24-016305/326-REV-01-RS

Munzing
structural engineering

STRUCTURAL CALCULATIONS

Ishibashi Remodel Rev 3
(Garage Lateral Strengthening)
1809 NE 63rd Ave., Portland Oregon

Sora Design

LIMITATIONS

Engineer was retained in a limited capacity for this project. Design is based upon information provided by the client who is solely responsible for accuracy of same. No responsibility and/or liability is assumed by or is to be assigned to engineer for items beyond that shown on these sheets.

Project No. 23-151
September 10th, 2024

CLIENT: Sora Design
PROJECT: Ishibashi Remodel
PROJECT NUMBER: 23-151
DATE: 09/10/2024
BY: Munzing Structural Engineering

Design Criteria

General
Building Department .....City of Portland
Building Code/Year.....2021 IBC/2022 OSSC

Roof Loads
Snow Load.....25 psf
Dead Load .....15 psf

Wind Loads
Design Wind Speed (3-Sec Gust).....98 mph
Exposure.....B

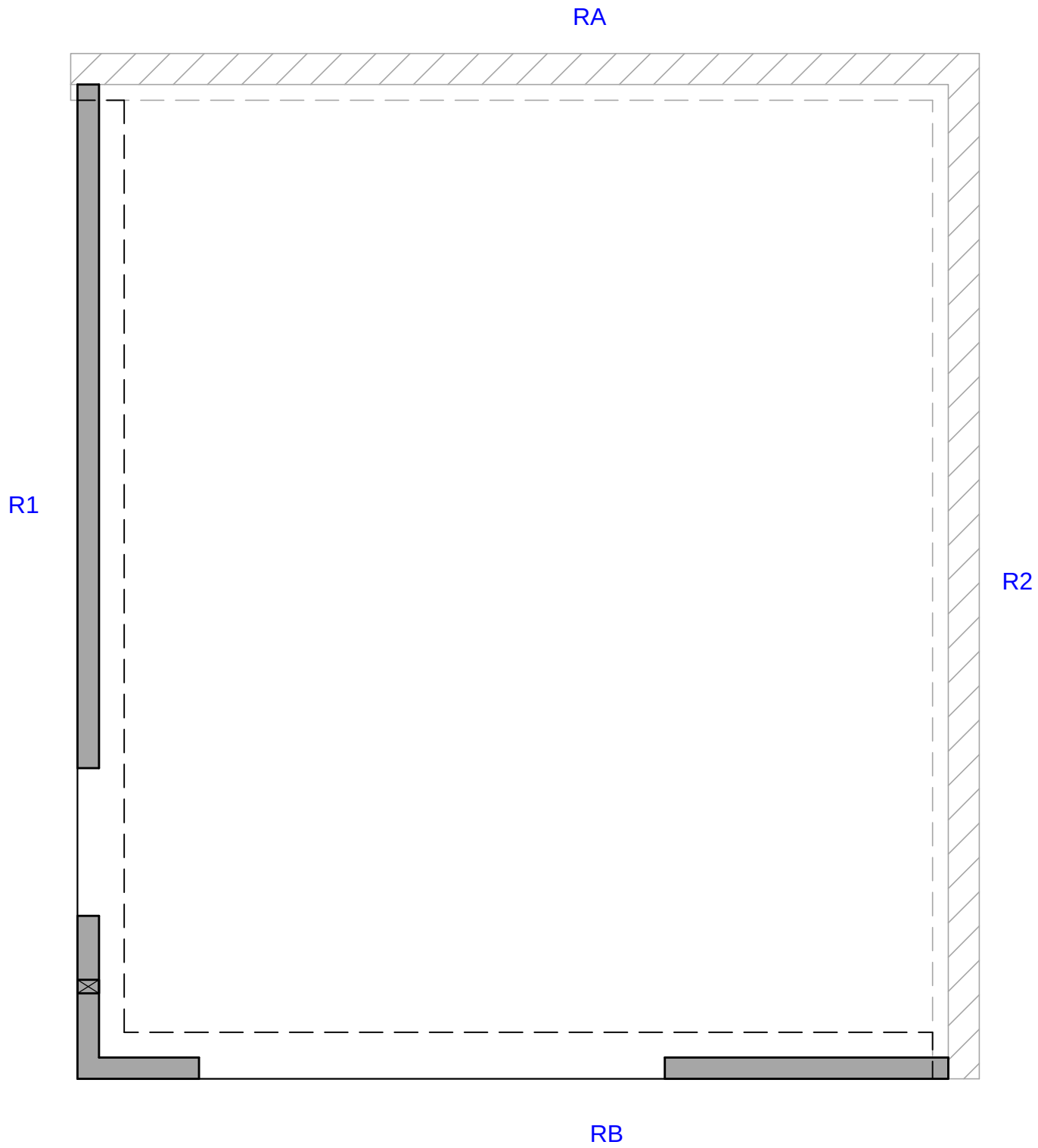
Seismic Loads
Project Site Zip Code.....97213
Seismic Soil Site Class .....D
Special Seismic Ordinances/Notes: None

Soil Parameters
Allowable Soil Bearing Pressure .....1500 psf
1/3 Increase for Wind/Earthquake forces? .....yes
Minimum Footing Depth.....18"
Active Pressure (unrestrained).....40 pcf
Active Pressure (restrained).....60 pcf
Passive Pressure .....250 pcf
Coefficient of Friction 0.35

Additional Ordinances/Notes:

Garage Voluntary Lateral Strengthening:

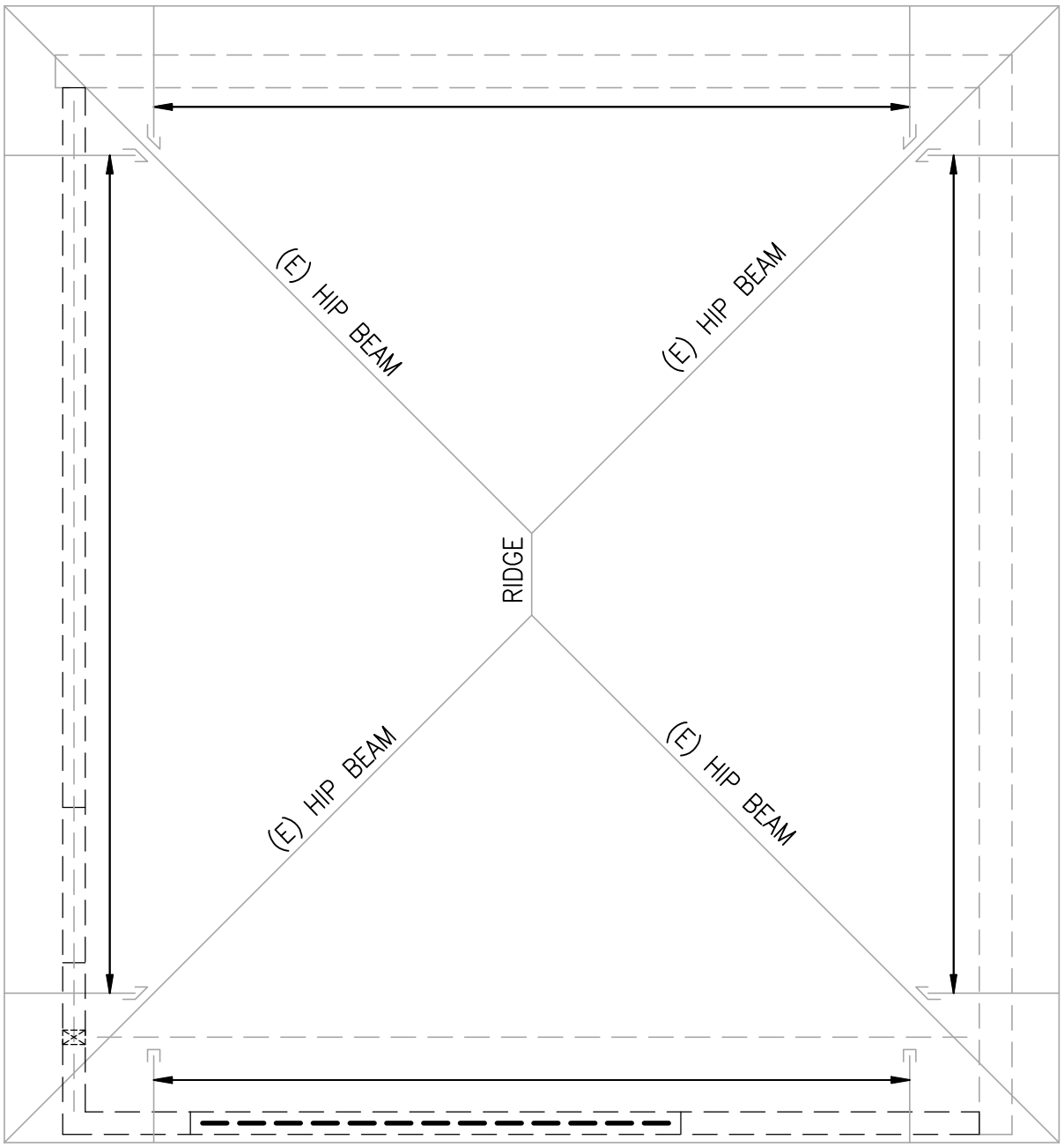
- The Existing North and West Exterior Garage walls consist of CMU block shearwalls. No changes proposed at these walls.
- The Existing South Exterior Garage wall consists of wood 4x posts sheathed with exterior horizontal 1x skip sheathing. The posts were found to have dry-rot at the bases, therefore a new 2x6 bearing / shearwall is proposed to replace the damaged posts. This shearwall is designed to support 50% of the design lateral forces
- The Existing East Exterior wall consisted of a cantilevered unreinforced masonry wall pier without any connection to the existing roof framing. A new 2x6 bearing / shearwall is proposed to replace cantilevered masonry wall pier. This shearwall is designed to support 50% of the design lateral forces.



GARAGE FLOOR FOUNATION PLAN

SCALE: 1/4"=1'-0"

N



GARAGE ROOF FRAMING PLAN

SCALE: $^1/_4$"=1'-0"

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

Search Information

Address: 1809 NE 63rd Ave, Portland, OR 97213, USA

Coordinates: 45.5356823, -122.5988436

Elevation: 205 ft

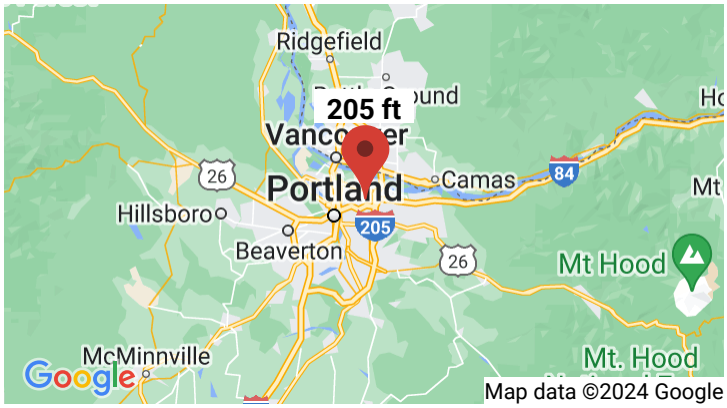
Timestamp: 2024-02-12T22:40:49.560Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default



Basic Parameters

Name	Value	Description
S_S	0.883	MCE_R ground motion (period=0.2s)
S_1	0.383	MCE_R ground motion (period=1.0s)
S_{MS}	1.059	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.706	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.878	Coefficient of risk (0.2s)
CR_1	0.865	Coefficient of risk (1.0s)

PGA	0.401	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.481	Site modified peak ground acceleration
T_L	16	Long-period transition period (s)
SsRT	0.883	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.005	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.775	Factored deterministic acceleration value (0.2s)
S1RT	0.383	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.443	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.71	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Lateral Design Criteria

Design per 2021 International Building Code (2022 Oregon Structural Specialty Code)

Ishibashi Garage

Structure Geometry:

Structure Heights:

Overall Structure Height =	10.00	ft
Mean Roof Height, h =	8.50	ft
1st Floor Wall Heights =	7.00	ft
Foundation to 1st Floor Walls =	0.00	in
Top of 1st Floor Walls =	7.00	ft
Fundimental Period, T_a =	0.09	≤ 1 → Rigid Structure

Roof Slope:

Short Direction Roof Slope =	4	: 12	→ 18.43	°
Long Direction Roof Slope =	4	: 12	→ 18.43	°

Plan Lengths and Areas:

Roof Diaphragm Length, L =	23	ft
1st Floor Structure Length, L =	22	ft
Roof Diaphragm Length, W =	21.5	ft
1st Floor Structure Width, W =	19.5	ft
A_{Roof} =	495	ft^2

Projected Areas:

Short Direction:

A_P (Roof) =	44	ft^2
A_{Pr} =	69	ft^2

Long Direction:

A_P (Roof) =	36	ft^2
A_{Pr} =	61	ft^2

Length of 1st Floor Walls:

Exterior Walls =	41.5	ft
Partition Walls =	0	ft
Party Walls =	0	ft
Masonry Walls =	41.5	ft

Structure Dead Load:

W_{Roof} =	7,425	lb
$W_{1st\ Walls}$ =	19,827	lb
$W_{@\ Roof\ Diaphragm}$ =	17,338	lb
W_{Total} =	**17,338**	**lb**

Typical Dead Loads:

Roof:

Asphalt Membrane	3	psf
½" Plywood Sheathing	2	psf
Wood Roof Framing	5	psf
Drop Ceiling Finishes	3	psf
Miscellaneous	2	psf
Roof Dead Load =	**15**	**psf**

Floors:

Finishes	2	psf
Topping Slabs	0	psf
¾" Plywood Sheathing	3	psf
Wood Floor Framing	5	psf
⅝" Gypsum Finishes	2	psf
Miscellaneous	3	psf
Floor Dead Load =	**15**	**psf**

Exterior Walls:

Horizontal Lap Siding	2	psf
½" Plywood Sheathing	2	psf
2x6 Studs @ 16" oc	3	psf
5½" Insulation	2.75	psf
⅝" Gypsum Finishes	2.5	psf
Miscellaneous	0	psf
Exterior Wall Dead Load =	**12.25**	**psf**

Partition Walls:

⅝" Gypsum Finishes	2.5	psf
2x4 Studs @ 16" oc	2	psf
3½" Insulation	1.75	psf
⅝" Gypsum Finishes	2.5	psf
Miscellaneous	0	psf
Partition Wall Dead Load =	**8.75**	**psf**

Party Walls:

(2) ⅝" Gypsum Finishes	5	psf
(2) 2x6 Studs @ 16" oc	6	psf
(2) 5½" Insulation	5.5	psf
(2) ⅝" Gypsum Finishes	5	psf
Miscellaneous	0	psf
Party Wall Dead Load =	**21.5**	**psf**

Masonry (Brick, CMU or Veneer)

8" CMU	56	psf
Miscellaneous	0	psf
Masonry Dead Load =	**56**	**psf**

Wind Lateral Design Analysis

Ishibashi Garage

Directionally Independent:

Design Parameters:

Building Category =	II	
Importance Factor, I_W =	1.00	
Basic Wind Speed (3-sec), V =	98	mph
Exposure Category =	B	
Directionality Factor, K_d =	0.85	
ω =	1	

Velocity Pressure Exposure Coefficient:

α =	7.0	
z_g =	1200	ft

Structure Height (ft)	8.5	15	20	25	30	40	50
$K_Z = 2.01*(z/z_g)^{2/\alpha}$ =	0.49	0.57	0.62	0.67	0.70	0.76	0.81

Topographic Factor:

2-D Ridge [ ] 2-D Escarp [X] 3-D Hill [ ] ("X" One Box)

Elevation Change, H =	55	ft	**< 60ft Topographic Factor NOT Required**
Crest to Mid-Height, L_h =	300	ft	
Dist from Crest, x =	50	ft	Downwind of Crest? [No] (Yes or No)

H / L_h = 0.18 **< 0.2 Topographic Factor NOT Required**

K_1 =	0.14	γ =	2.5
$K_2 = 1 - (\lvert x \rvert/\mu L_h)$ =	0.89	μ =	1.5

Structure Height (ft)	8.5	15	20	25	30	40	50
$K_3 = e^{(-\gamma z/L_h)}$ =	0.93	0.88	0.85	0.81	0.78	0.72	0.66
$K_{zt} = (1 + K_1 K_2 K_3)^2$ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Velocity Pressure:

Structure Height (ft)	8.5	15	20	25	30	40	50	
$q_Z = 0.00256 K_Z K_{zt} K_d V^2 I_w \omega$ =	10.21	12.01	13.04	13.90	14.64	15.90	16.94	psf

Directionally Dependent:

Gust Effect Factor:

G_S = 0.85 G_L = 0.85

External Pressure Coefficients:

Short Direction:	Windward	Leeward
Roof, C_P =	0.1	-0.55
Walls, C_P =	0.8	-0.50

Long Direction:	Windward	Leeward
Roof, C_P =	0.1	-0.55
Walls, C_P =	0.8	-0.47

Design Wind Pressures:

Short Direction:	Windward	Leeward	
$p_{Roof} = q_h G_S C_P$ =	0.87	-4.77	psf
$p_{Walls} = q_h G_S C_P$ =	See Below	-4.34	psf

Structure Height (ft)	8.5	15	20	25	30	40	50	
$p_{Walls} = q_Z G_S C_P$ =	6.94	8.17	8.87	9.45	9.96	10.81	11.52	psf

Long Direction:	Windward	Leeward	
$p_{Roof} = q_h G_S C_P$ =	0.87	-4.77	psf
$p_{Walls} = q_h G_S C_P$ =	See Below	-4.12	psf

Structure Height (ft)	8.5	15	20	25	30	40	50	
$p_{Walls} = q_Z G_S C_P$ =	6.94	8.17	8.87	9.45	9.96	10.81	11.52	psf

Base Shear:

Short Direction:

$V_{Roof} = \Sigma\, p\, A_P$ = .6 x [(.87+4.77) x 44 + (8.17+4.12) x 69] = 667 lb

Σ 667 lb

Long Direction:

$V_{Roof} = \Sigma\, p\, A_P$ = .6 x [(.87+4.77) x 36 + (8.17+4.12) x 61] = 571 lb

Σ 571 lb

Wind Lateral Force Distribution

Ishibashi Garage

Vertical Distribution:

	Long Direction		Long Direction	
V_{Roof} =	667	V_{Roof} =	571	lb

Short Direction

Roof:

Width = 23.00 ft

		Tributary Width (ft)	Wall Length (ft)	
RA =	333	11.5	19.5	(E) CMU WALL
RB =	333	11.5	8.5	

Long Direction

Roof:

Width = 21.50 ft

		Tributary Width (ft)	Wall Length (ft)	
R1 =	286	10.75	17.75	
R2 =	286	10.75	22	(E) CMU WALL

Seismic Lateral Design Analysis

Ishibashi Garage

Directionally Independent:

Design Parameters:

Structural Use Group =	II		
Importance Factor, I_E =	1.00		
Site Class =	D		
Fundimental Period, T_a =	0.09		
Ts =	0.69	→	1.5Ts > Ta, Cs to be determined by EQ 12.8-2

Allowable Story Drift:

No story drift requirements for single story structures.

Spectral Response Acceleration:

S_S =	88.3	%g
S_1 =	38.3	%g
$S_{MS} = S_S F_a$ =	106.0	%g
$S_{M1} = S_1 F_V$ =	73.4	%g
$S_{DS} = ⅔ S_{MS}$ =	70.6	%g
$S_{D1} = ⅔ S_{M1}$ =	48.9	%g
$0.2 S_{DS} / 1.4$ =	10.1	%g

Site Coefficients:

Fa =	1.20
Fv =	1.92

Seismic Design Category:

SDC (S_{DS}) =	D
SDC (S_{D1}) =	D
SDC (S_1) =	A
Controlling Case →	D

Vertical Distribution Factor:

Level	k	h_x	$(h_x)^k$	W_x	$(h_x)^k W_x$	$C_{vx} = \frac{(h_x)^k W_x}{\sum(h_x)^k W_x}$
Roof	1	7.00	7.00	17,338	121,368	1.000
				$\sum(h_x)^k W_x$ =	121,368	

Directionally Dependent:

	Short Direction			Long Direction		
Design Factors:						
Response Modification Factor, R =	6.5			R =	6.5	
System Overstrength Factor, Ω =	2.5			Ω =	2.5	
Deflection Amplification Factor, C_d =	4.0			C_d =	4.0	
Seismic Response Coefficient:						
(EQ 12.8-2) $C_S = 0.7 S_{DS} / (R/I)$ =	7.61	%	← ***Controls***	C_S =	7.61	% ← ***Controls***
(EQ 12.8-3) $C_S \le 0.7 S_{D1} / [T(R/I)]$ =	61.24	%		$C_S \le$	61.24	%
(EQ 12.8-5) $C_S > 0.6 (0.044 S_{DS} I)$ =	2.18	%		$C_S >$	2.18	%
(EQ 12.8-6) $C_S > (0.5 S_1) / 1.4(R/I)$ =	2.06	%		SDC = E or F→$C_S >$	2.06	%
Base Shear:						
$V = C_S W_{@ \text{ Roof Diaphragm}}$ =	1,319	lb		$V = C_S W_{@ \text{ Roof Diaphragm}}$ =	1,319	lb
$V_{Base} = C_S W_{Total}$ =	**1,319**	**lb**		**$V_{Base} = C_S W_{Total}$ =**	**1,319**	**lb**
Vertical Distribution:						
$V_{Roof} = C_{vRoof} V_{Base}$ =	1,319	lb		$V_{Roof} = C_{vRoof} V_{Base}$ =	1,319	lb

Seismic Lateral Force Distribution

Ishibashi Garage

Vertical Distribution:

Short Direction		Long Direction	
V_{Roof} =	1,319 lb	V_{Roof} =	1,319 lb

Short Direction

Roof:

Area = 495 ft^2

		Q_E (lb)	ρQ_E (lb)	Tributary Area (ft^2)	Wall Length (ft)		
RA	=	659		248	19.5	(E) CMU WALL	
RB	=	659		248	8.5		

ρ = 1.00 **NO REDISTRIBUTION REQUIRED**

Long Direction

Roof:

Area = 495 ft^2

		Q_E (lb)	ρQ_E (lb)	Tributary Area (ft^2)	Wall Length (ft)		
R1	=	659		248	17.75		
R2	=	659		248	22	(E) CMU WALL	

ρ = 1.00 **NO REDISTRIBUTION REQUIRED**

Short Direction Lateral Analysis - 2nd Floor Shearwalls

RB v = (659 / 8.5) = 109 plf ≤ 260plf

Use 15/32" APA Rated Plywood
w/ 8d at 6" o.c. edges, 12" o.c. field

Total Wall Length = 8.50 ft

Critical Wall Length = 2.50 ft **(2w / h) = 0.71**

1st Floor Wall Height = 7.00 ft V_{Roof} = 659 lb ← **Seismic Controls**

M_{OT} = (659 / 8.5) x 2.5 x 7 = 1,358 ft*lbs

	Weight(psf)		Trib Width (ft.)		Length (ft.)		Arm (ft)		M_{Res} (ft*lbs)	
M_{Res}=	12.25	x	7.00	x	2.5	x	1.25	=	268	Wall
	15	x	4	x	2.5	x	1.25	=	188	Roof
	0.00	x	0	x	2.5	x	1.25	=	0	Uplift on Roof
	0	x	0	x	2.5	x	1.25	=	0	
	0	x	0	x	2.5	x	1.25	=	0	
	0	x	0	x	2.5	x	1.25	=	0	
									0	No Wall Above
Mres=								∑	455	

H.D. = [1,358 - (0.7 - 0.101) x 455] / 2.5 = 434 lbs.

No Holdown Required

Long Direction Lateral Analysis - 2nd Floor Shearwalls

R1	v = (659 / 17.75) =	40	plf	≤ 260plf	Use 15/32" APA Rated Plywood w/ 8d at 6" o.c. edges, 12" o.c. field	
	Total Wall Length =	17.75	ft			
	Critical Wall Length =	3.25	ft	**(2w / h) = 0.93**		
	1st Floor Wall Height =	7.00	ft	V_{Roof} = 659	lb	← **Seismic Controls**

M_{OT} = (659 / 17.75) x 3.25 x 7 = 845 ft*lbs

	Weight(psf)		Trib Width (ft.)		Length (ft.)		Arm (ft)		M_{Res} (ft*lbs)	
M_{Res}=	12.25	x	7.00	x	3.25	x	1.625	=	453	Wall
	15	x	4	x	3.25	x	1.625	=	317	Roof
	0.00	x	0	x	3.25	x	1.625	=	0	
	15	x	4	x	2	x	13	=	1,560	
	0	x	0	x	3.25	x	1.625	=	0	
	0	x	0	x	3.25	x	1.625	=	0	
									0	No Wall Above
Mres=								∑	2,330	

H.D. = [845 - (0.7 - 0.101) x 2,330] / 3.25 = 0 lbs. No Holdown Required

F.S. = 2.76

Project Title:
Engineer:
Project ID:
Project Descr:

Multiple Simple Beam

Project File: 23-151 calculations.ec6

LIC# : KW-06017099, Build:20.23.08.30 | Munzing Structural Engineering | (c) ENERCALC INC 1983-2023

Description : Garage Roof 1

Wood Beam Design : Garage Header

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **5.50 X 3.50, Sawn, Fully Braced**

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 1.0 ft

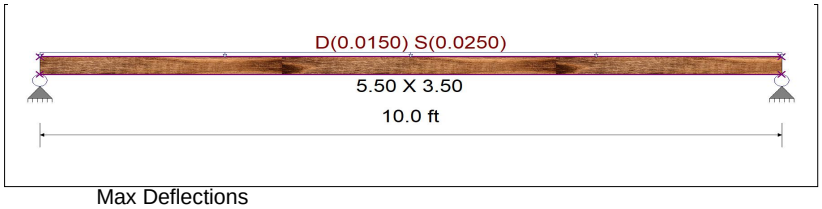
Design Summary

Max fb/Fb Ratio = **0.397** : 1
fb : Actual : 534.32 psi at 5.000 ft in Span # 1
Fb : Allowable : 1,345.50 psi
Load Comb : +D+S

Max fv/FvRatio = **0.071** : 1
fv : Actual : 14.75 psi at 9.733 ft in Span # 1
Fv : Allowable : 207.00 psi
Load Comb : +D+S

Max Reactions (k)

	D	Lr	L	S	W	E	H
Left Support	0.08			0.13			
Right Support	0.08			0.13			



Max Deflections

Transient Downward	0.180 in	Total Downward	0.288 in
Ratio	667	Ratio	416
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC: