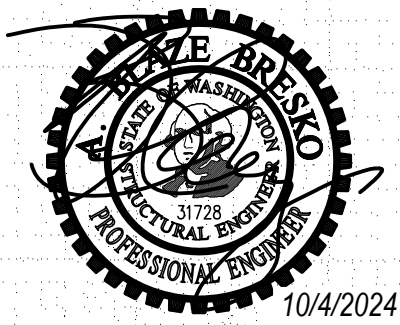

10/4/2024

Structural Calculations

For The

Jason Residence

4006 E Mercer Wy
Mercer Is, WA 98040

Architect

Sturman Architects

Contents:

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SSF STRUCTURAL ENGINEERING

Jason
PROJECT

10/4/2024
DATE
10315 - 2024 - 06
PROJ #
DESIGN
Cover
SHEET

Criteria Sheet

Codes

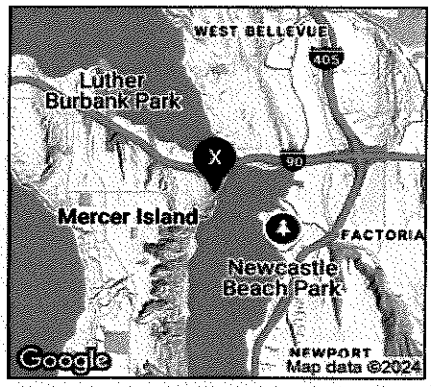
Structural	IBC 2021
Loading	ASCE 7-16
Wood:	NDS 2018 / SDPWS 2021
Steel:	AISC 360-16
Concrete:	ACI 318-19
Masonry:	TMS 402/602-16

Project Location

Street & Number	4006 E Mercer Way
City:	Mercer Island State: WA
ZIP:	98040
Latitude:	47.5743 N
Longitude:	-122.2041 W
Ground Elevation	42 ft

Occupancy Category

Risk Category: II ASCE 7 Table 1.5-1



Seismic Load Summary:

Analysis Procedure:	Equivalent Lateral Force Procedure		
Lateral System:	Light-frame (wood) Walls Sheathed with Wood Structural Panels Rated for Shear Resistance		
R:	6.50	C_d=	4
Base Shear V =	27 kips	Ω_o=	2.5
S_s=	1.4	S_1=	0.487
S_{DS}=	1.00	S_{D1}=	0.88
C_s=	0.154	I_E=	1.0

Story Information

# Stories Above Grade (Including Mezzanine Levels)	2

Horizontal and Vertical Irregularities:

Is the building a "Regular Structure"? (No horizontal or vertical irregularities)	Yes

Wind Load Summary:

V= 98 K_{zt}= 1.00

Exposure = C

Dead Loads:

Roof		Floor		Deck	
Roofing	2.5 psf	Finish Floor	1.0 psf	Add 9 psf for porcelain pavers	
1/2" Sheathing	1.8 psf	3/4" Sheathing	2.7 psf	Use	20 psf
Framing	2.5 psf	Joists @ 16" oc	2.5 psf	add'l seismic wt	
Misc./Mech.	1.0 psf	Misc./Mech.	1.0 psf		5 psf
Ceiling Finish	2.5 psf	Ceiling Finish	2.8	Total seismic wt	
Solar Panels (if appl)	5.0 psf		10.0 psf		25 psf
	15.3 psf	Use	10 psf		
Use	15 psf	Add'l Seismic Weight	10 psf		
Add'l Seismic Weight	5 psf	Seismic Weight	20 psf		
Seismic Weight	20 psf				

Live Loads:

Roof	20	psf
Floor	40	psf
Deck	60	psf

Snow Loading Criteria:

Ground Snow, p_g	25 psf	Flat Roof Snow Load, p_f	25.0 psf	Importance Factor, I_s	1.00
Exposure Factor, C_e	1.00	Sloped Roof Snow Load, p_s	25.0 psf		
Thermal Factor, C_t	1.00	Slope Factor, C_s	1.00		

Soils:

Allowable Bearing	2000 psf	Active	45/35	pcf (Restrained/Unrestrained)
Sliding, μ	0.35	Seismic Surcharge	8H	
Passive	250 pcf			

Soils Report Provided?	Yes
Site Specific Ground Motion Hazard Analysis Provided?	No

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SHEET CR. 1

Seismic Design

ASCE 7-16 Seismic Analysis | Equivalent Lateral Force Procedure | Apply Section 12.8.1.3 (Where Applicable)? Yes

Seismic Force Resisting System Per Table 12.2-1	System	Bearing Wall Systems
	Type:	Light-frame (wood) Walls Sheathed with Wood Structural Panels Rated for Shear Resistance

Seismic Design Cat.	D	
Risk Category	II	I, II, or III, or IV per Table 1.5-1
Site Class	D (Default)	Assumed default soil properties, per 11.4.3.
Diaphragm Flexibility	Flexible	

Section 12.8.1.3

1. Regular Structure	Yes
2. ≤ 5 Stories above grade	Yes
3. T ≤ 0.5s	Yes
4. ρ = 1.0	Yes
5. Not Site Class E or F	Yes
6. Risk Category I or II	Yes

If all items above are met, S_{DS} may be taken as 1.0, but not less than 0.7*(Calculated S_{DS})

S_S	1.4 g	2% in 50 yr, Latitude & Longitude lookup
S_1	0.487 g	2% in 50 yr, Latitude & Longitude lookup
R	6.50	
C_d	4.0	
Ω_o	2.5	
I_e	1.00	Table 1.5-2
h_n	23.0 ft	
Ct	0.02	Table 12.8-2
x	0.75	Table 12.8-2
T_a	0.21 sec	
T	0.21 sec	Eq. 12.8-7
T_0	0.18 sec	
T_S	0.88 sec	
T_L	6.00 sec	
F_a	1.20	Table 11.4-1
F_v	1.81	Table 11.4-2
S_{MS}	1.68 g	Eq. 11.4-1
S_{M1}	1.32 g	Eq. 11.4-2
S_{DS}	1.000 g	Eq. 11.4-3
S_{D1}	0.883 g	Eq. 11.4-4
C_s	***0.154 Controls***	Eq. 12.8-2
	0.647	Eq. 12.8-3 need not exceed, T < T_L
	0.010	Eq. 12.8-5 or 12.8-6 minimum
C_s, design	0.154	
Bldg. Weight	176.3 k	
V = C_sW	27.1 k	Eq. 12.8-1, Strength Level Base Shear
V = C_{sasd}W	19.0 k	Eq. 12.8-1 ASD Base Shear

Building Period Per Alternate Analysis

T (sec)	

Per Geotech Report

F_a	
F_v	

$$T_a = C_t h_n^x \quad \text{Eq. 12.8.7}$$

$$S_{MS} = F_a S_S \quad \text{Eq. 11.4-1}$$
$$S_{M1} = F_v S_1 \quad \text{Eq. 11.4-2}$$
$$S_{DS} = {}^2/_3\, S_{MS} \quad \text{Eq. 11.4-3}$$
$$S_{D1} = {}^2/_3\, S_{M1} \quad \text{Eq. 11.4-4}$$

$$C_S = \frac{S_{DS}}{(R/I_e)} \quad \text{Eq. 12.8-2}$$
$$C_S = \frac{S_{D1}}{T(R/I_e)} \quad \text{Eq. 12.8-3}$$
$$C_S = \frac{S_{D1} T_L}{T^2(R/I_e)} \quad \text{Eq. 12.8-4}$$
$$C_S \geq 0.044 S_{DS} I_e \quad \text{Eq. 12.8-5}$$
$$C_S \geq 0.01 \quad \text{Eq. 12.8-5}$$

$$C_{VX} = w_x h_x^k / \sum_{i=1}^{n} w_x h_i^k \quad \text{Eq. 12.8-12}$$

$$F_{px} = {}^{\sum_{i=x}^{n} F_i}/_{\sum_{i=x}^{n} w_i}\, w_{px} \quad \text{Eq. 12.10-1}$$
$$F_{px} \geq 0.2 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-2}$$
$$F_{px} \leq 0.4 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-3}$$

Vertical Distribution ASD ρ= 1 k= 1.000

Level	h_x (ft)	W_x (k)	h_x^k (ft)	$W_x h_x^k$	Story Shear ASD C_{vx} (%)	Story Shear ASD F_x (k)	Story Shear ASD SV (k)	Diaphragm Force (ρ not included) $F_{px,calc}$	$F_{px,min}$	$F_{px,max}$	$F_{px,design}$	$\gamma = F_{px}/F_x$
Roof	23.0	83.0	23.0	1909	0.650	12.3	**12.3**	12.3	11.6	23.2	**12.3**	1.00
Upper floor	11.0	93.3	11.0	1026	0.350	6.6	**19.0**	10.0	13.1	26.1	**13.1**	1.97
Σ		176.3		2935		**19.0**						

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Wind Design - MWFRS

ASCE 7 Chapter 27 - Directional Procedure

Design Method	ASD

Wind Coefficients

Exposure	C	
V=	98	mph
K_d=	0.85	Table 26.6-1
K_h=	0.95	Table 27.3-1
K_e=	1.00	Table 26.9-1
G=	0.85	26.9.4

Location and Building Dimensions

Calculate Kzt?	Yes	
Kzt	1.00	
Roof Type	Monoslope	
Roof Slope - Transverse Dir	0	degrees
Roof Slope - Long Dir	0	degrees
Ground to top of roof	26	ft
Bot of roof to top of roof	1	ft
Mean Roof Height, h	25.5	ft
Short Plan Dimension	52	ft
Long Plan Dimension	80	ft
Parapet ?	No	
Ground to top of parapet		ft
Average Parapet Height		ft

Transverse Wind Pressures

L/B = 0.65 h/L = 0.49

Pressure Coefficients from Figure 27.4-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.50
Windward Roof	-0.9 / -0.18
Leeward Roof	-0.49

Velocity Pressure at Mean Roof Height, q_h =	19.8	psf

Wall Pressures (Unfactored): ASD

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lwwalls}$	P_{walls} (psf)
0-15	0.85	17.74	12.06	8.42	**12.3**
15-20	0.9	18.78	12.77	8.42	**12.7**
20-25	0.94	19.61	13.34	8.42	**13.1**
25-30	0.98	20.45	13.91	8.42	**13.4**
30-40	1.04	21.70	14.76	8.42	**13.9**
41-50	1.09	22.74	15.47	8.42	**14.3**
51-60	1.13	23.58	16.03	8.42	**14.7**
61-70	1.17	24.41	16.60	8.42	**15.0**
71-80	1.21	25.25	17.17	8.42	**15.4**
81-90	1.24	25.87	17.59	8.42	**15.6**
91-100	1.26	26.29	17.88	8.42	**15.8**

Roof Pressures (Unfactored) ASD

Windward		Leeward	Horiz Proj (psf)
Max	Min		
-3.0	-15.2	-8.3	**4.80**

Longitudinal Wind Pressures

L/B = 1.54 h/L = 0.32

Pressure Coefficients from Figure 27.4-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.39
Windward Roof	-0.9 / -0.18
Leeward Roof	-0.49

Wall Pressures (Unfactored): ASD

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lwwalls}$	P_{walls} (psf)
0-15	0.85	17.74	12.06	6.60	**11.20**
15-20	0.9	18.78	12.77	6.60	**11.63**
20-25	0.94	19.61	13.34	6.60	**11.97**
25-30	0.98	20.45	13.91	6.60	**12.31**
30-40	1.04	21.70	14.76	6.60	**12.82**
41-50	1.09	22.74	15.47	6.60	**13.24**
51-60	1.13	23.58	16.03	6.60	**13.58**
61-70	1.17	24.41	16.60	6.60	**13.92**
71-80	1.21	25.25	17.17	6.60	**14.26**
81-90	1.24	25.87	17.59	6.60	**14.52**
91-100	1.26	26.29	17.88	6.60	**14.69**

Roof Pressures (Unfactored) ASD

Windward		Leeward	Horiz Proj (psf)
Max	Min		
-3.0	-15.2	-8.2	**4.80**

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Jason Residence

Wind Criteria

DATE 10/4/2024

PROJ. #

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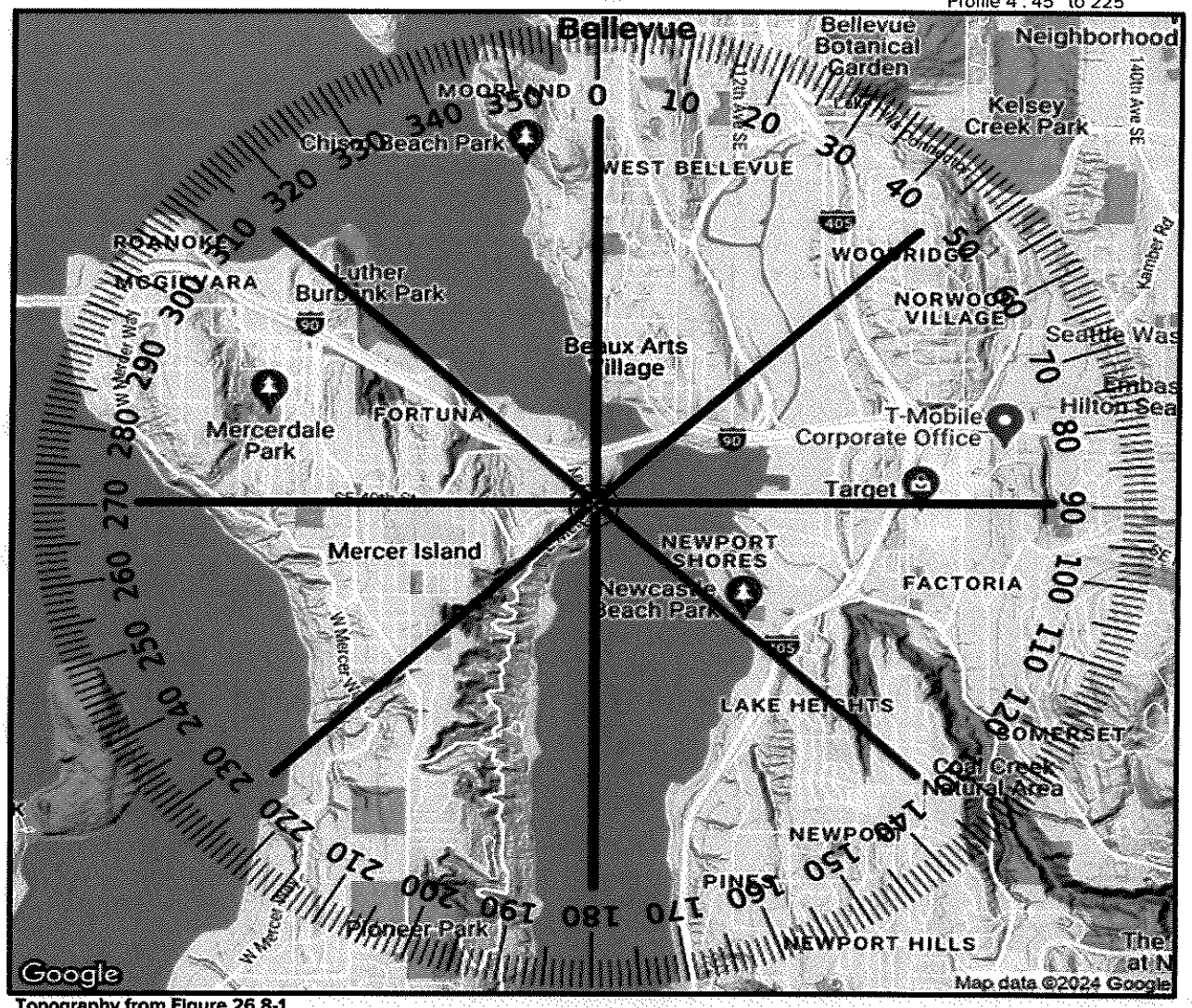
SHEET CR. 3

Site Address

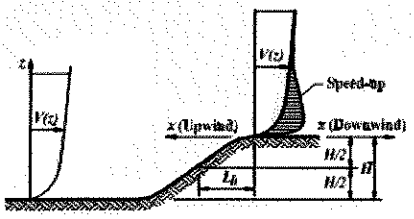
Address	4006 E Mercer Wy			Wind Radius	2.00 Miles
City:	Mercer Is	State:	WA	Angle	0 °
Lat Long	47.57433	-122.2041		Exposure	C

Profile 1 : 0 ° to 180 °
Profile 2 : 270 ° to 90 °
Profile 3 : 315 ° to 135 °
Profile 4 : 45 ° to 225 °

SITE MAP



Topography from Figure 26.8-1



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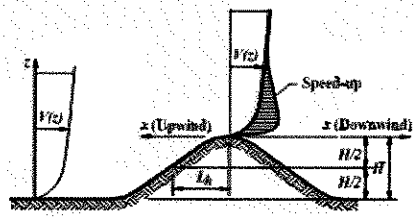

2-D RIDGE OR 3-D AXISYMMETRICAL HILL

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$
$$K_1 = \text{Per Figure}$$
$$K_2 = (1 - |x|/\mu L_h)$$
$$K_3 = e^{-\gamma z / L_h}$$
$$K_{zt} = 1, \text{ If } H/Lh \le 0.2$$

PER FIGURE 26.8-1

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Jason Residence
Kzt Calculations

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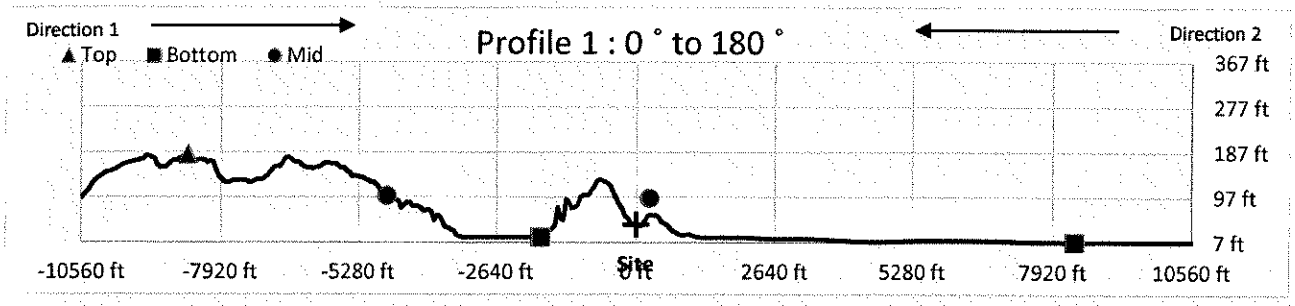
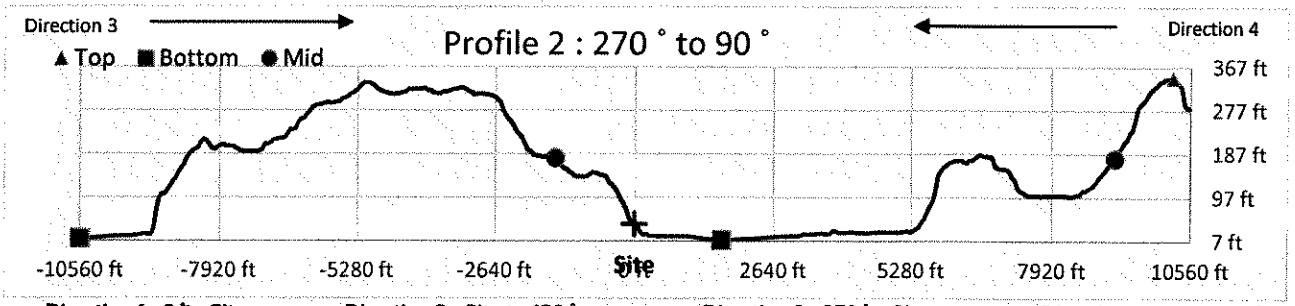
SHEET CR. 4





Direction 1 - 0 °to Site

Site Conditions (26.8.1)

1. Unobstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	-8544
Bott. of Hill Dist.	-1804
L @ H/2	-4723
Site	downwnd
Top of Hill Elev.	182
Bott. of Hill Elev.	16
Site Elev.	41.6
Site Dist.	0
H/2	99

Kzt Calculations

H=	165
Lh=	3821
x=	8544
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.06
K2=	0.00
k3=	0.98
H/Lh =	0.04
Kzt =	1.00

Direction 2 - Site to 180 °

Site Conditions (26.8.1)

1. Unobstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	-8544
Bott. of Hill Dist.	8331
L @ H/2	265
Site	upwind
Top of Hill Elev.	182
Bott. of Hill Elev.	7
Site Elev.	41.6
Site Dist.	0
H/2	94

Kzt Calculations

H=	175
Lh=	8809
x=	8544
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.03
K2=	0.35
k3=	0.99
H/Lh =	0.02
Kzt =	1.00

Direction 3 - 270 °to Site

Site Conditions (26.8.1)

1. Unobstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	10242
Bott. of Hill Dist.	-10560
L @ H/2	-1486
Site	upwind
Top of Hill Elev.	344
Bott. of Hill Elev.	11
Site Elev.	41.6
Site Dist.	0
H/2	177

Kzt Calculations

H=	333
Lh=	11728
x=	10242
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.04
K2=	0.42
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

Direction 4 - Site to 90 °

Site Conditions (26.8.1)

1. Unobstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	Yes	
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	10242
Bott. of Hill Dist.	1645
L @ H/2	9127
Site	downwnd
Top of Hill Elev.	344
Bott. of Hill Elev.	8
Site Elev.	41.6
Site Dist.	0
H/2	176

Kzt Calculations

H=	336
Lh=	1115
x=	10242
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.44
K2=	0.00
k3=	0.93
H/Lh =	0.30
Kzt =	1.00

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Kzt Calculations

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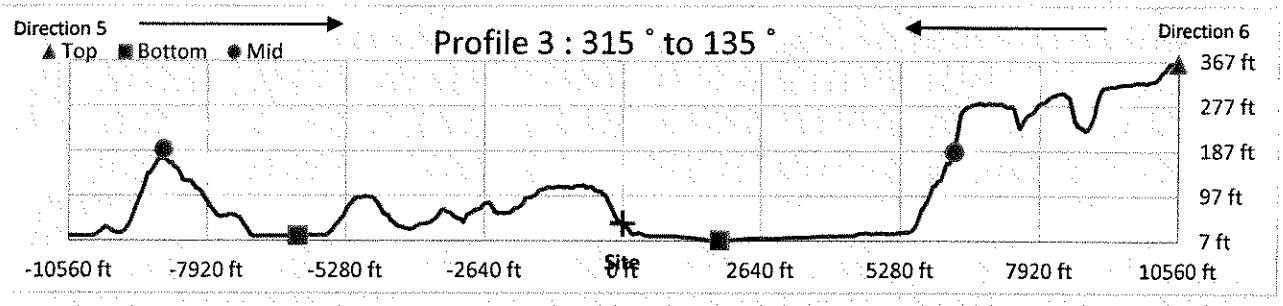
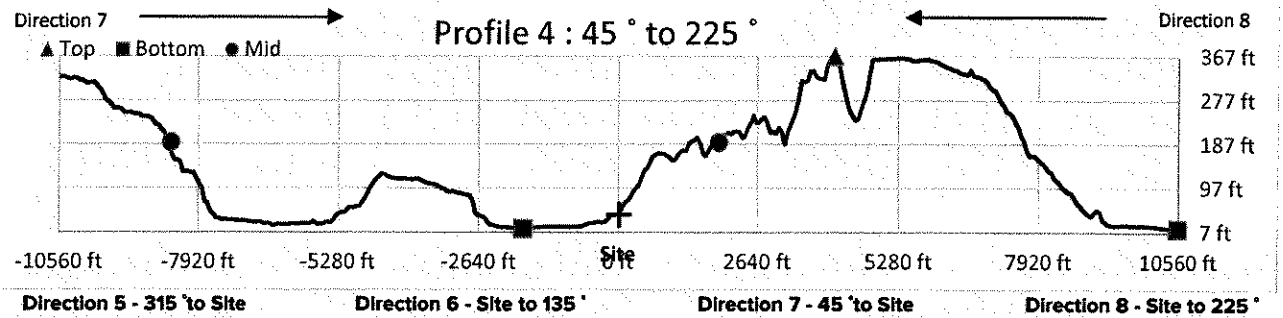
SHEET CR. 5





Direction 5 - 315 ° to Site

Site Conditions (26.8.1)

1. Unubstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	10560
Bott. of Hill Dist.	-6156
L @ H/2	-8756
Site	upwind
Top of Hill Elev.	362
Bott. of Hill Elev.	16
Site Elev.	41.6
Site Dist.	0
H/2	189

Kzt Calculations

H=	346
Lh=	19316
x=	10560
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.03
K2=	0.64
k3=	1.00
H/Lh =	0.02
Kzt =	1.00

Direction 6 - Site to 135 °

Site Conditions (26.8.1)

1. Unubstructed	Yes	
2. Isolated		
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	10560
Bott. of Hill Dist.	1857
L @ H/2	6315
Site	downwnd
Top of Hill Elev.	362
Bott. of Hill Elev.	7
Site Elev.	41.6
Site Dist.	0
H/2	185

Kzt Calculations

H=	355
Lh=	4245
x=	10560
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.12
K2=	0.00
k3=	0.98
H/Lh =	0.08
Kzt =	1.00

Direction 7 - 45 ° to Site

Site Conditions (26.8.1)

1. Unubstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	4086
Bott. of Hill Dist.	-1804
L @ H/2	-8437
Site	upwind
Top of Hill Elev.	367
Bott. of Hill Elev.	13
Site Elev.	41.6
Site Dist.	0
H/2	190

Kzt Calculations

H=	353
Lh=	12523
x=	4086
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.04
K2=	0.78
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

Direction 8 - Site to 225 °

Site Conditions (26.8.1)

1. Unubstructed	Yes	
2. Isolated	Yes	
3. Upper Half Hill	No	Kzt=1
4. H/Lh ≥ 0.2	No	Kzt=1
5. H≥ 15'	Yes	

Terrain Data

Terrain	Ridge
Top of Hill Dist.	4086
Bott. of Hill Dist.	10560
L @ H/2	1910
Site	downwnd
Top of Hill Elev.	367
Bott. of Hill Elev.	13
Site Elev.	41.6
Site Dist.	0
H/2	190

Kzt Calculations

H=	353
Lh=	2176
x=	4086
z=	25.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.24
K2=	0.00
k3=	0.97
H/Lh =	0.16
Kzt =	1.00

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Kzt Calculations

DATE 10/4/2024

PROJ. #

DESIGN ENG

SHEET Ch. 6

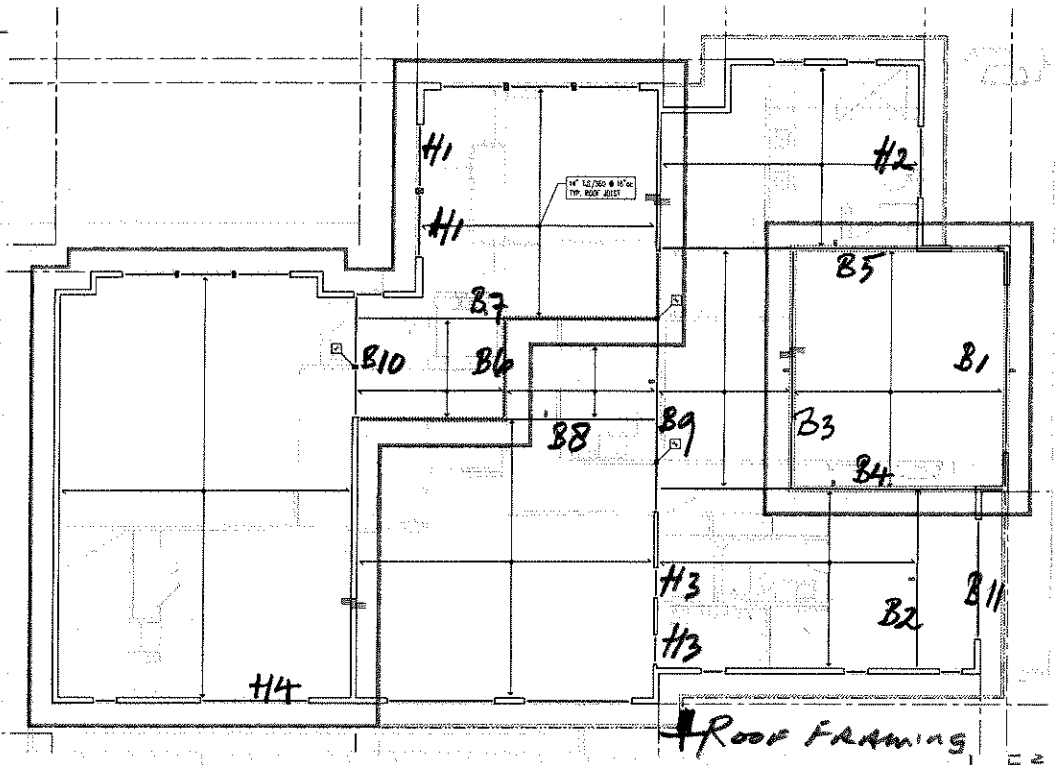
D = 15 psf
S = 25 psf

DEFL. CRITERIA.

$\Delta_{TL} \leq L/240$

$\Delta_{SNOW} \leq L/360$

(NO TJI PRORATING REQ'D)



ROOF FRAMING (14" JOISTS)

SEATTI TACOM

SWENSON SAY FAGET

ssfengineers.com

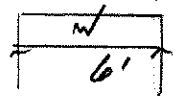
ROOF JOIST OPTIONS.

OPTION	L_{max} (clear span)	Δ_{TL} (in) L/–	Δ_{SNOW}	$M^{(k)}$	$M_{ALLOW.}^{(k)}$	$R^{(k)}$	$R_{ALLOW.}^{(k)}$
14" TJI-210 @24	22'-0"	0.89 L/299	0.56 L/479	4.91	5.17	0.89	1.16
14" TJI-360 @24	25'-6"	1.23 L/250	0.77 L/400	6.59	8.44	1.03	1.24
14" TJI-210 @16	26'-6"	1.24 L/257	0.78 L/411	4.74	5.17	0.91	1.16
14" TJI-360 @16	29'-0"	1.38 L/254	0.86 L/406	5.67	8.44	0.78	1.24

• H1 (typ all holes)

TRIB (INCL. O.H.) = 12.1'

w = 12.1 (40) = 485 plf



(2)2x8

Δ_{TL} = .09" = L/776

f_b = 1.0 ksi < F_b' = (1.15)(1.2)(0.85) = 1.17 ksi

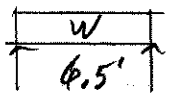
f_v = 80 psi

R = 1.46

• H2

TRIB = 13.1'

w = 13.1 (40) = 525 plf



4x8

Δ_{TL} = .12" = L/657

f_b = 1.09 ksi < F_b' = (1.15)(1.3)(0.90) = 1.35 ksi

f_v = 82 psi

R = 1.71

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PROJECT

10/4/2024
DATE

0315-2024-06
PROJ. # BNB

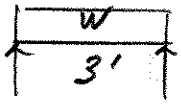
DESIGN

SHEET 1.

• H3

TRIB = 23.5'

W = 23.5(40) = 940 plf



(2) 2x8

Δ_{TL} = 0.01" = L/3203

f_b = .48 ksi

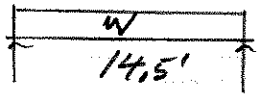
f_v = 58 psi

R = 1.41 k

• B1

TRIB = 11.1'

W = 11.1(40) = 445 plf



LSL 3½x14

Δ_{TL} = .36" = L/487 f_v = 83 psi

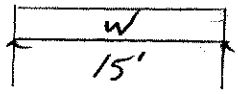
f_b = 1.22 ksi R = 3.23 k

Δ_S = .23" = L/773

• B2

TRIB = 13.5'

W = 13.5(40) = 540 plf



LSL 3½x14

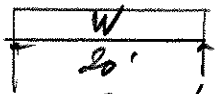
Δ_{TL} = .50" = L/363 f_v = 105 psi

Δ_S = .31" = L/596 R = 4.05 k

f_b = 1.59 ksi

• B3

TRIB = 14.5' W = 14.5(40) = 580 plf



PSL 5¼x14

Δ_{TL} = .87" = L/276 f_v = 105 psi

Δ_S = .54" = L/1441 R = 5.80 k

f_b = 2.03 ksi

• B4

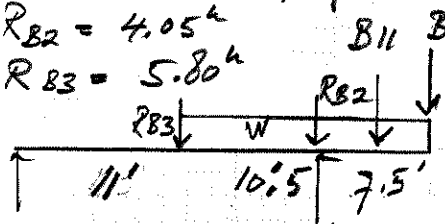
TRIB FROM ROOF ABV (DUE TO O.H.) = 4'

W = 4(40) = 160 plf + STUCCO WALL

= 180 plf

R_{B2} = 4.05 k

R_{B3} = 5.80 k



R_{B1} = 3.23 k

R_{B11} = 1.69 k

PSL 7x14

Δ_{TL} = 0.61" = 2L/295 E1 = 3200 E6 lbs-in²

Δ_S = 0.38" = 2L/473

f_b = 2.07 ksi R_1 = 1.79 k

f_v = 100 psi R_2 = 17.11 k

↙ OR W12x19

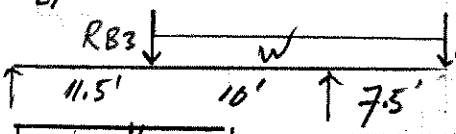
E1 = 3770 E6 lbs-in²

• B5

SEE B4.

W = 180 plf

R_{B1} = 3.23 k R_{B3} = 5.80 k



PSL 5¼x14

Δ_{TL} = 0.46" = L/560 f_v = 122 psi

Δ_S = 0.29" = L/897 R_1 = 2.05 k

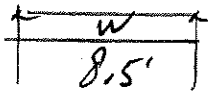
f_b = 2.10 ksi R_2 = 14.83 k

↙ 6x6 POST IN WALL

$f_{\perp}$ = 490 psi

• B6

TRIB = 13' W = 13(40) = 520 plf



LSL 1¾x14

Δ_{TL} = 0.10" = L/1035 f_v = 98 psi

f_b = 0.99 ksi R = 2.21 k

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PROJECT JASON

DATE 10/4/2024

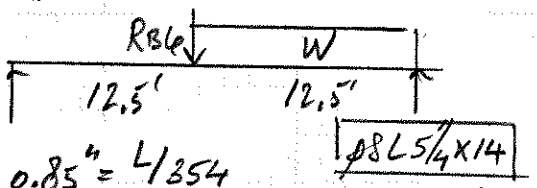
PROJ. # BNB

DESIGN

SHEET 2

• B7 & B8

W = 180 plf
R_{B6} = 2.21k



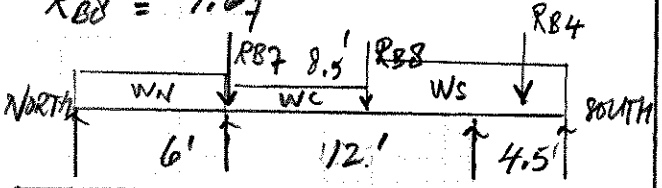
LSL5¼x14

Δ_{TL} = 0.85" = L/354
f_b = 1.46 ksi
f_v = 53 psi
Δ_{SNOW} = .53" = L/565
R = 1.67k
R_2 = 2.79k

• B9

TRIB NORTH = 14.5' W = 600 plf
" CENTER = 12' W = 480 "
" SOUTH = 18' W = 720 "

R_{B7} = 2.79k R_{B4} = 5.31k
R_{B8} = 1.67k



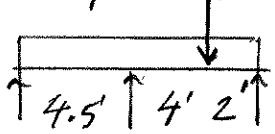
LSL3½x14

Δ_{TL} = 0.106"
Δ_S =
f_b = 0.98 ksi
f_v = 195 psi

R_1 = 0.85k
R_2 = 8.93k →
R_3 = 11.55k → PSL 3½x7 COL.
R_4 = 2.22k
f_c = 471 psi

• B10

TRIB = 19' W = 760 plf
R_{B7} = 1.67k

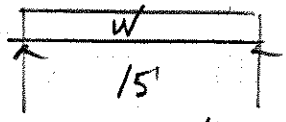


LSL1¾x14

R_1 = 0.91k
R_2 = 6.00k
R_3 = 2.81k
Δ_{TL} = 0.02"
f_b = 0.85 ksi
f_v = 211 psi

• B11

TRIB = 5.6' W = 225 plf

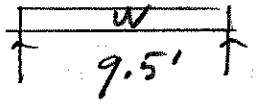


LSL1¾x14

Δ_{TL} = .41" = L/435
Δ_{LL} = .26"
f_b = 1.33 ksi
f_v = 87 psi
R = 1.69k

• #4.

TRIB Roof ~ 4'-0"
W = 4(40) = 160 plf



(2) 2x8

Δ_{TL} = .19" = L/592
Δ_S = .12"
f_b = .82 ksi
f_v = 46 psi
R = 0.96k

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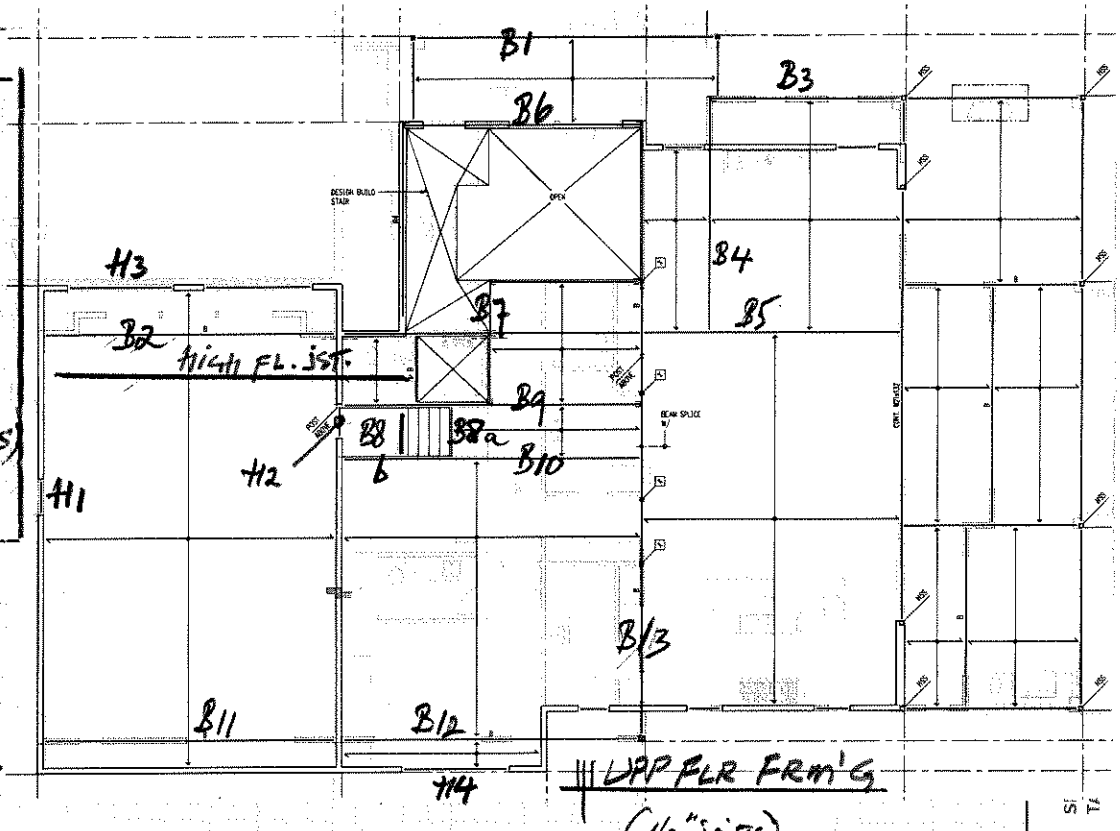
PROJECT Jason Residence
DATE 10/4/2024
PROJ # BNB
DESIGN
SHEET 3.

Floor
D = 10 psf
L = 40 psf

Deck
D = 20 psf
(incl. 10 for pavers)
L = 60 psf

DEFL. CRITERIA
$\Delta_{TL} = L/240$
$\Delta_{LL} = L/480$
min TJI PRO RATING = 40

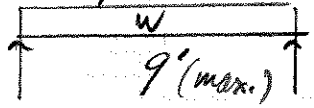


FLOOR joist options

option	L_{max} (clear span)	Δ_{TL} in	L/-	Δ_{LL} in	L/-	M (k')	$M_{ALL.}$ (k')	R (k)	$R_{ALL.}$ (k)	PRO
16" TJI-210 @ 16	22'-0"	0.57	466	0.46	583	4.10	5.14	0.74	1.01	40
16" TJI-230 @ 16	22'-6"	0.57	473	0.46	592	4.28	5.71	0.76	1.06	40
16" TJI-360 @ 16	23'-3"	0.56	504	0.45	630	4.57	8.41	0.79	1.08	40
16" TJI-560 @ 16	25'-3"	0.53	576	0.42	719	5.38	12.93	0.85	1.27	40

ROOF AT NORTH

D = 15 psf
S = 25 psf
W = 40 psf



2x6 @ 24" o/c

$\Delta_{TL} = 0.35" = L/304$
$\Delta_S = 0.22" = L/486$
$f_v = 59$ psi
$R = 0.36^k$
$f_b = 1.29$ ksi < $F_b' = 1.15(1.15)(1.3)(0.85) = 1.46$ ksi
(C_r, C_D, C_F)

DECK joists AT NORTH-EAST

DECK

9 psf PAVERS ON PEDESTALS	10 psf
WATERPROOFING/INSULATION	3 "
3/4" PLYWOOD	2.5 "
JOISTS	2.5 "
T&G CEILING	2.0 "
+	
D =	20 psf

jason

10/4/2024

PROJECT

DATE

PROJ. # BNB

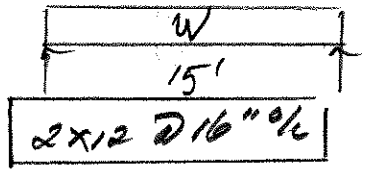
DESIGN 4.

SHEET

STRUCTURAL ENGINEERING

DECK JOIST (CONT'D)

$w = 80$ psf.



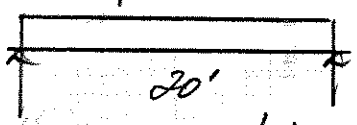
$\Delta_{TL} = .43" = L/421$ — $f_b = 1.13$ ksi
$\Delta_{LL} = .32" = L/562$ — $f_v = 62$ psi
$R = 0.80^k$

$F_b' = 1.15(1.0) = 1.15$ ksi
(C_r ↑ DF #1)

DECK BEAMS (SEE KEYPLAN)

• B1

$D = 135$ plf
$L = 375$ "
$\} w = 510$ plf

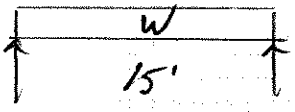


GL 5½x18

$\Delta_{TL} = .38" = L/629$ — $f_v = 79$ psi
$f_b = 1.03$ ksi — $R = 5.1^k$

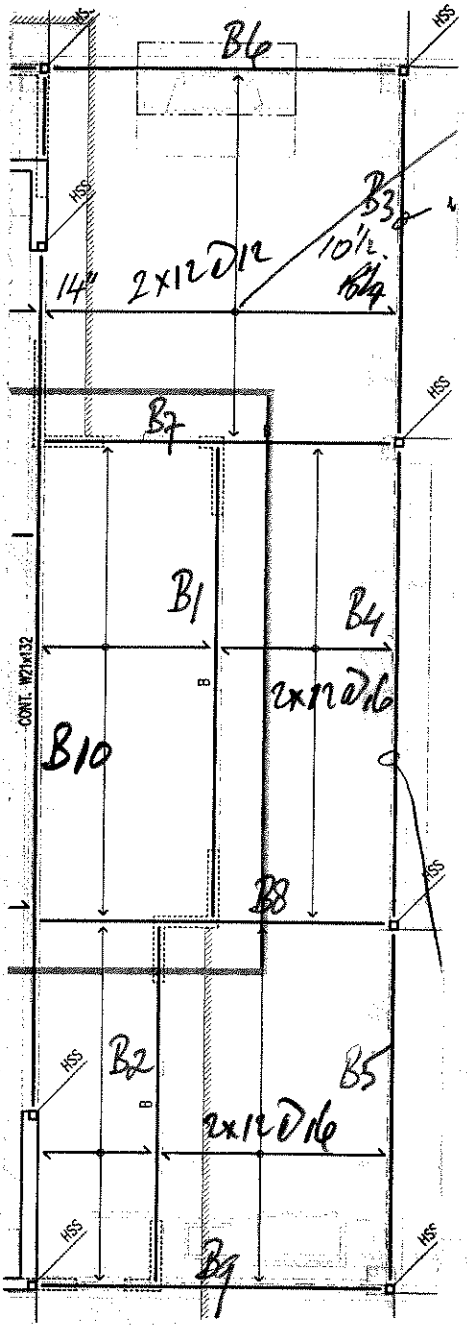
• B2

$D = 125$ plf
$L = 400$ "
$\} w = 525$ plf



SEE B1
GL 5½x18 SUFF

$R = 3.9^k$



DECK BEAMS (1/8"=1'-0")
KEY PLAN.

NOTE:
ALL ROOF LOADS RESOLVED AT ROOF LEVEL VIA CANTILEVER BEAMS.
→ UPPFL & DECK LOADING ONLY + SELF WT OF WALLS ABV.

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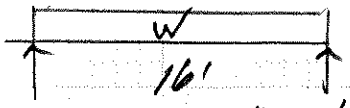
PROJECT JASON
DATE 10/4/2024
PROJ # BNB
DESIGN
SHEET 5.

• B3

D = 7.5(20) = 150 plf
L = 7.5(60) = 450 "
plus Beam 25 "
W = 625 "

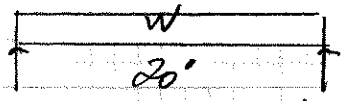


GL 6¾ x 12

Δ_{TL} = 0.52" = L/364
Δ_{LL} = 0.35" = L/544
f_b = 1.48 ksi
f_v = 79 psi
R = 5.0 k

• B4

D = 3.75(20) + 25 = 100 plf
L = 3.75(60) = 225 "
W = 325 "



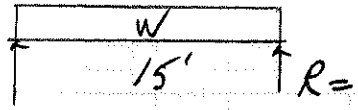
GL 6¾ x 12

Δ_{TL} = 0.67" = L/358
Δ_{LL} = 0.50" = L/478
f_b = 1.20 ksi
f_v = 54 psi
R = 3.25 k

• B5

D = 125 plf
L = 200 "
W = 325 plf

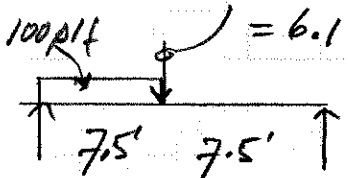
SEE B3 → GL 6¾ x 12 SUFF.



R = 2.45 k

• B7

From B1: R = 5.1 + 1.0 (WALL x BW) = 6.1 k

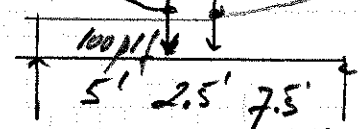


GL 5½ x 18 → 12

Δ_{TL} = 0.45" = L/394
Δ_{LL} = 0.33" = L/533
f_b = 2.25 ksi
f_v = 72 psi
R_1 = 3.6 k
R_2 = 3.2 k

• B8

From B1: 6.1 k
" B2: 4.6 k

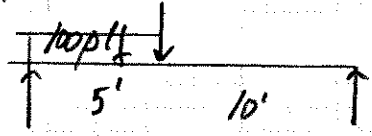


GL 8¾ x 18 → 12

Δ_{TL} = 0.35" = L/514
f_b = 2.0 ksi
f_v = 88 psi
R_1 = 6.3 k
R_2 = 4.7 k

• B9

From B2: 4.6 k



SUFF.
GL 5½ x 18 → 12
SEE B7

R_1 = 3.48 k
R_2 = 1.61 k

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B10

- BETW. C.5 & D: D = 11(10) + 7.5(20) = 260 plf
  L = 11(40) + 7.5(60) = 890
  FROM ROOF D = 13(15) + 100 = 295
  S = 13(25) = 325
  } W1

- BETW D & F: D = 11(10) + 3.75(20) = 185
  L = 11(40) + 3.75(60) = 665
  } W2

- BETW F & F.5: D = 11(10) + 2.5(20) = 160
  L = 11(40) + 25(60) = 590.
  } W3

D + .75(L+S)

W21X132

Δ_{TL} = .66" = L/654

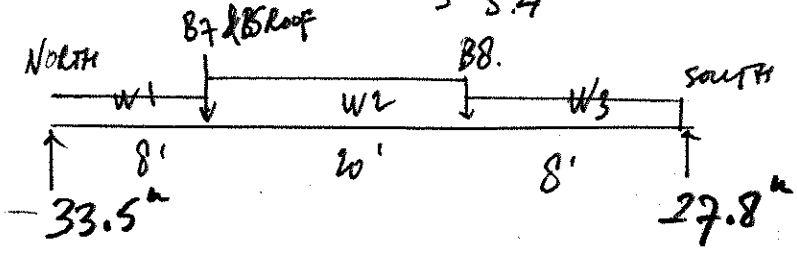
Δ_{LL} = .38"

f_s = 10.1 ksi

- FROM B7: D = 2.8
  L = 1.9
  S = 1.4

- FROM B8: D 5.8
  L 3.9
  S 5.4

- FROM B8 (ROOF) D = 3.6
  S = 6.0



SWENSON SAY FAGET

STRUCTURAL ENGINEERING

PROJECT JASON

DATE 10/4/2024

PROJ # BNB

DESIGN

SHEET 7

• H1

TRIB Roof = 14.5'

D = 14.5(15) + 100 = 320 plf

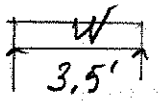
S = 14.5(25) = 365 "

TRIB FLOOR = 12.5'

D = 12.5(10) = 125 "

L = 12.5(40) = 500 "

D + 0.75(L+S) = 1100 " (W)



(2) 2x8

Δ_{TL} = .02"

f_b = .77 ksi

f_v = 87 psi

R = 1.93 k

• H2

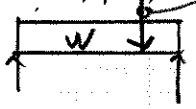
TRIB FLOOR = 15'

D = 15(10) = 150 plf

L = 15(40) = 600 "

ADD 2.5(10) = 25 " FOR OVERFR.

W = 775 plf { P Roof D = 2.25 k, S = 3.75 k



• H3

TRIB LOW Roof = 4.5'

D = 4.5(15) = 70 plf

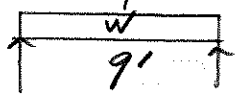
S = 4.5(25) = 115 "

TRIB FROM WALL ABV. ~ ½ x WALL LOAD

D = 0.5(100 + 4(15)) = 80 plf

S = 0.5(4(25)) = 50 "

ΣD+S = 70 + 80 + 115 + 50 = 315 plf (W)



Δ_{TL} = .26" = L/413

f_b = 1.25 ksi

f_v = 73 psi

R = 1.42 k

4x8

F_b' = 1.15(1.3)(0.9) = 1.35 ksi

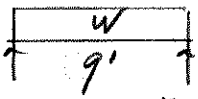
• H4

TRIB LOW Roof = 4'

D = 4(15) = 60 plf

S = 4(25) = 100 "

W = 160 "



(2) 2x8

Δ_{TL} = .15" = L/700

f_b = 0.74 ksi

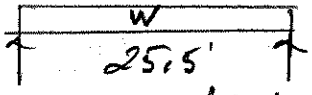
f_v = 43 psi

R = .72 k

• B1

TRIB LOW Roof = 4.5'

W = 4.5(40) = 180 plf



GL 5½ x 13½

Δ_{TL} = .84" = L/362

Δ_S = 0.52" = L/580

f_b = 1.05 ksi

f_v = 42 psi

R = 2.30 k

• B2

TRIB LOW Roof ~ 2'

D = 2(15) = 30 plf

S = 2(25) = 50 "

FROM WALL ABV (SEE H3) D = 80 plf, S = 50 "

TRIB FLOOR ~ 2' + 8/12 = 2.67'

D = 2.67(10) = 30 "

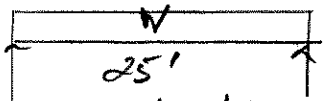
L = 2.67(40) = 110 "

ΣD = 140 plf

ΣL = 110 "

ΣS = 100 "

D + .75(L+S) = 300 plf (W)



PSL 5¼ x 16

Δ_{TL} = .74" = L/407

f_b = 1.25 ksi

f_v = 60 psi

R = 3.75 k

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SHEET 8

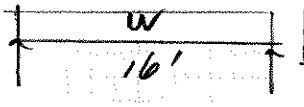
• B3

TRIB TIGHT ROOF ~ 4'

D = 4(15) + 100 (WALL) = 160 plf

S = 4(25) = 100 "

W = 260 "



LSL 1¾ x 16

Δ_{TL} = .41" = L/463

f_b = 1.34 ksi

f_v = 93 psi

R = 2.1 k

(D = 1.28 k
S = 0.8 k)

• B4

- AT "BRICK SPAN", TRIB FLOOR = 11'

D = 11(10) = 110 plf

L = 11(40) = 440 "

- AT OVERHANG, TRIB FLOOR = 8'

D = 8(10) = 80 plf

L = 8(40) = 320 "

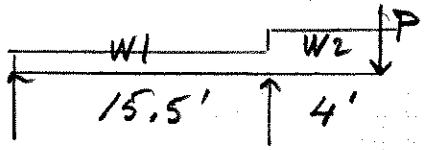
TRIB TIGHT ROOF = 10'

D = 10(15) + 100(WALL) = 250 plf

S = 10(25) = 250 "

FROM B3 D = 1.28 k

S = 0.8 k



W1 : D = 110 plf

L = 440 "

W2 : D = 330 "

L = 320 "

S = 250 "

P : D = 1.28 k

S = 0.8 k

LSL 3½ x 16

f_b = 1.10 ksi (D + 0.75(L+S))

f_v = 136 psi " "

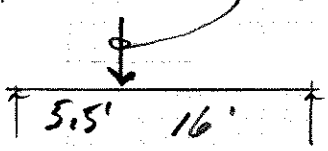
$\Delta_{TL,FIELD}$ = 0.25" = L/744 (D+L)

$\Delta_{TL,O.H.}$ = 0.24" = 2L/400 (D+S)

R (k)	R_1	R_2
D	0.48	4.17
L	3.24	4.85
S	0.33	2.13

• B5

FROM B4 R_{max} = 0.48 + 3.24 = 3.72 k



LSL 3½ x 16

Δ_{TL} = .50" = L/512

Δ_{LL} = 0.40" = L/645

f_b = 1.22 ksi

f_v = 74 psi

R_1 = 2.77 k

R_2 = 0.95 k

• B6

TRIB LOW ROOF = 3.5'

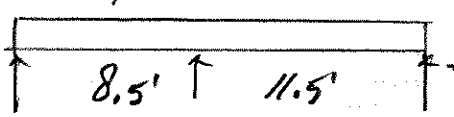
D = 3.5(15) = 55 plf

S = 3.5(25) = 90 "

TRIB TIGHT ROOF ≅ 4' D = 160 plf

S = 100 "

ΣW = 405 plf



PSL 7 x 16

f_b = 0.22 ksi

f_v = 30 psi

R_1 = 1.09 k

R_2 = 5.16 k

R_3 = 1.86 k

WIND, ASD 20 psf

TRIB = 12' 0.6W = 12(20) = 240 plf

PSL 16x7

•7Δ = .166" = L/362

f_{by} = 1.10 ksi

f_{vy} = 30 psi

R_y = 2.4 k

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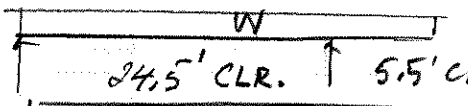
SHEET 9

• HIGH FLOOR JOISTS. (psf)

W: D=10 L=40

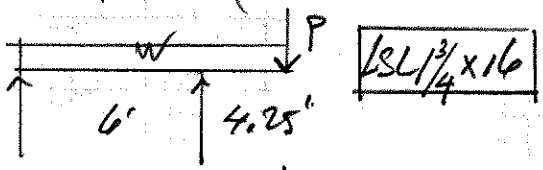


16" TJI-560 @ 16" o/c | EI = 1752E6 in²-lbs.

Δ_{TL} = .47" = L/629
Δ_{LL} = 0.39" = L/769
M = 5.02 k' < $M_{ALL.}$ = 12.9 k'
R = 1.25k < $R_{ALL.}$ = 1.73k
PRO = 42 > 40
$\Delta_{TL,NEG}$ = -0.26" = 2L/551
$\Delta_{LL,NEG}$ = -0.21" = 2L/692

• B7

TRIB FLOOR = 6.5' w = 6.5(50) = 325plf
TRIB STAIR = ~200#
P = 200(50) = 1000 lbs.

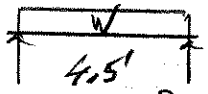


LSL 1¾x16

$\Delta_{TL,N}$ = 0.16" = 2L/624
$\Delta_{LL,N}$ = 0.13" = 2L/797
f_s = 1.15 ksi
f_v =
R_1 = -0.23k
R_2 = 4.55k

• B8a

TRIB FLOOR & STAIR = 10'
w = 10(50) = 500plf



R = 1125 lbs.

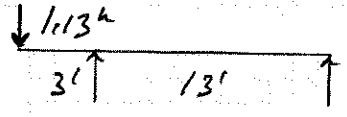
LSL 1¾x16 supp. by OBEAM

• B8b

TRIB Floor & STAIR = 5'
SEE B8a. R = 0.56k

• B9

From B7 (-0.23k) NEGLECT
" B8a 1.13k

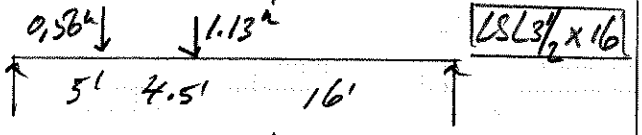


LSL 1¾x16

$\Delta_{N,TL}$ = .10" = 2L/711
f_b = 0.54 ksi
f_v = 61 psi
R_1 = 1.39k
R_2 = -0.26k

• B10

From B8a P = 1.13k
" B8b P = 0.56k



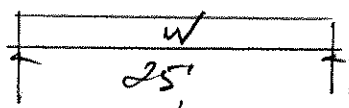
LSL 3½x16

Δ_{TL} = 0.44" = L/691
f_v = 25 psi
f_b = 1.72 ksi
R_1 = 0.95k
R_2 = 0.56k

• B11

TRIB from HIGH Roof ~ 4'
w = 4(15) + 100 + 4(25) = 260plf
TRIB LOW Roof ~ 1'
w =

40
ΣW = 300



PSL 5¼x16

Δ_{TL} = .73" = L/407
Δ_s = .46" = L/652
f_s = 1.25
f_v = 60 psi
R = 3.75k

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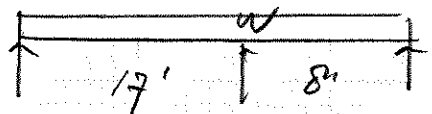
• B12



$f_s = 1.30$ ksi
$f_c = 141$ psi
$R_1 = 2.07^k$

L8L1¾x16

$R_2 = 5.25^k$
$R_3 = 0.18^k$

• B13

BETW GRIDS C & D:

W FLOOR D = 3(10) = 30 plf
L = 3(40) = 120 "

W ROOF D = 21(15)+100 = 415 plf
S = 21(25) = 525 "

FROM ROOF BEAM B5
D = 0.80^k
S = 1.35^k

FROM ROOF BEAM B9
D = 0.32^k
S = 0.53^k

BETW GRIDS D & E

W FLOOR = D = 9(10) = 90 plf
L = 9(40) = 360 "

FROM ROOF BEAMS

	D (k)	S (k)
B7	1.05	1.75
B9	3.35	5.58

BETW GRIDS E & F

W FLOOR D = 23.5(10) = 235 plf
L = 23.5(40) = 940 "

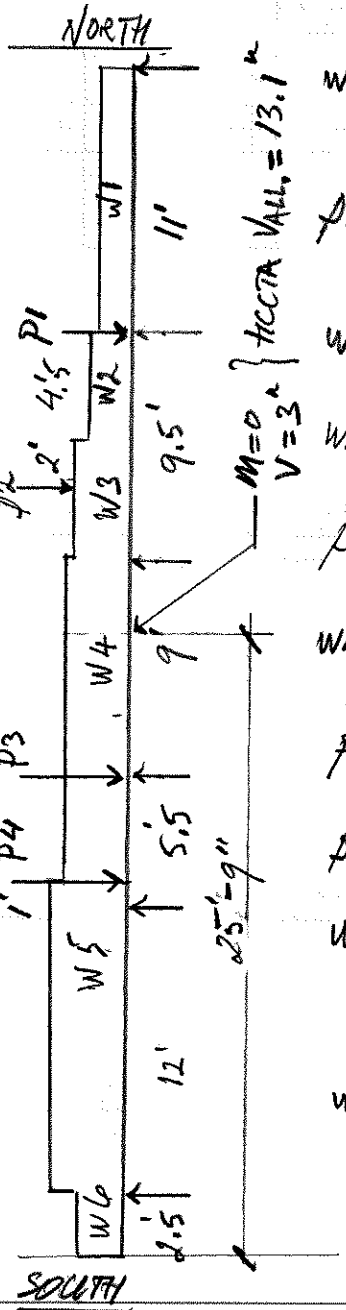
FROM ROOF BEAM B9: D = 4.33^k
S = 7.22^k

BETW GRIDS F & G.

W FLOOR: D = 235 plf
L = 940 "

W ROOF: D = 23.5(15)+100 = 450 plf
S = 23.5(25) = 590 "

FROM ROOF BEAM B9: D = 0.83^k
S = 1.39^k



W1 D = 445 plf
L = 120 "
S = 525 "

P1: D = 1.22^k
S = 1.88^k

W2: D = 90 plf
L = 360 "

W3: D = 170 "
L = 680 "

P2: D = 4.40^k
S = 7.33^k

W4: D = 235 plf
L = 940 "

P3: D = 4.33^k
S = 7.22^k

P4: D = 0.83^k
S = 1.39^k

W5: D = 685 plf
L = 940 "
S = 590 "

W6: D = 325 plf
L = 160 "
S = 315 "

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SHEET 11

D + 0.75(L+S) controls

LSL 3½ x 16

$f_b = 1.93$ ksi

$V_{max} = 12.92 - (16/12)(0.685 + 0.75(.94 + .59))$

$= 10.47^k$

$f_v = \frac{1.5(10.47)}{3.5(16)} = 280$ psi

$f_v' = 1.15(310) = 357$ psi

$\Delta_{TL} = 0.25'' = L/576$

$\Delta_{(L+S).75} = 0.16'' = L/900$

R	R_{max} (k)	LOAD COMB	COL.
R_1	11.0	D+.75(L+S)	4x6
R_2	22.5	"	4x12
R_3	10.8	"	4x10
R_4	16.1	"	6x6
R_5	13.1	"	6x6.
R_6	3.2	D+S	(2) studs.

- BEARING STUDS in WALL.

$h_{STUD} = 10'-0'' - (3)(1.5'') = 9.63'$

2x4 DF #2 STUD $P_{ALL.} = 2150$ lbs.

- AT $R = 22.5^k$

$A_{min} = \frac{22.5}{.625} = 36 in^2$

$= 3.5 \times 11.25$

$= 39.4 in^2$

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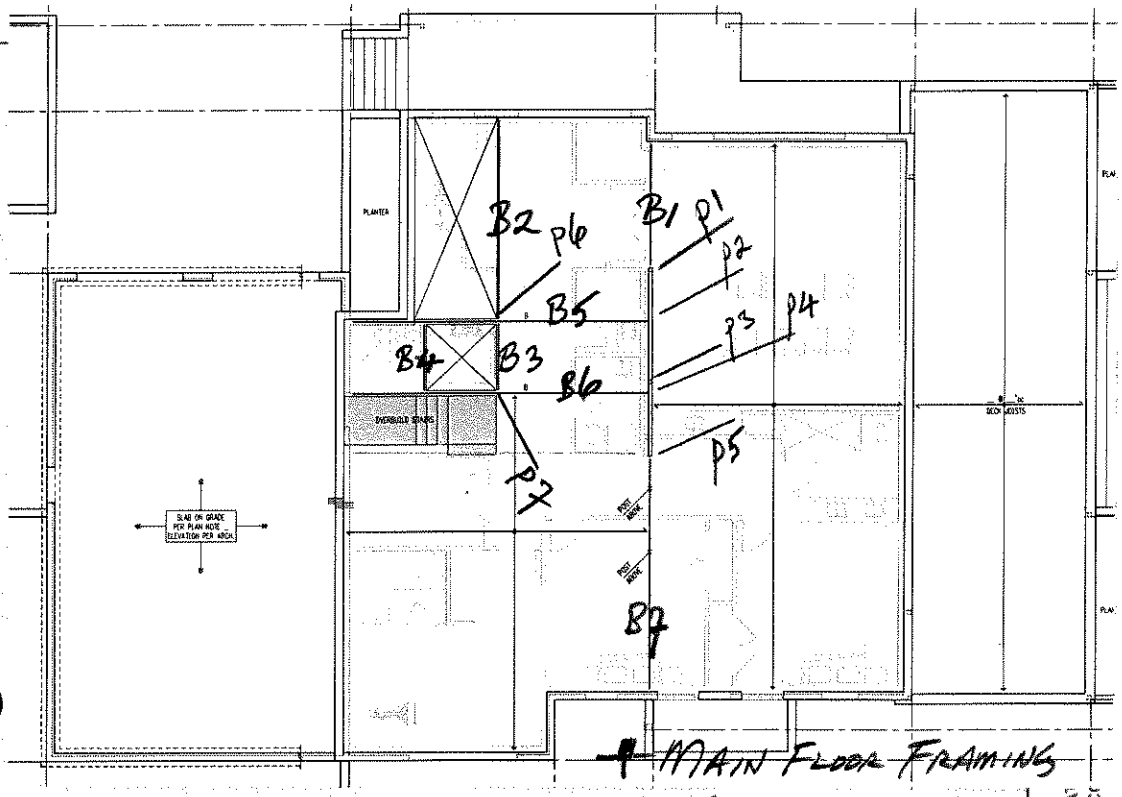
DESIGN

SHEET 12.

FLOOR
D = 10 psf
L = 40 psf

DECK
D = 20 psf
L = 60 psf

DEFL. CRITERIA
$\Delta_{TL} = L/240$
$\Delta_{LL} = L/480$
TJI-PRO = 40 (min.)



MAIN FLOOR FRAMING (16" JOISTS)

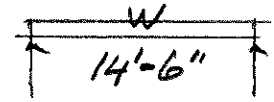
Floor joist options:

See upper fl. framing.

16" TJI-210 @ 16" $L_{CLR.max.}$ = 22'-0"
16" TJI-560 @ 16" " " = 25'-3"

Deck joist framing.

D = 20 psf
L = 60 "
w = 80 psf +

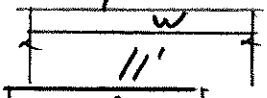


2x12 @ 16

Δ_{TL} = .39" = L/467 f_b = 1.06 ksi
Δ_{LL} = .28" = L/622 f_v = 60 psi
R = 0.77 k

• B1

w = 17(10+40) = 850 plf

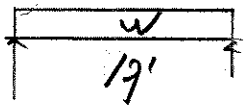


LSL 1¾x16

Δ_{TL} = .30" = L/436
Δ_{LL} = .24" = L/546
f_b = 2.07 ksi f_v = 90 psi
R = 4.7 k

• B2

TRIB FLOOR & STAIR = 10' w = 500 plf

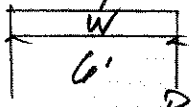


LSL 3½x16

Δ_{TL} = .51" = L/402 f_b = 1.45 ksi
Δ_{LL} = .41" = L/503 f_v = 96 psi
R = 4.45 k

• B3

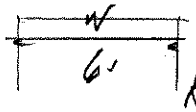
TRIB FLOOR = 6.5' w = 325 plf



LSL 1¾x16 suff. by obsv'n.

• B4

TRIB FLOOR = 3.5' w = 3.5(20+40) = 210 plf



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13
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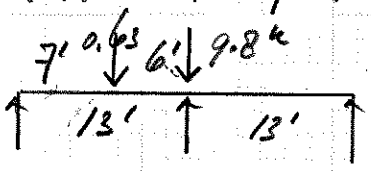
• B5

FROM BEAMS.

	D (k)	L (k)	P (k)
B2	0.85	3.40	4.25
B3	0.20	0.80	1.00
B4	0.13	0.50	0.63
POST ABV.	0.91	3.64	4.55



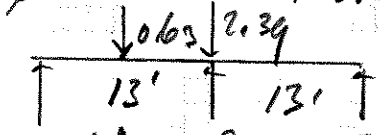
W14x82 — $f_b = 0.09$ ksi, $f_v = 7$ psi

$R_1 = 0.26^k$ $\quad R_3 = -0.06^k$

$R_2 = 0.43 + 9.8 = 10.22^k$

• B6

FROM BEAMS.	D (k)	L (k)	P (k)
B3	0.20	0.80	1.00
B4	0.13	0.50	0.63
POST ABV.	0.28	1.11	1.39



• B7

TRIB FLOOR = 23.5'

$D = 23.5(10) = 235$ plf
$L = 23.5(40) = 940$ "
} W

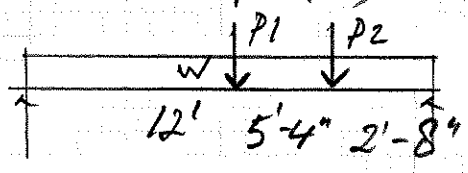
POST ABV. (BEAM B13)	D (k)	L (k)	S (k)
P1 4x12	8.51	10.86	7.73
P2 4x10	3.81	4.73	4.63

ΣLL ON BEAM = 20'(0.940) + 10.86 + 4.73 = 34.4k

$A_{LL,TRIB} = \frac{34.4}{0.040} = 860$ sf

$L/L_o = 0.25 + \frac{15}{\sqrt{k_L A_T}}$ $\quad (k_L = 2)$

$= 0.25 + \frac{15}{\sqrt{2(860)}} = 0.61$



W: D = 235 plf
L = 0.61 (940) = 575 plf

P1: D = 8.51k
L = 0.61 (10.86) = 6.62k
S = 7.73k

P2: D = 3.81k
L = 0.61 (4.73) = 2.89k
S = 4.63k

W14x82 $\quad$ D + 0.75(L+S) CONTROLS

$\Delta_{TL} = 0.35" = L/685$

$\Delta_{L+S} = 0.20" = L/1200$

$f_b = 14.0$ ksi

$R_1 = 16.5^k$

$R_2 = 27.2^k$

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STRUCTURAL ENGINEERING

PROJECT JASON

DATE 10/4/2024

PROJ. # 3NB

DESIGN

SHEET 14

POSTS.

• P1

FROM MAIN FL BEAM B1: 4.7"
FROM UPP FL BEAM B13: 13.1"
17.8" +

POST MWALL. 6x6 $f_\perp$ = 588 psi

• P2

FROM MAIN FL. BEAM B5: —
NEGLECTABLE.

• P3

FROM UPPER FL. BEAM B13: 16.1"
6x6 POST $f_\perp$ = 532 psi

• P4

FROM MAIN FL BEAM B6: —
NEGLECTABLE.

• P5

FROM MAIN FLOOR BEAM B7: 27.2".
HSS 4x4x1/4

• P6

" MAIN FL " B5: 10.22"
6x6 $f_\perp$ = 338 psi

• P7

FROM MAIN FL BEAM B6: 2.82"
4x6 $f_\perp$ = 146 psi

2x6 SHEARWALL

TRIB FLOOR = 23.5'
W = 23.5(10+40) = 1175 plf
2x6 @ 16 $f_\perp$ = 190 psi

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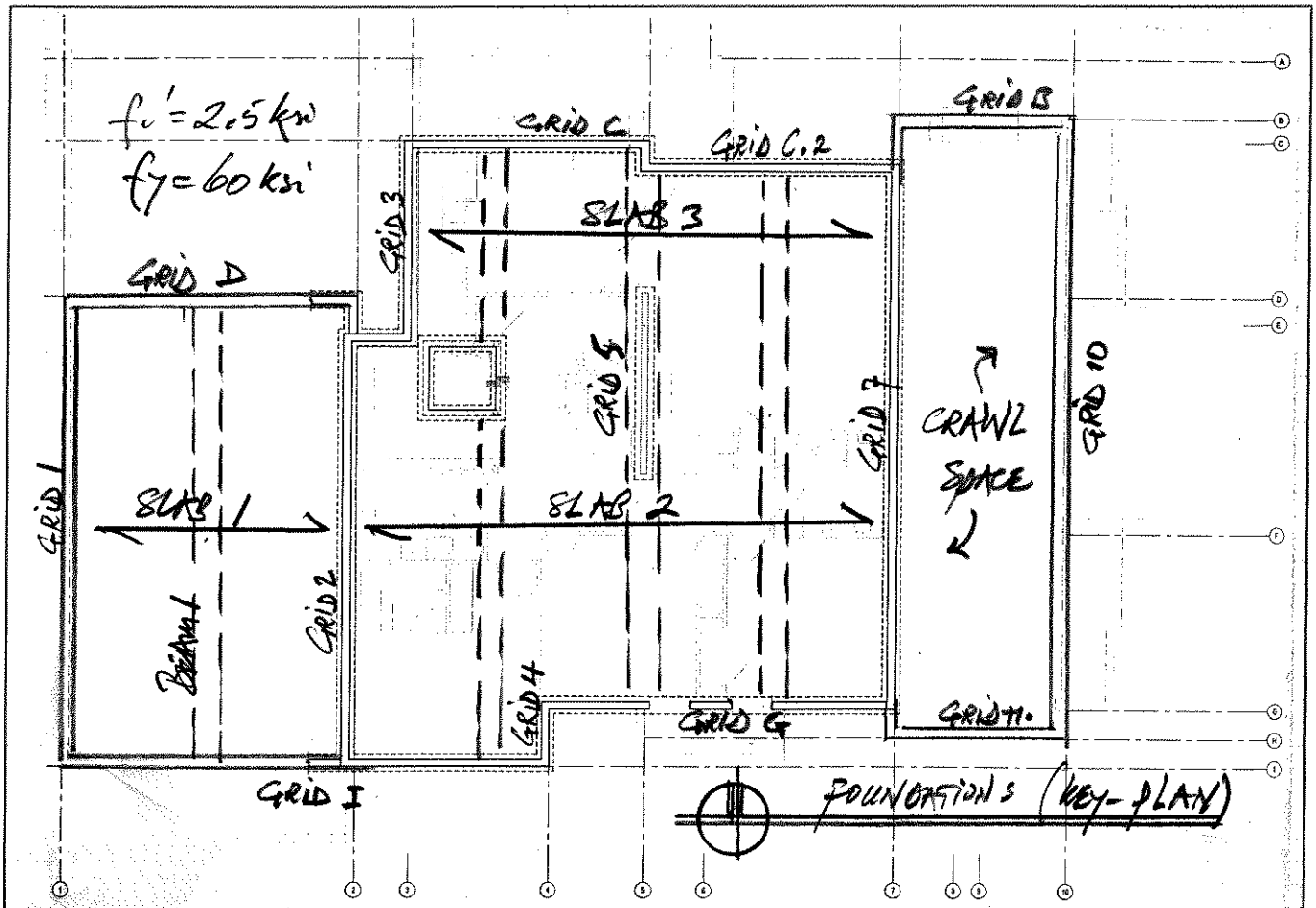
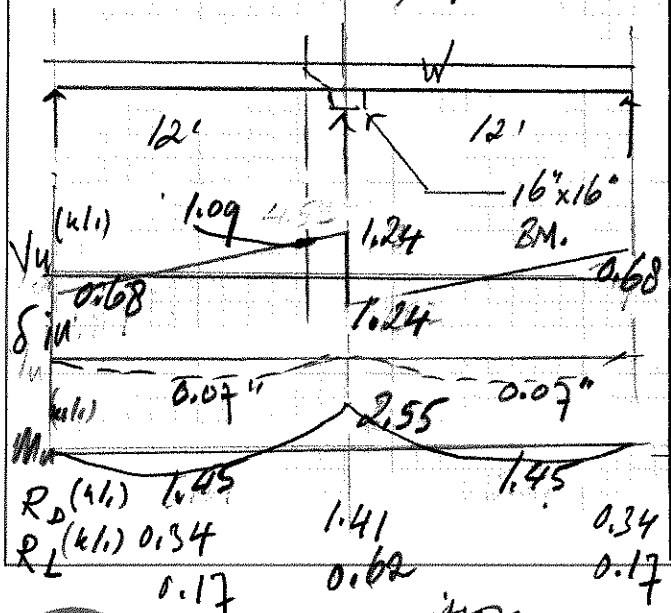
DATE 10/4/2024
PROJ. # DNB
DESIGN
SHEET 15



SLAB 1 (GARAGE)

6" SLAB D = 75 psf
L = 40 psf } w

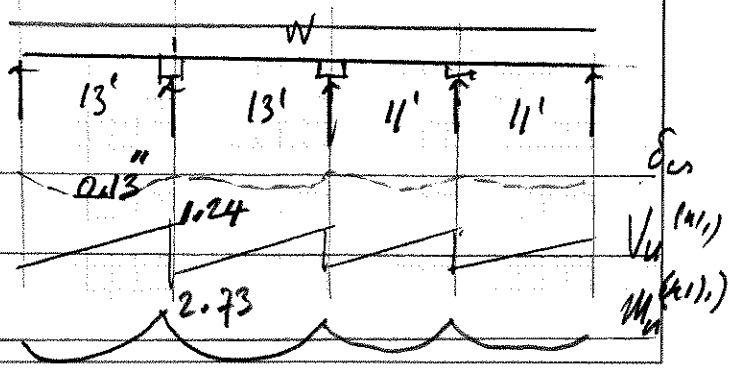


Vu AT d FROM FACE OF BEAM
= 1.09 k/ft
b = 12" } φVc = 2.7 k/ft
d ~ 3"

AT Mu = 2.55 k-ft → Avg d = 0.21 in

D = 85 psf (+10 FOR WALLS)

SLAB 2.



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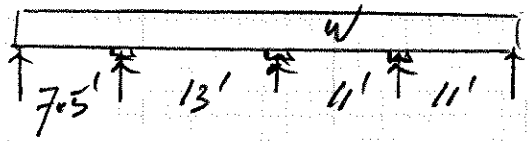
DATE 10/4/2024
PROJ # BNB
DESIGN
SHEET 16

	R_1	R_2	R_3	R_4	R_5
$D^{(k/l)}$	0.42	1.48	1.09	1.25	0.36
$L^{(k/l)}$	0.20	0.62	0.44	0.51	0.17

SURB 3.



$D^{(k/l)}$	0.16	1.20	1.18	1.21	0.36
$L^{(k/l)}$	0.08	0.49	0.48	0.49	0.17

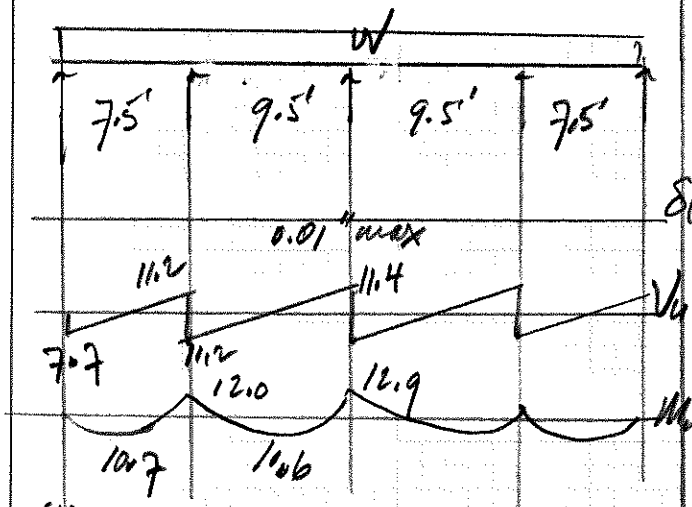
- 16"x16" BEAM

$D = 1.48^{k/l}$ (INCL. BEAM WT) ($1.21^{k/l}$ EXCL. BEAM)

$L = 0.62^{k/l} + 2.10^{k/l}$

PILE CAP. = 20^k.

MAX. PILE SP. = $\frac{20}{2.10} = 9.5'$



$R_D^{(k)}$	4.1	14.0	14.2	14.0	4.1
R_L	1.7	5.9	5.9	5.9	1.7
ΣR	5.8	19.9	20.1	19.9	5.8

$V_{u\,max} = 11.4^k$

W/ #3 TIES @ 6" o/c. $\phi V_c = 16.2^k$

$\phi V_s = 42 - 3^k$

$\phi V_n = 38.5^k$

$M_{u\,max} = 12.9^{k/l}$

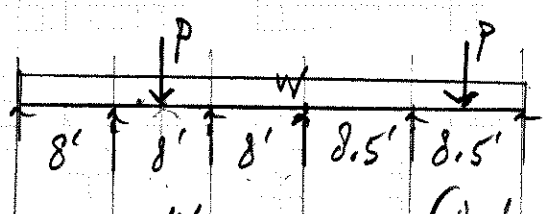
$b = 16"$

$d \approx 16 - 1.5 - 0.5 - 0.5 = 13.5"$

~~$A_{req'd} = 0.29\ in^2$~~

- WALL GRID I

From	$D^{(k/l)}$	$L^{(k/l)}$	$S^{(k/l)}$
LOW ROOF (INCL. WALL)	0.160	—	0.100
MAIN FLOOR (COVER WALL ONLY)	1.10	—	—
	1.26	—	0.100
+ FTG.	1.53	—	0.100



$w = 1.53^{k/l}$ (D+L CONTROLS)

$P = 5.8^k$ ($D = 4.1^k$, $L = 1.7^k$)

4.6 16.7 16.7 12.6 18.3 5.4 $R^{(k)}$

δ(in)

(4) • WALL GRID G

From	$D^{(k/l)}$	$L^{(k/l)}$	$S^{(k/l)}$
(4) HIGH ROOF (INCL. WALL)	0.160	—	0.100
LOW ROOF (INCL. WALL)	0.160	—	0.100
MAIN FLOOR (COVER WALL ONLY)	1.10	—	—
+ FTG.	1.68	—	0.20.

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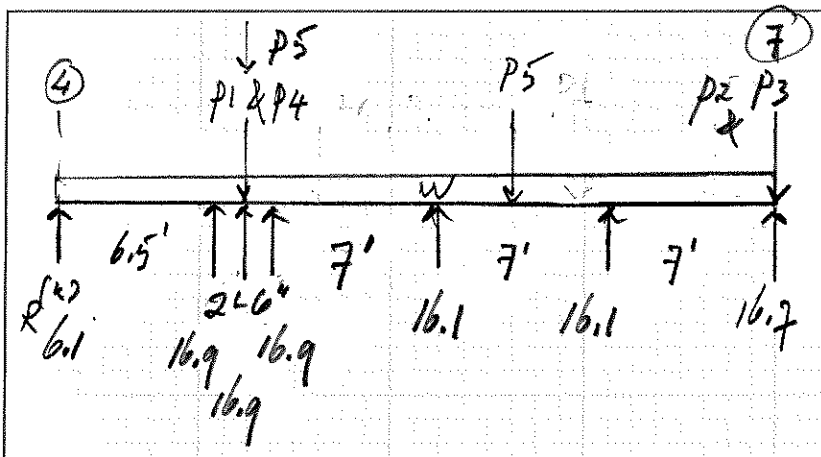
PROJ. # BNB

DESIGN

SHEET 17

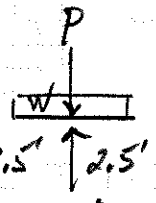


W: D = 1.68 k/l
S = 0.20 k/l

	D (k)	L (k)	S (k)	
P1	4.4	5.1	3.8	11.1
P2	2.3	–	3.9	6.2
P3	0.9	3.0	–	3.9
P4	7.1	8.8	3.7	16.5
			D + 0.75(L+S)	
P5	4.1	1.7		5.8

• GRID 4

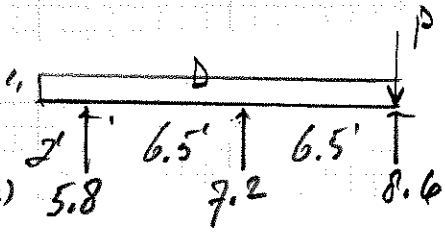
	D (k/l)	L (k/l)	S (k/l)
UPP. FL.	0.3	0.63	–
MAIN FL.	1.2	0.34	–



W: D = 1.5 k/l
L = 1.0 k/l
P: D = 1.2 k
L = 4.1 k

• GRID H

COVER. WALL ONLY. D = 1.1 k/l

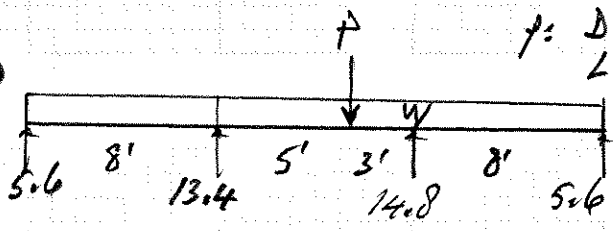


P: D = 1.4 k
L = 3.6 k

• GRID D

	D (k/l)	L (k/l)	S (k/l)
UPP. FL.	0.17	–	0.12
MAIN FL.	1.1	–	–
(COVER WALL ONLY)	1.27	+	0.12

W = 1.4 k/l

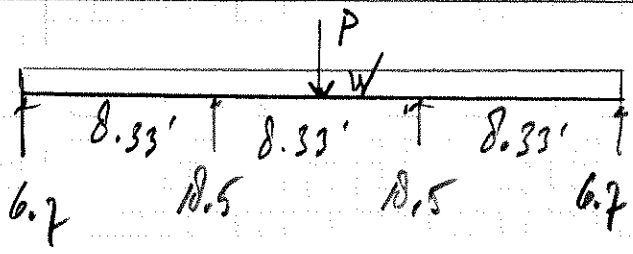


P: D = 4.1 (k)
L = 1.7 (k)

• GRID C

	D (k)	L (k/l)	S (k/l)
HIGH ROOF	0.16	–	0.10
LOW ROOF	0.16	–	0.10
MAIN FL (COVER WALL ONLY)	1.1	–	–

W = 1.62 k/l



P: D = 5.1 k
L = 5.0 k
S = –

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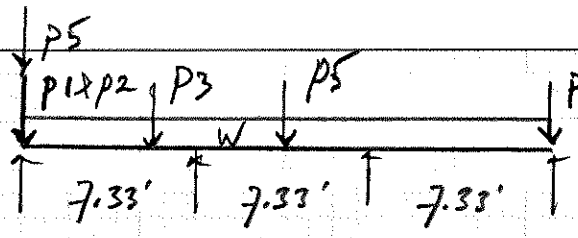
DESIGN

SHEET 18

• GRID C.2

W = 1.2 k/l. COLOR WALL ONLY.



$R^{(k)}$ 16.8 18.2 11.7 7.1

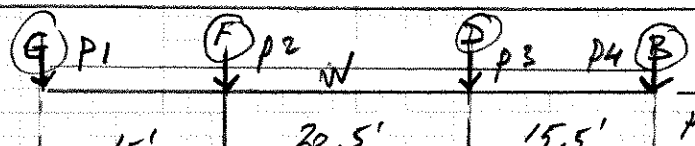
P	D (k)	L (k)	S (k)
P1	1.5	0.4	1.7
P2	1.0	3.7	—
P3	4.2	4.9	2.1
P4	1.0	1.6	0.5
P5	4.1	1.7	—

(D+L GOVERNS)

• GRID B

SEE GRID H

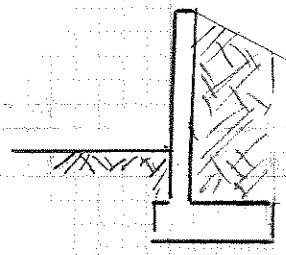
• GRID 10



P	D (k)	L (k)	S (k)
P1	1.1	4.2	—
P2	2.0	9.0	—
P3	2.3	9.2	—
P4	2.0	4.0	—

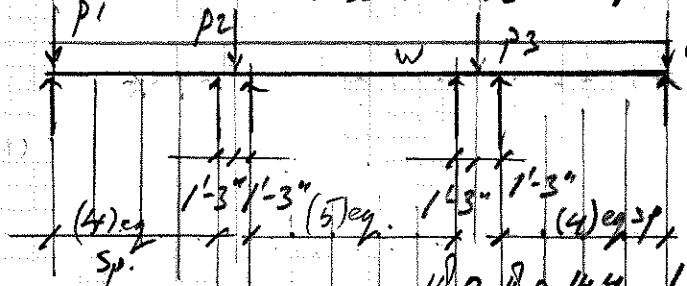
W MAINFL: D = 0.14 k/l
L = 0.42 k/l

SECTION AT STAIR ON GRADE:



W: WALL ~ 8'x10" = 1.0 k/l
FTG: 5'x16" 1.0 k/l
OVERB: 3.84x8'x.12 = 3.7 k/l
0.33x2'x.12 = 0.1 k/l

WUNDERWALL = 3.46 k/l



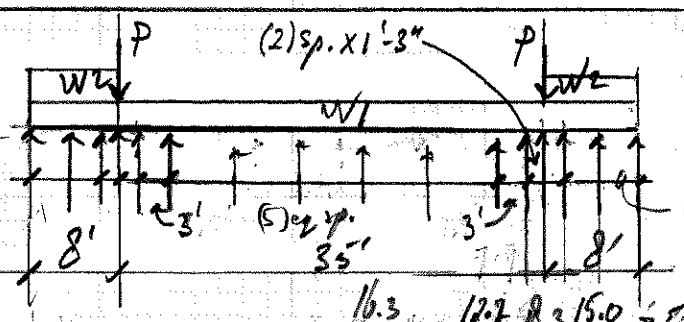
W:
D = 3.60 k/l
L = 0.42 k/l

$R^{(k)}$ 13.8 13.8 17.7 18.0 18.0 14.4 13.3
12.2 13.8 17.4 14.5 14.5 14.4
14.5 14.5

• GRID 7.

W:	D (k/l)	L (k/l)	S (k/l)
HIGH RF.	0.33	—	0.38
UPP FL.	0.26	0.77	—
MAIN FL. (INCL. WALL)	1.50	0.87	—

D+L controls.



W = 2.38 k/l
W_2 = 1.36 k/l
P = 33.5 k
ADD W = 0.53 k/l FROM S.O.G.

16.3 12.7 8.3 15.0 7.5
16.3 16.3 8.3 8.3

$R^{(k)}$

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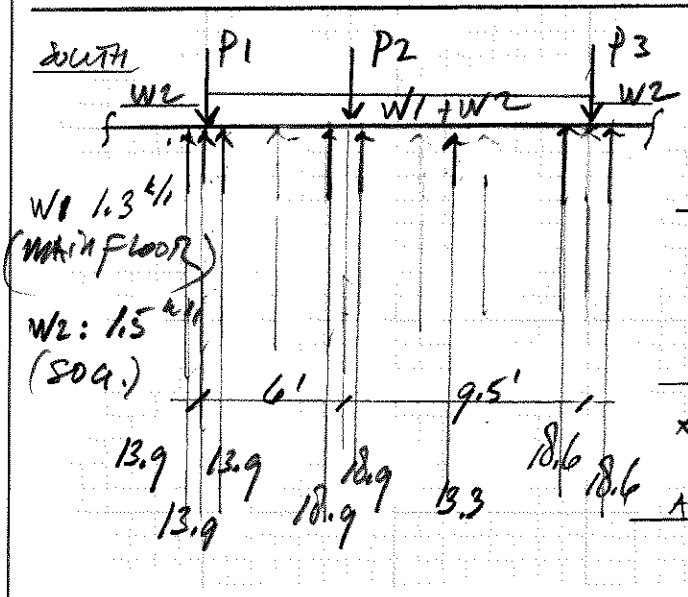
PROJ. # BNB

DESIGN

SHEET 19

• GRID 5



	(k)	
P1	27.2	(D+L)
P2	16.1	
P3	17.8	

AT P1 (4' max from W2)

$$R = \frac{4(1.5) + 3(2.8) + 27.2}{3} = 13.9^{k}$$

AT P2

$$R = \frac{(3+4.75)(2.8) + 16.1}{2} = 18.9^{k}$$

AT P3

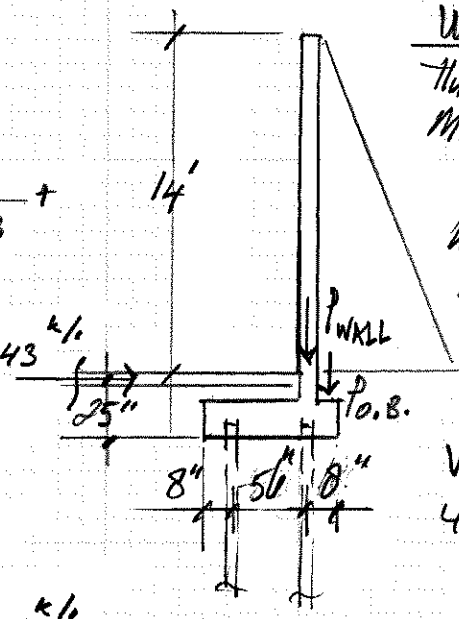
$$R = \frac{4(1.5) + 4.75(2.8) + 17.8}{2} = 18.6^{k}$$

• GRID 2

	D (k/l.)	L (k/l)	S (k/l)
Roof	0.48	–	0.63
upp. FL.	0.35	1.0	–
main FL.	0.23	0.50	–
WALL	2.0	–	–
GARAGE SOG	0.34	0.17	
BASEMENT SOG	0.42	0.20	
	3.82	1.87	0.63
FTG	+ 1.0 (x0.5 (2) floors)		
	4.32		

D + 0.75(L+S) = 4.32 + 0.75(1.87 + 0.63)
= 6.2 k/l

TEMP. CONDITION.



WALL

$M_u = 1.6(490) = 784$ psf

$M_u = (.784)(14)(0.5)(14/3)$
$= 25.6$ k/l.

$h = 12"$

$d = 9.5"$

$A_{s\,req'd} = 0.65 in^2/l.$

0.F.

$M_{max} = 14(35)$
$= 490$ psf

$V_u = 5.5$ k/l.

$\phi V_c = 8.6$ k/l.

PILES IN TEMP. CONDITION.

$M = \frac{25.6}{1.6} = 16$ k/l.

$P_{WALL} = 15(0.15) = 2.25$ k/l.

$P_{OVERB.} = 0.83(15)(1.20) = 1.5$ k/l.

$M_{RESIST.} = 2.25(4) + 1.5(5) + 3.43(2.09) = 23.7$ k/l.

$F.S. = \frac{23.7}{16} = 1.48 \sim 1.5$ ✓

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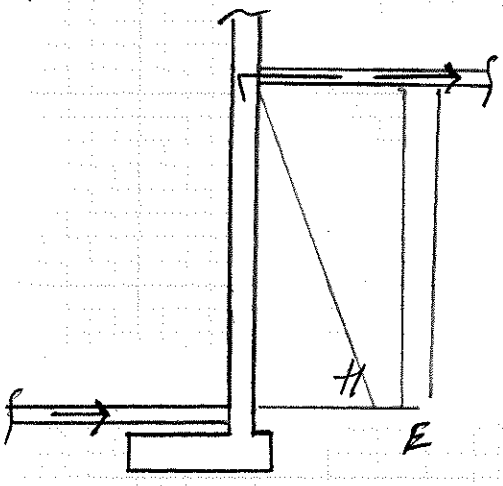
PROJ # BNB

DESIGN

SHEET 20

PERM. COND.



$q_{max} = 14(.045) = .63$ ksf

$E = 14(.008) = 0.112$ ksf

WALL

$M_H = 7.92$ k/l

$R_{TOP} = 1.47$ k/l

$R_{BOT} = 2.94$ k/l

$M_E = 2.74$ k/l

$R_{TOP} = 0.78$ k/l

$R_{BOT} = 0.78$ k/l

$M_u = 1.6(7.92) + 2.74 = 15.4$ k/l

$b = 12"$

$h = 12"$

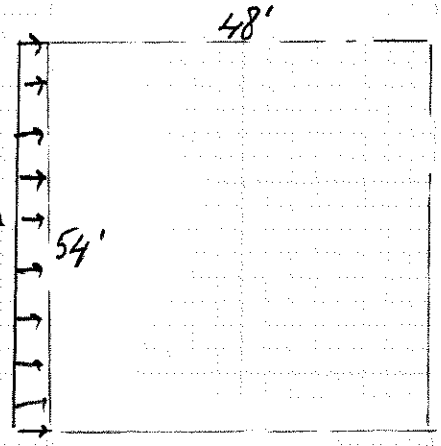
$d \approx 9.5"$

A_s req'd $0.38 in^2/l.f.$

BASEMENT SLAB ON GRADE.

$W_u = 1.6(2.94) + 0.78 = 5.48$ k/l

$f_u = \frac{5.48}{12(6)} = 0.076$ ksi



SHEAR.

$V_u = \frac{5.48(54)(0.5)}{48} = 3.08$ k/l

SHEAR FR. #4 @ 12" o/c

$\phi V_n = 0.75(0.6)(0.20)(60) = 5.4$ k/l ✓

MOMENT.

$M_u = 0.105(5.48)(54)^2 = 1997$ k/l →

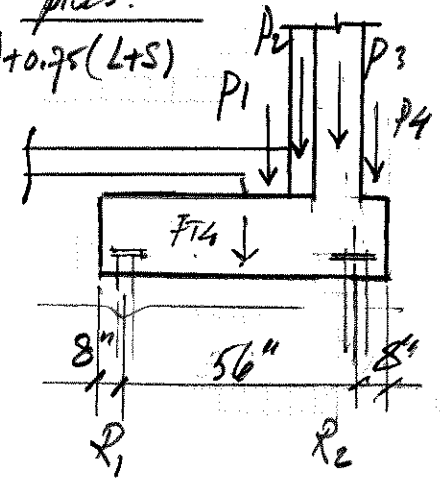
TENSION CORD:

$T_u = M_u/a = \frac{1997}{48} = 41.6^k$

A_s req'd $= \frac{41.6}{.9(60)} = 0.77 in^2$ in SLAB.

piles.

$D + 0.75(L+S)$



P_1: 0.57 k/l

P_2: 2.66 k/l

P_3: $15(0.15) + 0.47 = 2.72$ k/l

P_4: $15(0.5)(0.12) = 0.90$ k/l

$FT_4 = 6(20/12)(0.15) = 1.50$ k/l

$\Sigma P = 8.35$ k/l

$R_2 = \frac{1.50(28) + 0.57(34) + 2.66(43) + 2.72(52) + .90(61)}{56}$

$= 6.63$ k/l

$R_1 = 8.35 - 6.63 = 1.72$ k/l

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STRUCTURAL ENGINEERING

PROJECT jason

DATE 10/4/2024

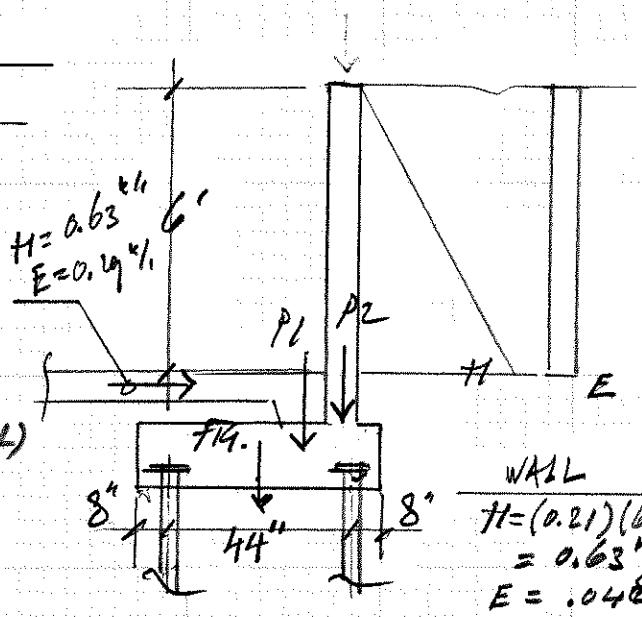
PROJ. # BNB

DESIGN

SHEET 21

• GRID 1

	D (k/l)	L (k/l)	S (k/l)
Roof	0.32	—	0.36
Upr FL	0.23	0.50	—
Main FL	0.34	0.17	—
SOG			



P1 : D = 0.34 k/l
L = 0.17

P2 : D = 1.25 k/l (INCL 8" WALL)
L = 0.50 k/l
S = 0.36 k/l

FTG = 5(1.33)0.15 = 1.0 k/l

$H_{max} = 6(.035) = 0.21$ ksf

$E = 6(.008) = 0.048$ ksf

WALL

$H = (0.21)(6)(0.5) = 0.63$ k/l

$E = .048(6) = .29$ k/l

$M_u = 0.63(2)1.6 + 0.29(3) = 2.9$ k'/l

d = 6" $A_s = 0.15$ in²/l 0.F.

piles.

ROW UNDER WALL

IGNORE H+E FOR MAX. LOADING IN PILES.

$R_2 = \frac{0.47(32) + 1.90(42) + 0.42(49) + 1.0(22)}{44} = 3.12$ k/l

$R_1 = 3.79 - 3.12 = 0.67$ k/l

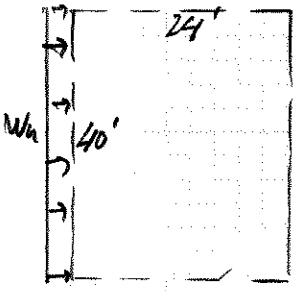
SLAB ON GRADE

$\Sigma H = 0.63 + 1.47$ (FROM GRID 2) $= 2.1$ k/l

$\Sigma E = 0.29 + 0.78 = 1.07$ k/l

$W_u = 1.6(2.1) + 1.07 = 4.43$ k/l

$V_u = \frac{4.43(20)}{24} = 3.7$ k/l → SEE BASEMT. S.O.G. → #4@12



$M_u = 0.125(4.43)(40)^2 = 886$ k'

$A_s = \frac{886}{24(0.9)60} = 0.68$ in² IN SLAB

CHECK GLOBAL SLIDING. (ASD)

$\Sigma H = 2.94 + 1.47 + 0.63 = 5.04$ k/l

$.7\Sigma E = 0.70(0.78(2) + 0.29) = 1.30$ k/l

$\Sigma = 6.34$ k/l

PASSIVE RESIST 16" FTG AT GRID 1 = 0.55 k/l

" 20" FTG AT GRID 2 = 0.76 k/l

5.03 k/l

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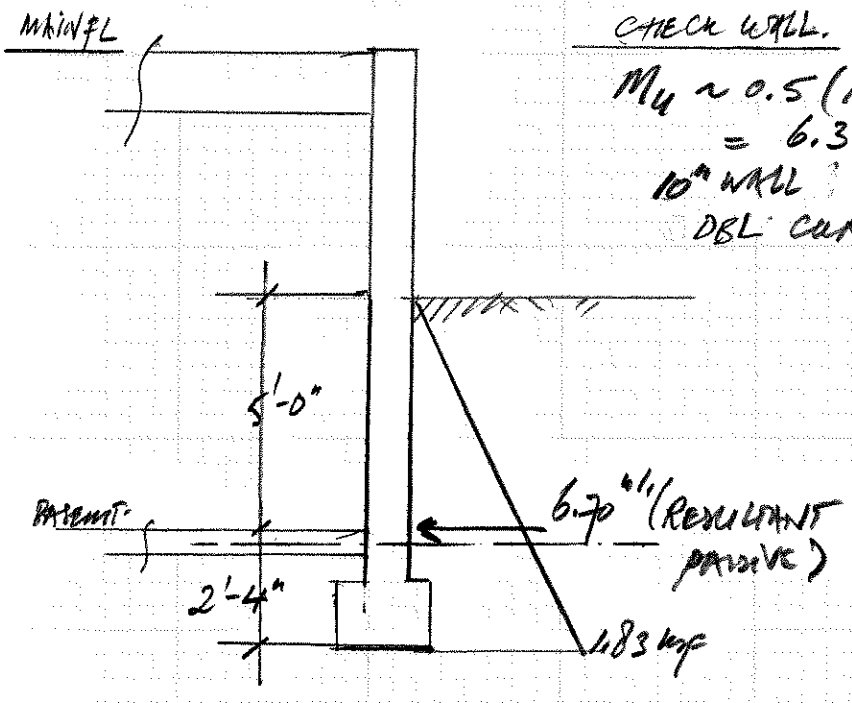
SHEET 22

WALL AT GRID 7.

PASSIVE MAX = $\frac{7.33(0.250)7.33}{2}$ = 6.70 k/l

> 5.03 k/l ✓



CHECK WALL.

$M_u \sim 0.5(1.83)(1.6)(2.08)^2$

= 6.33 k-ft

10" WALL

DBL CURTAIN 6@12" d=8" → A_s = 0.24 in²/ft

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LATERAL ANALYSIS

• SEISMIC

$A_{ROOF} = 4{,}000$ SF

$W = 4{,}000(0.015 + 0.005)$

$= 80^{k}$

$A_{UPPER\ FL} = 3125$ SF

DECK = 535 SF

LOW ROOFS = 645 SF

$W = 3125(0.010 + 0.010) = 62.5^{k}$

$535(0.020 + 0.005) = 13.4^{k}$

$645(0.015 + 0.005) = 12.9^{k}$

MISC. MOTERED VENEER.

$A_{TRIB} = 500\ SF(0.015) = 7.5^{k}$

$\Sigma W = 80 + 62.5 + 13.4 + 12.9 + 7.5$

$= 176.3^{k}$

$S_{DS} = 1.0$

$R = 6.5$

$V = \frac{S_{DS} \cdot W}{R} = \frac{1.0(176.3)}{6.5}$

$= 27.1^{k}$

$0.7E = 0.7(27.1) = 19.0^{k}$

• WIND

SEE CRITERIA SHEETS.

$P_{ASD,\ ULT.} = 13\ psf.\ (0.6W)$

- SAIL AREA N-S = 1500 SF

$0.6W = 1500(.013) = 19.5^{k}$

- SAIL AREA E-W = 1150 SF

$0.6W = 1150(.013) = 15.0^{k}$

WIND GOVERNS IN N-S DIRECTION

$0.6W = 19.5^{k}$

SEISMIC GOVERNS IN E-W DIRECTION

$0.7E = 19.0^{k}$

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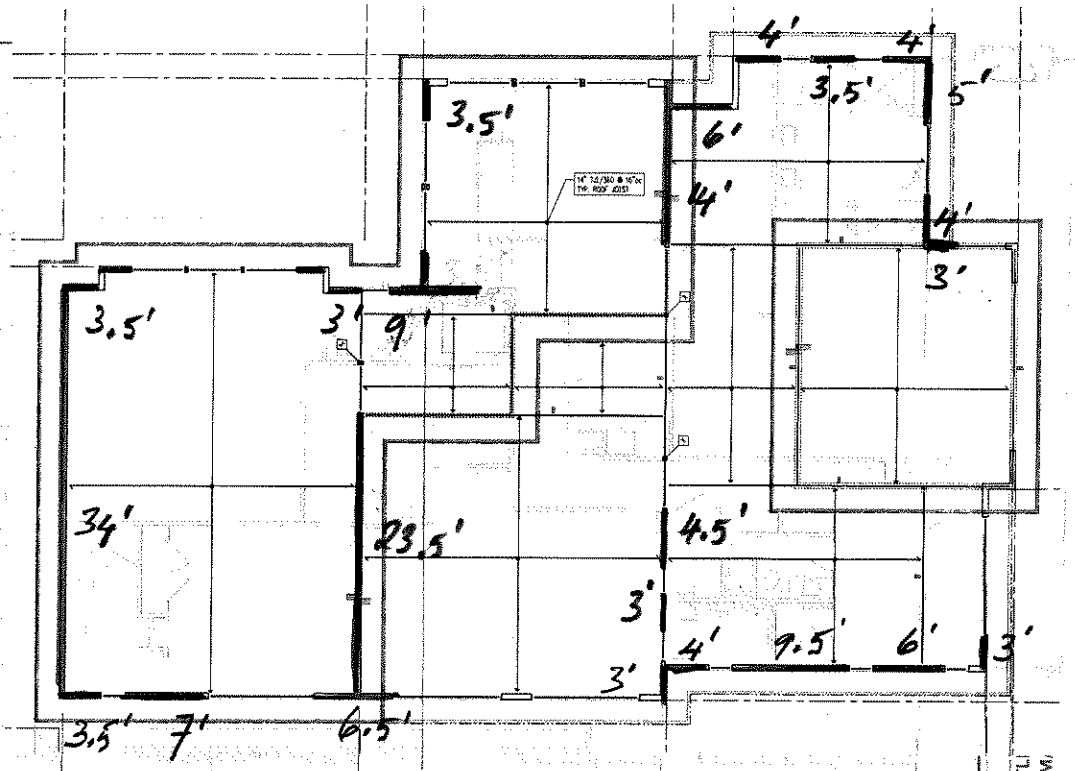
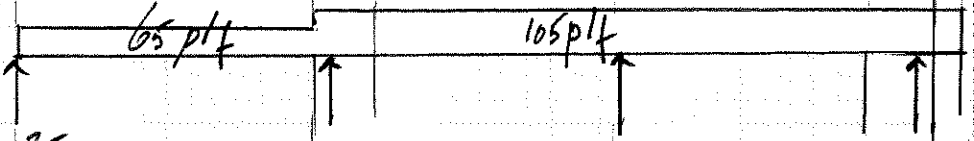
LATERAL DESIGN



ROOF SHEARWALL KEY-PLAN

N-S DIRECTION (WIND CONTROLS.)



$R^{(k)}$	0.85	2.16	2.31	1.52
L_{WALL} (')	34	30.5	24.5	12
V (plf)	25	70	94	126
SW	W6	W6	W6	W6
p_{up} (k)	0.22k	0.64k	0.85	1.14
0.6D (k)	2.93k	0.69k	1.17	1.57
p_{uet} (k)	—	—	—	—
H.D.	—	—	—	—

SEE SHEET FOR SHEARWALLS BELOW.

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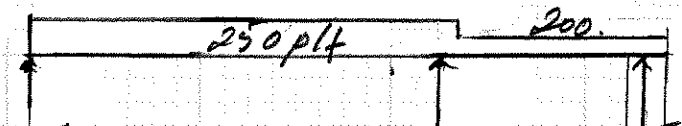
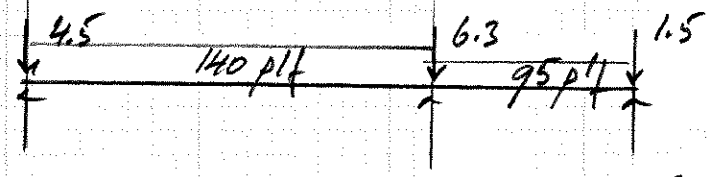
E-W DIRECTION (SEISMIC CONTROLS)

SOUTH — 250 plf — 200 — NORTH — ROOF LEVEL



R (k)	4.5	6.3	1.5
l (ft)	36.5	18.5	17.5
v (plf)	123	340	85
SW	W6	W4	W6
P_{wp} (k)	1.11	3.06	0.77
$0.6P_{DWN}$	0.77	0.77	0.77
P_{net} (k)	0.44	2.39	—
H.D.	(1) CS16	(1) CS14	—



W/ FL. LEVEL

(SEE SHEET 4 FOR SHEARWALL KEYPLAN)

R (k)	7.0	9.5	2.5
l (ft)	54	18	14.5
v (plf)	130	527	172
SW	W6	W6	W6
P_{wp} (k)	2.34	7.81	2.32
$0.6P_{DWN}$	1.54	1.54	1.54
P_{net} (k)	0.80	6.27	0.80
H.D.	HDU2	HDU8	HDU2

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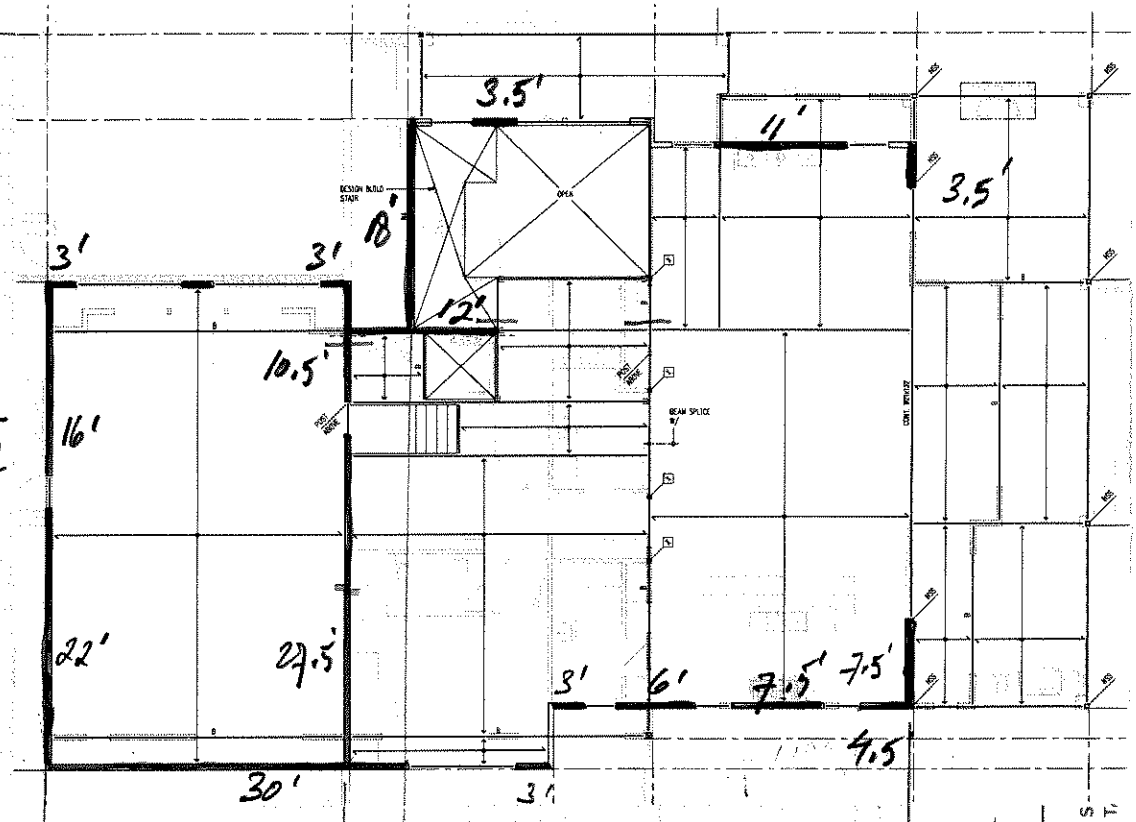
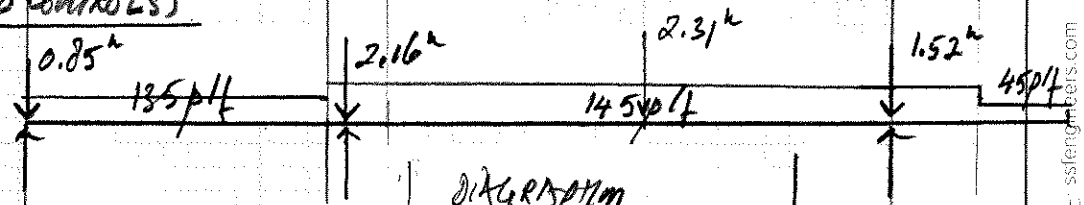
LATERAL (CONT)



UPP. FL. SHEARWALL KEYPLAN.

N-S DIRECTION (WIND CONTROLS)



$R^{(k)}$	2.54	8.91	8.05
ℓ_{wall} (')	38	56	11
v (plf)	67	159	731
SW	W6	W6	W2 OF FRAMING
$P_{up}^{(k)}$	0.83	2.07	7.71
$0.6P_D^{(k)}$	3.93	1.20	2.24
$P_{net}^{(k)}$	—	0.87	5.47
H.D.	—	HDU2 (AT STAIR ONLY)	HDU5 AT (1) LOCATION ONLY (W/OUT HSS COL.)

DIAGRAMM

$V_{max} = 24(.145) + \frac{2.31}{2} = 4.64^k$

WIDTH = 26' (min.)

$V = \frac{4.64}{26} = .178^{k/'}$

WIND, CASE 1

$V_{ALLOW.} = \frac{.740}{2} = .37^{k/'}$

$M = 40.0 + 27.1 = 67.1^{k'}$

$T = \frac{67.1}{31} = 2.16^k$

CS14 STRAP

$T_{ALLOW.} = 2.4^k$

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SHEET 27