



Structural Calculations

Project: **Biggs Residence**
2411 60th Ave SE
Mercer Island, WA 98040

For: **Sturman Architects**
9 – 103rd Avenue NE, Suite 203
Bellevue, WA 98004

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

Date: **May 10, 2024**



Design Criteria



Project Name: **Biggs Residence**
 Location: **2411 60th Ave SE, Mercer Island, WA**

Date: **5/9/2024**
 Soil Bearing: **2000** psf
 Frost Depth: **12"**

Dead Loads:	<u>Roof:</u>		<u>Floors:</u>		<u>Walls:</u>	
	Comp. Roofing	5.1 PSF	Flooring	3.0 PSF	Siding	2.3 PSF
	1/2" Sheathing	1.7 PSF		0.0 PSF	Plywood	1.7 PSF
	Rafters	2.2 PSF	3/4" Sheathing	2.5 PSF	2x Studs	1.8 PSF
	Insulation	0.9 PSF	Joists	2.2 PSF	Insulation	0.5 PSF
	5/8" Gypsum	2.8 PSF	5/8" Gypsum	2.8 PSF	1/2" Gypsum	2.2 PSF
	Miscellaneous	2.3 PSF	Miscellaneous	1.5 PSF	Miscellaneous	1.5 PSF
	Total	15.0 PSF	Total	12.0 PSF	Total	10.0 PSF
Live Loads:	Snow	25.0 PSF	Floor	40.0 PSF	Wind	16.6 PSF

Seismic Loads: *per 2018 IBC, Sect. 1613 & ASCE 7-16, Chapter 11*

Design Category = **D** Importance = **1.0** Redundancy = **1.00**
 Site Class = **D** R = **6.5**
 Latitude ($^{\circ}$ N) = **47.589** (*per USGS*) $S_s = 1.398$ $F_a = 1.200$ $S_{DS} = 2/3(F_a \times S_s) = 1.118$
 Longitude ($^{\circ}$ W) = **122.254** (*per USGS*) $S_1 = 0.487$ $F_v = 1.813$ $S_{D1} = 2/3(F_v \times S_1) = 0.589$

Building $C_t = 0.02$ (wood)
 Height $h_n = 19.0$ ft.
 Period $T = C_t(h_n)^{3/4} = 0.18$ sec. $T_0 = 0.2 * (S_{D1}/S_{DS}) = 0.11$ $T_s = (S_{D1}/S_{DS}) = 0.53$

$S_a = 1.118$ $S_a = S_{DS}$ if $T_0 < T < T_{sr}$, $S_a = 0.6 * (S_{DS}/T_0) * T + 0.4 * S_{DS}$ if $T < T_0$, $S_a = S_{D1}/T$ if $T > T_s$

Not greater than: $C_s = S_{D1}/T * (R/I) = 0.498$
 Not less than: $C_s = 0.044 S_{DS} * I = 0.049$
 Design Category E or F; not less than: $C_s = 0.5 S_1 / (R/I) = 0.037$
 Seismic Design Coefficient: $C_s = S_{DS} / (R/I) = 0.172$

$C_s = 0.172$

Seismic Weight Distribution:

Diaphragm	h_i (ft.)	w_i (kips)	$h_i w_i$ (K-ft.)	$w_i h_i / \sum(w_i h_i)$	F_i (lbs.)	Sum F _i (lbs.)
			0	0	0	0
			0	0	0	0
			0	0	0	0
Roof	21.0	68.90	1447	0.7067	11,244	11,244
2nd Floor	9.5	63.20	600.4	0.2933	4,666	15,909
		132.09	2047			

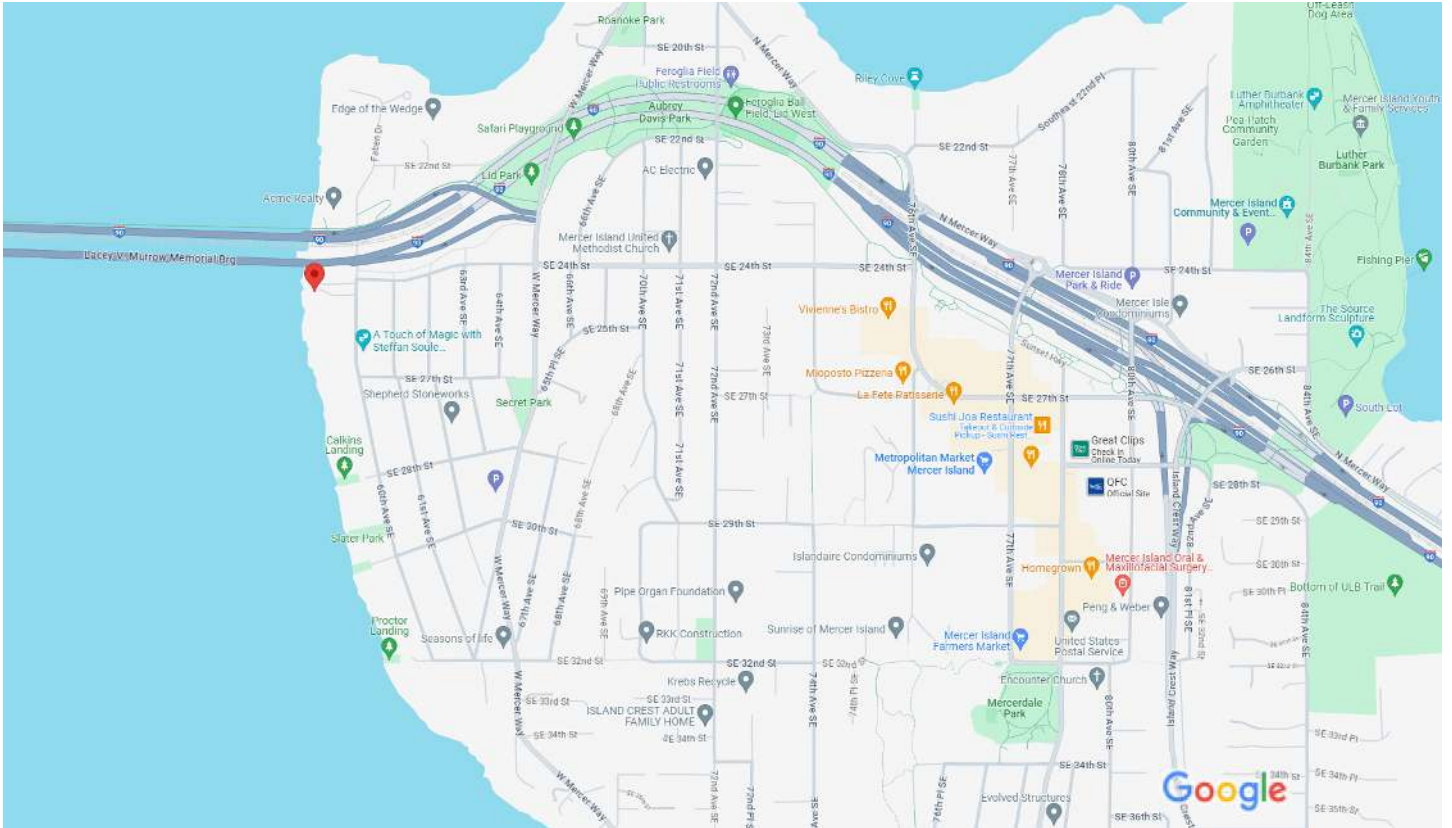
Design Base Shear (ASD) = $0.7 * (0.172 * W) = 0.120 * W =$ **15,909 lbs.**

Wind Loads: *per ASCE 7-16, Section 27.5*

Section 30.4

Cladding (ft2): 100 20

Wind Speed (MPH)	110	Zone	(ASD)	Adj.	Zone	Pn30	P	Pn30	P		
Exposure	C	Wall - Ph	26.0	15.6	(p.352)	Wall	4	-20.4	-15.0	-22.6	-16.6
Roof Pitch (x:12)	1	Wall - Po	25.7	15.4			5	-22.6	-16.6	-27.2	-20.0
$K_1 =$	0.00	Roof - 1	0.0	0.0		Roof	1	-27.1	-19.9	-32.4	-23.8
$K_2 =$	0.00	Roof - 2	0.0	0.0			1'	-19.9	-14.6	-19.9	-14.6
$K_3 =$	0.00	Roof - 3	-25.2	-15.1			2	-36.0	-26.5	-42.8	-31.5
$K_t = (1 + K_1 * K_2 * K_3)^2 =$	1.00	Roof - 4	-22.4	-13.4			3	-42.8	-31.5	-56.5	-41.6
(p.362) $\lambda =$	1.23	Roof - 5	-18.4	-11.0				0.0	0.0	0.0	0.0
(p.291) Exp. Fctr =	1.00							0.0	0.0	0.0	0.0



Map data ©2023 Google 500 ft



110 MPH, Exposure C, Kt = 1.00

2411 60th Ave SE

Building



Directions



Save



Nearby



Send to phone



Share



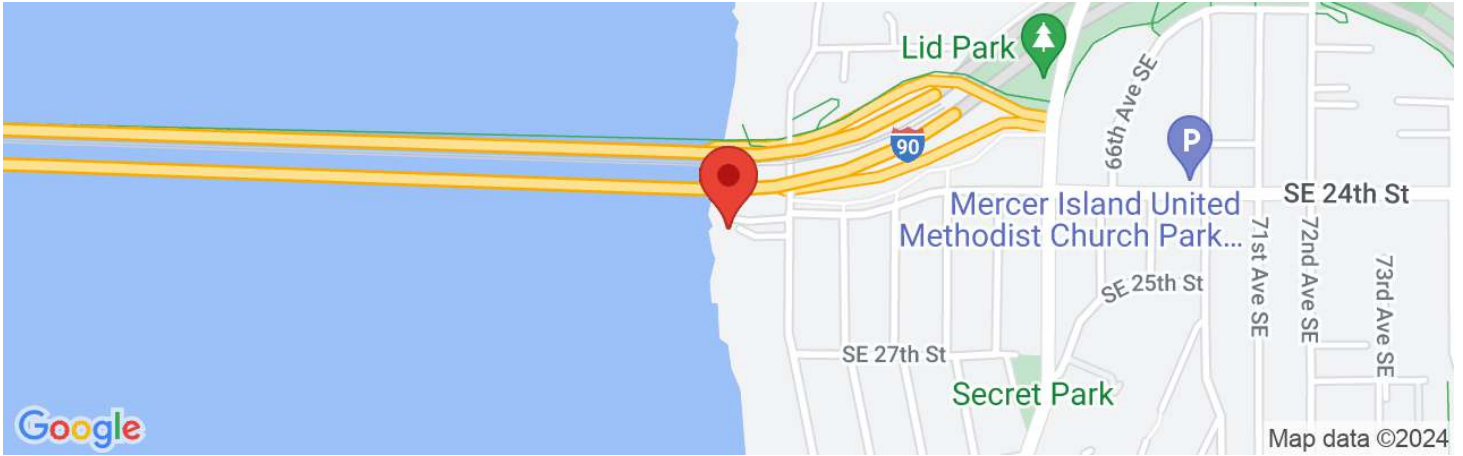
2411 60th Ave SE, Mercer Island, WA 98040



Biggs Residence

2411 60th Ave SE, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.58870510000001, -122.2541438



Date	2/3/2024, 2:56:05 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.398	MCE_R ground motion. (for 0.2 second period)
S_1	0.487	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.678	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.118	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.598	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.717	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
S_{sRT}	1.398	Probabilistic risk-targeted ground motion. (0.2 second)
S_{sUH}	1.55	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
S_{sD}	3.157	Factored deterministic acceleration value. (0.2 second)
S_{1RT}	0.487	Probabilistic risk-targeted ground motion. (1.0 second)
S_{1UH}	0.543	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S_{1D}	1.292	Factored deterministic acceleration value. (1.0 second)

LATERAL ANALYSIS - SEISMIC WEIGHT:

AT MAIN HOUSE; AT ROOF;

$$W_{R2} = 2962 \text{ ft}^2 (15+4) \text{ ft}^2 + 10 \text{ ft}^2 \left(\frac{11.5'}{2} \times 221' \right) = 68,936 \text{ ft}^2$$

AT FLOOR; $W_{F2} = 2456 \text{ ft}^2 (12 \text{ ft}^2) + 630 \text{ ft}^2 (19 \text{ ft}^2)$
 $+ 10 \text{ ft}^2 \left(\frac{11.5'}{2} \times 221' + \frac{8.6'}{2} \times 225' \right) = 63,195 \text{ ft}^2$

DESIGN BASE SHEAR; $V = \frac{11,244 \text{ ft}^2 + 4,666 \text{ ft}^2}{15,909 \text{ ft}^2 \text{ (ASD)}}$

in Garage/

AT GARAGE/WORKSHOP; AT ROOF;

$$W_{R1} = 688 \text{ ft}^2 (15+4) \text{ ft}^2 + 10 \text{ ft}^2 \left(\frac{8.4'}{2} \times 67' \right) = 15,886 \text{ ft}^2$$

AT FLOOR; $W_{F1} = 512 \text{ ft}^2 (25 \text{ ft}^2) + 225 \text{ ft}^2 (18 \text{ ft}^2)$
 $+ 10 \text{ ft}^2 \left(\frac{8.4'}{2} \times 67' + \frac{8.8'}{2} \times 78' \right) = 23,346 \text{ ft}^2$

DESIGN BASE SHEAR; $V = \frac{2,646 \text{ ft}^2 + 2,139 \text{ ft}^2}{4,785 \text{ ft}^2 \text{ (ASD)}}$

∴ TOTAL SEISMIC LOAD

$= 2,646 \text{ ft}^2$	$3,440 \text{ ft}^2$
$= 11,244 \text{ ft}^2 + 2,139 \text{ ft}^2 = 13,383 \text{ ft}^2$	$17,398 \text{ ft}^2$
$= 4,666 \text{ ft}^2$	$6,066 \text{ ft}^2$
$\text{(ASD) } 20,969 \text{ ft}^2$	$27,253 \text{ ft}^2$

WIND ANALYSIS; IN LONGITUDINAL DIR; (N-S):

AT UPPER ROOF; $W_{UR} = 171 \text{ ft}^2 (15.6 \text{ ft}^2) = 2,761 \text{ ft}^2$

AT MAIN ROOF/WORKSHOP FLOOR;

$$W_{RF} = 701 \text{ ft}^2 (15.6 \text{ ft}^2) = 10,936 \text{ ft}^2$$

AT FLOOR; $W_{FL} = 376 \text{ ft}^2 (15.6 \text{ ft}^2) = 5,865 \text{ ft}^2$

$$\Sigma W_L = 19,562 \text{ ft}^2$$

TRANSVERSE DIR; E-W:

AT UPPER ROOF; $W_{UR} = 109 \text{ ft}^2 (15.6 \text{ ft}^2) = 1,760 \text{ ft}^2$

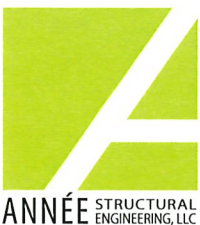
AT MAIN ROOF; $W_{RF} = 483 \text{ ft}^2 (15.6 \text{ ft}^2) = 7,535 \text{ ft}^2$

AT FLOOR; $W_{FL} = 712 \text{ ft}^2 (15.6 \text{ ft}^2) = 11,167 \text{ ft}^2$

$$\Sigma W_T = 20,342 \text{ ft}^2$$

∴ SEISMIC CONTROLS AT ALL LOCATIONS

$h_w = 30 \text{ ft GA}$
 $m = 9.55'$
 $l = 7.9'$



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LATERAL LOAD DISTRIBUTION;

TO WORKSHOP WAUS;

LINES ⑤, ⑦; $V_5 = V_7 = \frac{1}{2}(2,761^*) = 1,381^*$

$V_5 = 1,381^*/7.0' = 197^*/ft.$
 $V_7 = 1,381^*/10.25' = 135^*/ft.$ } Swb

LINES ④, ⑥; $V_D = V_F = \frac{1}{2}(2,646^*) = 1,323^*$

$V_D = 1,323^*/18.25' = 73^*/ft.$
 $V_F = 1,323^*/11.05' = 120^*/ft.$ } Swb

TO MAIN FLOOR WAUS;

LINE ② $V_2 = 35\%(17,398^*) = 6,089^*$

$V_2 = 6,089^*/12.15' = 501^*/ft.$ → Sw2DF*

LINE ⑤/⑥; $V_{5/6} = 45\%(17,398^*) + 50\%(3,440^*) = 9,549^*$

$V_{5/6} = 9,549^*/20.2' = 473^*/ft.$ → Sw2

LINE ⑥/②; $V_{6/2} = 11\%(17,398^*) + 16\%(3,440^*) = 2,464^*$

$V_{6/2} = 2,464^*/18.3' = 135^*/ft.$ → Swb

LINE ③; $V_3 = 9\%(17,398^*) + 84\%(3,440^*) = 4,455^*$

$V_3 = 4,455^*/22.0' = 202^*/ft.$ → Swb

LINE ①; $V_A = 29\%(13,383^*) = 3,881^*$

$V_A = 3,881^*/34.1' = 114^*/ft.$ → Swb

LINE ⑧; $V_E = 49\%(13,383^*) + 65\%(2,646^*) = 8,278^*$

$V_E = 8,278^*/17.1' = 484^*/ft.$ → Sw2

LINE ④/⑩; $V_{G/H} = 22\%(13,383^*) + 35\%(2,646^*) = 3,870^*$

$V_{G/H} = 3,870^*/50.3' = 77^*/ft.$ → Swb

TO LOWER FLOOR WAUS:

LINE ③; $V_3 = 65\%(6,066^*) + 6,089^* = 10,032^*$

$V_3 = 10,032^*/17.15' = 585^*/ft.$ → Sw2DF*

LINE ④; $V_A = 34\%(4,666^*) + 3,881^* = 5,467^*$

$V_A = 5,467^*/24.8' = 220^*/ft.$ → Swb

LINE ⑤; $V_E = 47\%(4,666^*) + \frac{58'}{17.1'}(3,278^*) = 5,001^*$

TO POND w/ HOUSE

LINE ⑥/⑩; $V_{G/H} = 19\%(4,666^*) + \frac{22.3'}{50.3'}(3,870^*) = 2,602^*$

$V_{G/H} = 2,602^*/32.1' = 81^*/ft.$ → Swb



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OVERTURNING: FROM WORKSHOP WALLS;

LINE (5); $T_5 = 197 \text{ kN} \cdot (9.95) - \frac{651}{2} (0.6 \times 9.95) = 1,589 \text{ k}$
 (7) → sim. CS16 ←

LINE (6); $T_6 = 120 \text{ kN} \cdot (9.9) - \frac{1155}{2} (0.6 \times 9.9) = 845 \text{ k}$
 (1) → sim.

FROM MAIN FLR. WALLS;

LINE (2); $T_2 = 501 \text{ kN} \cdot (10.7) - \frac{1061}{2} (0.6 \times 10.7) = 5,020 \text{ k}$
 HDU5/MSTC66 ←

LINE (5/6); $T_{5/6} = 473 \text{ kN} \cdot (10.7) - \frac{1321}{2} (0.6 \times 10.7) = 4,637 \text{ k}$
 HDU5 ←

LINE (6/2); $T_{6/2} = 135 \text{ kN} \cdot (8.4) - \frac{691}{2} (0.6 \times 10.0) = 927 \text{ k}$
 HDU2 ←

LINE (8); $T_8 = 202 \text{ kN} \cdot (8.4) - \frac{221}{2} (0.6 \times 8.4) = 1,142 \text{ k}$
 HDU2 ←

LINE (A); $T_A = 114 \text{ kN} \cdot (9.1) - \frac{1321}{2} (0.6 \times 9.1) = 677 \text{ k}$
 CS16/HDU2 ←

LINE (E); $T_E = 484 \text{ kN} \cdot (8.1) - \frac{791}{2} (0.6 \times 8.1) = 2,805 \text{ k}$
 HDU4/5 ←

LINE (G/H); $T_{G/H} = 77 \text{ kN} \cdot (8.8) - \frac{810}{2} (0.6 \times 8.8) = 451 \text{ k}$
 NO HD REQ'D ←

FROM LOWER FLR. WALLS;

LINE (3); $T_3 = 595 \text{ kN} \cdot (8.6) - \frac{451}{2} (0.6 \times 8.6) = 4,583 \text{ k}$
 HDU5 ←

LINE (A); $T_A = 220 \text{ kN} \cdot (8.6) - \frac{1091}{2} (0.6 \times 9.4) = 1,585 \text{ k}$
 HDU2 ←

LINE (G/H); $T_{G/H} = 81 \text{ kN} \cdot (8.6) - \frac{2731}{2} (0.6 \times 9.4) = -73 \text{ k}$
 ∴ NO HD REQ'D

LINE (2); MSTC40 FROM BEAMS TO WALL FRAMING,
HDU5 TO FAN. 3792 k (3)

DIAPHRAGM FORCES;

AT MAIN FLOOR; LINE (E)

$D_E = 1.25 \left[\frac{4,051 \text{ k}^2}{1,833 \text{ k}^2} (0.44 \times 13,383) \right] = 4,700 \text{ k}$
 ∴ 3/16" PLATE w/ (10) SDS 1/4" x 2 1/2" EACH END.

LINE (3);

$D_3 = 1.25 \left[\frac{302}{1,327} (0.35 \times 13,383) \right] = 1,333 \text{ k}$
 CS16 ←

AT MAIN FLOOR; LINE (3)

$D_3 = 1.25 \left[\frac{958}{2,026} (0.15 \times 6,066) \right] + 6,059 \text{ k} = 8,420 \text{ k}$
 ∴ CMST12



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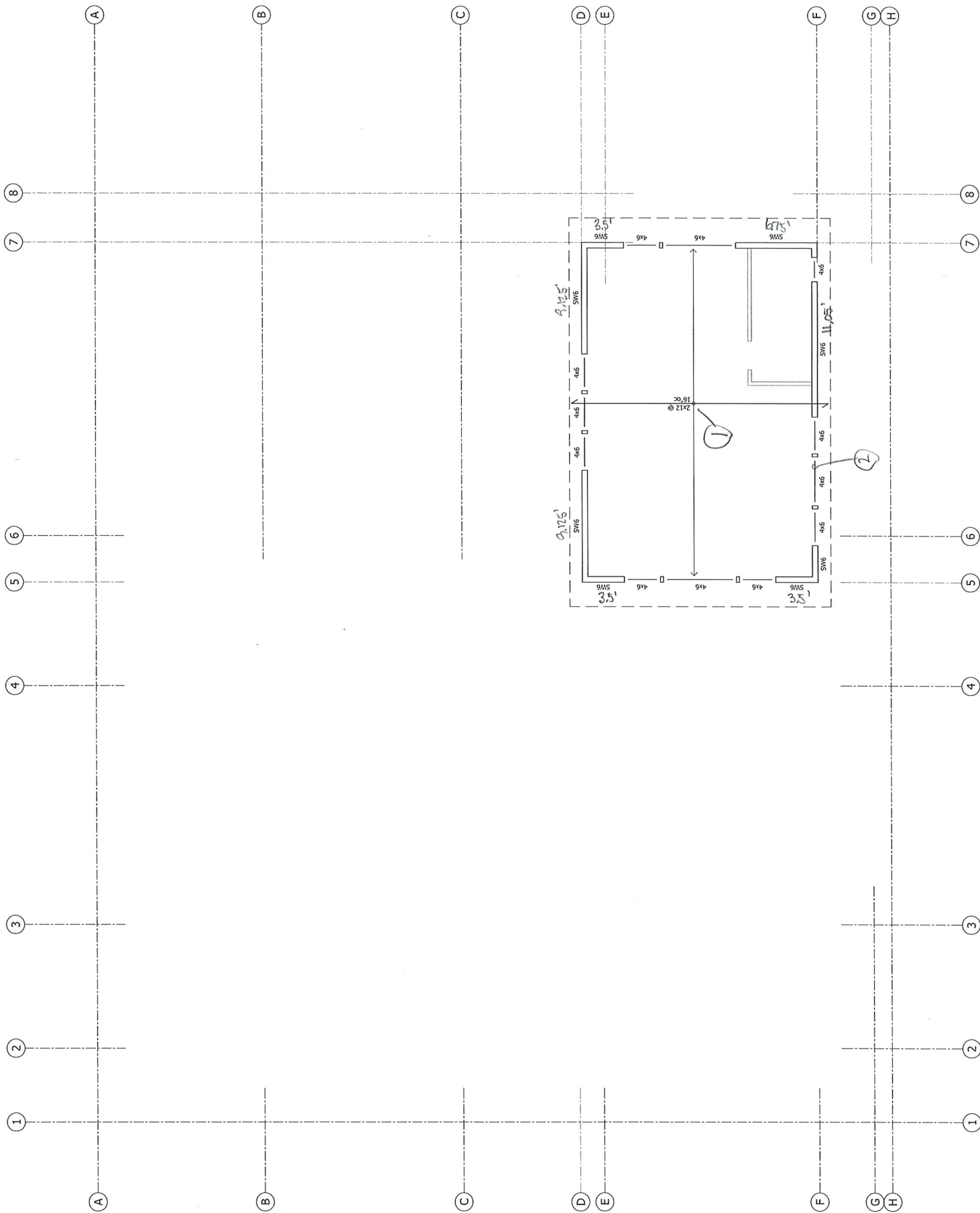
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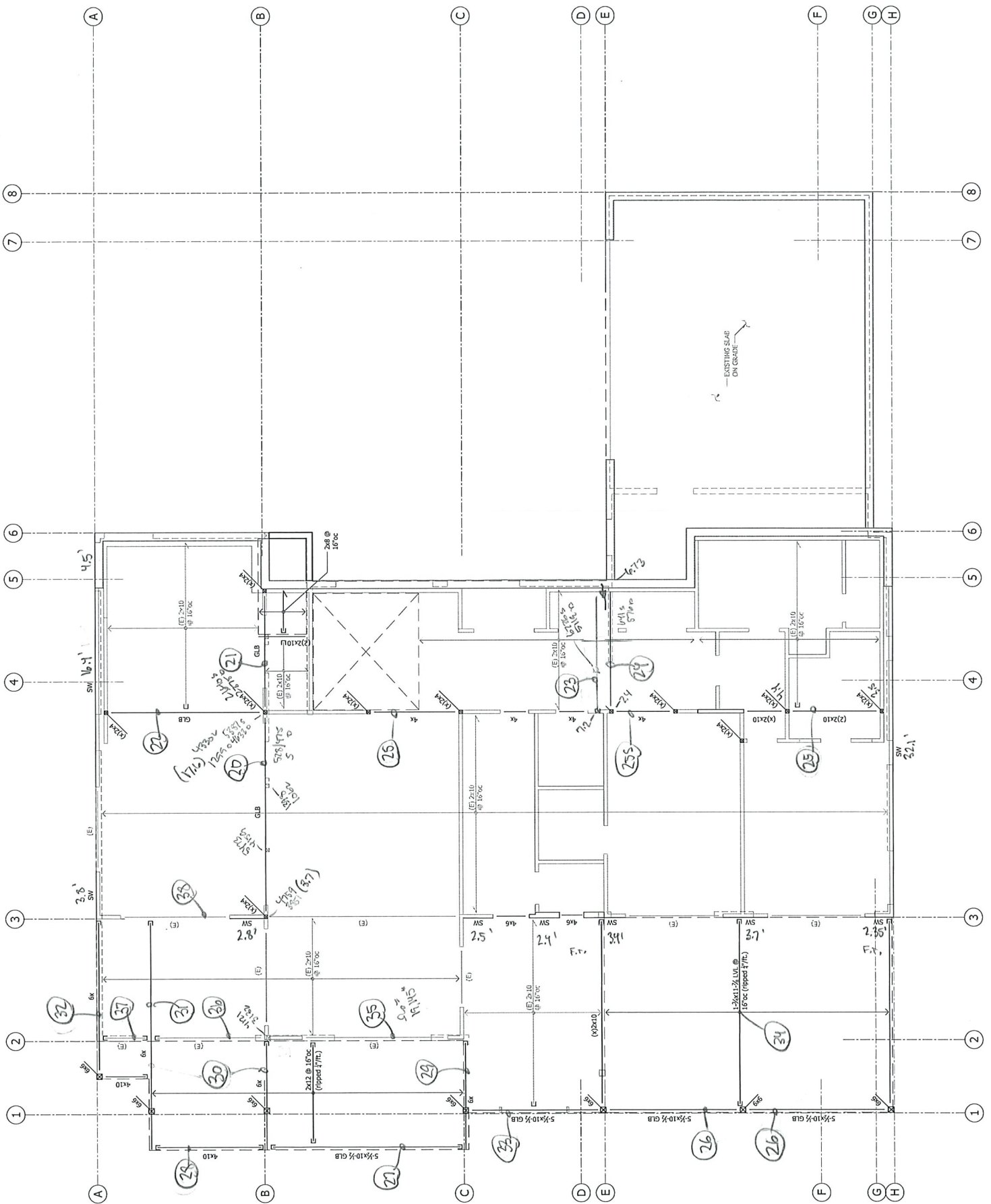
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Upper Roof Framing Plan
SCALE: 1/4" = 1'-0"



Main Floor Framing Plan

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

GRAVITY ANALYSIS - ROOF FRAMING (253, 15+140) #/ft²:

① SEE ATTACHED CALC. → 2x12 HP #2 @ 16" oc

② $L=42'$; $w = \frac{21.6'}{2}(25+19) = 476 \#/ft.$

$R=V = 999 \#$; $M = 1,049 \#-ft$

$f_v = 78 \text{ psi}$; $f_b = 713 \text{ psi}$; $\Delta_n = 0.04" = 4/1170$

∴ 4x6 DF #2

Low ROOF / WORKSHOP FR. FRAMING (60x, 20x) #/ft²

③ SEE ATTACHED CALC. → 14" TJI / 560 @ 16" oc

④ SEE ATTACHED CALC. → 14" TJI / 360 @ 24" oc

⑤ SEE ATTACHED CALC. → 11 3/8" TJI / 360 @ 16" oc

⑥ SEE ATTACHED CALC. → 3 1/2 x 11 3/8 LSL

⑦ SEE ATTACHED CALC. → 3 1/2 x 11 3/8 PSL

⑧ SEE ATTACHED CALC. → 5 1/2 x 22 1/2 CLB

⑨ $L=18.75'$; $w = 300x + 65L + 5520 = 1,265 \#/ft.$

$R=V = 11,862 \#$; $M = 55,607 \#-ft$

$f_v = 180 \text{ psi}$; $f_b = 2,247 \text{ psi}$; $\Delta_n = 0.73" = 4/35$

∴ 5 1/2 x 18 CLB

STEEL OPTION: $S \geq 22.2 \text{ in}^3$; $I \geq 195 \text{ in}^4$ (4360)

∴ W10 x 39

⑩ $L=21.0'$; $w = \frac{51.3'}{2}(25+19) = 1,129 \#/ft.$

$R=V = 11,855 \#$; $M = 62,236 \#-ft$

$f_v = 166 \text{ psi}$; $f_b = 2,143 \text{ psi}$; $\Delta_n = 0.81" = 4/312$

∴ 5 1/2 x 19 1/2 CLB

⑪ $L=16.5'$; $w = \frac{42.3'}{2}(25+19) = 931 \#/ft.$

$R=V = 7,212 \#$; $M = 27,947 \#-ft$

$f_v = 146 \text{ psi}$; $f_b = 2,007 \text{ psi}$; $\Delta_n = 0.60" = 4/312$

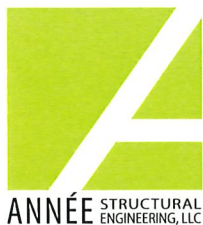
∴ 5 1/2 x 13 1/2 CLB

⑫ $L=52'$; $w = 931 \#/ft.$

$R=V = 2,421 \#$; $M = 3,147 \#-ft$

$f_v = 109 \text{ psi}$; $f_b = 717 \text{ psi}$ ∴ 4x10 DF #2

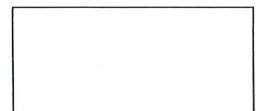
⑬ SEE ATTACHED CALC. → 4x12 DF #2



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⑭ SEE ATTACHED CALC. → 3½ x 10½ CLB

⑮ SEE ATTACHED CALC. → 3½ x 10½ CLB

⑯ SEE ATTACHED CALC. → 5½ x 14 PSL

⑰ $L = 4.6'$; $w = 13.1(255 + 190) = 576 \#/ft.$

$$R = V = 1,325 \#; M = 1,523 \text{ ft-}\#$$

$$f_v = 103 \text{ psi}; f_b = 1,026 \text{ psi}; \Delta_n = 0.07" = 1/140$$

∴ 4 x 6 DP #2

⑱ SEE ATTACHED CALC. → (2) 2 x 10 HP #2

⑲ SEE ATTACHED CALC. → 4 x 8 DP #2

FLOOR/DECK FINISH. $(30,40,60 \text{ lb} / 12-22 \text{ sq}) \#/ft.^2$

⑳ SEE ATTACHED CALC. → 5½ x 15 CLB

㉑ $L = 10.0'$; $w = 5285 + 4150 = 1,003 \#/ft.$

$$R = V = 5,015 \#; M = 12,538 \text{ ft-}\#$$

$$f_v = 152 \text{ psi}; f_b = 2,026 \text{ psi}; \Delta_n = 0.38" = 1/260$$

∴ 5½ x 9 CLB

㉒ $L = 13.8'$; $w = \frac{214}{2}(406 + 120) = 816 \#/ft.$

$$R = V = 5,629 \#; M = 19,419 \text{ ft-}\#$$

$$f_v = 128 \text{ psi}; f_b = 1,765 \text{ psi}; \Delta_n = 0.47" = 1/355$$

∴ 5½ x 12 CLB

㉓ SEE ATTACHED CALC. → 5½ x 12 CLB

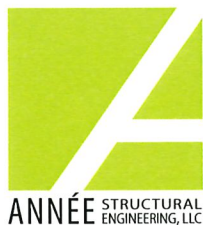
㉔ SEE ATTACHED CALC. → (3) 1¾ x 9¼ LVL

㉕ $L = 8.5'$; $w = \frac{21.6}{2}(40 + 12) = 822 \#/ft.$

$$R = V = 3,492 \#; M = 7,420 \text{ ft-}\#$$

$$f_v = 166 \text{ psi}; f_b = 1,881 \text{ psi}; \Delta_n = 0.25" = 1/400$$

∴ 3½ x 9 CLB



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255; $L = 5.3'$; $\frac{273'}{2}(40c + 12D) = 711 \text{ #/ln.}$

$R = V = 1,883 \text{ #}; M = 2,495 \text{ ft-#}$

$f_v = 108 \text{ psi}; f_b = 913 \text{ psi} \therefore \underline{4 \times 8 \text{ DP #2}}$

26 $L = 12.0'$; $w = \frac{16.1'}{2}(60c + 18D) = 629 \text{ #/ln.}$

$R = V = 3,773 \text{ #}; M = 11,320 \text{ ft-#}$

$f_v = 114 \text{ psi}; f_b = 1,829 \text{ psi}; \Delta_{TL} = 0.49" = 4/295$

$\therefore \underline{5 \frac{1}{2} \times 9 \text{ CLB}}$

27 $L = 16.2'$; $w = \frac{9'}{2}(60 + 18) = 351 \text{ #/ln.}$

$R = V = 2,843 \text{ #}; M = 11,515 \text{ ft-#}$

$f_v = 74 \text{ psi}; f_b = 1,367 \text{ psi}; \Delta_{TL} = 0.57" = 4/341$

$\therefore \underline{5 \frac{1}{2} \times 10 \frac{1}{2} \text{ CLB}}$

28 $L = 9.8'$; $w = 351 \text{ #/ln.}$

$R = V = 1,720 \text{ #}; M = 4,214 \text{ ft-#}$

$f_v = 76 \text{ psi}; f_b = 960 \text{ psi}; \Delta_{TL} = 0.18" = 4/646$

$\therefore \underline{4 \times 10 \text{ DP #2}}$

29 SEE ATTACHED CALC. $\rightarrow \underline{3 \frac{1}{2} \times 10 \frac{1}{2} \text{ CLB}}$

30 SEE ATTACHED CALC. $\rightarrow \underline{5 \frac{1}{2} \times 10 \frac{1}{2} \text{ CLB}}$

31 SEE ATTACHED CALC. $\rightarrow \underline{6 \frac{3}{4} \times 10 \frac{1}{2} \text{ CLB}}$

32 SEE ATTACHED CALC. $\rightarrow \underline{3 \frac{1}{2} \times 10 \frac{1}{2} \text{ CLB}}$

33 SEE ATTACHED CALC. $\rightarrow \underline{3 \frac{1}{2} \times 10 \frac{1}{2} \text{ CLB}}$

34 $L = 15.6'$; $w = \frac{16''}{12''}(60 + 18) = 104 \text{ #/ln.}$

$R = V = 311 \text{ #}; M = 3,164 \text{ ft-#}$

$f_v = 96 \text{ psi}; f_b = 1,521 \text{ psi}; \Delta_{TL} = 0.60" = 4/312$

$d_v = 7.25"$ $d_b = 9.25"$
 $\therefore \underline{1 \frac{3}{4} \times 11 \frac{1}{4} \text{ LVL @ } 16" \text{oc}}$
(RIPPER $\frac{1}{4}"$ PER FT.)

35 SEE ATTACHED CALC. $\rightarrow \underline{3 \frac{1}{2} \times 13 \frac{1}{2} \text{ CLB}}$

36 SEE ATTACHED CALC. $\rightarrow \underline{5 \frac{1}{2} \times 9 \text{ CLB}}$

37 SEE ATTACHED CALC. $\rightarrow \underline{5 \frac{1}{2} \times 9 \text{ CLB}}$



Project _____

Designer _____

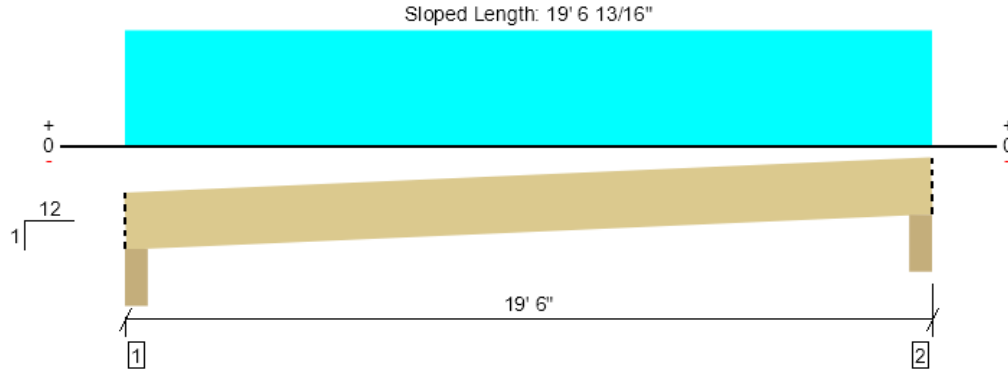
Date _____

1801 18th Ave S, Seattle, WA 98144 206.658.5169

Sheet



Roof Framing, 1 - Workshop Rafters
1 piece(s) 2 x 12 HF No.2 @ 16" OC



Drawing is Conceptual. 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)	573 @ 4 1/2"	3341 (5.50")	Passed (17%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	491 @ 1' 4 11/16"	1941	Passed (25%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2582 @ 9' 9"	2964	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.403 @ 9' 9"	0.941	Passed (L/560)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.711 @ 9' 9"	1.254	Passed (L/318)	--	1.0 D + 1.0 S (All Spans)

Member Length : 19' 7 3/4"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

- 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	Factored	
1 - Beveled Plate - HF	5.50"	5.50"	1.50"	248	325	573	Blocking
2 - Beveled Plate - HF	5.50"	5.50"	1.50"	248	325	573	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)	3' 6" o/c	
Bottom Edge (Lu)	19' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 19' 6"	16"	19.0	25.0	Default Load

Weyerhaeuser Notes

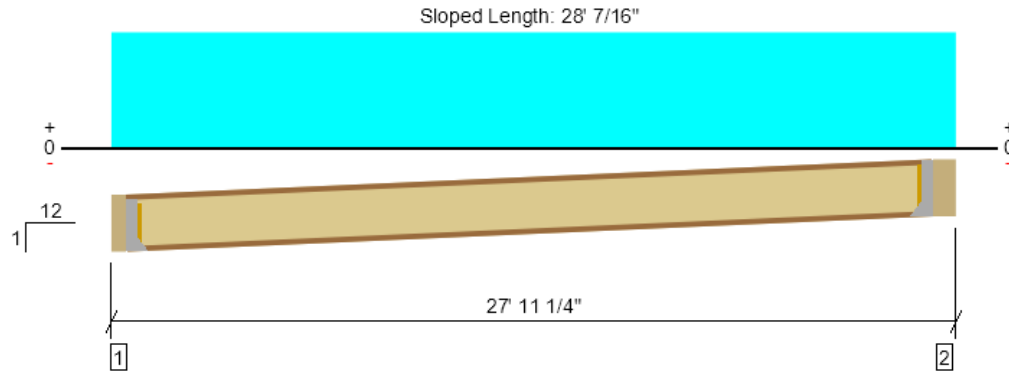
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Roof Framing, 3 - Long-span Rafters
1 piece(s) 14" TJI® 560 @ 24" OC



Drawing is Conceptual. 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)	1198 @ 3 1/2"	1455 (1.75")	Passed (82%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1198 @ 3 1/2"	2749	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	8143 @ 13' 10 5/8"	12966	Passed (63%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.729 @ 13' 10 5/8"	1.364	Passed (L/449)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.284 @ 13' 10 5/8"	1.819	Passed (L/255)	--	1.0 D + 1.0 S (All Spans)

Member Length : 27' 4 9/16"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

- Deflection criteria: LL (L/240) and TL (L/180).
- 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	Factored	
1 - Hanger on 14" GLB beam	3.50"	Hanger ¹	1.75" / - ²	529	694	1224	See note ¹
2 - Hanger on 14" GLB beam	5.50"	Hanger ¹	1.75" / - ²	536	703	1238	See note ¹

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 8" o/c	
Bottom Edge (Lu)	27' 3" 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	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	Web Stiffeners	
2 - Face Mount Hanger	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	Web Stiffeners	

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

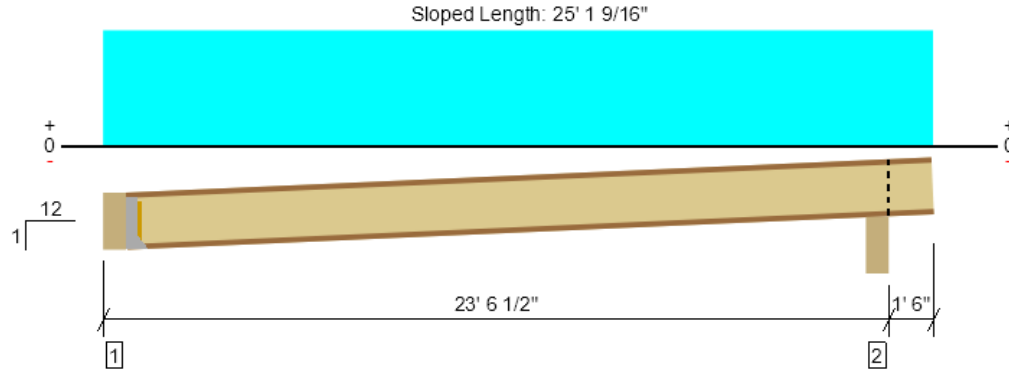
Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 27' 11 1/4"	24"	19.0	25.0	Default Load

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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	



Roof Framing, 4 - Rafters
1 piece(s) 14" TJI® 360 @ 24" OC



Drawing is Conceptual. 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)	1003 @ 5 1/2"	1242 (1.75")	Passed (81%)	1.15	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	1003 @ 5 1/2"	2248	Passed (45%)	1.15	1.0 D + 1.0 S (Alt Spans)
Moment (Ft-lbs)	5707 @ 11' 10 1/16"	8435	Passed (68%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.551 @ 11' 10 1/2"	1.147	Passed (L/499)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.969 @ 11' 10 7/16"	1.529	Passed (L/284)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 24' 9 3/16"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- 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	Factored	
1 - Hanger on 14" GLB beam	5.50"	Hanger ¹	1.75" / - ²	451	593	1043	See note ¹
2 - Beveled Plate - HF	5.50"	5.50"	3.50"	504	661	1165	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
- ¹ See Connector grid below for additional information and/or requirements.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 3" o/c	
Bottom Edge (Lu)	9' 7" 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	LSSR2.37Z	1.88"	N/A	14-10dx2.5	12-10dx1.5	Web Stiffeners

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

Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 25' 1/2"	24"	19.0	25.0	Default Load

Weyerhaeuser Notes

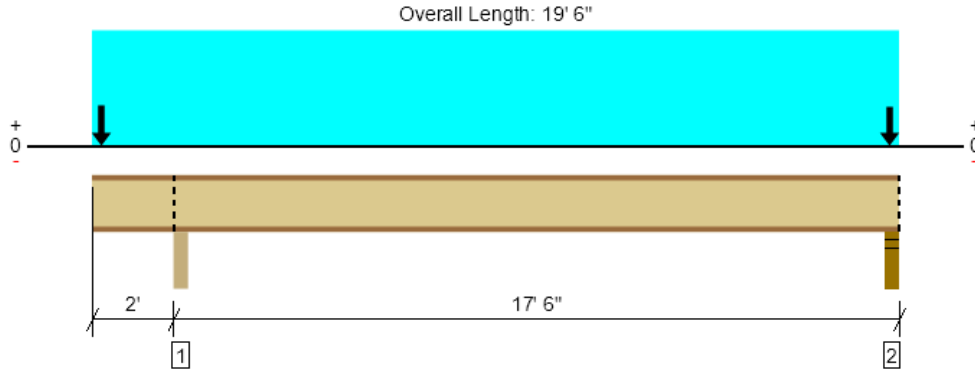
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Upper Floor Framing, 5 -Workshop Joists
1 piece(s) 11 7/8" TJI @ 360 @ 12" OC



Drawing is Conceptual. 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)	951 @ 19' 3 1/2"	1505 (3.50")	Passed (63%)	1.00	1.0 D + 1.0 L (Alt Spans)
Shear (lbs)	643 @ 19' 2 1/2"	1705	Passed (38%)	1.00	1.0 D + 1.0 L (Alt Spans)
Moment (Ft-lbs)	2637 @ 11' 2 1/16"	6180	Passed (43%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.282 @ 10' 8 5/8"	0.429	Passed (L/730)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.335 @ 10' 10 11/16"	0.857	Passed (L/614)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	53	40	Passed	--	--

Member Length : 19' 6"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/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	Snow	Factored	
1 - Beam - GLB	3.50"	3.50"	3.50"	552	651	300	1265	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.75"	424	527/-8	255	1011	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' 10" o/c	
Bottom Edge (Lu)	9' o/c	

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

Vertical Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 19' 6"	12"	20.0	60.0	-	Default Load
2 - Point (PLF)	2 3/4"	12"	-	-	-	
3 - Point (lb)	2 3/4"	N/A	301	-	270	
4 - Point (lb)	19' 3 1/4"	N/A	285	-	270	

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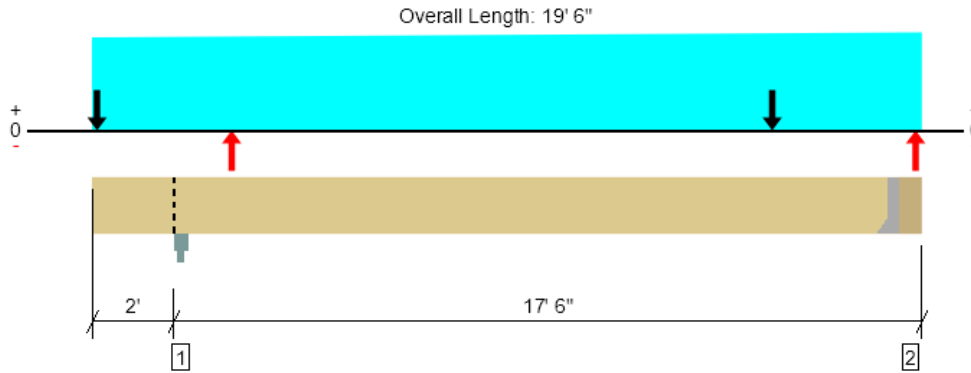
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



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ForteWEB v3.7, Engine: V8.4.0.40, Data: V8.1.5.0

File Name: Biggs Residence

Upper Floor Framing, 6 - Beam
 1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



Drawing is Conceptual. 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)	4851 @ 19' 1/2"	4851 (1.54")	Passed (100%)	--	1.0 D + 0.7 E (Alt Spans)
Shear (lbs)	4673 @ 18' 5/8"	13743	Passed (34%)	1.60	1.0 D + 0.7 E (Alt Spans)
Moment (Ft-lbs)	13860 @ 3' 4 1/2"	25525	Passed (54%)	1.60	1.0 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.217 @ 10' 7 5/16"	0.422	Passed (L/933)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.646 @ 10' 7 5/8"	0.845	Passed (L/314)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)

Member Length : 19' 1/2"
 System : Floor
 Member Type : Flush Beam
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Upward deflection on left cantilever exceeds overhang deflection criteria.
- 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	Factored	
1 - Column Cap - steel	3.50"	3.50"	2.18"	1837	429	805	7168/-7168	6854/-3915	Blocking
2 - Hanger on 11 7/8" GLB beam	5.50"	Hanger ¹	1.54"	1546	356	663	4831/-4831	4928/-2454	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	19' 1" o/c	
Bottom Edge (Lu)	19' 1" 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	HHUS410	3.00"	N/A	30-16d	10-16d	

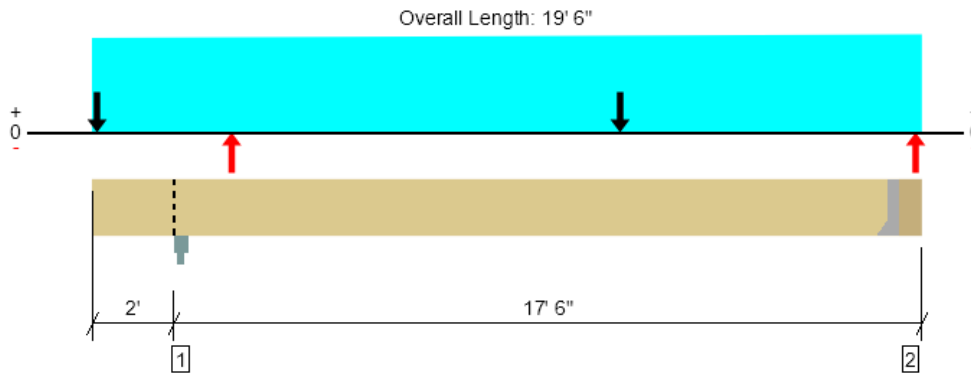
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 19' 1/2"	N/A	13.0	--	--	--	
1 - Uniform (PSF)	0 to 19' 6" (Front)	8"	20.0	60.0	-	-	Default Load
2 - Tapered (PLF)	0 to 19' 6" (Front)	N/A	140.0 to 155.0	-	75.0 to 75.0	-	
3 - Point (lb)	1 1/2" (Front)	N/A	-	-	-	6402	
4 - Point (lb)	3' 4 1/2" (Front)	N/A	-	-	-	-6402	
5 - Point (lb)	16' 1 1/2" (Front)	N/A	-	-	-	6402	
6 - Point (lb)	19' 4 1/2" (Front)	N/A	-	-	-	-6402	

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



Upper Floor Framing, 7 - Beam
1 piece(s) 3 1/2" x 11 7/8" 2.2E Parallam® PSL



Drawing is Conceptual. 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)	4250 @ 19' 1/2"	4250 (1.94")	Passed (100%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Shear (lbs)	2653 @ 18' 5/8"	8035	Passed (33%)	1.00	1.0 D + 1.0 L (Alt Spans)
Moment (Ft-lbs)	12539 @ 10' 8 5/16"	19902	Passed (63%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.287 @ 10' 7 1/8"	0.422	Passed (L/705)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.630 @ 10' 7 1/2"	0.845	Passed (L/322)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 19' 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Upward deflection on left cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -633 lbs uplift at support located at 19' 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	Factored	
1 - Column Cap - steel	3.50"	3.50"	2.52"	2084	1717	537	4913/-4913	5523/-2189	Blocking
2 - Hanger on 11 7/8" GLB beam	5.50"	Hanger ¹	1.94"	1748	1425	442	2402/-2402	4409/-633	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	19' 1" o/c	
Bottom Edge (Lu)	19' 1" 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	HHUS48	3.00"	N/A	22-10d	8-10d	

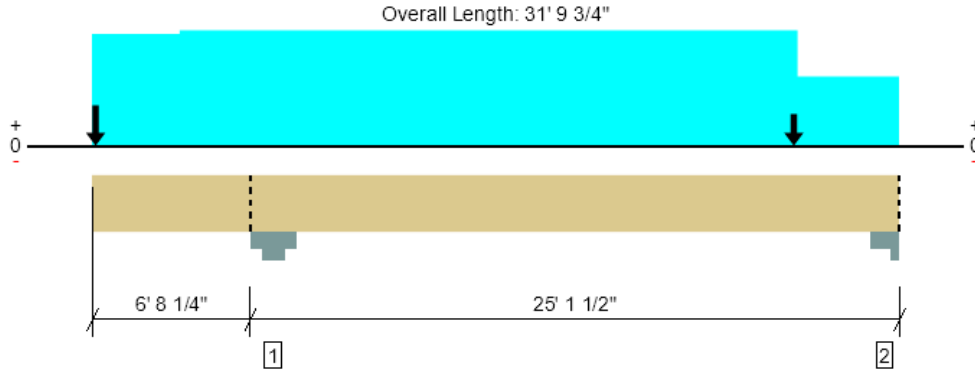
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 19' 1/2"	N/A	13.0	--	--	--	
1 - Uniform (PSF)	0 to 19' 6" (Front)	2' 8"	20.0	60.0	-	-	Default Load
2 - Tapered (PLF)	0 to 19' 6" (Front)	N/A	123.0 to 138.0	-	50.0 to 50.0	-	
3 - Point (lb)	1 1/2" (Front)	N/A	-	-	-	4388	
4 - Point (lb)	3' 4 1/2" (Front)	N/A	-	-	-	-4388	
5 - Point (lb)	12' 7 1/2" (Front)	N/A	-	-	-	4388	
6 - Point (lb)	19' 4 1/2" (Front)	N/A	-	-	-	-4388	

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



Upper Floor Framing, 8 - Beam
1 piece(s) 5 1/2" x 22 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	31046 @ 7' 1 3/4"	39325 (11.00")	Passed (79%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	13525 @ 9' 5 3/4"	21863	Passed (62%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	79705 @ 20' 4 1/2"	85926	Passed (93%)	1.00	1.0 D + 1.0 L (Alt Spans)
Neg Moment (Ft-lbs)	-61886 @ 7' 1 3/4"	110516	Passed (56%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Live Load Defl. (in)	0.556 @ 19' 3 7/8"	0.605	Passed (L/522)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.867 @ 19' 7 3/4"	1.210	Passed (L/335)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 31' 9 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Upward deflection on left cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.93 that was calculated using length L = 22' 6 3/4".
- Critical negative moment adjusted by a volume/size factor of 0.97 that was calculated using length L = 14' 10".
- Upward deflection on left cantilever exceeds 0.4".
- 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	Snow	Seismic	Factored	
1 - Column Cap - steel	11.00"	11.00"	8.68"	13137	12688	6574	6594/-6594	31046	Blocking
2 - Column Cap - steel	7.00"	7.00"	4.41"	6074	9009/-576	2498	2036/-2036	15774	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)	18' o/c	
Bottom Edge (Lu)	31' 10" o/c	

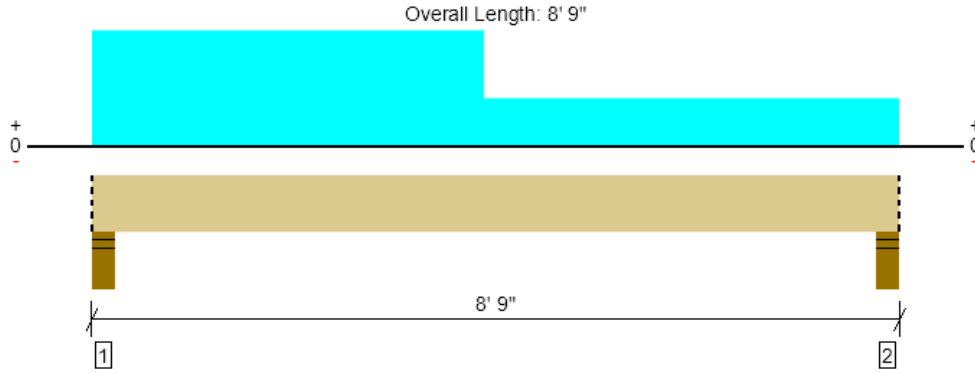
•Maximum allowable bracing intervals based on applied load.

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 31' 9 3/4"	N/A	30.1	--	--	--	
1 - Uniform (PSF)	0 to 31' 9 3/4" (Front)	8' 6"	20.0	60.0	-	-	Default Load
2 - Uniform (PSF)	0 to 3' 5 1/2" (Front)	3'	19.0	-	25.0	-	
3 - Uniform (PSF)	3' 5 1/2" to 31' 9 3/4" (Front)	2' 3"	18.0	60.0	-	-	
4 - Uniform (PLF)	0 to 27' 9 3/4" (Front)	N/A	303.0	-	270.0	-	
5 - Point (lb)	1 3/4" (Front)	N/A	1443	-	603	4831	
6 - Point (lb)	27' 8" (Front)	N/A	1631	1069	442	2402	

ForteWEB Software Operator Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	Job Notes
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Upper Floor Framing, 13 - Beam
1 piece(s) 4 x 12 HF No.2



Drawing is Conceptual. 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)	3521 @ 4"	7796 (5.50")	Passed (45%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2211 @ 1' 4 3/4"	4528	Passed (49%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5485 @ 3' 9"	6615	Passed (83%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.065 @ 4' 2 13/16"	0.202	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.116 @ 4' 2 13/16"	0.404	Passed (L/834)	--	1.0 D + 1.0 S (All Spans)

Member Length : 8' 9"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - HF	5.50"	5.50"	2.48"	1545	1976	3521	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.58"	992	1248	2241	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' 9" o/c	
Bottom Edge (Lu)	8' 9" 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 8' 9"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 4' 3" (Front)	21' 1 1/4"	19.0	25.0	Default Load
2 - Uniform (PSF)	4' 3" to 8' 9" (Front)	8' 8 3/4"	19.0	25.0	Default Load

Weyerhaeuser Notes

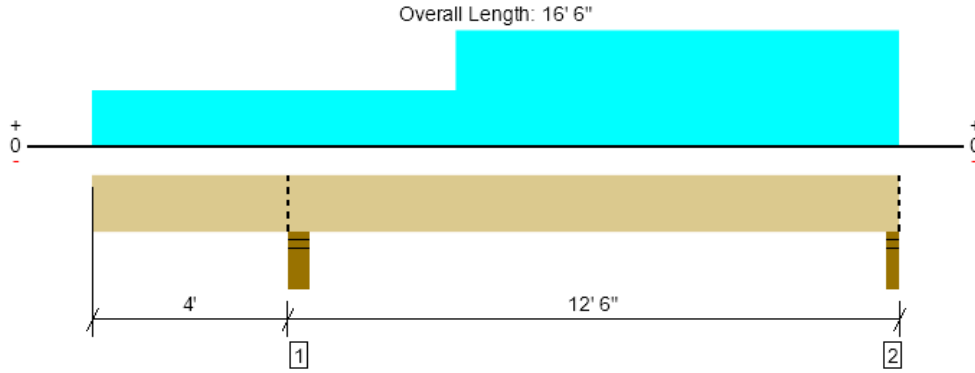
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Upper Floor Framing, 14 - Beam
1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	3911 @ 16' 4 1/2"	4253 (3.00")	Passed (92%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	3142 @ 15' 4 1/2"	7466	Passed (42%)	1.15	1.0 D + 1.0 S (Alt Spans)
Pos Moment (Ft-lbs)	10704 @ 10' 9 3/8"	14792	Passed (72%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-2978 @ 4' 2 3/4"	11402	Passed (26%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.262 @ 10' 5 3/16"	0.304	Passed (L/557)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.450 @ 10' 5 5/8"	0.607	Passed (L/324)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 16' 6"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Upward deflection on left cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 5 3/4".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 5' 1 11/16".
- Upward deflection on left cantilever exceeds 0.4".
- 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	Factored	
1 - Stud wall - HF	5.50"	5.50"	3.41"	2141	2687	4828	Blocking
2 - Stud wall - HF	3.00"	3.00"	2.76"	1687	2224	3911	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)	16' 6" o/c	
Bottom Edge (Lu)	16' 6" 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 16' 6"	N/A	8.9	--	
1 - Uniform (PSF)	0 to 7' 5 1/4" (Front)	7' 4 3/8"	19.0	25.0	Default Load
2 - Uniform (PSF)	7' 5 1/4" to 16' 6" (Front)	15' 4"	19.0	25.0	Default Load

Weyerhaeuser Notes

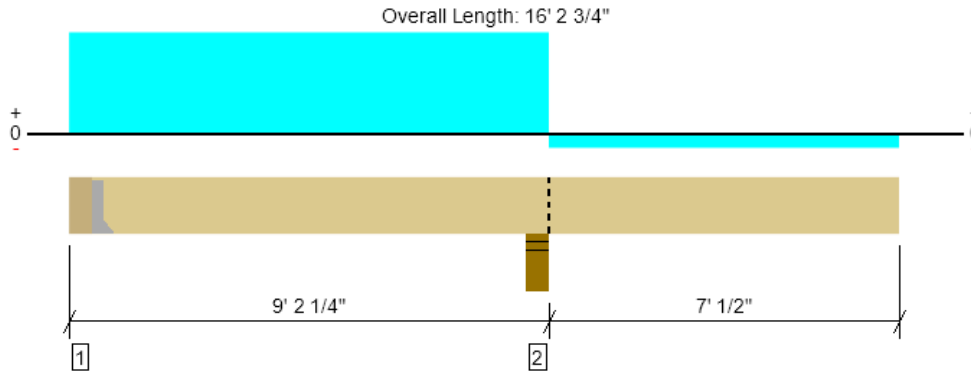
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Upper Floor Framing, 15 - Beam
1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	4826 @ 8' 11 1/2"	7796 (5.50")	Passed (62%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2158 @ 7' 10 1/4"	7466	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	3683 @ 8' 11 1/2"	15435	Passed (24%)	1.60	0.6 D + 0.6 W (All Spans)
Neg Moment (Ft-lbs)	-8102 @ 8' 11 1/2"	8552	Passed (95%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.484 @ 16' 2 3/4"	0.485	Passed (2L/360)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.633 @ 16' 2 3/4"	0.727	Passed (2L/276)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 15' 9 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Upward deflection on right cantilever exceeds overhang deflection criteria.
- Right 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.
- Moment capacity over cantilever support 2 has been reduced by 25% to lessen the effects of buckling.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 15' 9 1/4".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 12' 3".
- Upward deflection on right cantilever exceeds 0.4".
- 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	Wind	Factored	
1 - Hanger on 10 1/2" PSL beam	5.50"	Hanger ¹	1.50"	506	670/-112	937/-796	1176/-174	See note ¹
2 - Stud wall - HF	5.50"	5.50"	3.40"	1717	3109	-4071	4826/-1412	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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	15' 9" o/c	
Bottom Edge (Lu)	15' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

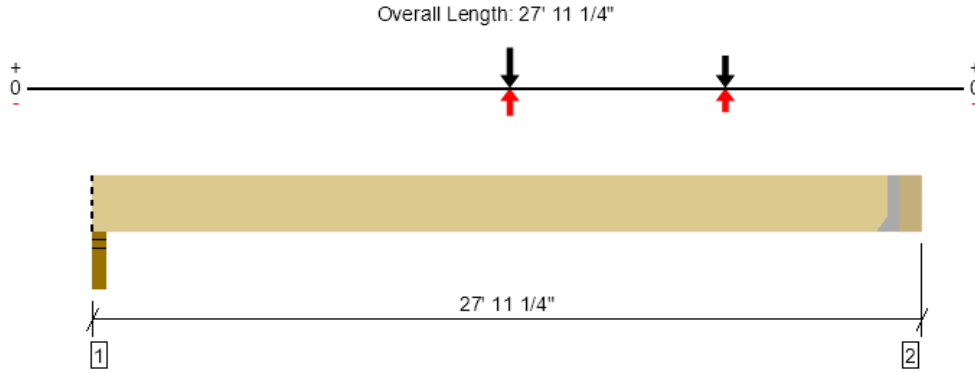
Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS48	2.00"	N/A	6-10dx1.5	4-10d	

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

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



Upper Floor Framing, 16 - Beam
1 piece(s) 5 1/4" x 14" 2.2E Parallam® PSL



Drawing is Conceptual. 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)	2518 @ 27' 5 3/4"	4922 (1.50")	Passed (51%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2491 @ 26' 3 3/4"	16342	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	20851 @ 14' 5 1/2"	46854	Passed (45%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.482 @ 14' 5 1/2"	1.366	Passed (L/680)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.960 @ 14' 5 1/2"	1.821	Passed (L/341)	--	1.0 D + 1.0 S (All Spans)

Member Length : 27' 5 3/4"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Snow	Wind	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	883	744	-592	1627	Blocking
2 - Hanger on 14" GLB beam	5.50"	Hanger ¹	1.50"	1266	1252	-996	2518	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	27' 6" o/c	
Bottom Edge (Lu)	27' 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	HU612	2.50"	N/A	22-10dx1.5	8-10d	

- 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)	Wind (1.60)	Comments
0 - Self Weight (PLF)	0 to 27' 5 3/4"	N/A	23.0	--	--	
1 - Point (lb)	14' 5 1/2" (Front)	N/A	919	1209	-962	Default Load
2 - Point (lb)	21' 8" (Front)	N/A	599	787	-626	Default Load

Weyerhaeuser Notes

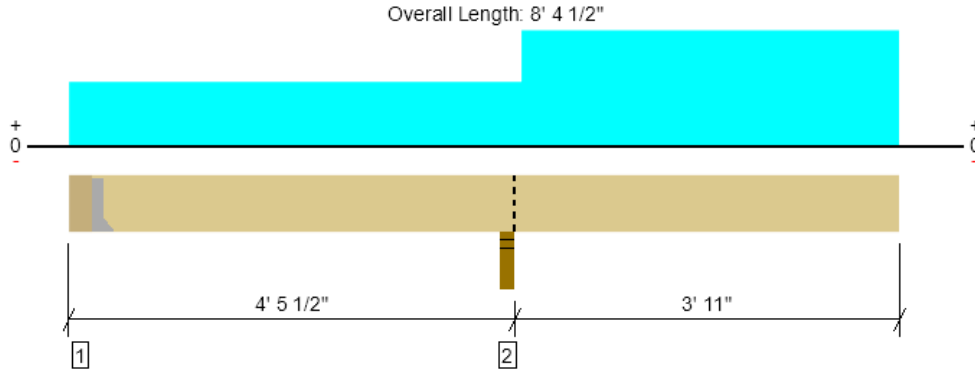
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Upper Floor Framing, 18 - Beam
2 piece(s) 2 x 10 HF No.2



Drawing is Conceptual. 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)	1414 @ 4' 3 3/4"	4253 (3.50")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	615 @ 5' 2 3/4"	2775	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1613 @ 4' 3 3/4"	3333	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.075 @ 8' 4 1/2"	0.203	Passed (2L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.099 @ 8' 4 1/2"	0.406	Passed (2L/982)	--	1.0 D + 1.0 L (All Spans)

Member Length : 7' 11"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Right 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.
- -311 lbs uplift at support located at 5 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	Factored	
1 - Hanger on 9 1/4" PSL beam	5.50"	Hanger ¹	1.50"	-37	191/-274	153/-311	See note ¹
2 - Stud wall - HF	3.50"	3.50"	1.50"	370	1044	1414	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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 11" o/c	
Bottom Edge (Lu)	7' 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	LUS28-2	2.00"	N/A	6-10dx1.5	3-10d		

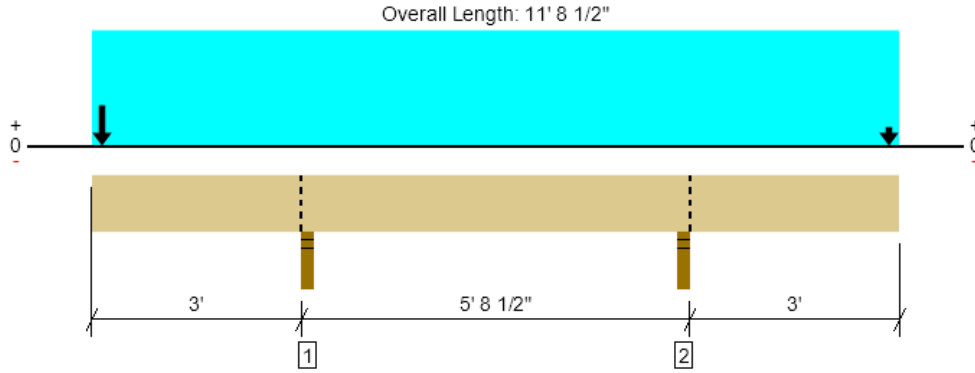
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	5 1/2" to 8' 4 1/2"	N/A	7.0	--	
1 - Uniform (PSF)	0 to 4' 5 1/2" (Front)	1' 4"	18.0	60.0	Default Load
2 - Uniform (PSF)	4' 5 1/2" to 8' 4 1/2" (Front)	2' 5"	18.0	60.0	Default Load

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



Upper Floor Framing, 19 - Beam
1 piece(s) 4 x 8 DF No.2



Drawing is Conceptual. 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)	1820 @ 3' 1 1/2"	4253 (3.00")	Passed (43%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	1114 @ 2' 4 3/4"	3502	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-3205 @ 3' 1 1/2"	3438	Passed (93%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.158 @ 0	0.313	Passed (2L/474)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.278 @ 0	0.417	Passed (2L/270)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 11' 8 1/2"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
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.
- Right 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.
- -237 lbs uplift at support located at 8' 7". 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	Factored	
1 - Stud wall - HF	3.00"	3.00"	1.50"	801	1020	1820	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	-53	58/-185	5/-237	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)	11' 9" o/c	
Bottom Edge (Lu)	11' 9" 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 11' 8 1/2"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 11' 8 1/2" (Front)	1'	19.0	25.0	Default Load
2 - Point (lb)	1 3/4" (Front)	N/A	429	564	
3 - Point (lb)	11' 6 3/4" (Front)	N/A	21	35	

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

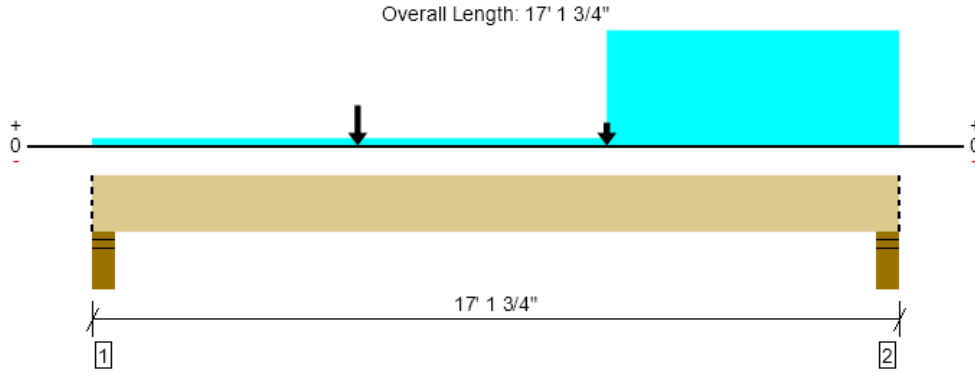
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



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ForteWEB v3.7, Engine: V8.4.0.40, Data: V8.1.5.0

File Name: Biggs Residence

Main Floor Framing, 20 - Beam
 1 piece(s) 6 3/4" x 15" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	10211 @ 16' 9 3/4"	15036 (5.50")	Passed (68%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	8732 @ 1' 8 1/2"	20571	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	46112 @ 5' 7 3/4"	56747	Passed (81%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.345 @ 8' 4 11/16"	0.412	Passed (L/573)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.637 @ 8' 5"	0.824	Passed (L/310)	--	1.0 D + 1.0 S (All Spans)

Member Length : 17' 1 3/4"
 System : Floor
 Member Type : Flush Beam
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.97 that was calculated using length L = 16' 5 3/4".
- 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	Snow	Factored	
1 - Stud wall - HF	5.50"	5.50"	3.22"	4042	457	4759	8801	Blocking
2 - Stud wall - HF	5.50"	5.50"	3.74"	4824	457	5387	10211	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' 2" o/c	
Bottom Edge (Lu)	17' 2" 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 17' 1 3/4"	N/A	24.6	--	--	
1 - Uniform (PSF)	0 to 17' 1 3/4" (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Point (lb)	5' 7 3/4" (Front)	N/A	4159	-	5473	
3 - Point (lb)	10' 11 1/4" (Front)	N/A	1062	-	1395	
4 - Uniform (PLF)	10' 11 1/4" to 17' 1 3/4" (Front)	N/A	475.0	-	528.0	

Weyerhaeuser Notes

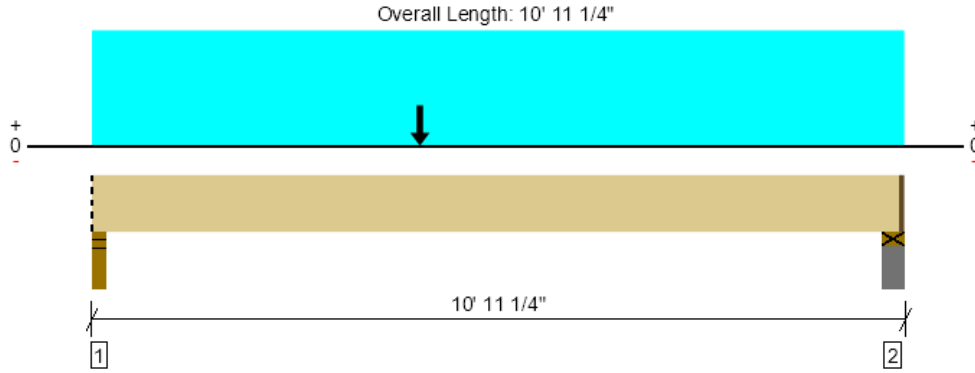
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Main Floor Framing, 23 - Beam
1 piece(s) 7" x 9 1/2" 2.2E Parallam® PSL



Drawing is Conceptual. 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)	7226 @ 2"	9923 (3.50")	Passed (73%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	7186 @ 1' 1"	14785	Passed (49%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	30352 @ 4' 5"	30031	Passed (101%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.263 @ 5' 1 7/8"	0.261	Passed (L/476)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.472 @ 5' 1 15/16"	0.522	Passed (L/265)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 10"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- 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	Factored	
1 - Stud wall - HF	3.50"	3.50"	2.55"	3233	287	3993	7226	Blocking
2 - Plate on concrete - HF	5.50"	4.25"	1.77"	2286	296	2743	5029	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6" o/c	
Bottom Edge (Lu)	10' 10" 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 10' 10"	N/A	20.8	--	--	
1 - Uniform (PSF)	0 to 10' 11 1/4" (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Point (lb)	4' 5" (Front)	N/A	5119	-	6736	

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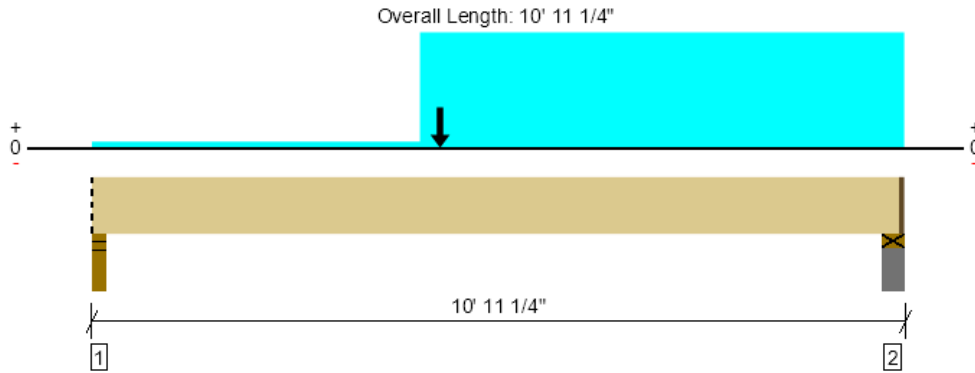
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@anneestructural.com	



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File Name: Biggs Residence

Main Floor Framing, 24 - Beam
 1 piece(s) 7" x 9 1/2" 2.2E Parallam® PSL



Drawing is Conceptual. 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)	9014 @ 2"	9923 (3.50")	Passed (91%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	8974 @ 1' 1"	20571	Passed (44%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	40324 @ 4' 8 1/4"	41782	Passed (97%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.110 @ 5' 7 13/16"	0.261	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.219 @ 5' 7 11/16"	0.522	Passed (L/572)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 10"
 System : Floor
 Member Type : Flush Beam
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- 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	Factored	
1 - Stud wall - HF	3.50"	3.50"	3.18"	1254	287	1176	11085/-11085	9014/-7006	Blocking
2 - Plate on concrete - HF	5.50"	4.25"	3.42"	2902	296	3004	8469/-8469	9823/-4188	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 10" o/c	
Bottom Edge (Lu)	10' 10" 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 10' 10"	N/A	20.8	--	--	--	
1 - Uniform (PSF)	0 to 10' 11 1/4" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Uniform (PLF)	4' 5" to 10' 11 1/4" (Front)	N/A	576.0	-	641.0	-	
3 - Point (lb)	4' 8 1/4" (Front)	N/A	-	-	-	19554	

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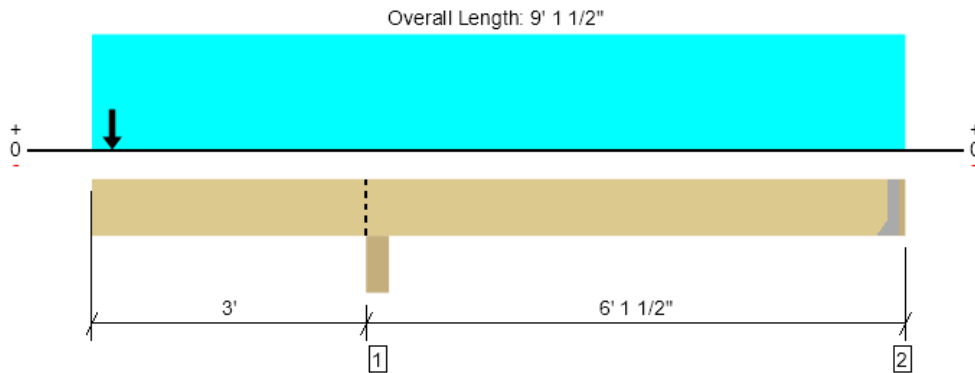
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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



Main Floor Framing, 29 - Beam
1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	4770 @ 3' 2 3/4"	19663 (5.50")	Passed (24%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2987 @ 2' 3"	8745	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	0 @ N/A	N/A	Passed (N/A)	--	N/A
Neg Moment (Ft-lbs)	-8863 @ 3' 2 3/4"	11447	Passed (77%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.185 @ 0	0.200	Passed (2L/418)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.241 @ 0	0.323	Passed (2L/322)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 9'
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 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	Floor Live	Factored	
1 - Column - DF	5.50"	5.50"	1.50"	1166	3605	4770	Blocking
2 - Hanger on 9" HF Ledger	1.50"	Hanger ¹	1.50"	-292	120/-1168	-1460	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' o/c	
Bottom Edge (Lu)	9' 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	

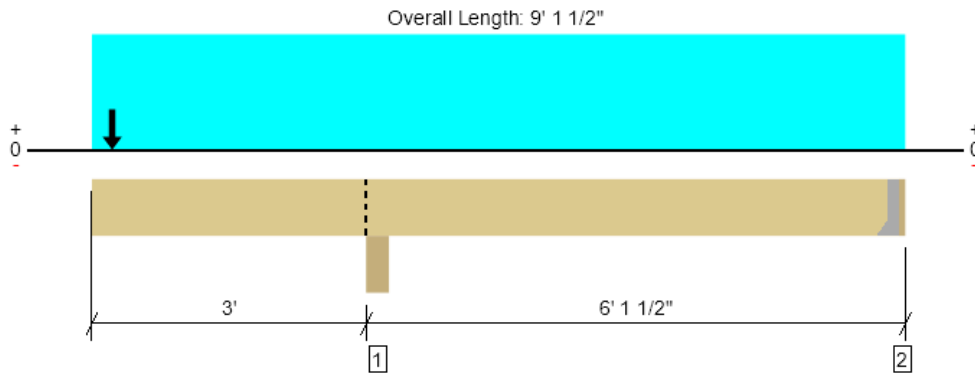
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 9'	N/A	12.0	--	
1 - Uniform (PSF)	0 to 9' 1 1/2" (Front)	1'	12.0	40.0	Default Load
2 - Point (lb)	2 3/4" (Front)	N/A	656	2187	

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



Main Floor Framing, 30 - Beam
1 piece(s) 5 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	7399 @ 3' 2 3/4"	19663 (5.50")	Passed (38%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4703 @ 2' 1 1/2"	10203	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	0 @ N/A	N/A	Passed (N/A)	--	N/A
Neg Moment (Ft-lbs)	-14033 @ 3' 2 3/4"	15580	Passed (90%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.185 @ 0	0.200	Passed (2L/418)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.241 @ 0	0.323	Passed (2L/322)	--	1.0 D + 1.0 L (All Spans)

Member Length : 9'
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 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	Floor Live	Factored	
1 - Column - DF	5.50"	5.50"	2.07"	1783	5615	7399	Blocking
2 - Hanger on 10 1/2" HF Ledger	1.50"	Hanger ¹	1.50"	-494	120/-1856	-2350	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' o/c	
Bottom Edge (Lu)	9' 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	

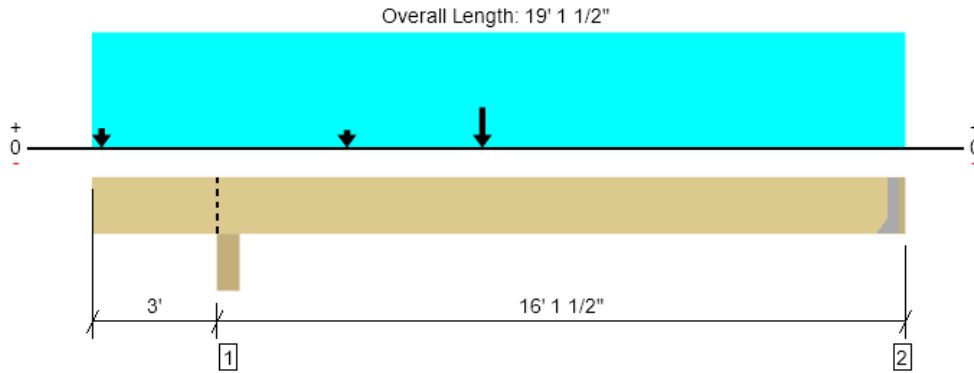
- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 9'	N/A	14.0	--	
1 - Uniform (PSF)	0 to 9' 1 1/2" (Front)	1'	12.0	40.0	Default Load
2 - Point (lb)	2 3/4" (Front)	N/A	1053	3510	

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



Main Floor Framing, 31 - Beam
 1 piece(s) 6 3/4" x 12" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	4944 @ 19'	6581 (1.50")	Passed (75%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Shear (lbs)	8163 @ 4' 5 1/2"	22896	Passed (36%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	45269 @ 9' 3"	51840	Passed (87%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Neg Moment (Ft-lbs)	-25059 @ 9' 3"	39265	Passed (64%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.262 @ 10' 7 3/4"	0.394	Passed (L/723)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.460 @ 10' 8 1/8"	0.789	Passed (L/412)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 19'
 System : Floor
 Member Type : Flush Beam
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 15' 7 1/4".
- Critical negative moment adjusted by a volume/size factor of 0.98 that was calculated using length L = 19'.
- 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	Snow	Seismic	Factored	
1 - Column - DF	5.50"	5.50"	2.24"	2463	4025	665	7327/-7327	9827/-3651	Blocking
2 - Hanger on 12" HF Ledger	1.50"	Hanger ¹	1.50"	1151	1486/-260	410	4525/-4525	4949/-2477	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	19' o/c	
Bottom Edge (Lu)	19' o/c	

•Maximum allowable bracing intervals based on applied load.

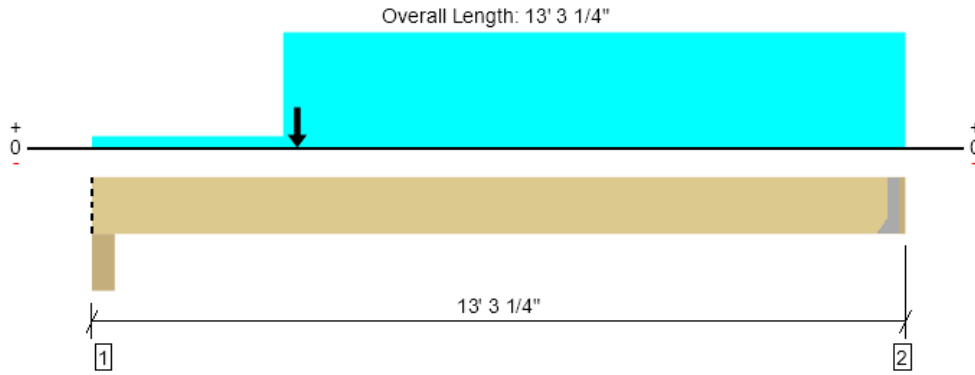
Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

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

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



Main Floor Framing, 32 - Beam
1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	3840 @ 13' 1 3/4"	3840 (1.69")	Passed (100%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	5116 @ 1' 4"	10388	Passed (49%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	15960 @ 4' 10"	20580	Passed (78%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Neg Moment (Ft-lbs)	-7054 @ 3' 4 1/2"	15864	Passed (44%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.219 @ 6' 7 11/16"	0.320	Passed (L/701)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.505 @ 6' 8 3/16"	0.641	Passed (L/304)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 13' 1 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 12' 9 3/4".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 10 5/16".
- 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	Snow	Seismic	Factored	
1 - Column - DF	5.50"	5.50"	2.28"	1510	748	949	4573/-4573	5184/-2295	Blocking
2 - Hanger on 10 1/2" HF Ledger	1.50"	Hanger ¹	1.69"	1824	410	1357	1423/-1423	3897	See note ¹

- 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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	13' 2" o/c	
Bottom Edge (Lu)	13' 2" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

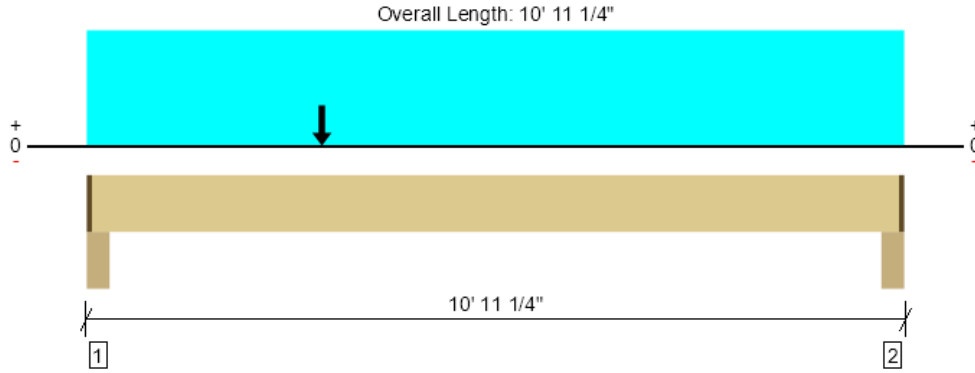
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

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

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



Main Floor Framing, 33 - Beam
1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	3399 @ 4"	9669 (4.25")	Passed (35%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2658 @ 1' 4"	6493	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	7795 @ 5' 3/8"	12863	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.136 @ 5' 3 15/16"	0.257	Passed (L/907)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.248 @ 5' 3 3/4"	0.514	Passed (L/496)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 10' 8 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 10' 3 1/4".
- 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	Snow	Factored	
1 - Column - DF	5.50"	4.25"	1.50"	1567	1759	741	3442	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.50"	1205	1759	279	2964	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 9" o/c	
Bottom Edge (Lu)	10' 9" 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)	1 1/4" to 10' 10"	N/A	8.9	--	--	
1 - Uniform (PSF)	0 to 10' 11 1/4" (Front)	8' 1/2"	12.0	40.0	-	Default Load
2 - Point (lb)	3' 1 3/4" (Front)	N/A	801	-	1020	
3 - Uniform (PLF)	0 to 10' 11 1/4" (Front)	N/A	75.0	-	-	

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

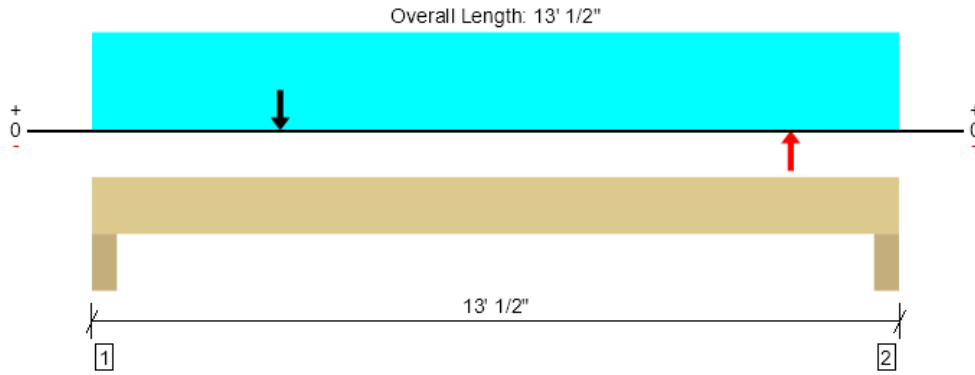
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@annestructural.com	



5/9/2024 8:30:28 PM UTC
ForteWEB v3.7, Engine: V8.4.0.40, Data: V8.1.5.0

File Name: Biggs Residence

Main Floor Framing, 35 - Header
 1 piece(s) 3 1/2" x 13 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	12214 @ 4 1/2"	13650 (6.00")	Passed (89%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10851 @ 1' 7 1/2"	13356	Passed (81%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	28779 @ 3' 1/2"	34020	Passed (85%)	1.60	1.0 D + 0.7 E (All Spans)
Neg Moment (Ft-lbs)	-21111 @ 3' 1/2"	26224	Passed (81%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.187 @ 6' 6 5/16"	0.410	Passed (L/789)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.335 @ 6' 6 5/16"	0.615	Passed (L/440)	--	1.0 D + 1.0 L (All Spans)

Member Length : 13' 1/2"
 System : Wall
 Member Type : Header
 Building Use : Residential
 Building Code : IBC 2018
 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/size factor of 1.00 that was calculated using length L = 9' 3 1/2".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 2 1/8".
- 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	Snow	Seismic	Factored	
1 - Trimmer - HF	6.00"	6.00"	5.37"	2435	3065	978	12850/- 12850	12214/- 7534	None
2 - Trimmer - HF	6.00"	6.00"	5.37"	2435	3065	978	12850/- 12850	12214/- 7534	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 8" o/c	
Bottom Edge (Lu)	13' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 13' 1/2"	N/A	11.5	--	--	--	
1 - Uniform (PLF)	0 to 13' 1/2"	N/A	362.0	470.0	150.0	-	Default Load
2 - Point (lb)	3' 1/2"	N/A	-	-	-	19145	
3 - Point (lb)	11' 3 1/2"	N/A	-	-	-	-19145	

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

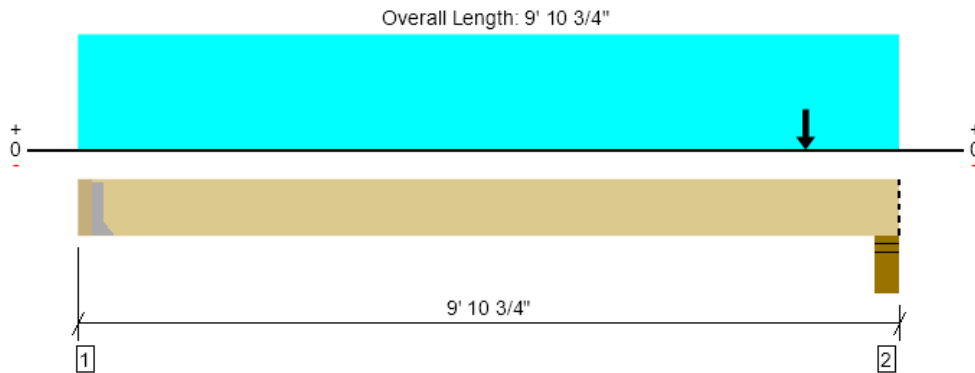
ForteWEB Software Operator	Job Notes
Mike Annee Annee Structural Engineering LLC (206) 658-5169 mike@annestructural.com	



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 ForteWEB v3.7, Engine: V8.4.0.40, Data: V8.1.5.0

File Name: Biggs Residence

Main Floor Framing, 36 - Beam
1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	4715 @ 3 3/8"	5363 (1.50")	Passed (88%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	11978 @ 8' 7 3/4"	13992	Passed (86%)	1.60	1.0 D + 0.7 E (All Spans)
Pos Moment (Ft-lbs)	9007 @ 4' 10 13/16"	14850	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-8736 @ 8' 9"	18315	Passed (48%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.128 @ 4' 10 3/4"	0.231	Passed (L/865)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.230 @ 4' 10 3/4"	0.462	Passed (L/482)	--	1.0 D + 1.0 L (All Spans)

Member Length : 9' 7 3/8"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 9' 2 7/8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 9' 2 7/8".
- 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	Snow	Seismic	Factored	
1 - Hanger on 9" GLB beam	3.38"	Hanger ¹	1.50"	1830	2303	735	1597/-1597	4947/-20	See note ¹
2 - Stud wall - DF	6.00"	6.00"	4.12"	1868	2348	749	17548/-17548	14152/-11163	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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 7" o/c	
Bottom Edge (Lu)	9' 7" 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	HGUS5.50/8	4.00"	N/A	36-10d	12-10d	

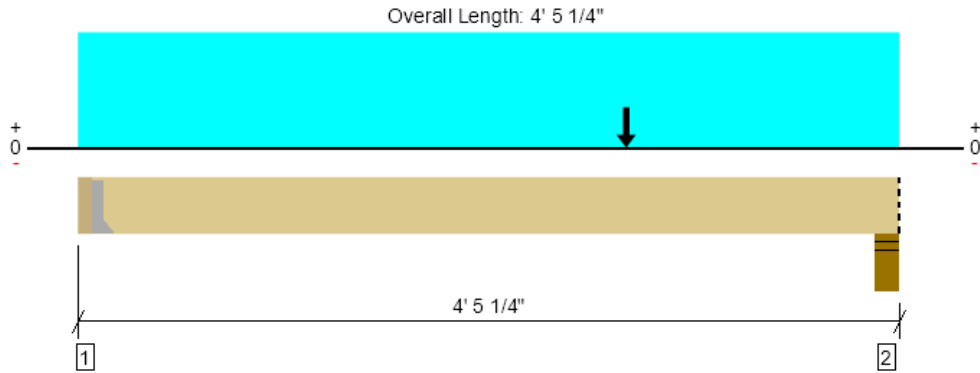
• Refer to manufacturer notes and instructions for proper installation and use of all connectors.

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 3/8" to 9' 10 3/4"	N/A	12.0	--	--	--	
1 - Uniform (PLF)	0 to 9' 10 3/4" (Front)	N/A	362.0	470.0	150.0	-	Default Load
2 - Point (lb)	8' 9" (Front)	N/A	-	-	-	19145	

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



Main Floor Framing, 37 - Beam
1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	4592 @ 3 3/8"	5363 (1.50")	Passed (86%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	9739 @ 3' 2 1/4"	13992	Passed (70%)	1.60	1.0 D + 0.7 E (All Spans)
Pos Moment (Ft-lbs)	11069 @ 2' 11 1/4"	23760	Passed (47%)	1.60	1.0 D + 0.7 E (All Spans)
Neg Moment (Ft-lbs)	-10304 @ 2' 11 1/4"	18315	Passed (56%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.003 @ 2' 2 3/16"	0.095	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.005 @ 2' 2 3/16"	0.189	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 4' 1 7/8"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 9 3/8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 9 3/8".
- 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	Snow	Seismic	Factored	
1 - Hanger on 9" GLB beam	3.38"	Hanger ¹	1.50"	692	630	326	5696/- 5696	4679/-3572	See note ¹
2 - Stud wall - HF	6.00"	6.00"	4.55"	725	657	340	13449/- 13449	10139/- 8979	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
- ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 2" o/c	
Bottom Edge (Lu)	4' 2" 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	HGUS5.50/10	4.00"	N/A	46-16d	16-16d	

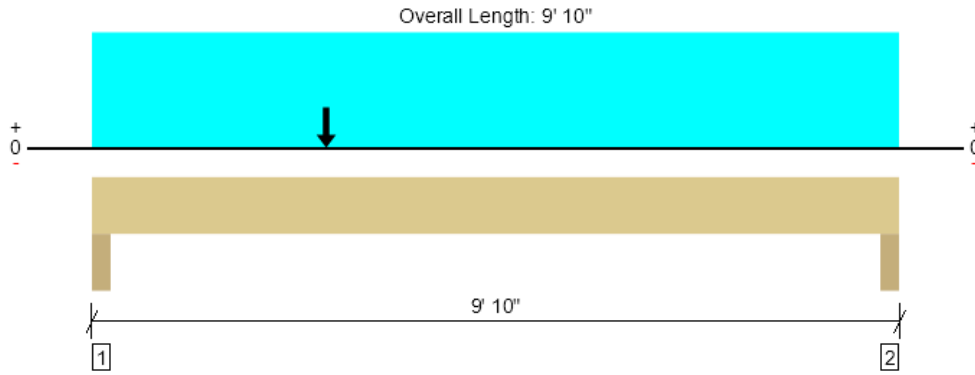
• Refer to manufacturer notes and instructions for proper installation and use of all connectors.

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 3/8" to 4' 5 1/4"	N/A	12.0	--	--	--	
1 - Uniform (PLF)	0 to 4' 5 1/4" (Front)	N/A	308.0	290.0	150.0	-	Default Load
2 - Point (lb)	2' 11 1/4" (Front)	N/A	-	-	-	19145	

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



Main Floor Framing, 38 - Header
 1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. 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)	6384 @ 3"	10238 (4.50")	Passed (62%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	4494 @ 1' 3"	6493	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	11516 @ 3' 10 1/2"	12863	Passed (90%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-3757 @ 2' 10 1/4"	15864	Passed (24%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.205 @ 4' 9 9/16"	0.311	Passed (L/547)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.294 @ 4' 9 3/16"	0.467	Passed (L/380)	--	1.0 D + 1.0 L (All Spans)

Member Length : 9' 10"
 System : Wall
 Member Type : Header
 Building Use : Residential
 Building Code : IBC 2018
 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/size factor of 1.00 that was calculated using length L = 9' 4".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 9' 4".
- 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	Snow	Seismic	Factored	
1 - Trimmer - HF	4.50"	4.50"	2.81"	1666	3712	296	3262/-3262	6384/-1284	None
2 - Trimmer - HF	4.50"	4.50"	1.85"	1157	3055	114	1263/-1263	4213/-189	None

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 9' 10"	N/A	8.9	--	--	--	
1 - Uniform (PSF)	0 to 9' 10"	13' 5 1/8"	12.0	40.0	-	-	Default Load
2 - Point (lb)	2' 10 1/4"	N/A	1151	1486	410	4525	

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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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**Compressive Member Design Guide
Doug Fir No. 2 4x Posts**

$E' = 1.6E+06$ psi $F_c = 1350$ psi $F_{c\perp} = 625$ psi

height (feet)						8	9	10	11	12	13	14	18
height (in.)						96	108	120	132	144	156	168	216
Column	d (in.)	area (sq.in.)	C_D	C_F	P_L (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)
4 X 4	3.5	12.25	1.00	1.15	7656	7664	6320	5261	4430	3772	3245	2819	1735
4 X 6	3.5	19.25	1.00	1.10	12031	11627	9561	7946	6683	5686	4890	4246	2610
4 X 8	3.5	25.38	1.00	1.05	15863	14766	12110	10048	8441	7176	6168	5354	3289
4 X 10	3.5	32.38	1.00	1.00	20238	18101	14806	12265	10293	8744	7512	6517	4000

$F_{ce} = 638.021$ 504.115 408.333 337.466 283.5648 241.6174 208.3333 126.0288

**Compressive Member Design Guide
Douglas Fir No 1: (6X Posts**

$E' = 1.6E+06$ psi $F_c = 1000$ psi $F_{c\perp} = 625$ psi

height (feet)						8	9	10	11	12	13	14	18
height (in.)						96	108	120	132	144	156	168	216
Column	d (in.)	area (sq.in.)	C_D	C_F	P_L (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)
6X6	5.5	30.25	1.00	1.00	18906	24841	23015	20989	18906	16902	15061	13421	8710
6X8	5.5	41.25	1.00	1.00	25781	33874	31384	28621	25781	23048	20538	18302	11877
6X10	5.5	52.25	1.00	1.00	32656	42908	39753	36253	32656	29194	26015	23183	15044

$F_{ce} = 1575.52$ 1244.86 1008.33 833.333 700.2315 596.6469 514.4558 311.214

**Compressive Member Design Guide
PSL Posts**

$E' = 2.0E+06$ psi $F_c = 2900$ psi $F_{c\perp} = 750$ psi

height (feet)						8	9	10	11	12	13	14	18
height (in.)						96	108	120	132	144	156	168	216
Column	d (in.)	area (sq.in.)	C_D	C_F	P_L (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)	Pmax (lbs.)
5.25X5.25	5.25	27.56	1.00	1.00	17225	40889	34029	28494	24081	20556	17719	15412	9512
7X7	7	49.00	1.00	1.00	30625	72697	60502	50660	42814	36548	31503	27402	16911

$F_{ce} = 1794.43$ 1417.82 1148.44 949.122 797.526 679.5488 585.9375 354.456

note: these tables do not account for lateral uniform loading (wind)

NDS 2018 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	12
Wind (psf)	0.0
Moment (ft.-lbs.)	0
Moment - Strong	0
Moment - Weak	0
Axial Load (plf)	14,152
Load/stud (lbs.)	14,152
Ke	1.0

# of members	1
Section Mark	3-1/2x7
Grade Mark	G
Axial Load (lbs.)	14,152
Moment Strong Axis (ft.-lbs.)	0
Moment Weak Axis (ft.-lbs.)	688
Load Duration Factor	1.60
Repetitive Factor Cr	1
Incised Lumber (Y/N)	N
Unbraced Length Strong Axis (ft.)	1.33
Unbraced Length Weak Axis (ft.)	8.17
Grade	1.8E PSL
Axial alone = fc/F^*c	0.61
Interaction Eq. Term 1	0.37
Interaction Eq. Term 2	0.00
Interaction Eq. Term 3	0.37
Total Interaction Eq.	0.75

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	3-1/2x7
1	3-1/2x7

Strong axis deflection - uniform load over simple span of 1.33' =	0.00	L / 0
Weak axis deflection - uniform load over simple span of 8.17' =	0.18	L / 534
Strong axis deflection - point load at center of 1.33' span =	0.00	L / 0
Weak axis deflection - point load at center of 8.17' span =	0.15	L / 667

Fbx (psi) = 2,654
 Fby (psi) = 2,400
 Fc (psi) = 2,500
 Ex (psi) = 1.80E+06
 Ex min (psi) = 9.30E+05
 Ey (psi) = 1.80E+06
 Ey min (psi) = 9.30E+05

fc = P/A (psi) = 577.6	AXIAL
F*c = Fc x Cd x Ci (psi) = 4000.0	
K*(le2/d2) = 28.0	OK
K*(le1/d1) = 2.3	OK
= 974.3	
F' = Fce/F*c = 0.244	
c = 0.9	
(1+F')/2c = 0.691	
Cp = 0.236	Column Stability Factor
F*c = F*c x Cp (psi) = 945.0	
fc/F*c = 0.611	
(fc/F*c)^2 = 0.37	Interaction Equation, 1st term

$fb1 = M/S$ (psi) = 0.0	STRONG AXIS BENDING
$Fb^* = Fb \times Cd \times Cr \times Ci$ (psi) = 4246.6	
$lu = 16.0$	in.
$le = 32.9$	in.
$Rb = \text{sq. rt.}(le \times d/b^2)$ 5.5	OK
$Fbe = 1.2 \times E'_{min}/Rb^2$ (psi) = 36655.4	OK
$F = Fbe/Fb^* = 8.632$	
$(1+F)/1.9 = 5.069$	
$CL = 0.994$	Beam Stability Factor
$F'b1$ (psi) = <u>4219.2</u>	
$fb1/F'b1 = \mathbf{0.000}$	
(psi) = 147056.8	OK
$1-(fc/Fce1) = 0.996$	
$fb1/[F'b1*(1-(fc/Fce2))] = \mathbf{0.00}$	Interaction Equation, 2nd term

$fb2 = M/S$ (psi) = 577.6	WEAK AXIS BENDING
$Fb^* = Fb \times Cd \times Cr \times Ci$ (psi) = 3840.0	
$Fbe = 1.2 \times E'_{min}/Rb^2$ (psi) = 36655.4	OK
$F = Fbe/Fb^* = 9.546$	
$(1+F)/1.9 = 5.550$	
$CL = 0.994$	Beam Stability factor
$F'b2$ (psi) = <u>3817.8</u>	
$fb2/F'b2 = \mathbf{0.151}$	
(psi) = 974.3	OK
$1-(fc/Fce2) = 0.407$	
$fb1/Fbe = 0.000$	
$fb2/[(F'b2)*(1-(fc/Fce2)-(fb1/Fbe)^2)] = \mathbf{0.37}$	Interaction Equation, 3rd term

Project Title:
Engineer:
Project ID:
Project Descr:

Project Information

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

Project Title :

Description :

I.D. :

Address : , ,

Project Leader :

Phone :

Fax :

eMail :

Project Notes

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall at Existing Exterior

Code Reference:

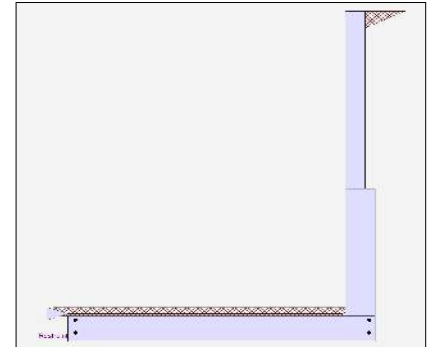
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load	=	238.0 lbs
Axial Live Load	=	215.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	8.000
(Multiplier used on soil density)		

Lateral Load Applied to Stem

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

Uniform Seismic Force	=	104.000
Total Seismic Force	=	1,352.000

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall at Existing Exterior

Design Summary

Wall Stability Ratios			
Overturning	=	1.50	OK
Slab Resists All Sliding !			
Global Stability	=	5.36	
Total Bearing Load	=	6,011 lbs	
...resultant ecc.	=	28.76 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,126 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,576 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	35.7 psi	OK
Footing Shear @ Heel	=	3.9 psi	OK
Allowable	=	75.0 psi	
Sliding Calcs			
Lateral Sliding Force	=	4,326.4 lbs	

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

Load Factors

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

Stem Construction

		2nd	Bottom
Design Height Above Ftc	ft =	Stem OK 5.00	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	SD	SD
Thickness	=	8.00	12.00
Rebar Size	=	# 4	# 6
Rebar Spacing	=	9.00	6.00
Rebar Placed at	=	Edge	Edge
Design Data			
fb/FB + fa/Fa	=	0.871	0.762
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	2,296.0	5,856.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	6,206.7	25,920.0
Moment.....Allowable	ft-# =	7,122.4	34,002.9
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	30.6	50.7
Shear.....Allowable	psi =	75.0	75.0
Anet (Masonry)	in2 =		
Wall Weight	psf =	100.0	150.0
Rebar Depth 'd'	in =	6.25	9.63

Masonry Data

f'm	psi =
Fs	psi =
Solid Grouting	=
Modular Ratio 'n'	=
Equiv. Solid Thick.	=
Masonry Block Type	=
Masonry Design Method	= ASD

Concrete Data

f'c	psi =	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall at Existing Exterior

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
2nd Stem		
As (based on applied moment) :	0.2325 in2/ft	
(4/3) * As :	0.3101 in2/ft	Min Stem T&S Reinf Area 1.344 in2
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.25 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2667 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in #6@ 55.00 in

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
Bottom Stem		
As (based on applied moment) :	0.6189 in2/ft	
(4/3) * As :	0.8253 in2/ft	Min Stem T&S Reinf Area 1.440 in2
200bd/fy : 200(12)(9.625)/60000 :	0.385 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.288 in2/ft
0.0018bh : 0.0018(12)(12) :	0.2592 in2/ft	Horizontal Reinforcing Options :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.6189 in2/ft	#4@ 8.33 in #4@ 16.67 in
Provided Area :	0.88 in2/ft	#5@ 12.92 in #5@ 25.83 in
Maximum Area :	1.3039 in2/ft	#6@ 18.33 in #6@ 36.67 in

Footing Data

Toe Width	=	9.25 ft
Heel Width	=	1.00
Total Footing Width	=	10.25
Footing Thickness	=	12.00 in
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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	1,576	0 psf
Mu' : Upward	=	42,064	0 ft-#
Mu' : Downward	=	13,348	0 ft-#
Mu: Design	=	28,716	118 ft-#
phiMn	=	30,055	OK - Flush
Actual 1-Way Shear	=	35.66	3.94 psi
Allow 1-Way Shear	=	75.00	40.00 psi
Toe Reinforcing	=	# 6 @ 6.00 in	
Heel Reinforcing	=	Flush heel condition. No reinforcing required.	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 3.07 in, #5@ 4.76 in, #6@ 6.76 in, #7@ 9.23 in, #8@ 12.15 in, #9@ 15.38 in, #10@ 19.53 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area	2.66	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
<u>If one layer of horizontal bars:</u>		<u>If two layers of horizontal bars:</u>
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Cantilevered Retaining Wall

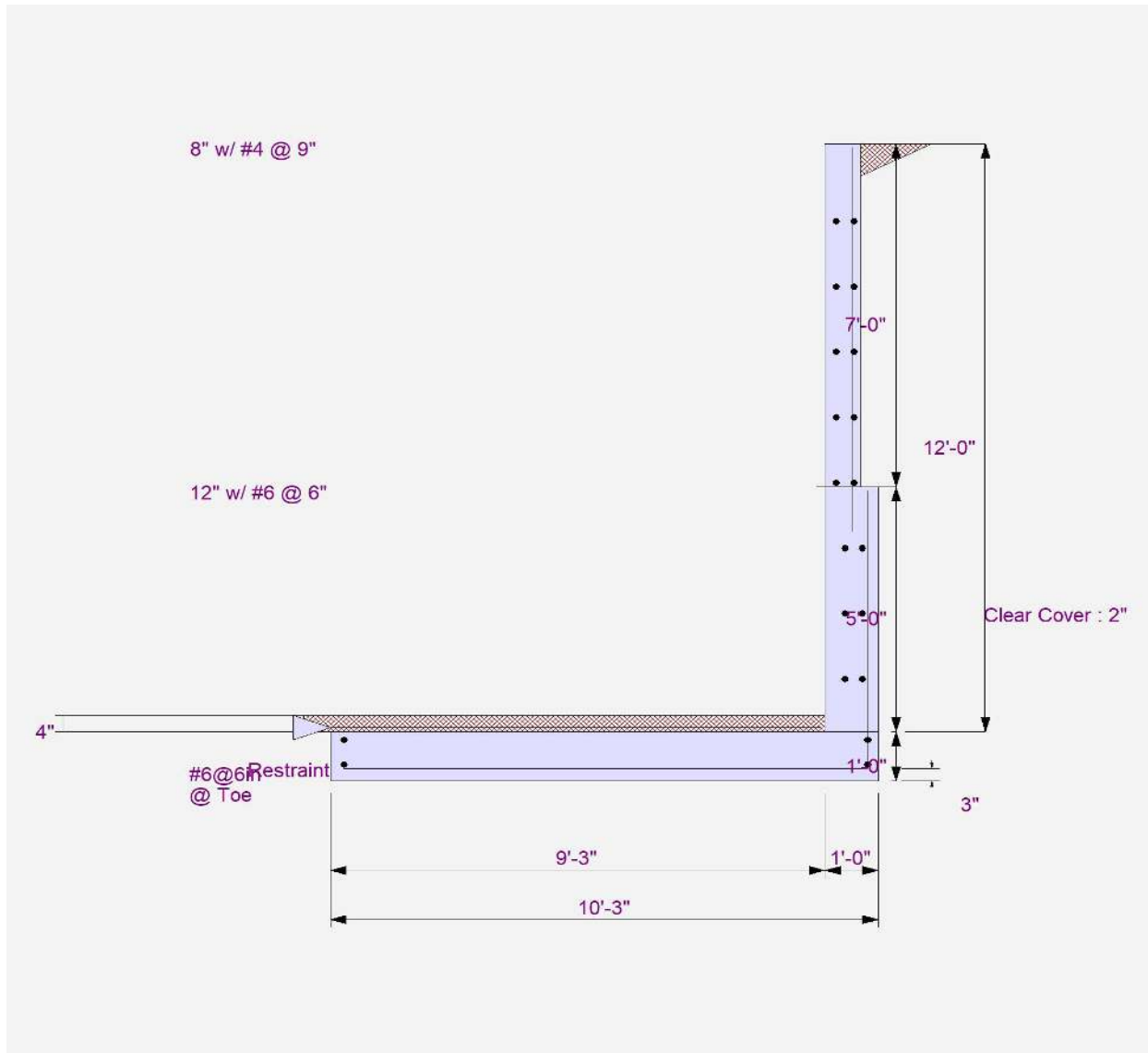
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall at Existing Exterior



Cantilevered Retaining Wall

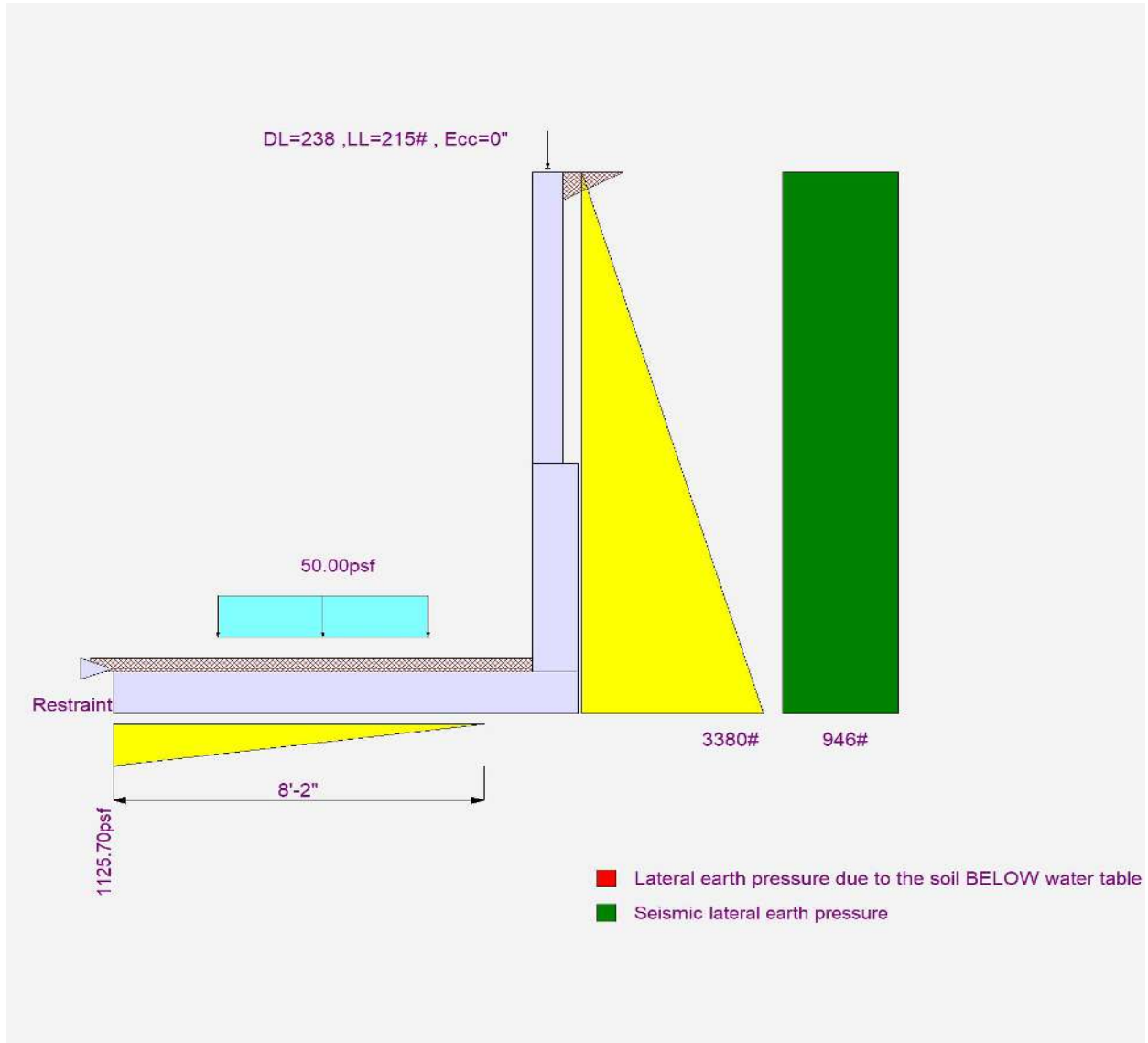
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall at Existing Exterior



Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 10'-0" Site Retaining Wall

Code Reference:

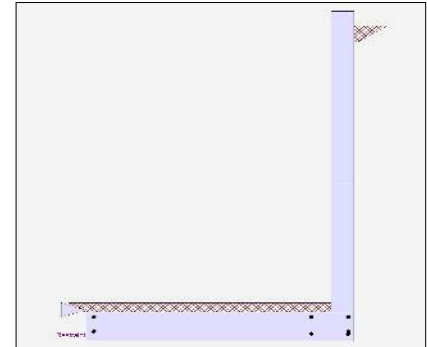
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

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

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 10'-0" Site Retaining Wall

Design Summary

Wall Stability Ratios			
Overturning	=	1.70	OK
Slab Resists All Sliding !			
Global Stability	=	16.31	
Total Bearing Load = 4,073 lbs			
...resultant ecc.	=	21.79 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	907 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,270 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	18.9 psi	OK
Footing Shear @ Heel	=	0.0 psi	OK
Allowable	=	75.0 psi	
Sliding Calcs			
Lateral Sliding Force	=	2,420.0 lbs	

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

Load Factors

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

Stem Construction

		2nd	Bottom
Design Height Above Ftc	ft =	Stem OK 4.50	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	SD	SD
Thickness	=	8.00	8.00
Rebar Size	=	# 4	# 5
Rebar Spacing	=	12.00	6.00
Rebar Placed at	=	Center	Edge
Design Data			
fb/FB + fa/Fa	=	0.523	0.700
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	968.0	3,200.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	1,774.7	10,666.7
Moment.....Allowable	ft-# =	3,387.6	15,222.0
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	20.2	43.1
Shear.....Allowable	psi =	75.0	75.0
Anet (Masonry)	in2 =		
Wall Weight	psf =	100.0	100.0
Rebar Depth 'd'	in =	4.00	6.19

Masonry Data

f'm	psi =
Fs	psi =
Solid Grouting	=
Modular Ratio 'n'	=
Equiv. Solid Thick.	=
Masonry Block Type	=
Masonry Design Method	= ASD

Concrete Data

f'c	psi =	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 10'-0" Site Retaining Wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
2nd Stem		
As (based on applied moment) :	0.1071 in2/ft	
(4/3) * As :	0.1428 in2/ft	Min Stem T&S Reinf Area 1.152 in2
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.5419 in2/ft	#6@ 27.50 in #6@ 55.00 in

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
Bottom Stem		
As (based on applied moment) :	0.4039 in2/ft	
(4/3) * As :	0.5385 in2/ft	Min Stem T&S Reinf Area 0.864 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.4039 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.62 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	7.25 ft
Heel Width	=	0.67
Total Footing Width	=	7.92
Footing Thickness	=	12.00 in

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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	1,270	0 psf
Mu' : Upward	=	20,839	0 ft-#
Mu' : Downward	=	8,200	0 ft-#
Mu: Design	=	12,639	0 ft-#
phiMn	=	22,203	OK - Flush
Actual 1-Way Shear	=	18.88	0.00 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 6.00 in	
Heel Reinforcing	=	Flush heel condition. No reinforcing required.	
Key Reinforcing	=	# 5 @ 14.00 in	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.99 in, #5@ 10.83 in, #6@ 15.37 in, #7@ 20.97 in, #8@ 27.61 in, #9@ 34.95 in, #10@ 44.39 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area	2.05	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
<u>If one layer of horizontal bars:</u>		<u>If two layers of horizontal bars:</u>
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 10'-0" Site Retaining Wall

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	2,420.0	3.67	8,873.3	Soil Over HL (ab. water tbl)	0.0	7.92	0.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		7.92	0.3
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =	314.2	3.63	1,138.9
				Surcharge Over Toe =	362.5	3.63	1,314.1
				Stem Weight(s) =	1,050.0	7.58	7,962.5
				Earth @ Stem Transitions =			
				Footing Weight =	1,187.5	3.96	4,700.6
				Key Weight =			
				Vert. Component =			
Total	= 2,420.0	O.T.M.	= 8,873.3	Total =	2,914.2 lbs	R.M.=	15,116.3
Resisting/Overturning Ratio		=	1.70	* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			
Vertical Loads used for Soil Pressure =		4,072.9 lbs					

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 200.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.042 in

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

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

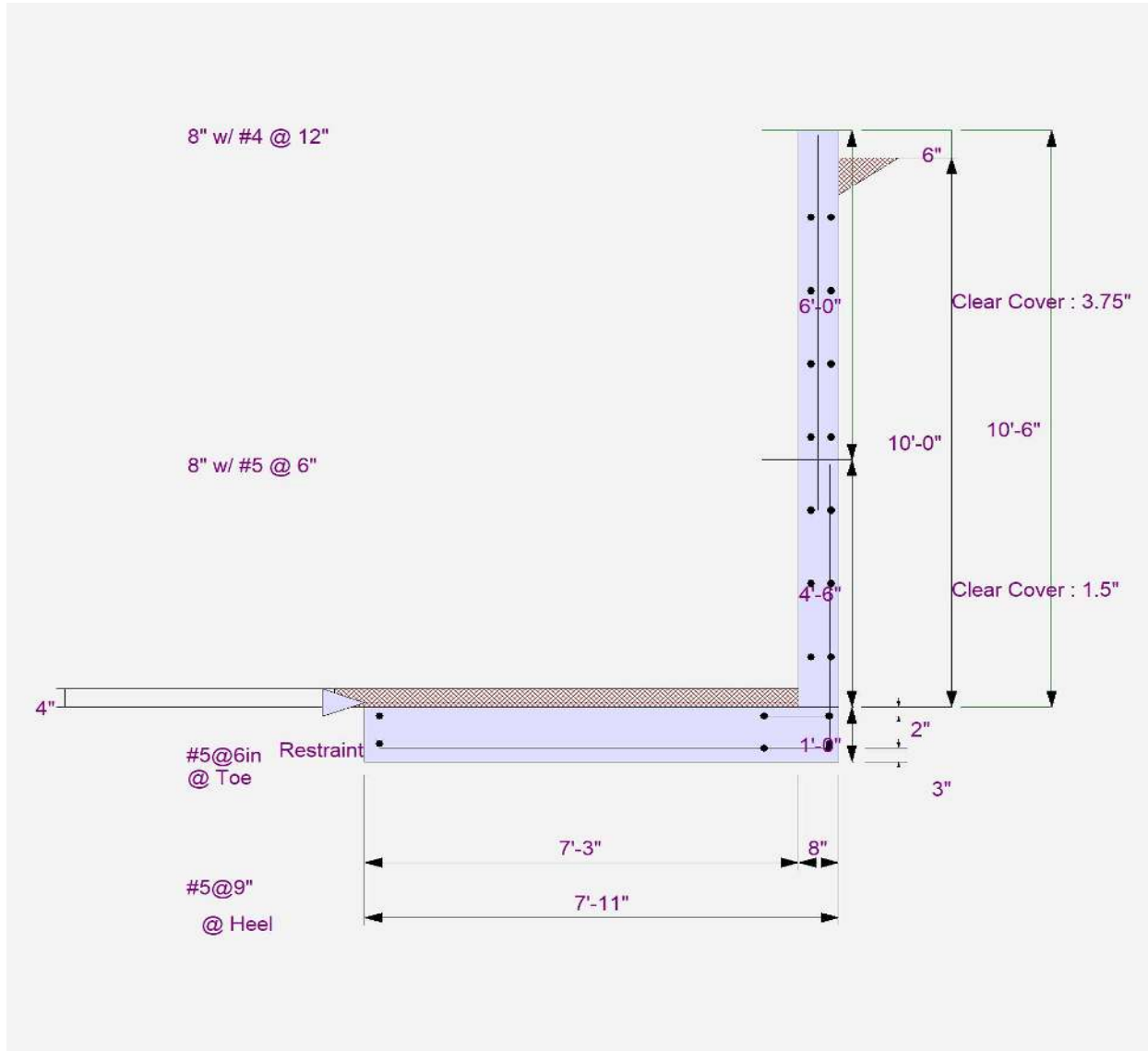
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 10'-0" Site Retaining Wall



Cantilevered Retaining Wall

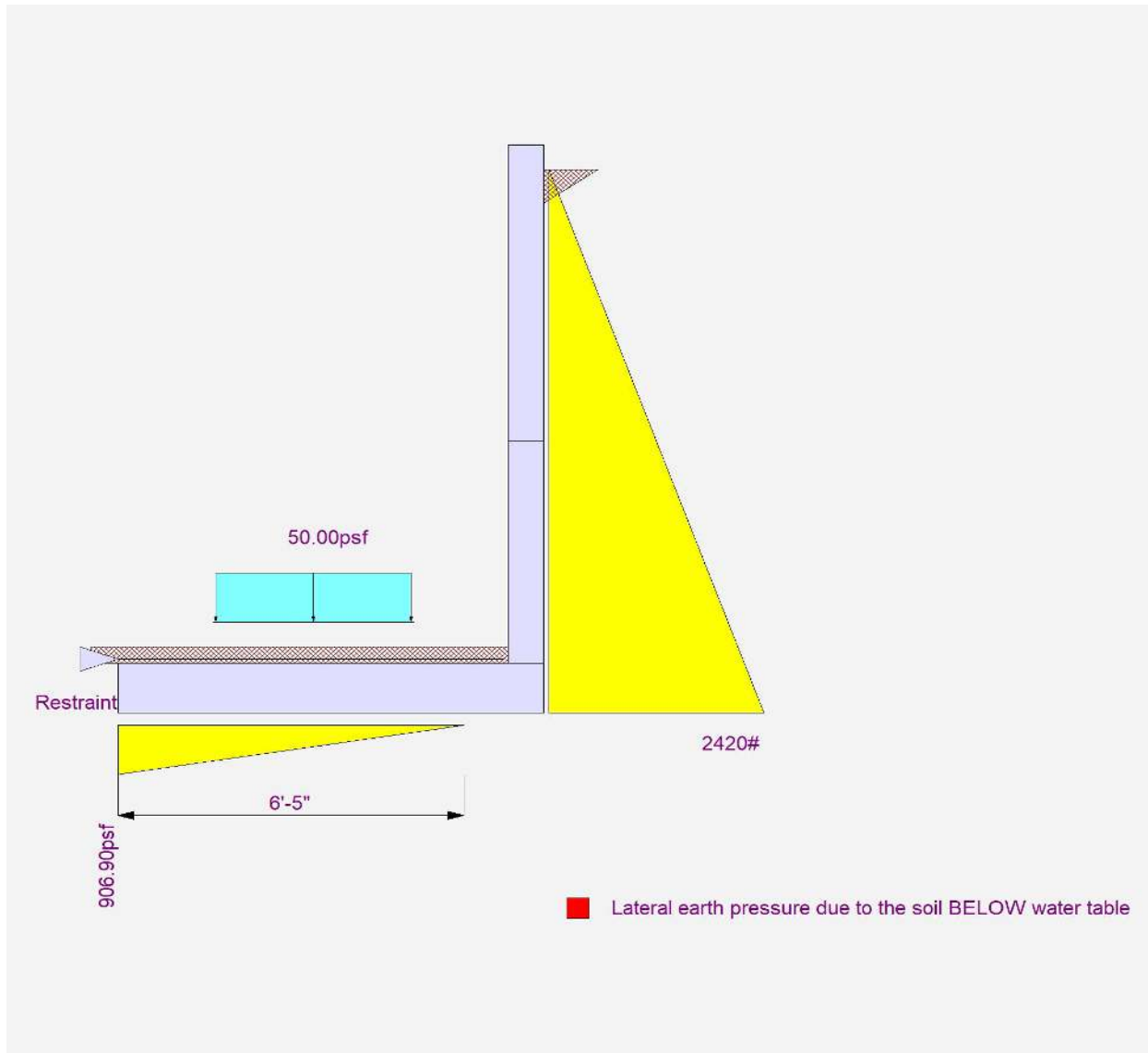
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 10'-0" Site Retaining Wall



Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 8'-0" Site Retaining Wall

Code Reference:

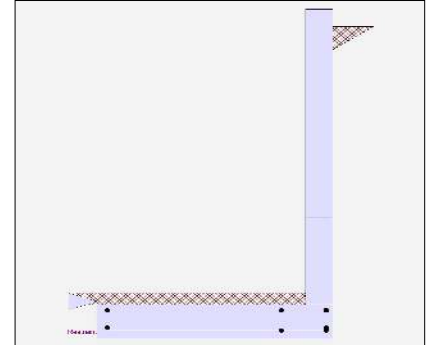
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	8.000
(Multiplier used on soil density)		

Lateral Load Applied to Stem

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

Uniform Seismic Force	=	72.000
Total Seismic Force	=	648.000

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 8'-0" Site Retaining Wall

Design Summary

Wall Stability Ratios

Overturning	=	1.20	Ratio < 1.5!
Slab Resists All Sliding !			
Global Stability	=	6.22	
Total Bearing Load = 2,963 lbs			
...resultant ecc.	=	26.88	in
Eccentricity outside middle third			
Soil Pressure @ Toe	=	2,297	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	2,500	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,216	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	15.9	psi OK
Footing Shear @ Heel	=	0.0	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	2,073.6	lbs
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Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

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

Stem Construction

		2nd	Bottom
Design Height Above Ftc	ft =	Stem OK 2.50	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	SD	SD
Thickness	=	8.00	8.00
Rebar Size	=	# 4	# 5
Rebar Spacing	=	12.00	10.00
Rebar Placed at	=	Center	Edge
Design Data			
fb/FB + fa/Fa	=	0.845	0.806
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	1,364.0	2,624.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	2,863.7	7,765.3
Moment.....Allowable	ft-# =	3,387.6	9,623.1
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	28.4	35.3
Shear.....Allowable	psi =	75.0	75.0
Anet (Masonry)	in2 =		
Wall Weight	psf =	100.0	100.0
Rebar Depth 'd'	in =	4.00	6.19

Masonry Data

f'm	psi =
Fs	psi =
Solid Grouting	=
Modular Ratio 'n'	=
Equiv. Solid Thick.	=
Masonry Block Type	=
Masonry Design Method	= ASD

Concrete Data

f'c	psi =	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 8'-0" Site Retaining Wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
2nd Stem		
As (based on applied moment) :	0.1729 in2/ft	
(4/3) * As :	0.2305 in2/ft	Min Stem T&S Reinf Area 1.152 in2
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.1729 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.5419 in2/ft	#6@ 27.50 in #6@ 55.00 in

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
Bottom Stem		
As (based on applied moment) :	0.294 in2/ft	
(4/3) * As :	0.392 in2/ft	Min Stem T&S Reinf Area 0.480 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.294 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.372 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	5.08 ft
Heel Width	=	0.67
Total Footing Width	=	5.75
Footing Thickness	=	12.00 in
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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	3,216	0 psf
Mu' : Upward	=	13,619	0 ft-#
Mu' : Downward	=	4,031	0 ft-#
Mu: Design	=	9,589	0 ft-#
phiMn	=	13,810	OK - Flush
Actual 1-Way Shear	=	15.89	0.00 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 10.00 in	
Heel Reinforcing	=	Flush heel condition. No reinforcing required.	
Key Reinforcing	=	# 5 @ 14.00 in	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 7.05 in, #5@ 10.94 in, #6@ 15.52 in, #7@ 21.17 in, #8@ 27.88 in, #9@ 35.29 in, #10@ 44.82 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area	1.49	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
<u>If one layer of horizontal bars:</u>		<u>If two layers of horizontal bars:</u>
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 8'-0" Site Retaining Wall

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,620.0	3.00	4,860.0	Soil Over HL (ab. water tbl)	0.0	5.75	0.2
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		5.75	0.2
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =	220.3	2.54	559.8
Seismic Earth Load =	453.6	4.50	2,041.2	Surcharge Over Toe =	254.2	2.54	645.9
=				Stem Weight(s) =	850.0	5.42	4,603.9
Total =	2,073.6	O.T.M. =	6,901.2	Earth @ Stem Transitions =			
				Footing Weight =	862.5	2.87	2,479.4
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio =			1.20	Total =	2,186.9 lbs	R.M.=	8,289.2
Vertical Loads used for Soil Pressure =		2,962.6 lbs					

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

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 200.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.118 in

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

Cantilevered Retaining Wall

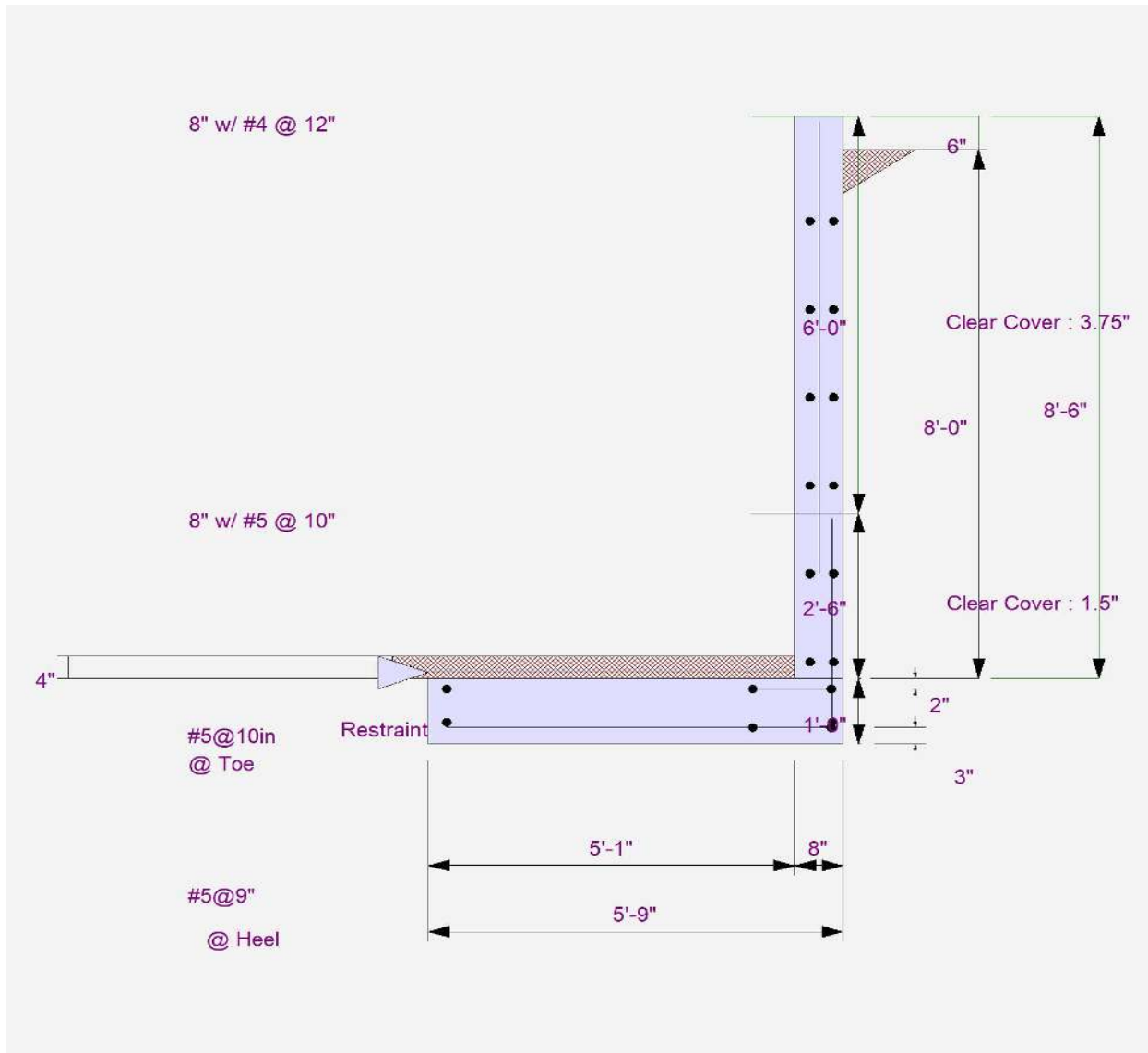
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 8'-0" Site Retaining Wall



Cantilevered Retaining Wall

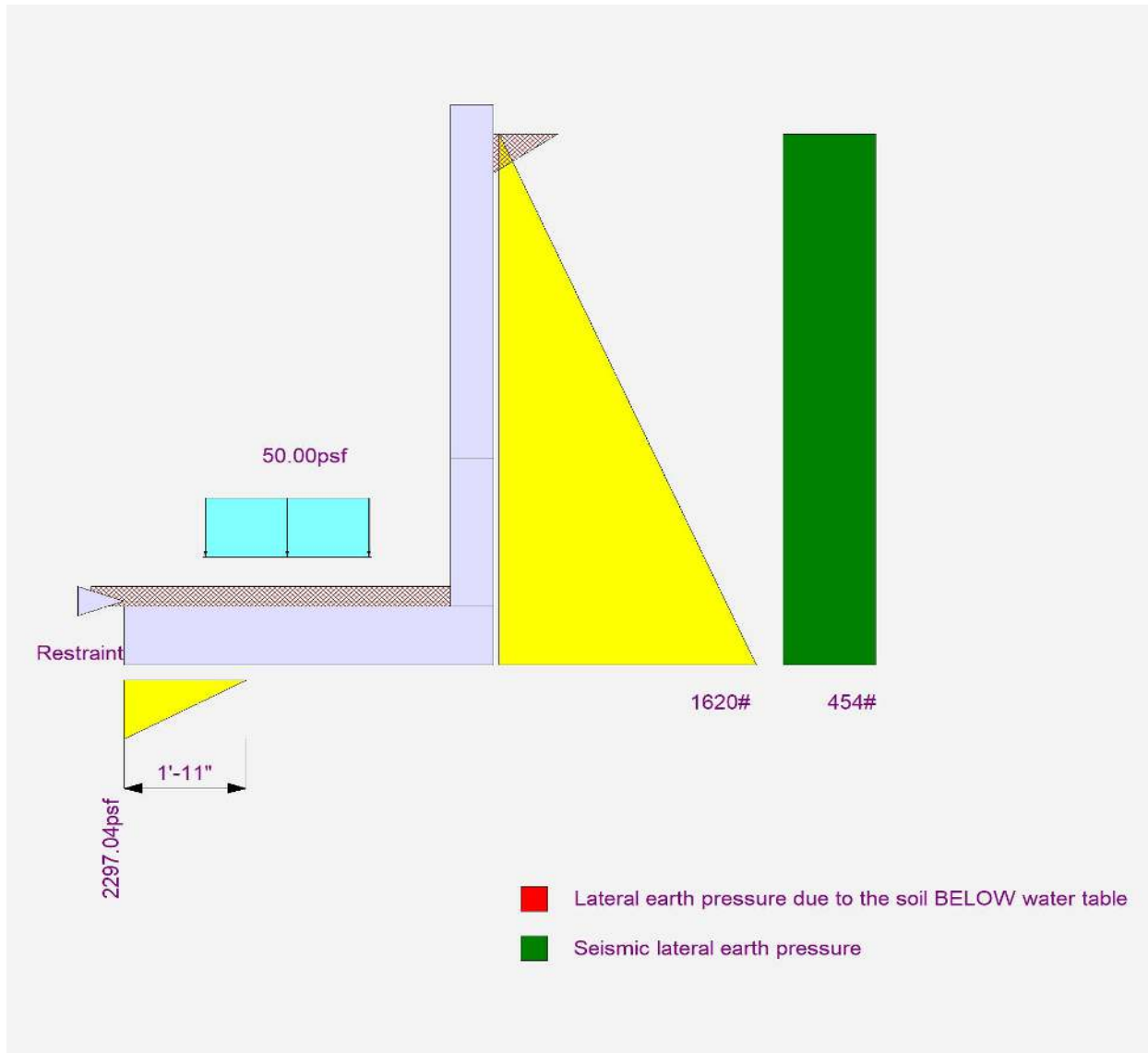
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 8'-0" Site Retaining Wall



Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 6'-0" Site Retaining Wall

Code Reference:

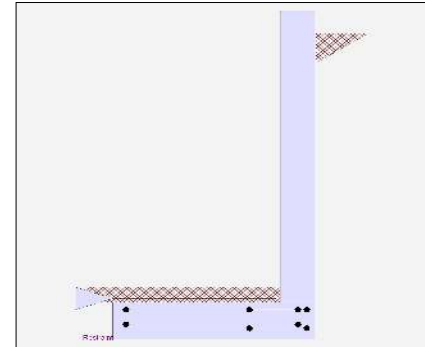
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

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

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 6'-0" Site Retaining Wall

Design Summary

Wall Stability Ratios

Overturning	=	1.72	OK
Slab Resists All Sliding !			
Global Stability	=	0.98	
Total Bearing Load	=	1,872	lbs
...resultant ecc.	=	10.08	in
Eccentricity outside middle third			
Soil Pressure @ Toe	=	882	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	2,500	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,235	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	14.6	psi OK
Footing Shear @ Heel	=	0.0	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	933.9	lbs
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Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
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 Ftc	ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete	
Design Method	=	SD	SD
Thickness	=	8.00	
Rebar Size	=	# 4	
Rebar Spacing	=	10.00	
Rebar Placed at	=	Center	

Design Data

fb/FB + fa/Fa	=	0.573
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,152.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	2,304.0

Moment.....Allowable	=	4,014.1
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Shear.....Actual

Service Level	psi =	
Strength Level	psi =	24.0

Shear.....Allowable	psi =	75.0
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Anet (Masonry)	in2 =	
----------------	-------	--

Wall Weight	psf =	100.0
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Rebar Depth 'd'	in =	4.00
-----------------	------	------

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 6'-0" Site Retaining Wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.1391 in2/ft		
(4/3) * As :	0.1854 in2/ft	Min Stem T&S Reinf Area 1.248 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.16 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.24 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.5419 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	3.17 ft
Heel Width	=	0.67
Total Footing Width	=	3.83
Footing Thickness	=	10.00 in

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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	1,235	0 psf
Mu' : Upward	=	4,169	0 ft-#
Mu' : Downward	=	1,414	0 ft-#
Mu: Design	=	2,755	0 ft-#
phiMn	=	6,985	OK - Flush
Actual 1-Way Shear	=	14.60	0.00 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 10.00 in	
Heel Reinforcing	=	Flush heel condition. No reinforcing required.	
Key Reinforcing	=	# 5 @ 14.00 in	
Footing Torsion, Tu	=	0.00 ft-lbs	
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs	

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

Other Acceptable Sizes & Spacings

Toe: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 55.55 in, #10@ 70.55 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area	0.83	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft

If one layer of horizontal bars:

#4@ 11.11 in
 #5@ 17.22 in
 #6@ 24.44 in

If two layers of horizontal bars:

#4@ 22.22 in
 #5@ 34.44 in
 #6@ 48.89 in

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 6'-0" Site Retaining Wall

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	933.9	2.28	2,127.2	Soil Over HL (ab. water tbl)	0.0	3.83	0.1
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.83	0.1
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =	137.2	1.58	217.3
				Surcharge Over Toe =	158.4	1.58	250.7
				Stem Weight(s) =	650.0	3.50	2,275.2
				Earth @ Stem Transitions =			
				Footing Weight =	479.2	1.92	918.6
				Key Weight =			
				Vert. Component =			
Total	= 933.9	O.T.M.	= 2,127.2	Total =	1,424.8 lbs	R.M.=	3,662.0
Resisting/Overturning Ratio		=	1.72	* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			
Vertical Loads used for Soil Pressure =		1,872.0 lbs					

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 200.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.052 in

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

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

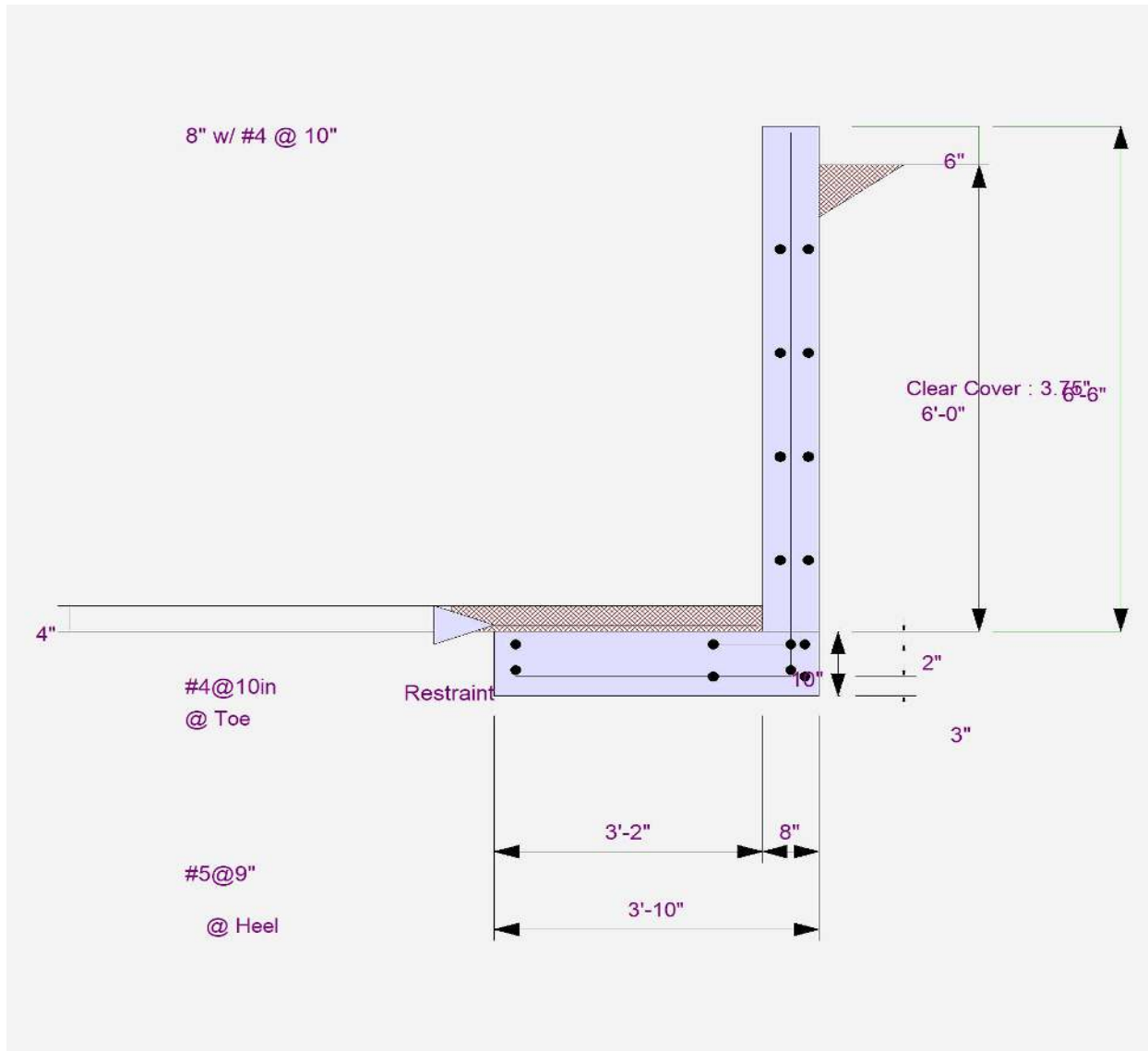
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 6'-0" Site Retaining Wall



Cantilevered Retaining Wall

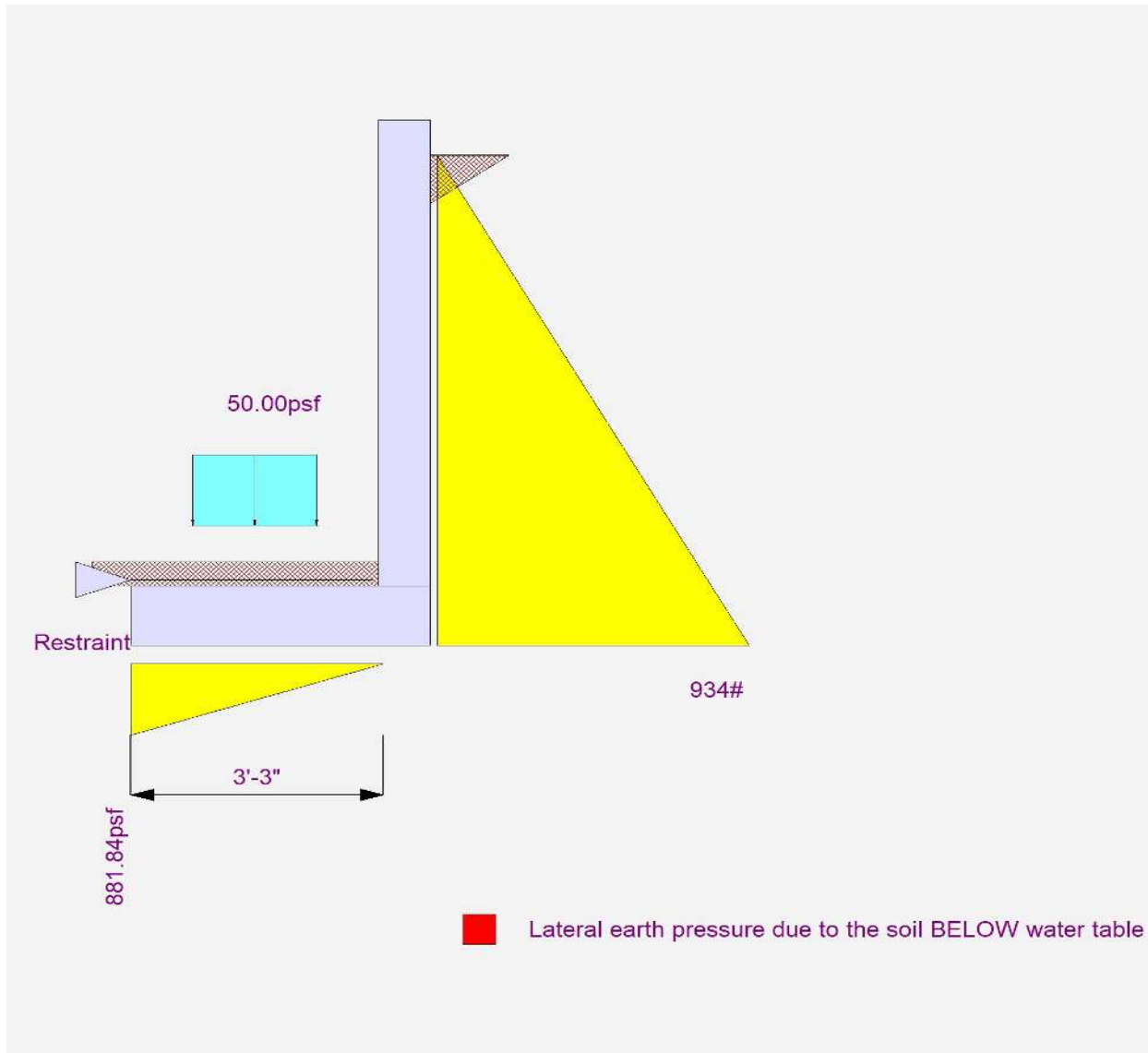
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 6'-0" Site Retaining Wall



Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 4'-0" Site Retaining Wall

Code Reference:

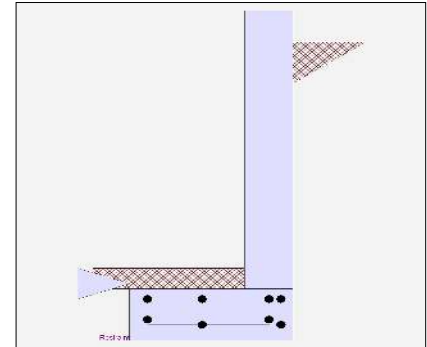
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

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

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 4'-0" Site Retaining Wall

Design Summary

Wall Stability Ratios

Overturning	=	1.72	OK
Slab Resists All Sliding !			
Global Stability	=	1.51	
Total Bearing Load	=	1,103 lbs	
...resultant ecc.	=	6.09 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	949 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,328 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	8.8 psi	OK
Footing Shear @ Heel	=	0.0 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	467.2 lbs
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Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
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 Ftc	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Center

Design Data

fb/FB + fa/Fa	=	0.201
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	512.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	682.7

Moment.....Allowable	=	3,387.6
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Shear.....Actual

Service Level	psi =	
Strength Level	psi =	10.7

Shear.....Allowable	psi =	75.0
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Anet (Masonry)	in2 =	
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Wall Weight	psf =	100.0
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Rebar Depth 'd'	in =	4.00
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Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: 4'-0" Site Retaining Wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.0412 in ² /ft		
(4/3) * As :	0.0549 in ² /ft	Min Stem T&S Reinf Area 0.864 in ²	
200bd/fy : 200(12)(4)/60000 :	0.16 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.1728 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.5419 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	1.58 ft
Heel Width	=	0.67
Total Footing Width	=	2.25
Footing Thickness	=	10.00 in

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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	1,328	0 psf
Mu' : Upward	=	1,190	0 ft-#
Mu' : Downward	=	353	0 ft-#
Mu: Design	=	837	0 ft-#
phiMn	=	5,863	OK - Flush
Actual 1-Way Shear	=	8.75	0.00 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 12.00 in	
Heel Reinforcing	=	Flush heel condition. No reinforcing required.	
Key Reinforcing	=	# 5 @ 14.00 in	
Footing Torsion, Tu	=	0.00 ft-lbs	
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs	

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

Other Acceptable Sizes & Spacings

Toe: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 55.55 in, #10@ 70.55 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area	0.49	in ²
Min footing T&S reinf Area per foot	0.22	in ² /ft

If one layer of horizontal bars:

#4@ 11.11 in
 #5@ 17.22 in
 #6@ 24.44 in

If two layers of horizontal bars:

#4@ 22.22 in
 #5@ 34.44 in
 #6@ 48.89 in

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

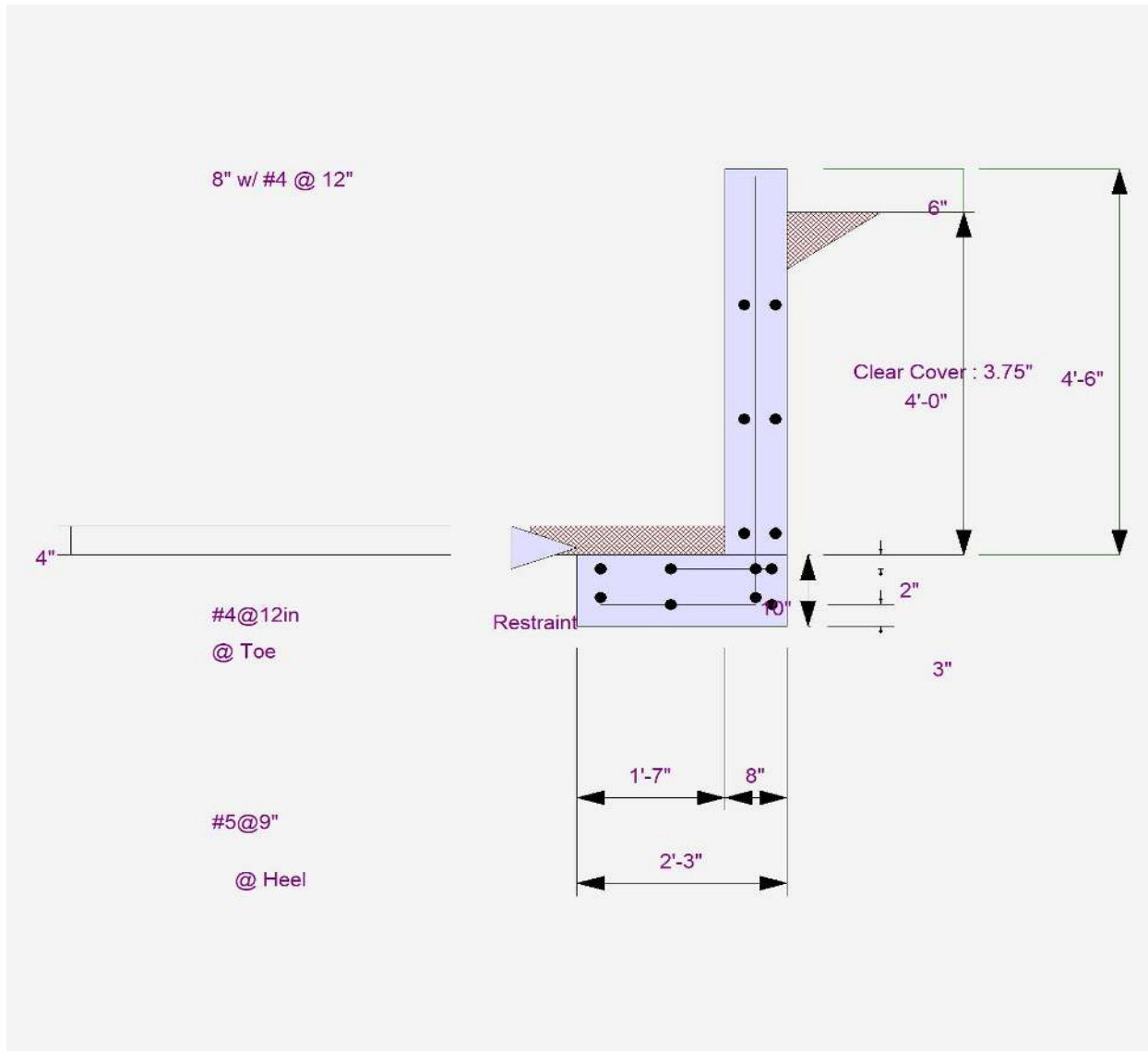
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 4'-0" Site Retaining Wall



Cantilevered Retaining Wall

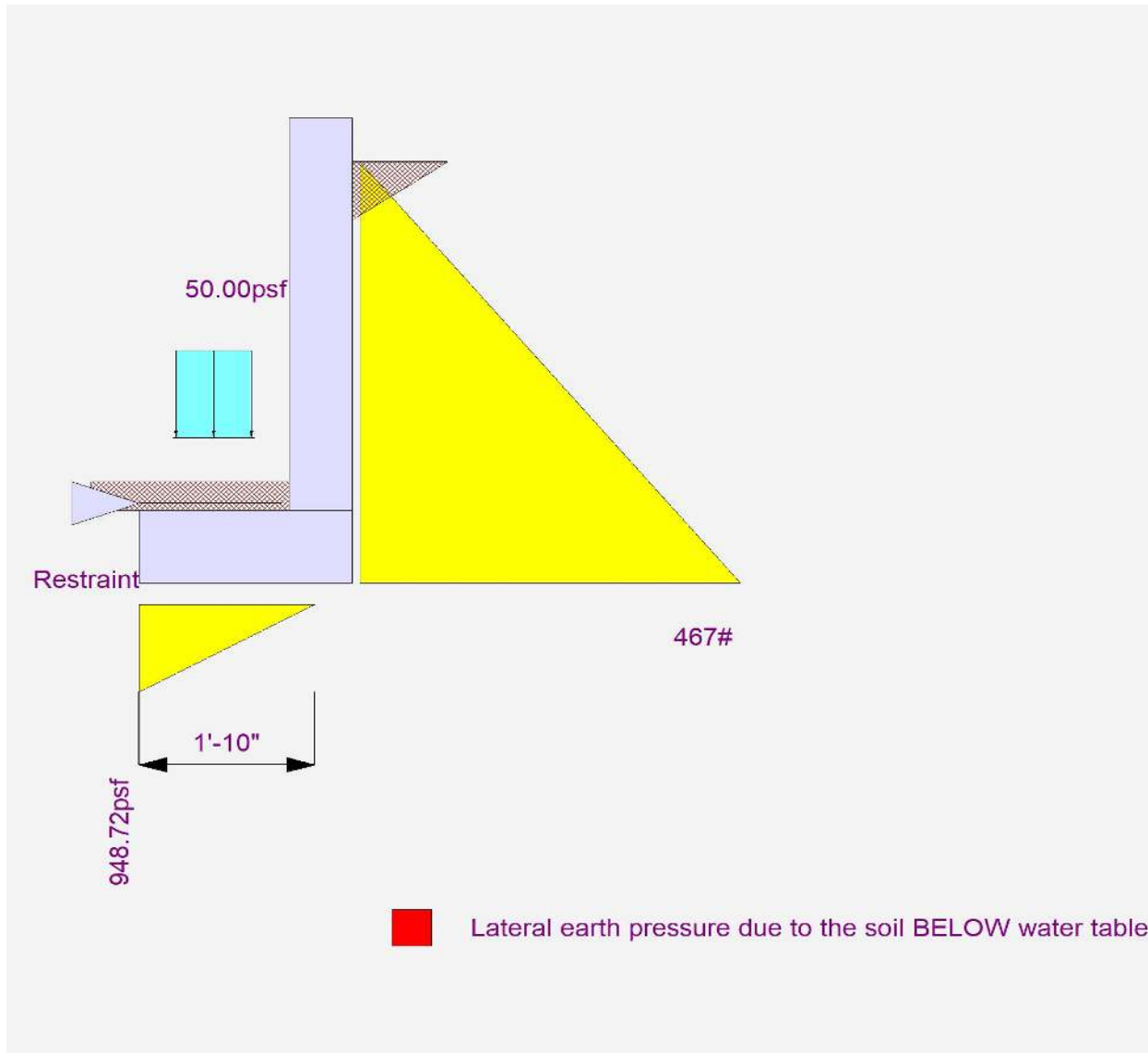
Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: 4'-0" Site Retaining Wall



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall

Code Reference:

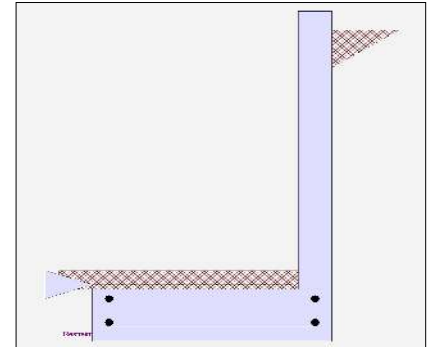
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	4.58 ft
Wall height above soil	=	0.33 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing Soil Friction	=	0.400
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	=	50.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	215.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

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

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: Sunken Pool retaining wall

Design Summary

Wall Stability Ratios			
Overturning	=	1.52	OK
Slab Resists All Sliding !			
Global Stability	=	0.85	
Total Bearing Load = 1,305 lbs			
...resultant ecc.	=	7.47 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	778 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,089 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	10.7 psi	OK
Footing Shear @ Heel	=	4.4 psi	OK
Allowable	=	75.0 psi	
Sliding Calcs			
Lateral Sliding Force	=	861.9 lbs	

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

Load Factors

Building Code	
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 Ftc	ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete	
Design Method	=	SD	SD
Thickness	=	6.00	
Rebar Size	=	# 4	
Rebar Spacing	=	16.00	
Rebar Placed at	=	Center	
Design Data			
fb/FB + fa/Fa	=	0.843	
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	981.2	
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	1,606.6	
Moment.....Allowable	=	1,905.5	
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =	27.3	
Shear.....Allowable	psi =	75.0	
Anet (Masonry)	in2 =		
Wall Weight	psf =	75.0	
Rebar Depth 'd'	in =	3.00	

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Sunken Pool retaining wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.1332 in ² /ft		
(4/3) * As :	0.1775 in ² /ft	Min Stem T&S Reinf Area 0.708 in ²	
200bd/fy : 200(12)(3)/60000 :	0.12 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in ² /ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in ² /ft	Horizontal Reinforcing Options :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.1332 in ² /ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.15 in ² /ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.4064 in ² /ft	#6@ 36.67 in	#6@ 73.33 in

Footing Data

Toe Width	=	3.08 ft
Heel Width	=	0.50
Total Footing Width	=	3.58
Footing Thickness	=	11.00 in

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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	= 1,089	0	psf
Mu' : Upward	= 3,659	0	ft-#
Mu' : Downward	= 1,411	0	ft-#
Mu: Design	= 2,248	118	ft-#
phiMn	= 8,065	OK - Flush	
Actual 1-Way Shear	= 10.74	4.37	psi
Allow 1-Way Shear	= 75.00	40.00	psi
Toe Reinforcing	= # 4 @ 10.00 in		
Heel Reinforcing	= Flush heel condition. No reinforcing required.		
Key Reinforcing	= None Spec'd		
Footing Torsion, Tu	=	0.00	ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00	ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 10.10 in, #5@ 15.65 in, #6@ 22.22 in, #7@ 30.30 in, #8@ 39.89 in, #9@ 50.50 in, #10@ 64.14 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area 0.85 in²
 Min footing T&S reinf Area per foot 0.24 in² /ft

If one layer of horizontal bars:

#4@ 10.10 in
 #5@ 15.66 in
 #6@ 22.22 in

If two layers of horizontal bars:

#4@ 20.20 in
 #5@ 31.31 in
 #6@ 44.44 in

Cantilevered Retaining Wall

Project File: Biggs retaining walls.ec6

LIC# : KW-06019266, Build:20.24.02.28

Annee Structural Engineering LLC

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DESCRIPTION: Sunken Pool retaining wall

