



Structural Calculations for:

Alpay Residence

5419 96th Ave SE, Mercer Island, WA 98040

Client: Ripple Design Studio

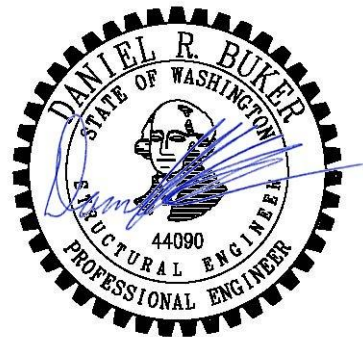
Code: 2021 International Building Code

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- C1 – Design Criteria
- L1 – L8 – Lateral Calculations
- F1 – F11 – Framing Calculations

Scope: Addition to existing residence

November 10, 2025



Seismic Design Loads (ASCE 7-16)

for a Wood Framed Structure

RISK CATEGORY II

OCCUPANCY CAT. II Table 1.5-1

IMP. FACTOR 1 Table 1.5-2

SITE CLASS D Table 20.3-1

R = 6.5 Table 12.2-1

SEISMIC

DESIGN CATEGORY D 11.6

$S_s = 1.44$

$S_1 = 0.5$

$F_a = 1.00$ Table 11.4-1

$F_v = 1.80$ Table 11.4-2

$S_{DS} = 0.960$

$S_{D1} = 0.600$

$T_0 = 0.13$

$T_s = 0.63$

$T_L = 6$ Fig 22-14

$T = 0.21$

Seismic Dead Load: 15^{psf} Roof

15^{psf} Floor

20^{psf} Walls

$C_{S_{ULT}} = 0.148$ Eqn. 12.8-2

$C_{S_{ASD}} = 0.105$

$W_{roof} = 15 + 10 = 25^{psf}$

$W_{floor} = 10 + 10 + 10 = 30^{psf}$

Vertical Design Loads

Criteria

ASCE 7-16

IBC 2018

Dead Loads

Roof (Composit) 2.5 psf

1/2" Ply 1.5 psf

Rafter/Truss 2 psf

Insulation 1 psf

5/8" GWB 3.1 psf

Misc./Mech. 2 psf

12.1 psf

Use 15 psf

Flooring 1 psf

Sheathing 2.3 psf

Joist 2.6 psf

5/8" GWB 3.1 psf

Misc. Mech 1 psf

10 psf

Use 15 psf

Live Loads

Snow 25 psf

floor 40 psf

Soil Bearing

2000 psf



Project: Alpay Residence
5419 96th Ave SE
Mercer Island, WA 980

Date: 11/7/2025

Design: DRB

Wind Design Loads (ASCE 7-16)

Directional Procedure - Part 1

Exposure C
 V= 98 mph
 $K_d = 0.85$
 $I = 1$
 $G = 0.85$
 $K_e = 1.00$

Table 26.6-1
 26.11.1
 Table 26.9-1

Roof Angle = 18.5 degrees
 Ground to top of roof 13 ft
 Bottom of roof to top of roof 4 ft
 (mean roof height) h= 11.0 ft

Pressure Coefficients
 from Figure 27.4-1:

$K_{zt} = 1.00$

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.5
Windward Roof	0.3
Leeward Roof	-0.6

*Note= C_p values are conservative worst case values

Pressures: Calculated using ASCE7-16 Ch. 27 (Directional Procedure)						
Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lw\ walls}$	Ultimate P_{walls} (psf)	Allowable P_{walls} (psf)
0-15	0.85	17.76	12.08	7.55	19.63	11.78
15-20	0.9	18.81	12.79	7.55	20.34	12.20
20-25	0.94	19.64	13.36	7.55	20.91	12.54
25-30	0.98	20.48	13.93	7.55	21.48	12.89
30-40	1.04	21.73	14.78	7.55	22.33	13.40

$P_{ww\ roof}$	$P_{lw\ roof}$	P_{roof} (psf)	P_{roof} (psf)
4.53	9.06	13.59	8.15

Design for 13psf on windward surfaces



Project: Alpay Residence
 5419 96th Ave SE
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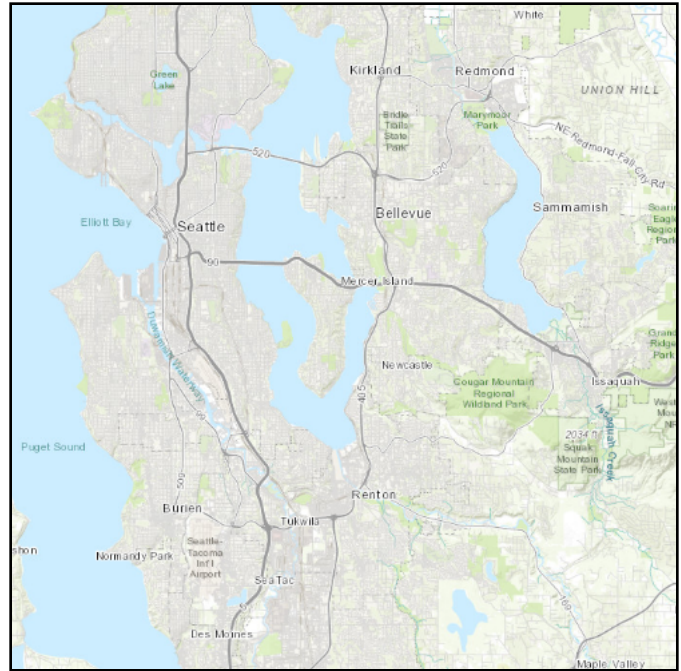
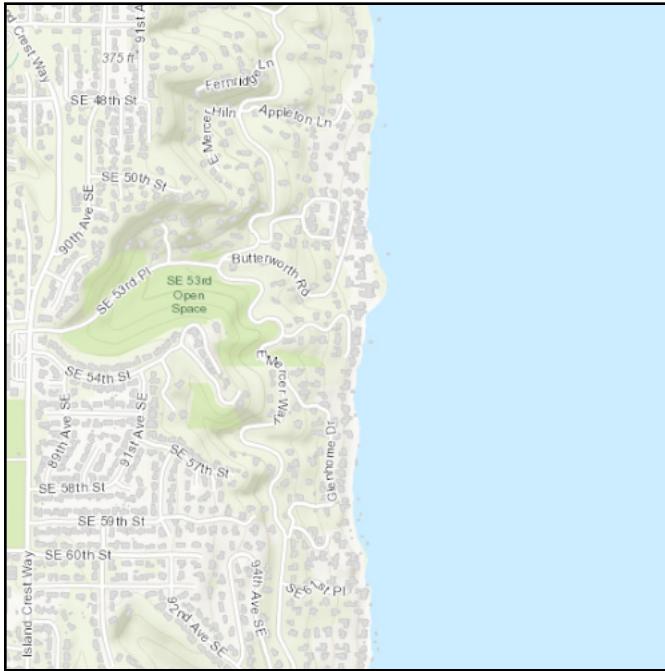
Date: 11/7/2025
 Design: DRB

ASCE Hazards Report

Address:
5419 96th Ave SE
Mercer Island, Washington
98040

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Latitude: 47.554398
Longitude: -122.210575
Elevation: 68.77801143974143 ft
(NAVD 88)



Site Soil Class: D - Stiff Soil

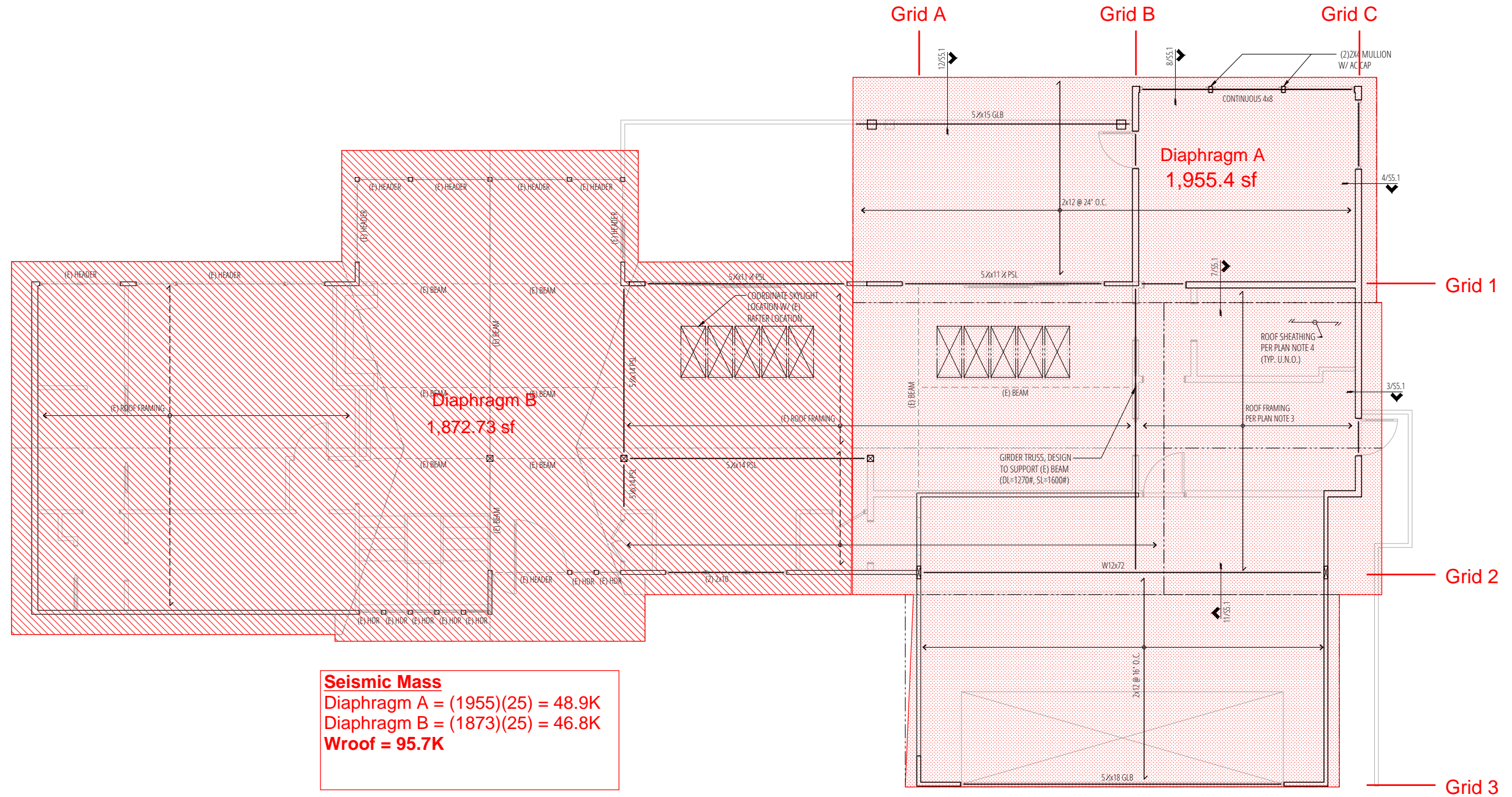
Results:

S_S :	1.44	S_{D1} :	N/A
S_1 :	0.5	T_L :	6
F_a :	1	PGA :	0.617
F_v :	N/A	PGA_M :	0.678
S_{MS} :	1.44	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.96	C_v :	1.388

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Mon Nov 10 2025

Date Source: [USGS Seismic Design Maps](#)



Seismic Mass
 Diaphragm A = (1955)(25) = 48.9K
 Diaphragm B = (1873)(25) = 46.8K
 Wroof = 95.7K

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

PLAN NOTES

- REFER TO GENERAL STRUCTURAL NOTES FOR ADDITIONAL REQUIREMENTS (S1.1)
- REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS UNLESS SPECIFICALLY NOTED ON STRUCTURAL PLANS.
- NEW ROOF FRAMING SHALL BE PRE-MANUFACTURED ROOF TRUSSES @ 24" O.C. (TRUSS DESIGN BY OTHERS).
- NEW ROOF SHEATHING SHALL BE 1/2" CDX PLYWOOD SHEATHING WITH 40/20 SPAN RATING. NAIL FRAMED PANEL EDGES W/ 8d COMMON (0.131" DIA. x 2 1/2") @ 6" O.C., FIELD @ 12" O.C. (REFER TO 9/54.1)
- "W" REFERS TO SHEARWALL TYPE PER 3/54.1 & 7/54.1. ALL OTHER NON-DESIGNATED EXTERIOR WALLS SHALL BE SHEARWALL TYPE W6. WHERE INDICATED, "(x-x)" REFERS TO MINIMUM SHEARWALL LENGTH. COORDINATE ACTUAL LENGTH WITH ARCHITECTURAL.
- ALL HEADERS AT NEW ROOF NOT NOTED OTHERWISE ON PLAN SHALL BE (2) 2x8. (REFER TO DETAIL 6/54.1)
- PROVIDE TOP PLATE SPLICES PER 5/54.1
- WHERE OVERFRAMING IS INDICATED, OVERFRAME WITH 2x6 @ 24" O.C. w/ 4'-0" MAX SPAN. (REFER TO DETAIL 2/55.1 FOR CONNECTION OF OVERFRAMING TO PRIMARY ROOF)
- REFER TO 11/54.1 AT SHEARWALL INTERSECTIONS.

LEGEND

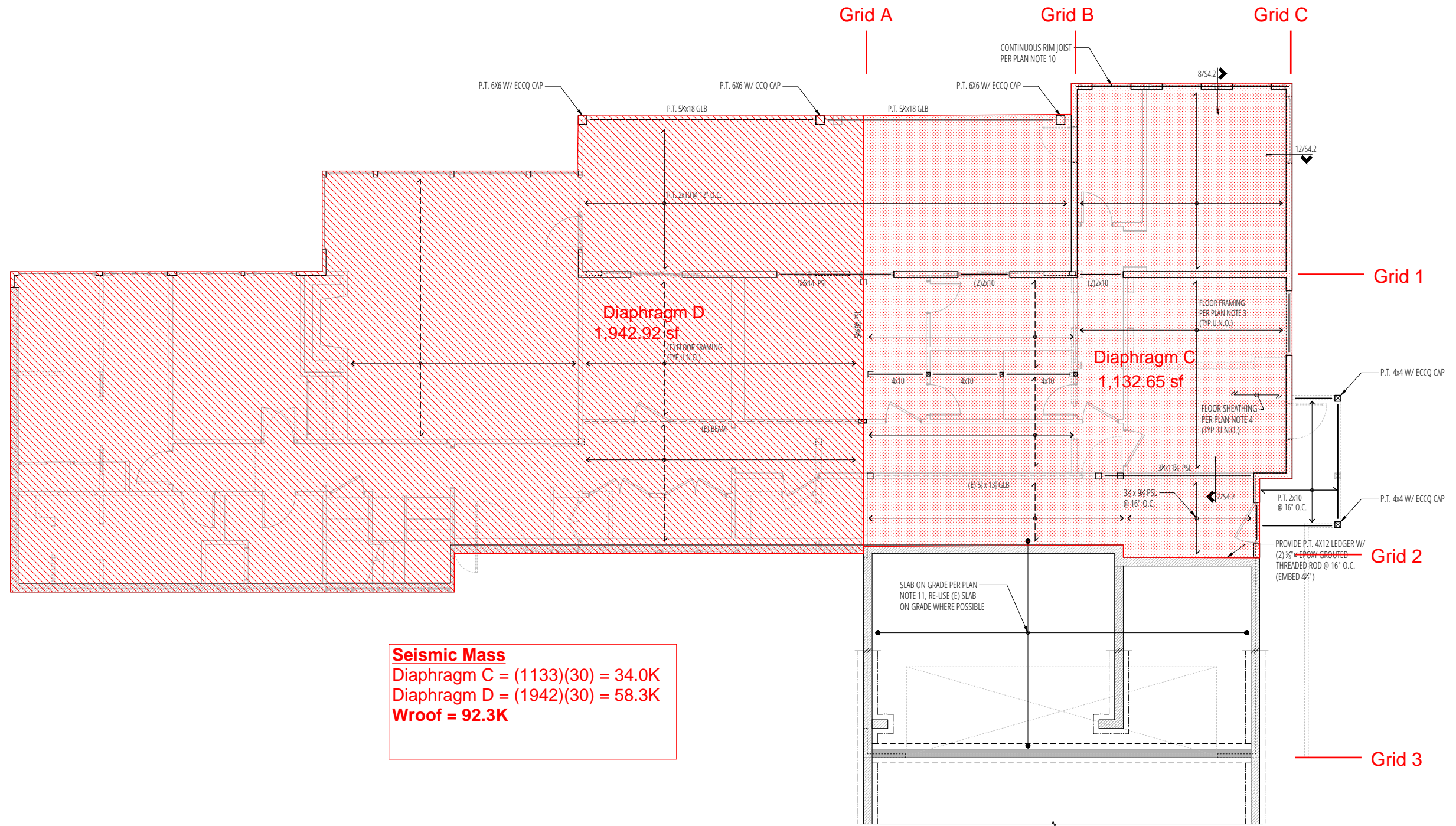
- | | | | |
|--|---|--|---|
| | STRUCTURAL WOOD WALL or POST BELOW THIS LEVEL | | JOIST or BEAM |
| | STRUCTURAL WOOD WALL or POST ABOVE THIS LEVEL | | (E) JOIST OR BEAM |
| | (E) STRUCTURAL WOOD WALL OR POST BELOW THIS LEVEL | | HOLDOWN |
| | (E) SPAN DIRECTION | | STRAP PER PLAN |
| | SPAN DIRECTION | | G.T. GIRDER TRUSS |
| | EXTENT OF SPAN | | H.T. HIP TRUSS |
| | (E) ROOFLINE | | OVERFRAMING |
| | ROOFLINE | | BLOCK DIAPHR. 2X'S LAID FLAT @ ALL PANEL EDGES. 8D @ 4" OC @ ALL PANEL EDGES & 12" OC IN FIELD. (REFER TO 9/54.1) |

No.	Date	Issue
11/10/25	Permit	

Sheet Contents
ROOF FRAMING PLAN

Sheet No.

S2.2
L4



Seismic Mass
 Diaphragm C = (1133)(30) = 34.0K
 Diaphragm D = (1942)(30) = 58.3K
Wroof = 92.3K

Main Floor Framing Plan
 SCALE: 1/4"=1'-0"

PLAN NOTES

- REFER TO GENERAL STRUCTURAL NOTES FOR ADDITIONAL REQUIREMENTS (S1.1)
- REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS UNLESS SPECIFICALLY NOTED ON STRUCTURAL PLANS.
- NEW FLOOR FRAMING WHERE INDICATED TO BE 1 1/2" TJI 210 @ 16" O.C. (U.N.O.).
- NEW FLOOR SHEATHING SHALL BE 3/4" T&G PLYWOOD SHEATHING WITH 48/24 SPAN RATING. NAIL FRAMED PANEL EDGES W/ 8d COMMON (0.131" DIA. x 2 1/2") @ 6" O.C., FIELD @ 12" O.C. (REFER TO 9/54.1)
- "W#" REFERS TO SHEARWALL TYPE PER 3/54.1 & 7/54.1. ALL OTHER NON-DESIGNATED EXTERIOR WALLS SHALL BE SHEARWALL TYPE W6, WHERE INDICATED. "(x-x)" REFERS TO MINIMUM SHEARWALL LENGTH. COORDINATE ACTUAL LENGTH WITH ARCHITECTURAL.
- "MSTC66/CM5T" & "CS16" REFER TO HOLDDOWNS PER 3/54.2 & 4/54.2 RESPECTIVELY.
- PROVIDE TOP PLATE SPLICES PER 5/54.1
- REFER TO 11/54.1 AT SHEARWALL INTERSECTIONS.
- ALL NEW HEADERS NOT NOTED OTHERWISE ON PLAN SHALL BE (2) 2x10. (REFER TO 6/54.1)
- AT NEW EXTERIOR WALLS, PROVIDE CONTINUOUS 1 1/2" x 11 1/2" LSL STRUCTURAL RIM JOIST, UNLESS NOTED OTHERWISE. RIM JOISTS OVER OPENINGS SHALL BE CONTINUOUS W/ NO SPLICES. REFER TO 8/54.2 & 12/54.2.
- 4" CONCRETE SLAB ON GRADE REINFORCED WITH #3 @ 12" OC EACH WAY, CENTERED IN SLAB. PROVIDE A BASE OF 4" COMPACTED, CLEAN 3/4" MINUS GRAVEL COVERED WITH 6 MIL VAPOR BARRIER. PROVIDE JOINTS PER 7/53.1.
- CONTRACTOR TO VERIFY THAT ALL POSTS HAVE CONTINUOUS BEARING THROUGH TO THE FOUNDATION.
- REFER TO DETAIL 1/53.1 FOR ALL GUARDRAIL REQUIREMENTS.

LEGEND

- STRUCTURAL WOOD WALL or POST BELOW THIS LEVEL
- STRUCTURAL WOOD WALL or POST ABOVE THIS LEVEL
- (E) STRUCTURAL WOOD WALL or POST BELOW THIS LEVEL
- (E) SPAN DIRECTION
- SPAN DIRECTION
- EXTENT OF SPAN
- (N) CONCRETE WALL ABOVE THIS LEVEL
- (E) CONCRETE WALL ABOVE THIS LEVEL
- JOIST or BEAM
- (E) JOIST or BEAM
- HOLDDOWN
- STRAP PER PLAN
- BLOCK DIAPHR. 2X'S LAID FLAT @ ALL PANEL EDGES, 8D @ 4" OC @ ALL PANEL EDGES & 12" OC IN FIELD. (REFER TO 9/54.1)

No.	Date	Issue
11/10/25	Permit	

Sheet Contents

MAIN FLOOR FRAMING PLAN

Sheet No.

S2.1
L5

Seismic Analysis (ASCE 7-16)

$S_s =$	1.44	$F_a =$	1.00	$S_{ms} =$	1.44	$S_{Ds} =$	0.96
$S_1 =$	0.50	$F_v =$	1.80	$S_{m1} =$	0.90	$S_{D1} =$	0.60

Site Class =	D	
Mean Roof Height =	17	ft
T =	0.17	sec
R =	6.5	
I =	1.0	
rho =	1.0	
Cs =	0.148	
W =	92.30	K
Allowable Base Shear V =	9.55	K

House

Level	Wx (K)	hx (ft)	Wxhx	Cvx	Fx (K)
Roof	58.3	17	991	0.78	7.5
Second	34	8	272	0.22	2.1
Sum	92.3		1263	1.0	9.5

Note: The portion of the house in Diaphragms B and D are largely untouched by the renovation and therefore are assumed to be self supporting and not included in the analysis



Alpay Residence

Roof Diaphragm

Upper Floor Shear walls

North/South Direction

Grid	1	2	3	
Vwind (kips)	2.83	2.06	0.825	
Vseismic (kips)	3.71	2.72	1.1	
Length of wall (ft)	16.5	25.5	6.6	
v_wind (p/f)**	193	81	173	
v_siesmic (p/l)**	253	107	231	
h (ft)	9	9	9	
OTF_Wind (lbs)*	1737	727	1558	
OTF_Seismic (lbs)*	2024	960	1500	
Length of shortest wall pier (ft)	4	9.5	3.25	
Apect Ratio Reduction for Seismic Loads	2.25	0.95	2.77	
Siesmic Penalty	0.89	1.0	0.72	
Shearwall	W4	W6	W6	
Holdown	(2)CS16	Not Req'd	HDU2	

*OTF does not take into account dead load and weight of the wall uno

**v_siesmic/wind includes penalty

East/West Direction

Grid	A	C		
Vwind (kips)	3.3	1.65		
Vseismic (kips)	3.75	3.75		
Length of wall (ft)	15.5	21.5		
v_wind (p/f)**	213	77		
v_siesmic (p/l)**	242	174		
h (ft)	9	9		
OTF_Wind (lbs)*	1916	691		
OTF_Seismic (lbs)*	2177	1570		
Length of shortest wall pier (ft)	15.5	21.5		
Apect Ratio Reduction for Seismic Loads	0.58	0.42		
Siesmic Penalty	1.0	1.0		
Shearwall	W4	W6		
Holdown	HDU2	Not Req'd		

*OTF does not take into account dead load and weight of the wall uno

**v_siesmic/wind includes penalty

Upper Floor Diaphragm

Basement Floor Shear walls

North/South Direction

Grid	1	2	3	
Vwind (kips)	4.6			
Vseismic (kips)	5.2			
Length of wall (ft)	21.75	Full	Height	
v_wind (p/f)**	211	Foundation	Wall	
v_siesmic (p/l)**	239			
h (ft)	8			
OTF_Wind (lbs)*	1692			
OTF_Seismic (lbs)*	1913			
Length of shortest wall pier (ft)	4.75			
Apect Ratio Reduction for Seismic Loads	1.68			
Siesmic Penalty	1.0			
Shearwall	W4			
Holdown	H DU4			

*OTF does not take into account dead load and weight of the wall uno

**v_siesmic/wind includes penalty

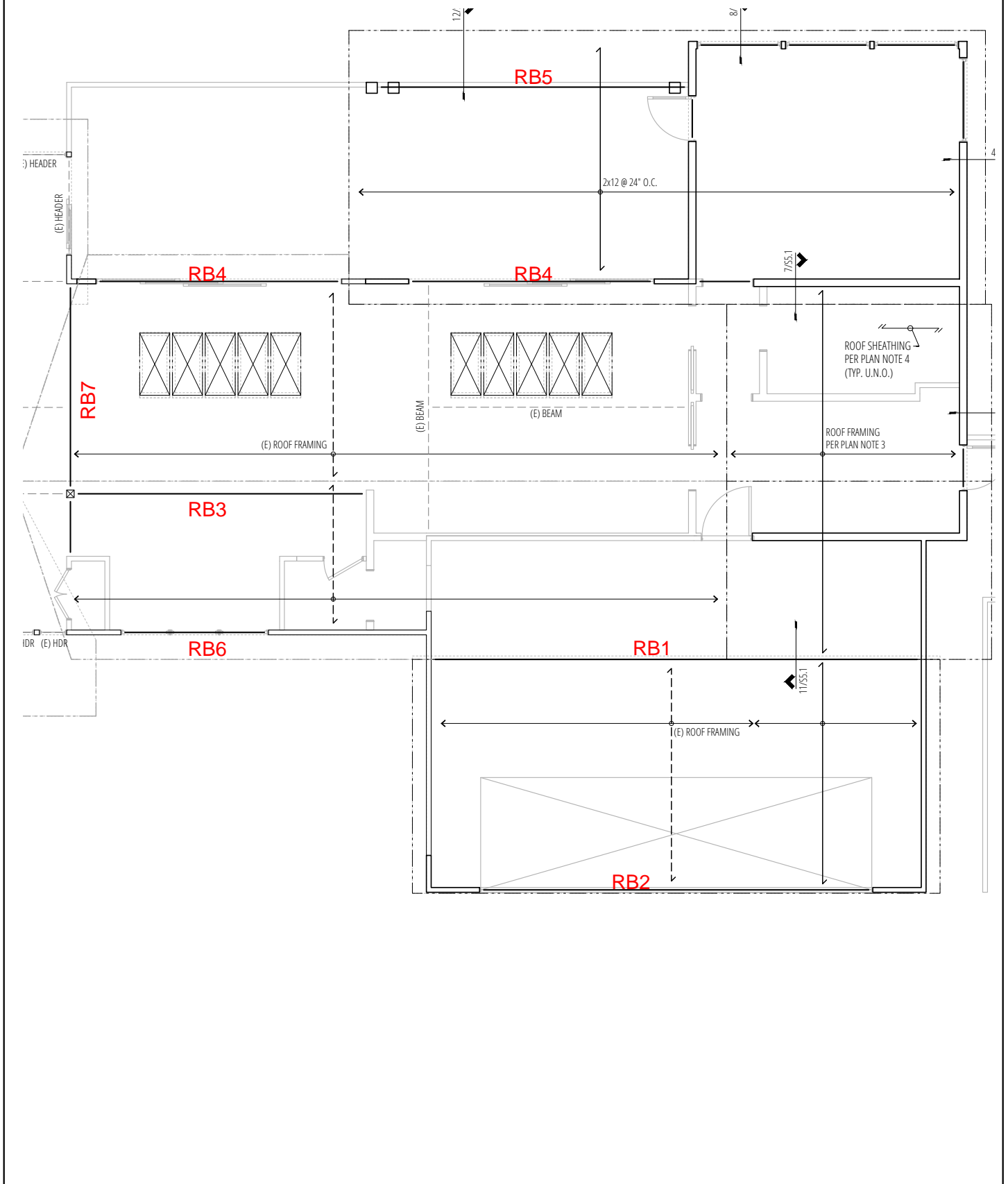
East/West Direction

Grid	A	C		
Vwind (kips)	Full	Height		
Vseismic (kips)	Foundation	Wall		
Length of wall (ft)				
v_wind (p/f)**				
v_siesmic (p/l)**				
h (ft)				
OTF_Wind (lbs)*				
OTF_Seismic (lbs)*				
Length of shortest wall pier (ft)				
Apect Ratio Reduction for Seismic Loads				
Siesmic Penalty				
Shearwall				
Holdown				

*OTF does not take into account dead load and weight of the wall uno

**v_siesmic/wind includes penalty

Roof Framing Key Plan



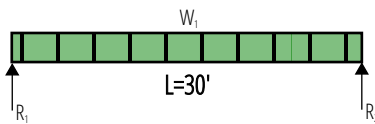
Alpay Residence

Roof Framing Design

$D_L = 20\text{psf}$, $S_L = 25\text{psf}$

RB1

W12x72



$$W_1 = (37/2)(45) + 72 = 905 \text{ plf}$$

$$R_1 = R_2 = 13,580^\#$$

$$M = 101.8 \text{ K-ft}$$

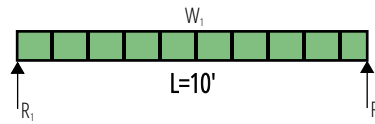
$$M_n/\Omega = 269.5 \text{ K-ft}$$

$$V_n/\Omega = 105.8 \text{ psi}$$

$$\Delta_{TL} = 0.95" = \ell/378$$

RB2

5.5X18 GLB



$$W_1 = (14/2)(45) = 315 \text{ plf}$$

$$R_1 = R_2 = 3780^\#$$

$$M = 22.68 \text{ K-ft}$$

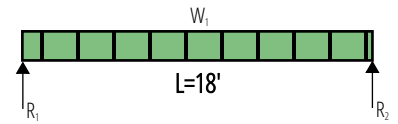
$$f_b = 916 \text{ psi}$$

$$f_v = 57 \text{ psi}$$

$$\Delta_{TL} = 0.49" = \ell/589$$

RB3

5.25x14 PSL



$$W_1 = (22/2)(45) = 495 \text{ plf}$$

$$R_1 = R_2 = 4455^\#$$

$$M = 20.05 \text{ K-ft}$$

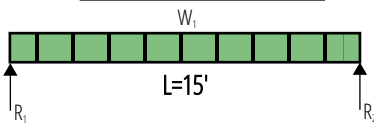
$$f_b = 1403 \text{ psi}$$

$$f_v = 91 \text{ psi}$$

$$\Delta_{TL} = 0.49" = \ell/444$$

RB4

5.25x11-7/8
PSL



$$W_1 = (27/2)(45) = 610 \text{ plf}$$

$$R_1 = R_2 = 4575^\#$$

$$M = 17.2 \text{ K-ft}$$

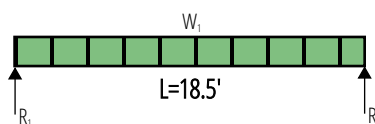
$$f_b = 1669 \text{ psi}$$

$$f_v = 110 \text{ psi}$$

$$\Delta_{TL} = 0.47" = \ell/380$$

RB5

5.5X15 GLB



$$W_1 = (15^2/2)/11.67 \times (45) = 435 \text{ plf}$$

$$R_1 = R_2 = 4024^\#$$

$$M = 18.61 \text{ K-ft}$$

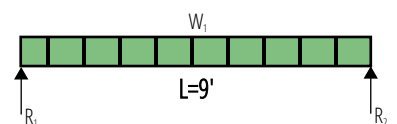
$$f_b = 1083 \text{ psi}$$

$$f_v = 73 \text{ psi}$$

$$\Delta_{TL} = 0.41" = \ell/539$$

RB6

(2)2x10



$$W_1 = (11^2/2)/9 \times (45) = 305 \text{ plf}$$

$$R_1 = R_2 = 1373^\#$$

$$M = 3.1 \text{ K-ft}$$

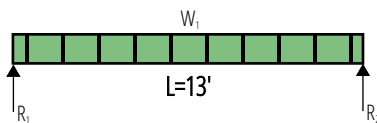
$$f_b = 866 \text{ psi}$$

$$f_v = 74 \text{ psi}$$

$$\Delta_{TL} = 0.14" = \ell/759$$

RB7

5.25x14 PSL



$$W_1 = (10/2)(45) = 225 \text{ plf}$$

$$R_1 = R_2 = 1463^\#$$

$$M = 4.8 \text{ K-ft}$$

$$f_b = 333 \text{ psi}$$

$$f_v = 30 \text{ psi}$$

$$\Delta_{TL} = 0.06" = \ell/2590$$

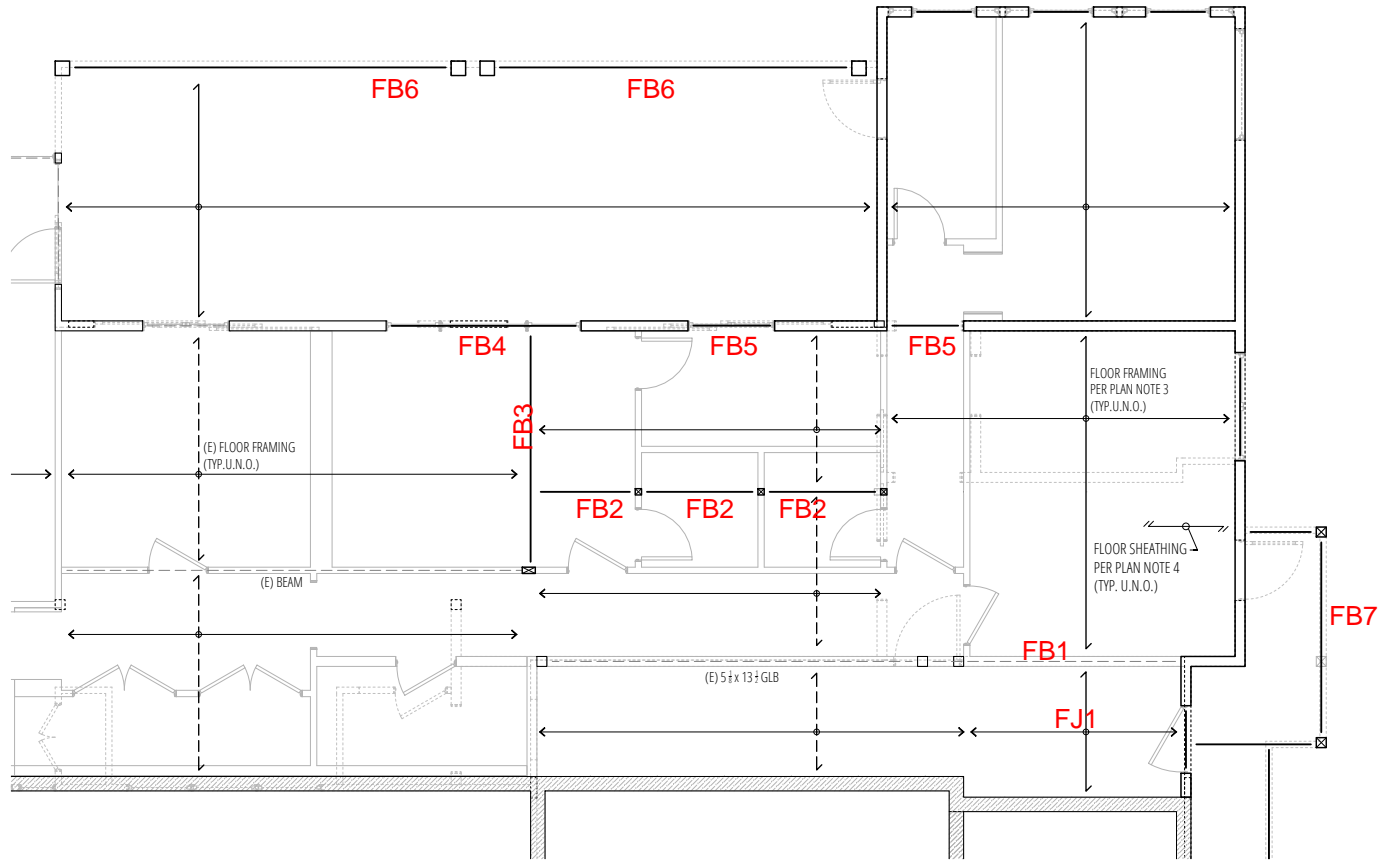
Alpay Residence

Alpay - Rafter

L =	14 ft 6 in	Lumber Type =	DF-L #2
w _{DL} =	20 psf	F _b =	900 psi
w _{LL} =	25 psf	F _v =	180 psi
Spacing =	24 in o.c.	E =	1,600,000 psi
Joist Size	2x12	C _D =	1
S =	31.64 in ³	C _r =	1.15
I =	177.98 in ⁴	C _F =	1
A =	16.88 in ²	incised	no
M =	2365 #-ft		
R1 = R2 =	653 #	E' =	1600000 psi
f _b =	897 psi	F _b ' =	1035 psi OK
f _v =	58.0 psi	F _v ' =	180 psi OK
Δ _{DL} =	0.140 in =	L/	1245
Δ _{LL} =	0.175 in =	L/	996
Δ _{TL} =	0.314 in =	L/	554

Alpay - Garage Rafter			
L =	15 ft 8 in	Lumber Type =	DF-L #2
w _{DL} =	20 psf	F _b =	900 psi
w _{LL} =	25 psf	F _v =	180 psi
Spacing =	16 in o.c.	E =	1,600,000 psi
Joist Size	2x12	C _D =	1
S =	31.64 in ³	C _r =	1.15
I =	177.98 in ⁴	C _F =	1
A =	16.88 in ²	incised	no
M =	1841 #-ft		
R1 = R2 =	470 #	E' =	1600000 psi
f _b =	698 psi	F _b ' =	1035 psi OK
f _v =	41.8 psi	F _v ' =	180 psi OK
Δ _{DL} =	0.127 in =	L/	1481
Δ _{LL} =	0.159 in =	L/	1185
Δ _{TL} =	0.286 in =	L/	658

Floor Framing Key Plan



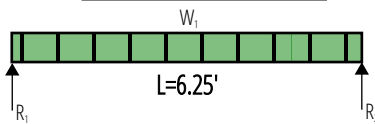
Alpay Residence

Upper Roof Framing Design

$D_L = 15\text{psf}$, $L_L = 40\text{psf}$, $LL_{@Deck} = 60\text{psf}$

FJ1

3.5x9.5 PSL @
16"o.c.



$$W_1 = (16/12)(50+40) = 120 \text{ plf}$$

$$R_1 = R_2 = 375^\#$$

$$M = 0.59 \text{ K-ft}$$

$$f_b = 134 \text{ psi}$$

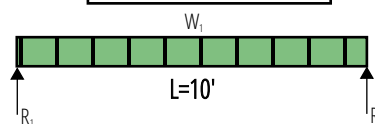
$$f_v = 17 \text{ psi}$$

$$\Delta_{TL} = 0.01" = \ell/9105$$

checked for
3000# wheel
load
($f_v = 113\text{psi}$)

FB1

3.5x11-7/8
PSL



$$W_1 = (15.5/2)(55) + 281 = 710 \text{ plf}$$

$$R_1 = R_2 = 3550^\#$$

$$M = 8.88 \text{ K-ft}$$

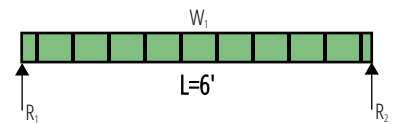
$$f_b = 1295 \text{ psi}$$

$$f_v = 128 \text{ psi}$$

$$\Delta_{TL} = 0.16" = \ell/734$$

FB2

4x10



$$W_1 = (15/2)(55) = 415 \text{ plf}$$

$$R_1 = R_2 = 1245^\#$$

$$M = 1868 \text{ K-ft}$$

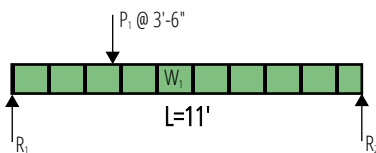
$$f_b = 449 \text{ psi}$$

$$f_v = 58 \text{ psi}$$

$$\Delta_{TL} = 0.03" = \ell/2197$$

FB3

5.25x9.5 PSL



$$W_1 = 100 \text{ plf}$$

$$P = 1245^\# \text{ (from FB2)}$$

$$R_1 = 1400 \text{ } R_2 = 946^\#$$

$$M = 4.28 \text{ K-ft}$$

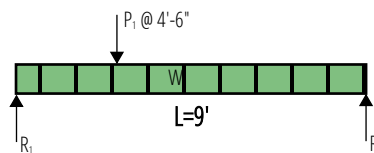
$$f_b = 651 \text{ psi}$$

$$f_v = 52 \text{ psi}$$

$$\Delta_{TL} = 0.11" = \ell/1200$$

FB4

5.25x14 PSL



$$W_1 = (12/2)(75) + (11/2)(55) = 755 \text{ plf}$$

$$P = 946^\# + 10,300^\# = 11250^\# \text{ (from FB2)}$$

$$R_1 = R_2 = 9020^\#$$

$$M = 33.0 \text{ K-ft}$$

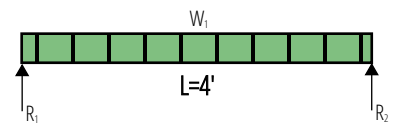
$$f_b = 2310 \text{ psi}$$

$$f_v = 184 \text{ psi}$$

$$\Delta_{TL} = 0.17" = \ell/635$$

FB5

(2)2x10



$$W_1 = (30/2)(55) = 825 \text{ plf}$$

$$R_1 = R_2 = 1650^\#$$

$$M = 1.65 \text{ K-ft}$$

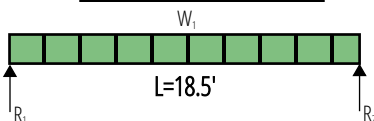
$$f_b = 463 \text{ psi}$$

$$f_v = 89 \text{ psi}$$

$$\Delta_{TL} = 0.02" = \ell/3198$$

FB6

P.T. 5.5x18
GLB



$$W_1 = (12/2)(75) = 450 \text{ plf}$$

$$R_1 = R_2 = 4163^\#$$

$$M = 19.25 \text{ K-ft}$$

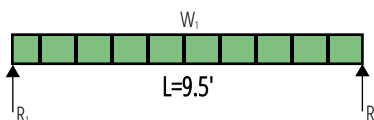
$$f_b = 778 \text{ psi}$$

$$f_v = 63 \text{ psi}$$

$$\Delta_{TL} = 0.25" = \ell/901$$

FB7

4x10



$$W_1 = (6/2)(75) = 225 \text{ plf}$$

$$R_1 = R_2 = 1069^\#$$

$$M = 2.54 \text{ K-ft}$$

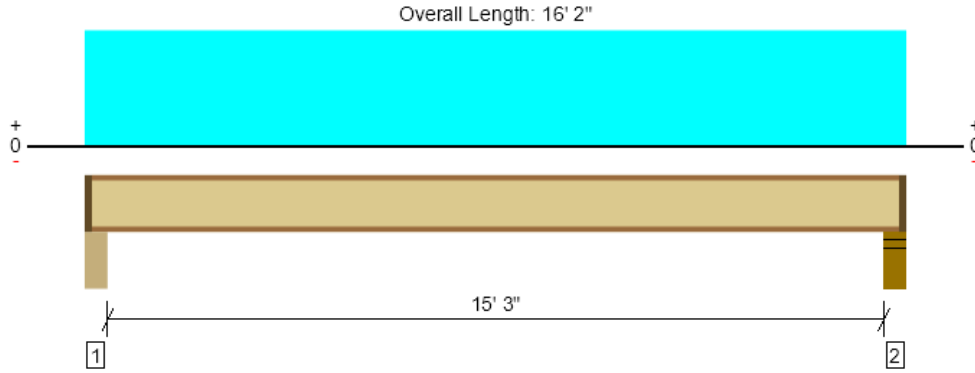
$$f_b = 610 \text{ psi}$$

$$f_v = 50 \text{ psi}$$

$$\Delta_{TL} = 0.11" = \ell/1021$$

Alpay Residence

Floor, Floor: Joist
1 piece(s) 11 7/8" TJI® 210 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	582 @ 4 1/2"	1460 (3.50")	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	559 @ 5 1/2"	1655	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2179 @ 8' 1"	3795	Passed (57%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.204 @ 8' 1"	0.385	Passed (L/909)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.280 @ 8' 1"	0.771	Passed (L/661)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	48	45	Passed	--	--

Member Length : 15' 10 1/2"
 System : Floor
 Member Type : Joist
 Building Use : Residential
 Building Code : IBC 2015
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories	Details
	Total	Available	Required	Dead	Floor Live	Factored		
1 - Beam - HF	5.50"	3.75"	1.75"	162	431	593	1 3/4" Rim Board	A3
2 - Stud wall - HF	5.50"	3.75"	1.75"	162	431	593	1 3/4" Rim Board	A3

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 11" o/c	
Bottom Edge (Lu)	15' 11" o/c	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 2"	16"	15.0	40.0	Default Load

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

ForteWEB Software Operator	Job Notes
Daniel Buker Buker Engineering, llc (206) 258-6333 daniel@bukerengineering.com	



Alpay - Deck Joist			
L =	12 ft 0 in	Lumber Type =	DF-L #2
w _{DL} =	15 psf	F _b =	900 psi
w _{LL}	60 psf	F _v =	180 psi
Spacing =	12 in o.c.	E =	1,600,000 psi
Joist Size	2x10	C _D =	1
S =	21.39 in ³	C _r =	1.15
I =	98.93 in ⁴	C _F =	1.1
A =	13.88 in ²	incised	yes
M =	1350 #-ft		
R1 = R2 =	450 #	E' =	1520000 psi
f _b =	757 psi	F _b ' =	911 psi OK
f _v =	48.6 psi	F _v ' =	144 psi OK
Δ _{DL} =	0.047 in =	L/	3094
Δ _{LL} =	0.186 in =	L/	774
Δ _{TL} =	0.233 in =	L/	619

Bedroom Pin Pile Supported Slab

Model Summary

Model Dimensions: X: 16 ft Y: 0 ft Z: 0 ft Object Counts: Nodes: 3 Spring Supports: 0 Members: 1 Cables: 0 Areas: 0 Plates: 0 Auto-Meshed Areas: 0 Auto-Meshed Plates: 0 Foundations: 0 Nonlinear Features: One-Way Spring Supports: 0 One-Way Members: 0

Member Loads, Uniform

Member	Service Case	Direction	Magnitude	Full Length?	Start Offset ft	End Offset ft	Projected?	Predefined Load
BmX003	D	Force Y	-0.1000 K/ft	Yes	0.0000	16.0000	No	N.A.
BmX003	L1	Force Y	-0.0400 K/ft	Yes	0.0000	16.0000	No	N.A.
BmX003	L2	Force Y	-0.0400 K/ft	No	0.0000	8.0000	No	N.A.
BmX003	L3	Force Y	-0.0400 K/ft	No	8.0000	16.0000	No	N.A.

Materials

Name	Elasticity, E Ksi	Poisson, ν	Density, γ K/in ³	Thermal, α in/in/deg-F	Shear Modulus, G Ksi
Concrete (F _c = 2.5 ksi)	3122.0000	0.1700	0.0001	7.2200E-06	1334.1880

Nodes

Name	X ft	Y ft	Z ft	Support	Mass K	Scissor	Used By
N001	0.0000	0.0000	0.0000	DX DY DZ RX	0.0000	No	BmX003
N002	8.0000	0.0000	0.0000	DY DZ	0.0000	No	-NA-
N003	16.0000	0.0000	0.0000	DY DZ	0.0000	No	BmX003

Nodal Supports

Name	Fix DX	Fix DY	Fix DZ	Fix RX	Fix RY	Fix RZ
N001	Yes	Yes	Yes	Yes	No	No
N002	No	Yes	Yes	No	No	No
N003	No	Yes	Yes	No	No	No

Member Analysis Properties

Name	Member Section	X1 ft	Y1 ft	Z1 ft	X2 ft	Y2 ft	Z2 ft	Elasticity, E Ksi	A in ²	Iz in ⁴	Iy in ⁴	Releases	Action
BmX003	Rectangle 8 x 12	0.0000	0.0000	0.0000	16.0000	0.0000	0.0000	3122.0000	96.0000	1152.0000	512.0000	(none)	Normal

Member: BmX003

1. Member Properties Length: 16 ft Shape: Rectangle 8 x 12 Material: Concrete (F _c = 2.5 ksi) Weight: 1.5999 K Framing: Beam	2. Connections Start: N001 @ (0, 0, 0 ft) - Other End: N003 @ (16, 0, 0 ft) - Other	3. Applied Loads Unif.: (D) Force Y -0.1 K/ft (L1) Force Y -0.04 K/ft (L2) Force Y -0.04 K/ft (L3) Force Y -0.04 K/ft
4. Extreme Forces Axial: 0 K (1) My: -1.753 K-ft (6) -> 2.6879 K-ft (6) Mz: 0 K-ft (7) -> 0 K-ft (6) Vy: 0 K (7) -> 0 K (6) Vz: -1.7491 K (7) -> 1.808 K (6) Torsion: 0 K-ft (1)	5. Extreme Deflections (all cases) Total Dy: 0 in (6) -> 0 in (3) Total Dz: -0.00071 in (3) -> 0.00985 in (6) Beam Dy: 0 in (11) -> 0 in (6) Beam Dz: 0 in (2) -> 0 in (6)	

Member Design Checks:BmX003

Type	Unity Check	Status	Demand	Capacity	Result Case	Code Reference
Flexure Check	0.3489	Pass	2.6879 K-ft	7.7029 K-ft	2. 1.2D+1.6L+0.5Lr(#1)	22.3
Minimum Steel	0.4331	Pass	0.17324 in ²	0.4 in ²	2. 1.2D+1.6L+0.5Lr(#1)	9.6.1.3
Shear Check	0.5522	Pass	1.808 K	3.2738 K	2. 1.2D+1.6L+0.5Lr(#1)	22.5

Result Case Legend

(1) D	(10) 3. 1.2D+1.6Lr+L(#2)
(3) L2	(4) L3
(5) 1. 1.4D	(6) 2. 1.2D+1.6L+0.5Lr(#1)
(7) 2. 1.2D+1.6L+0.5Lr(#2)	(8) 2. 1.2D+1.6L+0.5Lr
(9) 3. 1.2D+1.6Lr+L(#1)	
(11) 3. 1.2D+1.6Lr+L	(12) 3. 1.2D+1.6Lr+0.5W
(13) 5. 0.9D+W	(2) L1

Concrete_Beam X_G 1: Results

Deflections - Strong (dy) Limit Type: None	Deflections - Weak (dz) Limit Type: None	Concrete Material: Concrete (F _c = 2.5 ksi) Specification: ACI 318-19 High Seismic?: False Member Type: Beam Overstrength?: False Live Load Reduction: None Disable Checks?: False Check Level: Each Limit State
Size Constraints Limit Depth?: True Min Depth: 8 in Max Depth: 8 in Limit Width?: True Min Width: 12 in Max Width: 12 in	Beam Details Beam Spacing: 1 ft Start Column Width: 0 in End Column Width: 0 in Shear @ d from start?: True Shear @ d from end?: True Use Metric Bars?: False	Reinforcement Top Bars: TL: -None-, TC: 2-#4, TR: -None- Bottom Bars: BC: 2-#4, B: -None- Side Bars: -None- Fy: 60 Ksi Stirrup Info: #3-Open, 40 Ksi, Legs = 2 Stirrup Spacing: L: -None-, C: -None-, R: -None- Top Cover: 1.5 in Bottom Cover: 3 in Side Cover: 1.5 in

Concrete_Beam X_G 1: Flexure Check

(extreme rows: max)

Member	Section	Offset ft	Result Case	Demand M K-ft	Capacity Mn K-ft	Code Reference	Unity Check	Details
BmX003	Rectangle 8 x 12	8.0000	2. 1.2D+1.6L+0.5Lr(#1)	2.6879	7.7029	22.3	0.3489	Bar Set: 2-#4, As Prov. = 0.4 in ² , As Reqd = 0.12993 in ² , d = 4.75 in, beff = 12 in, φ = 0.9, Span Region: Center, Tension at: Bottom

Concrete Beam X_G 1: Minimum Steel

(extreme rows: max)

Member	Section	Offset ft	Result Case	As min in ²	As in ²	Code Reference	Unity Check	Details
BmX003	Rectangle 8 x 12	8.0000	2. 1.2D+1.6L+0.5Lr(#1)	0.1732	0.4000	9.6.1.3	0.4331	Bar Set: 2-#4, d = 4.75 in, beff = 12 in, Mu = 2.6879 K-ft, Tension at: Bottom

Concrete Beam X_G 1: Shear Check

(extreme rows: max)

Member	Section	Offset ft	Result Case	Demand V K	Capacity Vn K	Code Reference	Unity Check	Details
BmX003	Rectangle 8 x 12	8.0000	2. 1.2D+1.6L+0.5Lr(#1)	1.8080	3.2738	22.5	0.5522	Ag = 96 in ² , Vc (22.5.5.1(c)) = 4.3651 K, Nu = 0 K, Vs (22.5.8.5) = 0 K, Av/s Prov. = 0 in, Av/s Min = 0.015 in, bw = 12 in, d = 4.75 in, b = 12 in, Av/s Req'd = 0 in, φ = 0.75, λs (22.5.5.1.3) = 1, ρw = 0.00702, Span Region: Center, Stirrups: None

