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FILE NO. **170716**

TITLE MERCER ISLAND RESIDENCE
5236 W. Mercer Way
New Construction

PREPARED BY Tom Wolfe, PE

10/26/2017

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DATE 10/26/2017
REV. 0

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Introduction

The following pages provide lateral and gravity load calculations, and details, for a new single family residence.

Site and geotechnical survey are provided by others and are out of the scope of this report

The following Codes and references are used to develop loads and allowables:

[1] "International Building Code (IBC)", 2015 Edition, International Code Council

[2] ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures", American Society of Civil Engineers

[3] National Design Specification (NDS), "Design Allowables for Wood Construction", American Forest & Paper Association, American Wood Council

[4] American Wood Council; Special Design Provisions for Wind and Seismic - SDPWS-2015

[5] Simpson Strong-Tie, Catalog C-2015, "Wood Construction Connectors"

[6] Frederick Merritt; Standard Handbook for Civil Engineers

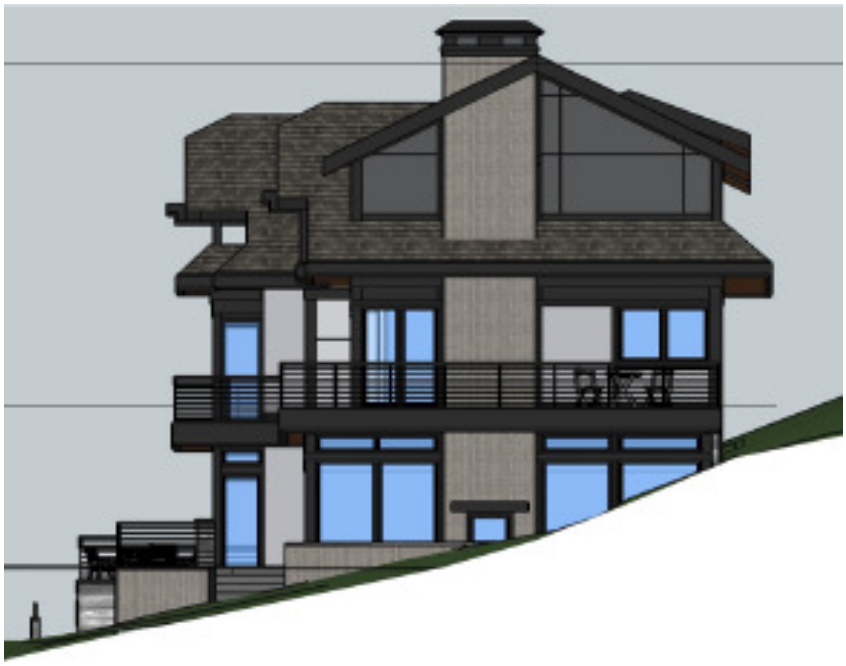
The following computer programs were utilized in the completion of this report:

PROFIS Anchor, Version 2.6.2, produced by Hilti Corporation

FORTE, Version 5.1, produced by Weyerhaeuser Corporation

Introduction

WEST



SOUTH

Seismic Loads

Ref.: Default Values

Site Classification, Ref. ASCE 7, Chapter 20 — Site Class: D

Site	Description		
A	Hard rock	D	Stiff soil
B	Rock	E	Soft clay soil
C	Very dense soil and soft rock	F	Soils requiring site response analysis

Note: Typically, Site Class "D" can be assumed if no soils report is available, Ref. ASCE 7 Section 11.4.2

Latitude and Longitude of Site

Site: 5236 West Mercer Way, Seattle WA
Latitude: 47.62551 °
Longitude: -122.24144 °

Site-Specific Seismic Parameters: (or use data from Geotech Report)

Ref.: http://earthquake.usgs.gov/hazards/designmaps/
Code: 2010 ASCE 7 (w/March 2013 errata)

USGS Design Maps Summary Report

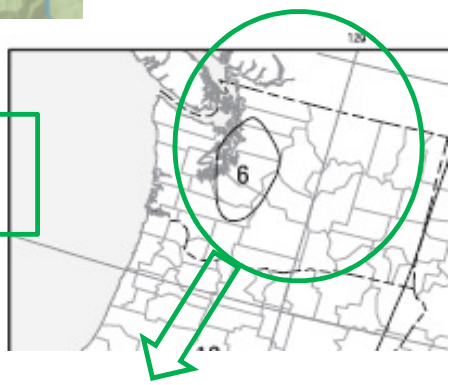
View Det

User-Specified Input

Report Title	Mills Residence 5236 W Mercer Way Sun July 16, 2017 19:29:04 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	47.555°N, 122.22627°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS-Provided Output

S_s =	1.446 g	S_{MS} =	1.446 g	S_{DS} =	0.964 g
S_1 =	0.555 g	S_{M1} =	0.833 g	S_{D1} =	0.555 g



Spectral Response Acceleration Parameters:

short period: S_s = 1.446 g
1 sec period: S_1 = 0.555 g
Transition period: T_L = 6 sec < Long Period transition period, Ref. ASCE 7, Fig. 22-12

Seismic Loads

Seismic Parameters:

Select	Risk Category: Non substantial risk to human life		II		Ref. ASCE 7 Table 1.5-1
I_e =	Seismic Importance Factor for Risk Category II	$I_{e,Risk}$ =	1.00		Ref. ASCE 7 Table 1.5-2
	Site Class		D		Ref. previous page
S_S =	Spectral Response Accel Param, short period	S_S =	1.446	g	Ref. previous page
S_1 =	Spectral Response Accel Param, 1 sec period	S_1 =	0.555	g	Ref. previous page
F_a =	Site Coefficient (based on S_s and Site Class)	F_a =	1		Ref. ASCE 7 Table 11.4-1
F_v =	Site Coefficient (based on S_1 and Site Class)	F_v =	1.5		Ref. ASCE 7 Table 11.4-2
S_{MS} =	MCE_R Spectral Response, short period	$S_{MS} = F_a S_S$ =	1.446		Ref. ASCE 7 Eqn. 11.4-1
S_{M1} =	MCE_R Spectral Response, 1 sec period	$S_{M1} = F_v S_1$ =	0.8325		Ref. ASCE 7 Eqn. 11.4-2
S_{DS} =	Design Spectral Response, short period	$S_{DS} = 2/3 * S_{MS}$ =	0.964		Ref. ASCE 7 Eqn. 11.4-3
S_{D1} =	Design Spectral Response, 1 sec period	$S_{D1} = 2/3 * S_{M1}$ =	0.555		Ref. ASCE 7 Eqn. 11.4-4
	Seismic Design Category based on S_{DS}: D		D		Ref. ASCE 7 Table 11.6-1,2
	(A = low, F = High) based on S_{D1}: D		(use worst case)		

Seismic Coefficients:

Ref. ASCE 7, Table 12.2-1

	Structure Type		Building Structure			Can be different in X & Z directions.
	Description:		Light Framed Wood Shear Walls			Light Framed Wood Shear Walls
R =	Response Modification Factor:	**X:** R_x =	6.50	**Z:** R_z =	6.50	
Ω_0 =	Overstrength Factor:	$\Omega_{0,x}$ =	3.00	$\Omega_{0,z}$ =	3.00	
C_d =	Deflection Amplification Factor:	$C_{d,x}$ =	4.00	$C_{d,z}$ =	4.00	

N =	Number of Stories =	N =	3

Seismic Loads

Calculate Fundamental Period of Strucure:

h_n =	Highest point on structure	35	Ft.
Cu =		1.4	Ref ASCE 7 Table 12.8-1
C_t =	for "all other structural systems"	0.02	Ref ASCE 7 Table 12.8-2
x =	for "all other structural systems"	0.75	Ref ASCE 7 Table 12.8-2
T_a =	Approx Period = $(C_t)\ (h_n^x)$ =	0.29	Ref ASCE 7 Eq 12.8-7
T_{max} =	Maximum Period = (Cu) (Ta) =	0.40	Ref ASCE 7 Sec 12.8.2
T =	Period = greater of T_{max} and T_a	0.40	
T_o =	$(0.2)\ (S_{D1} / S_{DS})$ =	0.12	Ref ASCE 7 Sec 11.4.5
T_S =	(S_{D1} / S_{DS}) =	0.58	
T_L =	Long Transition Period	6	Ref. ASCE 7, Fig. 22-12

Design Spectral Response Acceleration:

S_a =	Design Spectral Response Acceleratio	0.96	Ref ASCE 7 Sec 11.4.5

Seismic Design Procedure:

Seismic Design Category = D

Risk Category = II

Structure Type is Light Framed Wood Shear Walls

Number of Stories = 3

Based on these conditions, from Table 12.6-1: **Equivalent Lateral Force Procedure is Acceptable**

Determine C_s:

$$C_s = \frac{SDS}{R / I_{seismic}} = 0.148$$

C_{sMax} =	0.212	Ref ASCE 7 Eq 12.8-3 and 12.8-4
C_{sMin} =	0.042	Ref ASCE 7 Eq 12.8-5 and 12.8-6

Governing Value for Cs = 0.148

Seismic Base Shear = V = C_s x W

For Allowable Stress Procedure (ASD), Fs = 0.7 x Cs = 0.104

Seismic Base Shear = $0.7C_s$ x W

Seismic Loads

Shear wall loads

S/W Designation	Allowable Load Lb. / Ft.	
P1-6	242	
P1-4	353	
P1-3	456	
P1-2	595	
P2-6	484	
P2-4	707	
P2-3	911	
P2-2	1190	

Calculated Shear Wall values from SDPWS:

a) use lower values for Seimic
b) Use values for 15/32" structural panels per Footnote 2
c) Assume Hem-fir #2 framing with G = 0.43 per Footnote 3

Wall Type	Tabulated Value (Table 4.3A)	Tabulated Value x 0.5 x 0.93	
P1-6	520	242	
P1-4	760	353	
P1-3	980	456	
P1-2	1280	595	
P2-6	1040	484	See Section 4.3.3.3
P2-4	1520	707	See Section 4.3.3.3
P2-3	1960	911	See Section 4.3.3.3
P2-2	2560	1190	See Section 4.3.3.3

Wind Parameters

Use Directional Procedure per ASCE 7 Chapter 27

Per Section 27.4.6, for buildings meeting the requirements of Appendix D, paragraph D1.1, only Case 1 and 3 of Figure 27.4-8 need to be considered. Additionally, for flexible diaphragm structure, Case 1 will govern for shear wall design. Therefore, only Case 1 is considered.

Basic Wind Parameters:

	Risk Category: Non substantial risk to human life	II	ASCE 7 Table 1.5-1
I_w =	Wind Importance Factor for Risk Category II	1.00	ASCE 7 Table 1.5-2
	Exposure	C	
V =	Basic Wind Speed	110	ASCE 7 Figure 26.5-1
K_{zt} =	Spectral Response Accel Param, short period	1.60	ASCE 7 Section 26.8
K_d =		0.85	ASCE 7 Table 26.2-1
G =	Gust Factor	0.85	ASCE 7 Sec 26.9.1 & 26.9.2
G_{cpi} =	Site Coefficient (positive & Negative)	0.18	ASCE 7 Table 26.11-1

Story Heights:

11	Ft., Lower Floor
11	Ft., Main Floor
10	Ft., Upper Floor

0	Ft., Roof Height
32	Ft. Mean Roof Height

Wind Pressure at Upper Floor:

z = Upper Floor / 2 + Main + Lower = 27 Ft. = Mean wall height at upper floor

z_g = 900 from Table 26.9-1

α = 9.5 from Table 26.9-1

$K_z = 2.01 \times (z / z_g)^{(2/\alpha)}$ = 0.961

$K_h = 2.01 \times (h / z_g)^{(2/\alpha)}$ = 0.996

$q_z = 0.00256(K_z)(K_{zt})(K_d)(V^2)$ = 40.47

$q_h = 0.00256(K_h)(K_{zt})(K_d)(V^2)$ = 41.95

Wind Pressure at Main Floor:

z = Main Floor / 2 + Lower = 16.5 Ft. = Mean wall height at Main floor

$q_z = 0.00256(K_z)(K_{zt})(K_d)(V^2)$ = 36.49

$q_h = 0.00256(K_h)(K_{zt})(K_d)(V^2)$ = 41.95

$K_z = 2.01 \times (z / z_g)^{(2/\alpha)}$ = 0.866

$K_h = 2.01 \times (h / z_g)^{(2/\alpha)}$ = 0.996

Wind Pressure at Lower Floor:

z = Lower Floor / 2 = 5.5 Ft. = Mean wall height at Main floor

$q_z = 0.00256(K_z)(K_{zt})(K_d)(V^2)$ = 28.95

$q_h = 0.00256(K_h)(K_{zt})(K_d)(V^2)$ = 41.95

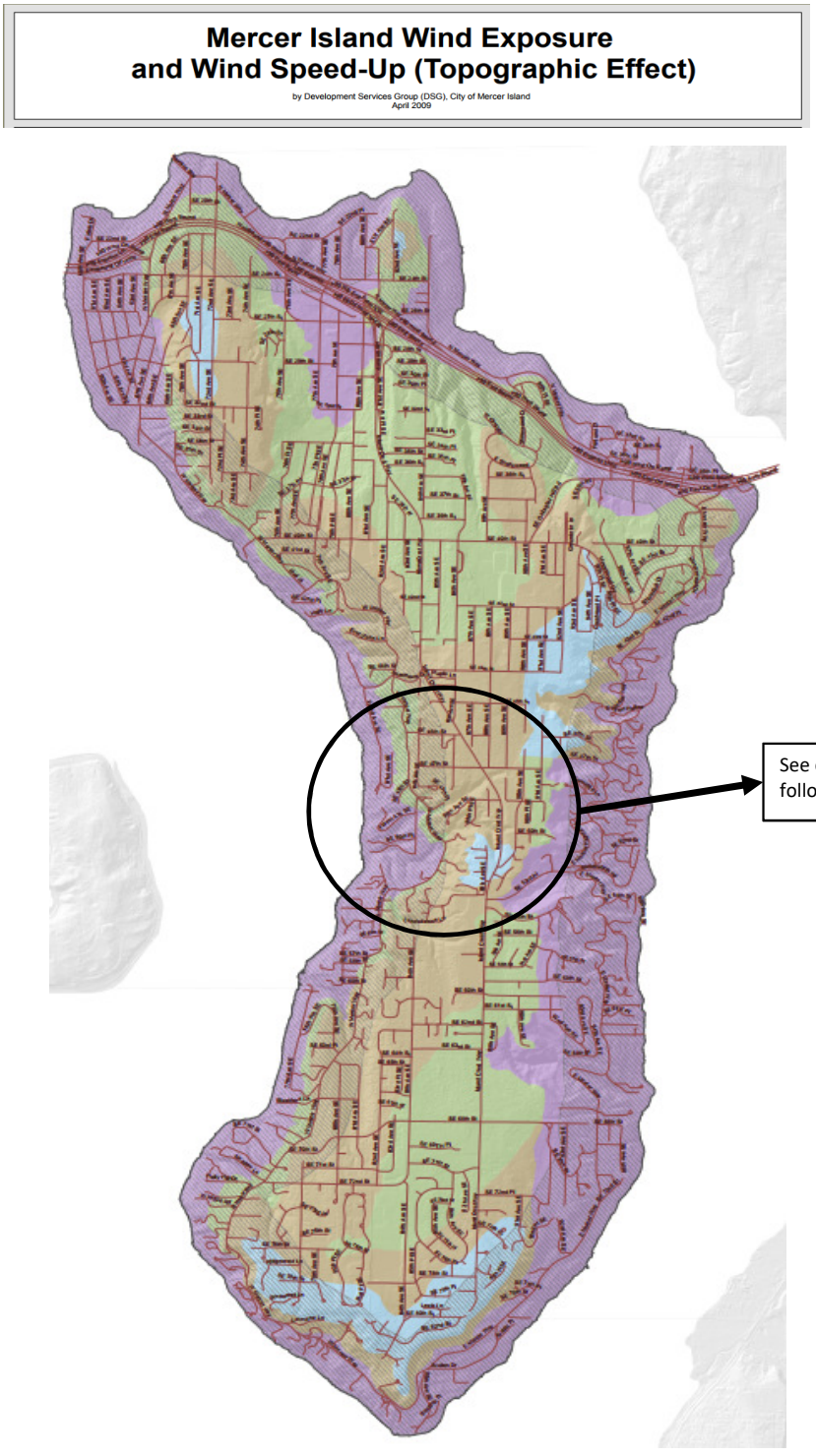
$K_z = 2.01 \times (z / z_g)^{(2/\alpha)}$ = 0.687

$K_h = 2.01 \times (h / z_g)^{(2/\alpha)}$ = 0.996

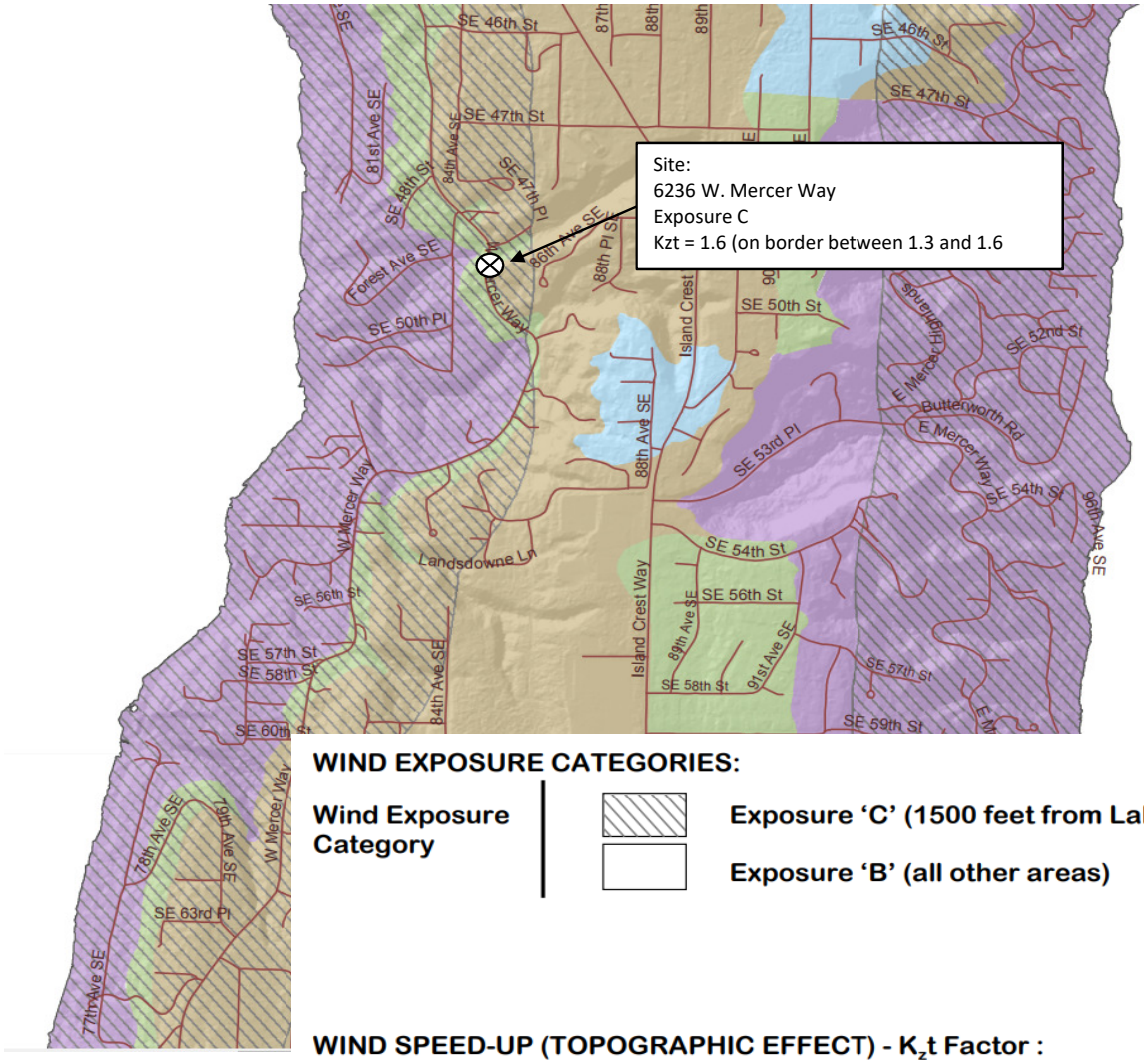
Wind Loads-Kzt

Calculate Kzt: Y

Kzt = 1.60 From Mercer Island Wind Map



Wind Loads-Kzt



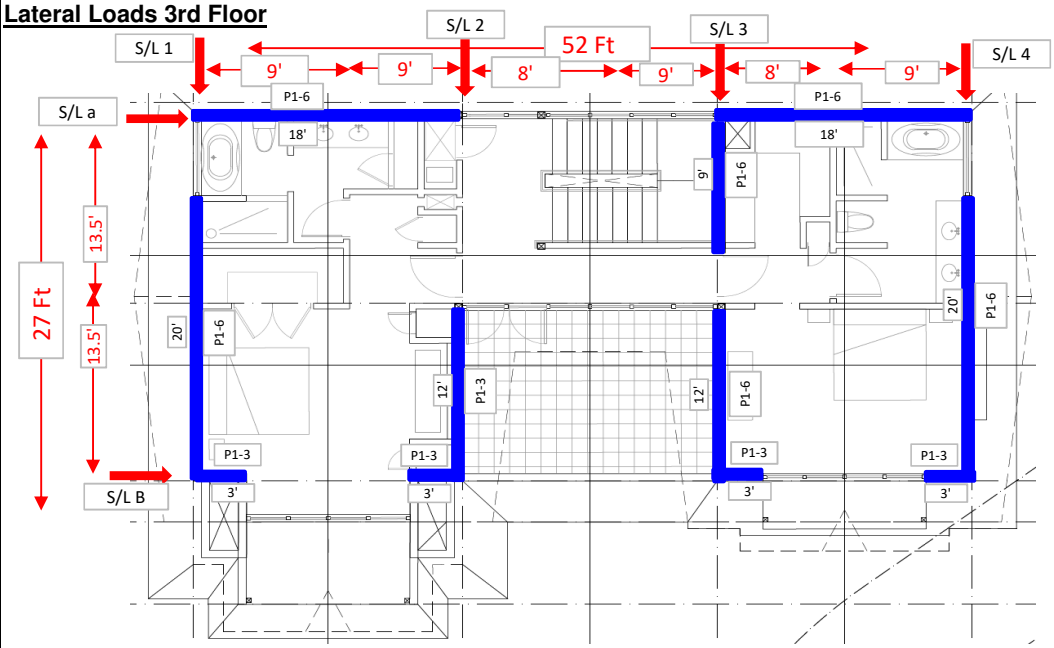
WIND EXPOSURE CATEGORIES:

Wind Exposure Category		
		Exposure 'C' (1500 feet from Lake)
		Exposure 'B' (all other areas)

WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K_zt Factor :

K_zt Factor	
	$K_zt = 1.0$
	$K_zt = 1.3$
	$K_zt = 1.6$
	$K_zt = 1.9$

Lateral Loads 3rd Floor



Upper Floor Plan
showing shear lines and tributary widths

Determine seismic weights per Shear Line (S/L):

Longitudinal Overall Length = 52 Ft
Transverse Overall Width = 27 Ft

Dead Load for Floor & Roof weight calculations = 10 psf
Dead Load for Exterior Wall weight calculations = 10 psf
Dead Load for Interior Wall weight calculations = 8 psf

Tributary Widths		
S/L a	13.5	Ft
S/L b	13.5	Ft
S/L c	0	Ft
S/L 1	9	Ft
S/L 2	17	Ft
S/L 3	17	Ft
S/L 4	9	Ft

SEISMIC WEIGHTS AND FORCE UPPER FLOOR

S/L	Roof Area x 10	Floor (above) Area x 10	Exterior Walls = Lngth x Story Ht x 10	Interior Walls	Seismic Force [Wt x 0.103](Rho)
a	7020	7990	7900	4400	3,685.8
b	4725	2270	7900	2720	2,377.3
c	0	0	0	0	0.0
d	0	0	0	0	0.0
				Total Seismic (Longitudinal) =	6,063.1

1	2430	2070	4500	1520	1,419.8
2	3510	2070	3400	1520	
3	3375	2160	3400	3200	1,637.7
4	2430	4080	4500	1440	1,680.3
				Total Seismic (Transverse) =	4,737.8

Rho = 1.3 for Upper Floor Longitudinal (see calculation in following section)
Rho = 1.3 for Upper Floor Transverse (see calculation in following section)

Lateral Loads 3rd Floor

WIND LOAD Cp FACTOR

LONGITUDINAL DIRECTION Parallel to Ridge

WALLS				ROOF				
L / B		Cp		h / L		Pitch	Angle	Cp
		Windward	Leeward			inch/Ft	Deg	Windward Leeward
52/27=	1.9	0.8	-0.3	32/52=	0.6	0	0.00	-0.7 -0.18

TRANSVERSE DIRECTION Normal to Ridge

27/52=	0.5	0.8	-0.5	32/27=	1.2	0	0.00	0.2 -0.6

CALCULATED WIND PRESSURE

LONGITUDINAL DIRECTION Parallel to Ridge

Windward Wall	Leeward Wall	Total Wall	Windward Roof	Leeward Roof	Total Roof
		Windward - Leeward			Horiz Comp
(qzGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	38.22	(qhGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	-32.51

TRANSVERSE DIRECTION Normal to Ridge

(qzGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	45.35	(qhGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	-0.42

GOVERNING WIND LOAD - COMPARE CALCULATED PRESSURE W/ MINIMUM ALLOWED

LONGITUGINAL	Wall	38.2		**TRANSVERSE**	Wall	45.3	
	Roof	8.0	Min per 27.4-1		Roof	8.0	Min per 27.4-1

WIND LOADS PER SHEAR LINE

S/L	TRIBUTARY WIDTH	STORY HEIGHT	WALL WIND LOAD =W x Hw x Pw	ROOF WIND LOAD =W x Hr x Pr	**TOTAL** = (0.6)W *
a	13.5	10	5159.3	0	3,095.6
b	13.5	10	5159.3	0	3,095.6
c	0	10	0.0	0	0.0
d					
				Total Longitudinal Wind Load =	6,191.2

1	9	10	4081.3	0.0	2,448.8
2	17	10	7709.1	0.0	4,625.5
3	17	10	7709.1	0.0	4,625.5
4	9	10	4081.3	0.0	2,448.8
				Total Transverse Wind Load =	14,148.5

COMPARING SEISMIC AND WIND LOADS:

Longitudinal Direction: WIND GOVERNS

Transverse Direction: WIND GOVERNS

* Per Load Case 6 in ASCE 7 Max wind load considered = 0.6W

Governing loads per shear line:

S/L	LOAD		S/L	LOAD
a	3,096		1	2,449
b	3,096		2	4,625
c	0		3	4,625
d	0		4	2,449

Wall Aspect Ratio

Min Allowed Wall Length = 10/3.5 = 2.9 Ft

For walls < 10/2 = 5 Ft, Strength reduction =: (2b)/h per SDPWS 4.3.4.3

For L = 3.5 ➡ 0.70

For L = 3 ➡ 0.60

Lateral Loads 3rd Floor

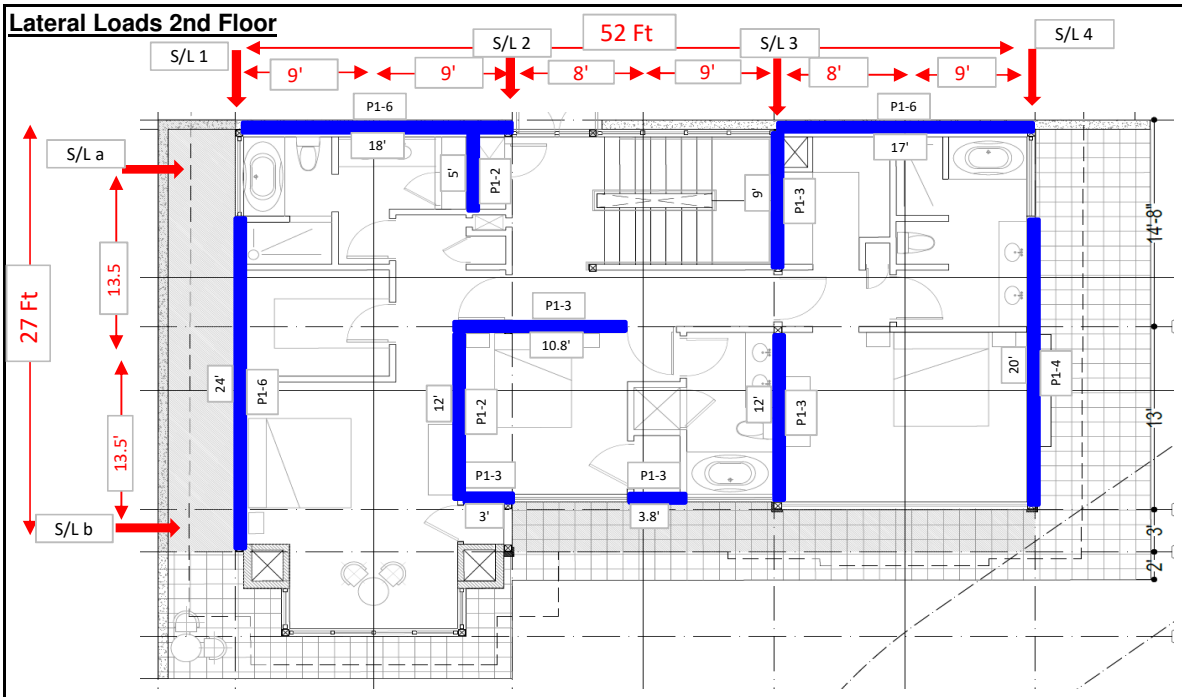
UNIT LATERAL LOADS PER S/L				
S/L	**S/W LENGTHS** (ft)	**TOTAL** (ft.)	**UNIT LOAD** (plf)	**S/W TYPE**
a	18' + 17"	35	88.45	P1-6
b	(3'+3'+3'+3')(0.6)	7.2	429.94	P1-3
c				
d				
1	20'	20	122.44	P1-6
2	12'	12	385.46	P1-3
3	9'+12'	21	220.26	P1-6
4	20'	20	122.44	P1-6

CALCULATE SHEAR WALL UPLIFT & HOLD-DOWNS

For resisting weight use 10 psf x 60% = 6 psf (60% of dead load resists overturning)

S/L	WALL LENGTH	WALL WEIGHT*	WALL HEIGHT	UPLIFT (Unit Load x L)(H) - (Weight)(L / 2)	HOLD-DOWN TYPE
a	18	1800	10	-15.5	MST37 (3815#)
	17	1700	10	34.5	MST37 (3815#)
b	3	300	10	4149.4	MST60 (5800#)
	3	300	10	4149.4	MST60 (5800#)
	3	300	10	4149.4	MST60 (5800#)
	3	300	10	4149.4	MST60 (5800#)
1	20	1200	10	624.4	MST37 (3815#)
2	12	720	10	3494.6	MST60 (5800#)
3	9	540	10	1932.6	MST37 (3815#)
	12	720	10	1842.6	MST37 (3815#)
4	20	1200	10	624.4	MST37 (3815#)

Lateral Loads 2nd Floor



Main Floor Plan
showing shear lines and tributary widths

Determine seismic weights per Shear Line (S/L):

Longitudinal Overall Length = 52 Ft
Transverse Overall Width = 33 Ft

Dead Load for Floor & Roof weight calculations =	10	psf
Dead Load for Exterior Wall weight calculations =	10	psf
Dead Load for Interior Wall weight calculations =	8	psf

Tributary Widths		
S/L a	13.5	Ft
S/L b	13.5	Ft
S/L c	0	Ft
S/L 1	9	Ft
S/L 2	17	Ft
S/L 3	17	Ft
S/L 4	9	Ft

SEISMIC WEIGHTS & FORCE FOR MAIN FLOOR						TOTAL SEISMIC FORCE
S/L	Roof A x 10	Floor (above) Area x 10	Exterior Walls = L x H x 10	Interior Walls	Seismic Force [Wt x 0.103](Rho)	Add Seismic force from floor(s) above
a	0	7020	1485	3256	1587.3	5273.0
b	0	4725	7205	0	1610.1	3987.4
c	0	0	0	0	0.0	0.0
d	0	0	0	0	0.0	0.0
					Total Longitudinal Seismic (including floor(s) above)	9260.4
1	0	2430	990	1496	663.46	2083.2
2	0	3510	1870	0	726.08	2363.8
3	0	3375	1870	1760	945.39	2625.6
4	0	2430	4620	0	951.47	2631.7
					Total Transverse Seismic (including floor(s) above)	9704.4

Rho = 1.3 for Main Floor Longitudinal (see calculation in following section)
Rho = 1.3 for Main Floor Transverse (see calculation in following section)

Lateral Loads 2nd Floor

WIND LOAD Cp FACTOR

LONGITUDINAL DIRECTION Parallel to Ridge

WALLS				ROOF				
L / B		Cp		h / L		Pitch	Angle	Cp
		Windward	Leeward			inch/Ft	Deg	Windward Leeward
52/33=	1.6	0.8	-0.3	32/52=	0.6	0	0.00	-0.7 -0.18

TRANSVERSE DIRECTION Normal to Ridge

33/52=	0.6	0.8	-0.5	32/33=	1.0	0	0.00	0.2 -0.6

CALCULATED WIND PRESSURE

LONGITUDINAL DIRECTION Parallel to Ridge

Windward Wall	Leeward Wall	Total Wall	Windward Roof	Leeward Roof	Total Roof
		Windward - Leeward			Horiz Comp
(qzGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	34.11	(qhGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	-32.51

TRANSVERSE DIRECTION Normal to Ridge

(qzGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	42.64	(qhGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	-0.42

GOVERNING WIND LOAD - COMPARE CALCULATED PRESSURE W/ MINIMUM ALLOWED

LONGITUGINAL	Wall	34.1		**TRANSVERSE**	Wall	42.6	
	Roof	8.0	Min per 27.4-1		Roof	8.0	Min per 27.4-1

WIND LOADS PER SHEAR LINE

S/L	TRIBUTARY WIDTH	STORY HEIGHT	WALL WIND LOAD =W x Hw x Pw	ROOF WIND LOAD =W x Hr x Pr	**TOTAL (= 0.6W)**	**COMBINED TOTAL** add upper floor
a	13.5	11	5,066.0	0.0	3,039.6	6,135.2
b	13.5	11	5,066.0	0.0	3,039.6	6,135.2
c	0	11	0.0	0.0	0.0	0.0
d	0	11	0.0	0.0	0.0	0.0
				Total Longitudinal Wind Load =	6,079.2	12,270.4
1	9	11	4,221.1	0.0	2,532.7	4,981.5
2	17	11	7,973.2	0.0	4,783.9	9,409.4
3	17	11	7,973.2	0.0	4,783.9	9,409.4
4	9	11	4,221.1	0.0	2,532.7	4,981.5
				Total Transverse Wind Load =	14,633.2	28,781.7

COMPARING SEISMIC AND WIND LOADS:

Longitudinal Direction: WIND GOVERNS

Transverse Direction: WIND GOVERNS

* Per Load Case 6 in ASCE 7
Max wind load considered = 0.6W

Governing loads per shear line:

S/L	LOAD		S/L	LOAD
a	6135.18		1	4981.45
b	6135.18		2	9409.41
c	0		3	9409.41
d	0		4	4981.45

Wall Aspect Ratio

Min Allowed Wall Length = 11/3.5 = 3.1 Ft

For walls < 11/2 = 5.5 Ft, Strength reduction =: (2b)/h per SDPWS 4.3.4.3

For L = 3 ➡ 0.60

For L = 3.75 ➡ 0.75

Lateral Loads 2nd Floor

UNIT LATERAL LOADS PER S/L				
S/L	**S/W LENGTHS** (ft)	**TOTAL** (Ft.)	**UNIT LOAD** (plf)	**S/W TYPE**
a	18'+17'	35	175.29	P1-6
b	(3)(0.6)+(3.75)(0.75)+10.8	15.4	398.07	P1-3
c				
d				
1	24'	24	207.56	P1-6
2	12'+5'	17	553.49	P1-2
3	9'+12'	21	448.07	P1-3
4	20'	20	249.07	P1-4

CALCULATE SHEAR WALL UPLIFT & HOLD-DOWNS					
For resisting weight use 10 psf x 60% = 6 psf (60% of dead load resists overturning)					
S/L	**WALL LENGTH**	**WALL WEIGHT**	**C.G. HEIGHT**	**UPLIFT (Unit Load x L)(H) - (Weight)(L / 2)**	**HOLD-DOWN TYPE**
a	18	4000	10.5	-159	No Hold-Down Required
	17	3775	10.5	-47	No Hold-Down Required
b	3	1330	10.5	3,515	MST37 (3815#)
	3.75	1660	10.5	3,350	MST37 (3815#)
	10.8	2400	10.5	2,980	MST37 (3815#)

Load is applied at average height of upper and main floor walls for purposes of determining overturning

$$= \frac{[H_{main} \times (H_{main} / 2)] + [H_{upper} \times ((H_{upper/2}) + Hmain)]}{H_{main} + H_{upper}}$$

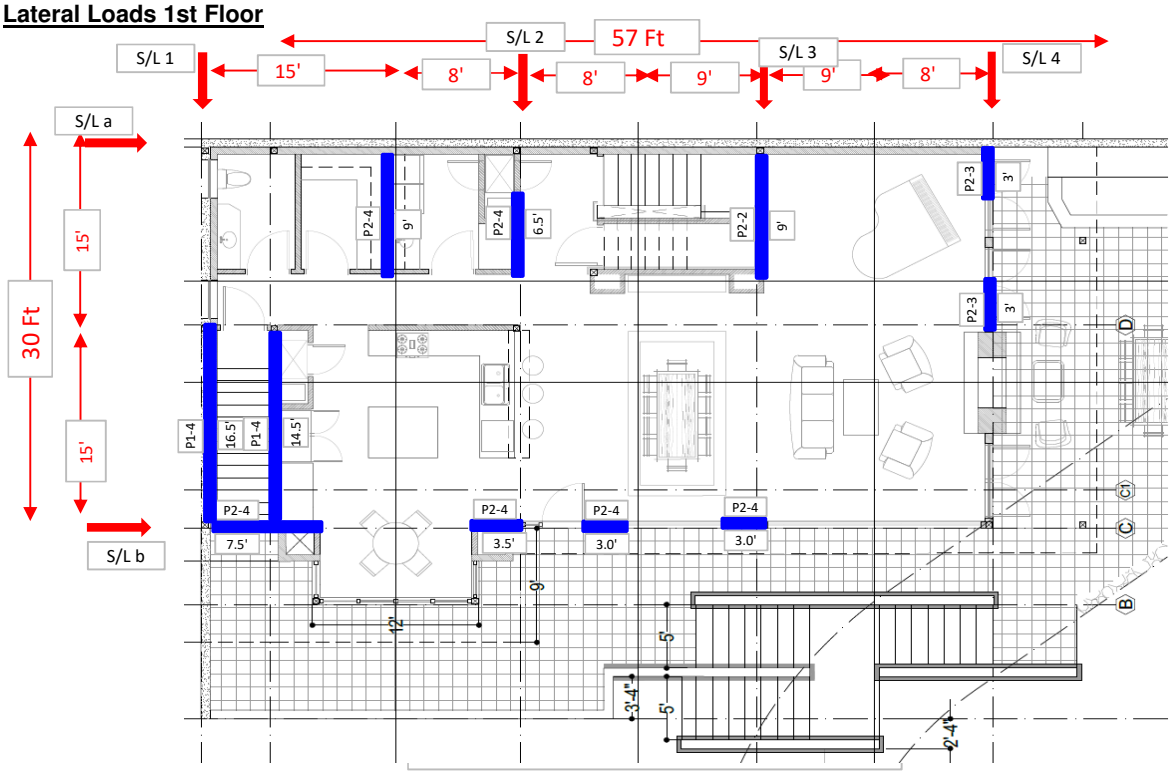
Lateral Loads 2nd Floor

CALCULATE SHEAR WALL UPLIFT & HOLD-DOWNS					
For resisting weight use 10 psf x 60% = 6 psf (60% of dead load resists overturning)					
S/L	**WALL LENGTH**	**WALL WEIGHT**	**C.G. HEIGHT**	**UPLIFT (Unit Load x L)(H) - (Weight)(L / 2)**	**HOLD-DOWN TYPE**
1	24	3000	10.5	679	MST37 (3815#)
2	12	1500	10.5	5,062	MST60 (5800#)
	5	650	10.5	3,855	MST48 (4460#)
3	9	1200	10.5	4,105	MST48 (4460#)
	12	1500	10.5	3,955	MST48 (4460#)
4	20	2525	10.5	1,353	MST37 (3815#)

Load is applied at average height of upper and main floor walls for purposes of determining overturning

$$= \frac{[H_{main} \times (H_{main} / 2)] + [H_{upper} \times ((H_{upper/2}) + Hmain)]}{H_{main} + H_{upper}}$$

Lateral Loads 1st Floor



Determine seismic weights per Shear 6235 Lake Washington Blvd

Longitudinal Overall Length = 70 Ft
Transverse Overall Width = 49 Ft

Dead Load for Floor & Roof weight calculations = 10 psf
Dead Load for Exterior Wall weight calculations = 10 psf
Dead Load for Interior Wall weight calculations = 8 psf

Tributary Widths		
S/L a	15	Ft
S/L b	15	Ft
S/L c	0	Ft
S/L 1	15	Ft
S/L 2	16	Ft
S/L 3	18	Ft
S/L 4	8	Ft

SEISMIC WEIGHTS & FORCE FOR LOWER FLOOR						TOTAL SEISMIC FORCE
S/L	Roof A x 10	Floor (above) Area x 10	Exterior Walls = L x H x 10	Interior Walls	Seismic Force [Wt x 0.103](Rho)	Add Seismic force from floor(s) above
a	0	7020	11000	4136	2300.1	7573.2
b	0	4725	11000	1320	1769.5	5756.9
c	0	0		0	0.0	0.0
d						
					Total Longitudinal Seismic (including floor(s) above)	13330.1
1	0	4725	8690	2904	2202.41	4285.7
2	0	4725	3520	1760	1038.67	3402.5
3	0	4725	6270	792	1223.67	3849.3
4	0	4725	4840	0	992.99	6682.2
					Total Transverse Seismic (including floor(s) above)	18219.7

Rho = 1 for Main Floor Longitudinal (see calculation in following section)
Rho = 1.3 for Main Floor Transverse (see calculation in following section)

Lateral Loads 1st Floor

WIND LOAD Cp FACTOR

LONGITUDINAL DIRECTION Parallel to Ridge

WALLS				ROOF				
L / B	Cp		h / L	Pitch	Angle	Cp	
	Windward	Leeward		inch/Ft	Deg	Windward	Leeward
70/49= 1.4	0.8	-0.3	32/70= 0.5	0	0.00	-0.3	-0.18

TRANSVERSE DIRECTION Normal to Ridge

49/70= 0.7	0.8	-0.5	32/49= 0.7	0	0.00	-0.4	-0.6

CALCULATED WIND PRESSURE

LONGITUDINAL DIRECTION Parallel to Ridge

Windward Wall	Leeward Wall	Total Wall	Windward Roof	Leeward Roof	Total Roof
		Windward - Leeward			Horiz Comp
(qzGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	30.38	(qhGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	-18.25

TRANSVERSE DIRECTION Normal to Ridge

(qzGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	37.51	(qhGCp) - (qhGcpi)	(qhGCp) - (qhGcpi)	-21.81

GOVERNING WIND LOAD - COMPARE CALCULATED PRESSURE W/ MINIMUM ALLOWED

LONGITUGINAL	Wall	30.4		**TRANSVERSE**	Wall	37.5	
	Roof	8.0	Min per 27.4-1		Roof	8.0	Min per 27.4-1

WIND LOADS PER SHEAR LINE

S/L	TRIBUTARY WIDTH	STORY HEIGHT	WALL WIND LOAD =W x Hw x Pw	ROOF WIND LOAD =W x Hr x Pr	TOTAL (= 0.6 W)	COMBINED TOTAL add upper floor walls
a	15	11	5,013.3	0.0	3,008.0	9,143.2
b	15	11	5,013.3	0.0	3,008.0	9,143.2
c	0	11	0.0	0.0	0.0	0.0
d						
				Total Longitudinal Wind Load =	6,016.0	18,286.3
1	15	11	6,189.9	0.0	3,713.9	8,695.4
2	16	0	0.0	0.0	0.0	9,409.4
3	18	0	0.0	0.0	0.0	9,409.4
4	8	0	0.0	0.0	0.0	4,981.5
				Total Transverse Wind Load =	3,713.9	32,495.6

COMPARING SEISMIC AND WIND LOADS:

Longitudinal Direction: WIND GOVERNS

Transverse Direction: WIND GOVERNS

Governing loads per shear line:

S/L	LOAD		S/L	LOAD
a	9143.16		1	8695.38
b	9143.16		2	9409.41
c	0		3	9409.41
d			4	4981.45

Wall Aspect Ratio

Min Allowed Wall Length = 11/3.5 = 3.1 Ft

For walls < 11/2 = 5.5 Ft, Strength reduction =:

(2b)/h per SDPWS 4.3.4.3

For L = 3 ➡ 0.60

For L = 3.5 ➡ 0.70

Lateral Loads 1st Floor

UNIT LATERAL LOADS PER S/L				
S/L	S/W LENGTHS (ft)	TOTAL (Ft.)	UNIT LOAD (plf)	S/W TYPE
a	N/A. Resolved to foundation at level above			
b	7.5+(3.5)(0.7)+(3+3)(0.6)	13.55	674.77	P2-4
1	16.5'+14.5'	31	280.50	P1-4
2	9'+6.5'	15.5	607.06	P2-4
3	9'	9	1045.49	P2-2
4	3'+3'	6	830.24	P2-3

CALCULATE SHEAR WALL UPLIFT & HOLD-DOWNS					
For resisting weight use 10 psf x 60% = 6 psf (60% of dead load resists overturning)					
S/L	WALL LENGTH	WALL WEIGHT*	C.G. HEIGHT	UPLIFT (Unit Load x L)(H) - (Weight)(L / 2)	HOLD-DOWN TYPE
a	N/A. Resolved to foundation at level above				
b	7.5	2500	16	9,546	HDU14- 8x Stud (14390#)
	3.5	1175	16	10,209	HDU14- 8x Stud (14390#)
	3	1000	16	10,296	HDU14- 8x Stud (14390#)
1	16.5	2200	16	3,388	STHD14 (5785#)
	14.5	2000	16	3,488	MST48 (4460#)
2	9	1200	16	9,113	HDU11- 6x Stud (9535#)
	6.5	875	16	9,275	HDU11- 6x Stud (9535#)
3	9	2550	16	15,453	HDU14- 8x Stud (14390#) 3X
4	3	550	16	13,009	HDU14- 8x Stud (14390#)
	3	550	16	13,009	HDU14- 8x Stud (14390#)

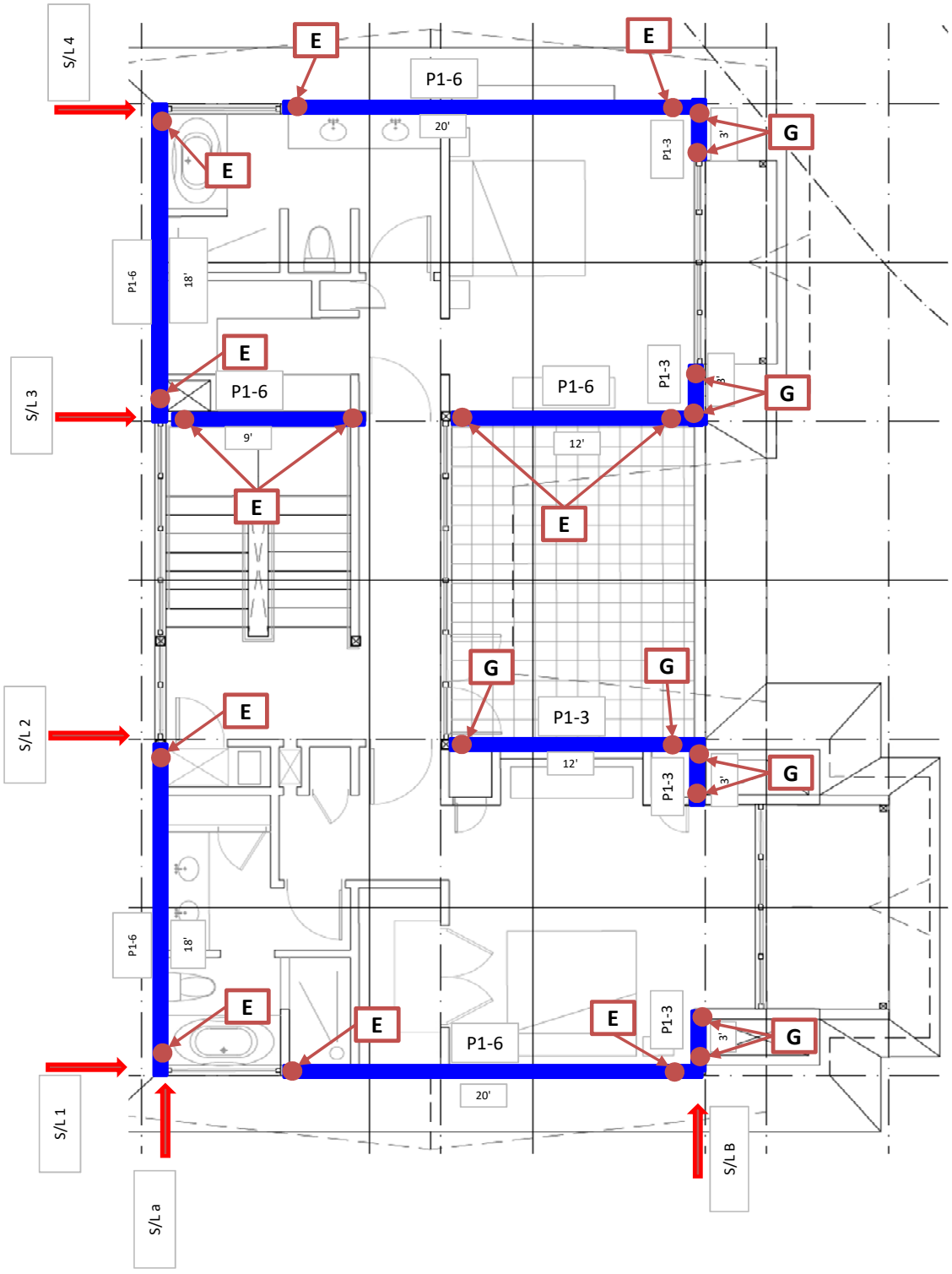
Load is applied at center of gravity of wall stack up
for purposes of determining overturning

$$= \frac{[H_{lower} \times (H_{lower/2})] + [Hmain \times ((H_{main} / 2) + H_{lower})] + [H_{upper} \times ((H_{upper/2}) + Hmain + Hlower)]}{H_{lower} + H_{main} + H_{upper}}$$

* Install STHD14 into new concrete of MST48 into existing.

** Install MST48 Strap. Bolt to face of existing foundation wall and nail to shear wall (see Detail)

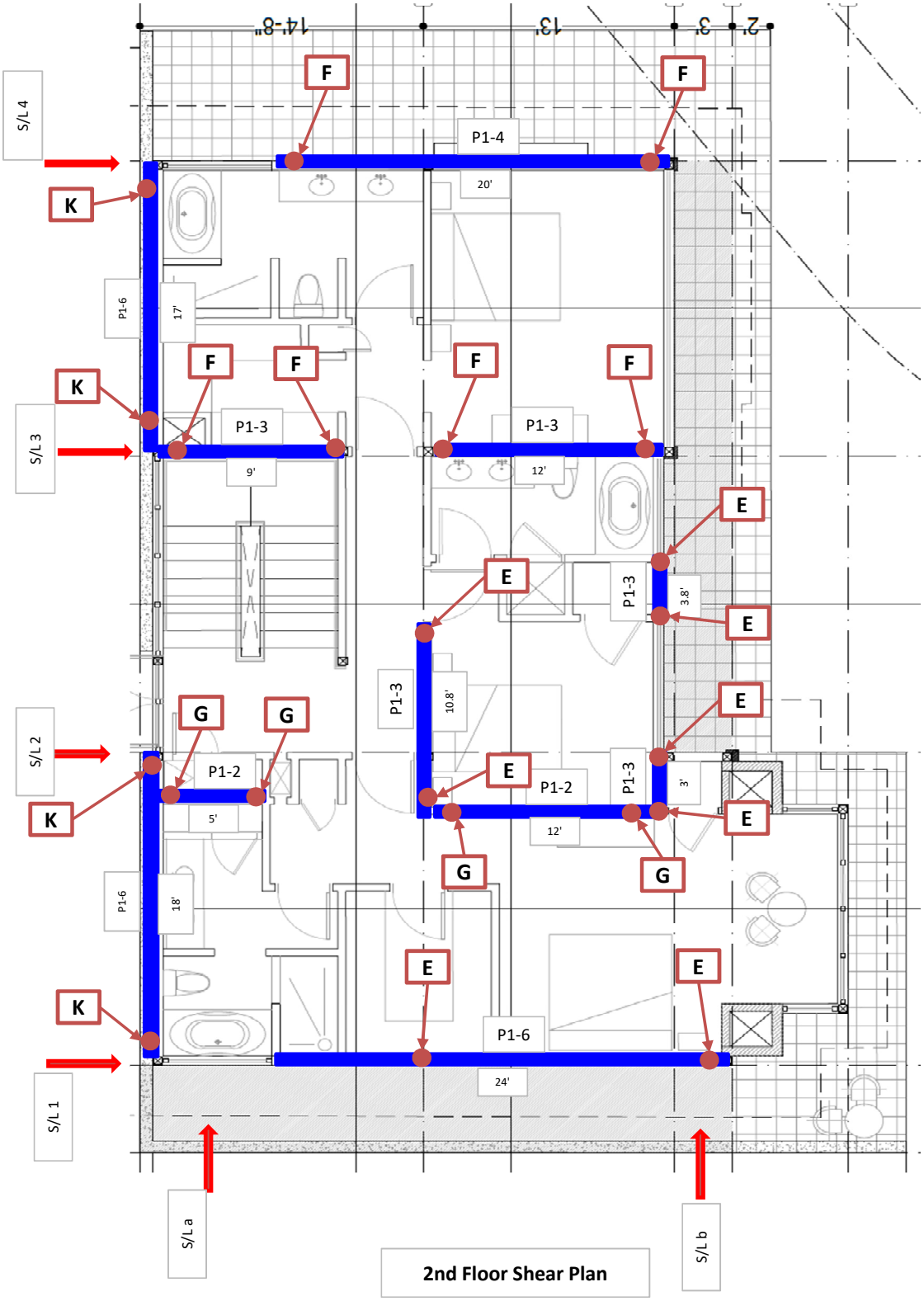
Lateral Engineering Sketches



3rd Floor Shear Plan

	QED QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 REPORT No. 170716 PAGE 23 / 135

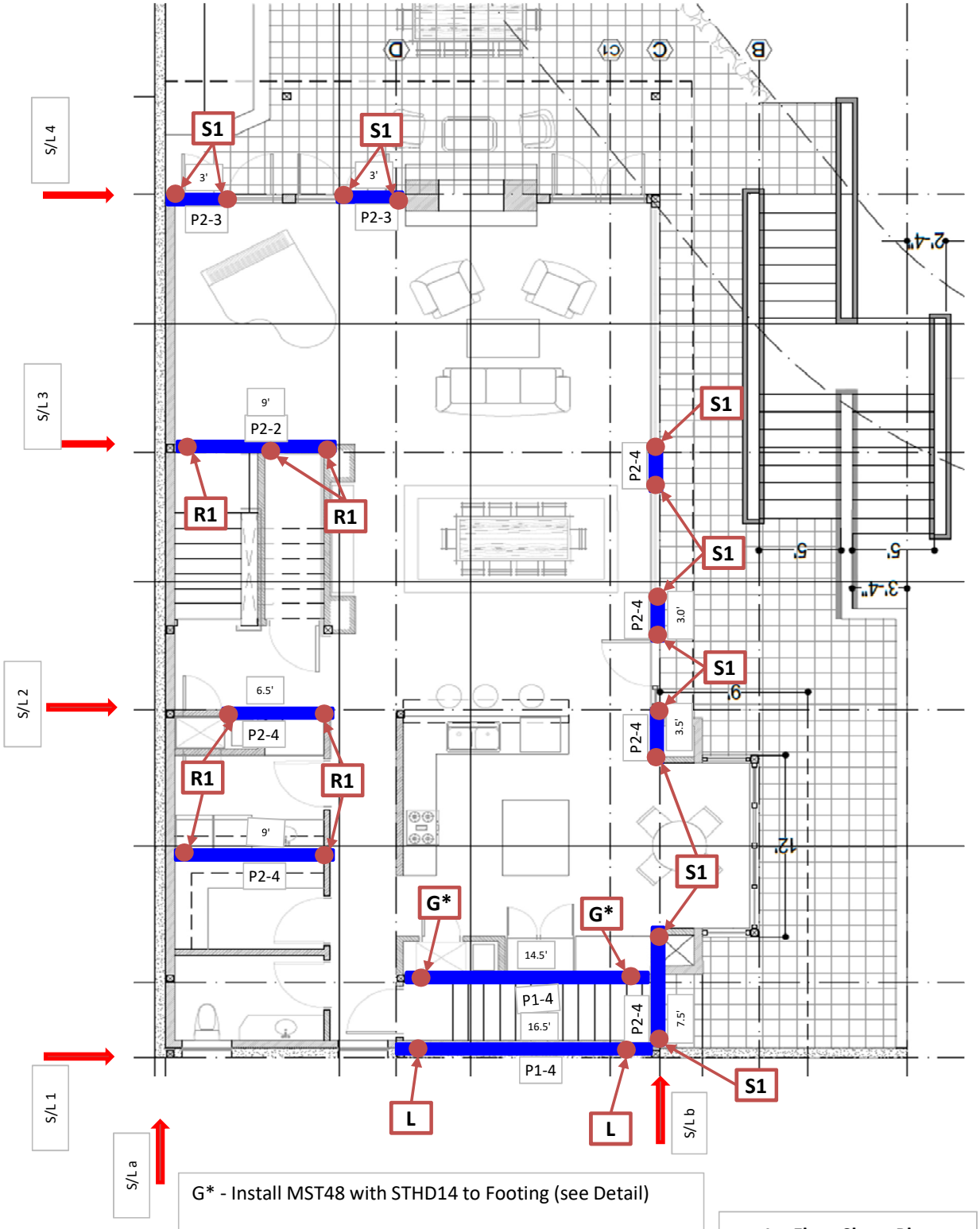
Lateral Engineering Sketches



2nd Floor Shear Plan

	QED QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 24 / 135

Lateral Engineering Sketches



G* - Install MST48 with STHD14 to Footing (see Detail)

1st Floor Shear Plan

	QED QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 25 / 135

SHEAR WALL SCHEDULE

DESIGNATION	NAIL SIZE	NAIL SPACING EDGE	NAIL SPACING FIELD	BLOCKING Y / N	BOTTOM PLATE ANCHORAGE	DESIGN LOAD (PLF)
P1-6	8d	6"	12"	YES	(2) 16d AT 6" O.C. OR 5/8" BOLTS AT 32" O.C.	242
P1-4	8d	4"	12"	YES	(2) 16d AT 6" O.C. OR 5/8" BOLTS AT 24" O.C.	353
P1-3	8d	3"	12"	YES	(3) 16d AT 5" O.C. OR 5/8" BOLTS AT 24" O.C.	456
P1-2	8d	2"	12"	YES	(3) 16d AT 5" O.C. OR 3/4" BOLTS AT 24" O.C.	595
P2-6	8d	6"	12"	YES	(2) 16d AT 5" O.C. OR 5/8" BOLTS AT 24" O.C.	484
P2-4	8d	4"	12"	YES	(3) 16d AT 5" O.C. OR 3/4" BOLTS AT 24" O.C.	707
P2-3	8d	3"	12"	YES	(4) 16d AT 5" O.C. OR 3/4" BOLTS AT 20" O.C.	911
P2-2	8d	2"	12"	YES	(4) 16d AT 4" O.C. OR 3/4" BOLTS AT 16" O.C.	1190

SHEAR WALL SCHEDULE NOTES

1. P1 SHEAR WALL TO HAVE 7/16" A.P.A. RATED PLYWOOD OR ORIENTED STRAND BOARD (O.S.B.) ON ONE SIDE
   P2 SHEAR WALL TO HAVE 7/16" A.P.A. RATED PLYWOOD OR ORIENTED STRAND BOARD (O.S.B.) ON BOTH SIDES
2. FOR P1-3 THROUGH P2-4 WALLS, 3X STUDS ARE REQUIRED AT ALL PANEL EDGES
3. NAILS ARE COMMON IN THE SIZE INDICATED
4. FOR DOUBLE SIDED SHEAR WALLS (P2-X), SEAMS SHALL BE STAGGERED ON EACH SIDE (NO TWO SEAMS ON SAME STUD).
5. PANEL EDGES TO BE BLOCKED WITH FULL WIDTH 2X NOMINAL FRAMING FOR P1-6 AND P1-4 WALLS. PANEL EDGES FOR P1-3 THROUGH P2-4 WALLS SHALL BE BLOCKED WITH 3X NOMINAL FRAMING. PANELS MAY BE INSTALLED EITHER VERTICALLY OR HORIZONTALLY.
6. ANCHOR BOLTS SHALL BE EMBEDED IN CONCRETE A MINIMUM OF 7", AND SHALL BE INSTALLED WITH 2" SQUARE X 0.229" WASHERS.

KEY TO LATERAL ENGINEERING SKETCHES

Designates Hold-Down Location
See schedule on following page for hold-down type

Shear Wall

P#-# Shear Wall Designation. See Schedule for details

HOLDDOWN SCHEDULE

DESIGNATION	DESCRIPTION	ALLOWABLE DESIGN LOAD (lb)		
A	CMST12	9,215 (End length =44" w/ (49) 10d each end)		
B	CMST14	6,490 (End Length = 34" w/ (38) 10d each end)		
C	CS16	1,700 (End Length = 12" w/ (11) 10d each end)		
D	CS14	2,490 (End Length = 16" w/ (15) 10d each end)		WOOD TO WOOD CONNECTION
E	MST37	3,815		
F	MST48	4,460		
G	MST60	5,800		
		6" Wall	8" Wall	
H	LSTHD8	1,695	1,695	CONCRETE STRAP (Based on 2000 psi Concrete)
J	STHD8	2,345	3,195	
K	STHD10	3,185	3,725	
L	STHD14	4,805	5,785	
M	HDU2-SDS2.5	3,075		BOLTED TO CONCRETE NAILED TO STUDS
O	HDU4-SDS2.5	4,565 (5/8" bolt)		
P	HDU5-SDS2.5	5,645 (5/8" bolt)		
Q	HDU8-SDS2.5	6970 (w/ 3 1/2" thick end studs**)		BOLTED TO CONCRETE SCREWED TO STUDS
R1	HDU11-SDS2.5	9535 (w/ 5 1/2" thick end studs**)		
R2	HDU11-SDS2.5	11175 (w/ 7 1/4" thick end studs**)		
S1	HDU14-SDS2.5	14390 (w/ 7 1/4" thick end studs**)		
S2	HDU14-SDS2.5	14925 (w/ 5 1/2 x 5 1/2 thick end studs)		

** Dimension shown is in direction parallel to SDS screws. Dimension perpendicular to screws (wall thickness) is 3 1/2" minimum except for Type S2 which requires a 6x6 post

HOLD-DOWNS LISTED ABOVE ARE SIMPSON STRONG-TIE

Rho Calculation

Determine if Rho per ASCE 7 Section 12.3.4

Rho Calculation for Lower Floor

Longitudinal Direction; Rho =	1	see following justification	Story Height =	11
Transverse Direction; Rho =	1.3	see following justification	Story Height =	11

For N/S direction (Shear Lines a and b):

Resolved to foundation at floor above

For E/W direction (Shear Lines 1-4):

From ASCE 7 Section 12.3.4.2(b):

Each side of structure must have at least (2) bays of seismic force resisting perimeter framing.

Where # Bays present = (2x Length of Shear Wall) / Story Height:

For South Side: $\frac{(2'+3') \times 2}{11}$ = 1.1 **< 2, Use Rho = 1.3**

For North Side: $\frac{(16.5'+14.5') \times 2}{11}$ = 5.6 **> 2, Use Rho =1**

Note that in the above calculations, it is only necessary to remove a length of wall equal to the story height (H / L =1)

Therefore, for wall longer than story height the percentage is based on a length = story height

Rho Calculation

Rho Calculation for 2nd Floor

Longitudinal Direction; Rho = 1 see following justification Story Height = 11

Transverse Direction; Rho = 1.3 see following justification Story Height = 11

For E/W direction (Shear Lines a and b):

From ASCE 7 Section 12.3.4.2(b):

Each side of structure must have at least (2) bays of seismic force resisting perimeter framing.

Where # Bays present = (2x Length of Shear Wall) / Story Height:

For South Side: $\frac{(20') \times 2}{11} = 3.6$ **> 2, Use Rho =1**

For North Side: $\frac{(24) \times 2}{11} = 4.4$ **> 2, Use Rho =1**

For N/S direction (Shear Lines 1, 2 and 3):

From ASCE 7 Section 12.3.4.2(a):

Removal of any wall with H/L > 1.0 would not reduce the Story strength by more than 33%

Determine total available strength of shear walls in E/W direction:

S/L	S/W Length	TYPE	UNIT STRNGTH Lb. / Ft.	WALL STRENGTH Lb.	PERCENT OF TOTAL
a	18	P1-6	250	4500	15.82%
	17	P1-6	250	4250	15.82%
		P1-2	631	0	0.00%
		P1-2	631	0	0.00%
		P1-2	631	0	0.00%
			Total for S/L a:	**8750**	
b	3	P1-3	492	1476	8.49%
	3.75	P1-3	492	1845	10.61%
	10.8	P1-3	492	5313.6	30.56%
		P1-2	631	0	0.00%
		P1-2	631	0	0.00%
			Total for S/L b:	**8634.6**	

Since no wall contributes more than 33% of total, use Rho = 1.0

Note that in the above calculations, it is only necessary to remove a length of wall equal to the story height (H / L =1)

Therefore, for wall longer than story height the percentage is based on a length = story height

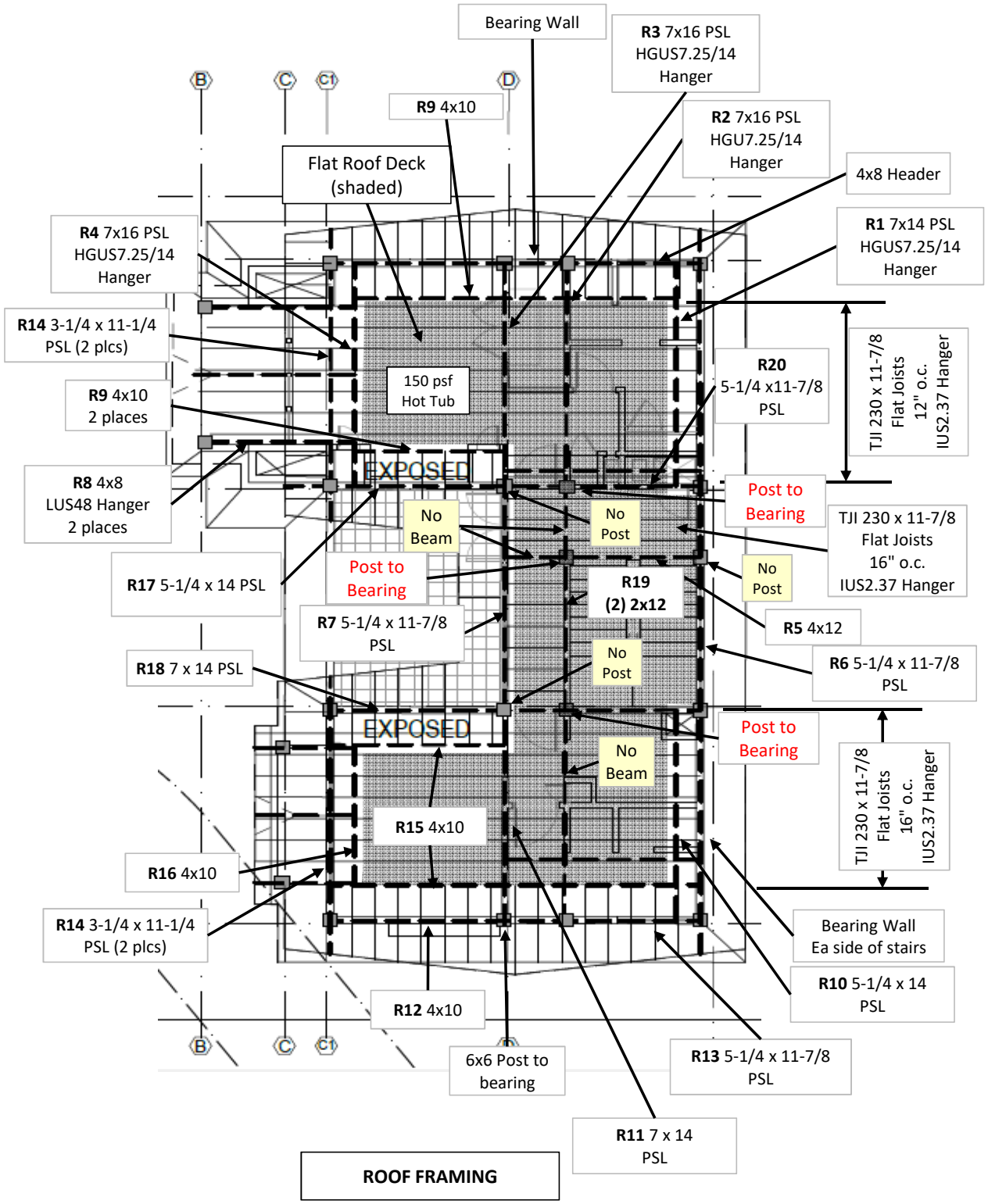
Rho Calculation

Total Lateral Seismic Load = 28653.6 Lb.
Seismic Load on upper floor = 6063.08 Lb.

% Seismic load on upper floor = 6063 / 28653.5 x 100 = 21.1%

Since load carried by upper floor is < 35% of total seismic load, it is not required to calculate Rho

Roof Framing



ROOF FRAMING

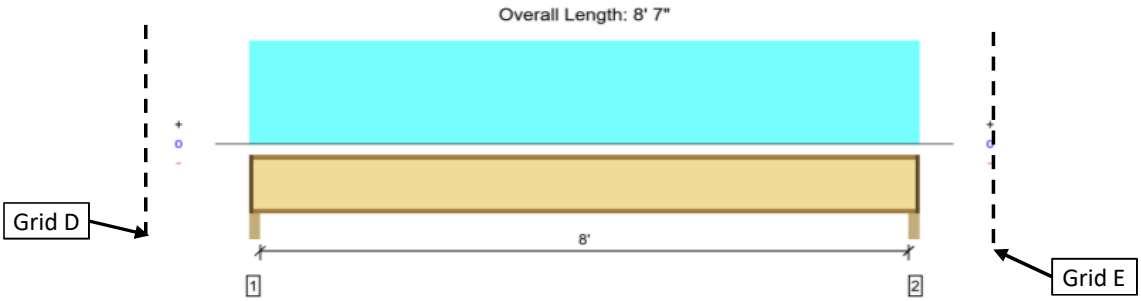
Roof Framing

Flat Roof Deck Joists at Hot Tub

FORTE MEMBER REPORT *ROOF, Flat Joist at hot tub*

1 piece(s) 11 7/8" TJI® 230 @12" OC

PASSED



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)	691 @ 2 1/2"	1183 (2.25")	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	660 @ 3 1/2"	1655	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1376 @ 4' 3 1/2"	4215	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.059 @ 4' 3 1/2"	0.204	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.065 @ 4' 3 1/2"	0.408	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	68	40	Passed	--	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 7' 4" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 5" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - LVL	3.50"	2.25"	1.75"	64	644	708	1 1/4" Rim Board
2 - Beam - LVL	3.50"	2.25"	1.75"	64	644	708	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 8' 7"	12"	15.0	150.0	Roof with Hot Tub

Member Notes

Flat roof joists at hot tub area. Design for 12.5' span with intermediate beam

Roof Framing

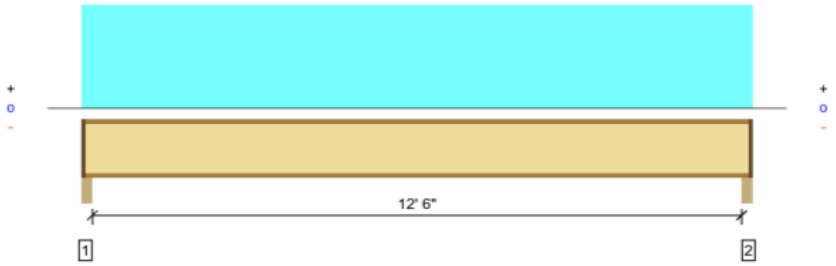
Flat Roof Deck west of hot tub.
60 psf deck loading + 35 psf provision for pavers

FORTE® MEMBER REPORT *ROOF, Flat Joist west of hot tub*

1 piece(s) 11 7/8" TJI® 230 @16" OC

PASSED

Overall Length: 13' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	815 @ 2 1/2"	1183 (2.25")	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	792 @ 3 1/2"	1655	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2540 @ 6' 6 1/2"	4215	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.139 @ 6' 6 1/2"	0.317	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.220 @ 6' 6 1/2"	0.633	Passed (L/691)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	54	40	Passed	--	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 4" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 11" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - LVL	3.50"	2.25"	1.75"	305	523	828	1 1/4" Rim Board
2 - Beam - LVL	3.50"	2.25"	1.75"	305	523	828	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 13' 1"	16"	35.0	60.0	Roof deck with provisions for pavers

Member Notes

Flat roof joists west of hot tub. Span 12.5' w/ 60 psf loading

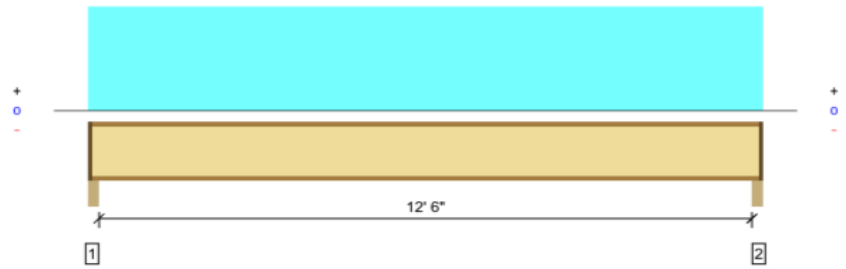
Roof Framing

Flat Roof Deck south end of roof.
60 psf deck loading + 35 psf provision for pavers

FORTE® MEMBER REPORT *ROOF, Flat Joist South end* **PASSED**

1 piece(s) 11 7/8" TJI® 230 @16" OC

Overall Length: 13' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	815 @ 2 1/2"	1183 (2.25")	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	792 @ 3 1/2"	1655	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2540 @ 6' 6 1/2"	4215	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.139 @ 6' 6 1/2"	0.317	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.220 @ 6' 6 1/2"	0.633	Passed (L/691)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	54	40	Passed	--	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 4" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 11" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - LVL	3.50"	2.25"	1.75"	305	523	828	1 1/4" Rim Board
2 - Beam - LVL	3.50"	2.25"	1.75"	305	523	828	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 13' 1"	16"	35.0	60.0	Roof deck with provisions for pavers

Member Notes

Flat roof joists on south end. Span 12.5' w/ 60 psf loading

Roof Framing

Roof Beam R1
North east corner at hot tub

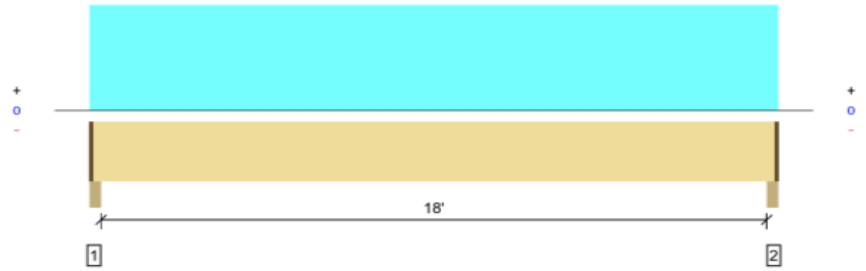
FORTE

MEMBER REPORT *ROOF, Beam R1*

1 piece(s) 7" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 7"



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)	7287 @ 2"	9844 (2.25")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	6213 @ 1' 5 1/2"	18947	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	33022 @ 9' 3 1/2"	54324	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.539 @ 9' 3 1/2"	0.608	Passed (L/407)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.657 @ 9' 3 1/2"	0.913	Passed (L/333)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Beam - PSL	3.50"	2.25"	1.67"	1327	6040	697	8064	1 1/4" Rim Board
2 - Beam - PSL	3.50"	2.25"	1.67"	1327	6040	697	8064	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 5 3/4"	N/A	30.7			
1 - Uniform (PLF)	0 to 18' 7" (Front)	N/A	75.0	650.0	-	Deck load at hot tub
2 - Uniform (PSF)	0 to 18' 7" (Front)	2' 6"	15.0	-	30.0	Rafters on east side

Member Notes

Roof beam northeast corner at hot tub

Roof Framing

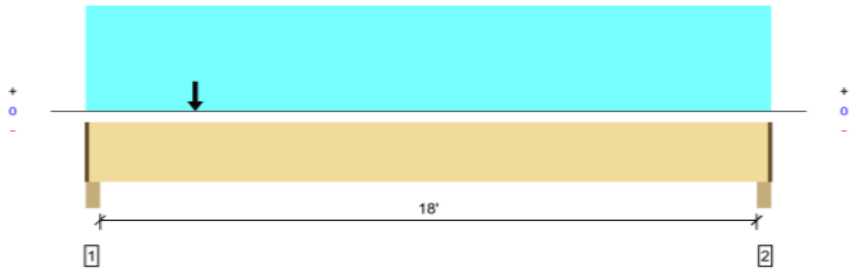
Roof Beam R2
North end at hot tub

FORTE® MEMBER REPORT *ROOF, Beam R2*

1 piece(s) 7" x 16" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 9"



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)	11639 @ 3"	14219 (3.25")	Passed (82%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	9654 @ 1' 8 1/2"	21653	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	51792 @ 9' 4 3/16"	69909	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.551 @ 9' 4 1/2"	0.608	Passed (L/397)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.704 @ 9' 4 3/8"	0.913	Passed (L/311)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Beam - PSL	4.50"	3.25"	2.66"	2624	9141	331	12096	1 1/4" Rim Board
2 - Beam - PSL	4.50"	3.25"	2.63"	2487	9141	59	11687	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 7 3/4"	N/A	35.1			
1 - Uniform (PSF)	0 to 18' 9" (Front)	6' 6"	35.0	150.0	-	Joists at hot tub
2 - Point (lb)	3' (Front)	N/A	195	-	390	Point load from lookout rafters

Member Notes

Roof beam at hot tub

Roof Framing

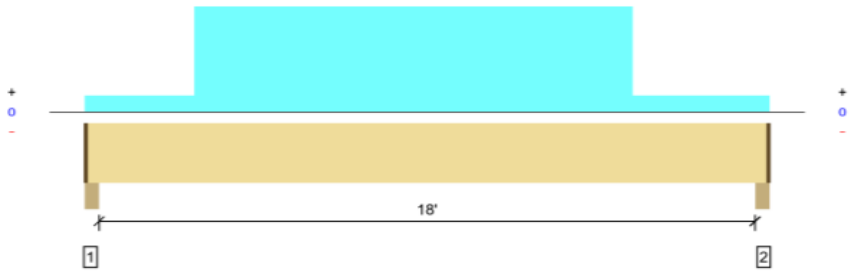
Roof Beam R3
North end deck, center

FORTE® MEMBER REPORT *ROOF, Beam R3*

1 piece(s) 7" x 16" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 9"



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)	9529 @ 3"	14219 (3.25")	Passed (67%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	9130 @ 1' 8 1/2"	21653	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	52778 @ 9' 3 1/4"	69909	Passed (75%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.533 @ 9' 4 1/16"	0.608	Passed (L/411)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.704 @ 9' 4 1/16"	0.913	Passed (L/311)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - PSL	4.50"	3.25"	2.18"	2430	7122	9552	1 1/4" Rim Board
2 - Beam - PSL	4.50"	3.25"	2.05"	2322	6659	8981	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 7 3/4"	N/A	35.1		
1 - Uniform (PSF)	0 to 18' 9" (Front)	2' 3"	35.0	60.0	Joists at deck area
2 - Uniform (PSF)	3' to 15' (Front)	6' 3"	35.0	150.0	Joists at hot tub

Member Notes

Roof beam at North deck, center

Roof Framing

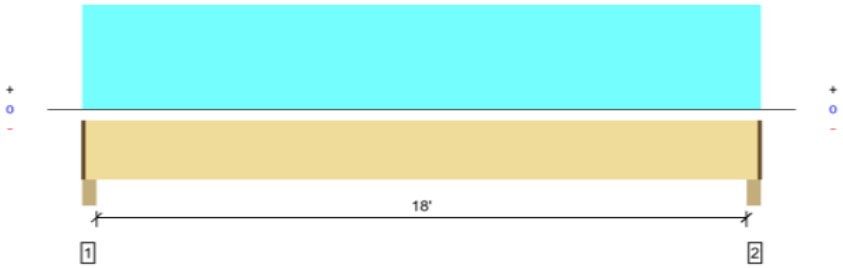
Roof Beam R4
North end deck, West side

FORTE® MEMBER REPORT *ROOF, Beam R4*

1 piece(s) 7" x 16" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 9"



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)	12870 @ 3"	14219 (3.25")	Passed (91%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	10456 @ 1' 8 1/2"	21653	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	56780 @ 9' 4 1/2"	69909	Passed (81%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.544 @ 9' 4 1/2"	0.608	Passed (L/403)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.785 @ 9' 4 1/2"	0.913	Passed (L/279)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Beam - PSL	4.50"	3.25"	2.94"	3993	8789	3234	16016	1 1/4" Rim Board
2 - Beam - PSL	4.50"	3.25"	2.94"	3993	8789	3234	16016	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 7 3/4"	N/A	35.1			
1 - Uniform (PSF)	0 to 18' 9" (Front)	6' 3"	35.0	150.0	-	Joists at deck
2 - Uniform (PSF)	0 to 18' 9" (Front)	11' 6"	15.0	-	30.0	Roof Joists west side

Member Notes

Roof beam at North deck, west end

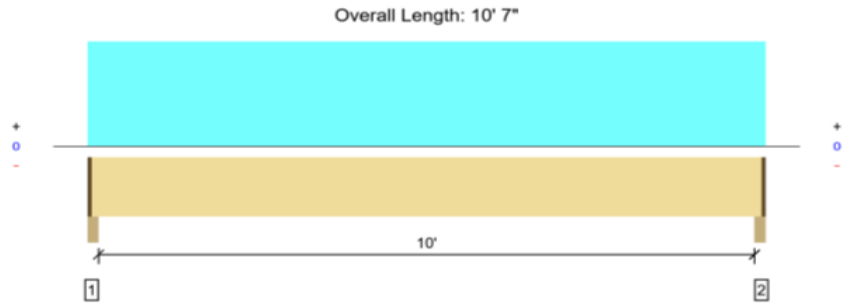
Roof Framing

Roof Beam R5
Roof at stair upper landing

FORTE® MEMBER REPORT *ROOF, Beam R5*

PASSED

1 piece(s) 4 x 12 Douglas Fir-Larch No. 2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1906 @ 2"	4922 (2.25")	Passed (39%)	–	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1493 @ 1' 2 3/4"	4725	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4826 @ 5' 3 1/2"	6091	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.097 @ 5' 3 1/2"	0.256	Passed (L/999+)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.137 @ 5' 3 1/2"	0.512	Passed (L/895)	–	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 10' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 10' 5" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - PSL	3.50"	2.25"	1.50"	568	1376	1944	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	568	1376	1944	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 10' 5 3/4"	N/A	10.0		
1 - Uniform (PSF)	0 to 10' 7" (Front)	1'	15.0	40.0	Floor load upper landing
2 - Uniform (PSF)	0 to 10' 7" (Front)	5' 6"	15.0	40.0	Stair load

Member Notes

Roof beam at top of stairs

Roof Framing

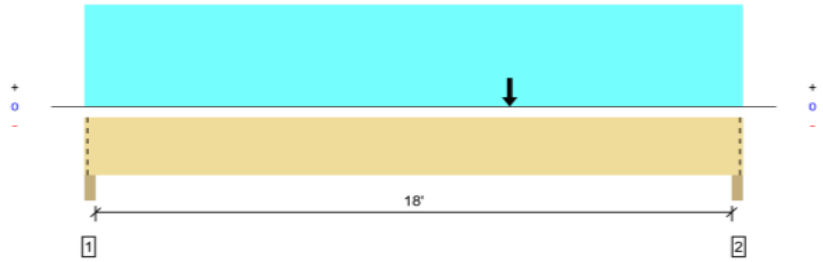
Roof Beam R6
Roof support east of stairs

FORTE MEMBER REPORT *ROOF, Beam R6*

PASSED

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 18' 7"



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)	3479 @ 18' 5"	11484 (3.50")	Passed (30%)	–	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	3144 @ 17' 3 5/8"	15066	Passed (21%)	1.25	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Moment (Ft-lbs)	16705 @ 11' 5 3/4"	37317	Passed (45%)	1.25	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Live Load Defl. (in)	0.425 @ 9' 6 1/2"	0.608	Passed (L/515)	–	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.689 @ 9' 6 5/16"	0.913	Passed (L/318)	–	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 7" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	1173	516	1951	3640	Blocking
2 - Column - DF	3.50"	3.50"	1.50"	1334	908	1951	4193	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 18' 7"	N/A	19.5			
1 - Uniform (PSF)	0 to 18' 7" (Front)	7'	12.0	-	30.0	Roof Load over stairs
2 - Point (lb)	12' (Front)	N/A	575	1400	-	Reaction from Beam R5
3 - Uniform (PSF)	0 (Front)	7'	15.0	40.0	-	Floor joists at upper landing

Member Notes
Roof Beam east of stairs

Roof Framing

Roof Beam R7
West side of upper hallway

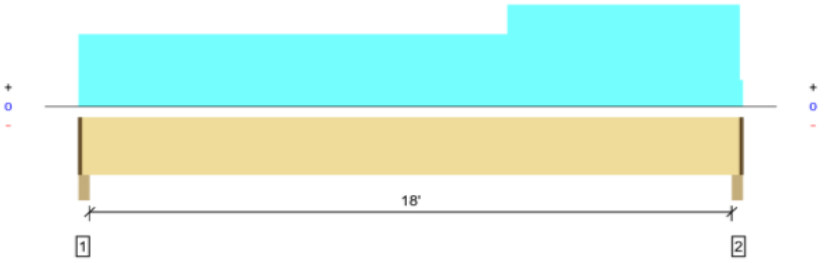
FORTE

MEMBER REPORT *ROOF, Beam R7*

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 7"



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)	3632 @ 18' 5"	7383 (2.25")	Passed (49%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	3020 @ 17' 3 5/8"	12053	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14022 @ 9' 10 3/8"	29854	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.387 @ 9' 4 3/4"	0.456	Passed (L/566)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.635 @ 9' 4 11/16"	0.913	Passed (L/345)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1236	1704	836	3776	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	1403	2148	836	4387	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 5 3/4"	N/A	19.5			
1 - Uniform (PSF)	0 to 18' 7" (Front)	3'	15.0	-	30.0	Roof Eave over lower deck west side
2 - Uniform (PSF)	0 to 12' (Front)	4' 3"	15.0	40.0	-	Hallway joists
3 - Uniform (PSF)	12' to 18' 6" (Front)	7'	15.0	40.0	-	Landing Joists

Member Notes

Roof beam at top of stairs west end of hallway next to stairs

Roof Framing

Roof Beam R8
Gable support at northeast dormer

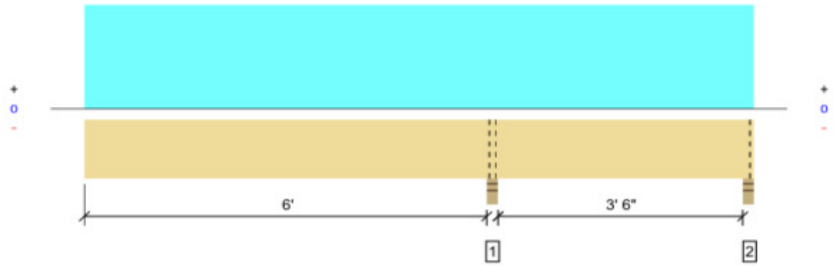
FORTE® MEMBER REPORT *ROOF, Beam R8*

FAILED

1 piece(s) 4 x 8 Douglas Fir-Larch No. 2

Left cantilever length exceeds 1/3 member length or 1/2 back span length.

Overall Length: 10' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	671 @ 6' 1 3/4"	4961 (3.50")	Passed (14%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	316 @ 6' 10 3/4"	3806	Passed (8%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	-971 @ 6' 1 3/4"	3737	Passed (26%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.093 @ 0	0.410	Passed (2L/999+)	--	1.0 D + 1.0 Lr (Alt Spans)
Total Load Defl. (in)	0.157 @ 0	0.615	Passed (2L/938)	--	1.0 D + 1.0 Lr (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 10' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 10' 1" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Stud wall - HF	3.50"	3.50"	1.50"	279	391	670	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	-63	-119	-182	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 10' 1"	N/A	6.4		
1 - Uniform (PSF)	0 to 10' 1" (Front)	1'	15.0	30.0	Roof

Member Notes
Gable support at northwest dormer roof

Beam failed due to uplift from cantilever
Install LUS48 hanger with upload capability of 1000#

Roof Framing

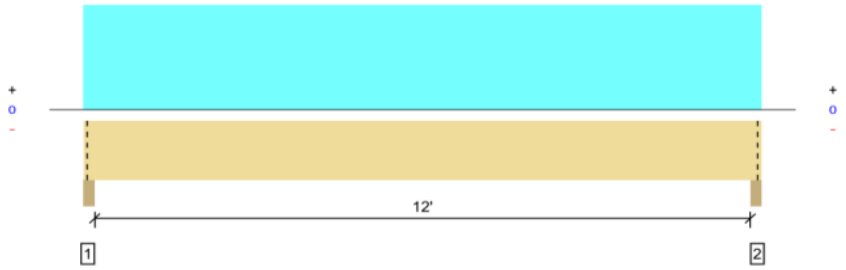
Roof Beam R9
Supports rafters at lower deck (2 places)

FORTE® MEMBER REPORT *ROOF, Beam R9*

1 piece(s) 2 x 10 Hem-Fir No. 2

PASSED

Overall Length: 12' 7"



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)	588 @ 2"	2126 (3.50")	Passed (28%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	489 @ 1' 3/4"	1734	Passed (28%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	1754 @ 6' 3 1/2"	2083	Passed (84%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.236 @ 6' 3 1/2"	0.408	Passed (L/622)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.368 @ 6' 3 1/2"	0.613	Passed (L/399)	--	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 4' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 7" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Beam - HF	3.50"	3.50"	1.50"	211	378	589	Blocking
2 - Beam - HF	3.50"	3.50"	1.50"	211	378	589	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 12' 7"	N/A	3.5		
1 - Uniform (PSF)	0 to 12' 7" (Front)	2'	15.0	30.0	Roof

Roof Framing

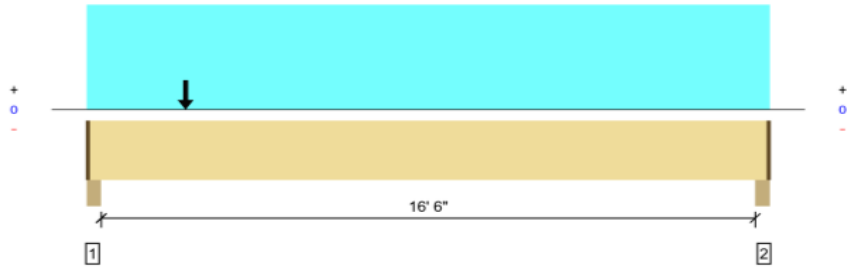
Roof Beam R10
Supports deck joists at south deck

FORTE® MEMBER REPORT *ROOF, Beam R10*

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 17' 3"



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)	6326 @ 3"	6910 (3.25")	Passed (92%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5293 @ 1' 6 1/2"	14210	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	25451 @ 8' 6 15/16"	40743	Passed (62%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.333 @ 8' 7 1/2"	0.419	Passed (L/604)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.576 @ 8' 7 3/8"	0.837	Passed (L/349)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 1" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Beam - HF	4.50"	3.25"	2.97"	2775	3622	933	7330	1 1/4" Rim Board
2 - Beam - HF	4.50"	3.25"	2.89"	2600	3623	582	6805	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 1 3/4"	N/A	23.0			
1 - Uniform (PSF)	0 to 17' 3" (Front)	7'	35.0	60.0	-	Deck area
2 - Uniform (PSF)	0 to 17' 3" (Front)	2'	15.0	-	30.0	Roof rafters
3 - Point (lb)	2' 6" (Front)	N/A	240	-	480	

Member Notes

South roof deck, East side

Roof Framing

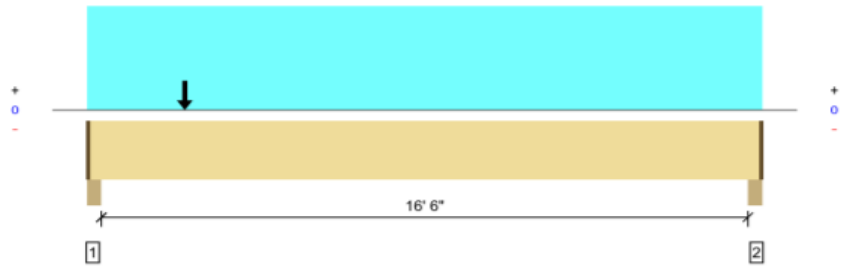
Roof Beam R11
Supports deck joists at south deck

FORTE MEMBER REPORT *ROOF, Beam R11*

1 piece(s) 7" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 17' 3"



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)	10391 @ 3"	14219 (3.25")	Passed (73%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8708 @ 1' 6 1/2"	18947	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	41598 @ 8' 6 13/16"	54324	Passed (77%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.428 @ 8' 7 1/2"	0.419	Passed (L/470)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.707 @ 8' 7 5/16"	0.837	Passed (L/284)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 1" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Beam - PSL	4.50"	3.25"	2.38"	4299	6210	831	11340	1 1/4" Rim Board
2 - Beam - PSL	4.50"	3.25"	2.29"	3948	6210	129	10287	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 1 3/4"	N/A	30.7			
1 - Uniform (PSF)	0 to 17' 3" (Front)	12'	35.0	60.0	-	Deck area
2 - Point (lb)	2' 6" (Front)	N/A	240	-	480	parapet wall supporting roof rafters
3 - Point (lb)	2' 6" (Front)	N/A	240	-	480	parapet wall supporting roof rafters

Member Notes

South roof deck, middle

Roof Framing

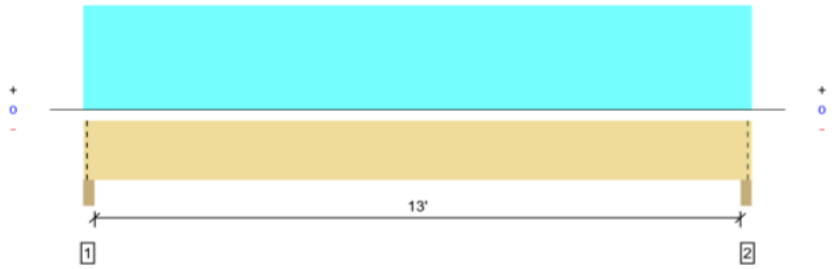
Roof Beam R12
Supports rafters at south end of deck

FORTE® MEMBER REPORT *ROOF, Beam R12*

1 piece(s) 4 x 10 Douglas Fir-Larch No. 1

PASSED

Overall Length: 13' 7"



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)	1278 @ 2"	7656 (3.50")	Passed (17%)	–	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	1078 @ 1' 3/4"	4856	Passed (22%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	4130 @ 6' 9 1/2"	6239	Passed (66%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.212 @ 6' 9 1/2"	0.442	Passed (L/750)	–	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.333 @ 6' 9 1/2"	0.663	Passed (L/478)	–	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 13' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 13' 7" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	463	815	1278	Blocking
2 - Column - DF	3.50"	3.50"	1.50"	463	815	1278	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 13' 7"	N/A	8.2		
1 - Uniform (PSF)	0 to 13' 7" (Front)	4'	15.0	30.0	Roof

Member Notes

Supports lookout rafters on south end

Roof Framing

Roof Beam R13
Supports rafters at south end of deck + R10

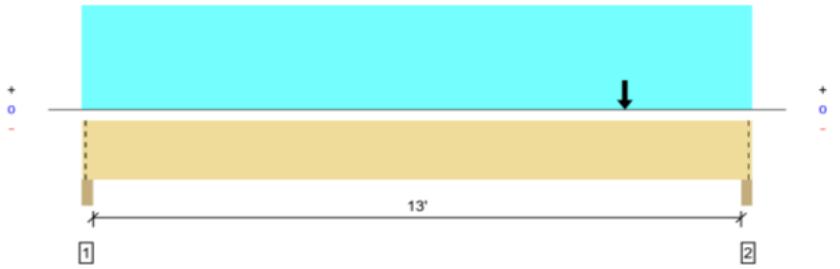
FORTE

MEMBER REPORT *ROOF, Beam R13*

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 13' 7"



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)	6213 @ 13' 5"	11484 (3.50")	Passed (54%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	5668 @ 12' 3 5/8"	12053	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13680 @ 11'	29854	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.158 @ 7' 5"	0.442	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.290 @ 7' 4 15/16"	0.663	Passed (L/549)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 13' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 13' 7" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	1046	661	985	2692	Blocking
2 - Column - DF	3.50"	3.50"	1.89"	2809	2961	1578	7348	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 13' 7"	N/A	19.5			
1 - Uniform (PSF)	0 to 13' 7" (Front)	4'	15.0	-	30.0	Roof
2 - Point (lb)	11' (Front)	N/A	2775	3622	933	Beam R10 reaction

Member Notes

Supports lookout rafters on south end

Roof Framing

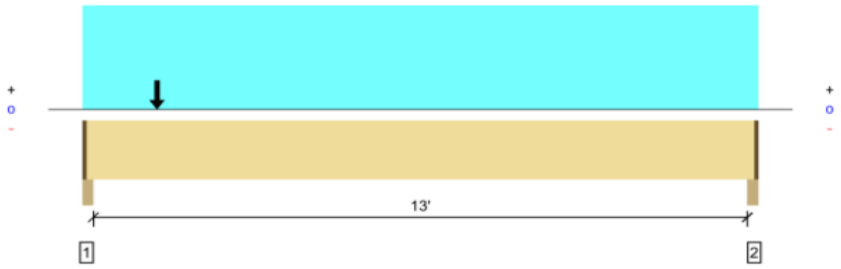
Roof Beam R15
Supports rafters at south deck

FORTE® MEMBER REPORT *ROOF, Beam R15*

PASSED

1 piece(s) 4 x 10 Douglas Fir-Larch No. 2

Overall Length: 13' 7"



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)	1286 @ 2"	4922 (2.25")	Passed (26%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	1192 @ 1' 3/4"	4856	Passed (25%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	2647 @ 6' 7/8"	5615	Passed (47%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.147 @ 6' 6 15/16"	0.442	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.232 @ 6' 7 1/4"	0.663	Passed (L/686)	--	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 13' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 13' 5" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Beam - DF	3.50"	2.25"	1.50"	438	857	1295	1 1/4" Rim Board
2 - Beam - DF	3.50"	2.25"	1.50"	279	458	737	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 13' 5 3/4"	N/A	8.2		
1 - Uniform (PSF)	0 to 13' 7" (Front)	2'	15.0	30.0	Roof
2 - Point (lb)	1' 6" (Front)	N/A	200	500	Reaction from Beam R16

Member Notes

Supports inner end of lookout rafters around deck (north and south decks)

Roof Framing

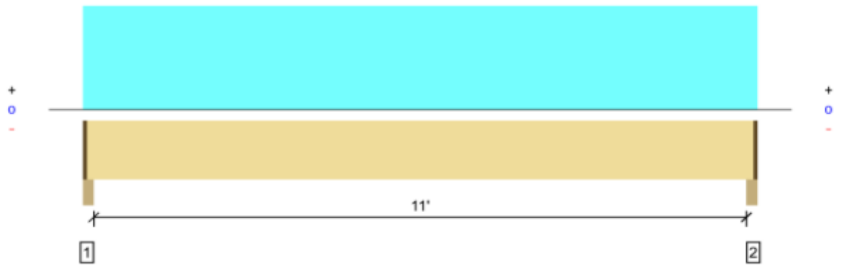
Roof Beam R16
Supports rafters at south deck

FORTE® MEMBER REPORT *ROOF, Beam R16*

1 piece(s) 4 x 10 Douglas Fir-Larch No. 2

PASSED

Overall Length: 11' 7"



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)	559 @ 2"	4922 (2.25")	Passed (11%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	464 @ 1' 3/4"	4856	Passed (10%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	1554 @ 5' 9 1/2"	5615	Passed (28%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.059 @ 5' 9 1/2"	0.375	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.096 @ 5' 9 1/2"	0.563	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 11' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 11' 5" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Beam - DF	3.50"	2.25"	1.50"	220	348	568	1 1/4" Rim Board
2 - Beam - DF	3.50"	2.25"	1.50"	220	348	568	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 11' 5 3/4"	N/A	8.2		
1 - Uniform (PSF)	0 to 11' 7" (Front)	2'	15.0	30.0	Roof

Member Notes

Suuports end of rafters at south deck

Roof Framing

Roof Beam R14
Supports rafters at south deck

FORTE® MEMBER REPORT *ROOF, Beam R14*

PASSED

1 piece(s) 3 1/2" x 11 1/4" 2.0E Parallam® PSL

Overall Length: 17' 7"

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)	3083 @ 2"	7656 (3.50")	Passed (40%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	2846 @ 1' 2 3/4"	9516	Passed (30%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	11591 @ 9' 2 5/8"	22463	Passed (52%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.522 @ 8' 10 1/16"	0.575	Passed (L/397)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.818 @ 8' 10 1/16"	0.863	Passed (L/253)	--	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 7" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	1114	1969	3083	Blocking
2 - Column - DF	3.50"	3.50"	1.50"	1057	1861	2918	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 17' 7"	N/A	12.3		
1 - Uniform (PSF)	0 to 17' 7" (Front)	4'	15.0	30.0	Roof
2 - Point (lb)	3' (Front)	N/A	450	860	R15 Reaction
3 - Point (lb)	13' 6" (Front)	N/A	450	860	R15 Reaction

Member Notes

Supports rafters at southwest corner

Roof Framing

Roof Beam R17
Supports rafters at lower deck + Beam R3

FORTE MEMBER REPORT *ROOF, Beam R17*

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 17' 7"

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)	7219 @ 17' 5"	7383 (2.25")	Passed (98%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7107 @ 16' 1 1/2"	14210	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	34467 @ 12' 6"	40743	Passed (85%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.424 @ 9' 8 1/16"	0.431	Passed (L/488)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.652 @ 9' 6 15/16"	0.863	Passed (L/318)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1420	1898	1319	4637	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	2.20"	2465	4761	1319	8545	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 5 3/4"	N/A	23.0			
1 - Point (lb)	12' 6" (Top)	N/A	2430	6659	-	Beam R3
2 - Uniform (PSF)	0 to 17' 7" (Top)	5'	12.0	-	30.0	roof load at lower deck

Member Notes

Supports small roof load +R3

Roof Framing

Roof Beam R18
Supports rafters at lower deck + Beam R7+R11

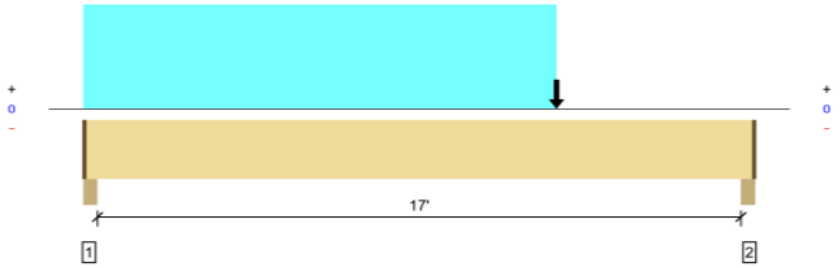
FORTE

MEMBER REPORT *ROOF, Beam R18*

1 piece(s) 7" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 17' 9"



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)	10487 @ 17' 6"	14219 (3.25")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	10443 @ 16' 2 1/2"	18947	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	52029 @ 12' 6"	54324	Passed (96%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.409 @ 9' 7 3/4"	0.431	Passed (L/506)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.729 @ 9' 7 5/8"	0.863	Passed (L/284)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 7" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	4.50"	3.25"	1.50"	2247	2423	1295	5965	1 1/4" Rim Board
2 - Column - DF	4.50"	3.25"	2.40"	4552	5935	1766	12253	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 7 3/4"	N/A	30.7			
1 - Uniform (PSF)	0 to 12' 6" (Front)	3'	12.0	-	30.0	Lower deck roof
2 - Point (lb)	12' 6" (Front)	N/A	4407	6210	1100	R11 end reaction
3 - Point (lb)	12' 6" (Front)	N/A	1403	2148	836	R7 end reaction

Member Notes

South end of lower deck. Supports lower deck roof + R11 reaction + R7 reaction

Roof Framing

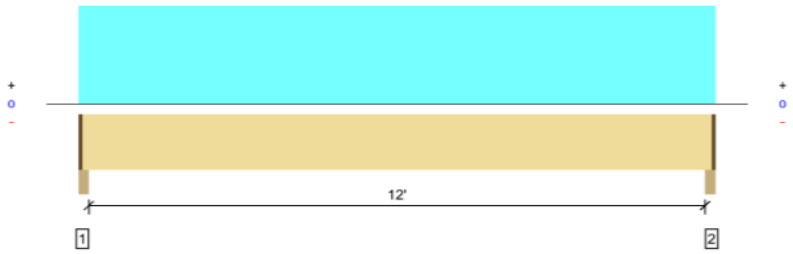
Roof Beam R19
Supports floor joists west of stairs

FORTE® MEMBER REPORT *ROOF, Beam R19*

2 piece(s) 2 x 12 Hem-Fir No. 2

PASSED

Overall Length: 12' 7"



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)	777 @ 2"	2734 (2.25")	Passed (28%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	636 @ 1' 2 3/4"	3375	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2355 @ 6' 3 1/2"	4482	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.099 @ 6' 3 1/2"	0.306	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.137 @ 6' 3 1/2"	0.613	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 5" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	223	566	789	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	223	566	789	1 1/4" Rim Board

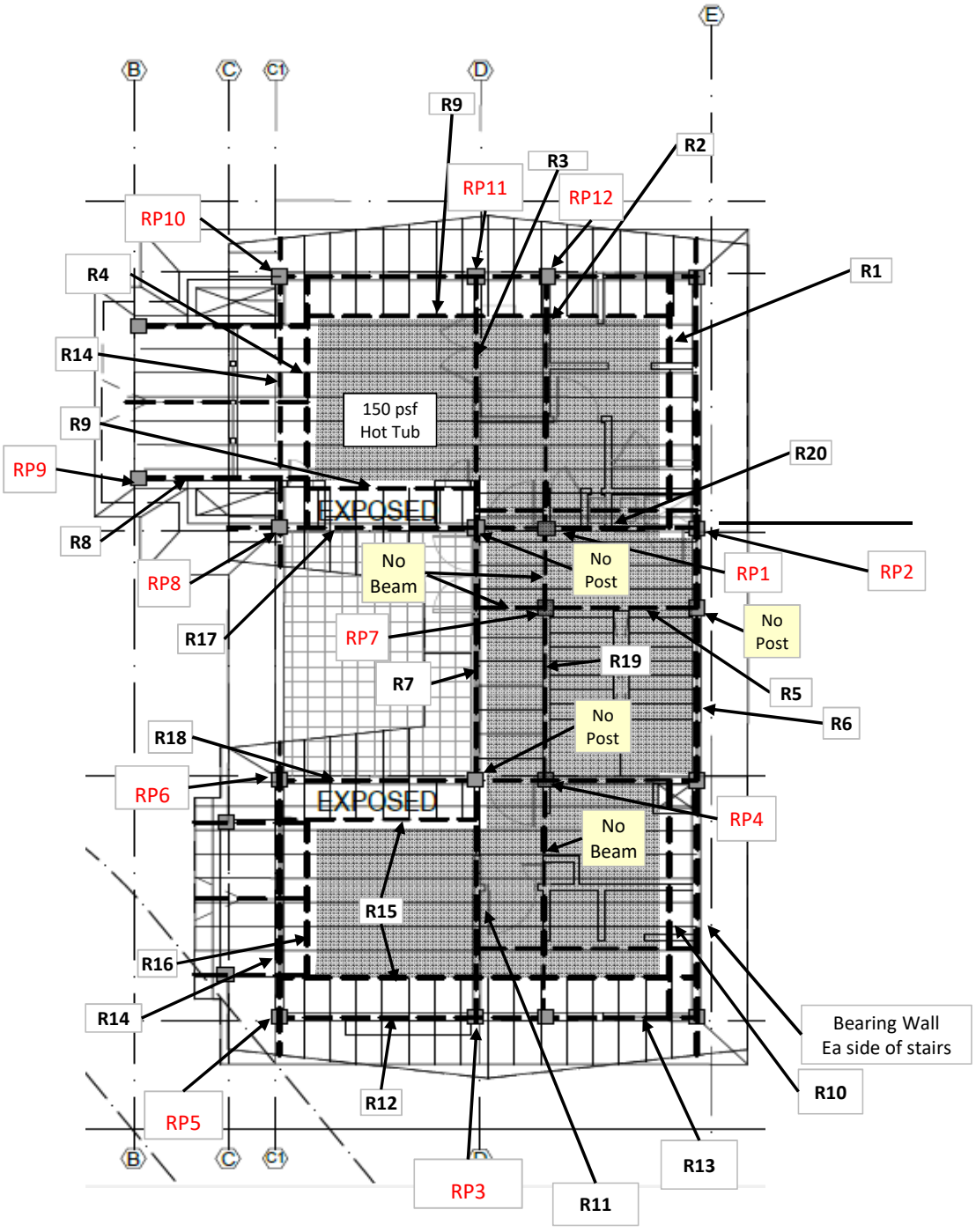
- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 5 3/4"	N/A	8.6		
1 - Uniform (PSF)	0 to 12' 7" (Front)	2' 3"	12.0	40.0	Residential - Living Areas

Member Notes

Floor Beam west of stairs

Roof Framing-Posts



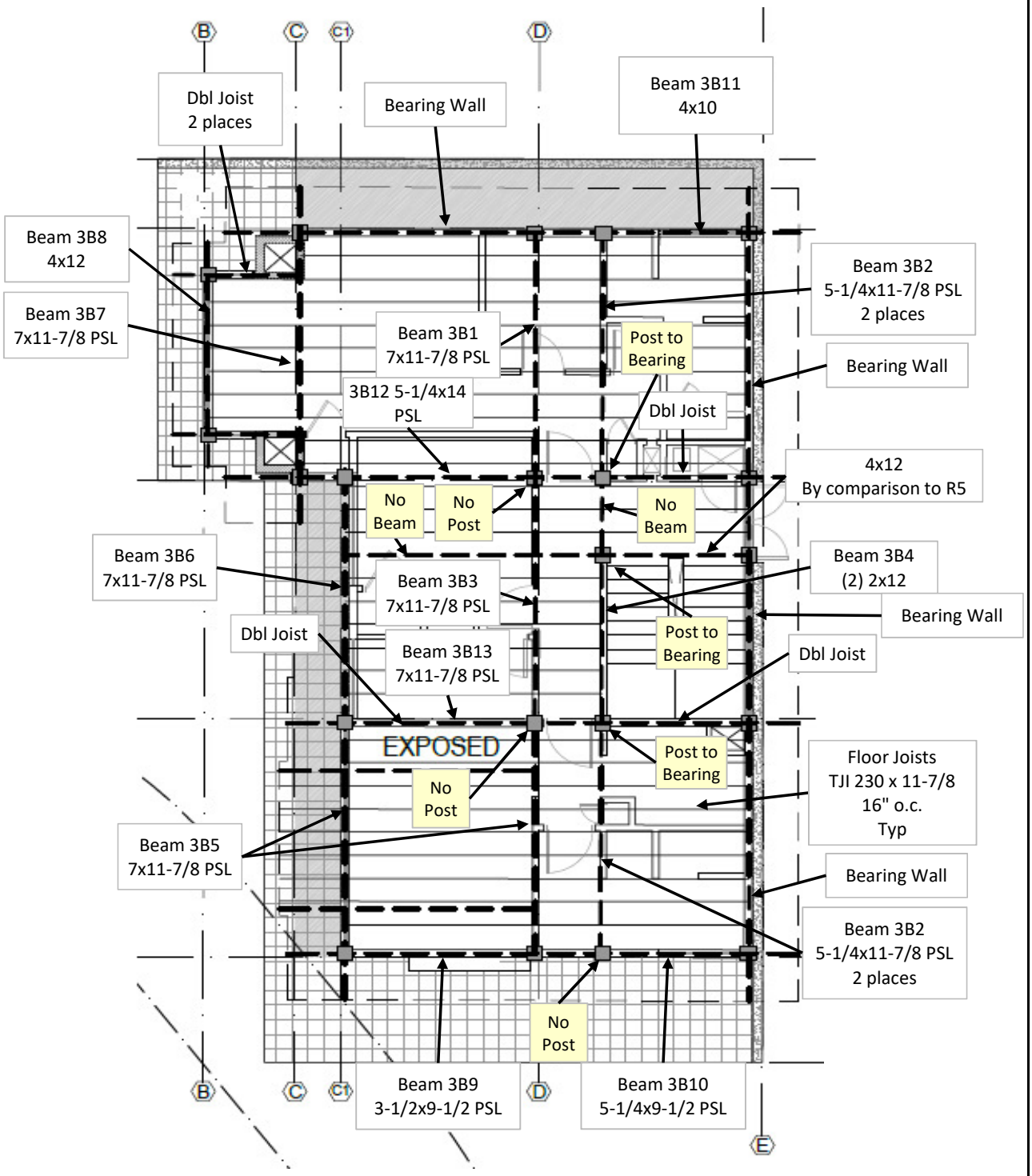
ROOF FRAMING POSTS

	QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 54 / 135

Roof Framing-Posts

BEAM ID	POST ID	POST SIZE	HANGER TYPE	NOTES
R1			HGUS7.25/14	
R2			HGU7.25/14	
	RP1	5-1/4 x 5-1/4 PSL		23000 lb Total
R3			HGUS7.25/14	
R4			HGUS7.25/14	
R5			HUS412	
R6				Lands on Post
	RP2	5-1/4 x 5-1/4 PSL		10,800 Lb Total
R7			HHUS5.5/10	
R8		4x4 D-Fir	LUS48	
R9			LUS210	
R10			HGUS5.50/14	
R11			HHGU7.25-SDS	
R12			LUS410	
R13			HGUS5.50/12	
	RP3	5-1/4 x 5-1/4 PSL		
R14				
R15			U410	
R16			U410	
R17			Custom	8600 lb. needs to hang on 5" post
R18			Custom	12500 lb
R19			U210-2	
R20			HGUS5.50/12	
	RP4	6x6 D-Fir		13,100 lb.
	RP5	3-1/2 x 3-1/2 PSL		
	RP6	3-1/2 x 7 PSL		
	RP7	4x4 D-Fir		
	RP8	3-1/2 x 5-1/4 PSL		
	RP9	4x4 D-Fir		
	RP10	4x4 D-Fir		
	RP11	5-1/4 x 5-1/4 PSL		
	RP12	5-1/4 x 5-1/4 PSL		

3rd Floor Framing



THIRD FLOOR FRAMING

QED QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716	
		PAGE	56 / 135

3rd Floor Framing

3rd Floor Joists

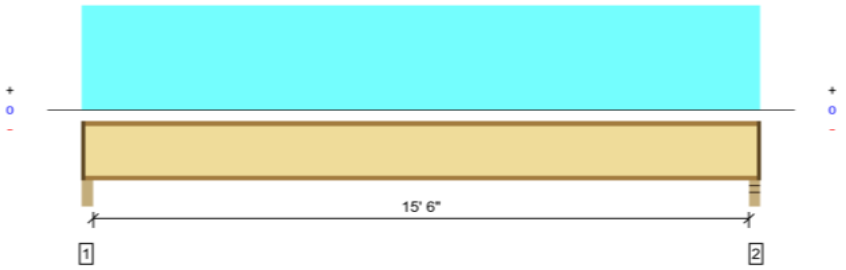
FORTE

MEMBER REPORT *3rd FLOOR, 3rd Floor Joists*

1 piece(s) 11 7/8" TJI® 230 @16" OC

PASSED

Overall Length: 16' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	550 @ 2 1/2"	1183 (2.25")	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	537 @ 3 1/2"	1655	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2127 @ 8' 1/2"	4215	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.201 @ 8' 1/2"	0.392	Passed (L/935)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.261 @ 8' 1/2"	0.783	Passed (L/719)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	45	40	Passed	--	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 10" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 15' 11" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - PSL	3.50"	2.25"	1.75"	129	429	558	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.75"	129	429	558	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 1"	16"	12.0	40.0	Residential - Living Areas

3rd Floor Framing

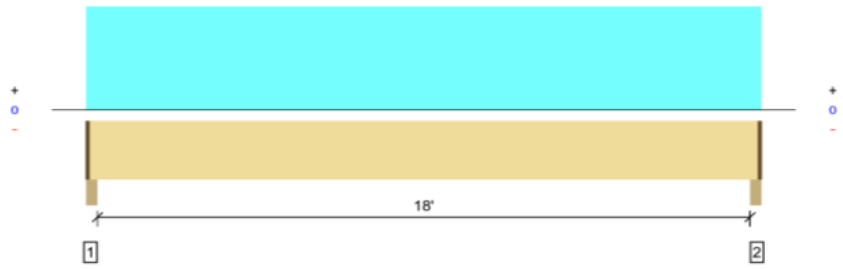
3rd Floor Beam 3B1

FORTE® MEMBER REPORT *3rd FLOOR, 3B1*

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 7"



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)	5017 @ 2"	9844 (2.25")	Passed (51%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4374 @ 1' 3 3/8"	16071	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22733 @ 9' 3 1/2"	39805	Passed (57%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.534 @ 9' 3 1/2"	0.608	Passed (L/410)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.729 @ 9' 3 1/2"	0.913	Passed (L/300)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1354	3717	5071	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	1354	3717	5071	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 5 3/4"	N/A	26.0		
1 - Uniform (PSF)	0 to 18' 7" (Front)	10'	12.0	40.0	Residential - Living Areas

Member Notes

Floor beam north end

3rd Floor Framing

3rd Floor Beam 3B2

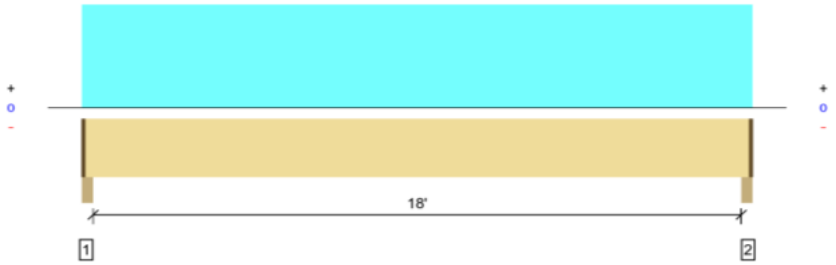
FORTE

MEMBER REPORT *3rd FLOOR, 3B2*

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 7"



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)	4001 @ 2"	7383 (2.25")	Passed (54%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3488 @ 1' 3 3/8"	12053	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	18131 @ 9' 3 1/2"	29854	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.570 @ 9' 3 1/2"	0.608	Passed (L/384)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.775 @ 9' 3 1/2"	0.913	Passed (L/282)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1071	2973	4044	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	1071	2973	4044	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 5 3/4"	N/A	19.5		
1 - Uniform (PSF)	0 to 18' 7" (Front)	8'	12.0	40.0	Residential - Living Areas

Member Notes

Floor beam north end

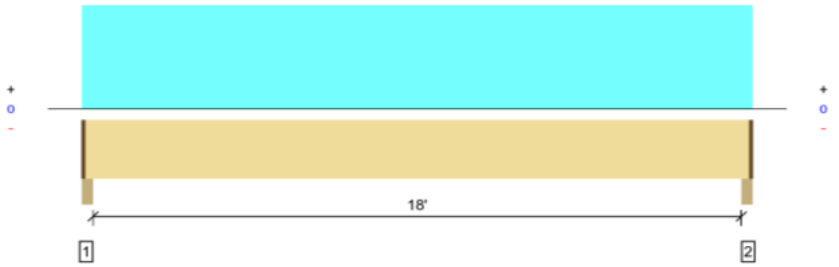
3rd Floor Framing

3rd Floor Beam 3B3

FORTE MEMBER REPORT *3rd FLOOR, 3B3* **PASSED**

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 18' 7"



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)	4539 @ 2"	9844 (2.25")	Passed (46%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3957 @ 1' 3 3/8"	16071	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	20568 @ 9' 3 1/2"	39805	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.481 @ 9' 3 1/2"	0.608	Passed (L/456)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.660 @ 9' 3 1/2"	0.913	Passed (L/332)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 5" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1243	3345	4588	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	1243	3345	4588	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 5 3/4"	N/A	26.0		
1 - Uniform (PSF)	0 to 18' 7" (Front)	9'	12.0	40.0	Residential - Living Areas

Member Notes

Floor beam center section

3rd Floor Framing

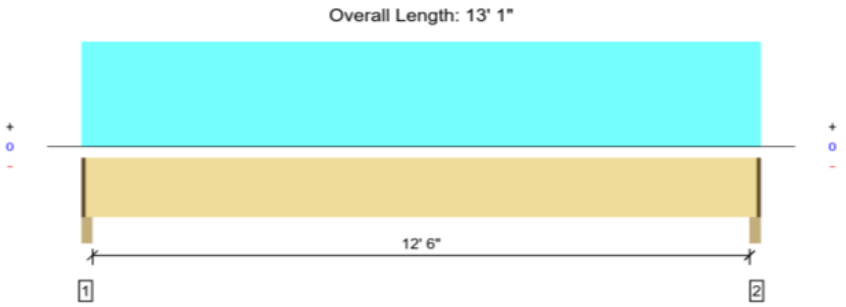
3rd Floor Beam 3B4

FORTE

MEMBER REPORT *3rd FLOOR, 3B4*

2 piece(s) 2 x 12 Hem-Fir No. 2

PASSED



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)	892 @ 2"	2734 (2.25")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	736 @ 1' 2 3/4"	3375	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2815 @ 6' 6 1/2"	4482	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.128 @ 6' 6 1/2"	0.319	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.178 @ 6' 6 1/2"	0.637	Passed (L/859)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 11" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	251	654	905	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	251	654	905	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 11 3/4"	N/A	8.6		
1 - Uniform (PSF)	0 to 13' 1" (Front)	2' 6"	12.0	40.0	Residential - Living Areas

Member Notes

Adjacent to stairs

3rd Floor Framing

Double joists adjacent to deck and stairs supporting bearing walls above

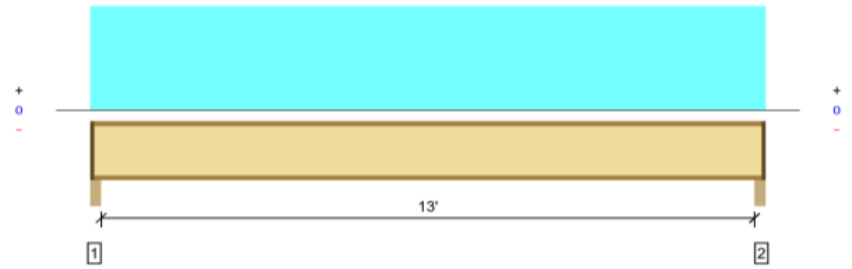
FORTE

MEMBER REPORT *3rd FLOOR, DoubleJoist adjacent to deck and stairs*

2 piece(s) 11 7/8" TJI® 230

PASSED

Overall Length: 13' 7"



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)	2008 @ 2"	2957 (2.25")	Passed (68%)	1.25	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	1952 @ 3 1/2"	4138	Passed (47%)	1.25	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Moment (Ft-lbs)	6590 @ 6' 9 1/2"	10538	Passed (63%)	1.25	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Live Load Defl. (in)	0.185 @ 6' 9 1/2"	0.331	Passed (L/860)	–	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.359 @ 6' 9 1/2"	0.663	Passed (L/443)	–	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 4' 8" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 13' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Beam - DF	3.50"	2.25"	1.75"	990	380	1019	2389	1 1/4" Rim Board
2 - Beam - DF	3.50"	2.25"	1.75"	990	380	1019	2389	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 13' 5 3/4"	N/A	6.0			
1 - Uniform (PSF)	0 to 13' 7" (Top)	1' 4 13/16"	12.0	40.0	-	Residential - Living Areas
2 - Uniform (PSF)	0 to 13' 7" (Top)	5'	15.0	-	30.0	Rafters on bearing wall above
3 - Uniform (PLF)	0 to 13' 7" (Top)	N/A	48.0	-	-	wall weight above

Member Notes

Supports 3rd floor load + bearing wall above

3rd Floor Framing

3rd Floor Beam 3B5

FORTE MEMBER REPORT *3rd FLOOR, 3B5* **PASSED**

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 17' 7"

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)	4557 @ 2"	9844 (2.25")	Passed (46%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4006 @ 1' 3 3/8"	16071	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	19041 @ 8' 10 9/16"	39805	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.364 @ 8' 9 1/2"	0.431	Passed (L/568)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.554 @ 8' 9 5/8"	0.863	Passed (L/374)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 5" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1614	2989	955	5558	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	1532	2989	795	5316	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 5 3/4"	N/A	26.0			
1 - Uniform (PSF)	0 to 17' 7" (Front)	8' 6"	12.0	40.0	-	Residential - Living Areas
2 - Point (lb)	3' (Top)	N/A	450	-	875	Reaction from R15 above
3 - Point (lb)	13' (Top)	N/A	450	-	875	Reaction from R15 above

Member Notes

Floor beam south section center, Supports floor joists + 2x RB15

3rd Floor Framing

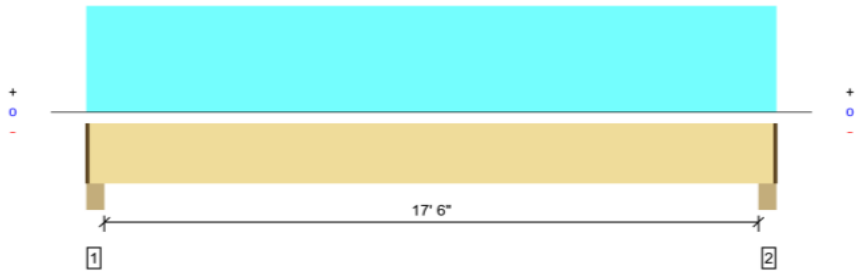
3rd Floor Beam 3B6

FORTE® MEMBER REPORT *3rd FLOOR, 3B6*

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 18' 5"



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)	5481 @ 4"	18594 (4.25")	Passed (29%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4672 @ 1' 5 3/8"	16071	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	23709 @ 9' 2 1/2"	39805	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.557 @ 9' 2 1/2"	0.592	Passed (L/382)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.721 @ 9' 2 1/2"	0.887	Passed (L/295)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 3" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	5.50"	4.25"	1.50"	1259	4282	5541	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.50"	1259	4282	5541	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 3 3/4"	N/A	26.0		
1 - Uniform (PSF)	0 to 18' 5" (Front)	6' 3"	12.0	60.0	Deck area
2 - Uniform (PSF)	0 to 18' 5" (Front)	3'	12.0	30.0	Roof Load

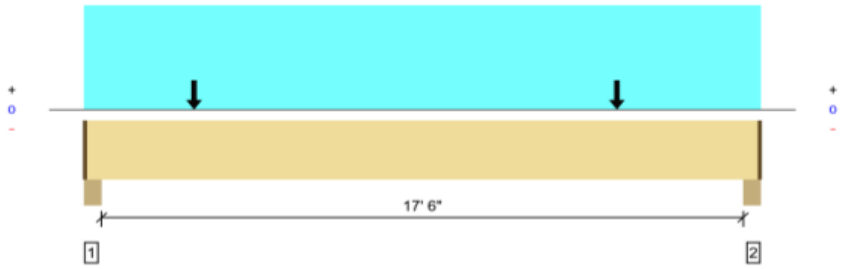
3rd Floor Framing

3rd Floor Beam 3B7

FORTE MEMBER REPORT *3rd FLOOR, 3B7* **PASSED**

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 18' 5"



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)	5886 @ 4"	18594 (4.25")	Passed (32%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5083 @ 1' 5 3/8"	16071	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	24865 @ 9' 2 15/16"	39805	Passed (62%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.527 @ 9' 2 1/2"	0.592	Passed (L/404)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.762 @ 9' 2 9/16"	0.887	Passed (L/280)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 18' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 18' 3" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	5.50"	4.25"	1.50"	1894	4052	1104	7050	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.50"	1851	4052	996	6899	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 18' 3 3/4"	N/A	26.0			
1 - Uniform (PSF)	0 to 18' 5" (Front)	11'	12.0	40.0	-	Residential - Living Areas
2 - Point (lb)	3' (Front)	N/A	420	-	1050	Roof Beam above
3 - Point (lb)	14' 6" (Front)	N/A	420	-	1050	Roof Beam above

Member Notes

floor beam northwest corner

3rd Floor Framing

3rd Floor Beam 3B8

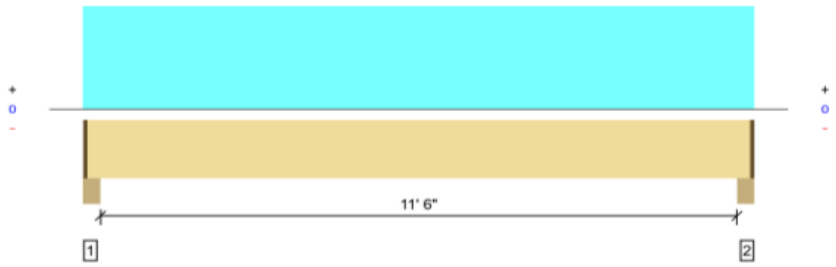
FORTE

MEMBER REPORT *3rd FLOOR, 3B8*

1 piece(s) 4 x 12 Douglas Fir-Larch No. 1

PASSED

Overall Length: 12' 5"



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)	1695 @ 4"	9297 (4.25")	Passed (18%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	1126 @ 1' 4 3/4"	4725	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4038 @ 6' 2 1/2"	6768	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.112 @ 6' 2 1/2"	0.392	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.169 @ 6' 2 1/2"	0.587	Passed (L/836)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 3" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	5.50"	4.25"	1.50"	582	869	652	2103	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.50"	582	869	652	2103	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 3 3/4"	N/A	10.0			
1 - Uniform (PSF)	0 to 12' 5" (Front)	3' 6"	12.0	40.0	-	Residential - Living Areas
2 - Uniform (PSF)	0 to 12' 5" (Front)	3' 6"	12.0	-	30.0	Roof Load

Member Notes
floor beam northwest corner

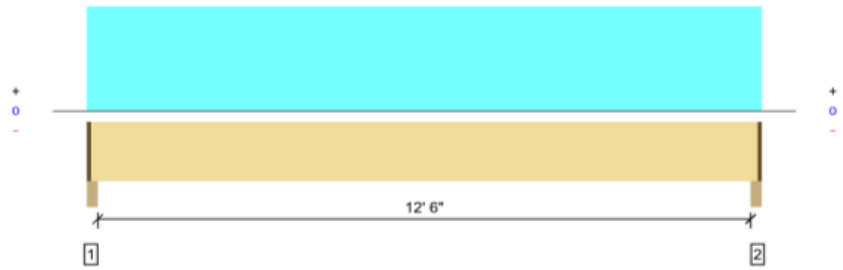
3rd Floor Framing

3rd Floor Beam 3B9

FORTE MEMBER REPORT *3rd FLOOR, 3B9* **PASSED**

1 piece(s) 3 1/2" x 9 1/2" 2.0E Parallam® PSL

Overall Length: 13' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1335 @ 2"	4922 (2.25")	Passed (27%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	1132 @ 1' 1"	8035	Passed (14%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	4214 @ 6' 6 1/2"	16321	Passed (26%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.132 @ 6' 6 1/2"	0.319	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.261 @ 6' 6 1/2"	0.637	Passed (L/586)	--	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 11" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	669	687	1356	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	669	687	1356	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 11 3/4"	N/A	10.4		
1 - Uniform (PSF)	0 to 13' 1" (Front)	3' 6"	12.0	30.0	Roof load
2 - Uniform (PLF)	0 to 13' 1" (Front)	N/A	50.0	-	Dead weight of wall above

Member Notes

Beam in south wall

3rd Floor Framing

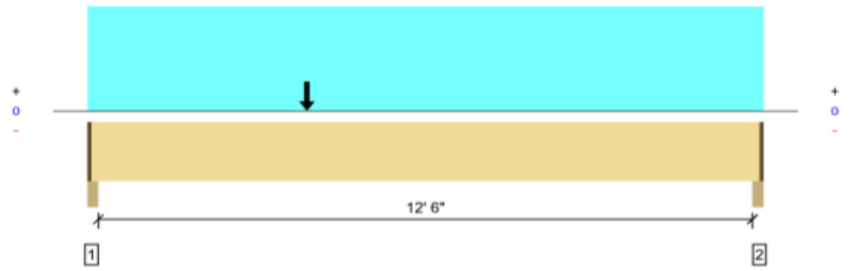
3rd Floor Beam 3B10

FORTE MEMBER REPORT *3rd FLOOR, 3B10*

PASSED

1 piece(s) 5 1/4" x 9 1/2" 2.0E Parallam® PSL

Overall Length: 13' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3443 @ 2"	7383 (2.25")	Passed (47%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	3336 @ 1' 1"	9643	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13128 @ 4' 3"	19585	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.263 @ 5' 11 3/8"	0.319	Passed (L/581)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.447 @ 6' 13/16"	0.637	Passed (L/342)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 11" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1430	2021	687	4138	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	1045	952	687	2684	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 11 3/4"	N/A	15.6			
1 - Uniform (PSF)	0 to 13' 1" (Top)	3' 6"	12.0	-	30.0	Roof load
2 - Uniform (PLF)	0 to 13' 1" (Top)	N/A	50.0	-	-	Dead weight of wall above
3 - Point (lb)	4' 3" (Top)	N/A	1071	2973	-	

Member Notes

Beam in south wall

3rd Floor Framing

3rd Floor Beam 3B11

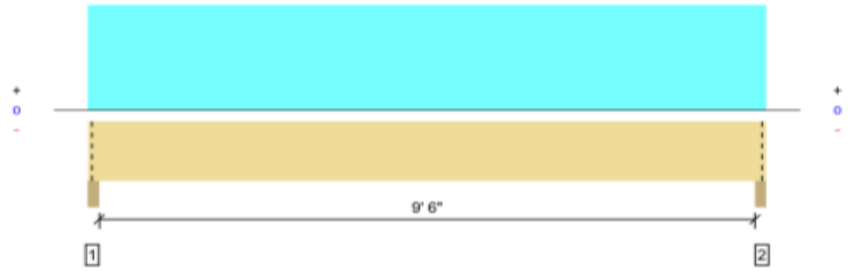
FORTE

MEMBER REPORT *3rd FLOOR, 3B11*

1 piece(s) 4 x 10 Douglas Fir-Larch No. 2

PASSED

Overall Length: 10' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1221 @ 2"	7656 (3.50")	Passed (16%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	964 @ 1' 3/4"	4856	Passed (20%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	2878 @ 5' 1/2"	5615	Passed (51%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.050 @ 5' 1/2"	0.325	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.133 @ 5' 1/2"	0.488	Passed (L/877)	--	1.0 D + 1.0 Lr (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 10' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 10' 1" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	767	454	1221	Blocking
2 - Column - DF	3.50"	3.50"	1.50"	767	454	1221	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 10' 1"	N/A	8.2		
1 - Uniform (PSF)	0 to 10' 1" (Top)	3'	12.0	30.0	Roof
2 - Uniform (PLF)	0 to 10' 1" (Top)	N/A	108.0	-	Dead load from walls above

Member Notes

Header at windows in Northeast corner

3rd Floor Framing

3rd Floor Beam 3B12

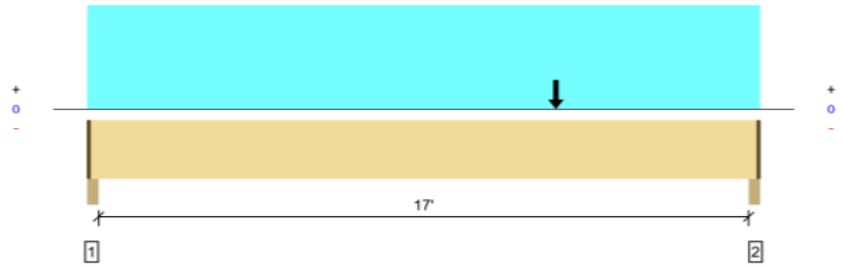
FORTE

MEMBER REPORT *3rd FLOOR, 3B12*

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 17' 7"



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)	7400 @ 17' 5"	7383 (2.25")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7301 @ 16' 1 1/2"	14210	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	37236 @ 12' 3"	40743	Passed (91%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.467 @ 9' 7 9/16"	0.470	Passed (L/444)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.702 @ 9' 6 11/16"	0.863	Passed (L/295)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/440) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	1417	2115	3532	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	2.26"	2458	4947	7405	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 5 3/4"	N/A	23.0		
1 - Uniform (PLF)	0 to 17' 7" (Front)	N/A	50.0	-	Wall weight above
2 - Point (lb)	12' 3" (Front)	N/A	1354	3717	Beam 3B1
3 - Point (lb)	12' 3" (Front)	N/A	1243	3345	Beam 3B3

Member Notes

North end of lower deck. Supports wall load +3B1+3B3

3rd Floor Framing

3rd Floor Beam 3B13

FORTE

MEMBER REPORT *3rd FLOOR, 3B13*

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 17' 9"

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)	7860 @ 17' 6"	14219 (3.25")	Passed (55%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7764 @ 16' 4 5/8"	16071	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	28898 @ 13' 9"	39805	Passed (73%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.391 @ 9' 11 5/16"	0.431	Passed (L/529)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.648 @ 9' 9 5/8"	0.863	Passed (L/320)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 7" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	4.50"	3.25"	1.50"	1293	1377	208	2878	1 1/4" Rim Board
2 - Column - DF	4.50"	3.25"	1.80"	2908	4957	747	8612	1 1/4" Rim Board

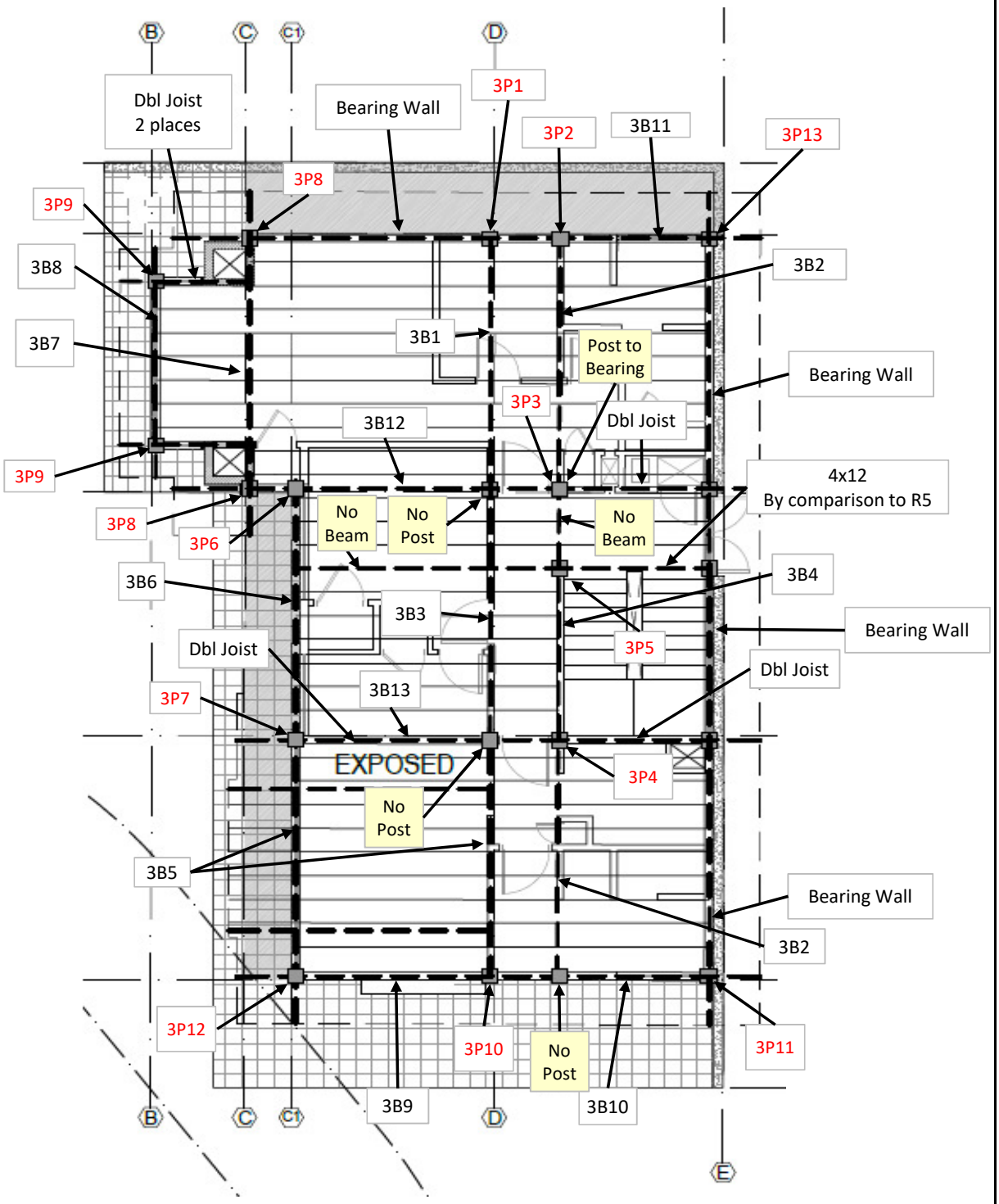
- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 7 3/4"	N/A	26.0			
1 - Uniform (PLF)	0 to 17' 9" (Front)	N/A	50.0	-	-	Wall weight above
2 - Point (lb)	13' 9" (Front)	N/A	1614	2989	955	Beam 3B5
3 - Point (lb)	13' 9" (Front)	N/A	1243	3345	-	Beam 3B3

Member Notes

At south end of stairs. Supports wall weight above + 3B3+3B5

3rd Floor Posts

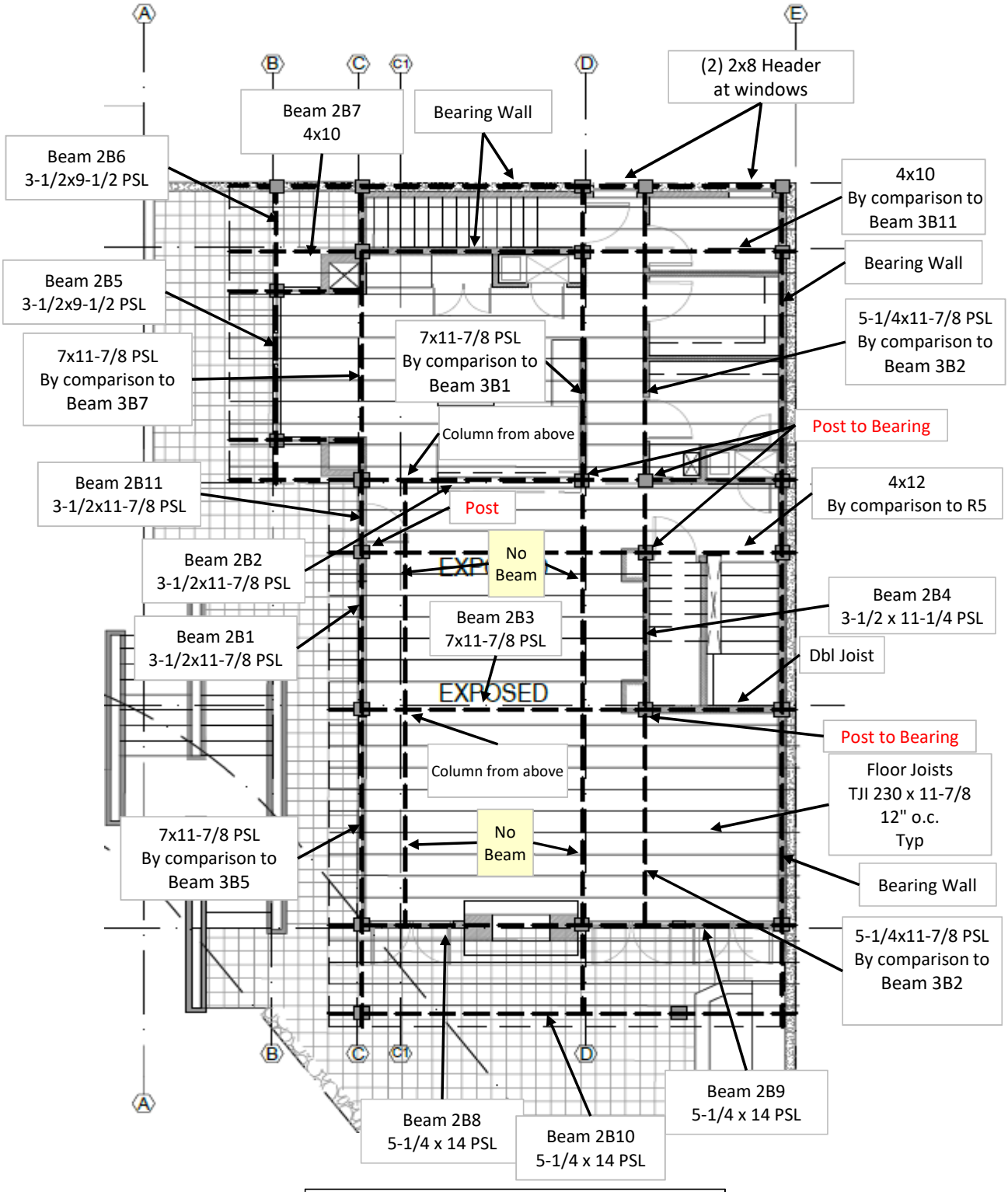


THIRD FLOOR FRAMING POSTS

3rd Floor Posts

BEAM ID	POST ID	POST SIZE	HANGER TYPE	NOTES
3B1	3P1	4x6 D-Fir	HHUS7.25/10	
3B2	3P2	4x4 D-Fir		
	3P3	5-1/4 x 5-1/4 PSL	12,000 lb.	12,000 lb.
	3P4	5-1/4 x 5-1/4 PSL	15,000 lb.	15,000 lb.
3B3			HGUS7.25/12	
3B4			U210-2	
	3P5	4x4 D-Fir		3000 lb.
3B5			HGUS7.25/12	
3B6	3P6	5-1/4 x 5-1/4 PSL		
	3P7	5-1/4 x 5-1/4 PSL		
3B7	3P8	6x6 D-Fir		
3B8	3P9	4x4 D-Fir		
3B9	3P10	6x6 D-Fir		
	3P11	4x4 D-Fir		4200 lb.
3B10	3P12	6x6 D-Fir		
3B11	3P13	4x4 D-Fir		
3B12			HGUS5.50/14	
3B13			HGUS7.25/12	

2nd Floor Framing



SECOND FLOOR FRAMING

QED QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 74 / 135

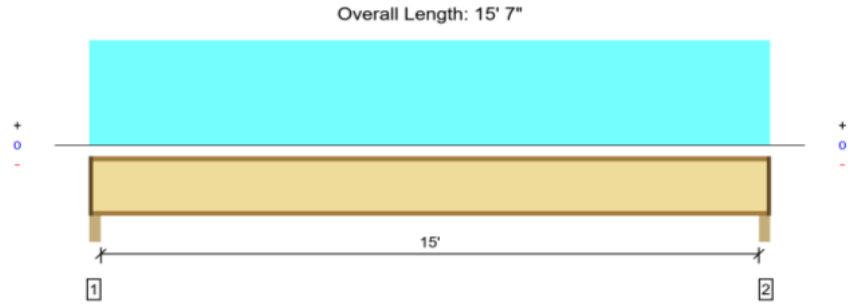
2nd Floor Framing

2nd Floor Joists

FORTE® MEMBER REPORT *2nd FLOOR, 2nd Floor Joists*

PASSED

1 piece(s) 11 7/8" TJI® 230 @16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	533 @ 2 1/2"	1183 (2.25")	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	520 @ 3 1/2"	1655	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1994 @ 7' 9 1/2"	4215	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.178 @ 7' 9 1/2"	0.379	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.232 @ 7' 9 1/2"	0.758	Passed (L/785)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	46	40	Passed	--	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 15' 5" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - PSL	3.50"	2.25"	1.75"	125	416	541	1 1/4" Rim Board
2 - Beam - PSL	3.50"	2.25"	1.75"	125	416	541	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 15' 7"	16"	12.0	40.0	Residential - Living Areas

2nd Floor Framing

2nd Floor Beam 2B1

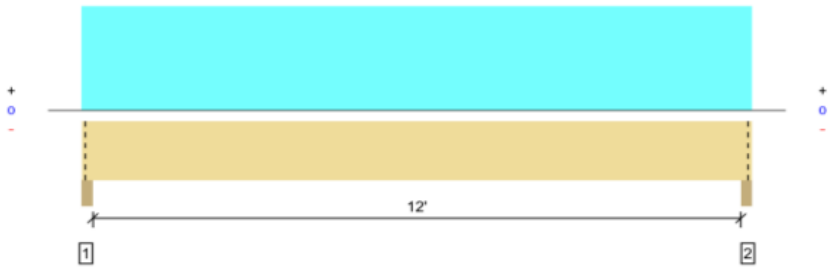
FORTE

MEMBER REPORT *2nd FLOOR, 2B1*

1 piece(s) 3 1/2" x 11 1/4" 2.0E Parallam® PSL

PASSED

Overall Length: 12' 7"



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)	4708 @ 2"	7656 (3.50")	Passed (61%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3788 @ 1' 2 3/4"	7613	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14036 @ 6' 3 1/2"	17970	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.386 @ 6' 3 1/2"	0.408	Passed (L/381)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.498 @ 6' 3 1/2"	0.613	Passed (L/295)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 7" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	3.50"	2.15"	1059	3649	4708	Blocking
2 - Column - DF	3.50"	3.50"	2.15"	1059	3649	4708	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 7"	N/A	12.3		
1 - Uniform (PSF)	0 to 12' 7" (Top)	10'	12.0	40.0	Residential - Living Areas
2 - Uniform (PSF)	0 to 12' 7" (Top)	3'	12.0	60.0	Deck area

Member Notes
West wall, center

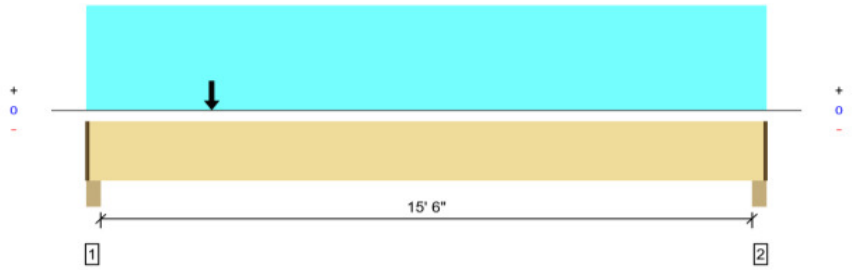
2nd Floor Framing

2nd Floor Beam 2B2

FORTE® MEMBER REPORT *2nd FLOOR, 2B2* **PASSED**

1 piece(s) 3 1/2" x 11 1/4" 2.0E Parallam® PSL

Overall Length: 16' 3"



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)	5274 @ 3"	7109 (3.25")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5168 @ 1' 3 3/4"	7613	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14137 @ 3'	17970	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.392 @ 7' 1"	0.394	Passed (L/483)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.657 @ 7' 3 15/16"	0.788	Passed (L/288)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 16' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 16' 1" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	4.50"	3.25"	2.41"	1747	3534	5281	1 1/4" Rim Board
2 - Column - DF	4.50"	3.25"	1.50"	928	748	1676	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 16' 1 3/4"	N/A	12.3		
1 - Point (lb)	3' (Top)	N/A	1259	4282	Post from 3B6
2 - Uniform (PLF)	0 to 16' 3" (Top)	N/A	75.0	-	Bearing Wall above

Member Notes

Grid line 3
Supports post from beam 3B6

2nd Floor Framing

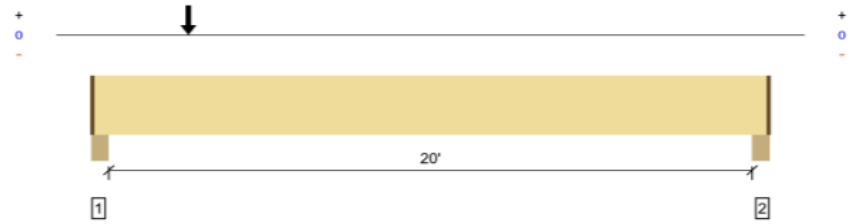
2nd Floor Beam 2B3

FORTE® MEMBER REPORT *2nd FLOOR, 2B3*

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL

PASSED

Overall Length: 20' 11"



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)	9078 @ 4"	18594 (4.25")	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	9043 @ 1' 5 3/8"	16071	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	24099 @ 3'	39805	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.455 @ 9' 5/16"	0.506	Passed (L/534)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.685 @ 9' 1 11/16"	1.013	Passed (L/355)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 20' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 20' 9" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	5.50"	4.25"	2.07"	2764	6314	829	9907	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.50"	648	957	126	1731	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 20' 9 3/4"	N/A	26.0			
1 - Point (lb)	3' (Top)	N/A	1259	4282	-	Post from 3B6
2 - Point (lb)	3' (Top)	N/A	1614	2989	955	Post from 3B5

Member Notes

Supports post from 3B3, 3B6, 3B5(x2)

2nd Floor Framing

2nd Floor Beam 2B4

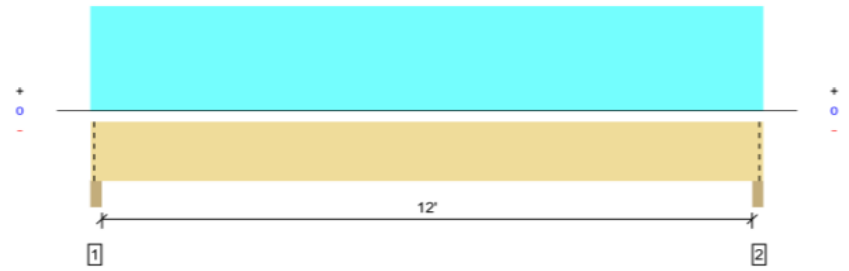
FORTE

MEMBER REPORT *2nd FLOOR, 2B4*

1 piece(s) 3 1/2" x 11 1/4" 2.0E Parallam® PSL

PASSED

Overall Length: 12' 7"



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)	3349 @ 2"	7656 (3.50")	Passed (44%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2695 @ 1' 2 3/4"	7613	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9984 @ 6' 3 1/2"	17970	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.266 @ 6' 3 1/2"	0.408	Passed (L/553)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.354 @ 6' 3 1/2"	0.613	Passed (L/415)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 7" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	3.50"	1.53"	832	2517	3349	Blocking
2 - Column - DF	3.50"	3.50"	1.53"	832	2517	3349	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 7"	N/A	12.3		
1 - Uniform (PSF)	0 to 12' 7" (Front)	10'	12.0	40.0	Residential - Living Areas

Member Notes

west side of stairs

2nd Floor Framing

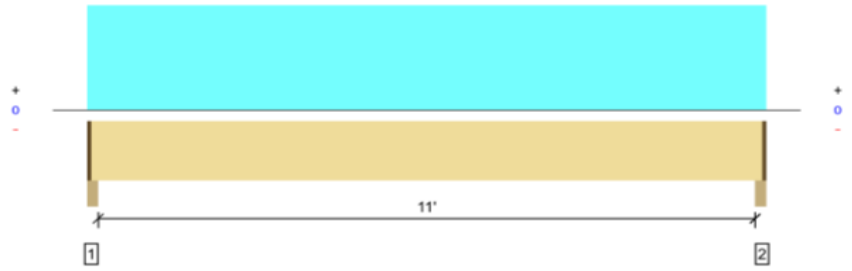
2nd Floor Beam 2B5

FORTE® MEMBER REPORT *2nd FLOOR, 2B5*

1 piece(s) 3 1/2" x 9 1/2" 2.0E Parallam® PSL

PASSED

Overall Length: 11' 7"



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)	2618 @ 2"	4922 (2.25")	Passed (53%)	–	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2168 @ 1' 1"	6428	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	7283 @ 5' 9 1/2"	13057	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.256 @ 5' 9 1/2"	0.281	Passed (L/528)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.357 @ 5' 9 1/2"	0.563	Passed (L/378)	–	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 11' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 11' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	754	1911	608	3273	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	754	1911	608	3273	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 11' 5 3/4"	N/A	10.4			
1 - Uniform (PSF)	0 to 11' 7" (Front)	3'	12.0	40.0	-	Residential - Living Areas
2 - Uniform (PSF)	0 to 11' 7" (Front)	3' 6"	12.0	60.0	-	Deck area
3 - Uniform (PSF)	0 to 11' 7" (Front)	3' 6"	12.0	-	30.0	Roof

Member Notes

supports roof and deck in northwest corner

2nd Floor Framing

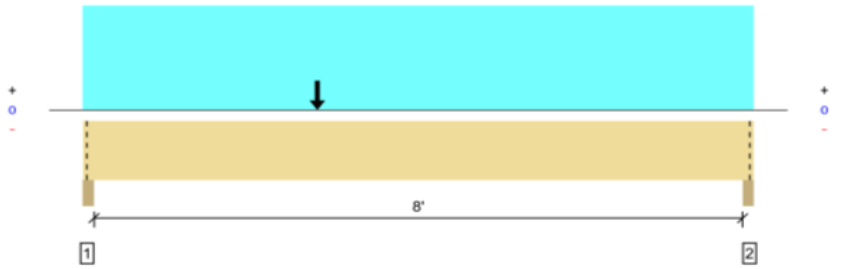
2nd Floor Beam 2B6

FORTE® MEMBER REPORT *2nd FLOOR, 2B6*

1 piece(s) 3 1/2" x 9 1/2" 2.0E Parallam® PSL

PASSED

Overall Length: 8' 7"



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)	4150 @ 2"	7656 (3.50")	Passed (54%)	–	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3489 @ 1' 1"	6428	Passed (54%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9020 @ 3'	13057	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.146 @ 4' 1 13/16"	0.275	Passed (L/678)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.239 @ 4' 1 7/8"	0.412	Passed (L/414)	–	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 7" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	3.50"	1.90"	1620	2530	4150	Blocking
2 - Column - DF	3.50"	3.50"	1.56"	1360	2060	3420	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 8' 7"	N/A	10.4		
1 - Uniform (PSF)	0 to 8' 7" (Top)	6'	40.0	60.0	Deck area (contingency for pavers)
2 - Point (lb)	3' (Top)	N/A	831	1500	

Member Notes

Deck Beams north end

2nd Floor Framing

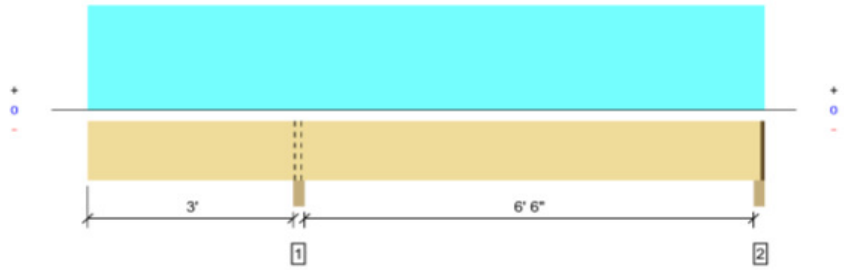
2nd Floor Beam 2B7

FORTE MEMBER REPORT *2nd FLOOR, 2B7*

1 piece(s) 4 x 10 Douglas Fir-Larch No. 2

PASSED

Overall Length: 10' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination (Pattern)
Member Reaction (lbs)	1875 @ 3' 1 3/4"	7656 (3.50")	Passed (24%)	–	1.0 D + 1.0 L (All Spans)
Shear (lbs)	826 @ 4' 3/4"	3885	Passed (21%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1278 @ 3' 1 3/4"	4492	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.033 @ 0	0.200	Passed (2L/999+)	–	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.037 @ 0	0.315	Passed (2L/999+)	–	1.0 D + 1.0 L (Alt Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 10' o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 10' o/c unless detailed otherwise.
- Applicable calculations are based on NDS

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Beam - DF	3.50"	3.50"	1.50"	786	1089	1875	Blocking
2 - Column - DF	3.50"	2.25"	1.50"	304	533/-94	837/-94	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.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 9' 11 3/4"	N/A	8.2		
1 - Uniform (PSF)	0 to 10' 1" (Top)	2' 6"	40.0	60.0	Deck area (contingency for pavers)

Member Notes

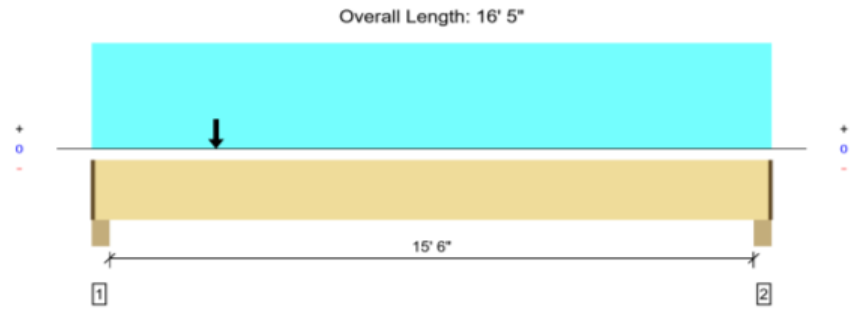
Deck Beam northwest corner

2nd Floor Framing

2nd Floor Beam 2B8

FORTE MEMBER REPORT *2nd FLOOR, 2B8* **PASSED**

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	10423 @ 4"	13945 (4.25")	Passed (75%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	8145 @ 1' 7 1/2"	14210	Passed (57%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22500 @ 5' 1 3/16"	40743	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.272 @ 7' 6 1/2"	0.394	Passed (L/694)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.495 @ 7' 7"	0.788	Passed (L/382)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 16' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 16' 3" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Column - DF	5.50"	4.25"	3.18"	4542	4207	3677	12426	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.50"	1989	2230	749	4968	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 16' 3 3/4"	N/A	23.0			
1 - Uniform (PSF)	0 to 16' 5" (Top)	3' 6"	40.0	60.0	-	Deck area (contingency for pavers)
2 - Point (lb)	3' (Top)	N/A	463	-	815	Beam R12
3 - Point (lb)	3' (Top)	N/A	1114	-	1969	Beam R14
4 - Point (lb)	3' (Top)	N/A	1614	2989	955	Beam 3B5
5 - Point (lb)	3' (Top)	N/A	669	-	687	Beam 3B9

Member Notes

South wall. Supports deck + post from Beam 3B5, 3B9, R14, R12.

2nd Floor Framing

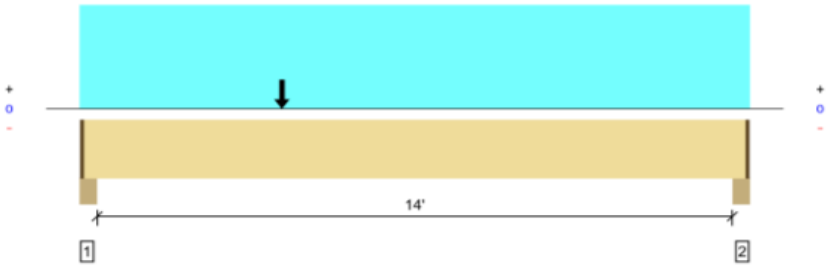
2nd Floor Beam 2B9

FORTE MEMBER REPORT *2nd FLOOR, 2B9*

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 14' 11"



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)	8466 @ 4"	13945 (4.25")	Passed (61%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7899 @ 1' 7 1/2"	14210	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	31681 @ 4' 6"	40743	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.313 @ 6' 11 1/2"	0.356	Passed (L/547)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.462 @ 6' 11 15/16"	0.712	Passed (L/370)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 14' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 9" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	5.50"	4.25"	2.58"	2729	5774	8503	1 1/4" Rim Board
2 - Column - DF	5.50"	4.25"	1.56"	1840	3305	5145	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 14' 9 3/4"	N/A	23.0		
1 - Uniform (PSF)	0 to 14' 11" (Front)	3' 6"	40.0	60.0	Deck area (contingency for pavers)
2 - Point (lb)	4' 6" (Top)	N/A	1071	2973	Beam 3B2
3 - Point (lb)	4' 6" (Top)	N/A	1071	2973	Beam 3B2 on 2nd floor

Member Notes

Supports deck on south end + Beam 3B2 (x2)

2nd Floor Framing

2nd Floor Beam 2B10

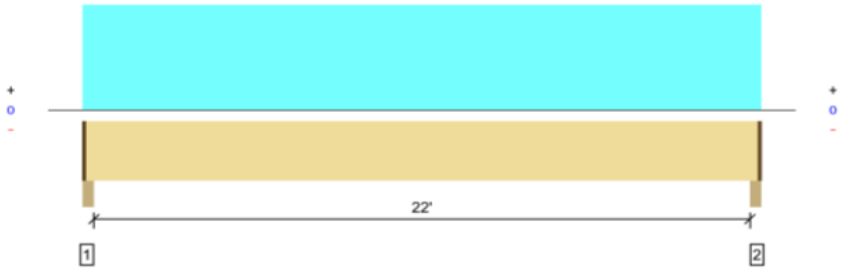
FORTE

MEMBER REPORT *2nd FLOOR, 2B10*

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL

PASSED

Overall Length: 22' 7"



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)	4732 @ 2"	7383 (2.25")	Passed (64%)	–	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4159 @ 1' 5 1/2"	14210	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	26175 @ 11' 3 1/2"	40743	Passed (64%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.574 @ 11' 3 1/2"	0.668	Passed (L/465)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	1.013 @ 11' 3 1/2"	1.112	Passed (L/264)	–	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/400) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 22' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 22' 5" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	2064	2710	4774	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	2064	2710	4774	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 22' 5 3/4"	N/A	23.0		
1 - Uniform (PSF)	0 to 22' 7" (Front)	4'	40.0	60.0	Deck area (contingency for pavers)

Member Notes

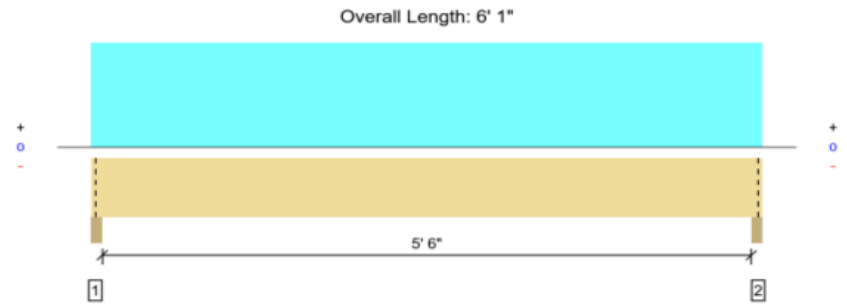
Deck Beam south end

2nd Floor Framing

2nd Floor Beam 2B11

FORTE MEMBER REPORT *2nd FLOOR, 2B11* **PASSED**

1 piece(s) 3 1/2" x 11 1/4" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2276 @ 2"	7656 (3.50")	Passed (30%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1356 @ 1' 2 3/4"	7613	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3093 @ 3' 1/2"	17970	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.024 @ 3' 1/2"	0.192	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.031 @ 3' 1/2"	0.287	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 1" o/c unless detailed otherwise.

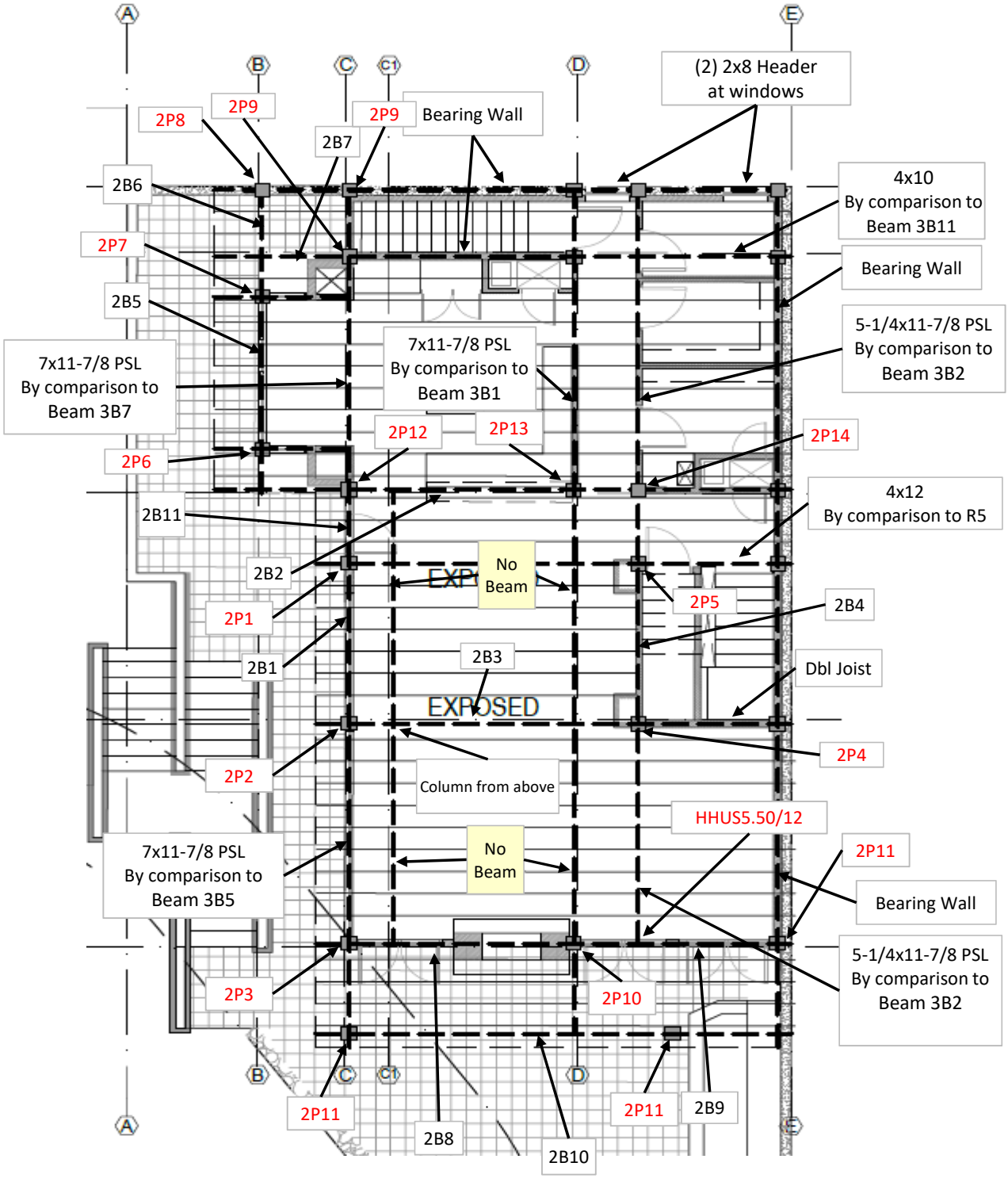
Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	512	1764	2276	Blocking
2 - Column - DF	3.50"	3.50"	1.50"	512	1764	2276	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 1"	N/A	12.3		
1 - Uniform (PSF)	0 to 6' 1" (Top)	10'	12.0	40.0	Residential - Living Areas
2 - Uniform (PSF)	0 to 6' 1" (Top)	3'	12.0	60.0	Deck area

Member Notes
West wall, center

2nd Floor Posts



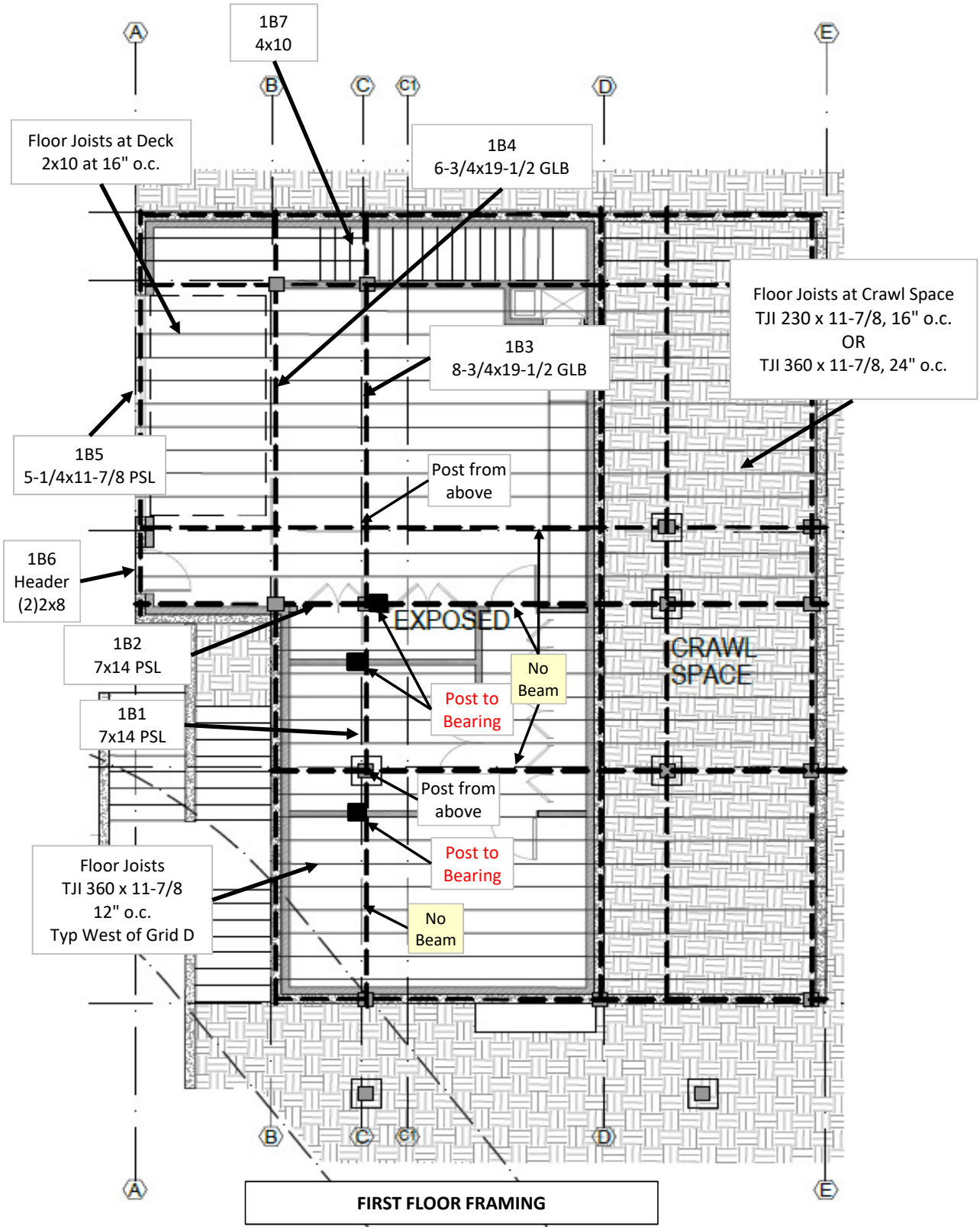
SECOND FLOOR FRAMING POSTS

	QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 87 / 135

2nd Floor Posts

BEAM ID	POST ID	POST SIZE	HANGER TYPE	NOTES
2B1	2P1	6x6 D-Fir	HHUS410	
2B2			HHUS410	
2B3	2P2	5-1/4 x 5-1/4 PSL		
	2P3	5-1/4 x 5-1/4 PSL		
2B4	2P4	7 x 7 PSL		17500 + 3P4 = 32500
	2P5	6x6 D-Fir		5400 + 3P5 = 8400
2B5	2P6	4x4 D-Fir		
	2P7	6x6 D-Fir		
2B6	2P8	4x6 D-Fir		
2B7	2P9	4x4 D-Fir		
2B8	2P10	5-1/4 x 7 PSL		Land on Post 2P3 & 2P10
2B9	2P11	6x6 D-Fir		5150 + 3P11 = 9350
2B10	2P11	6x6 D-Fir		6,000 lb.
2B11	2P12	5-1/4 x 5-1/4 PSL		
	2P13	6x6 D-Fir		10,500 lb.
	2P14	6x6 D-Fir		6,000 lb.

1st Floor Framing



FIRST FLOOR FRAMING

QED QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716	
		PAGE	89 / 135

1st Floor Framing

1st Floor Joists

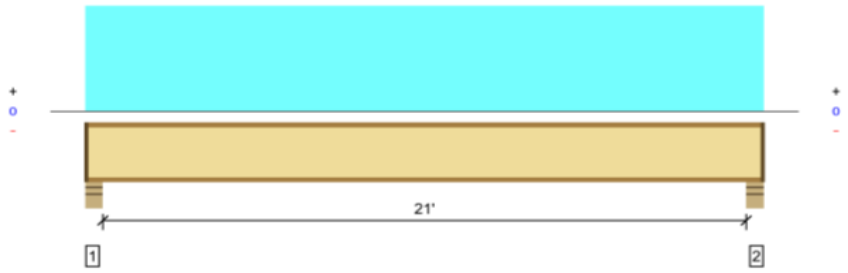
FORTE

MEMBER REPORT *1st FLOOR, 1st Floor Joist*

1 piece(s) 11 7/8" TJI® 360 @12" OC

PASSED

Overall Length: 21' 11"



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)	564 @ 4 1/2"	1505 (3.50")	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	546 @ 5 1/2"	1705	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2912 @ 10' 11 1/2"	6180	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.415 @ 10' 11 1/2"	0.529	Passed (L/612)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.540 @ 10' 11 1/2"	1.058	Passed (L/470)	–	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	38	38	Passed	–	–

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 21' 9" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	4.25"	1.75"	132	438	570	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	1.75"	132	438	570	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 21' 11"	12"	12.0	40.0	Residential - Living Areas

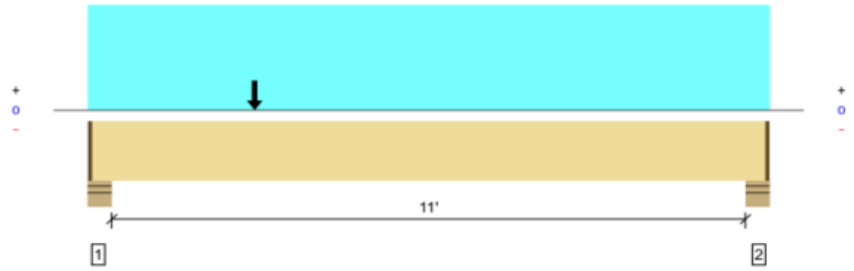
1st Floor Framing

Beam 1B1

FORTE MEMBER REPORT *1st FLOOR, 1B1* **PASSED**

1 piece(s) 7" x 14" 2.0E Parallam® PSL

Overall Length: 12' 3"



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)	17266 @ 6"	18594 (6.25")	Passed (93%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	16293 @ 1' 9 1/2"	18947	Passed (86%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	40792 @ 3'	54324	Passed (75%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.201 @ 5' 7 7/8"	0.281	Passed (L/673)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.283 @ 5' 7 13/16"	0.563	Passed (L/477)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 1" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Stud wall - SPF	7.50"	6.25"	5.80"	5068	12255	1388	18711	1 1/4" Rim Board
2 - Stud wall - SPF	7.50"	6.25"	2.49"	2131	5339	396	7866	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 1 3/4"	N/A	30.7			
1 - Uniform (PSF)	0 to 12' 3" (Front)	10' 6"	12.0	40.0	-	Residential - Living Areas
2 - Point (lb)	3' (Top)	N/A	908	3146	-	2B1
3 - Point (lb)	3' (Top)	N/A	2764	6314	829	2B3
4 - Point (lb)	3' (Top)	N/A	1614	2989	955	3B5 (on 2nd Floor)

Member Notes

Supports post fro 2B1, 2B3 and 3B5 (on 2nd floor)

1st Floor Framing

Beam 1B2

FORTE MEMBER REPORT *1st FLOOR, 1B2* **PASSED**

1 piece(s) 7" x 14" 2.0E Parallam® PSL

Overall Length: 8' 1"

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	18681 @ 7' 8"	19338 (6.50")	Passed (97%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	18628 @ 6' 4 1/2"	18947	Passed (98%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	49671 @ 5'	54324	Passed (91%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.119 @ 5'	0.242	Passed (L/728)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.168 @ 5'	0.363	Passed (L/519)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 1" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Total	
1 - Stud wall - SPF	6.50"	6.50"	3.67"	3198	7723	465	11386	Blocking
2 - Stud wall - SPF	6.50"	6.50"	6.28"	5407	13273	799	19479	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 8' 1"	N/A	30.7			
1 - Point (lb)	5' (Top)	N/A	908	3146	-	2B1
2 - Point (lb)	5' (Top)	N/A	2131	5339	396	1B1
3 - Point (lb)	5' (Top)	N/A	5318	12511	868	1B3

Member Notes

Header supports 2B1+2B2+3B7(2nd floor)

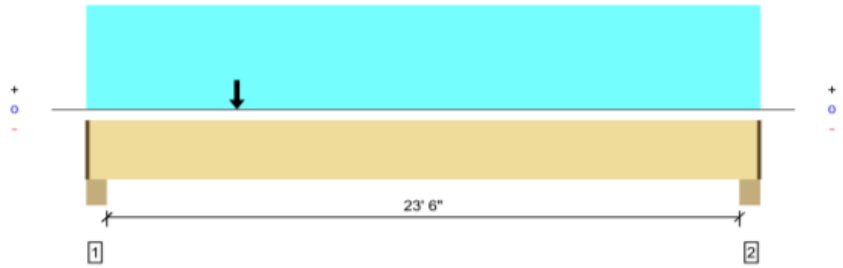
1st Floor Framing

Beam 1B3

FORTE MEMBER REPORT *1st FLOOR, 1B3* **PASSED**

1 piece(s) 8 3/4" x 19 1/2" 24F-V4 DF Glulam

Overall Length: 24' 7"



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)	17773 @ 5"	29859 (5.25")	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	16561 @ 2' 2"	30144	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	82851 @ 7' 3 3/16"	98922	Passed (84%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.591 @ 11' 7 1/8"	0.594	Passed (L/482)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.839 @ 11' 6 15/16"	1.188	Passed (L/340)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 24' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 24' 5" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 0.89 that was calculated using length L = 23' 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	Roof Live	Total	
1 - Column - DF	6.50"	5.25"	3.12"	5318	12511	868	18697	1 1/4" Rim Board
2 - Column - DF	6.50"	5.25"	1.77"	2943	7164	236	10343	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 24' 5 3/4"	N/A	41.5			
1 - Uniform (PSF)	0 to 24' 7" (Front)	10' 6"	12.0	40.0	-	Residential - Living Areas
2 - Point (lb)	5' 6" (Top)	N/A	1747	3534	-	2B2
3 - Point (lb)	5' 6" (Top)	N/A	1894	4052	1104	3B7 (on 2nd Floor)
4 - Point (lb)	5' 6" (Top)	N/A	512	1764	-	2B11

Member Notes

Supports post from

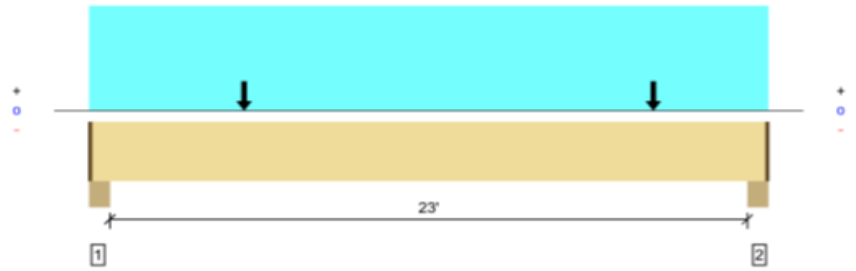
1st Floor Framing

Beam 1B4

FORTE MEMBER REPORT *1st FLOOR, 1B4* **PASSED**

1 piece(s) 6 3/4" x 19 1/2" 24F-V4 DF Glulam

Overall Length: 24' 1"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	14237 @ 23' 8"	23034 (5.25")	Passed (62%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	12870 @ 21' 11"	23254	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	64249 @ 12' 8 3/16"	78485	Passed (82%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.561 @ 12' 2 3/8"	0.581	Passed (L/497)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.867 @ 12' 2 9/16"	1.163	Passed (L/322)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 23' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 23' 11" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 0.92 that was calculated using length L = 23' 3".
- 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	Roof Live	Total	
1 - Column - DF	6.50"	5.25"	2.52"	3886	7251	571	11708	1 1/4" Rim Board
2 - Column - DF	6.50"	5.25"	3.24"	5087	9216	645	14948	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 23' 11 3/4"	N/A	32.0			
1 - Uniform (PSF)	0 to 24' 1" (Front)	5'	35.0	60.0	-	Deck Load with provision for concrete pavers
2 - Uniform (PSF)	0 to 24' 1" (Back)	3'	12.0	40.0	-	Residential living area
3 - Point (lb)	20' (Top)	N/A	754	1911	608	2B5 (North end)
4 - Point (lb)	5' 6" (Top)	N/A	754	1911	608	2B5 (South end)
5 - Point (lb)	20' (Top)	N/A	1620	2530	-	2B6

Member Notes

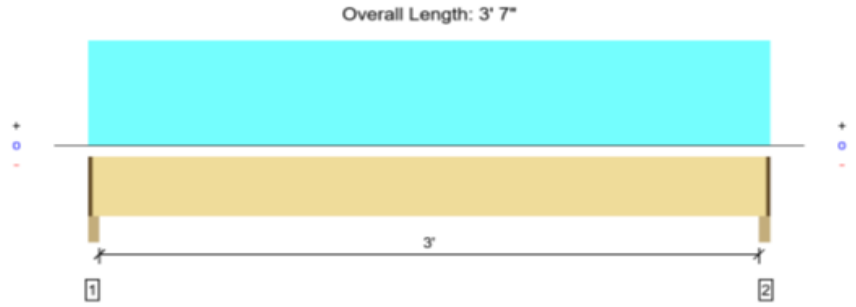
Supports first floor joists + deck joists +posts from 2B5 (2 places) + 2B6

1st Floor Framing

Beam 1B5 (header at door south of garage door)

FORTE MEMBER REPORT *1st FLOOR, 1B6* **PASSED**

2 piece(s) 2 x 8 Hem-Fir No. 2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination (Pattern)
Member Reaction (lbs)	731 @ 2"	2734 (2.25")	Passed (27%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	388 @ 10 3/4"	2175	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	572 @ 1' 9 1/2"	2234	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.005 @ 1' 9 1/2"	0.081	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.009 @ 1' 9 1/2"	0.162	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 3' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 3' 5" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	2.25"	1.50"	291	484	775	1 1/4" Rim Board
2 - Column - DF	3.50"	2.25"	1.50"	291	484	775	1 1/4" Rim Board

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

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 3' 5 3/4"	N/A	5.5		
1 - Uniform (PSF)	0 to 3' 7" (Front)	4' 6"	35.0	60.0	Deck load with provision for concrete pavers

Member Notes

door header south of garage door

1st Floor Framing

Floor Joists over Crawl space

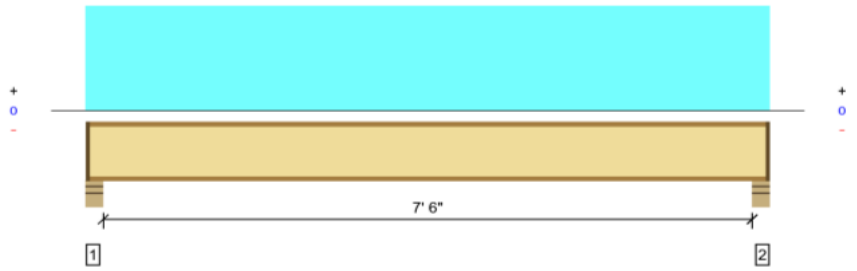
FORTE

MEMBER REPORT *1st FLOOR, 1st Floor Joist over Crawl Space*

1 piece(s) 11 7/8" TJI® 230 @ 16" OC

PASSED

Overall Length: 8' 5"



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)	285 @ 4 1/2"	1485 (3.50")	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	260 @ 5 1/2"	1655	Passed (16%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	509 @ 4' 2 1/2"	4215	Passed (12%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.017 @ 4' 2 1/2"	0.192	Passed (L/999+)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.022 @ 4' 2 1/2"	0.383	Passed (L/999+)	–	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	67	38	Passed	–	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 3" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	4.25"	1.75"	67	224	291	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	1.75"	67	224	291	1 1/4" Rim Board

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

Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 8' 5"	16"	12.0	40.0	Residential - Living Areas

1st Floor Framing

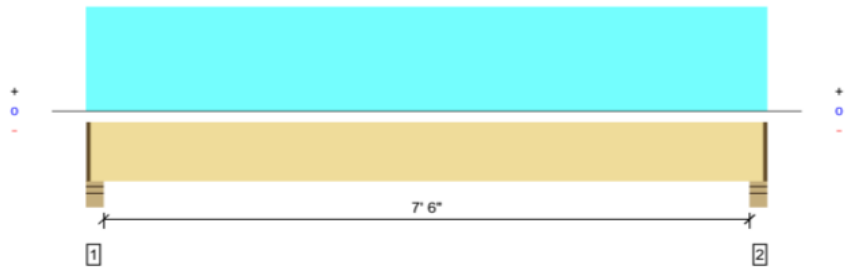
Floor Joists over Deck

FORTE® MEMBER REPORT *1st FLOOR, Joists at Deck*

1 piece(s) 2 x 10 Hem-Fir No. 2 @16" OC

PASSED

Overall Length: 8' 5"



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)	520 @ 4 1/2"	2582 (4.25")	Passed (20%)	–	1.0 D + 1.0 L (All Spans)
Shear (lbs)	377 @ 1' 2 3/4"	1388	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	931 @ 4' 2 1/2"	1917	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.048 @ 4' 2 1/2"	0.192	Passed (L/999+)	–	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.077 @ 4' 2 1/2"	0.383	Passed (L/999+)	–	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	--	–	--

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 3" o/c unless detailed otherwise.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	4.25"	1.50"	196	337	533	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	1.50"	196	337	533	1 1/4" Rim Board

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

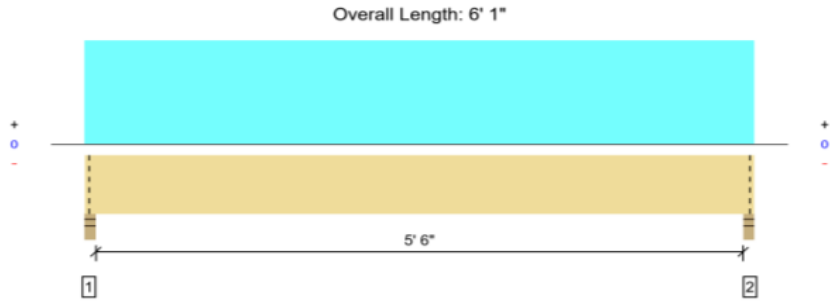
Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 8' 5"	16"	35.0	60.0	Deck Load with provision for concrete pavers

1st Floor Framing

Deck Joists

FORTE® MEMBER REPORT *1st FLOOR, 1B7* **PASSED**

1 piece(s) 4 x 10 Douglas Fir-Larch No. 2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1614 @ 2"	7656 (3.50")	Passed (21%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1050 @ 1' 3/4"	3885	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2193 @ 3' 1/2"	4492	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.022 @ 3' 1/2"	0.192	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.035 @ 3' 1/2"	0.287	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 1" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	3.50"	1.50"	610	1004	1614	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	610	1004	1614	Blocking

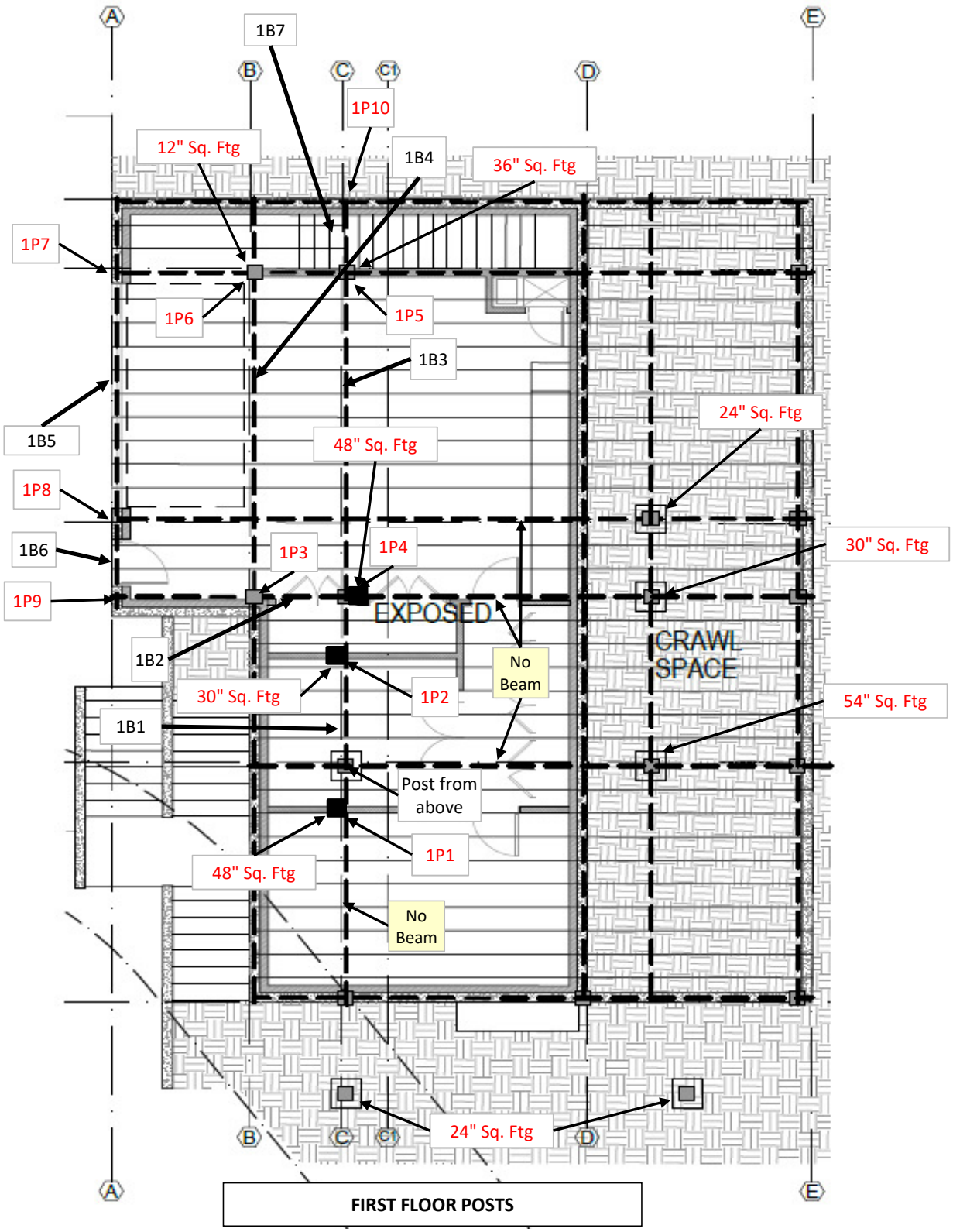
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 1"	N/A	8.2		
1 - Uniform (PSF)	0 to 6' 1" (Front)	5' 6"	35.0	60.0	Deck Load with provision for concrete pavers

Member Notes

Deck Beam, North end over stairs

1st Floor Posts



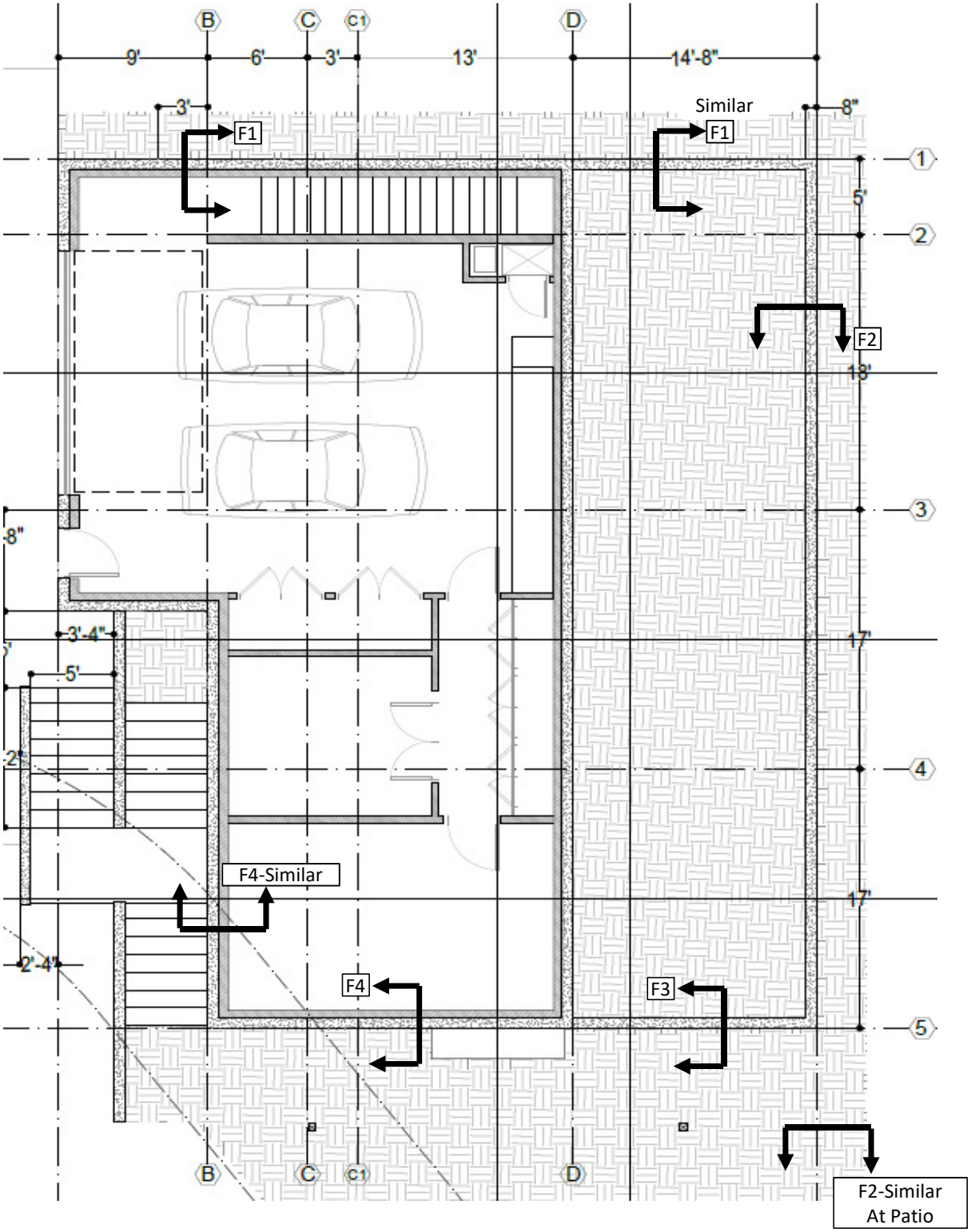
FIRST FLOOR POSTS

	QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 99 / 135

1st Floor Posts

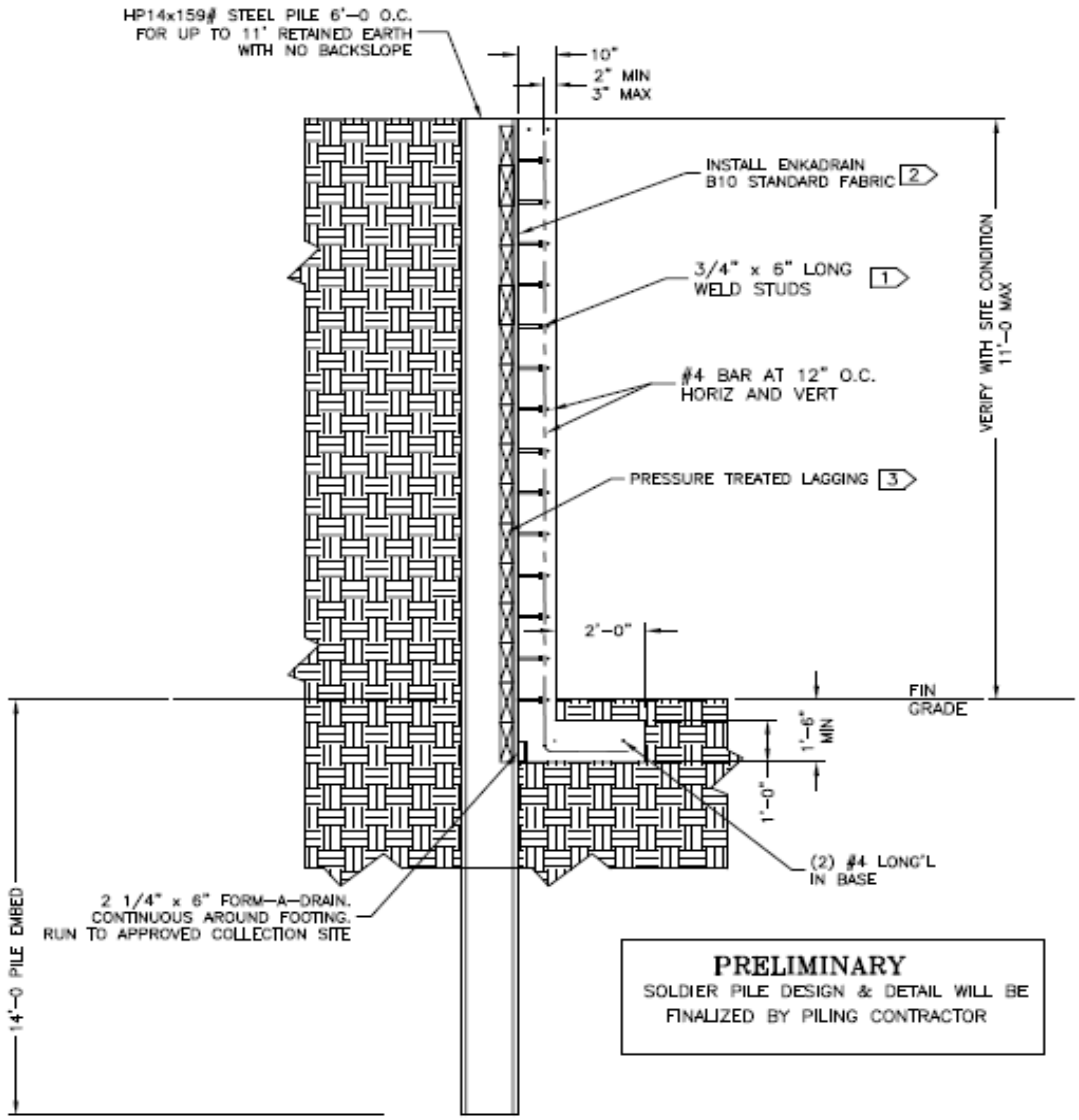
BEAM ID	POST ID	POST SIZE	HANGER TYPE	NOTES
1B1	1P1	5-1/4 x 5-1/4 PSL		18,711 lb.
	1P2	6x6 D-Fir		8000
1B2	1P3	5-1/4 x 7 PSL		27,000 lb.
	1P4	5-1/4 x 5-1/4 PSL		20000 lb.
1B3			EG9	18697
	1P5	6x6 D-Fir		12,500 lb.
1B4	1P6	6x6 D-Fir		12,000
1B5	1P7	4x6 D-Fir		4000
	1P8	4x6 D-Fir		5,000 lb.
1B6	1P9	4x4 D-Fir		1,000 lb.
1B7	1P10	4x4 D-Fir		1,700 lb.

Foundation Plan



	QUALITY ENGINEERING & DESIGN	MERCER ISLAND RESIDENCE 5236 W. Mercer Way New Construction	Revision 0 File No. 170716 PAGE 101 / 135

F1-Pile Supported Wall



SECTION F1

USE FOR UP TO 11'–0 RETAINED EARTH
WITH NO BACKSLOPE
SCALE: NONE

1 INSTALL HEADED STUDS, 3/4" DIAMETER x 6" EMBED LENGTH. INSTALL AT 12" O.C. INSTALL TOP STUD AT 6" BELOW TOP OF PILE. INSTALL STUDS ON PILE CENTERLINE.

2 INSTALL ENKADRAIN PER MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS. ENSURE THAT RIGID DRAIN IS ISOLATED FROM SOIL BY ENKADRAIN FABRIC. USE ENKADRAIN STANDARD FABRIC, MODEL B10 AS A MINIMUM REQUIREMENT.

3 INSTALL 4X PRESSURE TREATED WOOD LAGGING BETWEEN FLANGES OF PILES TO RETAIN EARTH PRIOR TO POURING CONCRETE WALL.

F1-Pile Supported Wall

Retained Soil Height, H_{soil} =	11	Ft.
Stem Wall Height, H_{wall} =	11.5	Ft.
Stem Wall Width, w_{stem} =	10	in.
W_{stem} =	0.83	Ft.
Width of Base, W_{base} =	2	Ft.
Base thickness, t_{base} =	10	in.
T_{base} =	0.83333	Ft.
Dist Toe to Face, x_{toe} =	14	in.
X_{toe} =	1.16667	Ft.
Heel width, X_{heel} =	0.00	Ft.
Unit Weight of Soil, D_{soil} =	90	Lb./Ft^3
Unit Weight of Concrete, D_{conc} =	150	Lb./Ft^3
Wall Embed, H_{embed} =	1.17	Ft

S = Pile Spacing = 6 Ft.

Weight / C.G.

Concrete Wall Weight = $[(W_{stem} \times (H_{wall} + H_{embed})) + (W_{base} \times T_{base})] \times D_{conc}$ = 1833.33 Lb. per Lineal Foot

Weight of Soil over Heel = $(X_{heel} \times [H_{soil} + H_{embed}]) \times D_{soil}$ = 0 Lb. per Lineal Foot

C.G. of Concrete, $X_{barConc} = \dfrac{(W_{stem} \times H_{conc})(W_{stem}/2 + X_{toe}) + (W_{base} \times T_{base})(W_{base}/2)}{(W_{stem} \times H_{conc}) + (W_{base} \times T_{base})}$ = 1.50 Ft

C.G. of Soil, $X_{barSoil} = (X_{heel}/2) + W_{stem} + X_{toe}$ = 2.00 Ft.

Soil Pressure:

For equivalent fluid pressure, D_{fluid}, of 40 Lb. per cubic foot (pcf)

Seismic Surcharge Pressure, P_{seis} = 7 x H PSF

Surcharge Pressure, P_{surch} = 0 lb. per Sq.Ft. (level, or terraced back fill)

Pressure at Depth = E_a = $(D_{fluid} \times H) + P_{surch} + (P_{seis} \times H)$ psf

Soil Depth	Pressure	Force on Wall = P x 1 Ft x S'	Bending Moment = F x S / 8	Design Moment = M x 1.6
11	517	3102	2326.5	3722.4
7	329	1974	1480.5	2368.8
3	141	846	634.5	1015.2
-1	-47	-282	-211.5	-338.4

Wall moment at various depths treating wall as beam supported by piles at ea end

F1-Pile Supported Wall

Vertical Reinforcing Steel:

f_c' = 2500 psi, compressive strength

$E_c = 57000\sqrt{f_c'}$ = 2.9E+06 psi, Elastic Modulus for concrete

F_{ySteel} = 60,000 psi, yield strength for steel (A615 Gr. 60)

F_{aSteel} = 20,000 psi, allowable stress for steel

$d = w_{stem} - 3$ = 7 in.

b = 12 in., Unit height of wall

Check Rebar requirements at various elevations

Ultimate Strength Design for Braced Wall:

β_1 = 0.85 for $f_c' < 4000$

$$\rho_b = \frac{0.85\,\beta_1\,f_c'}{f_{ySteel}} \times \frac{87000}{87000 + f_{ySteel}} = 0.01782$$

Min Value for ρ_b = $200 / F_{ySteel}$ = 0.00333

Max Value for ρ_b = $0.75\rho_b$ = 0.013

Max Reinforcing Steel, $A_{sMax} = (0.75)(\rho_b)(b)(d)$ = 1.122 in^2

At Bottom (H = 11 ft.)

Rebar Size = #4 Cross Section = 0.2 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.2 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.471$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)]$ = 73,059 in.lb. (= 6088.2 Ft.Lb.)

OK. Larger than Required Moment

At 4' Up (H = 7 ft.)

Rebar Size = #4 Cross Section = 0.2 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.2 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.471$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)]$ = 73,059 in.lb. (= 6088.2 Ft.Lb.)

OK. Larger than Required Moment

At 8' Up (H = 3 ft.)

Rebar Size = #4 Cross Section = 0.2 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.2 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.471$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)]$ = 73,059 in.lb. (= 6088.2 Ft.Lb.)

OK. Larger than Required Moment

F1-Pile Supported Wall

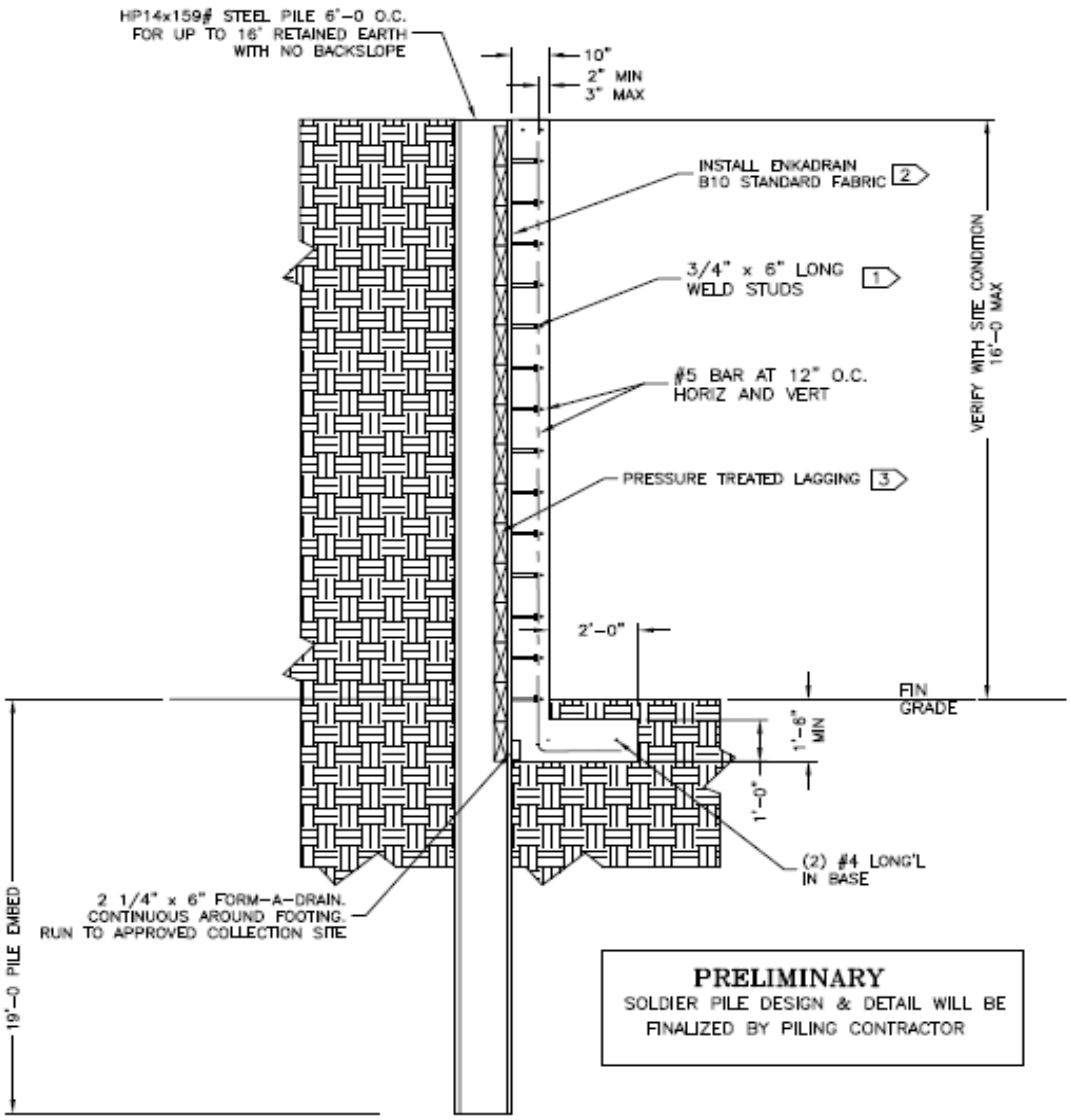
Check Attachment of Concrete wall to Piles:

Force on 1Ft high strip at bottom =	3102	lb.
End Reaction = F/2 =	1551	lb.
Force on Stud, per Ft Height =	3102	lb. multiplied R x 2 for interior pile
Force on 1Ft strip at 1/2 Height =	1551	lb.
End Reaction = F/2 =	775.5	lb.
Force on Stud, per Ft Height =	1551	lb. multiplied R x 2 for interior pile

Install 5/8" Headed Concrete anchors x 6" long at 12" o.c. in lower 1/2 wall
Install 5/8" Headed Concrete Anchors x 6" long at 18" o.c. in upper 1/2 of wall (load per stud = 2326)

See following calculation for stud embed requirements

F2-Pile Supported Wall



SECTION F2

USE FOR UP TO 16'-0 RETAINED EARTH
WITH NO BACKSLOPE
SCALE: NONE

1. INSTALL HEADED STUDS, 3/4" DIAMETER x 6" EMBED LENGTH. INSTALL AT 12" O.C. INSTALL TOP STUD AT 6" BELOW TOP OF PILE. INSTALL STUDS ON PILE CENTERLINE.

2. INSTALL ENKADRAIN PER MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS. ENSURE THAT RIGID DRAIN IS ISOLATED FROM SOIL BY ENKADRAIN FABRIC. USE ENKADRAIN STANDARD FABRIC, MODEL B10 AS A MINIMUM REQUIREMENT.

3. INSTALL 4X PRESSURE TREATED WOOD LAGGING BETWEEN FLANGES OF PILES TO RETAIN EARTH PRIOR TO POURING CONCRETE WALL.

F2-Pile Supported Wall

Retained Soil Height, H_{soil} =	16	Ft.
Stem Wall Height, H_{wall} =	16.5	Ft.
Stem Wall Width, w_{stem} =	10	in.
W_{stem} =	0.83	Ft.
Width of Base, W_{base} =	2	Ft.
Base thickness, t_{base} =	12	in.
T_{base}=	1	Ft.
Dist Toe to Face, x_{toe} =	14	in.
X_{toe} =	1.16667	Ft.
Heel width, X_{heel} =	0.00	Ft.
Unit Weight of Soil, D_{soil} =	90	Lb./Ft^3
Unit Weight of Concrete, D_{conc} =	150	Lb./Ft^3
Wall Embed, H_{embed} =	1.33	Ft

S = Pile Spacing = 6 Ft.

Weight / C.G.

Concrete Wall Weight = $[(W_{stem} \times (H_{wall} + H_{embed})) + (W_{base} \times T_{base})] \times D_{conc}$ = 2529.17 Lb. per Lineal Foot

Weight of Soil over Heel = $(X_{heel} \times [H_{soil} + H_{embed}]) \times D_{soil}$ = 0 Lb. per Lineal Foot

C.G. of Concrete, $X_{barConc} = \dfrac{(W_{stem} \times H_{conc})(W_{stem}/2 + X_{toe}) + (W_{base} \times T_{base})(W_{base}/2)}{(W_{stem} \times H_{conc}) + (W_{base} \times T_{base})}$ = 1.51 Ft

C.G. of Soil, $X_{barSoil} = (X_{heel}/2) + W_{stem} + X_{toe}$ = 2.00 Ft.

Soil Pressure:

For equivalent fluid pressure, D_{fluid}, of 40 Lb. per cubic foot (pcf)

Seismic Surcharge Pressure, P_{seis} = 7 x H PSF

Surcharge Pressure, P_{surch} = 0 lb. per Sq.Ft. (level, or terraced back fill)

Pressure at Depth = E_a = $(D_{fluid} \times H) + P_{surch} + (P_{seis} \times H)$ psf

Soil Depth	Pressure	Force on Wall = P x 1 Ft x S'	Bending Moment = F x S / 8	Design Moment = M x 1.6
16	752	4512	3384	5414.4
12	564	3384	2538	4060.8
8	376	2256	1692	2707.2
4	188	1128	846	1353.6

Wall moment at various depths treating wall as beam supported by piles at ea end

F2-Pile Supported Wall

Vertical Reinforcing Steel:

f_c' = 2500 psi, compressive strength

$E_c = 57000\sqrt{f_c'}$ = 2.9E+06 psi, Elastic Modulus for concrete

F_{ySteel} = 60,000 psi, yield strength for steel (A615 Gr. 60)

F_{aSteel} = 20,000 psi, allowable stress for steel

$d = w_{stem} - 3$ = 7 in.

b = 12 in., Unit height of wall

Check Rebar requirements at various elevations

Ultimate Strength Design for Braced Wall:

β_1 = 0.85 for $f_c' < 4000$

$$\rho_b = \frac{0.85\,\beta_1\,f_c'}{f_{ySteel}} \times \frac{87000}{87000 + f_{ySteel}} = 0.01782$$

Min Value for ρ_b = $200 / F_{ySteel}$ = 0.00333

Max Value for ρ_b = $0.75\rho_b$ = 0.013

Max Reinforcing Steel, $A_{sMax} = (0.75)(\rho_b)(b)(d)$ = 1.122 in^2

At Bottom (H = 16 ft.)

Rebar Size = #5 Cross Section = 0.31 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.31 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.729$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)]$ = 111,075 in.lb. (= 9256.2 Ft.Lb.)

OK. Larger than Required Moment

At 4' Up (H = 12 ft.)

Rebar Size = #4 Cross Section = 0.2 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.2 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.471$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)]$ = 73,059 in.lb. (= 6088.2 Ft.Lb.)

OK. Larger than Required Moment

At 8' Up (H = 8 ft.)

Rebar Size = #4 Cross Section = 0.2 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.2 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.471$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)]$ = 73,059 in.lb. (= 6088.2 Ft.Lb.)

OK. Larger than Required Moment

F2-Pile Supported Wall

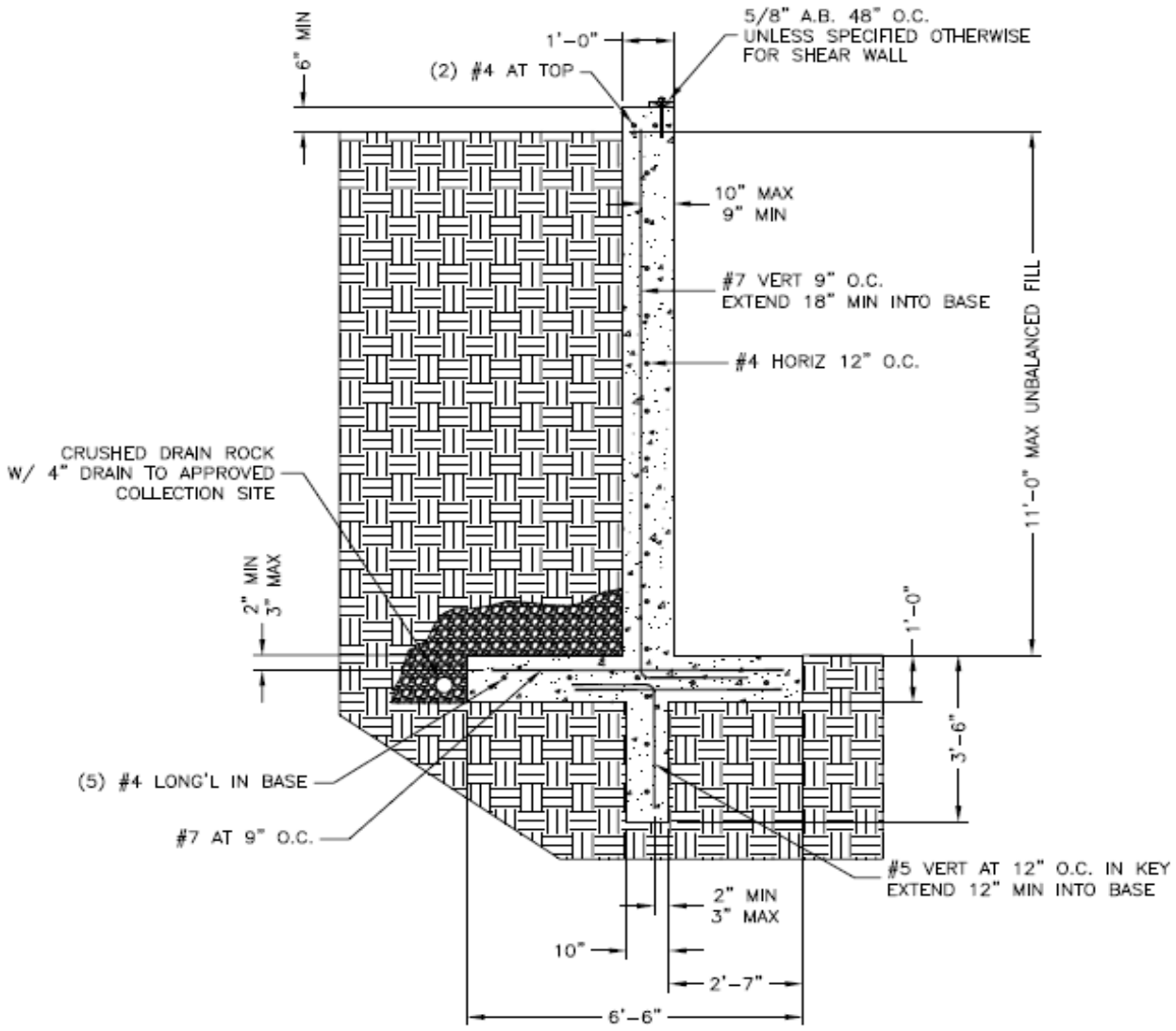
Check Attachment of Concrete wall to Piles:

Force on 1Ft high strip at bottom =	4512	lb.
End Reaction = F/2 =	2256	lb.
Force on Stud, per Ft Height =	4512	lb. multiplied R x 2 for interior pile
Force on 1Ft strip at 1/2 Height =	2256	lb.
End Reaction = F/2 =	1128	lb.
Force on Stud, per Ft Height =	2256	lb. multiplied R x 2 for interior pile

Install 5/8" Headed Concrete anchors x 6" long at 12" o.c. in lower 1/2 wall
Install 5/8" Headed Concrete Anchors x 6" long at 18" o.c. in upper 1/2 of wall (load per stud = 2326)

See following calculation for stud embed requirements

Foundation Wall F3-Cant-1



SECTION F3

USE FOR UP TO 11'-0 RETAINED EARTH
WITH NO BACKSLOPE
SCALE: NONE

Foundation Wall F3-Cant-1

Retained Soil Height, H_{soil} =	11	Ft.
Stem Wall Height, H_{wall} =	11.5	Ft.
Stem Wall Width, w_{stem} =	12	in.
W_{stem} =	1.00	Ft.
Width of Base, W_{base} =	6.5	Ft.
Base thickness, t_{base} =	12	in.
T_{base}=	1	Ft.
Dist Toe to Face, x_{toe} =	30	in.
X_{toe} =	2.5	Ft.
Heel width, X_{heel} =	3.00	Ft.
Unit Weight of Soil, D_{soil} =	90	Lb./Ft^3
Unit Weight of Concrete, D_{conc} =	150	Lb./Ft^3
Wall Embed, H_{embed} =	1.33	Ft

Weight / C.G.

Concrete Wall Weight = $[(W_{stem} \times (H_{wall} + H_{embed})) + (W_{base} \times T_{base})] \times D_{conc}$ = 2900 Lb. per Lineal Foot

Weight of Soil over Heel = $(X_{heel} \times [H_{soil} + H_{embed}]) \times D_{soil}$ = 3330 Lb. per Lineal Foot

$$\text{C.G. of Concrete, } X_{barConc} = \frac{(W_{stem} \times H_{conc})(W_{stem}/2 + X_{toe}) + (W_{base} \times T_{base})(W_{base}/2)}{(W_{stem} \times H_{conc}) + (W_{base} \times T_{base})} = 3.09 \text{ Ft}$$

C.G. of Soil, $X_{barSoil} = (X_{heel}/2) + W_{stem} + X_{toe}$ = 5.00 Ft.

Soil Pressure:

For equivalent fluid pressure, D_{fluid}, of 40 Lb. per cubic foot (pcf)

Seismic Surcharge Pressure, P_{seis} = 7 x H PSF

Surcharge Pressure, P_{surch} = 0 lb. per Sq.Ft. (level, or terraced back fill)

$$E_a = \frac{D_{fluid} \times H_{soil}^2}{2} + P_{surch} = 2420 \text{ Soil Force, Lb per Lin Ft}$$

Considering pressure as fluid pressure:

$E_h = E_a + (P_{seis} \times H^2) / 2$ = 2843.5 Horizontal component of pressure (including seismic surcharge)

Foundation Wall F3-Cant-1

Overturning Moment:

Moment in Stem Wall, $M_{ot} = E_h \times [(H_{soil} / 3) + H_{embed}] =$ 14217.5 Ft. Lb.

Resisting Moment , $M_{resist} = (W_{wall})(X_{barConc}) + (W_{soil})(X_{barSoil}) =$ 25611.8 Ft. Lb.

$$\frac{M_{resist}}{M_{OT}} = 1.80 \quad \text{> 1.5 ; OK}$$

Vertical Reinforcing Steel:

$f_c' =$ 2500 psi, compressive strength
$E_c = 57000\sqrt{f_c'} =$ 2.9E+06 psi, Elastic Modulus for concrete

$F_{ySteel} =$ 60,000 psi, yield strength for steel (A615 Gr. 60)
$F_{aSteel} =$ 20,000 psi, allowable stress for steel

$d = w_{stem} - 3 =$ 9 in.
$b =$ 12 in., Unit length of wall

Ultimate Strength Design for Cantilever Wall:

Design Moment = 1.6 x Mot = 1.6 x 14217.5 = 22748 Ft.Lb.

$\beta_1 =$ 0.85 for $f_c' < 4000$

$$\rho_b = \frac{0.85\,\beta_1\,f_c'}{f_{ySteel}} \times \frac{87000}{87000 + f_{ySteel}} = 0.01782$$

Min Value for $\rho_b = 200 / F_{ySteel} =$ 0.00333
Max Value for $\rho_b = 0.75\rho_b =$ 0.013

Max Reinforcing Steel, $A_{sMax} = (0.75)(\rho_b)(b)(d) =$ 1.443 in^2

Rebar Size = #7 Cross Section = 0.6 in^2
Rebar Spacing = 9 in.

Rebar Area per Foot = 0.8 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 1.882$$

Moment capability for Stem Wall:

$M_u = 0.9[(As)(fySteel)(d - a/2)] =$ 348,141 in.lb. (= 29011.8 Ft.Lb.)

OK. Larger than Required Moment

Foundation Wall F3-Cant-1

Reinforcing Steel in Base:

$d = w_{stem} - 3 =$ 9 in.

$b =$ 12 in., Unit length of base

Ultimate Strength Design for Base:

$\beta_1 =$ 0.85 for $f_c' < 4000$

$\rho_b = \frac{0.85\ \beta_1\ f_c'}{f_{ySteel}} \times \frac{87000}{87000 + f_{ySteel}} =$ 0.01782

Min Value for $\rho_b = 200 / F_{ySteel} =$ 0.00333

Max Value for $\rho_b = 0.75\rho_b =$ 0.013

Max Reinforcing Steel, $A_{sMax} = (0.75)(\rho_b)(b)(d) =$ 1.443 in^2

Rebar Size = #7 Cross Section = 0.6 in^2

Rebar Spacing = 9 in.

Rebar Area per Foot = 0.8 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 1.882$$

Moment capability for Base:

$M_u = 0.9[(As)(fySteel)(d - a/2)] =$ 348,141 in.lb. (= 29011.8 Ft.Lb.)

OK. Larger than Required Moment

Shear Capability at footing/wall shear plane per ACI 318 Section 11.6:

Unit Shear Force = $1.6 \times V_u =$ 4549.6 Lb. per Ft. (= $1.6 \times E_n$ from previous pages)

For vertical bars: $V_n = (A_{vf})(f_y)(\mu) =$ 28800 lb. per Ft.

Where: $A_{vf} =$ 0.8 in^2 per Foot

$f_y =$ 60,000

$\mu = 0.6 \times \lambda =$ 0.6

$\lambda =$ 1 for normal weight concrete

Max V_n shall not exceed: $0.2f'_cA_c =$ 72000 OR $800\ A_c =$ 115200

$\Phi V_n = (0.75)(28800) =$ 21600 **OK, Larger than Required Shear Force, Vu**

Where: $\Phi =$ 0.75 (Section 9.3.2.3)

$V_n =$ 28800 Min of $(A_{vf})(f_y)(\mu)$ OR $(0.2f'_cA_c)$ OR $(800\ A_c)$

Foundation Wall F3-Cant-1

Bending in Footing Key

Key Thickness, t = 10 in.

Force at Base = Eh = 2843.5 Lb. per lineal ft. d = t-3 = 7 in.

Moment in Key = 2844 x (3.5 / 2) = 4976.13 Ft.Lb. b = 12 in.
unit length

Design Moment = 1.6 x 4976.1 = 7961.8 Ft.Lb. (LRFD equivalent)

β_1 = 0.85 for $f_c' < 4000$

$$\rho_b = \frac{0.85\,\beta_1\,f_c'}{f_{ySteel}} \times \frac{87000}{87000 + f_{ySteel}} = 0.01782$$

Min Value for ρ_b = 200 /F_{ySteel} = 0.00333

Max Value for ρ_b = 0.75ρ_b = 0.013

Max Reinforcing Steel, A_{sMax} = $(0.75)(\rho_b)(b)(d)$ = 1.122 in^2

Rebar Size = #5 Cross Section = 0.31 in^2

Rebar Spacing = 12 in.

Rebar Area per Foot = 0.31 in^2 per Foot

$$a = \frac{(A_s)(f_{ySteel})}{(0.85)(f_c')(b)} = 0.729$$

Moment capability for Stem Wall:

M_u = 0.9[(As)(fySteel)(d - a/2)] = 111,075 in.lb. (= 9256.2 Ft.Lb.)

OK. Larger than Required Moment

Foundation Wall F3-Cant-1

Sliding Resistance:

$R_{passive}$ = 300 Passive Soil Resistance is equivalent to a fluid of density 300 pcf

μ_f = 0.35 Friction Factor against soil

Per Geotech report, these values

E_h = 2843.5 Lb. per Ft. Horizontal Load (see previous pages)

W_{wall} = 2900 Lb. per Ft. Wall Weight (see previous pages)

Friction Force, F_f = μ_f x W_{wall} = 1015 Lb. per Foot of wall

Net force to be resisted by wall embedment = E_{hNet} = (E_h)- F_f = 1828.5 Lb. per Lineal Foot

Passive Resistance:

Resisting pressure at bottom of footing embed = $R_{passive}$ x D (where D = embed depth)

Average pressure from top to bottom of embed = ($R_{passive}$ x D) / 2

Resistive force per foot of wall length = [($R_{passive}$ x D) / 2] x D

Solving for "D" required to equal the applied force:

$$D = SQRT\left[\frac{(2)(E_{hNet})}{R_{passive}}\right] = 3.5 \text{ Ft., Minimum embed depth to resist sliding}$$

= 41.9 in., Minimum

Actual Embed = 3.5 Ft.

= 42.0 in.

Foundation Wall F3-Cant-1

Overturning Soil Pressure:

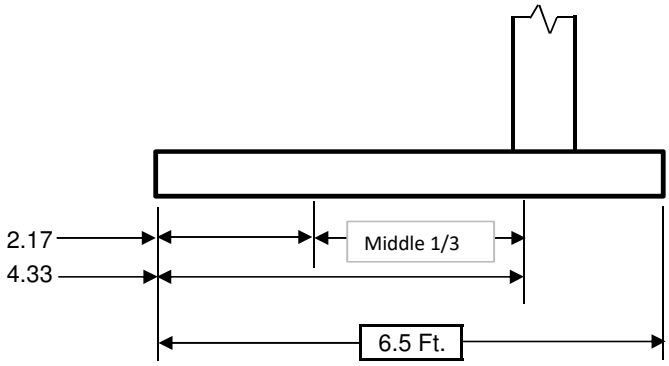
O.T. Moment = 14217.5 Ft. Lb. per Lineal Foot
Resisting Moment = -25612 Ft. Lb. per Lineal Foot
Net Moment, M_{net} = -11394 Ft. Lb. per Lineal Foot

$P_{vert} = W_{conc} + W_{soil} + (P_{surch} x W_{heel}) =$ 6230 Lb. per Lineal Foot Ref [6], Page 8-78

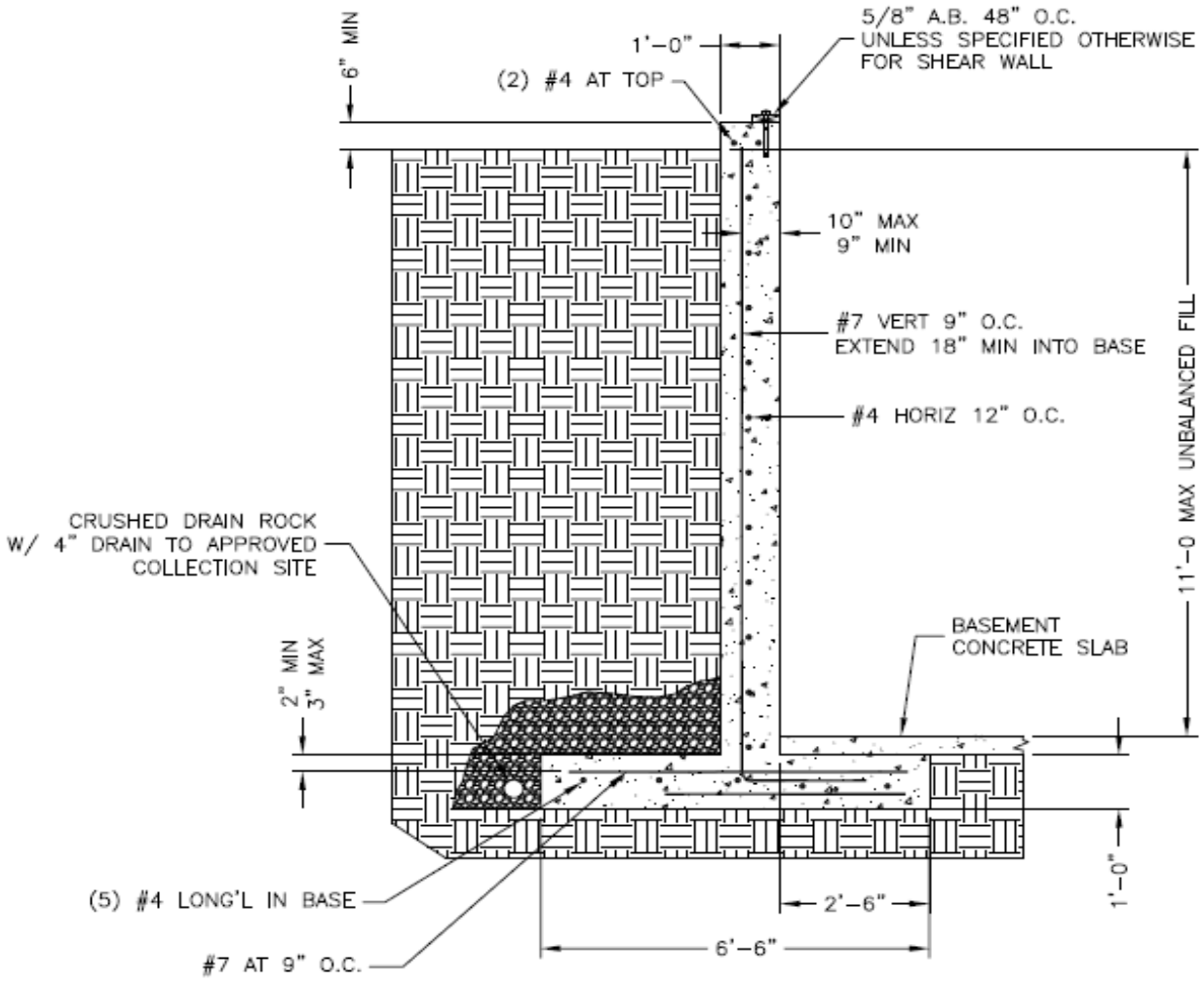
$$L_{net} = \frac{/M_{net}/}{P_{vert}} = 2.00 \text{ Ft.}$$

$$\text{Bearing Pressure} = \frac{P_{vert}}{A}\left(1 \pm 6e/L\right) = 2064.38 \text{ psf}$$

P_{vert} = 6230 Lb.
A = 6.5 Ft^2 (Area of Base at 1' Wide)
L = 6.5 Ft. Length of Base
e = 1.25 Ft.



Foundation Wall F4-Cant



SECTION F4

USE FOR UP TO 11'-0 RETAINED EARTH
WITH NO BACKSLOPE
SCALE: NONE

Design is similar to Foundation Wall F3 except that base sliding resistance is provided by basement slab

11 Ft Soldier Pile

GEOMETRY

H_{soil} =	11	Ft., Height of retained soil	Pile width =	1.30	Ft.
B =	1.3	Ft.	Dia Concrete =	0	Ft.
D =	14	Ft., Embed depth of pile			
S =	6	Ft., Pile spacing			
$H_{freeboard}$ =	0	Freeboard height above wall for falling debris			

LOAD REQUIREMENTS

D_{fluid} = 40 PCF, equivalent fluid density, for horizontal backslope

P_{seis} = 7 psf, Seismic Surcharge per foot of soil height

SOIL RESISTIVE FORCES

$P_{passive}$ = 300 PCF - apply to 2xB width and neglect first 2' embed depth

LATERAL LOADING ON PILE

Lateral Load above grade:

$F_{soil\_above} = (D_{fluid} \times H_{soil} \times 1/2)(H_{soil} \times S)$ = 14520 Lb.
triangular load w/ reaction at H/3

$F_{seismic} = (P_{seis} \times H_{soil} \times 1/2)(H_{soil} \times S)$ = 2541 lb.
triangular load w/ reaction at H/3

Lateral Load below grade:

$F_{below1} = (D_{fluid} \times H_{soil})(D \times B)$ = 8008 lb.
Uniform distribution based on equivalent pressure at bottom of wall
Acts at D / 2

$F_{below2} = (D_{fluid} \times D \times 1/2)(D \times B)$ = 5096 lb.
triangular distribution based on soil pressure from base of wall to base of pile. Acts at D/3 from bottom

Opposing soil pressure on Pile:

$F_{oppose} = (D_{fluid} \times D \times 1/2)(B \times D)$ = 5096 lb. Acts at D/3 from bottom
force due to the soil pressure on the front side of the pile

11 Ft Soldier Pile

Moment at Base of wall:

From soil pressure above:

$M_{soil} = F_{soil\_above} \times H/3 =$ 53240 Ft.Lb.

From Seismic:

$M_{seis} = F_{seis} \times H/3 =$ 9317 Ft.Lb.

Reaction Force at Base of Wall:

$R_{base} = F_{soil\_above} + F_{seis} + F_{below1} + F_{below2} - F_{oppose} =$ 25069 lb.

Opposing soil force = $(P_{passive} \times D \times 1/2)(2B \times (D-2)) =$ 65520 lb.

OK. Exceeds Base Reaction

Opposing soil Moment = 65520 x 2D/3 = 611520 Ft.Lb.

OK. Exceeds Base Moment

11 Ft Soldier Pile

Determine Pile Size

Moments on Pile:

$M_{soil} + M_{seis}$ = 62,557 Ft.Lb.

Beam Properties:

Size: **W 14x159#**

I_{pile} = 1900 in^4 E = 29000000 psi

c_{pile} = 7.5 in Depth = 15 in.

S_{pile} = 254 in^3 Widrh = 15.6 in.

Pile Bending Stress = $(M_{pile} x 12) / S_{pile}$ = 2,955 psi

Pile Deflection = $\frac{_{ase}(H_{soil} \times 12)^3}{15EI}$ = 0.07 in.

OK. < L/360 (=0.37)

Determine Lagging Size

At Bottom of Wall

Load on Lagging = $(D_{fluid} \times H_{soil}) \times 1/2$ 220 psf

For temporary lagging, design for
50% lateral soil pressure & omit seismic

Lagging Thickness = 3.5 in.

Section properties for unit height:

$I = (1)(t)^3 / 12$ = 3.57 in^4

$S = (1)(t)^2 / 6$ = 2.04 in^3

E = 1400000 in^2

Force on 1" wide strip = (1/12)(S)(220) = 110 lb.

Moment on 1" wide strip = (F)(S x 12) / 8 = 990 in.lb.

Bending Stress = M / S = 484.9 psi

Shear Stress = (F/2) / (1 x t) = 15.7 psi

11 Ft Soldier Pile

Determine Lagging Size
At 1/2 Height of Wall

Load on Lagging = $(D_{fluid} \times H_{soil}/2) \times 1/2$ = 110 psf
For temporary lagging, design for
50% lateral soil pressure & omit seismic

Lagging Thickness = 2.5 in.

Section properties for unit height:

$I = (1)(t)^3 / 12$ = 1.30 in^4
$S = (1)(t)^2 / 6$ = 1.04 in^3
E = 1E+06 in^2

Force on 1" wide strip = (1/12)(S)(110) = 55 lb.
Moment on 1" wide strip = (F)(S x 12) / 8 = 495 in.lb.

Bending Stress = M / S = 475.2 psi
Shear Stress = (F/2) / (1 x t) = 11.0 psi

Determine Lagging Size
At 2/3 Height of Wall

Load on Lagging = $(D_{fluid} \times H_{soil}/3) \times 1/2$ = 73.333 psf
For temporary lagging, design for
50% lateral soil pressure & omit seismic

Lagging Thickness = 1.5 in.

Section properties for unit height:

$I = (1)(t)^3 / 12$ = 0.28 in^4
$S = (1)(t)^2 / 6$ = 0.38 in^3
E = 1E+06 in^2

Force on 1" wide strip = (1/12)(S)(73.3) = 36.667 lb.
Moment on 1" wide strip = (F)(S x 12) / 8 = 330 in.lb.

Bending Stress = M / S = 880.0 psi
Shear Stress = (F/2) / (1 x t) = 12.2 psi

16 Ft Soldier Pile

GEOMETRY

H_{soil} =	16	Ft., Height of retained soil	Pile width =	1.30	Ft.
B =	1.3	Ft.	Dia Concrete =	0	Ft.
D =	19	Ft., Embed depth of pile			
S =	6	Ft., Pile spacing			
$H_{freeboard}$ =	0	Freeboard height above wall for falling debris			

LOAD REQUIREMENTS

D_{fluid} = 40 PCF, equivalent fluid density, for horizontal backslope

P_{seis} = 7 psf, Seismic Surcharge per foot of soil height

SOIL RESISTIVE FORCES

$P_{passive}$ = 300 PCF - apply to 2xB width and neglect first 2' embed depth

LATERAL LOADING ON PILE

Lateral Load above grade:

$F_{soil\_above} = (D_{fluid} \times H_{soil} \times 1/2)(H_{soil} \times S)$ = 30720 Lb.
triangular load w/ reaction at H/3

$F_{seismic} = (P_{seis} \times H_{soil} \times 1/2)(H_{soil} \times S)$ = 5376 lb.
triangular load w/ reaction at H/3

Lateral Load below grade:

$F_{below1} = (D_{fluid} \times H_{soil})(D \times B)$ = 15808 lb.
Uniform distribution based on equivalent pressure at bottom of wall
Acts at D / 2

$F_{below2} = (D_{fluid} \times D \times 1/2)(D \times B)$ = 9386 lb.
triangular distribution based on soil pressure from base of wall to base of pile. Acts at D/3 from bottom

Opposing soil pressure on Pile:

$F_{oppose} = (D_{fluid} \times D \times 1/2)(B \times D)$ = 9386 lb. Acts at D/3 from bottom
force due to the soil pressure on the front side of the pile

16 Ft Soldier Pile

Moment at Base of wall:

From soil pressure above:

$M_{soil} = F_{soil\_above} \times H/3 =$ 163840 Ft.Lb.

From Seismic:

$M_{seis} = F_{seis} \times H/3 =$ 28672 Ft.Lb.

Reaction Force at Base of Wall:

$R_{base} = F_{soil\_above} + F_{seis} + F_{below1} + F_{below2} - F_{oppose} =$ 51904 lb.

Opposing soil force = $(P_{passive} \times D \times 1/2)(2B \times (D-2)) =$ 125970 lb.

OK. Exceeds Base Reaction

Opposing soil Moment = $125970 \times 2D/3 =$ 1595620 Ft.Lb.

OK. Exceeds Base Moment

16 Ft Soldier Pile

Determine Pile Size

Moments on Pile:

$M_{soil} + M_{seis}$ = 192,512 Ft.Lb.

Beam Properties:

Size: **W 14x159#**

I_{pile} = 1900 in^4 E = 29000000 psi

c_{pile} = 7.5 in Depth = 15 in.

S_{pile} = 254 in^3 Widrh = 15.6 in.

Pile Bending Stress = $(M_{pile} x 12) / S_{pile}$ = 9,095 psi

Pile Deflection = $\frac{_{use}(H_{soil} \times 12)^3}{15EI}$ = 0.44 in.

OK. < L/360 (=0.53)

Determine Lagging Size

At Bottom of Wall

Load on Lagging = $(D_{fluid} \times H_{soil}) \times 1/2$ 320 psf

For temporary lagging, design for
50% lateral soil pressure & omit seismic

Lagging Thickness = 3.5 in.

Section properties for unit height:

$I = (1)(t)^3 / 12$ = 3.57 in^4

$S = (1)(t)^2 / 6$ = 2.04 in^3

E = 1400000 in^2

Force on 1" wide strip = (1/12)(S)(320) = 160 lb.

Moment on 1" wide strip = (F)(S x 12) / 8 = 1440 in.lb.

Bending Stress = M / S = 705.3 psi

Shear Stress = (F/2) / (1 x t) = 22.9 psi

16 Ft Soldier Pile

Determine Lagging Size
At 1/2 Height of Wall

Load on Lagging = $(D_{fluid} \times H_{soil}/2) \times 1/2$ = 160 psf
For temporary lagging, design for
50% lateral soil pressure & omit seismic

Lagging Thickness = 2.5 in.

Section properties for unit height:

$I = (1)(t)^3 / 12$ = 1.30 in^4
$S = (1)(t)^2 / 6$ = 1.04 in^3
E = 1400000 in^2

Force on 1" wide strip = (1/12)(S)(160) = 80 lb.
Moment on 1" wide strip = (F)(S x 12) / 8 = 720 in.lb.

Bending Stress = M / S = 691.2 psi
Shear Stress = (F/2) / (1 x t) = 16.0 psi

Determine Lagging Size
At 2/3 Height of Wall

Load on Lagging = $(D_{fluid} \times H_{soil}/3) \times 1/2$ = 106.67 psf
For temporary lagging, design for
50% lateral soil pressure & omit seismic

Lagging Thickness = 1.5 in.

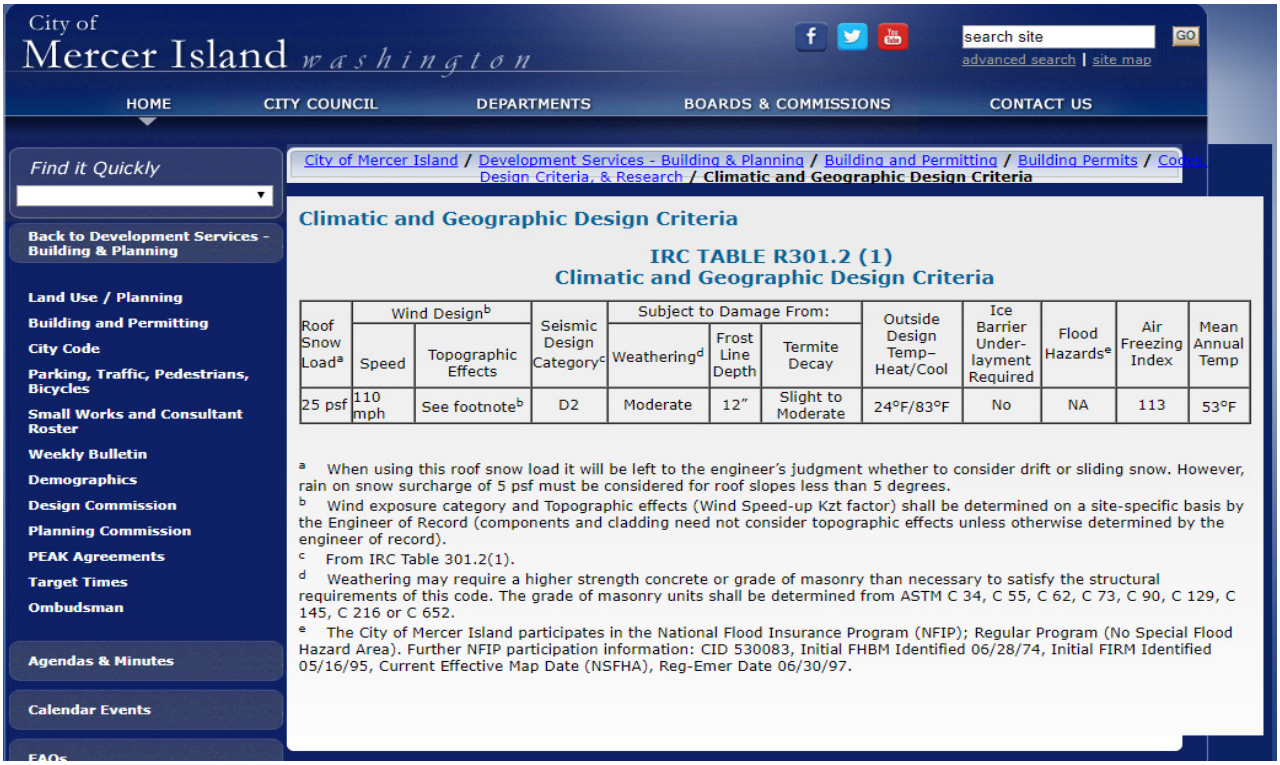
Section properties for unit height:

$I = (1)(t)^3 / 12$ = 0.28 in^4
$S = (1)(t)^2 / 6$ = 0.38 in^3
E = 1400000 in^2

Force on 1" wide strip = (1/12)(S)(106.7) = 53.33333 lb.
Moment on 1" wide strip = (F)(S x 12) / 8 = 480 in.lb.

Bending Stress = M / S = 1280.0 psi
Shear Stress = (F/2) / (1 x t) = 17.8 psi

Appendix 1



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Climatic and Geographic Design Criteria

IRC TABLE R301.2 (1)
Climatic and Geographic Design Criteria

Roof Snow Load[a]	Wind Design[b]		Seismic Design Category[c]	Subject to Damage From:			Outside Design Temp–Heat/Cool	Ice Barrier Under-layment Required	Flood Hazards[e]	Air Freezing Index	Mean Annual Temp
	Speed	Topographic Effects		Weathering[d]	Frost Line Depth	Termite Decay					
25 psf	110 mph	See footnote[b]	D2	Moderate	12"	Slight to Moderate	24°F/83°F	No	NA	113	53°F

[a] When using this roof snow load it will be left to the engineer's judgment whether to consider drift or sliding snow. However, rain on snow surcharge of 5 psf must be considered for roof slopes less than 5 degrees.

[b] Wind exposure category and Topographic effects (Wind Speed-up Kzt factor) shall be determined on a site-specific basis by the Engineer of Record (components and cladding need not consider topographic effects unless otherwise determined by the engineer of record).

[c] From IRC Table 301.2(1).

[d] Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The grade of masonry units shall be determined from ASTM C 34, C 55, C 62, C 73, C 90, C 129, C 145, C 216 or C 652.

[e] The City of Mercer Island participates in the National Flood Insurance Program (NFIP); Regular Program (No Special Flood Hazard Area). Further NFIP participation information: CID 530083, Initial FHBM Identified 06/28/74, Initial FIRM Identified 05/16/95, Current Effective Map Date (NSFHA), Reg-Emer Date 06/30/97.

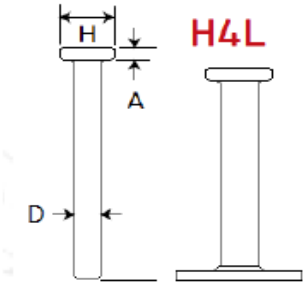
Appendix 1

Studs

Concrete Anchors

NELSON STUD WELDING SPECIFICATION

H4L Headed Concrete Anchors



Nelson headed concrete anchors deliver code specified embedded tension and shear strength values between steel and concrete. These anchors meet requirements of the following codes:

- AWS D1.1 Structural Welding Code – Steel, Type B
- AWS D1.6 Structural Welding Code – Stainless Steel, Type A
- AASHTO/AWS D1.5 Bridge Welding Code
- ISO-13918 Welding – Studs for Arc Stud Welding
- Canadian Standards Association, W59 – Welded Steel Construction, Type B
- International Building Code Section 19

See also: ICC-ES Evaluation Report ESR-2856 Nelson Shear Connectors

Headed anchors are widely used in precast, cast-in-place or composite steel construction for miscellaneous embedded plates, frames, curbing, attachments and connections.

For similar function studs, see Nelson S3L Shear Connectors and D2L Deformed Bar Anchors.

When ordering, specify: Type, Diameter, Before Weld Length, Material, Quantity, and Part Number

Example: **H4L 1/2 x 4-1/8"; Mild Steel; 5000 pieces; #101053003**

Stud Diameter D	Burn Off	A	H	Ferrule to Flat	Required Standard Accessories		
					Chuck	Foot*	Grip for Flat
1/4 / 6 mm	0.125 3 mm	0.187	0.500	100101067	500001014	502002001	501003007
3/8 / 10 mm	0.125 3 mm	0.281	0.750	100101099	500001018	502002001	501003009
1/2 / 13 mm	0.125 3 mm	0.312	1.000	100101114	500001085	502002002	501003010
5/8 / 16 mm	0.187 4 mm	0.312	1.250	100101187	500001088	502002002	501003014

*Feet 502002001 and 502002002 are used with Nelson's heavy duty gun. Feet 502002045 and 502002046 are used with Nelson's standard duty gun.

MATERIALS: Studs are available in Low Carbon Mild Steel and 316L Stainless Steel. For specific grade information and physical and chemical properties, and conforming standards, please see General Material Specifications. Certified Material Test Reports (CMTR) and Certificates of Compliance (COC) are available and must be requested at time of order.

For ferrules and grips used in welding at an angle to plate, welding to angles, and welding to a vertical base plate, see the Special Applications section of the Ferrule Specifications.

Appendix 1

ALLOWABLE LOADS FOR PSL COLUMNS

Allowable Axial Loads (lbs) for 1.3E TimberStrand® LSL

Column Bearing Type	Effective Column Length	Column Size																			
		3½" x 3½"			3½" x 4⅜"			3½" x 5½"			3½" x 7¼"			3½" x 8⅞"						
		100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%				
On Column Base	3'	12,165	13,665	14,625	15,210	17,085	18,280	19,120	21,475	22,980	25,205	28,310	30,290	29,985	33,680	36,035				
	4'	10,745	11,830	12,490	13,435	14,790	15,610	16,885	18,590	19,625	22,260	24,505	25,870	26,480	29,155	30,780				
	5'	9,120	9,810	10,215	11,400	12,265	12,765	14,335	15,420	16,050	18,895	20,325	21,155	22,480	24,180	25,170				
	6'	7,550	7,985	8,235	9,440	9,980	10,295	11,865	12,550	12,945	15,640	16,540	17,060	18,610	19,680	20,300				
	7'	6,235	6,525	6,695	7,795	8,160	8,370	9,800	10,255	10,520	12,915	13,520	13,870	15,365	16,085	16,500				
	8'	5,195	5,400	5,515	6,490	6,750	6,895	8,160	8,485	8,670	10,755	11,185	11,430	12,795	13,305	13,595				
	9'	4,375	4,525	4,610	5,465	5,655	5,765	6,870	7,110	7,245	9,060	9,370	9,550	10,775	11,150	11,360				
	10'	3,725	3,840	3,905	4,655	4,795	4,880	5,850	6,030	6,135	7,715	7,950	8,085	9,175	9,460	9,620				
	12'	2,785	2,855	2,895	3,480	3,565	3,615	4,375	4,485	4,545	5,770	5,910	5,995	6,860	7,030	7,130				
	14'	2,155	2,200	2,225	2,695	2,750	2,780	3,385	3,455	3,495	4,465	4,555	4,610	5,310	5,420	5,485				
On Wood Plate(1)(2)	3'–7'	5,765	5,765	5,765	7,065	7,065	7,065	8,740	8,740	8,740	10,785	10,785	10,785	12,830	12,830	12,830				
	8'	5,195	5,400	5,515	6,490	6,750	6,895	8,160	8,485	8,670	10,755	10,785	10,785	12,795	12,830	12,830				
	9'	4,375	4,525	4,610	5,465	5,655	5,765	6,870	7,110	7,245	9,060	9,370	9,550	10,775	11,150	11,360				
	10'	3,725	3,840	3,905	4,655	4,795	4,880	5,850	6,030	6,135	7,715	7,950	8,085	9,175	9,460	9,620				
	12'	2,785	2,855	2,895	3,480	3,565	3,615	4,375	4,485	4,545	5,770	5,910	5,995	6,860	7,030	7,130				
	14'	2,155	2,200	2,225	2,695	2,750	2,780	3,385	3,455	3,495	4,465	4,555	4,610	5,310	5,420	5,485				

(1) Wood plate bearing is based on compression perpendicular-to-grain stress of 425 psi adjusted per the NDS®, 3.10.4.
(2) See connection details below.

Allowable Axial Loads (lbs) for 1.8E Parallam® PSL

Column Bearing Type	Effective Column Length	Column Size																			
		3½" x 3½"			3½" x 5¼"			3½" x 7"			5¼" x 5¼"			5¼" x 7"			7" x 7"				
		100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%		
On Column Base	6'	10,595	11,200	11,545	15,890	16,800	17,320	21,190	22,395	23,095	33,295	36,675	38,735	40,000	40,000	40,000	40,000	40,000	40,000		
	7'	8,735	9,140	9,370	13,105	13,710	14,060	17,475	18,280	18,745	30,010	32,545	34,030	40,000	40,000	40,000	40,000	40,000	40,000		
	8'	7,265	7,550	7,715	10,900	11,325	11,570	14,535	15,100	15,425	26,650	28,490	29,555	35,530	37,985	39,410	40,000	40,000	40,000		
	9'	6,115	6,320	6,440	9,170	9,480	9,660	12,225	12,640	12,880	23,475	24,835	25,620	31,300	33,115	34,165	40,000	40,000	40,000		
	10'	5,200	5,355	5,445	7,800	8,035	8,170	10,400	10,715	10,895	20,660	21,695	22,290	27,545	28,925	29,725	40,000	40,000	40,000		
	12'	3,885	3,980	4,030	5,825	5,965	6,050	7,765	7,955	8,065	16,160	16,805	17,175	21,545	22,405	22,900	40,000	40,000	40,000		
	14'	3,000	3,065	3,100	4,500	4,595	4,645	6,005	6,125	6,195	12,890	13,315	13,560	17,185	17,755	18,080	34,155	35,785	36,720		
	16'	Slenderness ratio exceeds 50									10,480	10,775	10,950	13,970	14,370	14,595	28,485	29,640	30,300		
	18'										8,670	8,885	9,010	11,560	11,850	12,010	24,020	24,860	25,345		
	20'										7,285	7,445	7,535	9,710	9,925	10,050	20,475	21,110	21,475		
	22'																17,630	18,125	18,405		
	24'																15,325	15,715	15,935		

Appendix 1

ALLOWABLE LOADS FOR 4x4 COLUMNS

Allowable Column Compression = **4090** lb.

Column Type:	sawn lumber	
Material:	Hem-Fir	
Modulus of Elasticity:	1400000	
Basic allowable compression Fc =	1300	
Actual Length, L =	120	in.
K =	1	From NDS, Appendix G for pin/pin connection
Effective Column Length, KL =	120	in.
Column width, w =	3.5	in.
Column depth, d =	3.5	in.
Slenderness Ratio, Rc/d =	34.2857	max ratio of KL/w or KL/d OK < 50
Adjusted Compressive Stress =	333.897	psi
Kce =	0.3	for visually graded
Fce =	357.292	
c =	0.8	
F*c =	1287	
ct =	1	
cD =	0.9	
cM =	1	Wet service, See Table 4A
cF =	1.1	
ci =	1	incising factor (= 0.8 if incised)
Cp =	0.25944	

Appendix 1

ALLOWABLE LOADS FOR 4x6 COLUMNS

Allowable Column Compression = **6428** lb.

Column Type: sawn lumber
Material: Hem-Fir
Modulus of Elasticity: 1400000
Basic allowable compression Fc = 1300

Actual Length, L =	120	in.	
K =	1	From NDS, Appendix G for pin/pin connection	
Effective Column Length, KL =	120	in.	
Column width, w =	3.5	in.	
Column depth, d =	5.5	in.	
Slenderness Ratio, Rc/d =	34.2857	max ratio of KL/w or KL/d	OK < 50

Adjusted Compressive Stress = 333.897 psi

Kce =	0.3	for visually graded
Fce =	357.292	
c =	0.8	
F*c =	1287	
ct =	1	
cD =	0.9	
cM =	1	Wet service, See Table 4A
cF =	1.1	
ci =	1	incising factor (= 0.8 if incised)
Cp =	0.25944	

Appendix 1

ALLOWABLE LOADS FOR 6x6 COLUMNS

Allowable Column Compression = **21436** lb.

Column Type:	sawn lumber	
Material:	Hem-Fir	
Modulus of Elasticity:	1400000	
Basic allowable compression Fc =	1300	
Actual Length, L =	120	in.
K =	1	From NDS, Appendix G for pin/pin connection
Effective Column Length, KL =	120	in.
Column width, w =	5.5	in.
Column depth, d =	5.5	in.
Slenderness Ratio, Rc/d =	21.8182	max ratio of KL/w or KL/d OK < 50
Adjusted Compressive Stress =	708.639	psi
Kce =	0.3	for visually graded
Fce =	882.292	
c =	0.8	
F*c =	1287	
ct =	1	
cD =	0.9	
cM =	1	Wet service, See Table 4A
cF =	1.1	
ci =	1	incising factor (= 0.8 if incised)
Cp =	0.55061	

Appendix 2-Hold-Down Embed

ANCHOR EMBED FOR HDU14 HOLD-DOWN

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Profis Anchor 2.7.3

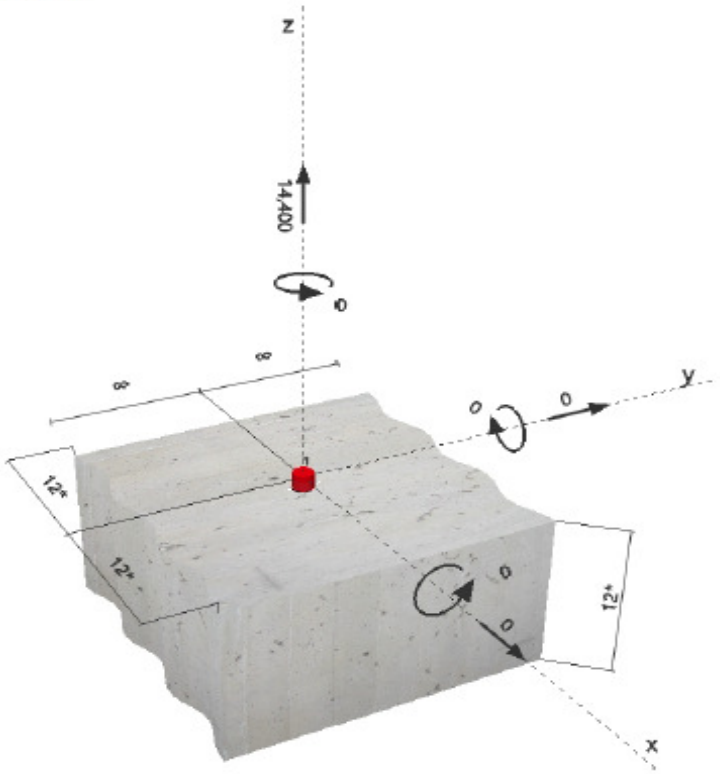
Company:	Quality Engineering & Design	Page:	1
Specifier:	T. Wolfe	Project:	Mercer Island Res
Address:		Sub-Project I Pos. No.:	
Phone I Fax:	|	Date:	10/18/2017
E-Mail:			

Specifier's comments: Anchor embed for HDU14 Hold-Down

1 Input data

Anchor type and diameter:	**Heavy Square Head ASTM F 1554 GR. 36 1**
Effective embedment depth:	h_{ef} = 10.000 in.
Material:	ASTM F 1554
Proof:	Design method ACI 318-14 / CIP
Stand-off installation:	- (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 2500, f_c' = 2500 psi; h = 12.000 in.
Reinforcement:	tension: condition B, shear: condition B; edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (b)) Shear load: yes (17.2.3.5.3 (a))

Geometry [in.] & Loading [lb, in.lb]



Appendix 2-Hold-Down Embed

Company:	Quality Engineering & Design	Page:	2
Specifier:	T. Wolfe	Project:	Mercer Island Res
Address:		Sub-Project I Pos. No.:	
Phone I Fax:	|	Date:	10/18/2017
E-Mail:			

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	Proof	Load	Capacity	β_N / β_V [%]	Status
Tension	Concrete Breakout Strength	14400	14982	97 / -	OK
Shear	-	-	-	- / -	-

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	-	-	-	-	-

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

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Appendix 2-Hold-Down Embed

ANCHOR EMBED FOR HDU11 HOLD-DOWN

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Profis Anchor 2.7.3

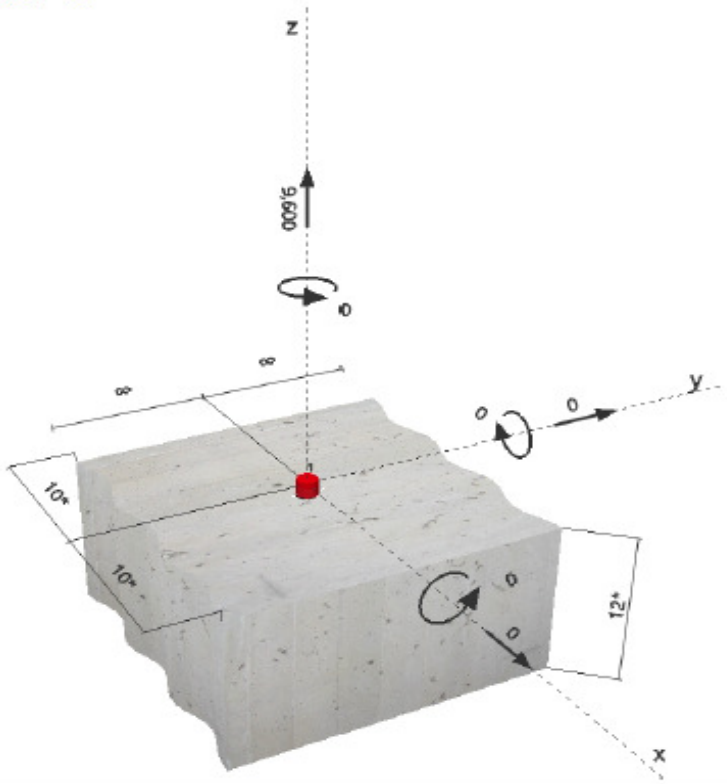
Company:	Quality Engineering & Design	Page:	1
Specifier:	T. Wolfe	Project:	Mercer Island Res
Address:		Sub-Project I Pos. No.:	
Phone I Fax:	|	Date:	10/18/2017
E-Mail:			

Specifier's comments: Anchor embed for HDU11 Hold-Down

1 Input data

Anchor type and diameter:	**Heavy Square Head ASTM F 1554 GR. 36 1**
Effective embedment depth:	h_{ef} = 10.000 in.
Material:	ASTM F 1554
Proof:	Design method ACI 318-14 / CIP
Stand-off installation:	- (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 2500, f_c' = 2500 psi; h = 12.000 in.
Reinforcement:	tension: condition B, shear: condition B; edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (b)) Shear load: yes (17.2.3.5.3 (a))

Geometry [in.] & Loading [lb, in.lb]



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Company:	Quality Engineering & Design	Page:	2
Specifier:	T. Wolfe	Project:	Mercer Island Res
Address:		Sub-Project I Pos. No.:	
Phone I Fax:	|	Date:	10/18/2017
E-Mail:			

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	Proof	Load	Capacity	β_N / β_V [%]	Status
Tension	Concrete Breakout Strength	9600	11953	81 / -	OK
Shear	-	-	-	- / -	-

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	-	-	-	-	-

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

4 Remarks; Your Cooperation Duties

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