				

LINE		V (lbs)	L (ft.)	=	v (lbs/ft.)	RESISTIVE SHEAR
<b>EAST/WEST</b>						
A	0.5(A1)	281	5	=	56	A-Wall
B	0.5(A1)	281	9	=	31	A-Wall
<b>Total Shear:</b>		<b>562 lbs</b>				

- A-Wall capacity of 15/32" plywd, blkd w/ 10d @ 6"/12" = 310 lbs/ft
- B-Wall capacity of 15/32" plywd, blkd w/ 10d @ 4"/12" = 460 lbs/ft
- C-Wall capacity of 15/32" plywd, blkd w/ 10d @ 3"/12" = 600 lbs/ft
- AA-Wall capacity of 15/32" plywd on 2 sides, blkd w/ 10d @ 6"/12" = 620 lbs/ft
- D-Wall capacity of 19/32" plywd, blkd w/ 10d @ 2"/12" = 870 lbs/ft
- BB-Wall capacity of 15/32" plywd on 2 sides, blkd w/ 10d @ 4"/12" = 920 lbs/ft
- CC-Wall capacity of 15/32" plywd on 2 sides, blkd w/ 10d @ 3"/12" = 1200 lbs/ft
- DD-Wall capacity of 19/32" plywd on 2 sides, blkd w/ 10d @ 2"/12" = 1740 lbs/ft

**SHEAR PANEL UPLIFT 1ST FLOOR**

**Line (1) V=281(12/12)**

	V, lbs	Length (L), ft	height (h), ft
P=	281	<b>12</b>	<b>8</b>
wD=	$(15\text{psf}\cdot 4.5')+(10\text{psf}\cdot 8')$		148 lbs/ft.
OTM=	$V\cdot h-(0.43)(wD)(L^2)/2=$		-2324 ft-lbs
T=C=	$-2324/(L-0.5')$		-202 lbs
Foundation Type=	<b>NEW</b>	$\Omega= \text{N/A}$	-202 lbs

**No Holddown Required**

**Line (2) V=281(4.5/4.5)**

	V, lbs	Length (L), ft	height (h), ft
P=	281	<b>4.5</b>	<b>8</b>
wD=	$(15\text{psf}\cdot 4.5')+(10\text{psf}\cdot 8')$		148 lbs/ft.
OTM=	$V\cdot h-(0.43)(wD)(L^2)/2=$		1604 ft-lbs
T=C=	$1604/(L-0.5')$		401 lbs
Foundation Type=	<b>NEW</b>	$\Omega= \text{N/A}$	401 lbs

**No Holddown Required**

**Line (A) V=281(5/5)**

	V, lbs	Length (L), ft	height (h), ft
P=	281	<b>5</b>	<b>8</b>
wD=	$(15\text{psf}\cdot 1')+(10\text{psf}\cdot 8')$		95 lbs/ft.
OTM=	$V\cdot h-(0.43)(wD)(L^2)/2=$		1735 ft-lbs
T=C=	$1735/(L-0.5')$		386 lbs
Foundation Type=	<b>NEW</b>	$\Omega= \text{N/A}$	386 lbs

**No Holddown Required**

**Line (B) V=281(9/9)**

	V, lbs	Length (L), ft	height (h), ft
P=	281	<b>9</b>	<b>8</b>
wD=	(15psf*4.5')+(10psf*8')=		148 lbs/ft.
OTM=	V*h-(0.43)(wD)(L^2)/2=		-324 ft-lbs
T=C=	-324 /(L-0.5')=		-38 lbs
Foundation Type=	<b>NEW</b>	$\Omega$ = N/A	-38 lbs

**No Holddown Required**

**Interior Headers**

NONE

**Exterior Headers**

**(N) Exterior Header (Worst Case) Along Wall Line 2**

$L_{max} = 3.3$  ft.       $w_{total} = 10' \times 0.5 \times 35$  psf = 175 plf  
 $M = [(3.25)^2 \times 175] / 8$        $M_{max} = 231$  ft-lb <      2,151 }  
     $V_{max} = 284$  lbs <      2,599 }      **4x6 DF # 1**      E      I (in<sup>4</sup>)  
                                                      1.60E+06      48.5  
    defl. = 0.01 in. = L/ 6893      **OK**      ← Beam Size  
                                       **OK**      ← Deflection

**New Beams**

NONE

**Roof / Ceiling Framing**

**(N) Roof Rafters Between Wall Lines A & B**

$L_{max} = 9.0$  ft.       $w_{total} = 3' \times 0.5 \times 35$  psf = 53 plf  
 $M = [(9)^2 \times 53] / 8$        $M_{max} = 532$  ft-lb <      1,659 }  
     $V_{max} = 236$  lbs <      2,228 }      **DBL 2x6 DF # 2**      E      I (in<sup>4</sup>)  
                                                      1.60E+06      41.6  
    defl. = 0.12 in. = L/ 927      **OK**      ← Beam Size  
                                       **OK**      ← Deflection

**Floor Framing**

**(N) Floor Joists Between Wall Lines A & B**

$L_{max} = 9.0$  ft.       $w_{total} = 3' \times 0.5 \times 55$  psf = 83 plf  
 $M = [(9)^2 \times 83] / 8$        $M_{max} = 835$  ft-lb <      1,330 }  
     $V_{max} = 371$  lbs <      1,468 }      **2x8 DF # 2**      E      I (in<sup>4</sup>)  
                                                      1.60E+06      47.6  
    defl. = 0.16 in. = L/ 676      **OK**      ← Beam Size  
                                       **OK**      ← Deflection

**Foundation**

NONE

**Interior Headers**

NONE

**Exterior Headers**

**(N) Exterior Header (Worst Case) Along Wall Line 2**

$L_{max} = 3.3$  ft.       $w_{total} = 10' \times 0.5 \times 35$  psf = 175 plf  
 $M = [(3.25)^2 \times 175] / 8$        $M_{max} = 231$  ft-lb <      2,151 }  
     $V_{max} = 284$  lbs <      2,599 }      **4x6 DF # 1**      E      I (in<sup>4</sup>)  
                                                      1.60E+06      48.5  
    defl. = 0.01 in. = L/ 6893      **OK**      ← Beam Size  
                                       **OK**      ← Deflection

**New Beams**

NONE

**Roof / Ceiling Framing**

**(N) Roof Rafters Between Wall Lines A & B**

$L_{max} = 9.0$  ft.       $w_{total} = 3' \times 0.5 \times 35$  psf = 53 plf  
 $M = [(9)^2 \times 53] / 8$        $M_{max} = 532$  ft-lb <      1,659 }  
     $V_{max} = 236$  lbs <      2,228 }      **DBL 2x6 DF # 2**      E      I (in<sup>4</sup>)  
                                                      1.60E+06      41.6  
    defl. = 0.12 in. = L/ 927      **OK**      ← Beam Size  
                                       **OK**      ← Deflection

**Floor Framing**

**(N) Floor Joists Between Wall Lines A & B**

$L_{max} = 9.0$  ft.       $w_{total} = 3' \times 0.5 \times 55$  psf = 83 plf  
 $M = [(9)^2 \times 83] / 8$        $M_{max} = 835$  ft-lb <      1,330 }  
     $V_{max} = 371$  lbs <      1,468 }      **2x8 DF # 2**      E      I (in<sup>4</sup>)  
                                                      1.60E+06      47.6  
    defl. = 0.16 in. = L/ 676      **OK**      ← Beam Size  
                                       **OK**      ← Deflection

**Foundation**

NONE