



Structural Calculations

FOR

Kanter Residence

12 Meadow Lane

Mercer Island, WA 98040



Prepared for: Dan J. Say SE

Date: August 9th, 2021

Kanter Residence Structural Calcs

ADDRESS: 12 Meadow Lane
Seattle, WA 98040 (Mercer Island)

Roof DL = 15
Snow = 25
Σ 40 PSF

Finer DL = 20
L = 40
Σ 60

Deck DL = 15 PSF
L = 60 PSF
Σ 75 PSF

Roof Framing

(N) Fnt Km → L = 20

W = 11(40) = 440 #1

M = 22,000 #1 = 264,000
S = 96" ?

Finer $\frac{(5)(440)(20)^4 + 1728}{384 + 1.8 \times 10^8 \times 1.60} = 880 \text{ in}^4$

(2) 1 3/4 + 9 1/2 LVL

GL 5'12" + 13'12"

Headers

NORTH

P = 4400 # L = 5'-6" M = $\frac{(4400)(5.5)}{4} = 6050 \text{ #}$

(2) 1 3/4 + 7 1/4 LVL

L = 5'

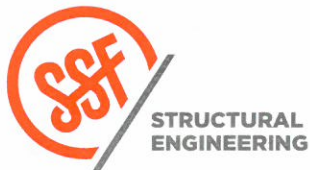
(2) 2x8

L = 6'

W = 12,400 = 480 #1

M = 2160 #1

(2) 1 3/4 + 7 1/4 LVL



PROJECT

Kanter Res

DATE

7.22.21

PROJ. #

D55

DESIGN

F-1

SHEET

EXSP

$L = 3'$ $W = 8 \times 40 = 320 \text{ #}'$

(2) 2x6's

WEST

$L = 6'6"$ $W = 13 + 40 = 520 \text{ #}'$

$M = 2746 \text{ #}'$

(2) 1 3/4" x 7 1/4" LVL

Rafters → 2x12's @ 24" o.c.

Ridge → $L = 15'$ $W = 11.5(40) = 460 \text{ #}'$ $M = 12,938 \text{ #}'$

$S = 100 \text{ #}^2$

$I = \frac{(5)(460)(15)^3 + 1728}{384 + 100 + 104 + 175} = 437 \text{ #}^4$

HIPS

$L = 15'6"$ $W = 6 + 40 = 240 \text{ #}'$

6x12

$M = 84,480 \text{ #}'$

$P_b = 890 + 11.5 \times 11.5$
 $= 1124 \text{ PSI}$

$S = 77 \text{ #}^3$

(3) 2x12

confirm HTR → $P = (10)(11.5)(40) = 4600 \text{ #}'$

$L = 6'6"$

$M = \frac{(4600)(6.5)}{4} = 7475 \text{ #}'$

(2) 1 3/4" x 7 1/4" LVL

Ceiling (SW)

$L = 19'6"$ $P = (8)(11.5)(40) = 3680 \text{ #}'$ $W = (3)(40) = 120 \text{ #}'$

$M = \frac{1}{8}(120)(19.5)^2 + \frac{(3680)(19.5)}{4} = 23,644 \text{ #}'$ $S_{GL} = 103$

$I_{M.} = \frac{(3680)(19.5)^3 + 1728}{4872 + 104 + 175} + \frac{(5)(120)(19.5)^3 + 1728}{384 + 2 + 104 + 175} =$

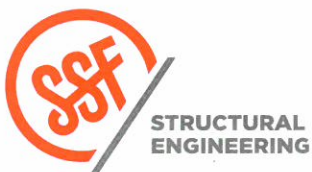
$I_{6L} = 1017 \text{ #}^4$

$635 + 261 = 915 \text{ #}^4$

GL 5 1/2" x 13 1/2"

Kanter

7.22.21



PROJECT

DATE

PROJ. #

DJS

DESIGN

F-2

SHEET

MAIN FLOOR FRMG

(N) HDKS @ NORTH END

NORTH WALL

$$L = 8'6"$$

$$W = (13.5)(40) + 80 + 9.5(60) = 1190 \#'$$

$$M = \frac{1}{2}(1190 \times 8.5)^2 = 10,747 \#'$$

(2) 1 3/4 + 9 1/2 LVL

$$L = 5'$$

$$M = \frac{1}{2}(1190 \times 5)^2 = 3719 \#'$$

(2) 1 3/4 + 7 1/4 LVL

WEST WALL

$$L = 5'$$

$$W = 4 + 60 + 80 + 11(40) = 760 \#'$$

$$M = 2373 \#'$$

(2) 2 + 8

(N) Beam over play room

$$L = 16' \quad W = 9 + 60 = 540 \#'$$

$$M = 19,280 \#'$$

$$= 207,360 \#'$$

$$F_b = 2400 \text{ PSI}$$

$$S = 86.4 \text{ in}^3$$

$$F_m = \frac{(5 \times 360)(16)471728}{384 + 1.8 \times 104 \times 1.5} = 590 \text{ FT}$$

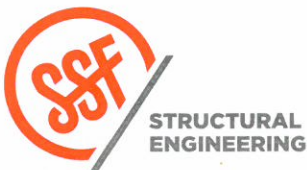
GL 5 1/2 + 12

$$R = 4320 \#'$$

$$M = \frac{(4320)(6)}{4} = 6480 \#'$$

(2) 1 3/4 + 9 1/4

LVL



PROJECT

Kanter

DATE

7-22-21

PROJ. #

PS5

DESIGN

F-3

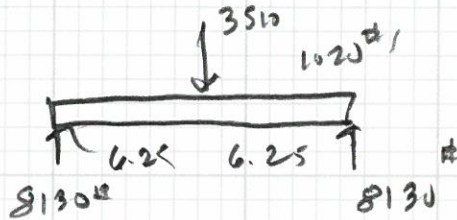
SHEET

WEST HDN

$$P = 6.5 + 540 = 3510 \text{ \#}$$

$$W = 80 + 16(40) + 4(75) = 1020 \text{ \#}$$

$$L = 12.6'$$



$$M = 8130 \times 6.25 - \frac{6.25^2}{2} \times 1020 = 31,891 \text{ \#}$$

$$370,688 \text{ \#}$$

$$S = 134.3 \text{ \#}$$

$$S_{req} = 12.4$$

$$I_{m.} = \frac{(5 \times 1020 \times (12.5)^4) + 1225}{384 + 1.8 \times 10^6 \times 1.4}$$

$$+ \frac{(3510 \times (12.5)^3) + 1225}{48 + 1.8 \times 10^6 \times 1.4}$$

$$F_{SR} = 69.6$$

$$= 778 + 343 = 1121 \text{ \#}$$

$$W8 \times 24$$

$$\underline{\underline{GL 5'12 + 13'12}}$$

EAST HDN

$$L = 5' \quad W = 16 + 40 + 80 = 720 \text{ \#}$$

$$M = 2250 \text{ \#}$$

$$\underline{\underline{(2) 2 \times 8}}$$

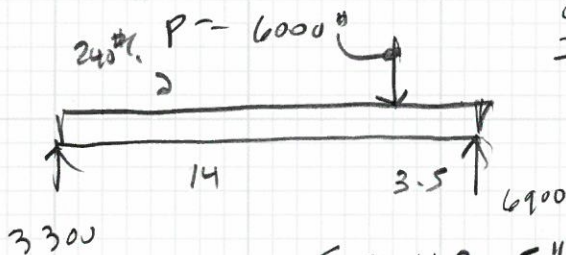
SITTING ROOM

$$\text{EAST HDN} \rightarrow L = 13' \quad W = 14 + 60 + 80 = 920 \text{ \#}$$

$$M = \frac{1}{2}(920)(13)^2 = 19,435 \text{ \#}$$

$$I_{m.} = \frac{(5 \times 920 \times (13)^4) + 1225}{384 \times 2 + 10^6 \times 1.65} = 455 \text{ \#}$$

$$L = 19.6' \quad W = 4 + 60 = 240 \text{ \#}$$

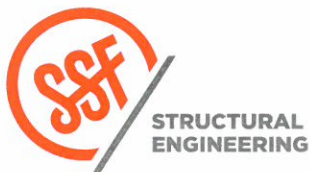


$$\underline{\underline{GL 5'12 + 12}} \quad \underline{\underline{(3) 1 \frac{3}{4} + 1 \frac{7}{8} LVL}}$$

$$M_{e 13.3} = 3300 \times 13.75 - \frac{13.75^2}{2} \times 240 = 22,688 \text{ \#}$$

$$S = 113.5 \text{ \#}$$

$$S_{req} = 9.1 \quad \therefore \text{use } 272,250 \text{ \#}$$



PROJECT

Kanter

DATE

7-22-21

PROJ #

205

DESIGN

F 4

SHEET

$$I_{min} = \frac{(5)(240)(17.5)^4 + 1728}{384 + 1.8 \times 10^6 \times 1.85} + \frac{(6000)(17.5)^3 + 1728}{48 + 1.8 \times 10^6 \times 1.85}$$

$$= 320 + 731 = 1051 \text{ in}^4$$

$$F_{sT} = 65 \text{ ksi}$$

GL 5'1/2 x 13'1/2
or W8 x 24

WEST TRNS

$$L = 13' \quad W = 8 + 60 + 80 + 4.5(75) + 11(40) = 1338 \text{ #}$$

$$M = \frac{1}{2}(1338)(13)^2 = 28,265 \text{ #}' < 339,183 \text{ #}'$$

$$S_{req'd} = 123 \text{ in}^3$$

$$S_{min} = 11.3 \text{ in}^3$$

$$F_{sT} = 46 \text{ ksi} \quad \underline{\underline{W8 x 24}}$$

(N) SET WALL TRNS

$$L = 6' \rightarrow \underline{\underline{(27) 2 \times 10}}$$

$$P = 8697$$

BM @ (N) FLUXE

$$L = 14'6" \quad W = 8 + 60 + 4.5(75) + 80 + 11(40) = 1338 \text{ #}$$

$$M = \frac{1}{2}(1338)(14.5)^2 = 35,164 \text{ #}' = 421,972 \text{ #}'$$

$$S_{req'd} = 152.9 \text{ in}^3$$

$$I_{min} = \frac{(5)(1338)(14.5)^4 + 1728}{384 + 1.8 \times 10^6 \times 1.85} = 1013 \text{ in}^4$$

$$S_{min} = 14.1 \text{ in}^3$$

$$F_{sT} = 62.9 \text{ ksi}$$

$$\underline{\underline{GL 5'1/2 \times 13'1/2}}$$

W8 x 24



Kanter

PROJECT

7.22.21

DATE

PROJ. # DSK

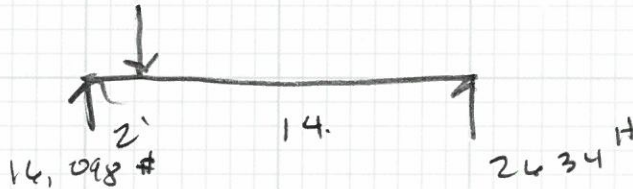
DESIGN F-5

SHEET

BM. SUMMIT 6L'S

$$p = 1338(14) = 18,732 \#$$

L = 16'



$$M = 14,098 \times 2 = 28,196 \#'$$

$$M = 28,196 + 2 = 384,352 \#'$$

$$S = 140 \text{''}^3$$

$$\text{Area} = \frac{(18,098)(1.5)}{1.15 \times 265} = 79.2$$

W8x24

GL 5'12 + 15

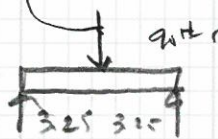
GL 6'3/4 + 12

HTON

$$P = 16,098 \#$$

$$L = 6'-6''$$

$$W = 1.5 \times 60 = 90 \#'$$



$$8,342$$

$$8,342$$

$$M = 8,342 \times 3.25 = 27,111 \#'$$

$$M = 27,111 + \frac{3.25^3}{2} \times 90 = 319,634 \#'$$

$$S_{GL} = 116 \text{''}^3$$

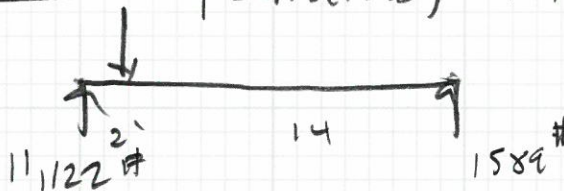
$$A = 41.1$$

GL 5'12 + 12

Southern Summit BM

$$p = 9.5(1338) = 12,711 \#$$

L = 16'



$$S = 96.7 \text{''}^3$$

USE GL 5'12 x 13'12

W8x24

$$M = 11,122 \times 2 = 22,244 \#'$$

$$M = 22,244 + 2 = 244,428 \#'$$

Kanter

7.22.21



PROJECT

DATE

PROJ. #

DESIGN

SHEET

HTON

$L = 6 \times 6'' \quad P = 11,122 \# \quad W = 90 \#'$

$M = \frac{1}{2}(90)(6.5)^2 + \frac{(11,122)(6.5)}{4} = 18,549 \#' = 222,583 \#'$

$S = 80.7''^3$

$A = \frac{1.5(5853)}{1.15 + 265} = 28.8''^2$

(3) 1 3/4 + 1 7/8 LVL

Replaced WMS @ SOUTH

$L = 15 \times 6'' \quad W = 6 + 60 + 80 + 8 + 40 = 760 \#'$

$M = 22,824 \#' = 273,885 \#'$

$S = 99.2''^3$

$F_{m} = \frac{(5)(760)(15.5)^4 + 728}{384 + 1.8 + 106 + 1.78} = 703''^4$

HTON

$L = 3 \times 6'' \quad W = 1338 \#'$

$M = 2049 \#'$

W8 + 2J

GL 5 1/2 + 12

(2) 1 3/4 + 7 1/4 LVL

Revision Deck WMS

$L = 12 \times 6'' \quad W = 13.5/2 + 70 = 473 \#'$

$M = \frac{1}{2}(473)(12.5)^2 = 9,238 \#' = 110,859 \#'$

$F_b = 1350 \times 1.8 = 1080 \text{ PSI}$

$S = 102.7''^3$

$F_{m} = \frac{(5)(473)(12.5)^4 + 728}{384 + 1.6 + 106 + 1.9 + 1.42} = 430''^4$

PT 6 + 12



PROJECT

Kauter

DATE

7.22.21

PROJ. #

DESIGN

SHEET

RJ
F-7

HDR SUPPORTING ROOF FROM GL 5'2" + 13'12" ROOF

$$P = \frac{3680}{2} + 9.75(120) = 3010 \#$$

$$L = 5' \quad W = (5)(40) + 80 + (10.5)(60) = 910 \#'$$

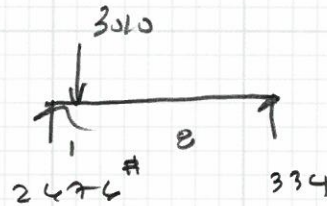
$$M = \frac{1}{2}(910)(5)^2 + \frac{(3010)(5)}{4} = 6606 \#'$$

USE (2) 1 3/4 + 7/4 LVL

BM SUPPORTING SOUTH END OF GL ROOF

$$P = 3010 \# \quad L = 9'$$

$$M = 2676 \#'$$



(2) 1 3/4 + 7/4 LVL MIN

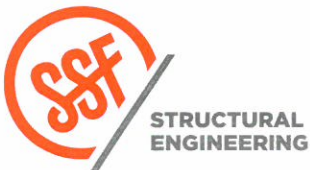
HDR SUPPORTING

$$L = 6' \quad P = 2676 \#'$$

$$W = (14)(60) + (10)(40) + 80 = 1320 \#'$$

$$M = \frac{1}{2}(1320)(6)^2 + \frac{(2676)(6)}{4} = 9954 \#'$$

(2) 1 3/4 + 9 1/2 LVL



Kauter

PROJECT _____

7-26-21

DATE _____

PROJ. # DJS

DESIGN F-8

SHEET _____

Lateral Analysis

ADDRESS: 12 Meadow Lane
Mercer Island, WA

SEISMIC

(NO WORK ON SOUTH SECTION OF HOUSE)

$$W_{\text{ROOF}} = [(37)(24) + (41)(56)] 15 = 48.9^k \quad H = 21'$$

$$W_{\text{WALL}} = [(34)(20) + (38)(56)] 20 = 52.2^k \quad H = 8.5'$$

$$S_s = 1.48 \quad S_1 = 0.51, \quad S_{DS} = 1.0, \quad S_{D1} = 0.58$$

$$C_s = 0.154$$

$$V_R = 7.7^k$$

$$V_M = 3.3^k \quad / \leq 11.0^k$$

WIND 110 mph $\Sigma + P C$

Roof slope = 24°

H_{wall} = 7.9'

H_{top} = 26'

to
Bottom = 7'

H_{sitew} 33'

$$P_{15} = 12.6 \text{ PSF}$$

$$P_{20} = 13.2 \text{ PSF}$$

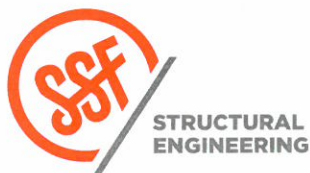
$$P_{25} = 13.6 \text{ PSF}$$

$$P_{30} = 14.0 \text{ PSF}$$

$$P_R = 4.8 \text{ PSF}$$

Kanter Kes

8-3-21



PROJECT

DATE

PROJ. #

DESIGN

SHEET

DJS

L-1

Criteria Sheet

Codes

Structural: IBC 2018
 Loading: ASCE 7-16
 Wood: NDS 2018
 Steel: AISC 360-16
 Concrete: ACI 318-14
 Masonry: TMS 402/602-16

Project Location

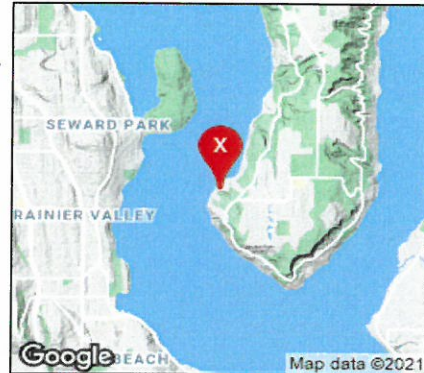
Street & Number: 12 Meadow Lane
 City: Mercer Island State: WA
 ZIP: 98040
 Latitude: 47.5402 N
 Longitude: -122.2417 W
 Ground Elevation: 54 ft

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 = 16 kips $\Omega_o = 2.5$
 $S_s = 1.476$ $S_r = 0.511$
 $S_{DS} = 1.00$ $S_{D1} = 0.58$
 $C_s = 0.154$ $I_E = 1.0$



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 = 110 $K_{ZT} = 1.00$
 Exposure = C

Dead Loads:

Roof		Floor	
Roofing	2.5 psf	Finish Floor	1 psf
1/2" Sheathing	1.8 psf	3/4" Sheathing	2.7 psf
Trusses @ 24" oc	2.5 psf	Joists @ 16" oc	2.2 psf
Misc./Mech.	1.5 psf	Misc./Mech.	2 psf
Ceiling Finish	2.8 psf	Ceiling Finish	2.8 psf
Solar Panels	4 psf		10.7 psf
	15 psf	Use	20 psf
Use	15 psf		

Live Loads:

Snow: 25 psf
 Floor: 40 psf

Soils:

Soils Report Provided? No To be approved by the authority having jurisdiction, per 11.8.2 exception.

Allowable Bearing: 1500 psf Active: 55/35 pcf (Restrained/Unrestrained)
 Sliding, μ : 0.3 Seismic Surcharge: 8H
 Passive: 250 pcf



Project: _____
 Criteria: _____

DATE: 8/3/2021
 PROJ. #: _____
 DESIGN: ENG
 SHEET: 1

L-19

Seismic Design

ASCE 7-16 Seismic Analysis

Equivalent Lateral Force Procedure

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
Site Class	D (Default)
Diaphragm Flexibility	Flexible

I, II, or III, or IV per Table 1.5-1
Assumed default soil properties, per 11.4.3.

Section 12.8.1.3 Exceptions

Regular Structure	Yes
≤ 5 Stories above grade	Yes
$T \leq 0.5s$	Yes
$\rho = 1.0$	Yes
Not Site Class E or F	Yes
Risk Category I or II	Yes

If all exceptions are met, S_{DS} may be taken as 1, but not less than $0.7 \cdot (\text{Calculated } S_{DS})$

S_s	1.476 g	2% in 50 yr, Latitude & Longitude lookup
S_1	0.511 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	21.0 ft	
C_t	0.02	Table 12.8-2
x	0.75	Table 12.8-2
T_a	0.20 sec	Eq. 12.8-7
T	0.20 sec	
T_o	0.12 sec	
T_s	0.58 sec	
T_L	6.00 sec	
F_a	1.20	Table 11.4-1
F_v	1.70	Table 11.4-2
S_{MS}	1.77 g	Eq. 11.4-1
S_{M1}	0.87 g	Eq. 11.4-2
S_{DS}	1.000 g	Eq. 11.4-3
S_{D1}	0.579 g	Eq. 11.4-4
C_s	0.154 Controls	Eq. 12.8-2
	0.454	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	Section 11.4.8 Exception 2 Applied
Bldg. Weight	102.2 k	
$V = C_s W$	15.7 k	Eq. 12.8-1, Strength Level Base Shear
$V = C_{s,asd} W$	11.0 k	Eq. 12.8-1 ASD Base Shear

Table 1.5-2

Table 12.8-2

Table 12.8-2

Eq. 12.8-7

Table 11.4-1

Table 11.4-2

Eq. 11.4-1

Eq. 11.4-2

Eq. 11.4-3

Eq. 11.4-4

Eq. 12.8-2

Eq. 12.8-3 need not exceed, $T < T_L$

Eq. 12.8-5 or 12.8-6 minimum

Section 11.4.8 Exception 2 Applied

Building Period Per Alternate Analysis

T (sec)

Per Geotech Report

F_a

F_v

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

$$S_{MS} = F_a S_s \quad \text{Eq. 11.4-1}$$

$$S_{M1} = F_v S_1 \quad \text{Eq. 11.4-2}$$

$$S_{DS} = \frac{2}{3} S_{MS} \quad \text{Eq. 11.4-3}$$

$$S_{D1} = \frac{2}{3} S_{M1} \quad \text{Eq. 11.4-4}$$

$$C_s = \frac{S_{DS}}{(R/I_e)} \quad \text{Eq. 12.8-2}$$

$$C_s = \frac{S_{D1}}{T(R/I_e)} \quad \text{Eq. 12.8-3}$$

$$C_s = \frac{S_{D1} T_L}{T^2 (R/I_e)} \quad \text{Eq. 12.8-4}$$

$$C_s \geq 0.044 S_{DS} I_e \quad \text{Eq. 12.8-5}$$

$$C_s \geq 0.01 \quad \text{Eq. 12.8-5}$$

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

$$F_{px} = \frac{\sum_{i=x}^n F_i}{\sum_{i=x}^n w_i} w_{px} \quad \text{Eq. 12.10-1}$$

$$F_{px} \geq 0.2 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-2}$$

$$F_{px} \leq 0.4 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-3}$$

Vertical Distribution ASD $\rho = 1$ k = 1.000

Level	h_x (ft)	W_x (k)	h_x^k (ft)	$W_x h_x^k$	Story Shear ASD			Diaphragm Force (ρ not included)				
					C_{vx} (%)	F_x (k)	SV (k)	$F_{px,calc}$	$F_{px,min}$	$F_{px,max}$	$F_{px,design}$	$\gamma = F_{px}/F_x$
Roof	21.0	50	21.0	1050	0.703	7.7	7.7	7.7	7.0	14.0	7.7	1.00
Main	8.5	52	8.5	444	0.297	3.3	11.0	5.6	7.3	14.6	7.3	2.24
Σ		102.2		1494		11.0						



Project _____
Seismic Criteria _____

DATE 8/3/2021
PROJ. # _____
DESIGN ENG
SHEET 2

SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 | 206.443.6212
 TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402 | 253.284.9470
 SWENSON SAY FAGET
 ssefengneers.com

L-1b

Wind Design - MWFRS

ASCE 7 Chapter 27 - Directional Procedure

Design Method	ASD
---------------	-----

Wind Coefficients

Exposure	C	
V=	110	mph
K_d =	0.85	Table 26.6-1
K_h =	0.92	Table 26.10-1
K_e =	1.00	Table 26.9-1
G=	0.85	26.9.4

Transverse Wind Pressures

L/B = 0.43 h/L = 0.68

Pressure Coefficients from Figure 27.3-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.50
Windward Roof	-1.05 / -0.18
Leeward Roof	-0.57

Location and Building Dimensions

Calculate Kzt?	Yes	
Kzt	1.00	
Roof Type	Gable	
Roof Angle - Transverse Dir	0	degrees
Roof Angle - Long Dir	24	degrees
Ground to top of roof	26	ft
Bot of roof to top of roof	7	ft
Mean Roof Height, h	22.5	ft
Short Plan Dimension	33	ft
Long Plan Dimension	77	ft
Parapet ?	No	
Ground to top of parapet		ft
Average Parapet Height		ft
Ht of 2nd Level Above Grade	8.5	ft

Velocity Pressure at Mean Roof Height, q_h =	24.3	psf
--	------	-----

Wall Pressures (Unfactored):

Ht	K_z	q_z	$P_{ww \text{ walls}}$	$P_{lw \text{ walls}}$	$P_{\text{walls (psf)}}$
0-15	0.85	22.34	15.19	10.33	15.3
15-20	0.9	23.65	16.08	10.33	15.8
20-25	0.94	24.70	16.80	10.33	16.3
25-30	0.98	25.75	17.51	10.33	16.7
30-40	1.04	27.33	18.58	10.33	17.3
41-50	1.09	28.64	19.48	10.33	17.9
51-60	1.13	29.69	20.19	10.33	18.3
61-70	1.17	30.75	20.91	10.33	18.7
71-80	1.21	31.80	21.62	10.33	19.2
81-90	1.24	32.58	22.16	10.33	19.5
91-100	1.26	33.11	22.52	10.33	19.7

Roof Pressures (Unfactored)

Windward		Leeward	Horiz Proj (psf)
Max	Min		
-3.7	-21.6	-11.8	4.80

Longitudinal Wind Pressures

L/B = 2.33 h/L = 0.29

Pressure Coefficients from Figure 27.4-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.28
Windward Roof	-0.24 / 0.26
Leeward Roof	-0.60

Wall Pressures (Unfactored):

Ht	K_z	q_z	$P_{ww \text{ walls}}$	$P_{lw \text{ walls}}$	$P_{\text{walls (psf)}}$
0-15	0.85	22.34	15.19	5.85	12.62
15-20	0.9	23.65	16.08	5.85	13.16
20-25	0.94	24.70	16.80	5.85	13.59
25-30	0.98	25.75	17.51	5.85	14.02
30-40	1.04	27.33	18.58	5.85	14.66
41-50	1.09	28.64	19.48	5.85	15.20
51-60	1.13	29.69	20.19	5.85	15.63
61-70	1.17	30.75	20.91	5.85	16.05
71-80	1.21	31.80	21.62	5.85	16.48
81-90	1.24	32.58	22.16	5.85	16.81
91-100	1.26	33.11	22.52	5.85	17.02

Roof Pressures (Unfactored)

Windward		Leeward	Horiz Proj (psf)
Max	Min		
5.4	-4.9	-12.4	4.80



Project _____
 Wind Criteria _____

DATE 8/3/2021
 PROJ. # _____
 DESIGN ENG
 SHEET 3

2124 Third Ave, Suite 100, Seattle, WA 98121 | ☎ 206.443.6212
 934 Broadway, Suite 100, Tacoma, WA 98402 | ☎ 253.284.9470
 SWENSON SAY FAGET SEATTLE TACOMA
 ☎ ssengineers.com

L-1c

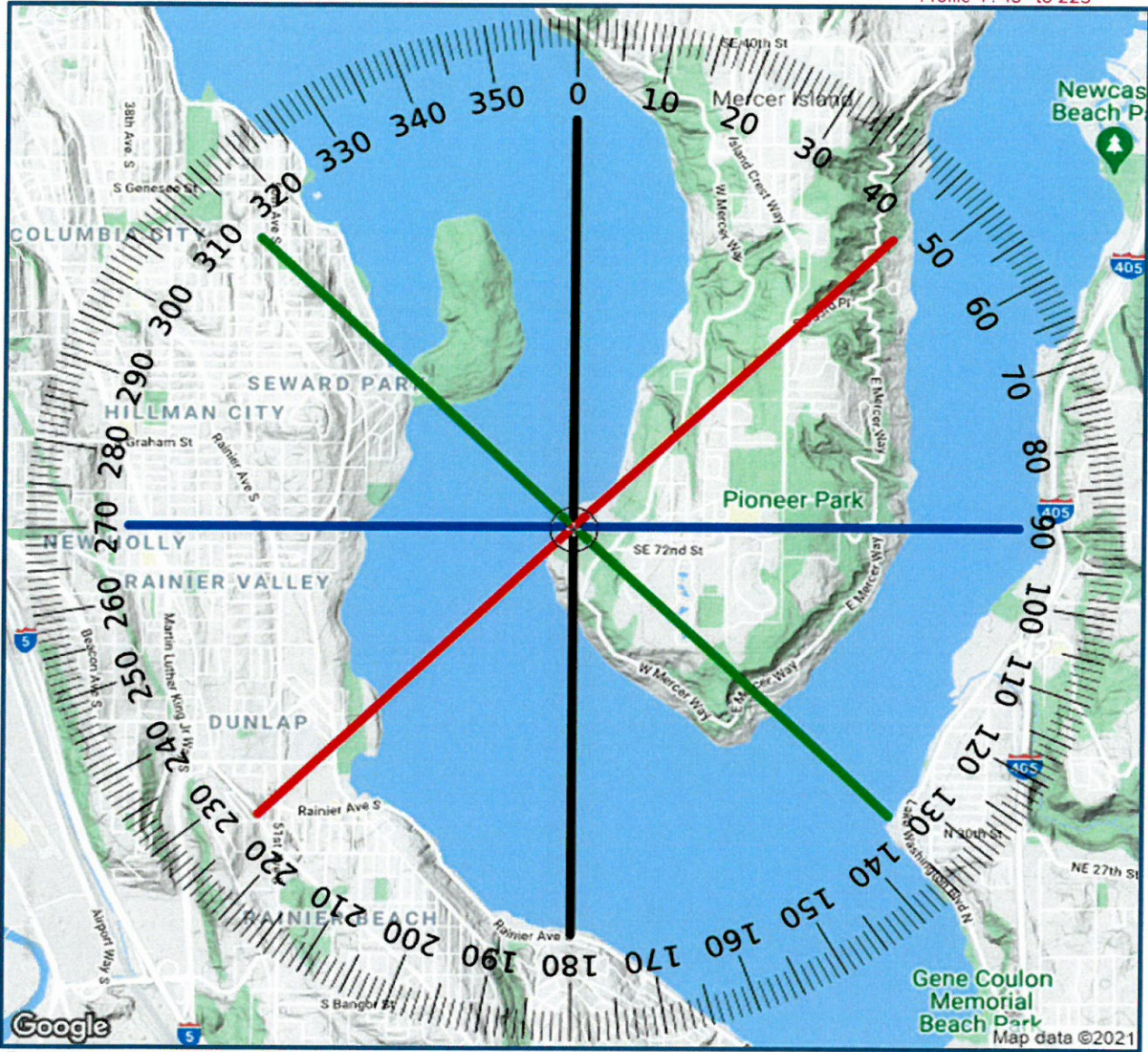
Site Address

Address 12 Meadow Lane
 City: Mercer Island State: WA
 Lat Long 47.54015 -122.2417

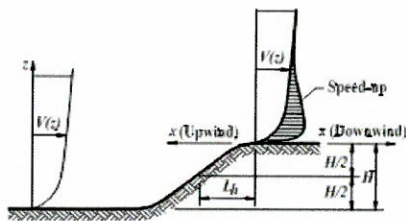
Wind Radius 2.00 Miles
 Angle 0°
 Exposure C

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

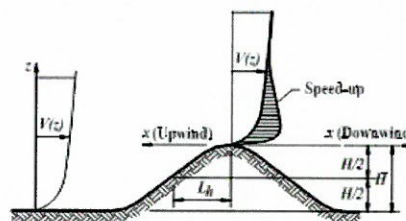
SITE MAP



Topography from Figure 26.8-1



ESCARPMENT



2-D RIDGE OR 3-D AXISYMMETRICAL HILL

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$

$$K_1 = \text{Per Figure}$$

$$K_2 = (1 - |x|/\mu L_h)$$

$$K_3 = e^{-\gamma z/L_h}$$

$$K_{zt} = 1, \text{ if } H/L_h \leq 0.2$$

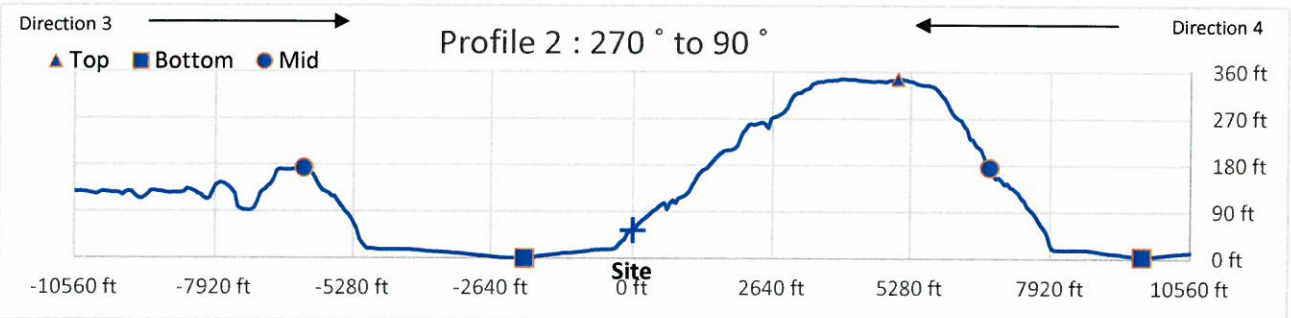
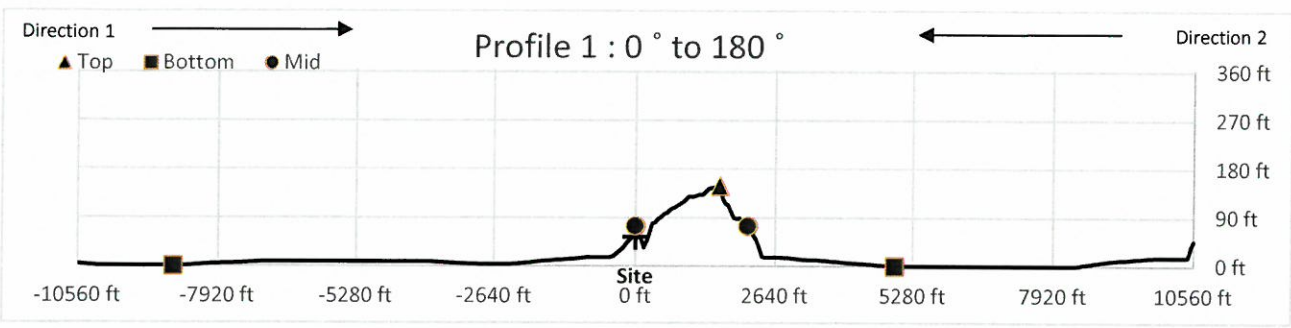
PER FIGURE 26.8-1



Project _____
 Kzt Calculations _____

DATE 8/3/2021
 PROJ. # _____
 DESIGN ENG
 SHEET 4

L-1d



Direction 1 - 0° to Site

Direction 2 - Site to 180°

Direction 3 - 270° to Site

Direction 4 - Site to 90°

Site Conditions (26.8.1)

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

Kzt=1

Site Conditions (26.8.1)

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

Kzt=1

Site Conditions (26.8.1)

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

Kzt=1

Site Conditions (26.8.1)

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

Kzt=1

Terrain Data

Terrain	Ridge
Top of Hill Dist.	1592
Bott. of Hill Dist.	-8756
L @ H/2	0
Site	upwind
Top of Hill Elev.	149
Bott. of Hill Elev.	0
Site Elev.	54.0
Site Dist.	0
H/2	74

Terrain Data

Terrain	Ridge
Top of Hill Dist.	1592
Bott. of Hill Dist.	4935
L @ H/2	2123
Site	downwnd
Top of Hill Elev.	149
Bott. of Hill Elev.	0
Site Elev.	54.0
Site Dist.	0
H/2	74

Terrain Data

Terrain	Hill
Top of Hill Dist.	5041
Bott. of Hill Dist.	-2016
L @ H/2	-6209
Site	upwind
Top of Hill Elev.	346
Bott. of Hill Elev.	0
Site Elev.	54.0
Site Dist.	0
H/2	173

Terrain Data

Terrain	Ridge
Top of Hill Dist.	5041
Bott. of Hill Dist.	9658
L @ H/2	6792
Site	downwnd
Top of Hill Elev.	346
Bott. of Hill Elev.	3
Site Elev.	54.0
Site Dist.	0
H/2	175

Kzt Calculations

H=	149
Lh=	1592
x=	1592
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.14
K2=	0.33
k3=	0.96
H/Lh =	0.09
Kzt =	1.00

Kzt Calculations

H=	149
Lh=	531
x=	1592
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.41
K2=	0.00
k3=	0.88
H/Lh =	0.28
Kzt =	1.00

Kzt Calculations

H=	346
Lh=	11250
x=	5041
z=	22.5
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.03
K2=	0.70
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

Kzt Calculations

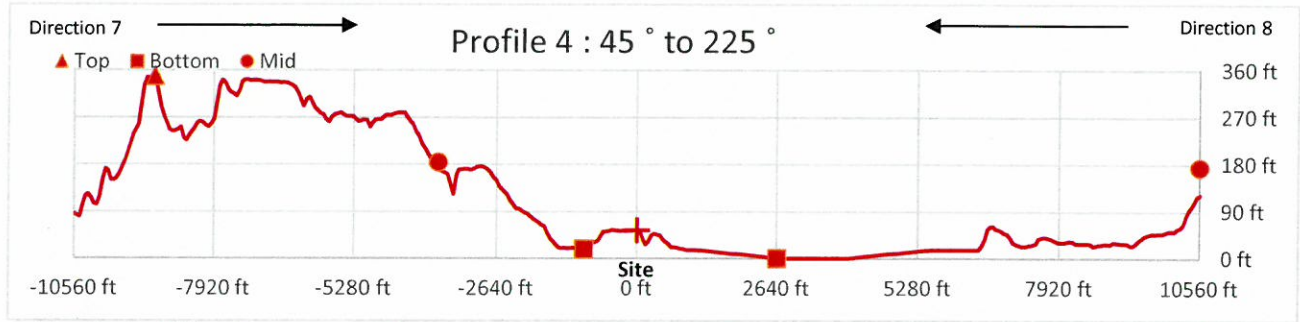
H=	343
Lh=	1751
x=	5041
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.28
K2=	0.00
k3=	0.96
H/Lh =	0.20
Kzt =	1.00



Project _____
Kzt Calculations _____

DATE 8/3/2021
PROJ. # _____
DESIGN ENG
SHEET 5

L-1e



Direction 5 - 315° to Site

Direction 6 - Site to 135°

Direction 7 - 45° to Site

Direction 8 - Site to 225°

Site Conditions (26.8.1)

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

Kzt=1

Site Conditions (26.8.1)

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

Kzt=1

Site Conditions (26.8.1)

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

Kzt=1

Site Conditions (26.8.1)

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

Kzt=1

Terrain Data

Terrain	Ridge
Top of Hill Dist.	4139
Bott. of Hill Dist.	-1963
L @ H/2	-9446
Site	upwind
Top of Hill Elev.	363
Bott. of Hill Elev.	0
Site Elev.	54.0
Site Dist.	0
H/2	182

Terrain Data

Terrain	Ridge
Top of Hill Dist.	4139
Bott. of Hill Dist.	8331
L @ H/2	5678
Site	downwind
Top of Hill Elev.	363
Bott. of Hill Elev.	0
Site Elev.	54.0
Site Dist.	0
H/2	182

Terrain Data

Terrain	Ridge
Top of Hill Dist.	-9021
Bott. of Hill Dist.	-1008
L @ H/2	-3715
Site	downwind
Top of Hill Elev.	349
Bott. of Hill Elev.	18
Site Elev.	54.0
Site Dist.	0
H/2	183

Terrain Data

Terrain	Ridge
Top of Hill Dist.	-9021
Bott. of Hill Dist.	2653
L @ H/2	10560
Site	upwind
Top of Hill Elev.	349
Bott. of Hill Elev.	0
Site Elev.	54.0
Site Dist.	0
H/2	174

Kzt Calculations

H=	363
Lh=	13585
x=	4139
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.04
K2=	0.80
k3=	1.00
H/Lh =	0.03
Kzt =	1.00

Kzt Calculations

H=	363
Lh=	1539
x=	4139
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.34
K2=	0.00
k3=	0.96
H/Lh =	0.24
Kzt =	1.00

Kzt Calculations

H=	330
Lh=	5306
x=	9021
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.09
K2=	0.00
k3=	0.99
H/Lh =	0.06
Kzt =	1.00

Kzt Calculations

H=	349
Lh=	19581
x=	9021
z=	22.5
μ=	1.5
γ=	3
K1 value =	1.45
K1=	0.03
K2=	0.69
k3=	1.00
H/Lh =	0.02
Kzt =	1.00

SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 | ☎ 206.443.6212
TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402 | ☎ 253.284.9470

SWENSON SAY FAGET | ssengineers.com

SWENSON SAY FAGET



Project _____
Kzt Calculations _____

DATE 8/3/2021
PROJ. # _____
DESIGN ENG
SHEET 6

L-1f

ONLY MODIFICATIONS: - NORTH MASTER BEDROOM
 - WEST WALL @ LOWER LEVEL

COMPUTE WIND FORCES

N/S DIRECTION

$$V_m = (10)(18)(13.6) + (4.5)(36)(13.2) = \underline{\underline{4587}} \#$$

$$V_L = (36)(8)(12.6) = \underline{\underline{3629}} \#$$

$$V_m = 7.7K$$

$$V_L = 3.3K$$

SEISMIC LOADS

$$\Sigma 8216 \#$$

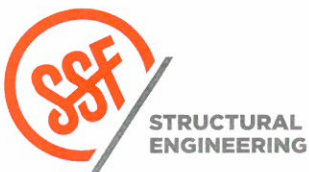
E/W DIRECTION

$$V_m = (10)(81)(4.8) + (12)(6)(13.6) + (4.5)(81)(13.2) = 9679 \#$$

$$V_L = (81)(8.5)(12.6) = 8675 \#$$

$$\Sigma 18,354 \#$$

WIND LOADS
E/W DIR



PROJECT

Kanter

DATE

8-3-21

PROJ. #

255

DESIGN

L-2

SHEET

N/S DIRECTION WALLS

MAIN

$V_u = 7700 \#$ 50% TO WEST ; 50% TO EAST

$1/2 V = 3850 \#$

WEST SIDE OF MBR ONLY

$V = \frac{3850}{24} = 160 \#/1$

(W6)
1/2" ply of w/ 8 @ 6" oc

EAST SIDE OF MBR ONLY

$V = \frac{3850}{38} = 101 \#/1$

(W6)
1/2" ply of w/ 8 @ 6" oc

Lower

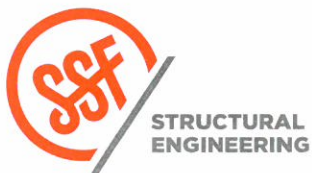
$V = 1100 \#$ $1/2 V = 5500 \#$

WEST SIDE

$V = \frac{5500}{26} = 212 \#/1$

(W6)
1/2" ply of w/ 8 @ 6" oc

(IN) WEST WALL SYSTEM ONLY



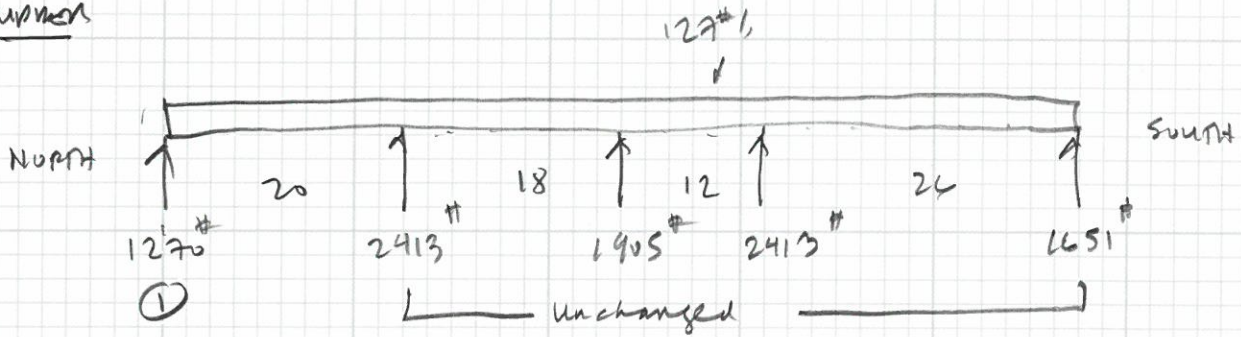
PROJECT Kanter

DATE 8-3-21
PROJ. # 1255
DESIGN L-3
SHEET

E/W DIRECTION

$$w = \frac{9679}{76} = 127 \#/\text{ft}$$

Upper



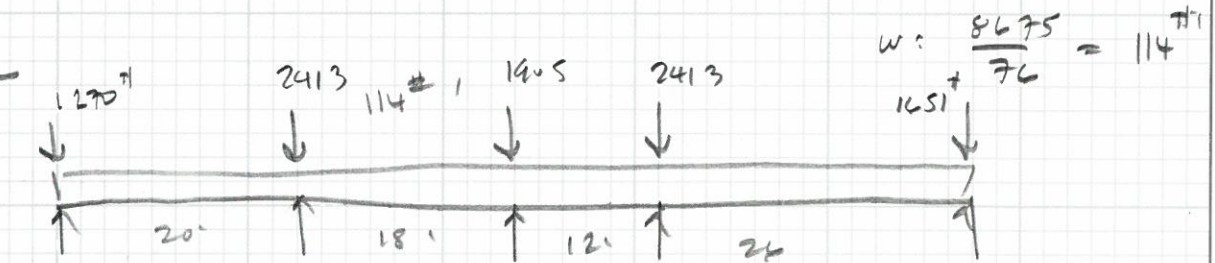
① North wall @ MASTER BR

$$V = \frac{1270}{7} = 181 \#/\text{ft}$$

WB

1/2" PY ONE SD
W/B D C L W

Lower



$$\begin{array}{r} 1270 \\ 1140 \\ \hline 2410 \end{array} \#$$

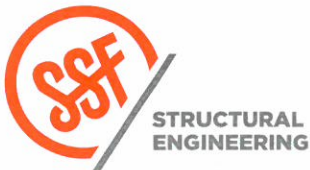
①

① $V = \frac{2410}{17} = 142 \#/\text{ft}$

WB

1/2" PY ONE SD
W/B D C L W

HDU 2 ea. end



PROJECT Kanter

DATE 8-9-21

PROJ. # 055

DESIGN L-4

SHEET