



## Structural Calculations

Project: **Mounger Residence**  
4006 E. Mercer Way  
Mercer Island, WA 98040

For: **Sturman Architects**  
9 - 103<sup>rd</sup> Ave SE, Suite 203  
Bellevue, WA 98004

By: **Année Structural Engineering, LLC**  
1801 18<sup>th</sup> Ave S  
Seattle, WA 98144

Date: **April 28, 2022**



# Design Criteria

Project Name: **Mounger Residence**  
 Location: **4006 E. Mercer Way, Mercer Island**

Date: **7/29/2020**  
 Soil Bearing: **2000** psf  
 Frost Depth: **12"**



<u>Dead Loads:</u>	<u>Roof:</u>		<u>Floors:</u>		<u>Walls:</u>	
	Comp. Roofing	<b>5.1</b> PSF	Flooring	<b>2.5</b> PSF	Siding	<b>2.3</b> PSF
	1/2" Sheathing	<b>1.7</b> PSF		<b>0.0</b> PSF	Plywood	<b>1.7</b> PSF
	Trusses	<b>3.0</b> PSF	1-1/8" Subfloor	<b>2.7</b> PSF	2x Studs	<b>1.8</b> PSF
	Insulation	<b>0.9</b> PSF	I-Joists	<b>2.5</b> PSF	Insulation	<b>0.5</b> PSF
	5/8" Gypsum	<b>2.8</b> PSF	5/8" Gypsum	<b>2.8</b> PSF	1/2" Gypsum	<b>2.2</b> PSF
	Miscellaneous	<b>3.5</b> PSF	Miscellaneous	<b>1.5</b> PSF	Miscellaneous	<b>1.5</b> PSF
	<b>Total</b>	<b>17.0</b> PSF	<b>Total</b>	<b>12.0</b> PSF	<b>Total</b>	<b>10.0</b> PSF
<u>Live Loads:</u>	Snow	<b>25.0</b> PSF	Floor	<b>40.0</b> PSF	Wind	<b>18.4</b> PSF

Seismic Loads: per IBC, Sect. 1613 & ASCE 7-10, Chapter 11

Design Category = **D**                      Importance = **1.0**                      Redundancy = **1.00**  
 Site Class = **D**                              R = **6.5**  
 Latitude (°N) = **47.574** (per USGS)      S<sub>s</sub> = **1.392**                      F<sub>a</sub> = **1.00**                      S<sub>DS</sub> = 2/3(F<sub>a</sub> × S<sub>s</sub>) = **0.928**  
 Longitude (°W) = **122.205** (per USGS)      S<sub>1</sub> = **0.534**                      F<sub>v</sub> = **1.50**                      S<sub>D1</sub> = 2/3(F<sub>v</sub> × S<sub>1</sub>) = **0.534**

Building                      C<sub>t</sub> = 0.02 (wood)  
 Height                      h<sub>n</sub> = **21.6** ft.  
 Period                      T = C<sub>t</sub>(h<sub>n</sub>)<sup>3/4</sup> = **0.20** sec.                      T<sub>0</sub> = 0.2\*(S<sub>D1</sub>/S<sub>DS</sub>) = **0.12**                      T<sub>s</sub> = (S<sub>D1</sub>/S<sub>DS</sub>) = **0.58**

S<sub>a</sub> = 0.928                      S<sub>a</sub> = S<sub>DS</sub> if T<sub>0</sub> < T < T<sub>sv</sub>, S<sub>a</sub> = 0.6\*(S<sub>DS</sub>/T<sub>0</sub>)\*T + 0.4\*S<sub>DS</sub> if T < T<sub>0</sub>, S<sub>a</sub> = S<sub>D1</sub>/T if T > T<sub>s</sub>

Not greater than:      C<sub>s</sub> = S<sub>D1</sub>/T\*(R/I) = **0.410**  
 Not less than:        C<sub>s</sub> = 0.044S<sub>DS</sub>\*I = **0.041**  
 Design Category E or F; not less than:      C<sub>s</sub> = 0.5S<sub>1</sub>/(R/I) = **0.041**  
 Seismic Design Coefficient:                      C<sub>s</sub> = S<sub>DS</sub>/(R/I) = **0.143**  
**C<sub>s</sub> = 0.143**

Seismic Weight Distribution:

<u>Diaphragm</u>	<u>h<sub>i</sub> (ft.)</u>	<u>w<sub>i</sub> (kips)</u>	<u>h<sub>i</sub>w<sub>i</sub> (K-ft.)</u>	<u>w<sub>i</sub>h<sub>i</sub>/sum(w<sub>i</sub>h<sub>i</sub>)</u>	<u>F<sub>i</sub> (lbs.)</u>	<u>Sum F<sub>i</sub> (lbs.)</u>
			0	0	0	0
			0	0	0	0
			0	0	0	0
<b>Roof</b>	<b>21.8</b>	<b>71.26</b>	<b>1556</b>	<b>0.481</b>	<b>9,997</b>	<b>9,997</b>
<b>2nd Floor</b>	<b>12.3</b>	<b>136.5</b>	<b>1676</b>	<b>0.519</b>	<b>10,768</b>	<b>20,765</b>
		<b>207.8</b>	<b>3233</b>			

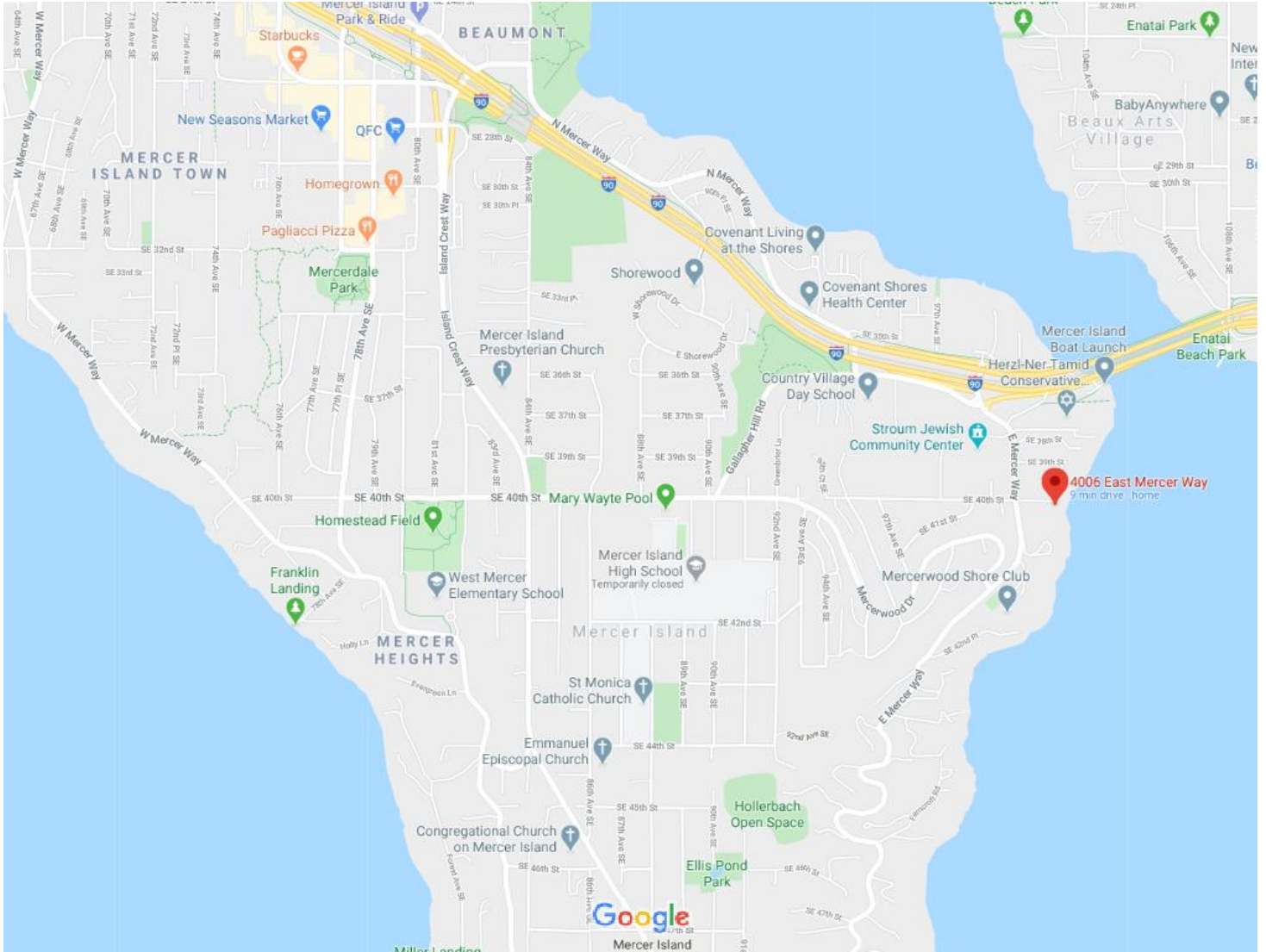
Design Base Shear (working str.) = 0.7\*( 0.143 \* W ) = 0.100 \* W = **20,765 lbs.**

Wind Loads:

Cladding (0.6W)-100 ft<sup>2</sup>

Wind Speed (MPH)	<b>110</b>	K <sub>z</sub> = 0.92	P <sub>net</sub> = 17.0 × C <sub>net</sub> (0.6W)	C <sub>net</sub>	P <sub>net</sub> (psf)	
Exposure	<b>C</b>	I <sub>w</sub> = 1.00		Roof-field (Zone 1)	<b>-0.92</b> -15.7	
Roof Pitch (x:12)	<b>5</b>		MFWRs (0.6W)	Overhang (Zone 1)	<b>-1.36</b> -23.2	
K <sub>1</sub> =	<b>0.00</b>		C <sub>net</sub>	Roof-edges (Zone 2)	<b>-1.17</b> -19.9	
K <sub>2</sub> =	<b>0.00</b>	Wall (windward)	<b>0.43</b>	7.3	Overhang (Zone 2)	<b>-1.87</b> -31.9
K <sub>3</sub> =	<b>0.00</b>	Wall (leeward)	<b>-0.51</b>	-8.7	Roof-corners (Zone 3)	<b>-1.85</b> -31.5
K <sub>t</sub> = (1 + K <sub>1</sub> *K <sub>2</sub> *K <sub>3</sub> ) <sup>2</sup> =	<b>1.00</b>	Roof (windward)	<b>0.03</b>	0.5	Overhang (Zone 3)	<b>-2.13</b> -36.3
		Roof (leeward)	<b>-0.66</b>	-11.2	Wall (Zone 4)-20 ft <sup>2</sup>	<b>-1.08</b> -18.4
					Wall (Zone 5)-20 ft <sup>2</sup>	<b>-1.33</b> -22.7

# Google Maps 4006 E Mercer Way



Map data ©2020 1000 ft



110 MPH, Exp. C, Kt = 1.0

## 4006 E Mercer Way

Mercer Island, WA 98040





# Mounger Residence

4006 E Mercer Way, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5742765, -122.2048415



<b>Date</b>	7/29/2020, 10:41:56 AM
<b>Design Code Reference Document</b>	ASCE7-10
<b>Risk Category</b>	II
<b>Site Class</b>	D - Stiff Soil

Type	Value	Description
$S_S$	1.392	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.534	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	1.392	Site-modified spectral acceleration value
$S_{M1}$	0.801	Site-modified spectral acceleration value
$S_{DS}$	0.928	Numeric seismic design value at 0.2 second SA
$S_{D1}$	0.534	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
$F_a$	1	Site amplification factor at 0.2 second
$F_v$	1.5	Site amplification factor at 1.0 second
PGA	0.573	$MCE_G$ peak ground acceleration
$F_{PGA}$	1	Site amplification factor at PGA
$PGA_M$	0.573	Site modified peak ground acceleration
$T_L$	6	Long-period transition period in seconds
$SsRT$	1.392	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	1.451	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	3.201	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.534	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.572	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	1.301	Factored deterministic acceleration value. (1.0 second)
$PGAd$	1.238	Factored deterministic acceleration value. (Peak Ground Acceleration)
$C_{RS}$	0.959	Mapped value of the risk coefficient at short periods
$C_{R1}$	0.934	Mapped value of the risk coefficient at a period of 1 s

LATERAL ANALYSIS - SEISMIC WEIGHTS;

AT ROOF;  $W_R = 3,538 \text{ k}^2 (17\% (a^2) + 10\% (a^2) (\frac{91}{2} \times 247^2))$   
 $= 71,261^*$

AT UPPER FLOOR;  $W_U = 3,259 \text{ k}^2 (12\% (a^2)) + 746 (55\% (a^2))$   
 Low ROOF  $+ 122 \text{ k}^2 (15\% (a^2)) + 10\% (a^2) (\frac{91}{2} \times 247^2) + \frac{101}{2} \times 265^2$   
 EXTERIOR WALLS  $+ 25.2' (1,050 \text{ k}^2) + 872 \text{ k}^2 (10\% (a^2)) = 136,513^*$

DESIGN BASE SHEAR;  $V = 20,765^* (ASD)$

WIND ANALYSIS PER IRC § 1603.6:

LONGITUDINAL DIR; EAST-TO-WEST:

AT ROOF;  $W_R = 379 \text{ k}^2 (7.3\% (a^2)) - 260 \text{ k}^2 (-8.7\% (a^2))$   
 $+ 290 \text{ k}^2 (0.5\% (a^2)) - 275 \text{ k}^2 (-11.2\% (a^2)) = 8,585^*$

AT UPPER FLOOR;  $W_U = 381 (7.3) - 640 (-8.7) = 8,276^*$

$\Sigma W_L = 16,861^*$

TRANSVERSE DIR; NORTH-TO-SOUTH:

AT ROOF;  $W_R = 489 (7.3) - 437 (-8.7) + 174 (0.5)$   
 $+ 80 (2.1) - 306 (-11.2) = 11,078^*$

AT UPPER FLOOR;  $W_U = 878 (7.3) (-8.7)$

$+ 62 (0.5) (-11.2) = 14,778^* \quad \Sigma W_T = 25,851^*$

∴ WIND CONTROLS AT WALLS IN TRANSVERSE DIRECTION AND SEISMIC CONTROLS AT ALL OTHER LOCATIONS

LATERAL LOAD DISTRIBUTION;

TO UPPER FLOOR WALLS:

LINE (A)-(B);  $V_{AB} = 32\% (9,997^*) = 3,199^*$

$V_{AB} = 3,199^* / 22.9' = 140^* / \text{ft.} \rightarrow \text{SWL}$

LINE (C);  $V_C = 34\% (9,997^*) = 3,399^*$

$V_C = 3,399^* / 19.5' = 174^* / \text{ft.} \rightarrow \text{SWL}$

LINE (E)-(H);  $V_E = V_H = 17\% (9,997^*) = 1,700^*$

(SEE MAIN FLOOR WALLS)

LINE (I);  $V_I = 15.5\% (9,997^*) = 1,549^* \text{ (SEIS.)}$

$= 11.2\% (11,078^*) = 1,241^* \text{ (WIND)}$

$V_I = 1,549^* / 38.58' = 40^* / \text{ft.} \rightarrow \text{SWL}$

LINE (2)-(3);  $V_{23} = 52.4\% (9,997^*) = 5,238^* \text{ (SEIS.)}$

$= 50.7\% (11,078^*) = 5,617^* \text{ (WIND)}$

$V_{23} = 5,617^* / 39.5' = 142^* / \text{ft.} \rightarrow \text{SWL}$

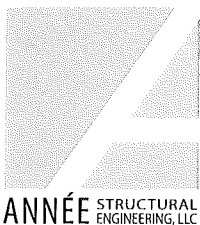
LINE (6);  $V_6 = 32.1\% (9,997^*) = 3,209^* \text{ (SEIS.)}$

$= 38.1\% (11,078^*) = 4,221^* \text{ (WIND)}$

$V_{6e} = 3,209^* / 18.7' = 172^* / \text{ft.}; V_{6w} = 4,221^* / 18.7' = 226^* / \text{ft.}$

$V_{6w} = 250 (\frac{247^2 \times 22}{6.92}) = 777^* / \text{ft.} \therefore \text{SWL}$

CHARACTER  
 $\bar{z} = 13.5$   
 $a_p = 0.025$



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TO MAIN FLR. WALLS:

LINE (C) \* NO LOAD FROM FLOOR DIAPHRAGM

$$V_c = 12.4' (140 \text{ #/ft.}) = 2,016 \text{ #}$$

$$N_c = 2,016 \text{ #} / 9.0' = 224 \text{ #/ft.} \rightarrow \text{SW6}$$

LINE (D);  $V_{pe} = 4.5\% (10,768 \text{ #}) + 1,183 \text{ #} = 6,298 \text{ #}$

$$N_{pe} = 6,362 \text{ #} / 10.8' = 589 \text{ #/ft.} \rightarrow \text{SW2}$$

LINE (E);  $V_{pe} = 4\% (10,768 \text{ #}) + 1,700 \text{ #} = 2,674 \text{ #}$

$$N_{pe} = 2,674 \text{ #} / 8.87' = 309 \text{ #/ft.} \rightarrow \text{SW4}$$

LINE (F);  $V_{pe} = 3.1\% (10,768 \text{ #}) + 3,399 \text{ #} = 6,787 \text{ #}$

$$N_{pe} = 6,787 \text{ #} / 20.7' = 325 \text{ #/ft.} \rightarrow \text{SW4}$$

LINE (H);  $V_{pe} = 12.5\% (10,768 \text{ #}) + 1,700 \text{ #} = 3,046 \text{ #}$

$$N_{pe} = 3,046 \text{ #} / 37.0' = 82 \text{ #/ft.} \rightarrow \text{SW6}$$

LINE (I);  $V_{iw} = 11\% (14,773 \text{ #}) + 1,241 \text{ #} = 2,866 \text{ #}$

$$N_{iw} = 2,866 \text{ #} / 38.6' = 74 \text{ #/ft.} \rightarrow \text{SW6}$$

LINE (J);  $V_{2w} = 26.5\% (14,773 \text{ #}) + 75\% (5,617 \text{ #})$

$$= 8,147 \text{ #}$$

$$N_{2w} = 8,147 \text{ #} / 35.1' = 236 \text{ #/ft.} \rightarrow \text{SW6}$$

LINE (3) \* NO LOAD FROM FLOOR DIAPHRAGM

$$V_3 = 8.14' (170 \text{ #/ft.}) = 1,385 \text{ #}$$

$$N_3 = 1,385 \text{ #} / 18.15' = 76 \text{ #/ft.} \rightarrow \text{SW6}$$

LINE (4.8);  $V_{4.8} = 28.8\% (14,773 \text{ #}) = 4,255 \text{ #}$

$$N_{4.8} = 4,255 \text{ #} / 9.05' = 470 \text{ #/ft.} \rightarrow \text{SW3}$$

LINE (6);  $V_{6e} = 60.3\% (10,768 \text{ #}) + 3,209 = 9,702 \text{ # (SEIS.)}$   
 $= 33.7\% (14,773 \text{ #}) + 4,221 = 9,206 \text{ # (WIND)}$

$$N_{6e} = 9,702 \text{ #} / 7.86' = 1,239 \text{ #/ft.}$$

Check  $1\frac{1}{2}$ " (or 0.58) STRUCT-I w/ 0.131" WALLS TO 3x DP, DOUBLE-SIDED PER SDPS

$$N_a = 2 \left( \frac{1740}{2.0} \right) \left( \frac{2 \times 392'}{10.0'} \right) = 1,363 \text{ #/ft.}$$

$\therefore$  (2) SW2 OR

OVERLAPPING; FROM UPPER FLR. WALLS:

LINE (C)  $T_c = 174 \text{ #/ft.} (9.56') - \frac{7}{2} (0.6 \times 90) = 1,475 \text{ #}$

SM. e (A), (B), (D), (E)

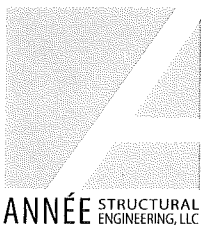
$\therefore$  CS16

FOR-IT, STAIR WALLS WILL USE CONTINUOUS STUDS TO REIN. UPPER FLR. AT e LINE S (B), (D)

LINE (6);  $T_b = 226 \text{ #/ft.} (9.56') - \frac{5.75}{2} (0.6 \times 90)$

$$= 2,005 \text{ #} \therefore \text{MSTC 4383 / MSTC 40}$$

NO HOLDDOWN REQ'D e LINE (E), (H), (I)  
BY INSPECTION



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From Main Pier, WALS:

$$\text{LINE (C)}; T_c = 224^* \left( \frac{11.23'}{2} \right) - \frac{14.85'}{2} (0.6 \times 112)$$
$$= 1,666^* = 3,683^* \rightarrow \text{HDU4/S}$$

$$\text{LINE (D)}; T_D = 589 \left( \frac{11.23'}{2} \right) - \frac{14.85'}{2} (0.6 \times 116)$$
$$= 7,131^* \rightarrow \text{HDU8}$$

$$\text{LINE (E)}; T_E = 369 \left( \frac{9.56'}{2} \right) - \frac{13.26'}{2} (0.6 \times 218)$$
$$= 2,083^* \rightarrow \text{HDU2}$$

$$\text{LINE (F)}; T_F = 325 \left( \frac{11.23'}{2} \right) - \frac{8.25'}{2} (0.6 \times 116)$$
$$= 3,263^* \rightarrow \text{HDU4/S}$$

$$\text{LINE (H)}; T_H = 82 \left( \frac{9.56'}{2} \right) - \frac{28.9'}{2} (0.6 \times 187) \leq 0^*$$

$\therefore$  NO HOLDDOWN REQ'D  $\Rightarrow$  SIM. @ (1)

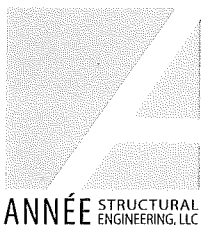
$$\text{LINE (I)}; T_I = 230 \left( \frac{11.23'}{2} \right) - \frac{11.2'}{2} (0.6 \times 192) + 1,268^*$$
$$= 3,206^* \rightarrow \text{HDU4/S}$$

$$\text{LINE (J)}; T_J = 76 \left( \frac{11.23'}{2} \right) - \frac{19.15'}{2} (0.6 \times 112) + 1,419^*$$
$$= 1,661^* \rightarrow \text{HDU2}$$

$$\text{LINE (K)}; T_K = 470 \left( \frac{11.23'}{2} \right) - \frac{9.05'}{2} (0.6 \times 176)$$
$$= 4,802^* \rightarrow \text{HDU5}$$

$$\text{LINE (G)}; T_G = 1,235^* \left( \frac{11.23'}{2} \right) - \frac{8'}{2} (0.6 \times 678) + \frac{2,035^*}{2}$$
$$= 13,289^* \rightarrow \text{HDU14 to 4x8 DF}$$

w/ PABS ( $d_c = 11''$ ;  $E = 16 \frac{1}{2}''$ )



Project

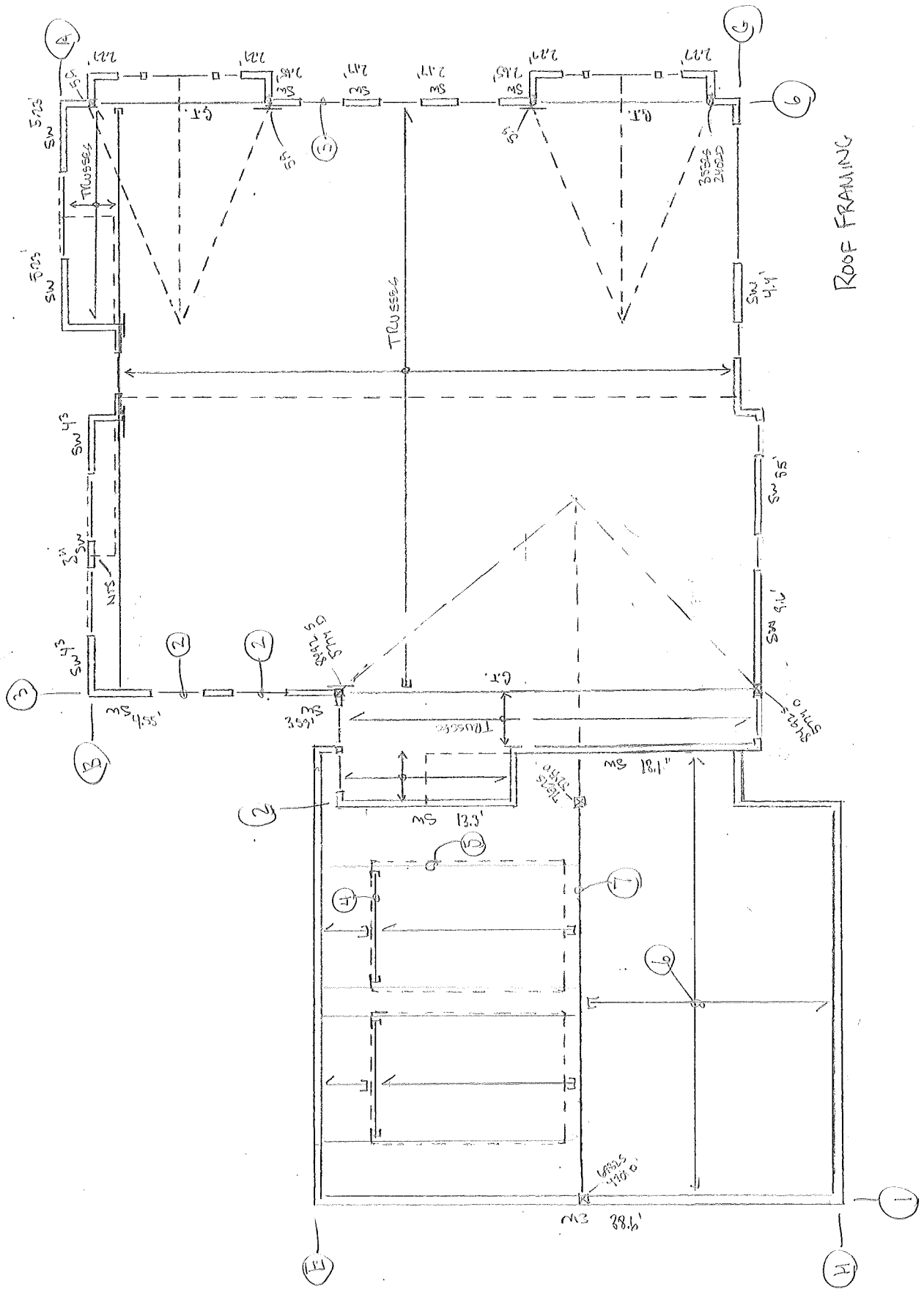
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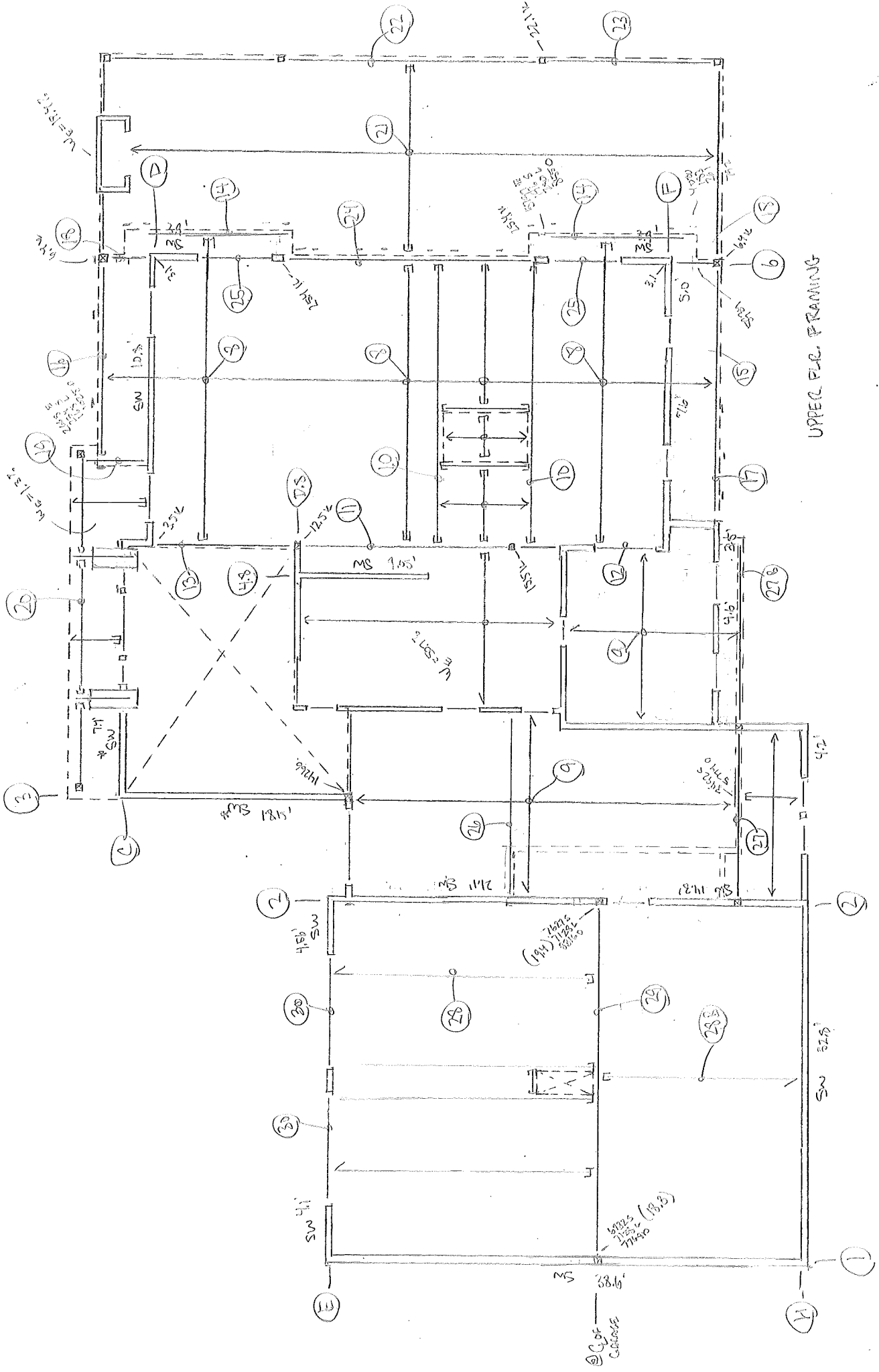
1801 18th Ave S, Seattle, WA 98144 206.658.5169

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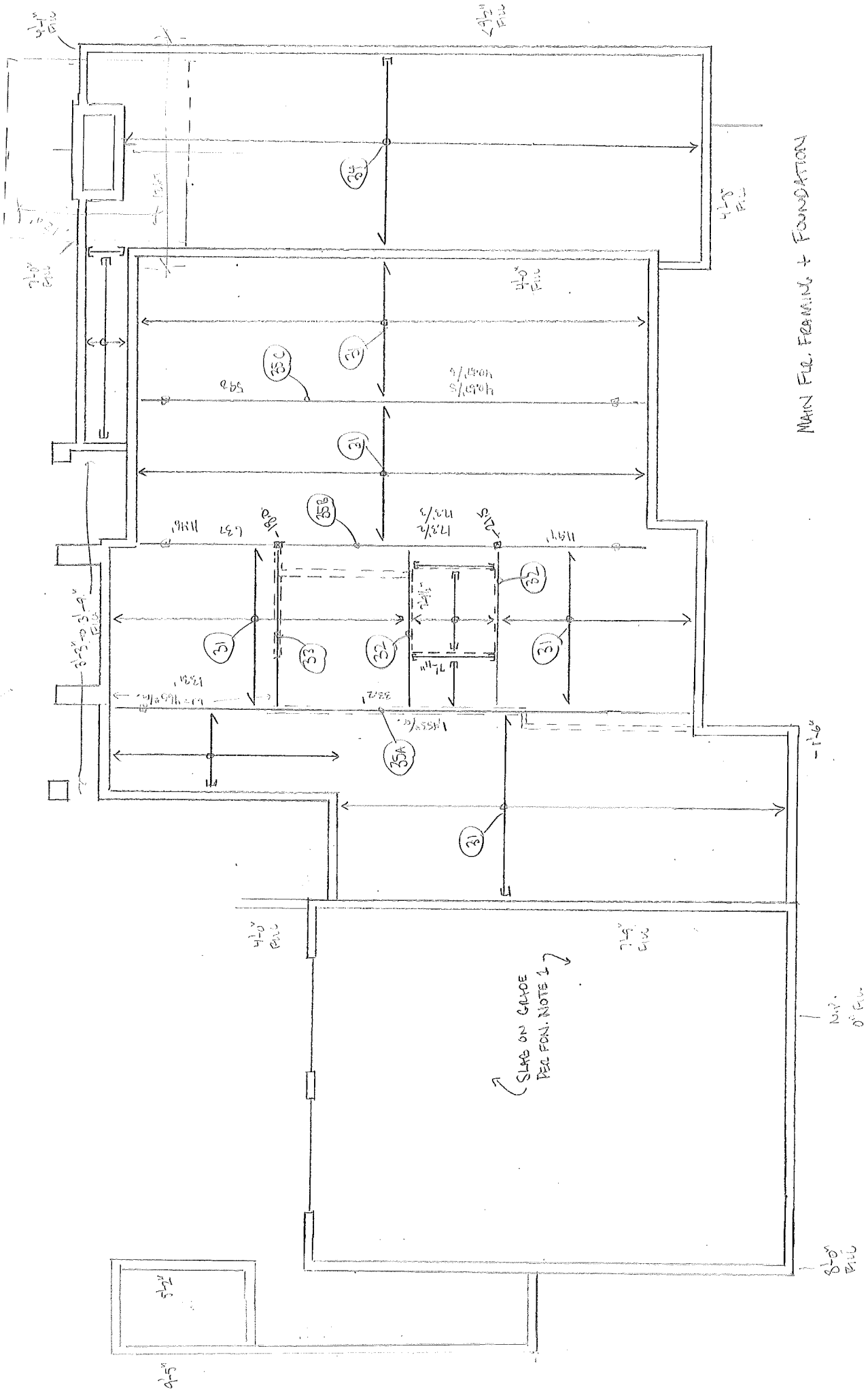








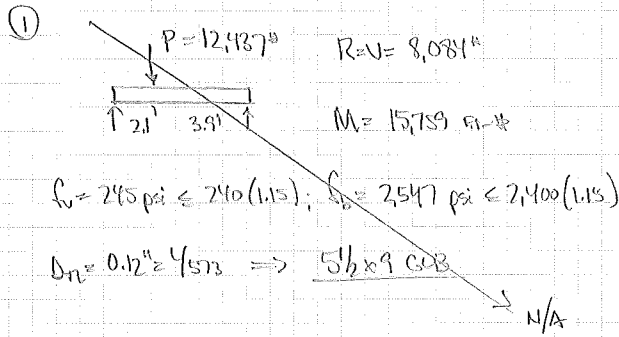
UPPER FLOOR FRAMING



MAIN FLR. FRAMING + FOUNDATION

SLAB ON GRADE  
PER FON. NOTE 1

GRAVITY ANALYSIS - ROOF FEMME. (25x15-10) #/ft<sup>2</sup>:



②  $L = 4.3'$ ;  $w = \frac{43.6}{2}(25+17) = 915^{\text{lb/ft}}$   
 or  $P = 1,830^{\text{lb}}$   
 $R=V = 2,746^{\text{lb}}$ ;  $M = 2,115 \text{ ft-lb}$   
 $f_v = 157 \text{ psi}$ ;  $f_b = 773 \text{ psi}$ ;  $D_n = 0.04^{\text{in}} < 4/1400$   
 $\therefore \underline{4 \times 8 \text{ DF}^{\#2}}$

③  $L = 3.8'$ ;  $w = 915^{\text{lb/ft}}$  or  $P = 1,830^{\text{lb}}$   
 $R=V = 1,830^{\text{lb}}$ ;  $M = 1,510 \text{ ft-lb}$   
 $f_v = 143 \text{ psi}$ ;  $f_b = 1,027 \text{ psi}$ ;  $\therefore \underline{4 \times 6 \text{ DF}^{\#2}}$

④  $L = 8.61'$ ;  $w = \frac{49}{2}(25+15) = 395^{\text{lb/ft}}$   
 $R=V = 1,417^{\text{lb}}$ ;  $M = 3,568 \text{ ft-lb}$   
 $f_v = 73 \text{ psi}$ ;  $f_b = 676 \text{ psi}$   $\therefore (2) 2 \times 12 \text{ HP}^{\#2}$

⑤ SEE ATTACHED CALC.  $\rightarrow (2) 2 \times 12 \text{ HP}^{\#2}$

⑥  $L = 18.7'$ ;  $w = \frac{16}{12}(25+15) = 53^{\text{lb/ft}}$

$R=V = 499^{\text{lb}}$ ;  $M = 2,331 \text{ ft-lb}$

$f_v = 41 \text{ psi}$ ;  $f_b = 881 \text{ psi}$ ;  $D_n = 0.12^{\text{in}} < 4/333$

$\therefore \underline{2 \times 12 \text{ HP}^{\#2} @ 16^{\text{oc}}}$

⑦  $L = 28.1'$ ;  $w = \frac{38.1}{2}(25+15) = 763^{\text{lb/ft}}$

$R=V = 10,827^{\text{lb}}$ ;  $M = 76,872 \text{ ft-lb}$

$f_v = 123 \text{ psi}$ ;  $f_b = 2,156 \text{ psi}$ ;  $D_n = 0.97^{\text{in}} < 4/352$

$\therefore \underline{6\frac{3}{4} \times 22\frac{1}{2} \text{ CLB}}$

STEEL OPTION;  $S \geq 30.7 \text{ in}^3$ ;  $J \geq 407 \text{ in}^4$

$\therefore \underline{W14 \times 13}$

UPPER FLR. FRAMING (20-60L, 12-55DL) #/ft<sup>2</sup>:

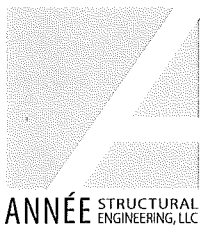
⑧ SEE ATTACHED CALC.  $\rightarrow \underline{14^{\text{in}} \text{ W1560} @ 16^{\text{oc}}}$

⑨ SEE ATTACHED CALC.  $\rightarrow \underline{14^{\text{in}} \text{ W1210} @ 16^{\text{oc}}}$

⑩ SEE ATTACHED CALC.  $\rightarrow \underline{5\frac{1}{4} \times 14 \text{ PSL}}$

⑪ SEE ATTACHED CALC.  $\rightarrow \underline{7 \times 14 \text{ PSL}}$

⑫ SEE ATTACHED CALC.  $\rightarrow \underline{4 \times 10 \text{ DF}^{\#2}}$



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(13)  $L = 11.8'$ ;  $w = \frac{2.8'}{2}(30+12) + 102 = 585 \text{ lb/ft}$

$R = V = 3,451 \text{ lb}$ ;  $M = 10,182 \text{ ft-lb}$

$f_v = 211 \text{ psi}$ ;  $f_b = 2,137 \text{ psi}$ ;  $\Delta_n = 0.41'' = 4.314$

$\therefore$   $1\frac{3}{4} \times 14 \text{ LSL}$

(14) SEE ATTACHED CALC.  $\rightarrow$   $4 \times 8 \text{ DF} \#2$ ;  
STEEL OPTION:  $W8 \times 18$  BY INSPECTION

(15) SEE ATTACHED CALC.  $\rightarrow$   $3\frac{1}{2} \times 14 \text{ LSL}$   $\rightarrow$   $1\frac{1}{2}$

(16) SEE ATTACHED CALC.  $\rightarrow$   $1\frac{3}{4} \times 14 \text{ LSL}$

(17) SEE ATTACHED CALC.  $\rightarrow$   $3\frac{1}{2} \times 14 \text{ LSL}$

(18) SEE ATTACHED CALC.  $\rightarrow$   $4 \times 10 \text{ DF} \#2$

(19)  $3\frac{1}{2} \times 14 \text{ LSL}$  BY INSPECTION

(20)  $L_1 = 8.2'$ ;  $w_1 = \frac{8.1'}{2}(25+15) = 162 \text{ lb/ft}$

$L_2 = 10.3'$ ;  $w_2 = \frac{6.1'}{2}(25+15) = 122 \text{ lb/ft}$

$R = V = 1,664 \text{ lb}$ ;  $M = 11,619 \text{ ft-lb}$

$f_v = 38 \text{ psi}$ ;  $f_b = 592 \text{ psi}$ ;  $\Delta_n = 0.16'' = 4.785$

$\therefore$   $4 \times 8 \text{ DF} \#2$

(20B) SEE ATTACHED CALC.  $\rightarrow$   $4 \times 8 \text{ DF} \#2$

(21) VERO 20 GA,  $1\frac{1}{2}''$  E-DECK w/ 5" TYPICAL CORR.  
MAX. UNIFORM SPAN = 7'-0";  $q_{max} = 300 \text{ PSF}$

(21)  $L = 15.5'$ ;  $w = \frac{5}{8}(14)(60+55) = 1,006 \text{ lb/ft}$

$R = V = 7,798 \text{ lb}$ ;  $M = 30,249 \text{ ft-lb}$

$S \geq \frac{3022(12)}{0.6(50)} = 12.1 \text{ in}^3$

$I \geq \frac{1587wL^3}{E} = 75.8 \text{ in}^4$ ;  $\Delta_n \leq 4/600 = 0.31''$

$\therefore$   $W8 \times 24$

(25)  $L = 6.4'$ ;  $w = 13.42(30+12) = 564 \text{ lb/ft}$

$R = V = 1,803 \text{ lb}$ ;  $M = 5,770 \text{ ft-lb}$

$f_v = 86 \text{ psi}$ ;  $f_b = 1,465 \text{ psi}$ ;  $\Delta_n = 0.06'' = 4/1380$

$\therefore$   $3\frac{1}{2} \times 9 \text{ CLB}$

(26) SEE ATTACHED CALC.  $\rightarrow$   $1\frac{3}{4} \times 14 \text{ LSL}$

(27) SEE ATTACHED CALC.  $\rightarrow$   $7 \times 14 \text{ PSL}$

(27B) " " "  $\rightarrow$   $1\frac{3}{4} \times 14 \text{ LSL}$

(22) SEE ATTACHED CALC.  $\rightarrow$   $5\frac{1}{2} \times 18 \text{ CLB}$

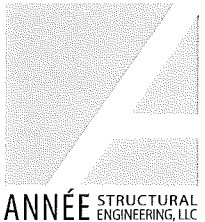
USE STEEL OPTION;  $S \geq \frac{52,425(12)}{0.6 \times 50} = 21.0 \text{ in}^3$

$I \geq \frac{1.8}{29}(2,678) \frac{600}{555} = 178.4 \text{ in}^4$   $\therefore$   $W8 \times 18$

(23)  $L = 11.0'$ ;  $P = 5,635 \text{ e MID-PT.}$

$R = 9,278 \text{ lb}$ ;  $V = 2,918 \text{ lb}$ ;  $M = 21,072 \text{ ft-lb}$

$S \geq 8.43 \text{ in}^3$ ;  $I \geq 39.3 \text{ in}^4$   $\therefore$   $W8 \times 24$



Project \_\_\_\_\_  
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24) Steel Moment:

$$L = 20.5'; \quad w = \frac{43.5 \text{ lb}}{2} \left( \overset{\text{roof}}{25+12} \right) + \frac{23'}{2} \left( \overset{\text{coll.}}{30+22} \right) + 95 \overset{\text{wall}}$$

$$+ \frac{16'}{2} (60+50) = 545 \text{ lb} + 825 \text{ lb} + 1,118 \text{ lb} = 2,488 \text{ lb}$$

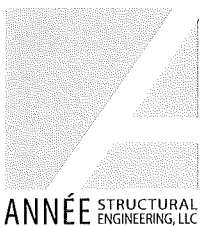
$$R_{\text{eff}} = 21,991 \text{ ft}; \quad M = 112,706 \text{ ft-lb}$$

$$S \geq \frac{112,706 (12)}{(0.6 \times 50,000)} = 45.1 \text{ in}^3$$

$$I \geq \frac{1,320 (1,326) 20.5^3}{29 \times 10^7} = 860.5 \text{ in}^4 \quad (\Delta_n = 1/170)$$

$$W21 \times 76; \quad S = 127 \text{ in}^3; \quad I = 1,320 \text{ in}^4$$

$$\Delta_n = 0.72'' = L/1113 \quad \text{or } W18 \times 76$$



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(28) SEE ATTACHED CALC. →  $11\frac{7}{8} \text{ TJI} / 210 @ 16" oc$

(28B) SEE ATTACHED CALC. →  $11\frac{7}{8} \text{ TJI} / 210 @ 24" oc$

(29)  $L = 28.4'$ ;  $w = 502 lb + 216 lb = 718 \text{ lb/ft}$

SEE #① ⇒  $3\frac{1}{4} \times 22\frac{1}{2} \text{ CLB}$  or  $11\frac{1}{4} \times 13$

(30)  $L = 9.5'$ ;  $w = 270 lb + 119 lb + \frac{19.5'}{2}(25+15) = 656 \text{ lb/ft}$

$R = V = 3,089 \text{ lb}$ ;  $M = 7,326 \text{ ft-lb}$

$f_v = 147 \text{ psi}$ ;  $f_b = 1,863 \text{ psi}$ ;  $\Delta_{TL} = 0.16" = 1/250$

∴  $3\frac{1}{2} \times 9 \text{ CLB}$  or  $10\frac{1}{4}$

MAIN FLOOR PERIMETER (40-bolt, 12-22 DL) #1/4"

(31) SEE ATTACHED CALC. →  $11\frac{7}{8} \text{ TJI} / 210 @ 16" oc$

(32) SEE ATTACHED CALC. →  $1\frac{3}{4} \times 11\frac{7}{8} \text{ LSL}$

(33) SEE ATTACHED CALC. →  $1\frac{3}{4} \times 11\frac{7}{8} \text{ LSL}$

(34) SEE ATTACHED CALC. →  $11\frac{7}{8} \text{ TJI} / 210 @ 16" oc$

FOUNDATION BEAMS:

(35A)  $L = 6.66'$ ;  $w_k = \frac{28.11}{2}(30+12) + 19(7) = 1,453 \text{ lb/ft}$

$R = V_k = 4,843 \text{ lb}$ ;  $M_k = 8,072 \text{ ft-lb}$

$f_v = 218 \text{ psi}$ ;  $f_b = 1,840 \text{ psi}$ ;  $\Delta_{TL} = 0.17" = 1/490$

(35B)  $L = 8.65'$ ;  $w_g = \frac{21.33}{2}(40+12) = 637 \text{ lb/ft}$

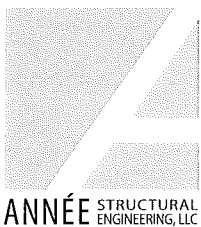
$R = V_g = 3,755 \text{ lb}$ ;  $M_g = 5,958 \text{ ft-lb}$

$f_v = 124 \text{ psi}$ ;  $f_b = 1,358 \text{ psi}$ ;  $\Delta_{TL} = 0.21" = 1/501$

(35C)  $L = 8.92'$ ;  $w_c = \frac{23}{2}(40+12) = 598 \text{ lb/ft}$

$R = V_c = 2,667 \text{ lb}$ ;  $M_c = 5,913 \text{ ft-lb}$

∴  $3\frac{1}{2} \times 9\frac{1}{2} \text{ LSL}$



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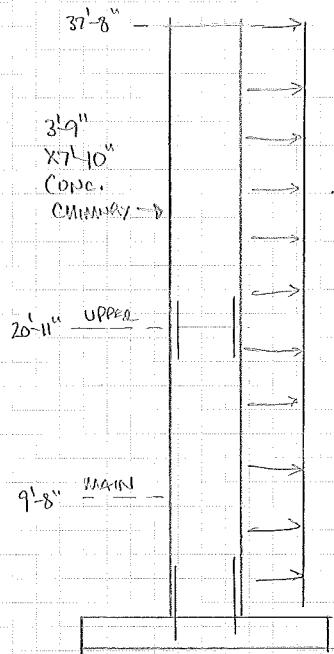
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PER ASCE 7-16; TABLE 15.4-2;  $R=2.0$ ;  $\alpha_p=1.5$

$$S_D = 0.928$$

$$C_s = C_D / (R/I) = \frac{0.928}{2.0/1.0} = 0.464$$

$$F_p = 0.464 \times W_p; \quad W_p = 150 \text{ lb/ft} \times \left(\frac{3}{12}\right) [2(7.83') + 2(2.42')] = 2050 \text{ lb/ft}$$

$$F_p = 0.464 \times 2050 \text{ lb/ft} = 951 \text{ lb/ft}$$

$$V_U = 0.95 \text{ ft} \times (37.67 \text{ ft}) = 35.8 \text{ k}$$

$$M_U = 0.95 \text{ ft} \times \left(\frac{37.67^2}{2}\right) = 675 \text{ k-ft}$$

$F_p/V_U/M_U$  DIMENSIONS PER 2 IN TRANSVERSE DIR, (2) 3'-9" WINDS BY 1 LONGITUDINAL (1) 7'-10" WIND

$$\text{TOTAL VERTICAL DEAD LOAD @ FC} = 2.05 \text{ lb/ft} \times (37.67') + (15.0)^2 \times 2.0' \times (150 \text{ lb/ft}) = 1447 \text{ k}$$

AG AGGREGATE

TRANSVERSE

LONGITUDINAL

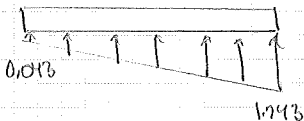
UPPER PILE,  $0.585 \text{ in}^2 (2) \#5$      $1.320 \text{ in}^2 (3) \#6$

FOOTING  $1.739 \text{ in}^2 (4) \#6$      $1.76 \text{ in}^2 (4) \#6$

AG AGGREGATE  $3.888 \text{ in}^2$      $7.776 \text{ in}^2 (18) \#6 \text{ @ B.M.}; (18) \#4 \text{ R.W. @ TOP}$

PIN PILES @ FOOTING:

$$\downarrow P = 1447 \text{ k} \quad \curvearrowright M_a = 0.7(675) = 472.5$$

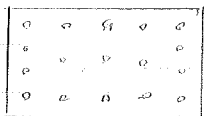


$$q = \frac{P}{A} + \frac{M}{S} = \frac{1447}{12(12.5)} + \frac{472.5}{176(12.5)^2/6} = 0.689 \pm 1.037 = 1.726 \text{ ksf (MAX.) @ RIG.}$$

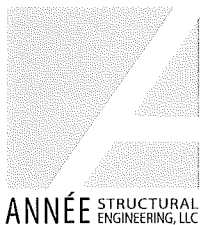
$$0.689 \pm 0.711 = 1.400 \text{ ksf (MIN.) @ LIG.}$$

PILES @  $C_L$ ;  $\frac{1447}{3} = 482 \text{ k} \therefore (3) 9" \phi$  PIN PILES (20% ALLOWABLE)

PILES @ ERM EDGE;  $1.38 \text{ k} \left(\frac{12}{8}\right) 17.5' = 96.8 \text{ k} \therefore (5) 4" \phi$  PILES AT N/S EDGES



$\therefore (17) 4" \phi$  PILES @ 4'-4" OC E.W., (1'-0" EDGE DISTANCE)



Project \_\_\_\_\_

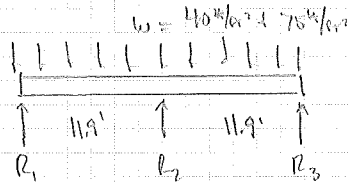
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STRUCTURAL SLAB ON GRADE @ GARAGE



$M_0^+ = 2.11 \text{ k-ft} ; M_0^- = -3.19 \text{ k-ft} \quad (\text{slab})$

$A_g \geq \frac{3.19}{4(6-3)} = 0.27 \text{ in}^2 \therefore \#5 @ 9" \text{ oc} \quad (\#4 @ 18" \text{ oc TRANSVERSE}) @ G$

$R_1 = 0.67 \text{ k/ft}$

$R_2 = 1.98 \text{ k/ft}$

$R_3 = 0.67 \text{ k/ft}$

ASD

Piles @ G:  $S_G = 20.0 / 2.15 = 9' - 3 \frac{1}{2}" \text{ oc}$

PILES @ SUPPORT OF CROSSOVER BEAM LINES

BEAM REF.	LOAD	4" PILE SPACING
35A	1.453 k/ft	$S = 20.0 / (1.453 + 0.267) = 11.63' \text{ or } 11' - 6 \frac{1}{2}" \text{ oc}$
35B	0.637 k/ft	$S = 20.0 / (0.637 + 0.267) = 22.1' \Rightarrow \text{USE } 12' - 0" \text{ oc MAX.}$
35C	0.598 k/ft	

GRADE BEAMS @ (C), (D), (L), (J)

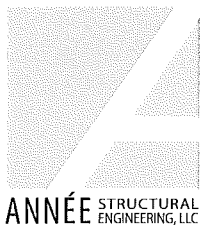
$w = \frac{(16')^2}{144} (156) + 4(100) + 20.2(10) + 17 + \frac{16''}{12} (12) = 0.90 \text{ k/ft} \therefore \text{USE } 12' - 0" \text{ oc MAX.}$

Critical GARAGE BEAM UNDER BEAM (35B):

$w_d = 983 \text{ L} + 4700 \text{ D} + 2670 = 1.72 \text{ k/ft}$

$w_u = 1.6(0.983) + 1.2(0.727) = 2.46 \text{ k/ft}$

$L_0 = 9.2'; M_0 = 2.16 \frac{(9.2)^2}{8} = 26.0 \text{ k-ft} \therefore A_g \geq \frac{26.0}{4(16-4)} = 0.51 \text{ in}^2 \therefore (7) \#5 \text{ T+B}$



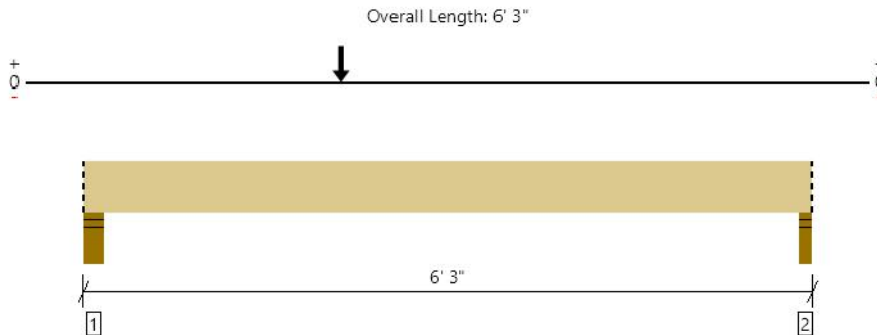
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 Date \_\_\_\_\_





Roof Framing, 1 - Beam  
**1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam**



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)	8420 @ 4"	12251 (5.50")	Passed (69%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	8406 @ 1' 2 1/2"	10057	Passed (84%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	15759 @ 2' 2 1/2"	17078	Passed (92%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.071 @ 3' 1/8"	0.287	Passed (L/966)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.120 @ 3' 1/8"	0.383	Passed (L/573)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD  
 Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 5' 9".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	3.78"	3431	4989	8420	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.84"	1678	2414	4092	Blocking

• 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' 3" o/c	
Bottom Edge (Lu)	6' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	12.0	--	
1 - Point (lb)	2' 2 1/2" (Front)	N/A	5034	7403	Default Load

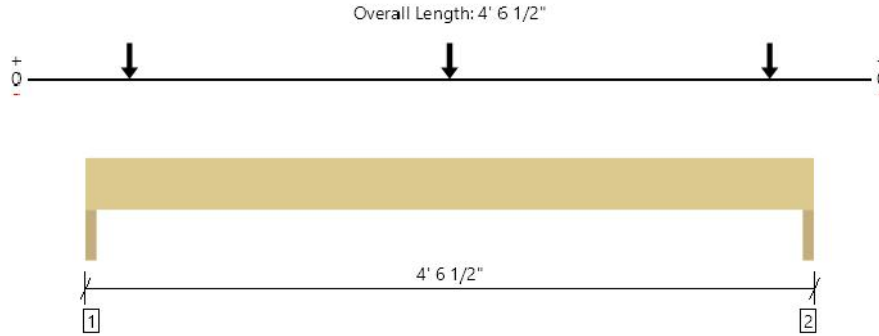
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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9/17/2020 12:56:33 AM UTC  
 ForteWEB v3.0, Engine: V8.1.3.1, Data: V8.0.0.0  
 File Name: Mounger Residence  
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Roof Framing, 2 - Header  
**1 piece(s) 4 x 8 Douglas Fir-Larch No. 2**



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)	2761 @ 1 1/2"	6563 (3.00")	Passed (42%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	988 @ 10 1/4"	3502	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2246 @ 2' 3 1/4"	3438	Passed (65%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.021 @ 2' 3 1/4"	0.143	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.036 @ 2' 3 1/4"	0.215	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall  
 Member Type : Header  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Trimmer - HF	3.00"	3.00"	1.50"	1126	60	1635	2821	None
2 - Trimmer - HF	3.00"	3.00"	1.50"	1126	60	1635	2821	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 7" o/c	
Bottom Edge (Lu)	4' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 6 1/2"	N/A	6.4	--	--	
1 - Point (lb)	3 1/4"	N/A	741	40	1090	Default Load
2 - Point (lb)	2' 3 1/4"	N/A	741	40	1090	Default Load
3 - Point (lb)	4' 3 1/4"	N/A	741	40	1090	Default Load

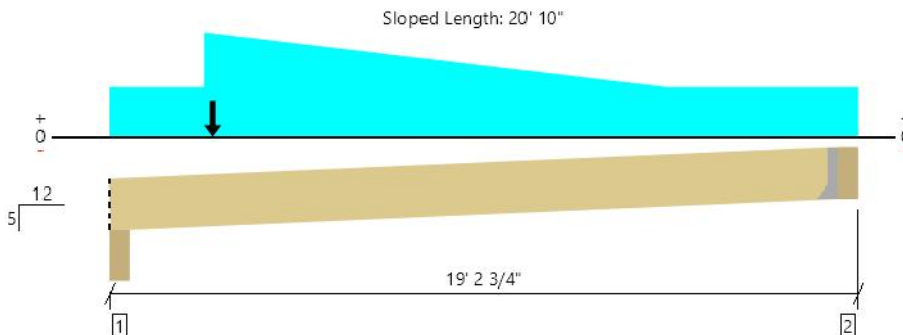
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



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 File Name: Mounger Residence  
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Roof Framing, 5 - Beam  
**2 piece(s) 2 x 12 Hem-Fir No. 2**



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

Member Length : 20' 8 11/16"

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	637 @ 18' 9 1/4"	1823 (1.50")	Passed (35%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1990 @ 1' 3 7/8"	3881	Passed (51%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4896 @ 4' 10 7/16"	5155	Passed (95%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.338 @ 8' 8 1/4"	0.999	Passed (L/710)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.723 @ 8' 9 9/16"	1.332	Passed (L/332)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD  
 Member Pitch : 5/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beveled Plate - HF	5.50"	5.50"	1.68"	984	1054	2038	Blocking
2 - Hanger on 11 1/4" GLB beam	5.50"	Hanger <sup>1</sup>	1.50"	354	295	649	See note <sup>1</sup>

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' o/c	
Bottom Edge (Lu)	20' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 18' 9 1/4"	N/A	8.6	--	
1 - Uniform (PSF)	0 to 19' 2 3/4"	8"	15.0	25.0	Default Load
2 - Point (lb)	2' 8 3/4"	N/A	761	1029	
3 - Tapered (PLF)	2' 6" to 14' 6"	N/A	30.0 to 0.0	-	

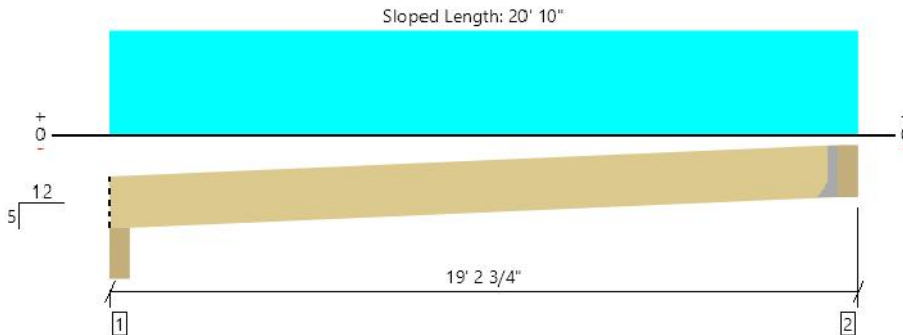
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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9/17/2020 12:58:18 AM UTC  
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Roof Framing, 6 - Joist  
**1 piece(s) 2 x 12 Hem-Fir No. 2 @ 16" OC**



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

Member Length : 20' 8 11/16"

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	506 @ 18' 9 1/4"	911 (1.50")	Passed (56%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	458 @ 17' 10 7/8"	1941	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2327 @ 9' 6 7/8"	2964	Passed (78%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.436 @ 9' 6 7/8"	0.996	Passed (L/549)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.719 @ 9' 6 7/8"	1.329	Passed (L/333)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD  
 Member Pitch : 5/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beveled Plate - HF	5.50"	5.50"	1.50"	207	319	526	Blocking
2 - Hanger on 11 1/4" GLB beam	5.50"	Hanger <sup>1</sup>	1.50"	208	322	530	See note <sup>1</sup>

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 4" o/c	
Bottom Edge (Lu)	20' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 19' 2 3/4"	16"	15.0	25.0	Default Load

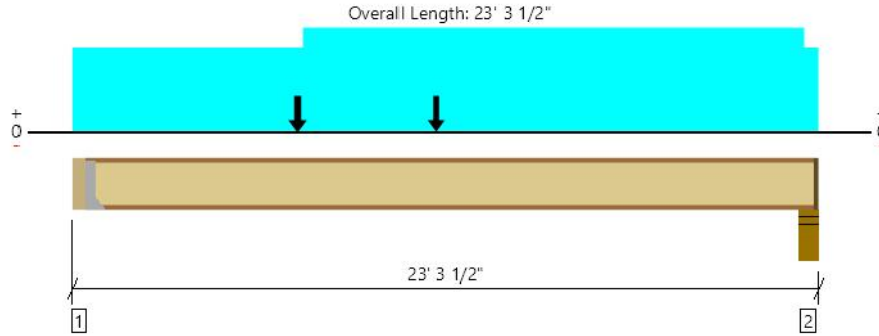
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ForteWEB Software Operator	Job Notes
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9/17/2020 12:58:35 AM UTC  
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Upper Floor Framing, 8 - Joist  
**1 piece(s) 14" TJI® 560 @ 16" OC**



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)	811 @ 3 1/2"	1265 (1.75")	Passed (64%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	830 @ 22' 10"	2390	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5034 @ 11' 1 3/4"	11275	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.259 @ 11' 7 1/4"	0.566	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.502 @ 11' 6 7/8"	1.131	Passed (L/541)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	49	40	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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: 5/8" Gypsum ceiling, Perpendicular Partitions.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 14" LSL beam	3.50"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	364	464	828	See note <sup>1</sup>
2 - Stud wall - HF	5.50"	4.25"	1.75"	388	468	856	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 8" o/c	
Bottom Edge (Lu)	22' 11" o/c	

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

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS3.56/14	2.00"	N/A	12-10dx1.5	2-Strong-Grip	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

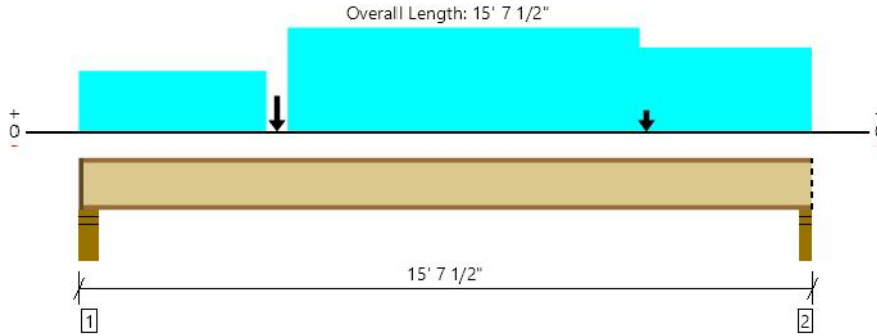
Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 23' 3 1/2"	16"	12.0	30.0	Default Load
2 - Point (PLF)	6' 10 1/4"	16"	63.0	-	
3 - Uniform (PSF)	7' to 22' 10"	16"	10.0	-	
4 - Point (PLF)	11' 1 3/4"	16"	63.0	-	

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Upper Floor Framing, 9 - Joist  
**1 piece(s) 14" 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)	578 @ 15' 5"	1460 (3.50")	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	562 @ 15' 4"	1945	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2214 @ 7' 9 1/2"	4490	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.092 @ 7' 11 11/16"	0.376	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.196 @ 7' 10 5/8"	0.752	Passed (L/923)	--	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 2015  
 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: 5/8" Gypsum ceiling, Perpendicular Partitions.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	4.25"	1.75"	298	255	50	603	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	3.50"	1.75"	280	299	17	596	Blocking

- 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)	5' 5" o/c	
Bottom Edge (Lu)	15' 6" o/c	

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

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 4'	16"	10.0	20.0	-	Default Load
2 - Point (PLF)	4' 2 3/4"	16"	121.0	-	50.0	
3 - Uniform (PSF)	4' 5 1/2" to 11' 11 1/2"	16"	10.0	-	-	
4 - Point (PLF)	12' 1 1/4"	16"	63.0	-	-	
5 - Uniform (PSF)	4' 5 1/2" to 15' 7 1/2"	16"	12.0	30.0	-	Default Load

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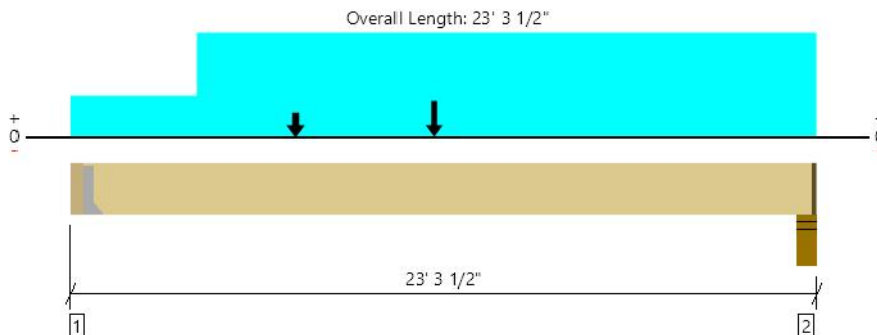
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ForteWEB Software Operator	Job Notes
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9/11/2020 7:40:40 PM UTC  
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Upper Floor Framing, 10 - Beam  
**1 piece(s) 5 1/4" x 14" 2.2E Parallam® PSL @ 8" 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)	2516 @ 3 1/2"	4922 (1.50")	Passed (51%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2483 @ 1' 5 1/2"	14210	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	19148 @ 11' 1 3/4"	42372	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.257 @ 11' 1 3/4"	0.566	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.614 @ 11' 1 3/4"	1.131	Passed (L/442)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	66	40	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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 4% increase in the moment capacity has been added to account for repetitive member usage.
- 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: 5/8" Gypsum ceiling, Perpendicular Partitions.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 14" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	1427	1097	2524	See note <sup>1</sup>
2 - Stud wall - HF	5.50"	4.25"	1.50"	1379	818	2197	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	22' 11" o/c	
Bottom Edge (Lu)	22' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie							
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories	
1 - Face Mount Hanger	HUC612	2.50"	N/A	22-10d	8-10d		

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

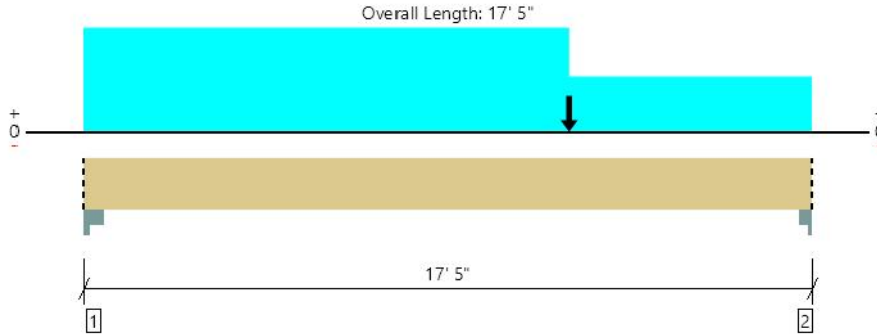
Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 23' 3 1/2"	8"	12.0	30.0	Default Load
2 - Point (lb)	6' 10 1/4"	N/A	535	587	
3 - Uniform (PLF)	3' 9 3/4" to 23' 3 1/2"	N/A	63.0	-	
4 - Point (lb)	11' 1 3/4"	N/A	857	862	

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Upper Floor Framing, 11 - Beam  
**1 piece(s) 7" x 14" 2.2E Parallam® PSL**



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)	7926 @ 17' 3"	15313 (3.50")	Passed (52%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7424 @ 1' 7 1/2"	18947	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	38592 @ 9' 2 5/8"	54324	Passed (71%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.348 @ 8' 9 1/2"	0.423	Passed (L/583)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.601 @ 8' 10"	0.846	Passed (L/338)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column Cap - steel	5.50"	5.50"	2.06"	3623	5389	9012	Blocking
2 - Column Cap - steel	3.50"	3.50"	1.81"	3396	4531	7927	Blocking

• 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)	17' 5" o/c	
Bottom Edge (Lu)	17' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 17' 5"	N/A	30.6	--	
1 - Uniform (PLF)	0 to 11' 7 1/2" (Front)	N/A	345.0	602.0	Default Load
2 - Point (lb)	11' 7 1/2" (Front)	N/A	1427	1097	
3 - Uniform (PLF)	11' 7 1/2" to 17' 5" (Front)	N/A	181.0	315.0	Default Load

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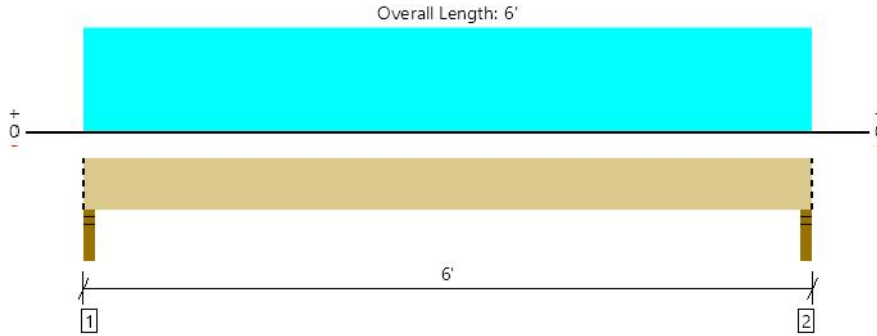
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Upper Floor Framing, 12 - Beam  
**1 piece(s) 4 x 10 Douglas Fir-Larch No. 2**



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)	2956 @ 1' 1/2"	4253 (3.00")	Passed (70%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1950 @ 1' 1/4"	3885	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4072 @ 3'	4492	Passed (91%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.037 @ 3'	0.144	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.066 @ 3'	0.287	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.00"	3.00"	2.09"	1285	1671	2956	Blocking
2 - Stud wall - HF	3.00"	3.00"	2.09"	1285	1671	2956	Blocking

• 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' o/c	
Bottom Edge (Lu)	6' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6'	N/A	8.2	--	
1 - Uniform (PLF)	0 to 6' (Front)	N/A	420.0	557.0	Default Load

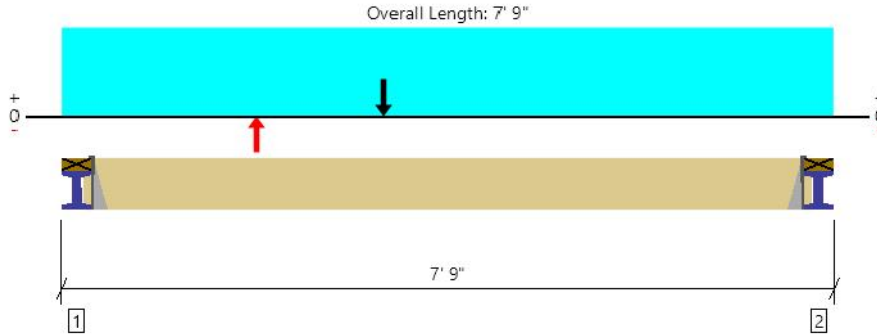
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



9/14/2020 9:53:56 PM UTC  
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 File Name: Mounger Residence  
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Upper Floor Framing, 14 - Beam  
**1 piece(s) 4 x 8 Douglas Fir-Larch No. 2**



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)	1055 @ 8"	3281 (1.50")	Passed (32%)	--	1.0 D - 0.7 E (All Spans)
Shear (lbs)	3375 @ 2' 1 3/4"	4872	Passed (69%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	3185 @ 3' 3 1/2"	4783	Passed (67%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-0.065 @ 4' 15/16"	0.160	Passed (L/999+)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	0.089 @ 4' 7/16"	0.321	Passed (L/867)	--	1.0 D + 0.7 E (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -430 lbs uplift at support located at 8". Strapping or other restraint may be required.
- -430 lbs uplift at support located at 7' 1". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Hanger on Single 2X HF plate	8.00"	Hanger <sup>1</sup>	1.50"	435	155	108	987/-987	1685/-987	See note <sup>1</sup>
2 - Hanger on Single 2X HF plate	8.00"	Hanger <sup>1</sup>	1.50"	435	155	108	987/-987	1685/-987	See note <sup>1</sup>

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 5" o/c	
Bottom Edge (Lu)	6' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

**Connector: Simpson Strong-Tie**

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	
2 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	8" to 7' 1"	N/A	6.4	--	--	--	
1 - Uniform (PLF)	0 to 7' 9" (Front)	N/A	107.0	40.0	28.0	-	Default Load
2 - Point (lb)	3' 3 1/2" (Front)	N/A	-	-	-	5529	
3 - Point (lb)	2' 1 3/4" (Front)	N/A	-	-	-	-5529	

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Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	

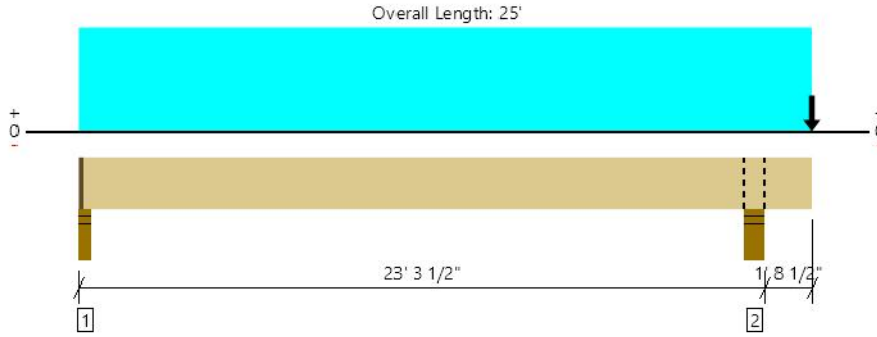


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 ForteWEB v3.0, Engine: V8.1.3.1, Data: V8.0.0.0  
 File Name: Mounger Residence  
 Page 1 / 2

Upper Floor Framing, 15 - Beam

**1 piece(s) 3 1/2" x 14" 1.55E TimberStrand® LSL**

An excessive uplift of -3656 lbs at support located at 23' 3/4" failed this product.



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)	5643 @ 23' 3/4"	7796 (5.50")	Passed (72%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	4926 @ 24' 5 1/2"	16203	Passed (30%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	-9563 @ 23' 3/4"	34944	Passed (27%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.199 @ 25'	0.200	Passed (2L/234)	--	1.0 D + 0.7 E (All Spans)
<b>Total Load Defl. (in)</b>	<b>0.211 @ 25'</b>	<b>0.200</b>	<b>Failed (2L/220)</b>	<b>--</b>	<b>1.0 D + 0.7 E (All Spans)</b>

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/0.2").
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -226 lbs uplift at support located at 2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - HF	3.50"	2.25"	1.50"	195	232/-23	-17	491/-491	918/-531	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	5.50"	3.98"	1241	573	213	6288/-6288	8315/-6288	Blocking

- 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)	24' 11" o/c	
Bottom Edge (Lu)	24' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	1 1/4" to 25'	N/A	15.3	--	--	--	
1 - Uniform (PSF)	0 to 25' (Front)	8"	12.0	30.0	-	-	Default Load
2 - Point (lb)	25' (Front)	N/A	855	280	196	5797	

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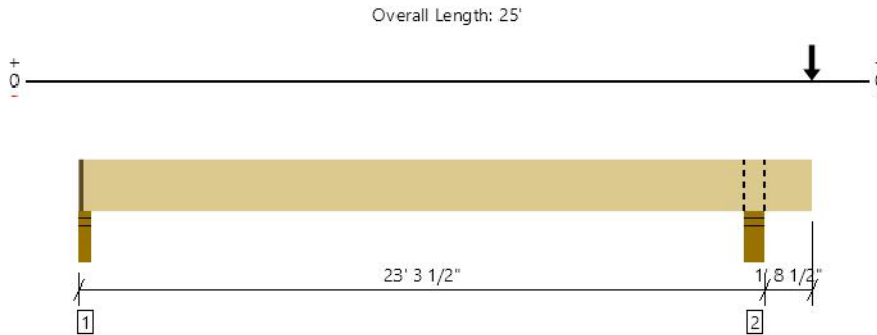
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



9/17/2020 1:02:28 AM UTC  
 ForteWEB v3.0, Engine: V8.1.3.1, Data: V8.0.0.0  
 File Name: Mounger Residence  
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Upper Floor Framing, 15B - Beam  
**1 piece(s) 3 1/2" x 14" 1.55E TimberStrand® LSL**

An excessive uplift of -2450 lbs at support located at 23' 3/4" failed this product.



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)	4176 @ 23' 3/4"	7796 (5.50")	Passed (54%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	3657 @ 24' 5 1/2"	16203	Passed (23%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	-7099 @ 23' 3/4"	34944	Passed (20%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.140 @ 25'	0.200	Passed (2L/332)	--	1.0 D + 0.7 E (All Spans)
Total Load Defl. (in)	0.158 @ 25'	0.200	Passed (2L/294)	--	1.0 D + 0.7 E (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/0.2").
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - HF	3.50"	2.25"	1.50"	119	29	-15	345/-345	493/-360	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	5.50"	2.95"	1079	34	198	4425/-4425	5736/-4425	Blocking

- 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)	24' 11" o/c	
Bottom Edge (Lu)	24' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	1 1/4" to 25'	N/A	15.3	--	--	--	
1 - Uniform (PSF)	0 to 25' (Front)	0	12.0	30.0	-	-	Default Load
2 - Point (lb)	25' (Front)	N/A	792	-	183	4080	

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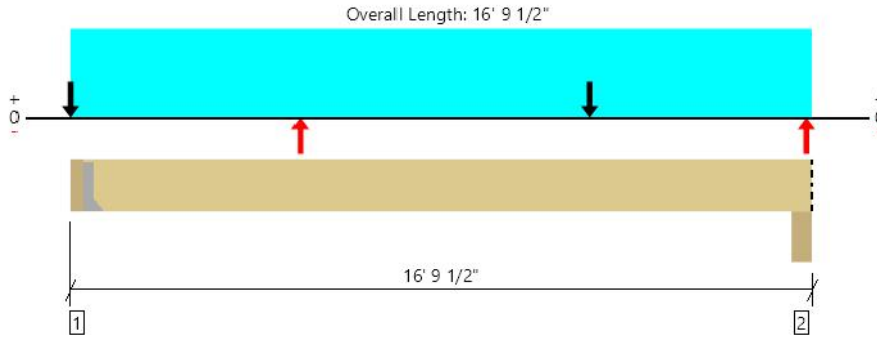
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



9/17/2020 1:02:46 AM UTC  
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An excessive uplift of -1252 lbs at support located at 3 1/2" failed this product.

An excessive uplift of -1248 lbs at support located at 16' 5 1/2" failed this product.



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)	2274 @ 3 1/2"	2363 (1.50")	Passed (96%)	--	1.0 D - 0.7 E (All Spans)
Shear (lbs)	2274 @ 11' 8 1/4"	8101	Passed (28%)	1.60	1.0 D - 0.7 E (All Spans)
Moment (Ft-lbs)	9524 @ 5' 1 1/4"	17472	Passed (55%)	1.60	1.0 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.176 @ 5' 1 1/4"	0.404	Passed (L/999+)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.463 @ 6' 9 11/16"	0.808	Passed (L/419)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Hanger on 14" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	1025	168	234	2668/-2668	4095/-2668	See note <sup>1</sup>
2 - Column - DF	5.50"	5.50"	2.14"	1032	168	236	2668/-2668	4104/-2668	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 11" o/c	
Bottom Edge (Lu)	16' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HUS1.81/10	3.00"	N/A	30-10dx1.5	10-10d	

• Refer to manufacturer notes and instructions for proper installation and use of all connectors.

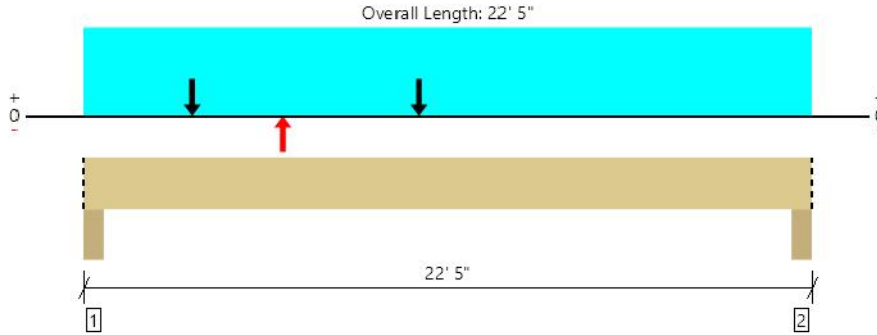
Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	3 1/2" to 16' 9 1/2"	N/A	7.7	--	--	--	
1 - Uniform (PSF)	0 to 16' 9 1/2" (Front)	8"	12.0	30.0	-	-	Default Load
2 - Point (lb)	0 (Front)	N/A	-	-	-	4500	
3 - Point (lb)	5' 1 1/4" (Front)	N/A	-	-	-	-4500	
4 - Point (lb)	11' 8 1/4" (Front)	N/A	-	-	-	4500	
5 - Point (lb)	16' 8" (Front)	N/A	-	-	-	-4500	
6 - Uniform (PLF)	0 to 16' 9 1/2" (Front)	N/A	107.0	-	28.0	-	

FortewEB Software Operator	Job Notes
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9/14/2020 9:56:23 PM UTC  
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An excessive uplift of -2046 lbs at support located at 4" failed this product.



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)	4383 @ 4"	14919 (5.50")	Passed (29%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	4172 @ 1' 7 1/2"	16203	Passed (26%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	24633 @ 10' 3 3/4"	34944	Passed (70%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-0.922 @ 11' 2 1/4"	0.544	Failed (L/283)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	1.474 @ 11' 2 5/16"	1.087	Failed (L/177)	--	1.0 D + 0.7 E (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -566 lbs uplift at support located at 22' 1". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Column - DF	5.50"	5.50"	1.62"	1461	224	314	4175/-4175	6174/-4175	Blocking
2 - Column - DF	5.50"	5.50"	1.50"	1461	224	314	2061/-2061	4060/-2061	Blocking

• 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)	12' 3" o/c	
Bottom Edge (Lu)	22' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 22' 5"	N/A	15.3	--	--	--	
1 - Uniform (PSF)	0 to 22' 5" (Front)	8"	12.0	30.0	-	-	Default Load
2 - Point (lb)	3' 4 1/4" (Front)	N/A	-	-	-	6236	
3 - Point (lb)	6' 1 3/4" (Front)	N/A	-	-	-	-6236	
4 - Point (lb)	10' 3 3/4" (Front)	N/A	-	-	-	6236	
5 - Uniform (PLF)	0 to 22' 5" (Front)	N/A	107.0	-	28.0	-	

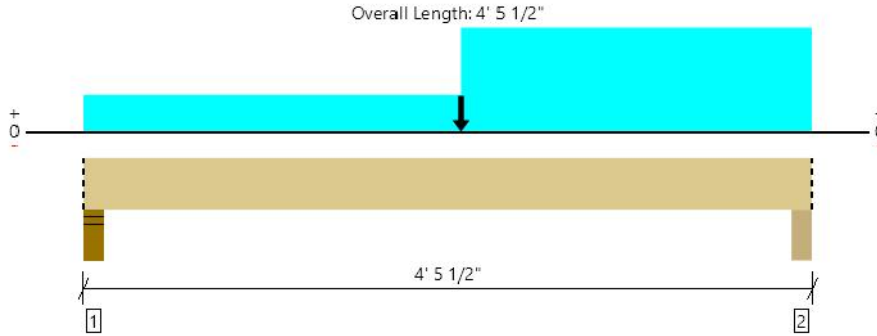
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ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



9/17/2020 1:04:17 AM UTC  
 ForteWEB v3.0, Engine: V8.1.3.1, Data: V8.0.0.0  
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Upper Floor Framing, 18 - Beam  
**1 piece(s) 4 x 10 Douglas Fir-Larch No. 2**



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)	3122 @ 4"	7796 (5.50")	Passed (40%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2742 @ 3' 2 3/4"	6216	Passed (44%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	4945 @ 2' 3 3/4"	7187	Passed (69%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.019 @ 2' 3 1/16"	0.126	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.030 @ 2' 3 1/8"	0.190	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -826 lbs uplift at support located at 4". Strapping or other restraint may be required.
- -582 lbs uplift at support located at 4' 1 1/2". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - HF	5.50"	5.50"	2.20"	1091	897	329	2115/-2115	4432/-2115	Blocking
2 - Column - DF	5.50"	5.50"	2.00"	1725	897	1032	2310/-2310	5964/-2310	Blocking

• 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)	4' 6" o/c	
Bottom Edge (Lu)	4' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 4' 5 1/2"	N/A	8.2	--	--	--	
1 - Uniform (PSF)	0 to 2' 3 3/4" (Front)	13' 5"	12.0	30.0	-	-	Default Load
2 - Point (lb)	2' 3 3/4" (Front)	N/A	1079	-	198	4425	
3 - Uniform (PLF)	2' 3 3/4" to 4' 5 1/2" (Front)	N/A	458.0	-	542.0	-	
4 - Uniform (PSF)	2' 3 3/4" to 4' 5 1/2" (Front)	13' 5"	12.0	30.0	-	-	Default Load

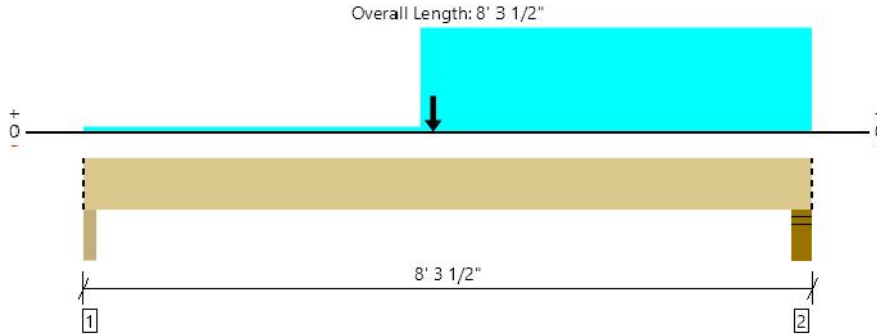
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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9/17/2020 1:04:47 AM UTC  
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Upper Floor Framing, 19 - Beam  
**1 piece(s) 3 1/2" x 14" 1.55E TimberStrand® LSL**



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)	3715 @ 7' 11 1/2"	7796 (5.50")	Passed (48%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1871 @ 6' 8"	11646	Passed (16%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	8195 @ 3' 11 3/4"	34944	Passed (23%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.050 @ 3' 11 3/4"	0.390	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.088 @ 3' 11 3/4"	0.519	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Roof  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD  
 Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -358 lbs uplift at support located at 2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Column - DF	3.50"	3.50"	1.50"	993	275	451	1363/-1363	3082/-1363	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.62"	1697	848	928	1305/-1305	4778/-1305	Blocking

• 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)	8' 4" o/c	
Bottom Edge (Lu)	8' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8' 3 1/2"	N/A	15.3	--	--	--	
1 - Uniform (PSF)	0 to 8' 3 1/2" (Front)	1'	15.0	-	25.0	-	Default Load
2 - Point (lb)	3' 11 3/4" (Front)	N/A	1025	-	236	2668	
3 - Uniform (PLF)	3' 10" to 8' 3 1/2" (Front)	N/A	317.0	252.0	210.0	-	

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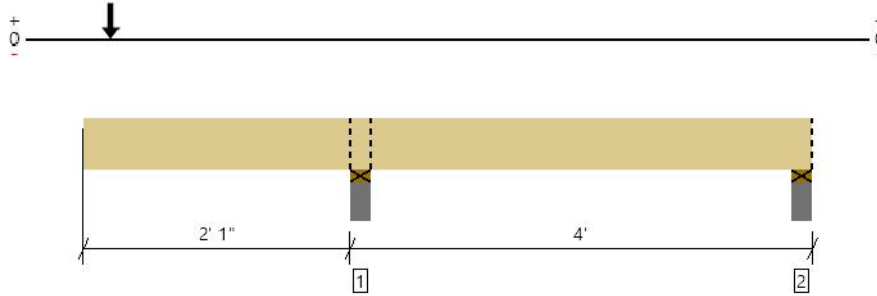


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Upper Floor Framing, 20B - Beam  
**1 piece(s) 4 x 8 Douglas Fir-Larch No. 2**

Overall Length: 6' 1"



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)	2108 @ 2' 3 3/4"	7796 (5.50")	Passed (27%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1303 @ 1' 5 3/4"	3502	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-2711 @ 2' 3 3/4"	3438	Passed (79%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.071 @ 0	0.231	Passed (2L/782)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.114 @ 0	0.308	Passed (2L/488)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD  
 Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -775 lbs uplift at support located at 5' 9". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Plate on concrete - HF	5.50"	5.50"	1.50"	810	1298	2108	Blocking
2 - Plate on concrete - HF	5.50"	5.50"	1.50"	-286	-490	-776	Blocking

- 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' 1" o/c	
Bottom Edge (Lu)	6' 1" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 1"	N/A	6.4	--	
1 - Point (lb)	2 3/4" (Front)	N/A	485	808	Default Load

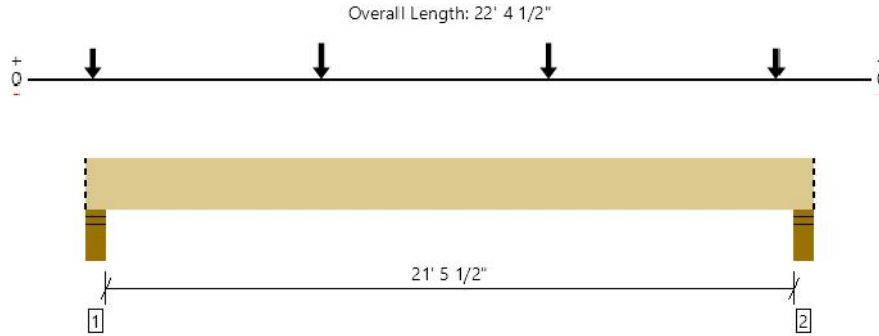
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Upper Floor Framing, 22 - Beam  
**1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam**



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)	12827 @ 4"	12856 (5.50")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8762 @ 20' 5"	17490	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	52425 @ 14' 2 3/4"	56451	Passed (93%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.467 @ 11' 2 3/4"	0.724	Passed (L/558)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.920 @ 11' 2 11/16"	1.085	Passed (L/283)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 0.95 that was calculated using length L = 21' 8 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	5.50"	5.49"	6275	6552	12827	Blocking
2 - Stud wall - SPF	5.50"	5.50"	5.07"	5813	6048	11861	Blocking

- 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)	22' 5" o/c	
Bottom Edge (Lu)	22' 5" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 22' 4 1/2"	N/A	24.1	--	
1 - Point (lb)	2 3/4" (Front)	N/A	2695	2940	
2 - Point (lb)	7' 2 3/4" (Front)	N/A	3080	3360	
3 - Point (lb)	14' 2 3/4" (Front)	N/A	3080	3360	
4 - Point (lb)	21' 2 3/4" (Front)	N/A	2695	2940	

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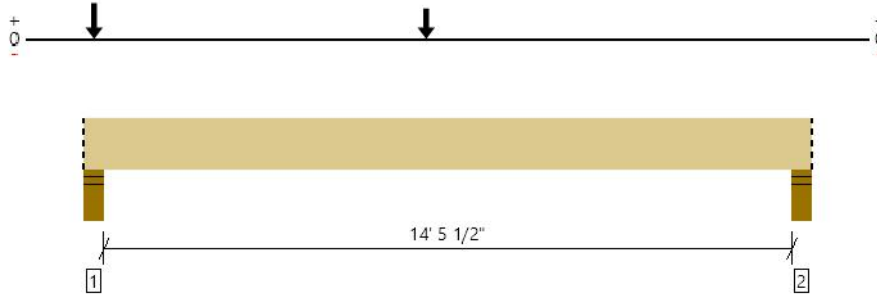
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Upper Floor Framing, 23 - Beam  
**1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam**

Overall Length: 15' 4 1/2"



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)	9556 @ 4"	12856 (5.50")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3093 @ 1' 5 1/2"	11660	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	21072 @ 7' 2 3/4"	26400	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.235 @ 7' 6 13/16"	0.490	Passed (L/751)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.462 @ 7' 6 7/8"	0.735	Passed (L/382)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 8 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	5.50"	4.09"	4635	4922	9557	Blocking
2 - Stud wall - SPF	5.50"	5.50"	1.50"	1387	1378	2765	Blocking

- 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)	15' 5" o/c	
Bottom Edge (Lu)	15' 5" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 15' 4 1/2"	N/A	16.0	--	
1 - Point (lb)	2 3/4" (Front)	N/A	3080	3360	
2 - Point (lb)	7' 2 3/4" (Front)	N/A	2695	2940	

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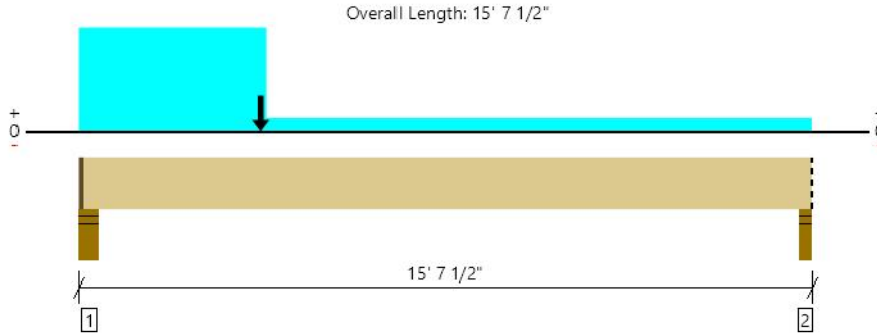
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An excessive uplift of -1883 lbs at support located at 4" failed this product.



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)	3369 @ 4"	4648 (4.25")	Passed (72%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2968 @ 1' 7 1/2"	8101	Passed (37%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	10126 @ 3' 10 1/2"	17472	Passed (58%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-0.460 @ 6' 11 7/8"	0.504	Passed (L/395)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	0.566 @ 7' 5/8"	0.756	Passed (L/321)	--	1.0 D + 0.7 E (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -578 lbs uplift at support located at 15' 5 1/2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - DF	5.50"	4.25"	3.08"	908	316	590	3468/-3468	5282/-3468	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	3.50"	1.58"	273	309	74	1060/-1060	1716/-1060	Blocking

- 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)	3' 8" o/c	
Bottom Edge (Lu)	15' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	1 1/4" to 15' 7 1/2"	N/A	7.7	--	--	--	
1 - Uniform (PSF)	0 to 15' 7 1/2" (Front)	1' 4"	12.0	30.0	-	-	Default Load
2 - Uniform (PLF)	0 to 4' (Front)	N/A	203.0	-	166.0	-	
3 - Point (lb)	3' 10 1/2" (Front)	N/A	-	-	-	4528	

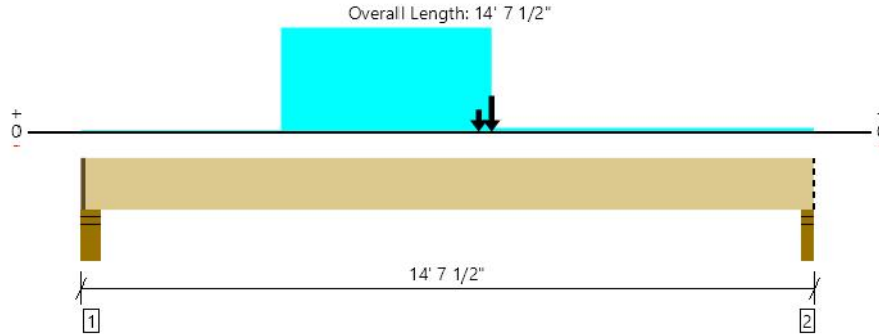
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9/14/2020 9:09:05 PM UTC  
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Upper Floor Framing, 27 - Beam  
**1 piece(s) 7" x 14" 2.2E Parallam® PSL**



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)	9952 @ 14' 5 1/2"	9923 (3.50")	Passed (100%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	9463 @ 13' 2"	21789	Passed (43%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	58701 @ 8' 2 1/2"	62472	Passed (94%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.343 @ 7' 11 3/8"	0.353	Passed (L/495)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.580 @ 7' 11 3/8"	0.706	Passed (L/292)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - HF	5.50"	4.25"	3.10"	3717	101	4733	2738/-2738	11289/-2738	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	3.50"	3.51"	4111	138	5408	3203/-3203	12860/-3203	Blocking

- 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)	14' 6" o/c	
Bottom Edge (Lu)	14' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	1 1/4" to 14' 7 1/2"	N/A	30.6	--	--	--	
1 - Uniform (PSF)	0 to 4' (Front)	8"	8.0	10.0	-	-	Default Load
2 - Uniform (PLF)	4' to 8' 2 1/2" (Front)	N/A	357.0	-	392.0	-	
3 - Point (lb)	8' 2 1/2" (Front)	N/A	5774	-	8492	-	
4 - Uniform (PSF)	4' to 14' 7 1/2" (Front)	8"	12.0	30.0	-	-	Default Load
5 - Point (lb)	7' 11 3/8" (Front)	N/A	-	-	-	5941	

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

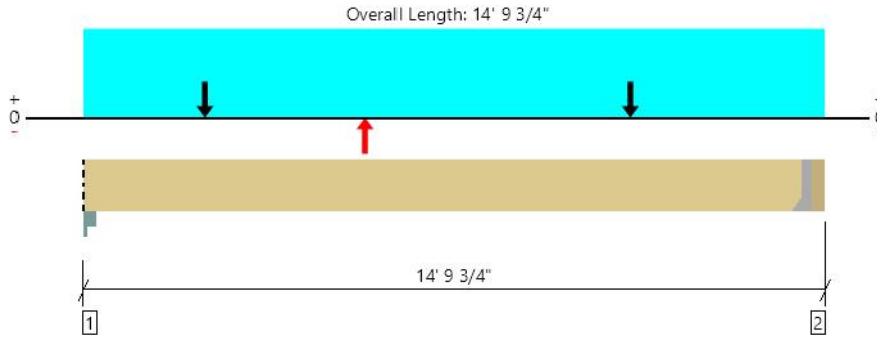
ForteWEB Software Operator	Job Notes
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An excessive uplift of -1507 lbs at support located at 2" failed this product.

An excessive uplift of -1723 lbs at support located at 14' 6 1/4" failed this product.



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)	2942 @ 14' 6 1/4"	2942 (1.87")	Passed (100%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	2820 @ 13' 4 1/4"	8101	Passed (35%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	9764 @ 10' 11 3/4"	17472	Passed (56%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-0.218 @ 10' 11 3/4"	0.359	Passed (L/790)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	0.369 @ 8' 9 5/16"	0.718	Passed (L/467)	--	1.0 D + 0.7 E (All Spans)

System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Snow	Seismic	Total	
1 - Column Cap - steel	3.50"	3.50"	1.74"	769	184	2811/-2811	3764/-2811	Blocking
2 - Hanger on 14" LSL beam	3.50"	Hanger <sup>1</sup>	1.87"	779	187	3130/-3130	4096/-3130	See note <sup>1</sup>

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 9" o/c	
Bottom Edge (Lu)	14' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	HUS1.81/10	3.00"	N/A	30-10dx1.5	10-10d	

• Refer to manufacturer notes and instructions for proper installation and use of all connectors.

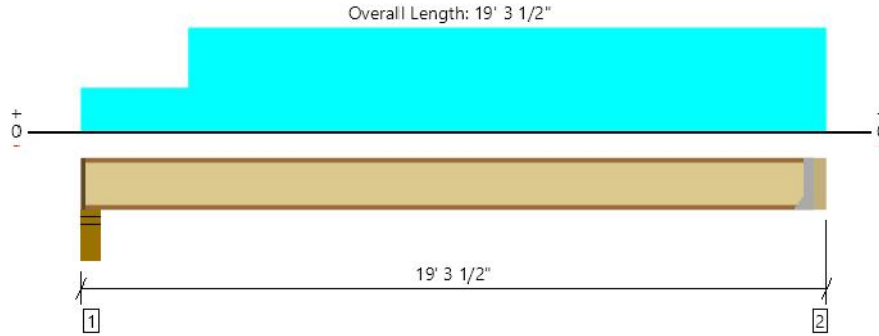
Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 14' 6 1/4"	N/A	7.7	--	--	
1 - Uniform (PLF)	0 to 14' 9 3/4" (Front)	N/A	97.0	25.0	-	
2 - Point (lb)	2' 5 3/4" (Front)	N/A	-	-	5941	
3 - Point (lb)	5' 8 3/4" (Front)	N/A	-	-	-5941	
4 - Point (lb)	10' 11 3/4" (Front)	N/A	-	-	5941	

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9/14/2020 9:01:04 PM UTC  
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Upper Floor Framing, 28 - Joist  
**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)	517 @ 19' 1/8"	1005 (1.75")	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	517 @ 19' 1/8"	1655	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2383 @ 9' 9 7/16"	3795	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.303 @ 9' 8 11/16"	0.466	Passed (L/738)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.426 @ 9' 8 5/8"	0.932	Passed (L/525)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	40	30	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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 Gold™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	4.25"	1.75"	141	316	457	1 1/4" Rim Board
2 - Hanger on 11 7/8" GLB beam	3.38"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	153	380	533	See note <sup>1</sup>

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 9" o/c	
Bottom Edge (Lu)	18' 11" o/c	

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

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	IUS2.06/11.88	2.00"	N/A	10-10dx1.5	2-Strong-Grip	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

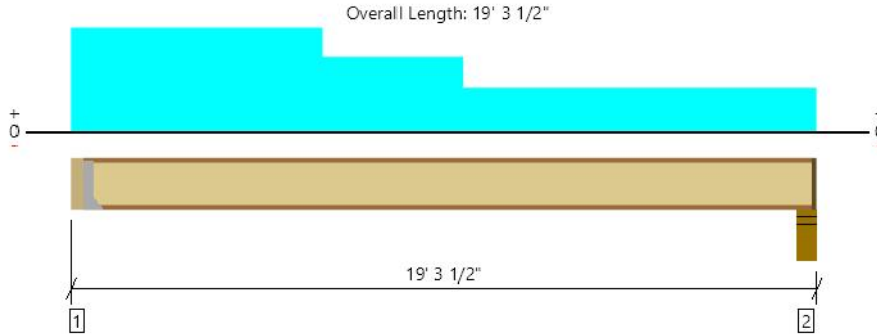
Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 2' 10"	16"	8.0	10.0	Default Load
2 - Uniform (PSF)	2' 10" to 19' 3 1/2"	16"	12.0	30.0	

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Upper Floor Framing, 28B - Joist  
**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)	420 @ 3 3/8"	1005 (1.75")	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	420 @ 3 3/8"	1655	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1598 @ 8' 4 3/16"	3795	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.184 @ 9' 2 7/8"	0.466	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.283 @ 9' 3 13/16"	0.932	Passed (L/789)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	40	30	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" GLB beam	3.38"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	137	299	436	See note <sup>1</sup>
2 - Stud wall - HF	5.50"	4.25"	1.75"	113	176	289	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 10" o/c	
Bottom Edge (Lu)	18' 11" o/c	

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

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS2.06/11.88	2.00"	N/A	10-10dx1.5	2-Strong-Grip	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 6' 4 1/2"	16"	12.0	30.0	Default Load
2 - Uniform (PSF)	6' 4 1/2" to 10'	16"	10.0	20.0	
3 - Uniform (PSF)	10' to 19' 3 1/2"	16"	8.0	10.0	

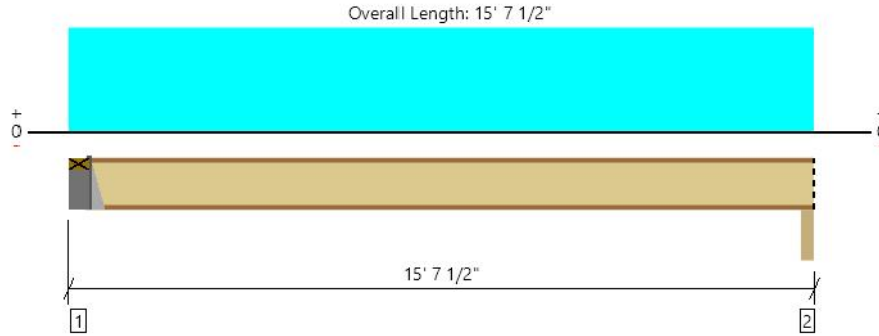
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Main Floor Framing, 31 - Joist  
**1 piece(s) 11 7/8" TJI® 210 @ 16" OC**



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)	519 @ 5 1/2"	1005 (1.75")	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	519 @ 5 1/2"	1655	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1939 @ 7' 11 1/4"	3795	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.182 @ 7' 11 1/4"	0.374	Passed (L/987)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.237 @ 7' 11 1/4"	0.748	Passed (L/759)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	45	40	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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 - Hanger on Single 2X HF plate	5.50"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	127	423	550	See note <sup>1</sup>
2 - Beam - DF	3.50"	3.50"	1.75"	123	410	533	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 3" o/c	
Bottom Edge (Lu)	15' 2" o/c	

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

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	ITS2.06/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 15' 7 1/2"	16"	12.0	40.0	Default Load

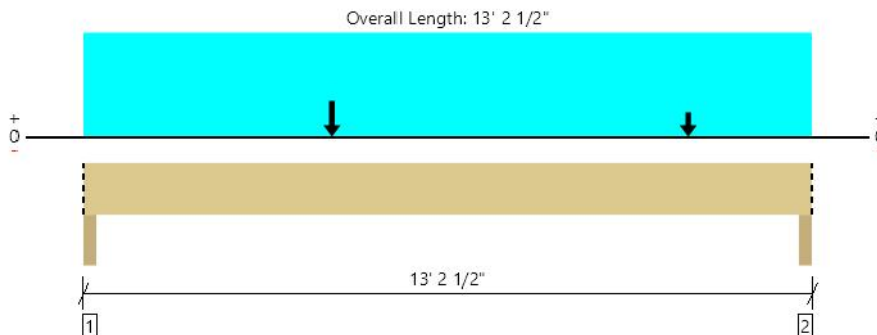
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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9/17/2020 1:08:49 AM UTC  
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Main Floor Framing, 32 - Joist  
**1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL @ 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)	1734 @ 13'	3828 (3.50")	Passed (45%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1690 @ 11' 11 1/8"	4295	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6243 @ 4' 6"	8296	Passed (75%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.236 @ 6' 5 13/16"	0.320	Passed (L/649)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.401 @ 6' 5 1/8"	0.640	Passed (L/383)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	58	40	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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 4% increase in the moment capacity has been added to account for repetitive member usage.
- 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"	1.50"	641	896	1537	Blocking
2 - Beam - DF	3.50"	3.50"	1.59"	646	1088	1734	Blocking

• 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)	4' 8" o/c	
Bottom Edge (Lu)	13' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PLF)	0 to 13' 2 1/2"	N/A	8.0	26.7	Default Load
2 - Point (lb)	4' 6"	N/A	791	909	
3 - Point (lb)	10' 11 1/2"	N/A	390	722	

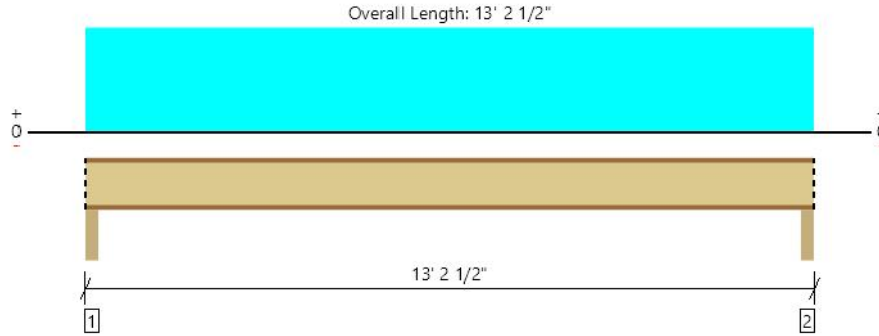
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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9/11/2020 7:44:57 PM UTC  
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Main Floor Framing, 33 - Joist  
**2 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)	1118 @ 2 1/2"	2920 (3.50")	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1069 @ 3 1/2"	3310	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3463 @ 6' 7 1/4"	7590	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.055 @ 6' 7 1/4"	0.320	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.174 @ 6' 7 1/4"	0.640	Passed (L/885)	--	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 2015  
 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"	766	352	1118	Blocking
2 - Beam - DF	3.50"	3.50"	1.75"	766	352	1118	Blocking

• 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)	5' 7" o/c	
Bottom Edge (Lu)	13' 3" o/c	

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

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 13' 2 1/2"	16"	12.0	40.0	Default Load
2 - Uniform (PLF)	0 to 13' 2 1/2"	N/A	100.0	-	
3 - Point (lb)	10' 11 1/2"	N/A	-	-	

**Weyerhaeuser Notes**

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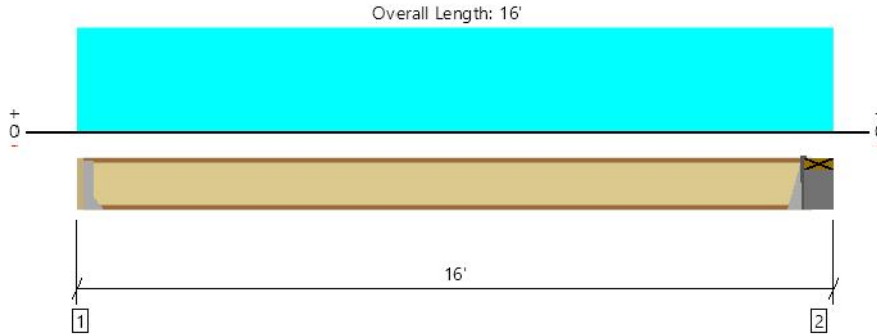
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ForteWEB Software Operator	Job Notes
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9/11/2020 7:45:08 PM UTC  
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Main Floor Framing, 34 - Joist  
**1 piece(s) 11 7/8" TJI® 210 @ 16" OC**



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)	790 @ 1 3/4"	1005 (1.75")	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	790 @ 1 3/4"	1655	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2999 @ 7' 8 7/8"	3795	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.289 @ 7' 8 7/8"	0.380	Passed (L/631)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.375 @ 7' 8 7/8"	0.759	Passed (L/486)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	44	40	Passed	--	--

System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2015  
 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 - Hanger on 11 7/8" HF beam	1.75"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	186	619	805	See note <sup>1</sup>
2 - Hanger on Single 2X HF plate	8.00"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	198	661	859	See note <sup>1</sup>

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 2" o/c	
Bottom Edge (Lu)	15' 2" o/c	

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

Connector: Simpson Strong-Tie							
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories	
1 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A		
2 - Top Mount Hanger	ITS2.06/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16'	16"	18.0	60.0	Default Load

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

ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



9/17/2020 1:09:52 AM UTC  
 ForteWEB v3.0, Engine: V8.1.3.1, Data: V8.0.0.0  
 File Name: Mounger Residence  
 Page 1 / 1

NDS 2015 Column Design - Combined Bending and Axial Load

Section	Grade
A	#2 SPF
B	#1 DF
C	#2 DF
D	#1 HF
E	#2 HF
F	HF-STUD
G	1.8E PSL

Stud Spacing	16
Wind (psf)	17.0
Moment (ft.-lbs.)	1,116
Moment - Strong	0
Moment - Weak	0
Axial Load (plf)	775
Load/stud (lbs.)	1,033
Ke	1.0

# of members	1
Section Mark	2x8
Grade Mark	C
Axial Load (lbs.)	1,033
Moment Strong Axis (ft.-lbs.)	1,116
Moment Weak Axis (ft.-lbs.)	0
Load Duration Factor	1.60
Repetitive Factor Cr	1.15
Incised Lumber (Y/N)	N
Unbraced Length Strong Axis (ft.)	19.85
Unbraced Length Weak Axis (ft.)	1.33
Grade	#2 DF
Axial alone = $f_c/F^*c$	0.22
Interaction Eq. Term 1	0.05
Interaction Eq. Term 2	0.68
Interaction Eq. Term 3	0.00
Total Interaction Eq.	0.73

Mk	Section
A	2x4
B	2x6
C	2x8
D	2x10
E	2x12
F	4x4
G	4x6
H	4x8
I	4x10
J	4x12
K	6x6
L	6x8
M	6x10
N	6x12
P	5-1/4x7
1	2x8

Strong axis deflection - uniform load over simple span of 19.85' =	0.73	L / 328
Weak axis deflection - uniform load over simple span of 1.33' =	0.00	L / 0
Strong axis deflection - point load at center of 19.85' span =	0.58	L / 409
Weak axis deflection - point load at center of 1.33' span =	0.00	L / 0

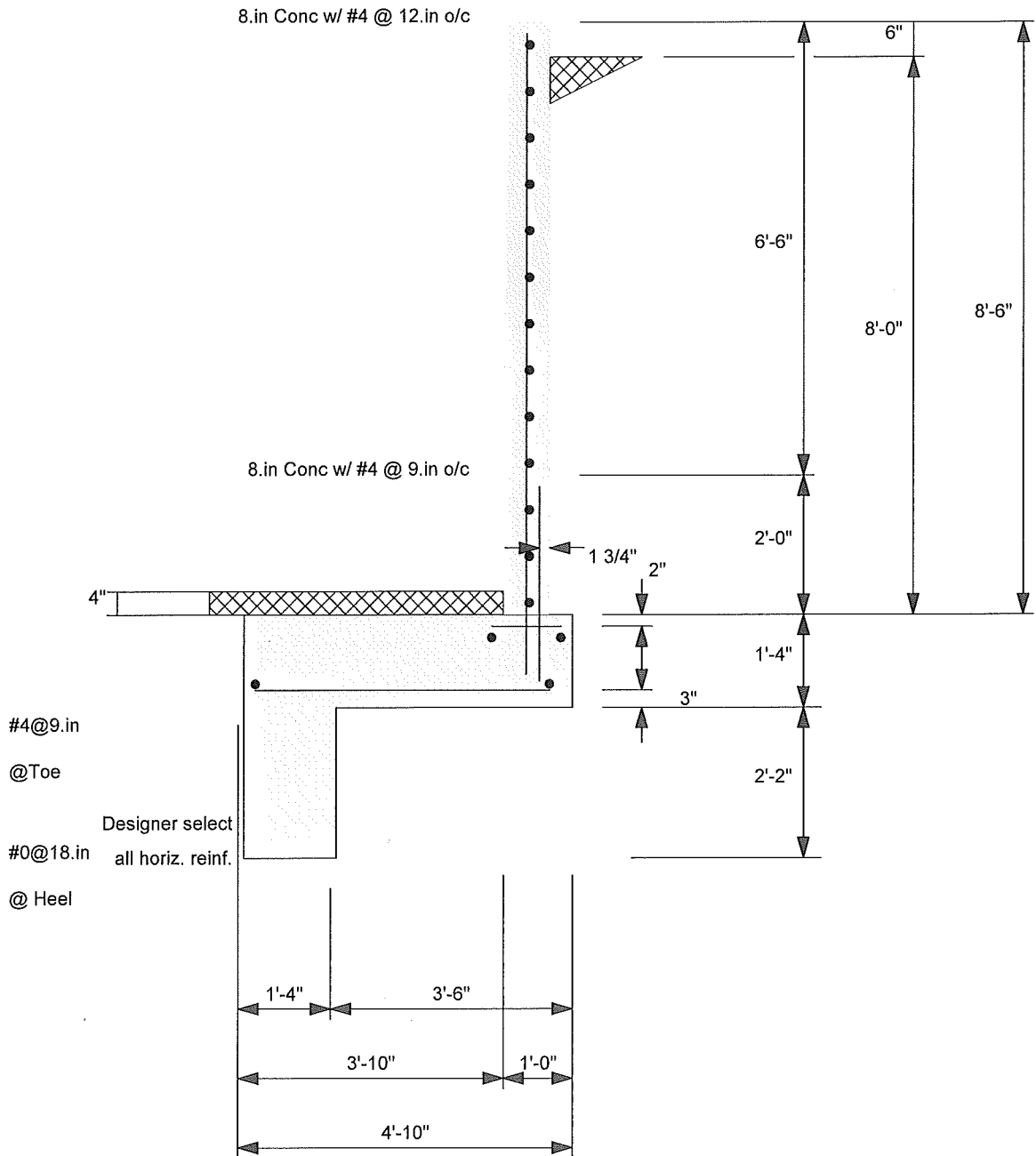
Fbx (psi) = 1,080  
 Fby (psi) = 1,242  
 Fc (psi) = 1,575  
 Ex (psi) = 1.60E+06  
 Ex min (psi) = 5.80E+05  
 Ey (psi) = 1.60E+06  
 Ey min (psi) = 5.80E+05

$f_c = P/A$ (psi) = 95.0	AXIAL
$F^*c = F_c \times C_d \times C_i$ (psi) = 2520.0	
$K^*(l_e2/d2) = 10.6$	OK
$K^*(l_e1/d1) = 32.9$	OK
= 441.7	
$F' = F_{ce}/F^*c = 0.175$	
c = 0.8	
$(1+F')/2c = 0.735$	
Cp = 0.168	Column Stability Factor
$F^*c = F^*c \times C_p$ (psi) = 424.5	
$f_c/F^*c = 0.224$	
$(f_c/F^*c)^2 = 0.05$	Interaction Equation, 1st term

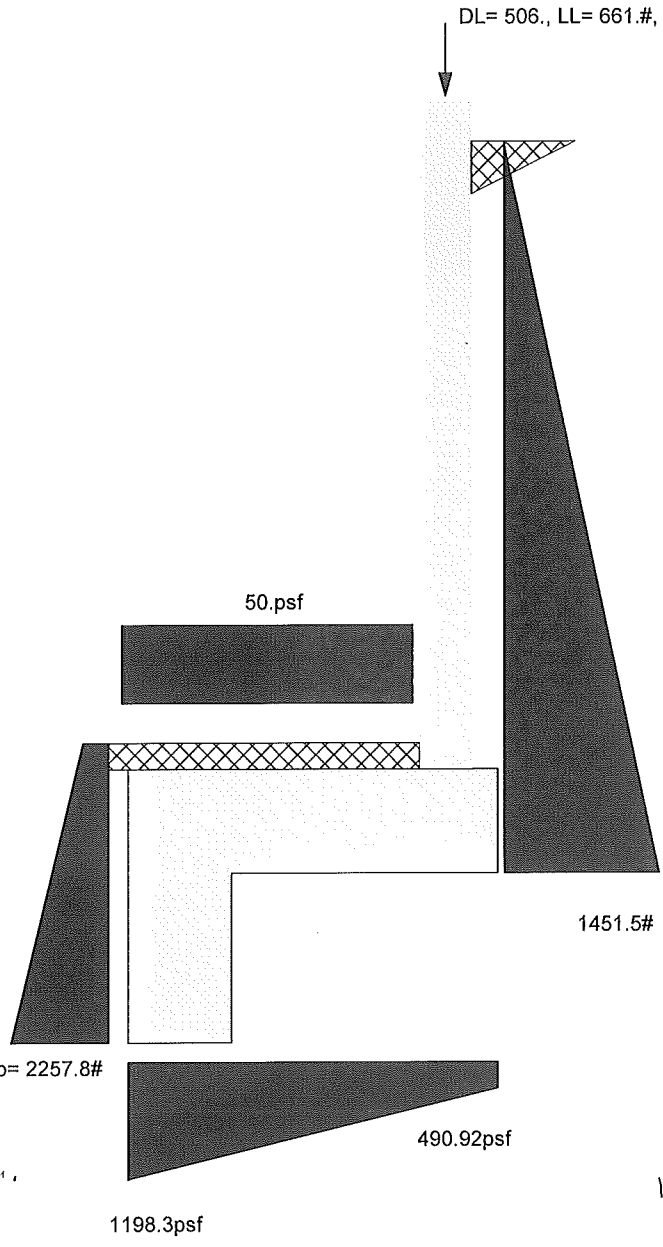
$fb1 = M/S \text{ (psi)} = 1019.5$	STRONG AXIS BENDING
$Fb^* = Fb \times Cd \times Cr \times Ci \text{ (psi)} = 1987.2$	
$lu = 16.0$	in.
$le = 32.9$	in.
$Rb = \text{sq. rt.}(le \times d/b^2) = 13.1$	OK
$Fbe = 1.2 \times E'min/Rb^2 \text{ (psi)} = 4054.1$	OK
$F = Fbe/Fb^* = 2.040$	
$(1+F)/1.9 = 1.600$	
$CL = 0.958$	Beam Stability Factor
$F'b1 \text{ (psi)} = 1903.0$	
$fb1/F'b1 = 0.536$	
$(\text{psi}) = 441.7$	OK
$1-(fc/Fce1) = 0.785$	
$fb1/[F'b1*(1-(fc/Fce2))] = 0.68$	Interaction Equation, 2nd term

$fb2 = M/S \text{ (psi)} = 0.0$	WEAK AXIS BENDING
$Fb^* = Fb \times Cd \times Cr \times Ci \text{ (psi)} = 2285.3$	
$Fbe = 1.2 \times E'min/Rb^2 \text{ (psi)} = 4054.1$	OK
$F = Fbe/Fb^* = 1.774$	
$(1+F)/1.9 = 1.460$	
$CL = 0.946$	Beam Stability factor
$F'b2 \text{ (psi)} = 2161.8$	
$fb2/F'b2 = 0.000$	
$(\text{psi}) = 4211.3$	OK
$1-(fc/Fce2) = 0.977$	
$fb1/Fbe = 0.251$	
$fb2/[(F'b2)*(1-(fc/Fce2)-(fb1/Fbe)^2)] = 0.00$	Interaction Equation, 3rd term

GRID ①

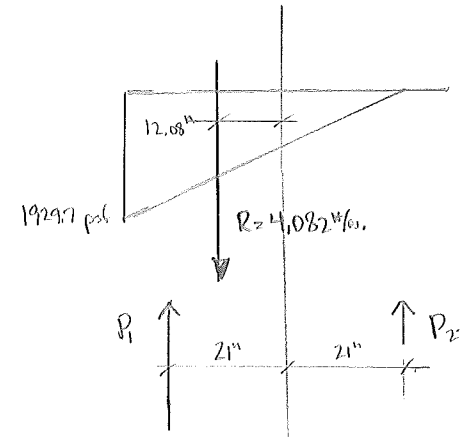
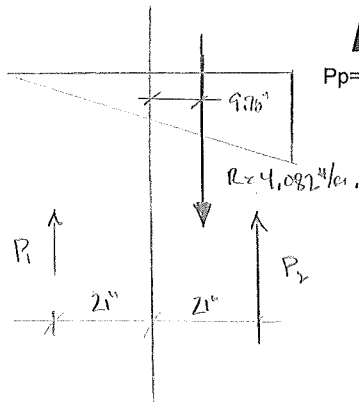


DL= 506., LL= 661.#, Ecc= 0.in



LIVE + DEAD (NO BRIDGE)

ALL LOAD w/ SEISMIC SURCHARGE



$$P_1 = \left( \frac{21'' - 9.76''}{21'' + 21''} \right) 4,082 = 1.094 \text{ k/ft.}$$

$$P_2 = \left( \frac{21'' + 9.76''}{21'' + 21''} \right) 4,082 = 2.994 \text{ k/ft.}$$

4" of PILE SPACING (702/PILE)

$$S_1 = 20.0 / 3.22 = 6.21' \text{ or } \underline{b' - 2' 6'' \text{ oc}}$$

$$S_2 = 20.0 / 2.99 = 6.69' \text{ or } \underline{b' - 8'' \text{ oc}}$$

$$P_1 = \left( \frac{21'' + 12.08''}{21'' + 21''} \right) 4,082 \text{ k/ft.} = 3.22 \text{ k/ft.}$$

$$P_2 = \left( \frac{21'' - 12.08''}{21'' + 21''} \right) 4,082 \text{ k/ft.} = 0.87 \text{ k/ft.}$$



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Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 15 SEP 2020, 8:12AM

## Cantilevered Retaining Wall

File = c:\ASE\Projects\MOUNGE~1\CALCUL~1\MOUNGE~1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 1

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 8.00 ft  
 Wall height above soil = 0.50 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 35.0 psf/ft  
 Toe Active Pressure = 35.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 0.00 in

### Surcharge Loads

Surcharge Over Heel = 0.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 50.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 plf  
 ...Height to Top = 8.00 ft  
 ...Height to Bottom = 0.00 ft

### Adjacent Footing Load

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

### Axial Load Applied to Stem

Axial Dead Load = 506.0 lbs  
 Axial Live Load = 661.0 lbs  
 Axial Load Eccentricity = 0.0 in

Wind on Exposed Stem = 0.0 psf

### Design Summary

**Wall Stability Ratios**  
 Overturning = 2.22 OK  
 Sliding = 1.56 OK  
 Total Bearing Load = 4,082 lbs  
 ...resultant ecc. = 4.05 in  
 Soil Pressure @ Toe = 1,198 psf OK  
 Soil Pressure @ Heel = 491 psf OK  
 Allowable = 2,000 psf  
 Soil Pressure Less Than Allowable  
 ACI Factored @ Toe = 1,516 psf  
 ACI Factored @ Heel = 621 psf  
 Footing Shear @ Toe = 16.2 psi OK  
 Footing Shear @ Heel = 2.9 psi OK  
 Allowable = 75.0 psi  
**Sliding Calcs** (Vertical Component NOT Used)  
 Lateral Sliding Force = 1,451.5 lbs  
 less 100% Passive Force = - 2,257.8 lbs  
 less 0 % Friction Force = - 0.0 lbs  
 Added Force Req'd = 0.0 lbs OK  
 ...for 1.5 : 1 Stability = 0.0 lbs OK

### Stem Construction

	Top Stem	2nd
<b>Design Height Above Ftg</b>	Stem OK	Stem OK
ft =	2.00	0.00
<b>Wall Material Above "H"</b>	Concrete	Concrete
Thickness	in = 8.00	8.00
Rebar Size	= # 4	# 4
Rebar Spacing	in = 12.00	9.00
Rebar Placed at	= Center	Edge
<b>Design Data</b>		
fb/FB + fa/Fa	= 0.595	0.671
Total Force @ Section	lbs = 1,008.0	1,781.1
Moment....Actual	ft-l = 2,016.0	4,777.0
Moment.....Allowable	ft-l = 3,387.6	7,122.4
Shear.....Actual	psi = 21.0	23.7
Shear.....Allowable	psi = 75.0	75.0
Wall Weight	psf = 100.0	100.0
Rebar Depth 'd'	in = 4.00	6.25
Lap splice if above	in = 18.72	18.72
Lap splice if below	in = 18.72	5.04
Hook embed into footing	in = 18.72	5.04

### Concrete Data

fc	psi = 2,500.0	2,500.0
Fy	psi = 24,000.0	20,000.0

### Load Factors

Dead Load = 1.200  
 Live Load = 1.600  
 Earth, H = 1.600  
 Wind, W = 1.600  
 Seismic, E = 1.000

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File = c:\ASE\Projects\MOUNGE~1\CALCUL~1\MOUNGE~1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

## Cantilevered Retaining Wall

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 1

### Footing Dimensions & Strengths

Toe Width = 3.83 ft  
 Heel Width = 1.00  
 Total Footing Width = 4.83  
 Footing Thickness = 16.00 in  
 Key Width = 16.00 in  
 Key Depth = 26.00 in  
 Key Distance from Toe = 0.00 ft  
 f'c = 2,500 psi Fy = 60,000 psi  
 Footing Concrete Density = 150.00 pcf  
 Min. As % = 0.0018  
 Cover @ Top 2.00 @ Btm. = 3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 1,516	621 psf
Mu' : Upward	= 0	0 ft-lb
Mu' : Downward	= 0	77 ft-lb
Mu: Design	= 4,777	77 ft-lb
Actual 1-Way Shear	= 16.25	2.86 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 4 @ 9.00 in	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

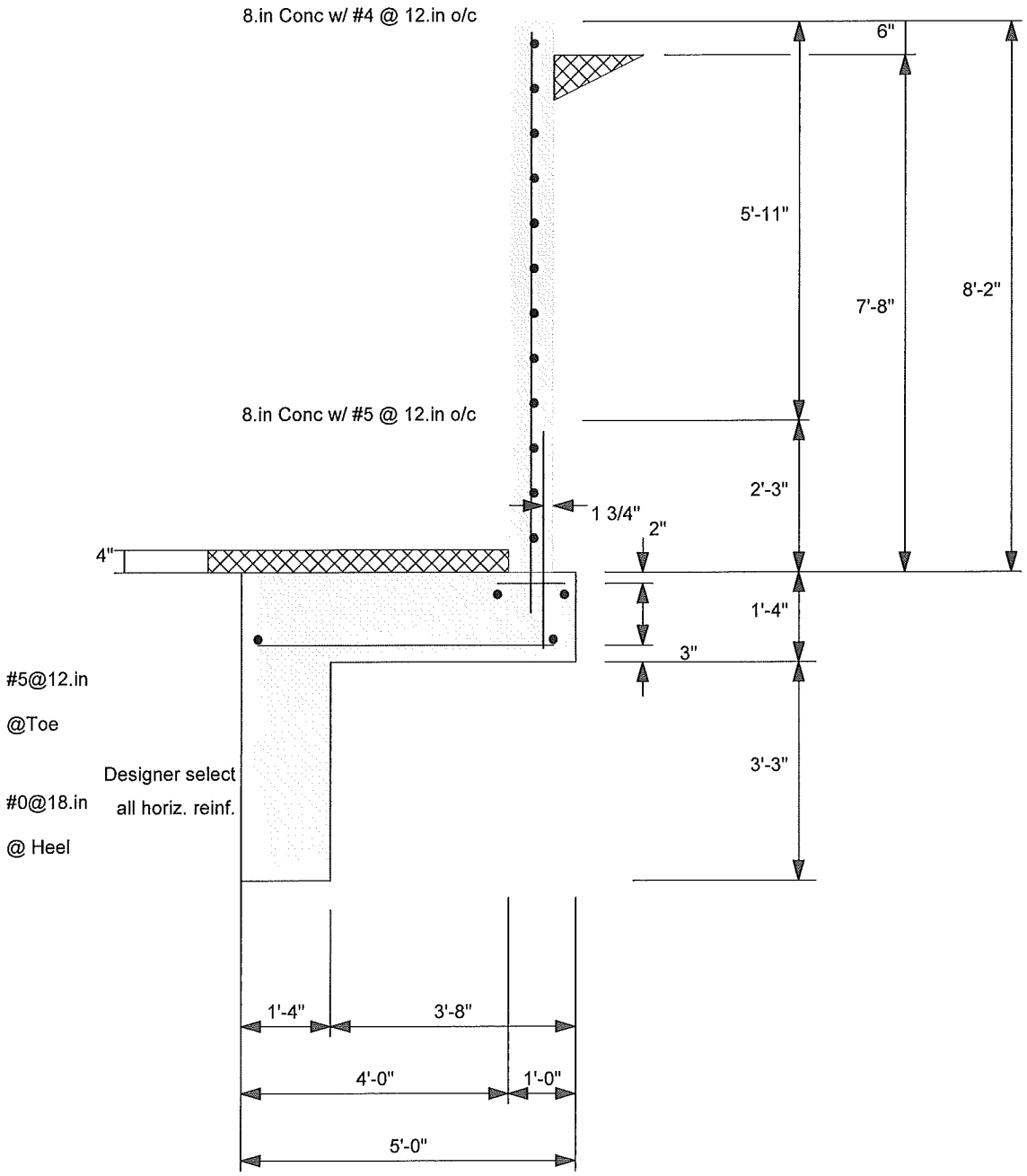
Toe: #4@ 9.00 in, #5@ 14.00 in, #6@ 19.75 in, #7@ 26.75 in, #8@ 35.25 in, #9@ 44  
 Heel: Not req'd, Mu < S \* Fr  
 Key: Not req'd, Mu < S \* Fr

### Summary of Overturning & Resisting Forces & Moments

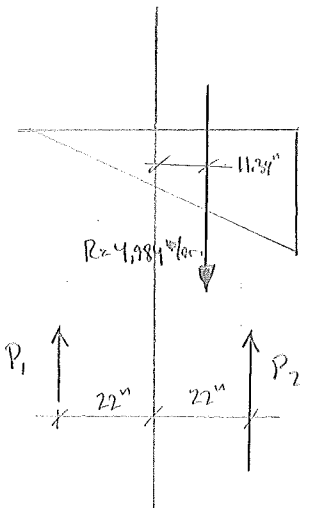
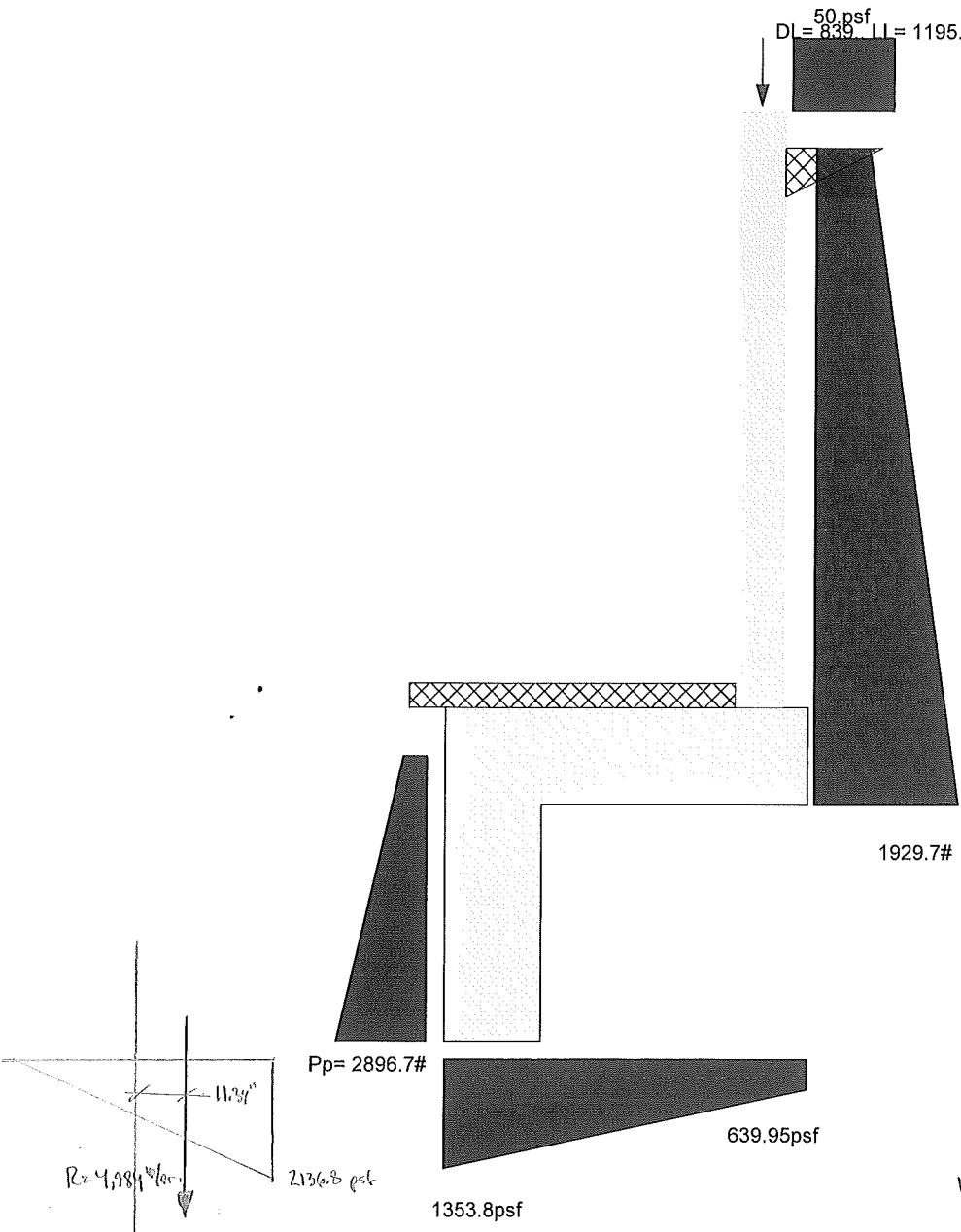
Item	.....OVERTURNING.....				.....RESISTING.....		
	Force lbs	Distance ft	Moment ft-lb		Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	= 1,524.4	3.11	4,742.7	Soil Over Heel	= 320.0	4.67	1,493.2
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Toe Active Pressure	= -48.6	0.56	-27.0	Surcharge Over Heel	=		
Surcharge Over Toe	= -24.3	0.83	-20.3	Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	= 506.0	4.17	2,108.2
Added Lateral Load	=			* Axial Live Load on Stem	= 661.0	4.17	2,753.9
Load @ Stem Above Soil	=			Soil Over Toe	= 153.3	1.92	293.8
				Surcharge Over Toe	= 191.7	1.92	367.3
				Stem Weight(s)	= 850.0	4.17	3,541.4
				Earth @ Stem Transitions	=		
				Footing Weight	= 966.6	2.42	2,335.8
				Key Weight	= 433.3	0.67	288.9
				Vert. Component	=		
<b>Total</b>	= 1,451.5	<b>O.T.M.</b>	= 4,695.5	<b>Total</b>	= 3,420.9 lbs	<b>R.M.</b>	= 10,428.6
<b>Resisting/Overturning Ratio</b>		=	<b>2.22</b>				
Vertical Loads used for Soil Pressure =		4,081.9 lbs					

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

GR10 (2) (4)



50 psf  
 DI = 839, LL = 1195#, Ecc = 0.in

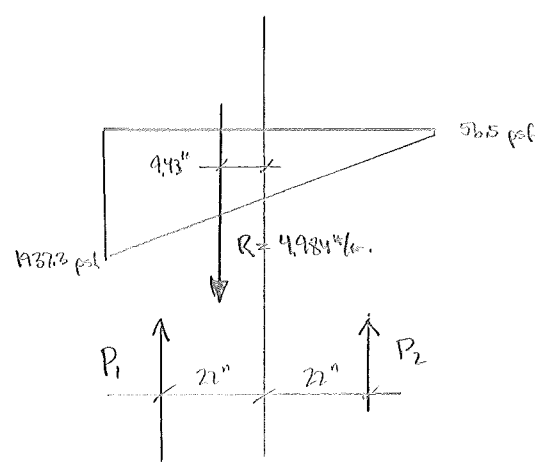


$$P_2 = \left( \frac{33.24''}{44''} \right) 4981 = 3718 \text{#/ft}$$

4" of PILE structure (20K/PILE)

$$S_1 = 20.0 / 3.56 = 5.61' \text{ or } 5' - 7\frac{1}{2}'' \text{ oc}$$

$$S_2 = 20.0 / 3.78 = 5.29' \text{ or } 5' - 3\frac{1}{2}'' \text{ oc}$$



$$P_1 = \left( \frac{31.45''}{44''} \right) 4981 = 3564 \text{/ft}$$

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## Cantilevered Retaining Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 2

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 7.67 ft  
 Wall height above soil = 0.50 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 45.0 psf/ft  
 Toe Active Pressure = 45.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 12.00 in

### Surcharge Loads

Surcharge Over Heel = 50.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 0.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 plf  
 ...Height to Top = 7.67 ft  
 ...Height to Bottom = 0.00 ft

### Adjacent Footing Load

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

### Axial Load Applied to Stem

Axial Dead Load = 839.0 lbs  
 Axial Live Load = 1,195.0 lbs  
 Axial Load Eccentricity = 0.0 in

### Wind on Exposed Stem

Wind on Exposed Stem = 0.0 psf

### Design Summary

**Wall Stability Ratios**  
 Overturning = 1.94 OK  
 Sliding = 1.50 OK  
 Total Bearing Load = 4,984 lbs  
 ...resultant ecc. = 3.58 in  
 Soil Pressure @ Toe = 1,354 psf OK  
 Soil Pressure @ Heel = 640 psf OK  
 Allowable = 2,000 psf  
 Soil Pressure Less Than Allowable  
 ACI Factored @ Toe = 1,754 psf  
 ACI Factored @ Heel = 829 psf  
 Footing Shear @ Toe = 23.2 psi OK  
 Footing Shear @ Heel = 2.9 psi OK  
 Allowable = 75.0 psi  
**Sliding Calcs** (Vertical Component NOT Used)  
 Lateral Sliding Force = 1,929.7 lbs  
 less 100% Passive Force = - 2,896.7 lbs  
 less 0 % Friction Force = - 0.0 lbs  
 Added Force Req'd = 0.0 lbs OK  
 ...for 1.5 : 1 Stability = 0.0 lbs OK

### Stem Construction

	Top Stem	2nd
<b>Design Height Above Ftg</b>	ft = 2.25	Stem OK 0.00
Wall Material Above "Ht"	= Concrete	Concrete
Thickness	in = 8.00	8.00
Rebar Size	= # 4	# 5
Rebar Spacing	in = 12.00	12.00
Rebar Placed at	= Center	Edge
<b>Design Data</b>		
fb/FB + fa/Fa	= 0.694	0.775
Total Force @ Section	lbs = 1,219.7	2,343.4
Moment....Actual	ft-l = 2,350.1	6,294.3
Moment....Allowable	ft-l = 3,387.6	8,121.3
Shear.....Actual	psi = 25.4	31.6
Shear.....Allowable	psi = 75.0	75.0
Wall Weight	psf = 100.0	100.0
Rebar Depth 'd'	in = 4.00	6.19
Lap splice if above	in = 18.72	23.40
Lap splice if below	in = 18.72	6.30
Hook embed into footing	in = 18.72	6.30

### Concrete Data

f'c = 2,500.0 psi  
 Fy = 24,000.0 psi

### Load Factors

Dead Load = 1.200  
 Live Load = 1.600  
 Earth, H = 1.600  
 Wind, W = 1.600  
 Seismic, E = 1.000

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 Project Descr:

Project ID:

Printed: 15 SEP 2020, 8:04AM

## Cantilevered Retaining Wall

File = c:\ASE\Projects\MOUNGE~1\CALCUL~1\MOUNGE~1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 2

### Footing Dimensions & Strengths

Toe Width = 4.00 ft  
 Heel Width = 1.00  
 Total Footing Width = 5.00  
 Footing Thickness = 16.00 in  
 Key Width = 16.00 in  
 Key Depth = 39.00 in  
 Key Distance from Toe = 0.00 ft  
 f'c = 2,500 psi Fy = 60,000 psi  
 Footing Concrete Density = 150.00 pcf  
 Min. As % = 0.0018  
 Cover @ Top 2.00 @ Btm. = 3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure =	1,754	829 psf
Mu' : Upward =	0	0 ft-lb
Mu' : Downward =	0	79 ft-lb
Mu: Design =	6,294	79 ft-lb
Actual 1-Way Shear =	23.21	2.93 psi
Allow 1-Way Shear =	75.00	75.00 psi
Toe Reinforcing =	# 5 @ 12.00 in	
Heel Reinforcing =	None Spec'd	
Key Reinforcing =	# 5 @ 12.00 in	

Other Acceptable Sizes & Spacings

Toe: #4@ 9.00 in, #5@ 14.00 in, #6@ 19.75 in, #7@ 26.75 in, #8@ 35.25 in, #9@ 44.

Heel: Not req'd, Mu < S \* Fr

Key: #4@ 8.75 in, #5@ 13.25 in, #6@ 19.00 in, #7@ 25.75 in,

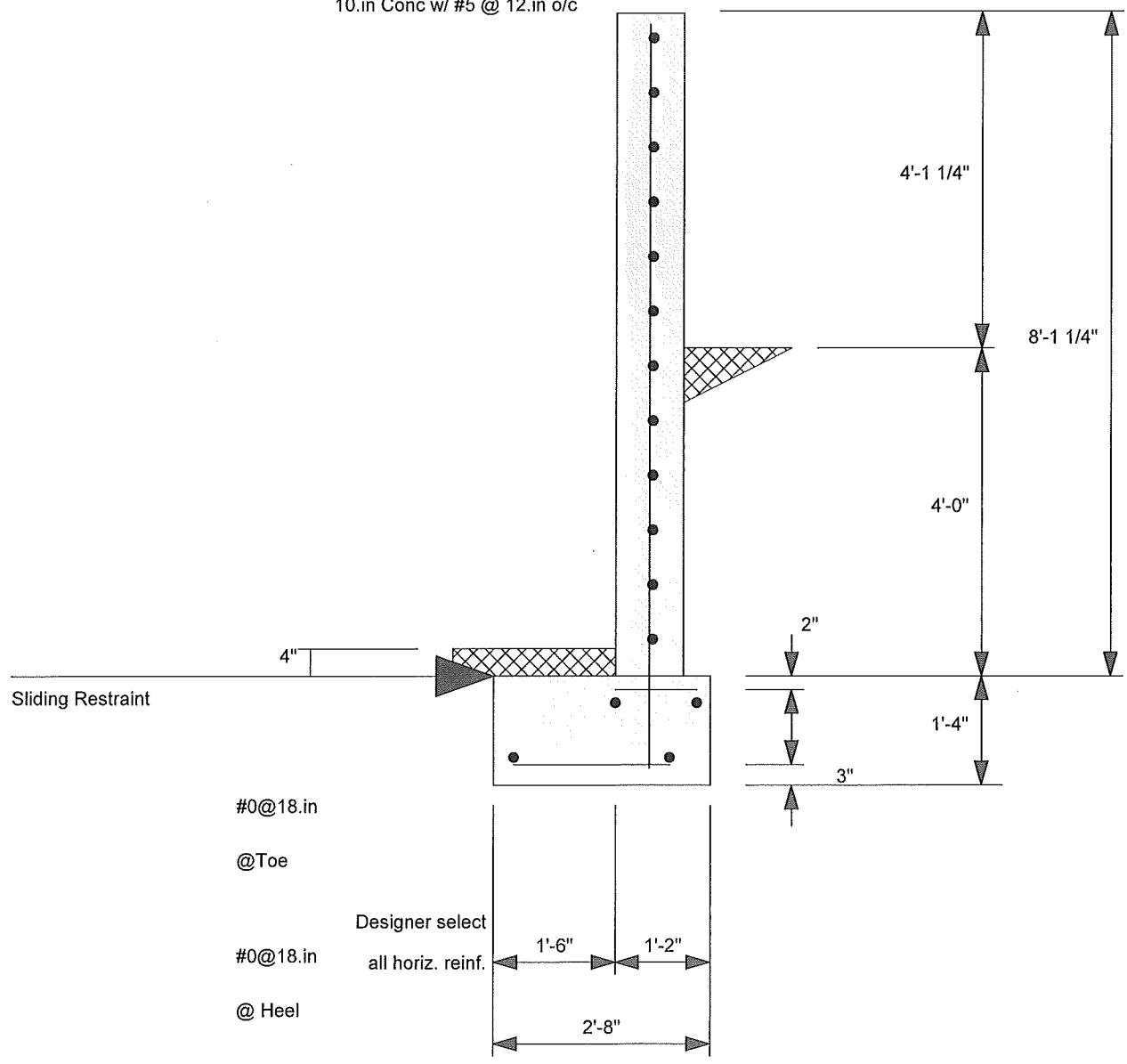
### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-lb	Force lbs	Distance ft	Moment ft-lb	
Heel Active Pressure =	1,823.4	3.00	5,471.8	Soil Over Heel =	306.8	4.83	1,482.7
Surcharge over Heel =	168.8	4.50	759.8	Sloped Soil Over Heel =			
Toe Active Pressure =	-62.5	0.56	-34.7	Surcharge Over Heel =	16.7	4.83	80.6
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	839.0	4.33	3,635.7
Added Lateral Load =				* Axial Live Load on Stem =	1,195.0	4.33	5,178.3
Load @ Stem Above Soil =				Soil Over Toe =	160.0	2.00	320.0
				Surcharge Over Toe =			
				Stem Weight(s) =	816.9	4.33	3,539.9
				Earth @ Stem Transitions =			
				Footing Weight =	1,000.0	2.50	2,500.0
				Key Weight =	650.0	0.67	433.3
				Vert. Component =			
<b>Total</b> =	<b>1,929.7</b>	<b>O.T.M. =</b>	<b>6,196.8</b>	<b>Total =</b>	<b>3,789.3 lbs</b>	<b>R.M. =</b>	<b>11,992.1</b>
<b>Resisting/Overturning Ratio</b> =			<b>1.94</b>				
Vertical Loads used for Soil Pressure =		4,984.3 lbs					

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

GRID (9)

10.in Conc w/ #5 @ 12.in o/c



Sliding Restraint

#0@18.in

@ Toe

#0@18.in

Designer select  
all horiz. reinf.

@ Heel

1'-6"

1'-2"

2'-8"

4'-1 1/4"

8'-1 1/4"

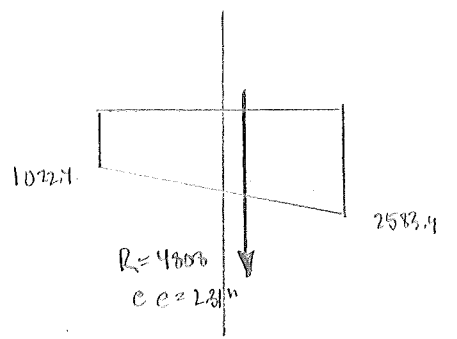
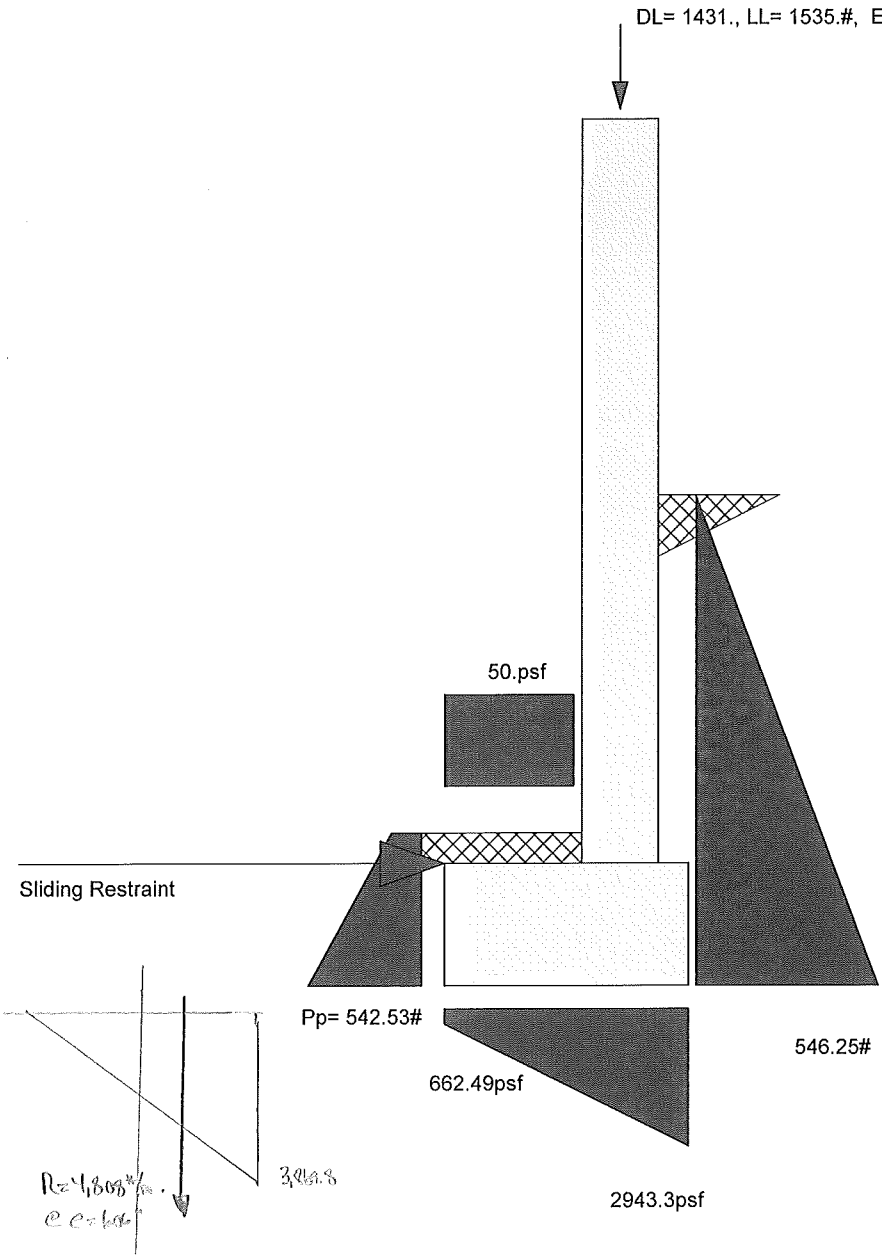
4'-0"

2"

1'-4"

3"

4"



$4'' \phi \text{ Piles}$

$S_1 = 20.0 / 1.71 = 11.69' \text{ or } 11'-8'' \text{ oc}$

$S_2 = 20.0 / 4.775 = 4.19' \text{ or } 4'-9'' \text{ oc}$

$P_2 = \left( \frac{8'' + 6.06''}{16''} \right) 4,808 = 4.775 \text{ in.}$

$P_1 = \left( \frac{8'' - 2.31''}{16''} \right) 4,808 = 1.71 \text{ in.}$



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 Engineer:  
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## Cantilevered Retaining Wall

File = c:\ASE\Projects\MOUNGE-1\CALCUL-1\MOUNGE-1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 9

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 4.00 ft  
 Wall height above soil = 4.11 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 45.0 psf/ft  
 Toe Active Pressure = 45.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 0.00 in

### Surcharge Loads

Surcharge Over Heel = 0.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 50.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 plf  
 ...Height to Top = 4.00 ft  
 ...Height to Bottom = 0.00 ft

### Adjacent Footing Load

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

### Axial Load Applied to Stem

Axial Dead Load = 1,431.0 lbs  
 Axial Live Load = 1,535.0 lbs  
 Axial Load Eccentricity = 0.0 in

### Wind on Exposed Stem

Wind on Exposed Stem = 0.0 psf

### Design Summary

**Wall Stability Ratios**  
 Overturning = 5.48 OK  
 Sliding = 3.09 OK  
*Slab Resists All Sliding!*  
 Total Bearing Load = 4,808 lbs  
 ...resultant ecc. = 3.37 in  
 Soil Pressure @ Toe = 662 psf OK  
 Soil Pressure @ Heel = 2,943 psf NG  
 Allowable = 2,000 psf  
 Soil Pressure Exceeds Allowable!  
 ACI Factored @ Toe = 880 psf  
 ACI Factored @ Heel = 3,908 psf  
 Footing Shear @ Toe = 2.3 psi OK  
 Footing Shear @ Heel = 1.7 psi OK  
 Allowable = 75.0 psi  
**Sliding Calcs** Slab Resists All Sliding!  
 Lateral Sliding Force = 546.3 lbs  
 less 100% Passive Force = - 542.5 lbs  
 less 100% Friction Force = - 1,146.0 lbs  
 Added Force Req'd = 0.0 lbs OK  
 ...for 1.5 : 1 Stability = 0.0 lbs OK

### Stem Construction

**Design Height Above Ftg**  
 Design Height Above Ftg ft = 0.00  
 Wall Material Above "Ht" = Concrete  
 Thickness in = 10.00  
 Rebar Size = # 5  
 Rebar Spacing in = 12.00  
 Rebar Placed at = Center  
**Design Data**  
 fb/FB + fa/Fa = 0.118  
 Total Force @ Section lbs = 562.0  
 Moment....Actual ft-l = 765.9  
 Moment....Allowable ft-l = 6,464.7  
 Shear.....Actual psi = 9.4  
 Shear.....Allowable psi = 75.0  
 Wall Weight psf = 125.0  
 Rebar Depth 'd' in = 5.00  
 Lap splice if above in = 23.40  
 Lap splice if below in = 10.50  
 Hook embed into footing in = 10.50

### Top Stem

Stem OK

### Concrete Data

f'c psi = 2,500.0  
 Fy psi =

### Load Factors

Dead Load 1.200  
 Live Load 1.600  
 Earth, H 1.600  
 Wind, W 1.600  
 Seismic, E 1.000

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## Cantilevered Retaining Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 9

### Footing Dimensions & Strengths

Toe Width	=	1.50	ft
Heel Width	=	1.17	
Total Footing Width	=	2.67	
Footing Thickness	=	16.00	in
Key Width	=	0.00	in
Key Depth	=	0.00	in
Key Distance from Toe	=	0.00	ft
$f_c$	=	2,500	psi
$F_y$	=	60,000	psi
Footing Concrete Density	=	150.00	pcf
Min. As %	=	0.0018	
Cover @ Top	=	2.00	
	@ Btm.	=	3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 880	3,908 psf
$M_u'$ : Upward	= 0	0 ft-lb
$M_u'$ : Downward	= 0	45 ft-lb
$M_u$ : Design	= 766	45 ft-lb
Actual 1-Way Shear	= 2.31	1.68 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd,  $M_u < S * Fr$

Heel: Not req'd,  $M_u < S * Fr$

Key: No key defined

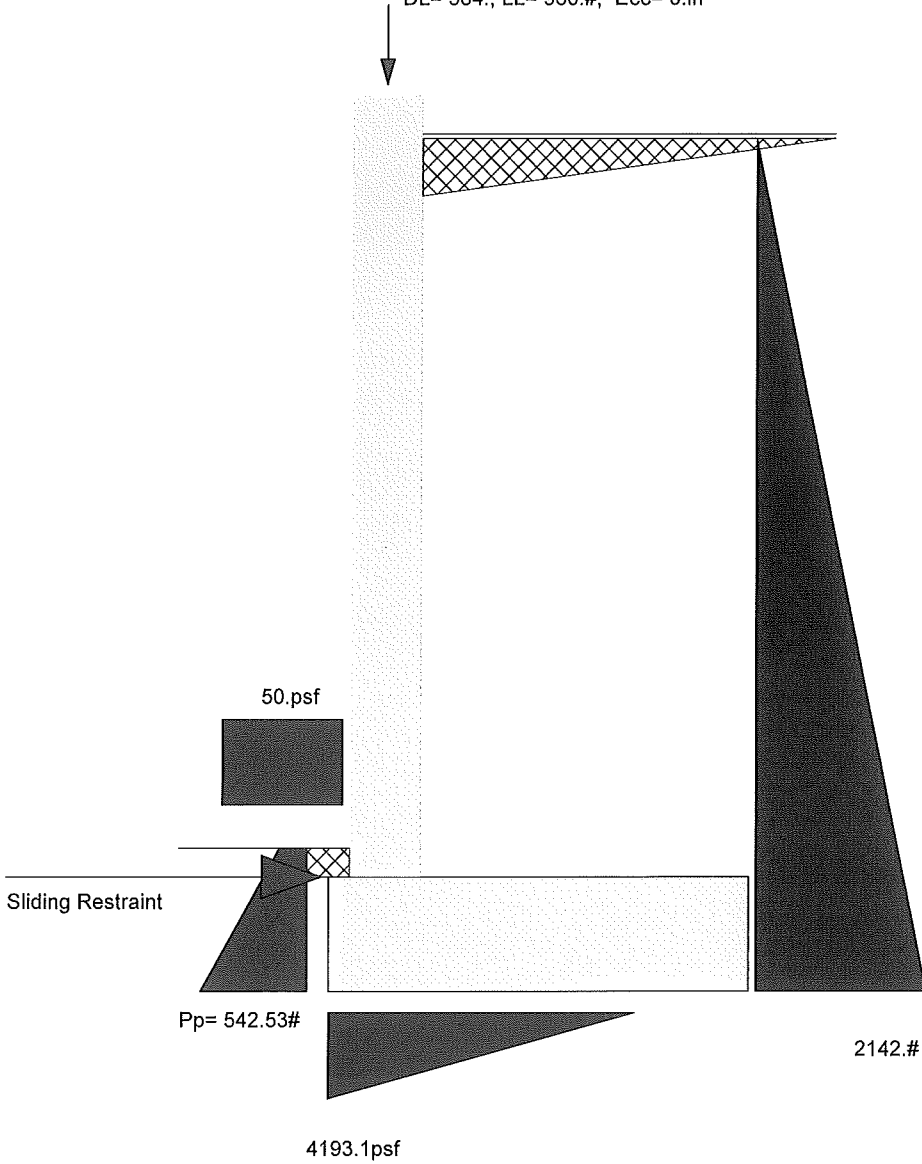
### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-lb	Force lbs	Distance ft	Moment ft-lb	
Heel Active Pressure	= 640.0	1.78	1,137.8	Soil Over Heel	= 160.2	2.50	400.4
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Toe Active Pressure	= -62.5	0.56	-34.7	Surcharge Over Heel	=		
Surcharge Over Toe	= -31.3	0.83	-26.0	Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	= 1,431.0	1.92	2,742.8
Added Lateral Load	=			* Axial Live Load on Stem	= 1,535.0	1.92	2,942.1
Load @ Stem Above Soil	=			Soil Over Toe	= 60.0	0.75	45.0
				Surcharge Over Toe	= 75.0	0.75	56.3
				Stem Weight(s)	= 1,013.8	1.92	1,943.0
				Earth @ Stem Transitions	=		
				Footing Weight	= 533.4	1.33	711.3
				Key Weight	=		
				Vert. Component	=		
<b>Total</b>	= 546.3	<b>O.T.M.</b>	= 1,077.0	<b>Total</b>	= 3,273.3	<b>lbs R.M.</b>	= 5,898.7
<b>Resisting/Overturning Ratio</b>		=	<b>5.48</b>				
Vertical Loads used for Soil Pressure	=	4,808.3	lbs				

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



DL= 584., LL= 960.#, Ecc= 0.in



FOOTING/CONC. WEIGHTS ASSUMED SOIL ONLY

$$R = 2.83(422)20 \frac{\text{lb}}{\text{ft}^2} + 7.7(100 \frac{\text{lb}}{\text{ft}^2} + 125 \frac{\text{lb}}{\text{ft}^2}) + 5.0(1.33)150 \frac{\text{lb}}{\text{ft}^2} = 6,321 \text{ lb}$$

$$P_2 = \frac{6,321 \text{ lb}}{2} = 3,160 \frac{\text{lb}}{\text{ft}}$$

$\frac{1}{4} \phi$  PILES

$$S_1 = 20.0 / 7.44 = 2.69 \text{ or } 2'-8" \text{ oc}$$

$$S_2 = 20.0 / 3.16 = 6.33 \text{ or } 6'-4" \text{ oc}$$

W/ SEISMIC SURCHARGE

$$R = 7,688 \text{ lb} \quad e = -15.33"$$

$$P_1 = \left( \frac{22^2 + 2053^2}{22^2 + 22^2} \right) 7,688 = 7,444 \text{ lb/ft}$$

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File = c:\ASE\Projects\MOUNGE~1\CALCUL~1\MOUNGE~1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

## Cantilevered Retaining Wall

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 11

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 8.64 ft  
 Wall height above soil = 0.50 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 45.0 psf/ft  
 Toe Active Pressure = 45.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 0.00 in

### Surcharge Loads

Surcharge Over Heel = 0.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 50.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 plf  
 ...Height to Top = 8.63 ft  
 ...Height to Bottom = 0.00 ft

### Adjacent Footing Load

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

### Axial Load Applied to Stem

Axial Dead Load = 584.0 lbs  
 Axial Live Load = 960.0 lbs  
 Axial Load Eccentricity = 0.0 in

### Wind on Exposed Stem

Wind on Exposed Stem = 0.0 psf

### Design Summary

#### Wall Stability Ratios

Overturning = 2.18 OK  
 Sliding = 1.35 Ratio < 1.5!  
*Slab Resists All Sliding!*  
 Total Bearing Load = 7,688 lbs  
 ...resultant ecc. = 15.33 in  
 Soil Pressure @ Toe = 4,193 psf NG  
 Soil Pressure @ Heel = 0 psf OK  
 Allowable = 2,000 psf  
*Soil Pressure Exceeds Allowable!*  
 ACI Factored @ Toe = 5,241 psf  
 ACI Factored @ Heel = 0 psf  
 Footing Shear @ Toe = 0.0 psi OK  
 Footing Shear @ Heel = 35.1 psi OK  
 Allowable = 75.0 psi

#### Sliding Calcs Slab Resists All Sliding!

Lateral Sliding Force = 2,142.0 lbs  
 less 100% Passive Force = - 542.5 lbs  
 less 100% Friction Force = - 2,359.9 lbs  
 Added Force Req'd = 0.0 lbs OK  
 ...for 1.5 : 1 Stability = 315.6 lbs NG

#### Load Factors

Dead Load 1.200  
 Live Load 1.600  
 Earth, H 1.600  
 Wind, W 1.600  
 Seismic, E 1.000

### Stem Construction

#### Design Height Above Ftg

	Top Stem	2nd
Stem OK	Stem OK	Stem OK
ft =	1.50	0.00
Wall Material Above "Ht"	Concrete	Concrete
Thickness	in = 10.00	10.00
Rebar Size	= # 5	# 5
Rebar Spacing	in = 12.00	11.00
Rebar Placed at	= Center	Edge
<b>Design Data</b>		
fb/FB + fa/Fa	= 0.674	0.652
Total Force @ Section	lbs = 1,832.7	2,670.3
Moment....Actual	ft-l = 4,358.8	7,724.1
Moment....Allowable	ft-l = 6,464.7	11,852.6
Shear.....Actual	psi = 30.5	27.2
Shear.....Allowable	psi = 75.0	75.0
Wall Weight	psf = 125.0	125.0
Rebar Depth 'd'	in = 5.00	8.19
Lap splice if above	in = 23.40	23.40
Lap splice if below	in = 23.40	10.50
Hook embed into footing	in = 23.40	10.50

#### Concrete Data

fc	psi = 2,500.0	2,500.0
Fy	psi = 20,000.0	20,000.0

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## Cantilevered Retaining Wall

File = c:\ASE\Projects\MOUNGE~1\CALCUL~1\MOUNGE~1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 8' retaining wall - grid 11

### Footing Dimensions & Strengths

Toe Width = 0.33 ft  
 Heel Width = 4.67  
 Total Footing Width = 5.00  
 Footing Thickness = 16.00 in  
 Key Width = 0.00 in  
 Key Depth = 0.00 in  
 Key Distance from Toe = 0.00 ft  
 $f_c = 2,500$  psi  $F_y = 60,000$  psi  
 Footing Concrete Density = 150.00 pcf  
 Min. As % = 0.0018  
 Cover @ Top 2.00 @ Btm. = 3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 5,241	0 psf
Mu' : Upward	= 282	0 ft-lb
Mu' : Downward	= 20	0 ft-lb
Mu: Design	= 261	7,724 ft-lb
Actual 1-Way Shear	= 0.00	35.11 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= # 5 @ 11.00 in	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd,  $M_u < S * F_r$   
 Heel: #4@ 8.25 in, #5@ 13.00 in, #6@ 18.25 in, #7@ 24.75 in, #8@ 32.75 in, #9@ 41  
 Key: No key defined

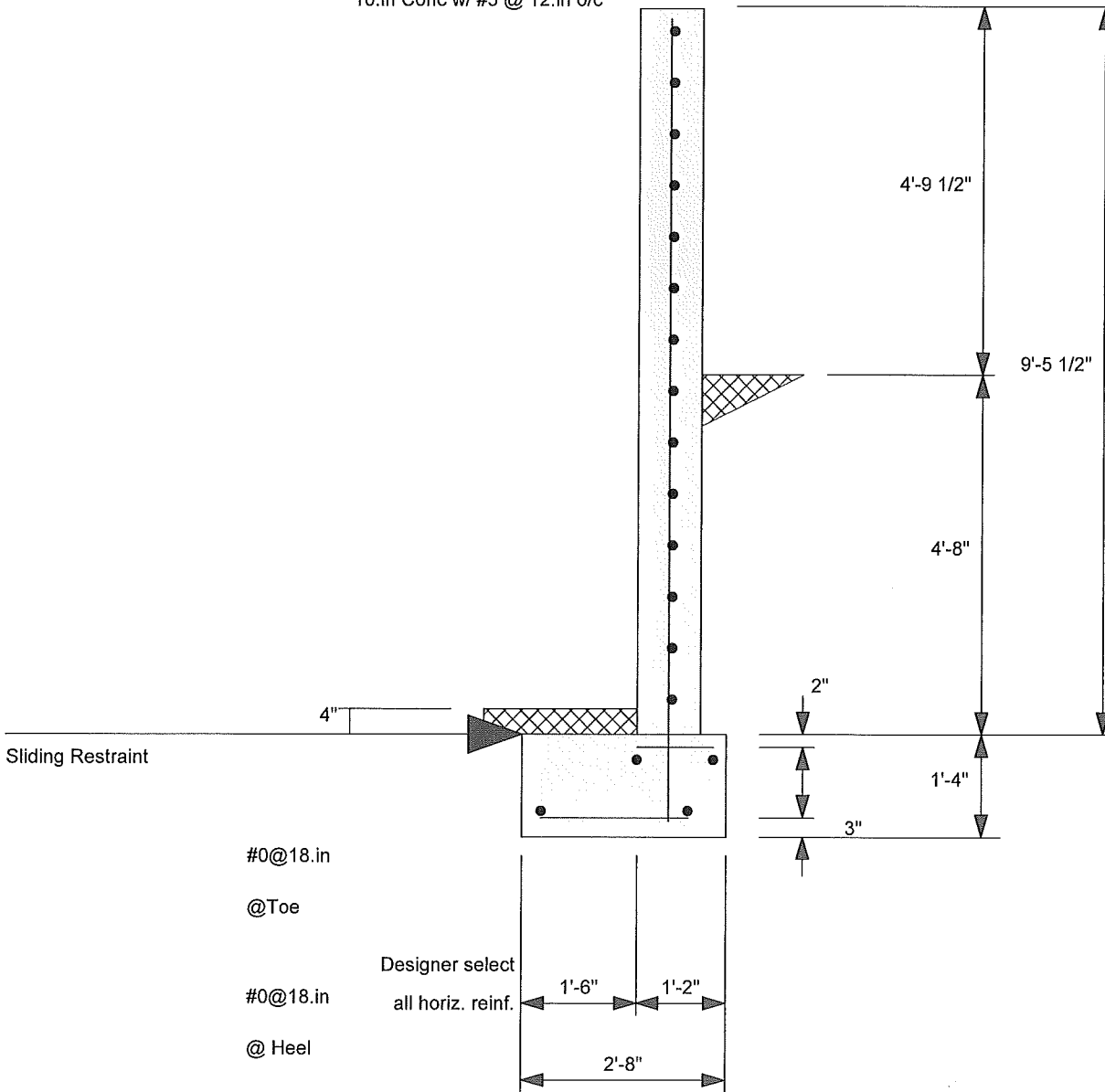
### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-lb	Force lbs	Distance ft	Moment ft-lb	
Heel Active Pressure	= 2,235.8	3.32	7,429.0	Soil Over Heel	= 3,972.4	3.08	12,247.7
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Toe Active Pressure	= -62.5	0.56	-34.7	Surcharge Over Heel	=		
Surcharge Over Toe	= -31.3	0.83	-26.0	Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	= 584.0	0.75	437.8
Added Lateral Load	=			* Axial Live Load on Stem	= 960.0	0.75	719.7
Load @ Stem Above Soil	=			Soil Over Toe	= 13.3	0.17	2.2
				Surcharge Over Toe	= 16.7	0.17	2.8
				Stem Weight(s)	= 1,141.9	0.75	856.0
				Earth @ Stem Transitions	=		
				Footing Weight	= 1,000.0	2.50	2,500.0
				Key Weight	=		
				Vert. Component	=		
<b>Total</b>	= 2,142.0	<b>O.T.M.</b>	= 7,368.2	<b>Total</b>	= 6,728.3 lbs	<b>R.M.</b>	= 16,046.5
<b>Resisting/Overturning Ratio</b>		=	<b>2.18</b>				
Vertical Loads used for Soil Pressure =		7,688.3 lbs					

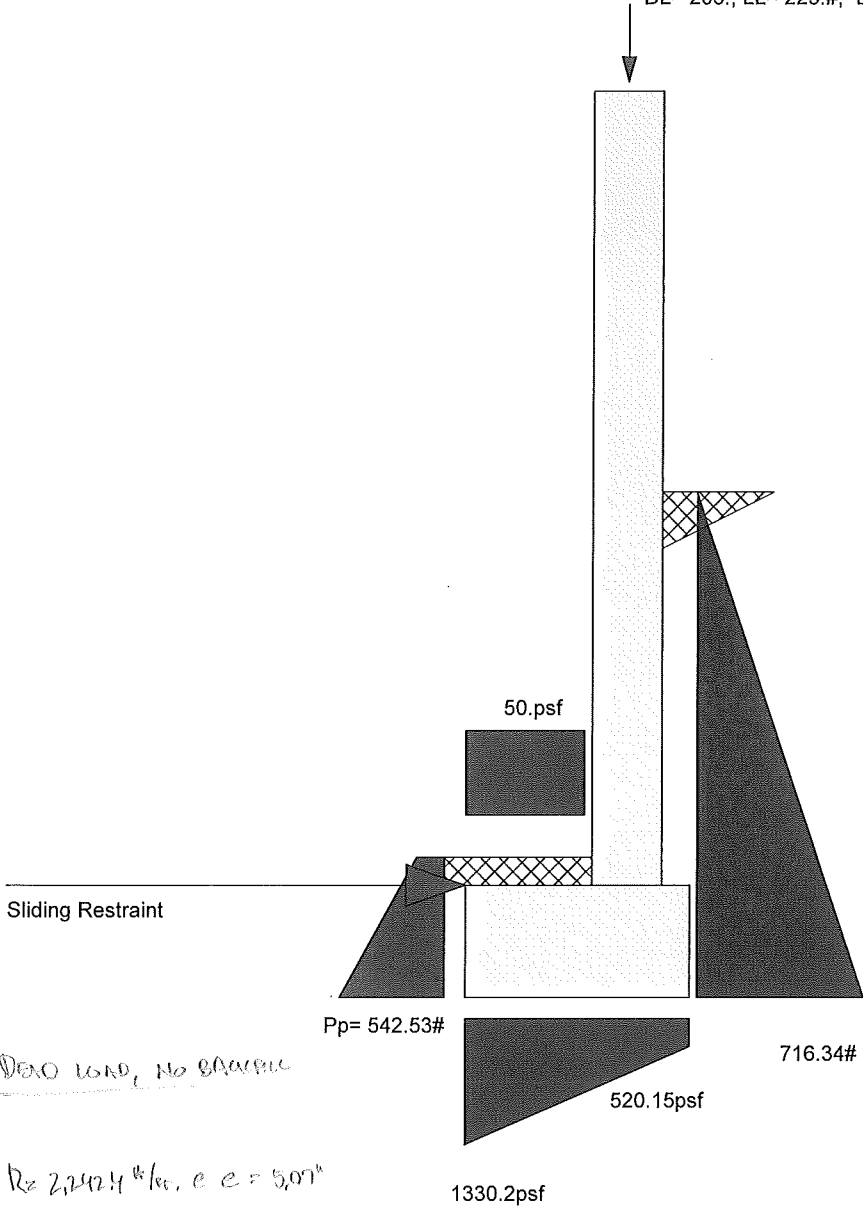
\* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

GRID (L) (C) (D)  
DECK

10.in Conc w/ #5 @ 12.in o/c



DL= 206., LL= 225.#, Ecc= 0.in



DEAD LOAD, NO SEISMIC

$$R_2 = 2,242.4 \text{ k/ft}, e = 5.07''$$

$$R_2 = \left( \frac{13.07''}{16''} \right) 2,242.4 = 1,823 \text{ k/ft}$$

4" PILES

$$S_2 = 20.0 / 1.83 = 10.92' \text{ or } 9'-11'' \text{ oc}$$

$$S_L = 20.0 / 1.83 = 10.92' \text{ or } 10'-11'' \text{ oc}$$

w/ SEISMIC SURCHARGE

$$R_2 = 2,467.4 \text{ k/ft}, e = 5.45''$$

$$R_1 = \left( \frac{13.45''}{16''} \right) 2,467.4 = 2,074 \text{ k/ft}$$



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Project Title:  
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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

## Cantilevered Retaining Wall

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 4'-8" retaining wall - grid L

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 4.67 ft  
 Wall height above soil = 4.78 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 45.0 psf/ft  
 Toe Active Pressure = 45.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 0.00 in

### Surcharge Loads

Surcharge Over Heel = 0.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 50.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 plf  
 ...Height to Top = 4.67 ft  
 ...Height to Bottom = 0.00 ft

### Axial Load Applied to Stem

Axial Dead Load = 206.0 lbs  
 Axial Live Load = 225.0 lbs  
 Axial Load Eccentricity = 0.0 in

### Adjacent Footing Load

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

Wind on Exposed Stem = 0.0 psf

### Design Summary

**Wall Stability Ratios**  
 Overturning = 2.53 OK  
 Sliding = 1.85 OK  
*Slab Resists All Sliding !*  
 Total Bearing Load = 2,467 lbs  
 ...resultant ecc. = 2.34 in  
 Soil Pressure @ Toe = 1,330 psf OK  
 Soil Pressure @ Heel = 520 psf OK  
 Allowable = 2,000 psf  
 Soil Pressure Less Than Allowable  
 ACI Factored @ Toe = 1,645 psf  
 ACI Factored @ Heel = 643 psf  
 Footing Shear @ Toe = 3.6 psi OK  
 Footing Shear @ Heel = 1.9 psi OK  
 Allowable = 75.0 psi  
**Sliding Calcs** Slab Resists All Sliding !  
 Lateral Sliding Force = 716.3 lbs  
 less 100% Passive Force = - 542.5 lbs  
 less 100% Friction Force = - 788.8 lbs  
 Added Force Req'd = 0.0 lbs OK  
 ...for 1.5 : 1 Stability = 0.0 lbs OK

### Stem Construction

**Design Height Above Ftg** ft = 0.00  
 Wall Material Above "Ht" = Concrete  
 Thickness in = 10.00  
 Rebar Size = # 5  
 Rebar Spacing in = 12.00  
 Rebar Placed at = Center  
**Design Data**  
 fb/FB + fa/Fa = 0.188  
 Total Force @ Section lbs = 770.1  
 Moment....Actual ft-l = 1,217.7  
 Moment....Allowable ft-l = 6,464.7  
 Shear.....Actual psi = 12.8  
 Shear.....Allowable psi = 75.0  
 Wall Weight psf = 125.0  
 Rebar Depth 'd' in = 5.00  
 Lap splice if above in = 23.40  
 Lap splice if below in = 10.50  
 Hook embed into footing in = 10.50

**Concrete Data**  
 f'c psi = 2,500.0  
 Fy psi =

### Load Factors

Dead Load 1.200  
 Live Load 1.600  
 Earth, H 1.600  
 Wind, W 1.600  
 Seismic, E 1.000

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## Cantilevered Retaining Wall

File = c:\ASE\Projects\MOUNGE~1\CALCUL~1\MOUNGE~1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 4'-8" retaining wall - grid L

### Footing Dimensions & Strengths

Toe Width	=	1.50	ft
Heel Width	=	1.17	
Total Footing Width	=	2.67	
Footing Thickness	=	16.00	in
Key Width	=	0.00	in
Key Depth	=	0.00	in
Key Distance from Toe	=	0.00	ft
$f_c$	=	2,500	psi
$F_y$	=	60,000	psi
Footing Concrete Density	=	150.00	pcf
Min. As %	=	0.0018	
Cover @ Top	=	2.00	
@ Btm.	=	3.00	in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 1,645	643 psf
$\mu'$ : Upward	= 0	0 ft-lb
$\mu'$ : Downward	= 0	51 ft-lb
$\mu$ : Design	= 1,218	51 ft-lb
Actual 1-Way Shear	= 3.59	1.88 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

#### Other Acceptable Sizes & Spacings

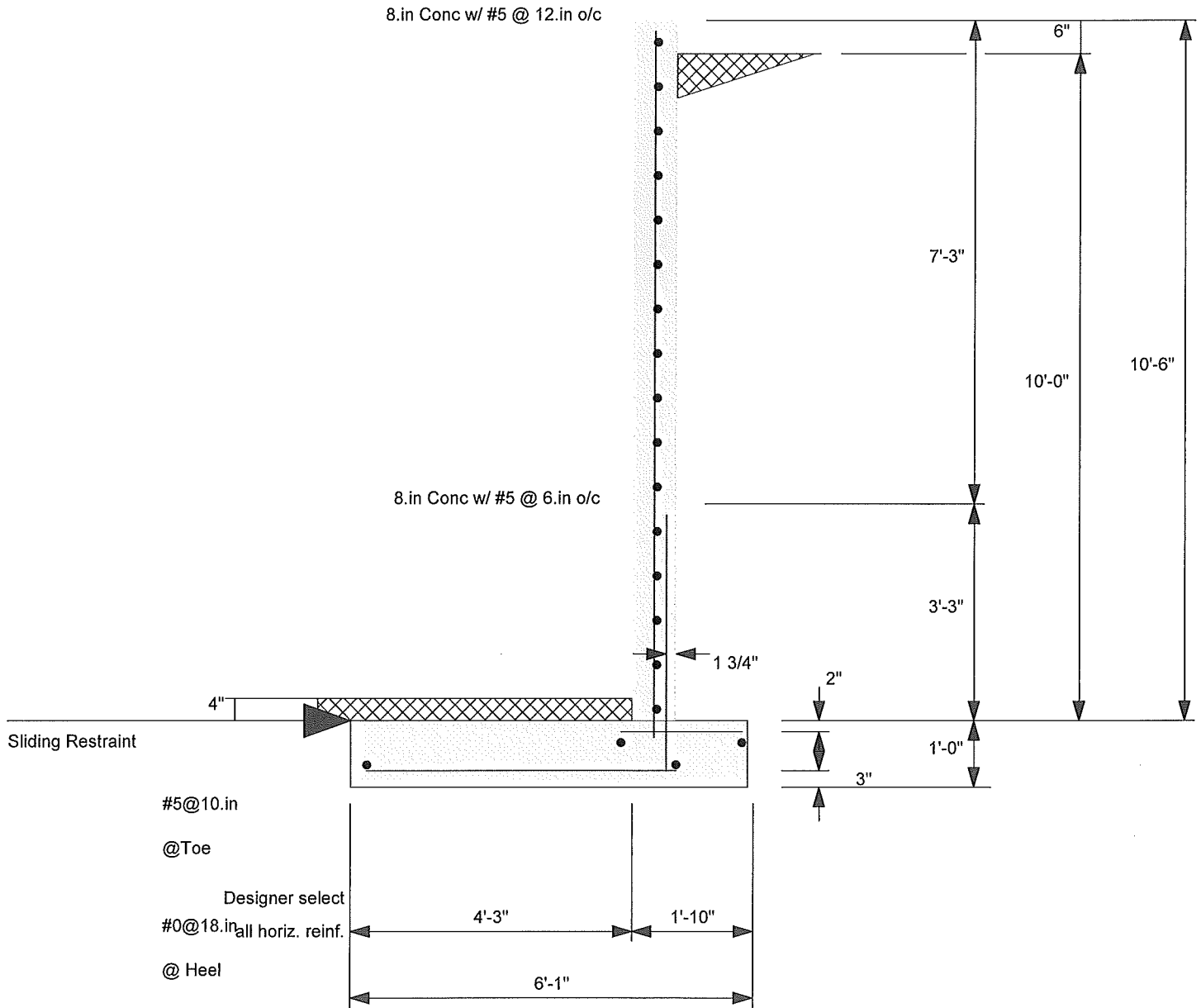
Toe: Not req'd,  $\mu < S * Fr$   
 Heel: Not req'd,  $\mu < S * Fr$   
 Key: No key defined

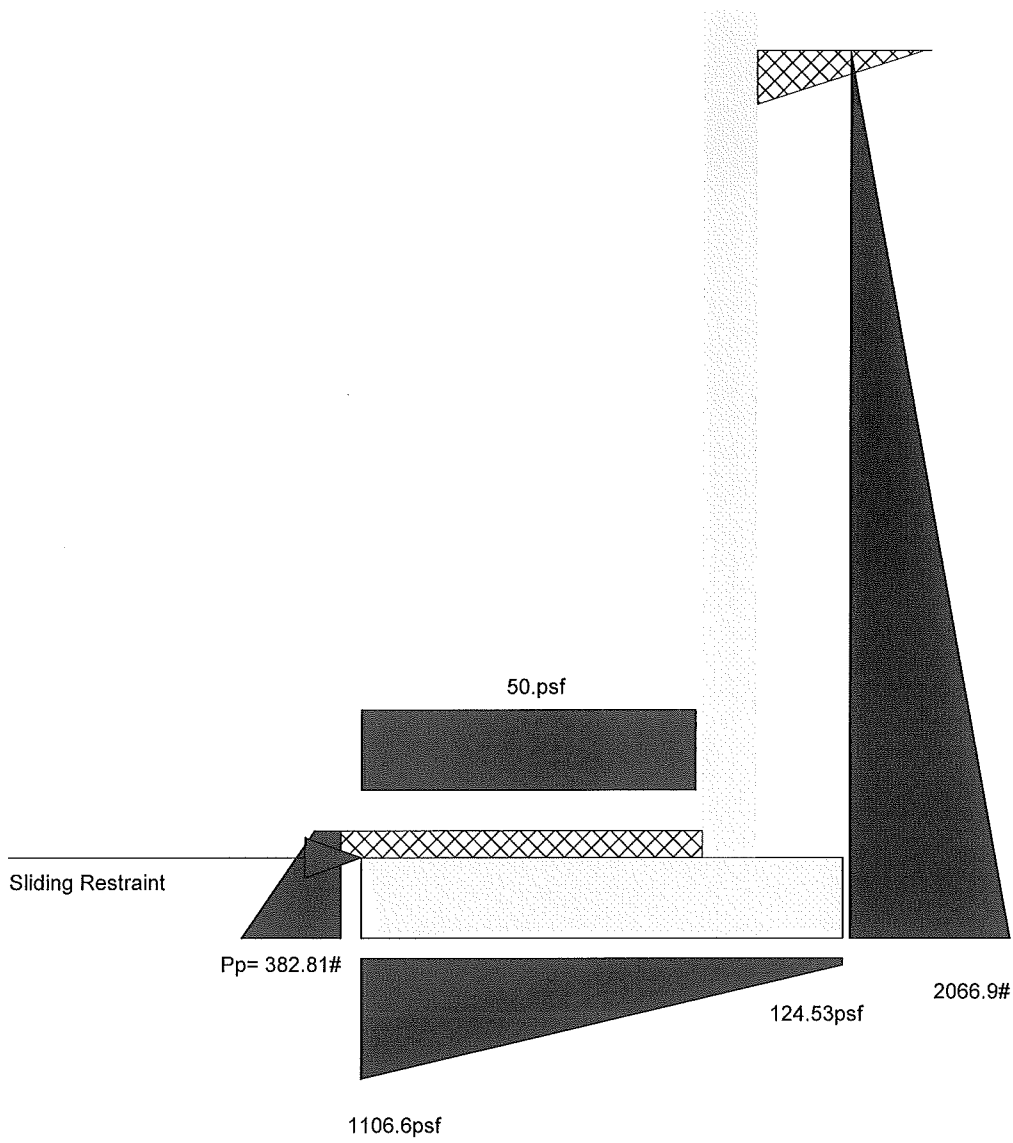
### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-lb	Force lbs	Distance ft	Moment ft-lb	
Heel Active Pressure	= 810.1	2.00	1,620.3	Soil Over Heel	= 186.9	2.50	467.2
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Toe Active Pressure	= -62.5	0.56	-34.7	Surcharge Over Heel	=		
Surcharge Over Toe	= -31.3	0.83	-26.0	Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	= 206.0	1.92	394.8
Added Lateral Load	=			* Axial Live Load on Stem	= 225.0	1.92	431.3
Load @ Stem Above Soil	=			Soil Over Toe	= 60.0	0.75	45.0
				Surcharge Over Toe	= 75.0	0.75	56.3
				Stem Weight(s)	= 1,181.1	1.92	2,263.8
				Earth @ Stem Transitions	=		
				Footing Weight	= 533.4	1.33	711.3
				Key Weight	=		
				Vert. Component	=		
<b>Total</b>	<b>= 716.3</b>	<b>O.T.M. =</b>	<b>1,559.5</b>	<b>Total =</b>	<b>2,242.4 lbs</b>	<b>R.M. =</b>	<b>3,938.4</b>
<b>Resisting/Overturning Ratio</b>		<b>=</b>	<b>2.53</b>				
Vertical Loads used for Soil Pressure =			2,467.4 lbs				

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

SITE WALL - WEST OF GARAGE





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## Cantilevered Retaining Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 10' landscape wall - west of garage

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 10.00 ft  
 Wall height above soil = 0.50 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 35.0 psf/ft  
 Toe Active Pressure = 35.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 0.00 in

### Surcharge Loads

Surcharge Over Heel = 0.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 50.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 pif  
 ...Height to Top = 10.00 ft  
 ...Height to Bottom = 0.00 ft

### Adjacent Footing Load

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

### Axial Load Applied to Stem

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

Wind on Exposed Stem = 0.0 psf

### Design Summary

#### Wall Stability Ratios

Overturning = 2.08 OK  
 Sliding = 0.82 UNSTABLE!  
*Slab Resists All Sliding!*  
 Total Bearing Load = 3,745 lbs  
 ...resultant ecc. = 9.70 in  
 Soil Pressure @ Toe = 1,107 psf OK  
 Soil Pressure @ Heel = 125 psf OK  
 Allowable = 2,000 psf  
 Soil Pressure Less Than Allowable  
 ACI Factored @ Toe = 1,328 psf  
 ACI Factored @ Heel = 149 psf  
 Footing Shear @ Toe = 22.9 psi OK  
 Footing Shear @ Heel = 16.6 psi OK  
 Allowable = 75.0 psi

#### Sliding Calcs Slab Resists All Sliding!

Lateral Sliding Force = 2,066.9 lbs  
 less 100% Passive Force = - 382.8 lbs  
 less 100% Friction Force = - 1,310.0 lbs  
 Added Force Req'd = 373.5 lbs NG  
 ...for 1.5 : 1 Stability = 1,407.0 lbs NG

### Stem Construction

#### Design Height Above Ftg

ft = 3.25 Stem OK  
 Wall Material Above "Ht" = Concrete Concrete  
 Thickness = 8.00 8.00  
 Rebar Size = # 5 # 5  
 Rebar Spacing = 12.00 6.00  
 Rebar Placed at = Center Edge

#### Design Data

	Top Stem	2nd
fb/FB + fa/Fa	0.566	0.613
Total Force @ Section	lbs = 1,275.8	2,789.1
Moment....Actual	ft-l = 2,870.4	9,331.7
Moment.....Allowable	ft-l = 5,069.7	15,222.0
Shear.....Actual	psi = 26.6	37.6
Shear.....Allowable	psi = 75.0	75.0
Wall Weight	psf = 100.0	100.0
Rebar Depth 'd'	in = 4.00	6.19
Lap splice if above	in = 23.40	23.40
Lap splice if below	in = 23.40	6.09
Hook embed into footing	in = 23.40	6.09

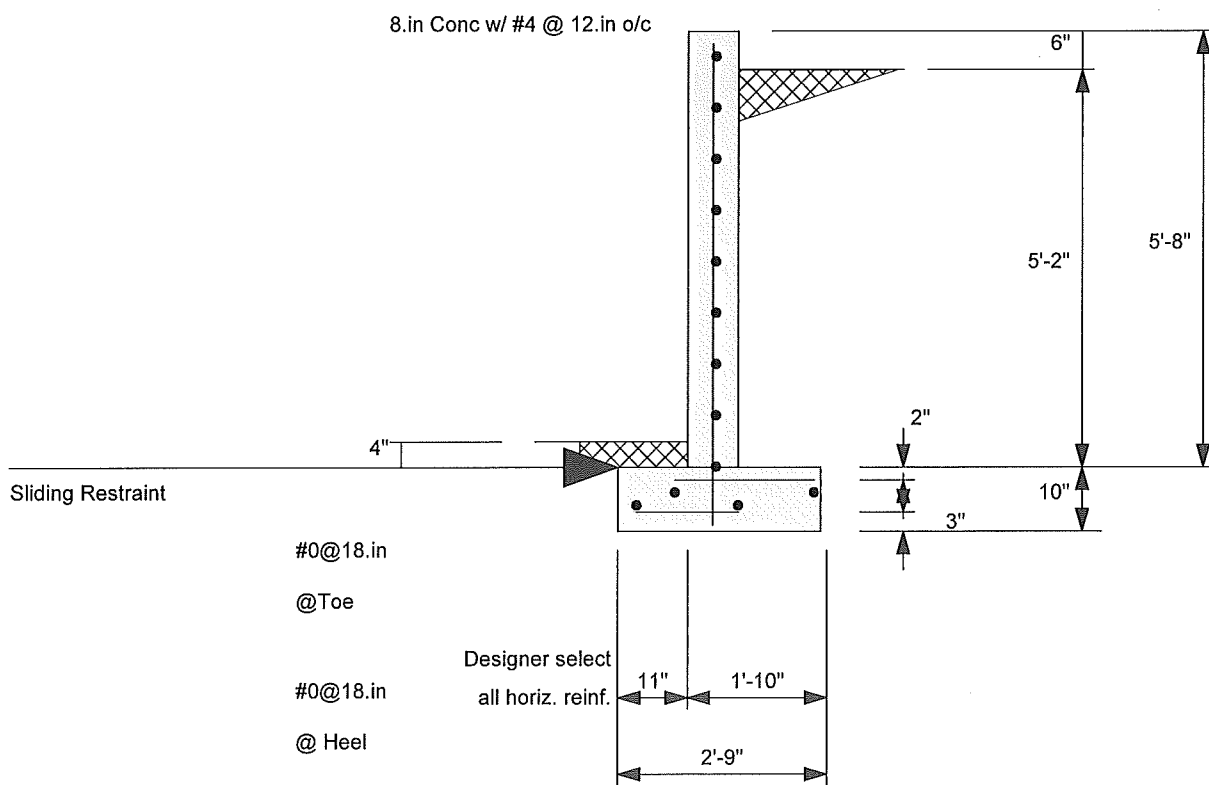
#### Concrete Data

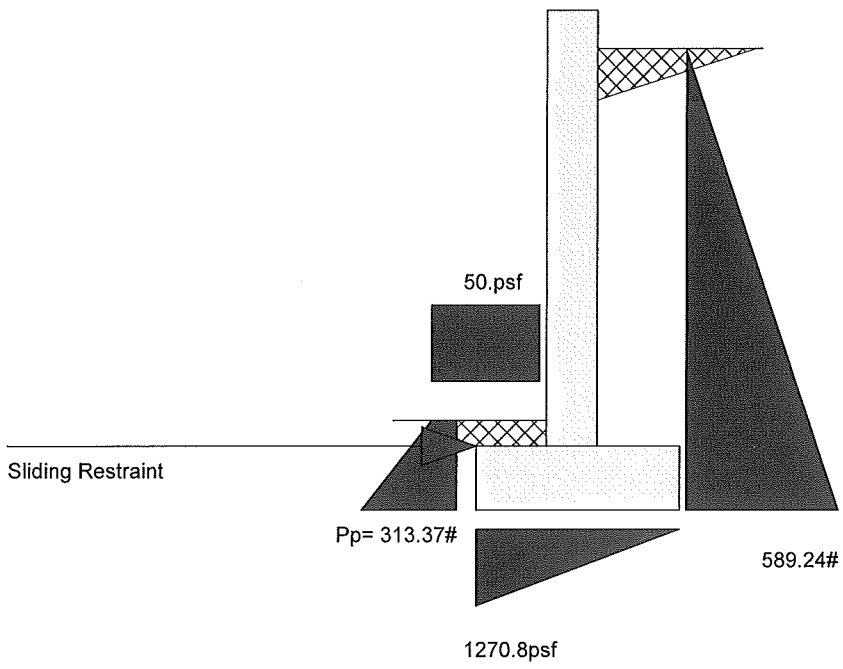
f'c	psi = 2,500.0	2,500.0
Fy	psi = 20,000.0	20,000.0

### Load Factors

Dead Load 1.200  
 Live Load 1.600  
 Earth, H 1.600  
 Wind, W 1.600  
 Seismic, E 1.000









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## Cantilevered Retaining Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31  
 Licensee : Annee Structural Engineering LLC

Lic. #: KW-06009341

Description : 5' landscape wall - west of garage

Calculations per ACI 318-11, ACI 530-11, IBC 2012,  
 CBC 2013, ASCE 7-10

### Criteria

Retained Height = 5.17 ft  
 Wall height above soil = 0.50 ft  
 Slope Behind Wall = 0.00 : 1  
 Height of Soil over Toe = 4.00 in  
 Water height over heel = 0.0 ft  
 Vertical component of active  
 Lateral soil pressure options:  
 NOT USED for Soil Pressure.  
 NOT USED for Sliding Resistance.  
 NOT USED for Overturning Resistance.

### Soil Data

Allow Soil Bearing = 2,000.0 psf  
 Equivalent Fluid Pressure Method  
 Heel Active Pressure = 35.0 psf/ft  
 Toe Active Pressure = 35.0 psf/ft  
 Passive Pressure = 250.0 psf/ft  
 Soil Density, Heel = 120.00 pcf  
 Soil Density, Toe = 120.00 pcf  
 Friction Coeff btwn Ftg & Soil = 0.350  
 Soil height to ignore  
 for passive pressure = 0.00 in

### Surcharge Loads

Surcharge Over Heel = 0.0 psf  
 Used To Resist Sliding & Overturning  
 Surcharge Over Toe = 50.0 psf  
 Used for Sliding & Overturning

### Lateral Load Applied to Stem

Lateral Load = 0.0 plf  
 ...Height to Top = 5.17 ft  
 ...Height to Bottom = 0.00 ft

### Adjacent Footing Load

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

### Axial Load Applied to Stem

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

### Wind on Exposed Stem

Wind on Exposed Stem = 0.0 psf

### Design Summary

**Wall Stability Ratios**  
 Overturning = 2.24 OK  
 Sliding = 1.55 OK  
*Slab Resists All Sliding !*  
 Total Bearing Load = 1,716 lbs  
 ...resultant ecc. = 5.70 in  
 Soil Pressure @ Toe = 1,271 psf OK  
 Soil Pressure @ Heel = 0 psf OK  
 Allowable = 2,000 psf  
 Soil Pressure Less Than Allowable  
 ACI Factored @ Toe = 1,525 psf  
 ACI Factored @ Heel = 0 psf  
 Footing Shear @ Toe = 5.4 psi OK  
 Footing Shear @ Heel = 11.6 psi OK  
 Allowable = 75.0 psi  
**Sliding Calcs** Slab Resists All Sliding !  
 Lateral Sliding Force = 589.2 lbs  
 less 100% Passive Force = - 313.4 lbs  
 less 100% Friction Force = - 600.0 lbs  
 Added Force Req'd = 0.0 lbs OK  
 ...for 1.5 : 1 Stability = 0.0 lbs OK

### Stem Construction

**Design Height Above Ftg** ft = 0.00  
 Wall Material Above "Ht" = Concrete  
 Thickness in = 8.00  
 Rebar Size = # 4  
 Rebar Spacing in = 12.00  
 Rebar Placed at = Center  
**Design Data**  
 fb/FB + fa/Fa = 0.380  
 Total Force @ Section lbs = 736.7  
 Moment....Actual ft-l = 1,285.9  
 Moment....Allowable ft-l = 3,387.6  
 Shear.....Actual psi = 15.3  
 Shear.....Allowable psi = 75.0  
 Wall Weight psf = 100.0  
 Rebar Depth 'd' in = 4.00  
 Lap splice if above in = 18.72  
 Lap splice if below in = 6.00  
 Hook embed into footing in = 6.00

**Concrete Data**  
 f'c psi = 2,500.0  
 Fy psi =

### Load Factors

Dead Load 1.200  
 Live Load 1.600  
 Earth, H 1.600  
 Wind, W 1.600  
 Seismic, E 1.000

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## Cantilevered Retaining Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: 5' landscape wall - west of garage

### Footing Dimensions & Strengths

Toe Width	=	0.92 ft
Heel Width	=	1.83
Total Footing Width	=	2.75
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm. = 3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 1,525	0 psf
Mu' : Upward	= 569	0 ft-lb
Mu' : Downward	= 117	608 ft-lb
Mu: Design	= 452	608 ft-lb
Actual 1-Way Shear	= 5.41	11.59 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

#### Other Acceptable Sizes & Spacings

Toe: Not req'd, Mu < S \* Fr  
 Heel: Not req'd, Mu < S \* Fr  
 Key: No key defined

### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-lb	Force lbs	Distance ft	Moment ft-lb	
Heel Active Pressure	= 630.1	2.00	1,260.2	Soil Over Heel	= 723.2	2.17	1,567.0
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Toe Active Pressure	= -23.8	0.39	-9.3	Surcharge Over Heel	=		
Surcharge Over Toe	= -17.0	0.58	-9.9	Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	=		
Added Lateral Load	=			* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=			Soil Over Toe	= 36.7	0.46	16.8
				Surcharge Over Toe	= 45.9	0.46	21.0
				Stem Weight(s)	= 566.7	1.25	708.6
				Earth @ Stem Transitions	=		
				Footing Weight	= 343.8	1.38	472.7
				Key Weight	=		
				Vert. Component	=		
<b>Total</b>	= 589.2	<b>O.T.M.</b>	= 1,241.0	<b>Total</b>	= 1,716.2 lbs	<b>R.M.</b>	= 2,786.1
<b>Resisting/Overturning Ratio</b>		=	<b>2.24</b>				
Vertical Loads used for Soil Pressure =			1,716.2 lbs				

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

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

## Concrete Shear Wall

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: Concrete Chimney - transverse

### Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10

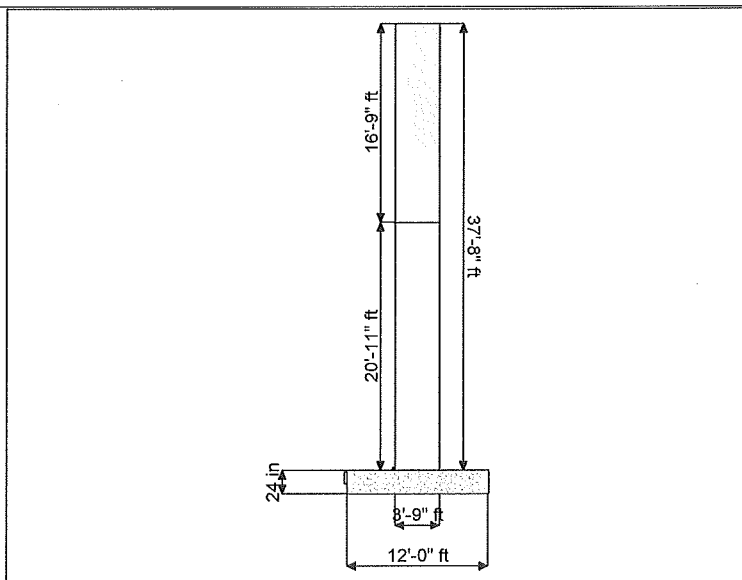
Load Combinations Used: ASCE 7-10

### General Information

Wall Material	Concrete	Material Properties			
Sds	0.9280	f'c	2.50 ksi	Ec	3,120.0 ksi
		fy	60.0 ksi	Ev	1,248.0 ksi
		Density	150.0 pcf	Phi - Shear	0.650

### Wall Data

	Bottom	2nd Level
Analysis Height	0.00 ft	20.916 ft
Wall Offset (datum) ft		ft
Wall Length	3.750 ft	3.750 ft
Wall Thickness	8.0 in	6.0 in
Structural Depth	3.250 ft	3.250 ft



### Applied Concentrated Vertical Loads

Load Location (ft)		Load Magnitude (kips)			
X Location	Y Location	Dead Load	Roof Live Load	Live Load	Snow Load
0.6670	20.916	1.170			
0.6670		5.556			
1.875	20.916	8.584			
1.875		13.595			

### DESIGN SUMMARY

	Bottom Level	2nd Level
Vu : Story Shear	11.651 +1.386D+0.50L+0	4.372 +1.386D+0.50L+0
Mu : Story Moment	215.432 +1.386D+0.50L+0	38.572 +1.386D+0.50L+0
Nu : Axial	58.043 +1.40D+1.60H	20.251 +1.40D+1.60H
Uplift @ Left End	56.366 +0.7144D+E+0.9C	9.653 +0.7144D+E+0.9C
Uplift @ Right End	56.366 +0.7144D+E+0.9C	9.653 +0.7144D+E+0.9C
vu : Applied	37.341 psi	18.683 psi
vc * .85	43.675 psi	61.055 psi
vn: max = .6*10*sqrt(f'c)	300.0 psi	300.0 psi
Horizontal As Req'd	0.240 in^2	0.1440 in^2
Vertical As Req'd	0.240 in^2	0.08640 in^2
Bending As Req'd	1.739 in^2	0.5850 in^2

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## Concrete Shear Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31  
 Licensee : Anhee Structural Engineering LLC

Lic. # : KW-06009341

Description : Concrete Chimney - transverse

### Footing Information

#### Footing Dimensions

Dist. Left	4.125 ft	f <sub>c</sub>	2.50 ksi	Rebar Cover	3.0 in
Wall Length	3.750 ft	F <sub>y</sub>	60.0 ksi	Footing Thickness	24.0 in
Dist. Right	4.125 ft			Width	8.833 ft
Total Ftg Length	12.0 ft				

#### Max Factored Soil Pressures

@ Left Side of Footing	58.524 psf
.... governing load comb	+1.40D+1.60H
@ Right Side of Footing	1,877.45 psf
.... governing load comb	+1.40D+1.60H

#### Max UNfactored Soil Pressures

@ Left Side of Footing	0.0 psf
.... governing load comb	0.0
@ Right Side of Footing	2,261.30 psf
.... governing load comb	+0.60D+0.70E+0.60H

#### Footing One-Way Shear Check...

vu @ Left End of Footing	2.645 psi
vu @ Right End of Footing	18.821 psi
vn * phi : Allowable	85.0 psi

#### Overturning Stability...

	<u>@ Left End of Ftg</u>	<u>@ Right End of Ftg</u>
Overturning Moment	159.233 k-ft	159.233 k-ft
Resisting Moment	241.895 k-ft	251.645 k-ft
Stability Ratio	1.519 : 1	1.580 : 1
.... governing load comb	+0.60D+0.70E+0.60H	+0.60D+0.70E+0.60H

#### Footing Bending Design...

	<u>@ Left End</u>	<u>@ Right End</u>
Mu	20.061 k-ft	125.427 k-ft
Ru	5.722 psi	35.777 psi
As % Req'd	0.00180 in^2	0.00180 in^2
As Req'd in Footing Width	4.579 in^2	4.579 in^2

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## Concrete Shear Wall

File = c:\ASE\Projects\MOUNGE-1\CALCUL-1\MOUNGE-1.EC6  
 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: Concrete Chimney - longitudinal

### Code References

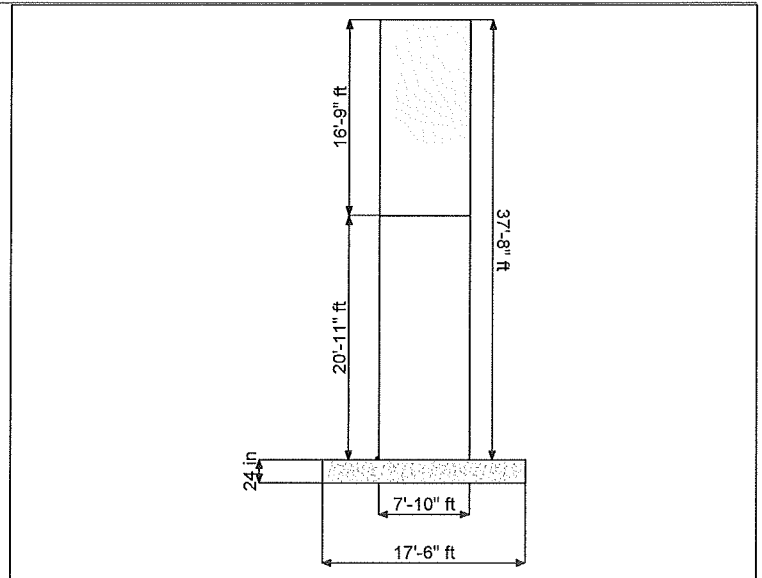
Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10  
 Load Combinations Used: ASCE 7-10

### General Information

Wall Material	Concrete	Material Properties			
Sds	0.9280	f'c	2.50 ksi	Ec	3,120.0 ksi
		fy	60.0 ksi	Ev	1,248.0 ksi
		Density	150.0 pcf	Phi - Shear	0.650

### Wall Data

	Bottom	2nd Level
Analysis Height	0.00 ft	20.916 ft
Wall Offset (datum)	ft	ft
Wall Length	7.833 ft	7.833 ft
Wall Thickness	8.0 in	6.0 in
Structural Depth	7.333 ft	7.333 ft



### Applied Concentrated Vertical Loads

Load Location (ft)		Load Magnitude (kips)			
X Location	Y Location	Dead Load	Roof Live Load	Live Load	Snow Load
3.917	20.916	1.170			
3.917		5.556			
3.917	20.916	9.840			
3.917	20.916	6.909			
3.917		16.384			
3.917		10.109			

### DESIGN SUMMARY

	Bottom Level	2nd Level
Vu : Story Shear	24.336 +1.386D+0.50L+0	9.132 +1.386D+0.50L+0
Mu : Story Moment	426.514 +1.386D+0.50L+0	76.491 +1.386D+0.50L+0
Nu : Axial	69.955 +1.40D+1.60H	25.087 +1.40D+1.60H
Uplift @ Left End	39.096 +0.7144D+E+0.9C	3.593 +0.7144D+E+0.9C
Uplift @ Right End	39.096 +0.7144D+E+0.9C	3.593 +0.7144D+E+0.9C
<b>vu : Applied</b>	34.569 psi	17.296 psi
vc * .85	65.178 psi	132.086 psi
vn: max = 6*10*sqrt(f'c)	300.0 psi	300.0 psi
Horizontal As Req'd	0.240 in^2	0.1440 in^2
Vertical As Req'd	0.240 in^2	0.08640 in^2
Bending As Req'd	1.760 in^2	1.320 in^2

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 Engineer:  
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Project ID:

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## Concrete Shear Wall

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 ENERCALC, INC. 1983-2015, Build:6.15.7.30, Ver:6.15.12.31

Lic. #: KW-06009341

Licensee: Annee Structural Engineering LLC

Description: Concrete Chimney - longitudinal

### Footing Information

#### Footing Dimensions

Dist. Left	4.833 ft	f'c	2.50 ksi	Rebar Cover	3.0 in
Wall Length	7.833 ft	Fy	60.0 ksi	Footing Thickness	24.0 in
Dist. Right	4.833 ft			Width	12.0 ft
Total Ftg Length	17.499 ft				

#### Max Factored Soil Pressures

@ Left Side of Footing	56.948 psf
.... governing load comb	+1.40D+1.60H
@ Right Side of Footing	1,449.81 psf
.... governing load comb	+1.40D+1.60H

#### Max UNfactored Soil Pressures

@ Left Side of Footing	0.0 psf
.... governing load comb	0.0
@ Right Side of Footing	1,531.77 psf
.... governing load comb	+0.60D+0.70E+0.60H

#### Footing One-Way Shear Check...

vu @ Left End of Footing	2.586 psi
vu @ Right End of Footing	19.101 psi
vn * phi : Allowable	85.0 psi

#### Overtuning Stability...

	@ Left End of Ftg	@ Right End of Ftg
Overtuning Moment	332.605 k-ft	332.605 k-ft
Resisting Moment	593.04 k-ft	593.01 k-ft
Stability Ratio	1.783 : 1	1.783 : 1
.... governing load comb	+0.60D+0.70E+0.60H	+0.60D+0.70E+0.60H

#### Footing Bending Design...

	@ Left End	@ Right End
Mu	25.952 k-ft	185.215 k-ft
Ru	5.449 psi	38.888 psi
As % Req'd	0.00180 in^2	0.00180 in^2
As Req'd in Footing Width	6.221 in^2	6.221 in^2