Structural Calculations for:

Day Residence Sunroom

7825 SE 76th Street
Mercer Island Washington

Client: Sturman Architects

5 November 2023

Index:

DC-	**Design Criteria**
KP-	**Key Plans**
LT-	**Lateral Analysis**
RF-	**Roof Framing**

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LOCATION

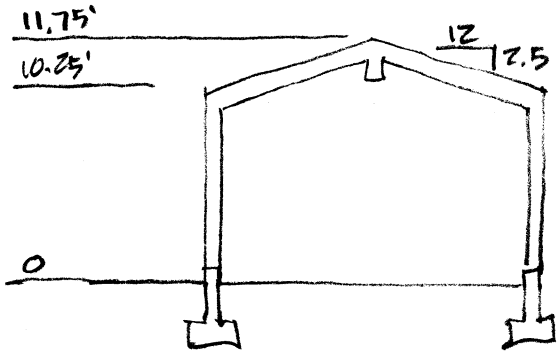
7825 SE 70TH STREET
MERCER ISLAND WASHINGTON

SEISMIC (SEAOC)

SEE DC.2

WIND (MERCER ISLAND WIND EXP MAP)

110 MPH (ULTD)
85 MPH (ASD)
EXPOSURE B
Kzt = 1.0



SECTION
NTS

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project: PAY RESIDENCE SUN ROOM

client: STORMAN ARCHIT.

date: 11-3-23

proj #: 2022-056

sheet: DC-1

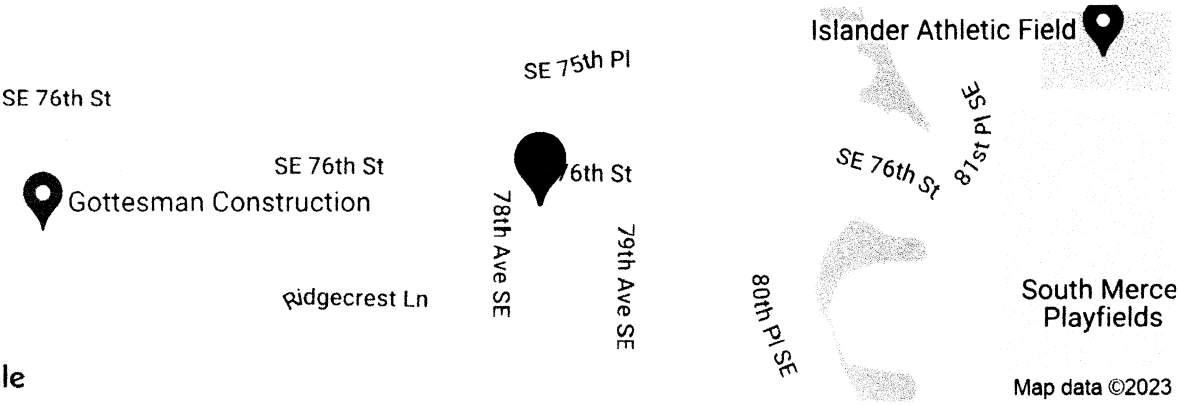
USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

OSHPD

Day Residence Sunroom

7825 SE 76th St, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5345683, -122.2346974



Date	11/3/2023, 2:17:35 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.471	MCE_R ground motion. (for 0.2 second period)
S_1	0.508	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.766	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.177	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.63	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.756	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	1.471	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.632	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	4.295	Factored deterministic acceleration value. (0.2 second)
S1RT	0.508	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.566	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.636	Factored deterministic acceleration value. (1.0 second)
PGAd	1.42	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.63	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.902	Mapped value of the risk coefficient at short periods
C_{R1}	0.898	Mapped value of the risk coefficient at a period of 1 s
C_V	1.394	Vertical coefficient

seismic loads (asce 7-16)

equiv lateral force procedure

risk factor	II	1.5-1
	I	
IMP. FACTOR	1	table 1.5-2
SITE CLASS	D	table 20.3-1
R =	6.5	table 12.2-1

S_s =	1.471		usgs maps
S_1 =	0.508		usgs maps
F_a =	1.2	table 11.4-1	
F_v =	null	see 11.4.8	
S_{DS}=	1.177		
S_{D1}=	null	see 11.4.8	
Cs=	0.181077	eqn 12.8-2	
Cs_{ASD}=	0.126754		

vertical design loads

criteria
asce 7-16
ibc 2018

dead loads

roofing	1	psf
5/8" plywood	1.9	psf
rafters/joists	3	psf
insulation/elec/mech	1	psf
solar panel allow.	4	psf
3/4" plywood	2.25	psf
	13.15	psf
use	15	psf

live loads

roof (snow)	25	psf		
floor (residential)	40	psf	deck (residential)	60 psf

soil bearing

1500	psf	assumed

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sturman architects

date: 03/11/2023
project #: 2022-056
design: nic
sheet: **dc-3**

wind loads (asce 7-16)

directonal procedure

			2.5:12 roof		
Exposure	B		Roof Angle =	11.77	degrees
V=	85	mph	Ground to top of roof	11.75	ft
K_d=	0.85	table 26.6-1	Bottom of roof to top of roof	1.5	ft
risk factor	1	table 1.5-1	(mean roof height) h=	11	ft
G=	0.85	26.9.1			

$K_{zt}= (1+K_1K_2K_3)^2 =$ **1.60**

Pressure Coefficients from Figure 6-6:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.5
Windward Roof	0
Leeward Roof	-0.6

*Note= Cp values are conservative worst case values

Pressures:

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lwwalls}$	**P_{walls} (psf)**
0-15	0.57	14.34	9.75	6.09	**15.84**
15-20	0.62	15.60	10.61	6.09	**16.70**
20-25	0.66	16.60	11.29	6.09	**17.38**
25-30	0.7	17.61	11.97	6.09	**18.07**
30-40	0.76	19.12	13.00	6.09	**19.09**

P_{roof} (psf)	
7.31	**2.5:12 rf**

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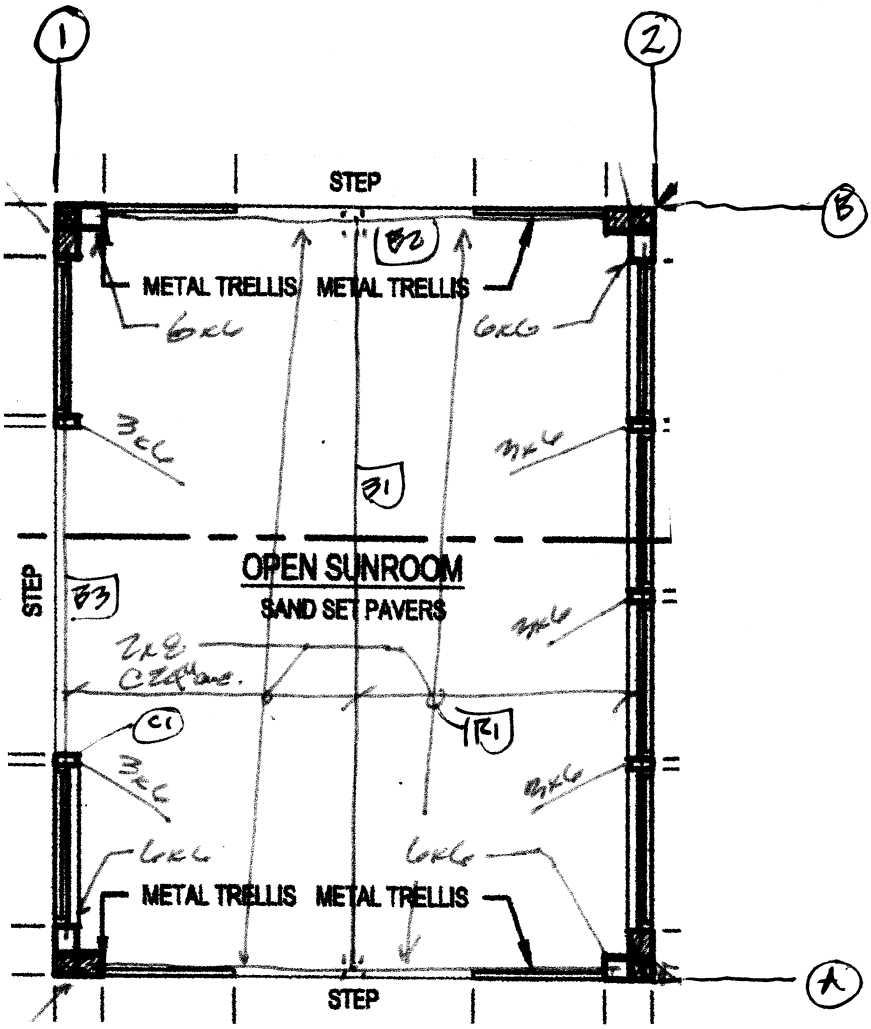

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sheet: KP-1

LATERAL

SEE DC - FOR DESIGN CRITERIA
& KP - FOR KEY PLANS.

SEISMIC

DIAPH ↓ ↓ TRIB WALLS

ROOF A = 200 ⌀ DL = 15 + 8 = 23 PSF

∴ W_{ROOF} = 4.6k

∴ E (ASD) = .58k

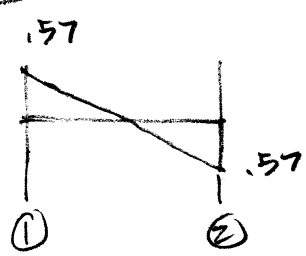
WIND

LONGIT	LATERAL
$\bar{w}_{1-2}$ = 91 plf	$\bar{w}_{A-B}$ = 94 plf
W_{LONG} = 1.14k	W_{LAT} = 1.50k

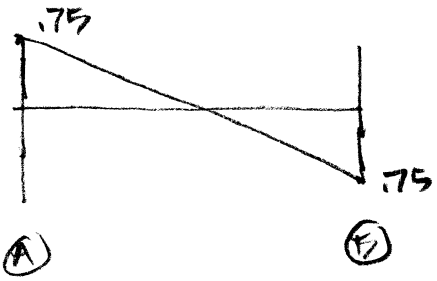
WIND CRITICAL BOTH DIRECTIONS

DIAPHRAGM

v_{diaph} = 36 plf

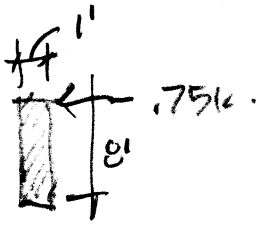


v_{diaph} = 60 plf



5/8" CDX
UNBLOCKED
w/ 8d @ 6"...

SHEAR WALLS



WSWH 12x8 - V_{allow} = 1.03k ✓

F_{HD} = 6.0k ± DL

FOR WIND CRITICAL
ANCHOR de = 6" ← D = 10.875
W = 16" USE 12" x 18"

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ROOF FRAMING
(SEE KP-1)

RAFTERS

R1 $l = 6'$
2x8 @ 24" o.c.

BEAMS

B1 $l = 15.75'$ $M = 7.75$ FT-K.
$w = .25$ K/F $V = 1.97$ K.

3 1/2 x 9 1/2 PSL

$\Delta TL = L/300$

USE 5 1/4 x 9 1/2 PSL

B2 $l = 11'$ $M = 5.42$ FT-K
$P = 1.97$ K $V = .99$ K.

3 1/2 x 9 1/2 PSL
$\Delta TL = L/769$

B3 $l = 7'$ $M = .92$ FT-K
$w = .15$ K/F $V = .53$ K.

3 1/2 x 9 1/2 PSL

COLUMNS

C1 $P_{MAX} = 1.0$ K.

TRY 3x6 (DF/L #2)
$l = 6.25'$ $E = 1.6E6$
$Fc = 1350$
$l/d = 30$
$\therefore F'c = 478$ psi
$fc = 73$ psi ✓

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