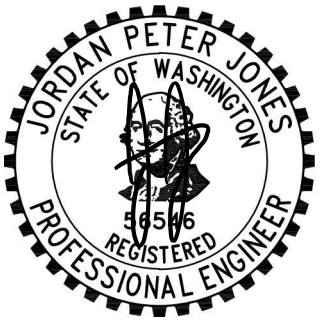
STRUCTURAL CALCULATIONS

Morishima Addition



Mercer Island, WA
February 10th, 2024

Prepared by:
Jordan Jones, P.E.

JP JONES
ENGINEERING

711 Saint Helens, Suite #208

Tacoma, WA

253.448.7331

Design Criteria

Project Address: 7650 Ridgecrest Lane, Mercer Island, WA 98040

Codes:

Structural: IBC 2021
Loading: ASCE 7-16
Wood: NDS 2018
Concrete: ACI 318-19

Occupancy:

Risk Category II

Seismic Load Summary:

Analysis Procedure: Equivalent Lateral Force
Lateral System: Wood Structural Panels

R = 6.5
Cd = 4

Ss = 1.473
S1 = 0.508

Wind Load Summary:

V = 98 mph Kzt = 1.0

Dead Loads:

Roof		Floor	
Roofing	2.5 psf	Finish	1 psf
½" Sheathing	1.8 psf	¾" plywood	2.4 psf
Trusses @ 24" oc	2.5 psf	Joists	2.8 psf
Misc/Mech	1.5 psf	Mech/Misc	1.5 psf
Ceiling Finish	2.8 psf	SUM = 7.7 psf → use 10psf	
SUM = 11.1 psf → use 15 psf			

Live Loads:

Snow: 25 psf
Live: 40 psf
Deck: 60 psf

Soils:

Allowable Soil Bearing = 1,500 (assumed)

JP JONES ENGINEERING
711 ST Helens Ave, STE #208
Tacoma, WA
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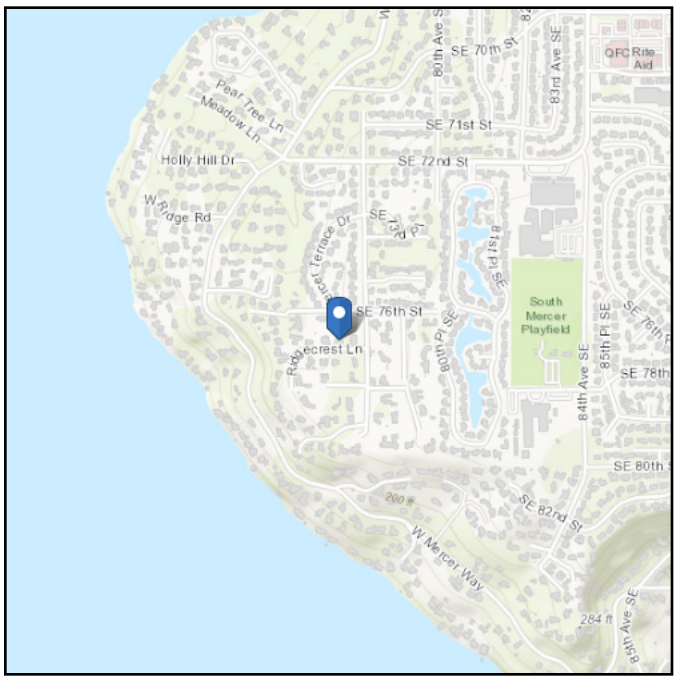
PROJECT: _____

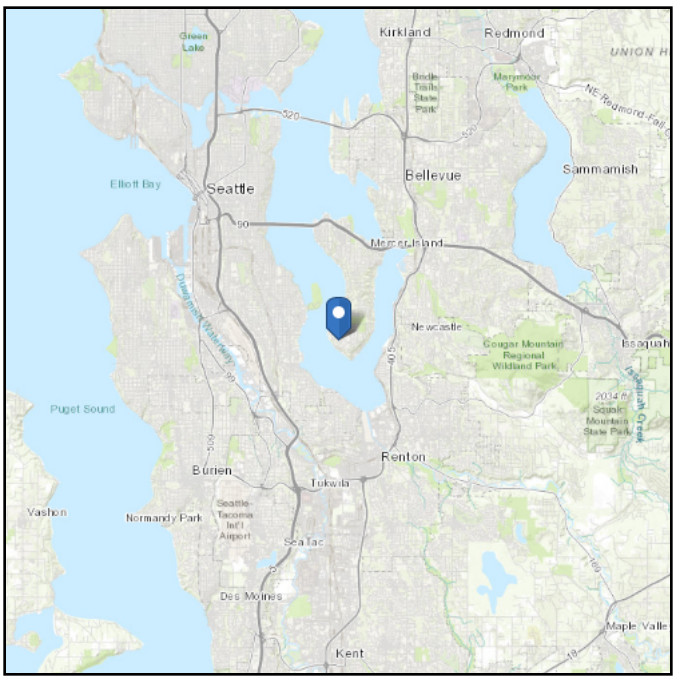
ASCE Hazards Report

Address:
7650 Ridgecrest Ln
Mercer Island, Washington
98040

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 47.534146
Longitude: -122.235948
Elevation: 281.9131205500909 ft (NAVD 88)





Wind

Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	74 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Fri Jan 03 2025

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.473	S_{D1} :	N/A
S_1 :	0.508	T_L :	6
F_a :	1.2	PGA :	0.63
F_v :	N/A	PGA_M :	0.756
S_{MS} :	1.767	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.178	C_v :	1.395

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

Data Accessed: Fri Jan 03 2025

Date Source: USGS Seismic Design Maps

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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WoodWorks® Shearwalls

SOFTWARE FOR WOOD DESIGN

WoodWorks® Shearwalls 13.1.2

Untitled **Jan. 3, 2025 14:56:15**

Project Information

COMPANY AND PROJECT INFORMATION

Company	Project
JP Jones Engineering 711 Saint Helens STE 208 Tacoma, WA	Morishima

DESIGN SETTINGS

Design Code	Wind Standard	Seismic Standard
IBC 2021/AWC SDPWS 2021	ASCE 7-16 Directional (All heights)	ASCE 7-16

Load Combinations		Building Code Capacity Modification	
For Design and MWFRS Deflection	For Deflection (Wind:Serviceability)	Wind	Seismic
0.7 Seismic + 0.6 Dead	1.0 Seismic + 0.9 Dead	1.00	1.00
0.6 Basic wind + 0.6 Dead	1.0 MRI wind + 1.0 Dead		

Service Conditions and Load Duration				Max Shearwall Offset [ft]	
Duration Factor	Temperature Range	Moisture Content		Plan (within story)	Elevation (between stories)
		Fabrication	Service		
1.60	T<=100F	(<=19%)	(<=19%)	0.50	-

Maximum Height-to-width Ratio

Wood panels		Fiberboard	Lumber		Gypsum	
Blocked	Unblocked		Wind	Seismic	Blocked	Unblocked
3.5	2.0	-	-	-	2.0	1.5

Ignore shear resistance contribution of...		Forces based on...	
Wall segments	Seismic	Hold-downs	Applied loads
Side with invalid aspect ratio	Any gypsum, lumber, fiberboard	Drag struts	Applied loads

Shearwall relative rigidity: Wall capacity

Non-identical materials and construction on the shearline: Allowed, except for material type

Deflection Equation: No deflection analysis

Drift limit for wind design: 1 / 500 story height

FTAO strap: Continuous at top of highest opening and bottom of lowest

Dead load in chord force for overturning design

Tension end	Compression end	When completely counteracts overturning
Wall length / 2	Wall length / 2	Wall length / 2

SITE INFORMATION

Wind		Seismic	
ASCE 7-16 Directional (All heights)		ASCE 7-16 12.8 Equivalent Lateral Force Procedure	
Design Wind Speed	98 mph	**Risk Category**	Category II - All others
Serviceability Wind Speed	98 mph	**Structure Type**	Regular
Exposure	Exposure D	**Building System**	Bearing Wall
Enclosure	Partially open	**Design Category**	D
Min Wind Loads: Walls	16 psf	**Site Class**	D
Roofs	8 psf		

Topographic Information [ft]

Shape	Height	Length
2-D Escarpment	289	689

Site Location: 633ft Upwind of crest

Elev: 281ft

Rigid building - Static analysis

Case 2	E-W loads	N-S loads
Eccentricity (%)	15	15
Loaded at	75%	

Spectral Response Acceleration

S1: 0.508g **Ss:** 1.473g

Fundamental Period	E-W	N-S
T Used	0.123s	0.123s
Approximate Ta	0.123s	0.123s
Maximum T	0.172s	0.172s
Response Factor R	6.50	6.50

Fa: 1.00 **Fv:** 1.79

Structural Data

STORY INFORMATION

	Story Elev [ft]	Floor/Ceiling Depth [in]	Wall Height [ft]
Ceiling	10.50	0.0	
Level 1	2.00	0.0	8.50
Foundation	2.00		

BLOCK and ROOF INFORMATION

Block Dimensions [ft]			Roof Panels Face	Type	Slope	Overhang [ft]
Block 1	1 Story	E-W Ridge				
Location X,Y =	0.25	-31.25	**North**	Side	23.0	1.00
Extent X,Y =	18.17	26.25	**South**	Side	23.0	1.00
Ridge Y Location, Offset	-18.12	0.00	**East**	Gable	90.0	0.00
Ridge Elevation, Height	16.07	5.57	**West**	Gable	90.0	1.00

SHEATHING MATERIALS by WALL GROUP

Grp	Surf	Material	Ratng	Sheathing Thick in	GU in	Ply	Or	Gvtv lbs/in	Fasteners Size	Type	RS	Eg in	Fd in	Bk	Apply Notes
1	Ext	Struct Sh OSB	24/0	7/16	-	-	Horz	77500	8d	Common	N	6	12	Y	1,3
	Int	Gyp. wallboard		1/2	-	1	Horz	40000	5d	Cooler	N	7	7	Y	5

Legend:
Grp – Wall Design Group number, used to reference wall in other tables (created by program)
Surf – Exterior or interior surface when applied to exterior wall
Ratng – Span rating, see SDPWS Table C4.2.3C
Thick – Nominal panel thickness
GU - Gypsum underlay thickness
Ply – Number of plies (or layers) in construction of plywood sheets
Or – Orientation of longer dimension of sheathing panels or lumber planks. Dbl. = Double diagonal.
Gvtv – Shear stiffness in lb/in. of depth from SDPWS Tables C4.2.3A-B
Type – Fastener type from SDPWS Tables 4.3A-D:
Common: common wire nail; Box: galvanized box nail; Casing: casing nail; Roof: galvanized roofing nail; Cooler: cooler nail; WBoard: wallboard nail; Screw: drywall screw; Gauge: nail measured by gauge; Galv: galvanized gauge nail; GWB: Gypsum wallboard blued nail
Size - From Tables 4.3A-D and Table A1; shown in Wall Input fastener dropdown
Common nails: 6d = 0.113 x 2", 8d = 0.131 x 2.5", 10d = 0.148 x 3", 12d = 0.148 x 3.5"
Box or casing nails: 6d = 0.099 x 2", 8d = 0.113 x 2.5", 10d = 0.128 x 3", 12d = 0.126 x 3.5"
Gauge, roofing and GWB nails: 13 ga = 0.92" x 1-1/8"; 11 ga = 0.120" x 1-1/8" (GWB nail for gypsum lath & plaster), 1-1/4" (gyp. L&P), 1-1/2" (wire lath & plaster, 1/2" fiberboard ,1/2" GWB), 1-3/4" (GSB, 5/8" GWB, 25/32" fiberboard, 2-ply GWB base), 2-3/8" (2-ply GWB face)
Cooler or wallboard nail: 5d = .086" x 1-5/8"; 6d = .092" x 1-7/8"; 8d = .113" x 2-3/8"; 6/8d = 6d base ply, 8d face ply for 2-ply GWB.
Drywall screws: No. 6, 1-1/4" long.
RS – Ring-shank nails (non-shearwalls only), with increased withdrawal capacity as per NDS 12.2.3.2.
Eg – Panel edge fastener spacing. For lumber sheathing, no. of nails per board at shear wall boundary. For 2-ply GWB, spacing of all nails in face ply.
Fd – Field spacing interior to panels. For lumber sheathing, no. of nails per board at interior studs. For 2-ply GWB, spacing of all nails in face ply.
Bk – Sheathing is nailed to blocking at all panel edges; Y(es) or N(o)
Apply Notes – Notes below table legend which apply to sheathing side

Notes:
1.Capacity has been reduced for framing specific gravity according to SDPWS Table 4.3A Note 3. A factor of 0.93 is applied for Hem.-Fir framing and 0.92 for S.-P.-F. For other materials with specific gravity G less than 0.5, it is G + 0.5.
3. Shear capacity for current design has been increased to the value for 15/32" sheathing with same nailing because stud spacing is 16" max. or panel orientation is horizontal. See SDPWS Table 4.3A Note 2.
5. This material does not contribute to seismic shear resistance because the Design setting for ignoring contribution was set.

FRAMING MATERIALS and STANDARD WALL by WALL GROUP

Wall Grp	Species	Grade	b in	d in	Spcg in	SG	E psi^6	Fcp	Standard Wall
1	Hem-Fir	Stud	1.50	5.50	16	0.43	1.20	405	

Legend:
Wall Grp – Wall Design Group
b – Stud breadth (thickness)
d – Stud depth (width)
Spcg – Maximum on-centre spacing of studs for design, actual spacing may be less.
SG – Specific gravity
E – Modulus of elasticity
Standard Wall - Standard wall designed as group.
Fcp - Compressive strength perpendicular to grain

Notes:
Check manufacture requirements for stud size, grade and specific gravity (G) for all shearwall hold-downs.
The following factors are applied to Fcp for compressive design and deformation under wall segment end studs :
Bearing area factor Cb from NDS 3.10.4, under window openings.

SHEARLINE, WALL and OPENING DIMENSIONS

North-south Shearlines	Type	Wall Group	Location X [ft]	Extent [ft] Start	Extent [ft] End	Length [ft]	FHS [ft]	Aspect Ratio	Height [ft]	Studs S	Studs N
Line 1											
Level 1											
Line 1		1	0.25	-31.25	-5.00	26.25	26.25	-	8.50	-	-
Wall 1-1	FT	1	0.25	-31.25	-5.00	26.25	26.25	-	-	2	2
Segment 1		-	-	-31.25	-29.50	1.75	-	2.57	-	-	-
Opening 1		-	-	-29.50	-27.83	1.67	-	-	4.50	-	-
Segment 2		-	-	-27.83	-18.50	9.33	9.08	0.48	-	-	-
Opening 2		-	-	-18.50	-17.25	1.25	-	-	4.50	-	-
Segment 3		-	-	-17.25	-10.75	6.50	6.25	0.69	-	-	-
Opening 3		-	-	-10.75	-9.58	1.17	-	-	4.00	-	-
Segment 4		-	-	-9.58	-5.00	4.58	4.33	0.98	-	-	-
Line 2											
Level 1											
Line 2	NSW		18.42	-31.25	-5.00	26.25	0.00	-	8.50	-	-
Wall 2-1	NSW		18.42	-31.25	-5.00	26.25	0.00	0.32	-	2	2

East-west Shearlines	Type	Wall Group	Location Y [ft]	Extent [ft] Start	Extent [ft] End	Length [ft]	FHS [ft]	Aspect Ratio	Height [ft]	Studs W	Studs E
Line A											
Level 1											
Line A		1	-31.25	0.25	18.42	18.17	18.17	-	8.50	-	-
Wall A-1	FT	1	-31.25	0.25	18.42	18.17	18.17	-	-	2	2
Segment 1		-	-	0.25	5.08	4.83	4.58	0.93	-	-	-
Opening 1		-	-	5.08	13.17	8.08	-	-	4.50	-	-
Segment 2		-	-	13.17	18.42	5.25	5.00	0.86	-	-	-
Line B											
Level 1											
Line B		1	-5.00	0.25	18.42	18.17	18.17	-	8.50	-	-
Wall B-1	FT	1	-5.00	0.25	18.42	18.17	18.17	-	-	2	2
Segment 1		-	-	0.25	1.75	1.50	-	2.67	-	-	-
Opening 1		-	-	1.75	4.75	3.00	-	-	4.00	-	-
Segment 2		-	-	4.75	12.17	7.42	7.17	0.54	-	-	-
Opening 2		-	-	12.17	14.42	2.25	-	-	4.00	-	-
Segment 3		-	-	14.42	18.42	4.00	3.75	1.00	-	-	-

Legend:
Type – Seg: Segmented, Prf: Perforated, FT: FTAO (force transfer around openings), NSW: Non-shearwall, NW: Non-wood/Proprietary, ND: Not designed
Location – Position in structure perpendicular to wall
Length – Shear line: Distance between exterior perpendicular walls defining the shear line extent
Wall, segment, or opening: End-to-end length of the element
FHS – Depending on element, shows different definitions of full-height sheathing length (FHS):
Shear lines with multiple walls, segmented walls, or FTAO walls: Total shear-resisting FHS
Individual wall segments or walls without openings: Distance between hold-downs beff
Perforated walls: Sum of factored segment lengths bi defined in SDPWS 4.3.5.6
Aspect Ratio – Ratio of wall height to segment length (h/b); for FTAO walls, the aspect ratio of the central pier
Wall Group – Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall
Studs: Number of end studs at the south and north or west and east ends of a wall segment or a perforated or FTAO wall.
If two wall group numbers listed, they are for rigid diaphragm and flexible diaphragm design.

Loads

WIND SHEAR LOADS (as entered or generated)

Level 1 Block	F	Element	Load Case	Wnd Dir	Surf Dir	Prof	Location [ft] Start	Location [ft] End	Magnitude [lbs,plf,psf] Start	Magnitude [lbs,plf,psf] End	Trib Ht [ft]
Block 1	W	Wall	1	W->E	Wind	Line	-31.25	-5.00	81.3		
Block 1	W	L Gable	1	W->E	Wind	Line	-31.25	-18.12	0.0	106.3	
Block 1	W	R Gable	1	W->E	Wind	Line	-18.12	-5.00	106.3	0.0	
Block 1	E	L Gable	1	W->E	Lee	Line	-31.25	-18.12	0.0	66.3	
Block 1	E	Wall	1	W->E	Lee	Line	-31.25	-5.00	50.6		
Block 1	E	R Gable	1	W->E	Lee	Line	-18.12	-5.00	66.3	0.0	
Block 1	W	L Gable	1	E->W	Lee	Line	-31.25	-18.12	0.0	66.3	
Block 1	W	Wall	1	E->W	Lee	Line	-31.25	-5.00	50.6		
Block 1	W	R Gable	1	E->W	Lee	Line	-18.12	-5.00	66.3	0.0	
Block 1	E	L Gable	1	E->W	Wind	Line	-31.25	-18.12	0.0	106.3	
Block 1	E	Wall	1	E->W	Wind	Line	-31.25	-5.00	81.3		
Block 1	E	R Gable	1	E->W	Wind	Line	-18.12	-5.00	106.3	0.0	
Block 1	S	Roof	1	S->N	Wind	Line	-0.75	18.42	16.8		
Block 1	S	Wall	1	S->N	Wind	Line	0.25	18.42	81.3		
Block 1	N	Roof	1	S->N	Lee	Line	-0.75	18.42	85.7		
Block 1	N	Wall	1	S->N	Lee	Line	0.25	18.42	41.6		
Block 1	S	Roof	1	N->S	Lee	Line	-0.75	18.42	85.7		
Block 1	S	Wall	1	N->S	Lee	Line	0.25	18.42	41.6		
Block 1	N	Roof	1	N->S	Wind	Line	-0.75	18.42	16.8		
Block 1	N	Wall	1	N->S	Wind	Line	0.25	18.42	81.3		

Legend:
Block - Block used in load generation
Accum. = loads from one block combined with another
Manual = user-entered loads (so no block)
F - Building face (north, south, east or west)
Element - Building surface on which loads generated or entered
Load Case - One of the following:
ASCE 7 All Heights: Case 1 or 2 from Fig 27.3-8 or minimum loads from 27.1.5
ASCE 7 Low-rise: Reference corner and Case A or B from Fig 28.3-1 or minimum loads from 28.3.4
Wind Dir - Direction of wind for loads with positive magnitude, also direction of MWFRS.
Surf Dir - Windward or leeward side of the building for loads in given direction
Prof - Profile (distribution)
Location - Start and end points on building element
Magnitude - Start = intensity of uniform and point loads or leftmost intensity of trapezoidal load, End = right intensity of trap load
Trib Ht - Tributary height of area loads only

Notes:
All loads entered by the user or generated by program are specified (unfactored) loads.The program applies a load factor of 0.60 to wind loads before distributing them to the shearlines.

WIND C&C LOADS

Block	Building Face	Wind Direction	Level	Magnitude [psf] Interior	Magnitude [psf] End Zone
Block 1	West	Windward	1	35.9	44.3
Block 1	East	Leeward	1	35.9	44.3
Block 1	West	Leeward	1	35.9	44.3
Block 1	East	Windward	1	35.9	44.3
Block 1	South	Windward	1	35.9	44.3
Block 1	North	Leeward	1	35.9	44.3
Block 1	South	Leeward	1	35.9	44.3
Block 1	North	Windward	1	35.9	44.3

DEAD LOADS (for hold-down calculations)

Shear Line	Level	Profile	Tributary Width [ft]	Location [ft] Start	Location [ft] End	Mag [lbs,psf,psi] Start	Mag [lbs,psf,psi] End
A	1	Line		0.25	18.42	85.0*	
B	1	Line		0.25	18.42	85.0*	
1	1	Line		-31.25	-5.00	85.0*	
2	1	Line		-31.25	-5.00	85.0*	

BUILDING MASSES

Level 1 Force Dir	Building Element	Block	Wall Line	Profile	Location [ft] Start	Location [ft] End	Magnitude [lbs,plf,psf] Start	Magnitude [lbs,plf,psf] End	Trib Width [ft]
E-W	Roof	Block 1	1	Line	-32.25	-4.00	151.2	151.2	
E-W	Roof	Block 1	2	Line	-32.25	-4.00	136.2	136.2	
E-W	R Gable	Block 1	1	Line	-31.25	-18.12	55.7	0.0	
E-W	L Gable	Block 1	1	Line	-18.12	-5.00	0.0	55.7	
E-W	L Gable	Block 1	2	Line	-31.25	-18.12	55.7	0.0	
E-W	R Gable	Block 1	2	Line	-18.12	-5.00	0.0	55.7	
N-S	Roof	Block 1	A	Line	-0.75	18.42	211.9	211.9	
N-S	Roof	Block 1	B	Line	-0.75	18.42	211.9	211.9	
Both	Wall 1-1	n/a	1	Line	-31.25	-5.00	42.5	42.5	
Both	Wall 2-1	n/a	2	Line	-31.25	-5.00	42.5	42.5	
Both	Wall A-1	n/a	A	Line	0.25	18.42	42.5	42.5	
Both	Wall B-1	n/a	B	Line	0.25	18.42	42.5	42.5	

Legend:
Force Dir - Direction in which the mass is used for seismic load generation, E-W, N-S, or Both
Building element - Roof, gable end, wall or floor area used to generate mass, wall line for user-applied masses, Floor F# - refer to Plan View for floor area number
Wall line - Shearline that equivalent line load is assigned to
Location - Start and end points of equivalent line load on wall line
Trib Width. - Tributary width; for user applied area loads only

SEISMIC LOADS

Level 1 Force Dir	Profile	Location [ft] Start	Location [ft] End	Mag [lbs,plf,psf] Start	Mag [lbs,plf,psf] End
E-W	Line	-32.25	-31.25	43.4	43.4
E-W	Point	-31.25	-31.25	117	117
E-W	Line	-31.25	-18.12	56.3	73.1
E-W	Line	-18.12	-5.00	73.1	56.3
E-W	Point	-5.00	-5.00	117	117
E-W	Line	-5.00	-4.00	43.4	43.4
N-S	Line	-0.75	0.25	64.0	64.0
N-S	Point	0.25	0.25	279	279
N-S	Line	0.25	18.42	76.9	76.9
N-S	Point	18.42	18.42	279	279

Legend:
Loads in table can be accumulation of loads from several building masses, so they do not correspond with a particular building element.
Location - Start and end of load in direction perpendicular to seismic force direction

Notes:
All loads entered by the user or generated by program are specified (unfactored) loads.The program applies a load factor of 0.70 and redundancy factor to seismic loads before distributing them to the shearlines.

Design Summary

SHEARWALL DESIGN

Wind Shear Loads, Rigid Diaphragm
All shearwalls have sufficient design capacity.

Components and Cladding Wind Loads, Out-of-plane Sheathing
All shearwalls have sufficient design capacity.

Components and Cladding Wind Loads, Nail Withdrawal
All shearwalls have sufficient design capacity.

Seismic Loads, Rigid Diaphragm
All shearwalls have sufficient design capacity.

HOLD-DOWN DESIGN

Wind Loads, Rigid Diaphragm
All hold-downs have sufficient design capacity.

Seismic Loads, Rigid Diaphragm
All hold-downs have sufficient design capacity.

COMPRESSION FORCE DESIGN

Wind Loads, Rigid Diaphragm
Bottom plate has sufficient perpendicular-to-grain compressive capacity under all wall end studs.

Seismic Loads, Rigid Diaphragm
Bottom plate has sufficient perpendicular-to-grain compressive capacity under all wall end studs.

This Design Summary does not include failures that occur due to excessive story drift from ASCE 7 CC.2.2 (wind) or 12.12 (seismic).
Refer to Story Drift table in this report to verify this design criterion.
Refer to the Deflection table for possible issues regarding fastener slippage (SDPWS Table C4.2.3D).

Rigid Diaphragm Wind Design
ASCE 7 Directional (All Heights) Loads

SHEAR RESULTS

N-S Shearlines	W Gp	For Dir	ASD Shear Force [plf] v	vmax/vft	V [lbs]	Asp-Cub Int	Asp-Cub Ext	Allowable Shear [plf] Int	Ext	Co	C	Cmb	V [lbs]	Resp. Ratio
Line 1														
Level 1														
Ln1, Lev1	-	Both	-	-	2518	-	-	-	-	-		-	8779	-
Wall 1-1	1^	Both	-	-	2518	1.0	1.0	0	339	-	A	-	8779	-
Seg. 1	-	Both	110.4	79.7	193	1.0	.78	0	264	-		264	462	0.42
Open. 1	-	Both	-	203.9	340	-	-	0	339	-		339	566	0.60
Seg. 2	-	Both	117.9	71.2	1101	1.0	1.0	0	339	-		339	3168	0.35
Open. 2	-	Both	-	203.9	255	-	-	0	339	-		339	424	0.60
Seg. 3	-	Both	113.6	76.1	738	1.0	1.0	0	339	-		339	2206	0.33
Open. 3	-	Both	-	203.9	238	-	-	0	339	-		339	396	0.60
Seg. 4	-	Both	106.0	84.6	486	1.0	1.0	0	339	-		339	1556	0.31

E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf] v	vmax/vft	V [lbs]	Asp-Cub Int	Asp-Cub Ext	Allowable Shear [plf] Int	Ext	Co	C	Cmb	V [lbs]	Resp. Ratio
Line A														
Level 1														
LnA, Lev1	-	Both	-	-	1719	-	-	-	-	-		-	6167	-
Wall A-1	1	Both	-	-	1719	1.0	1.0	0	339	-	A	-	6167	-
Seg. 1	-	Both	170.4	9.3	824	1.0	1.0	0	339	-		339	1641	0.50
Open. 1	-	Both	-	201.0	1625	-	-	0	339	-		339	2744	0.59
Seg. 2	-	Both	170.4	9.3	895	1.0	1.0	0	339	-		339	1782	0.50
Line B														
LnB, Lev1	-	Both	-	-	1719	-	-	-	-	-		-	6039	-
Wall B-1	1	Both	-	-	1719	1.0	1.0	0	339	-	A	-	6039	-
Seg. 1	-	Both	126.4	66.3	190	1.0	.75	0	255	-		255	382	0.50
Open. 1	-	Both	-	178.7	536	-	-	0	339	-		339	1018	0.53
Seg. 2	-	Both	145.1	49.7	1076	1.0	1.0	0	339	-		339	2518	0.43
Open. 2	-	Both	-	178.7	402	-	-	0	339	-		339	764	0.53
Seg. 3	-	Both	113.2	78.0	453	1.0	1.0	0	339	-		339	1358	0.33

Legend:
W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "^" means that this wall is critical for all walls in the Standard Wall group.
For Dir - Direction of wind force along shearline.
v – Design shear force on segment = ASD-factored shear force per unit length of full-height sheathing (FHS)
vmax/vft - Perforated walls: Collector and in-plane anchorage force as per SDPWS eqn. 4.3-9 = V/FHS/Co. FHS is factored for narrow segments as per 4.3.3.4
FTAO walls: Shear force in piers above and below either openings or piers beside opening(s). Aspect ratio factor does not apply to these piers.
V – ASD factored shear force. For shearline: total shearline force. For wall: total of all segments on wall. For segment: force on segment
Asp/Cub – Unblocked wood structural panel factor Cub from SDPWS 4.3.5.3 or Aspect Ratio factor from 4.3.5.5.1, which for perforated walls is sum bi / FHS from 4.3.5.6 with bi defined in 4.3.3.4. For multi-segment walls, wall row shows Cub and segment rows show Asp. For single-segment walls and perforated walls, value shown is Asp for blocked walls and Cub for unblocked walls.
Int, Ext - Nominal unit shear capacity of interior and exterior sheathing, factored by Table 4.3-1 Note 3 for framing specific gravity and Note 10 for presence of hold-downs. For wall segments, also include unblocked factor Cub and aspect ratio adjustments.
Co - Adjustment factor for perforated walls from SDPWS Equation 4.3-6.
C - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using Eqns. 4.3-3,-4.
Cmb - Combined interior and exterior unit shear capacity including perforated wall factor Co.
V – Total factored shear capacity of shearline, wall or segment.
Crit Resp – Response ratio = v/Cmb = design shear force/unit shear capacity. "S" indicates that the seismic design criterion was critical in selecting wall.

Notes:
Refer to Elevation View diagrams for individual level for uplift anchorage force t for perforated walls given by SDPWS 4.3.6.4.2,1.

Hold-Down and Compression Design (rigid wind design)

Level 1 Line-Wall	Posit'n	Location [ft] X	Location [ft] Y	Load Case	Tensile Hold-down or Compressive Stud Force [lbs] Shear	Dead	Uplift	Cmb'd	Hold-down	Cap [lbs]	Crit Resp.
Line 1											
1-1	L End	0.25	-31.12	1	1096	669		426	CS16	1705	0.25
1-1	L End	0.25	-31.12	1	1096	1116		2211	Compression	6682	0.33
1-1	R End	0.25	-5.12	1	1096	669		426	CS16	1705	0.25
1-1	R End	0.25	-5.12	1	1096	1116		2211	Compression	7518	0.29
Line A											
A-1	L End	0.38	-31.25	1	815	463		352	CS16	1705	0.21
A-1	L End	0.38	-31.25	1	815	772		1587	Compression	6682	0.24
A-1	R End	18.29	-31.25	1	815	463		352	CS16	1705	0.21
A-1	R End	18.29	-31.25	1	815	772		1587	Compression	7518	0.21
Line B											
B-1	L End	0.38	-5.00	1	815	463		352	CS16	1705	0.21
B-1	L End	0.38	-5.00	1	815	772		1587	Compression	6682	0.24
B-1	R End	18.29	-5.00	1	815	463		352	CS16	1705	0.21
B-1	R End	18.29	-5.00	1	815	772		1587	Compression	7518	0.21

Legend:
Line-Wall:
At wall or opening – Shearline and wall number
At vertical element – Shearline
Posit'n – Position of stud pack that hold-down is attached to or which is applying compression force:
V Elem – Vertical element: column or strengthened studs required where not at wall end or opening
L or R End – At left or right wall end
L or R Op n – At left or right side of opening n
t @ Op n – Uplift force t at opening n from offset opening in perforated wall above, from SDPWS 4.3.6.4.2.1
Location – Co-ordinates in Plan View
Load Case – Results are for critical load case:
ASCE 7 All Heights: Case 1 or 2 from Fig. 27.3-8
ASCE 7 Low-rise: Windward corner(s) and Case A or B from Fig. 28.3-1
ASCE 7 Minimum loads (27.1.5 / 28.3.4): "Min"
Tensile Hold-down or Compressive Stud Force – Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.
Shear – Overturning component = V x h / beff from SDPWS Eqn. 4.3-7; V = force on segment, ASD-factored by 0.60; h = wall height, beff = wall segment length – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width). For perforated walls = V x h / Co sum (bi) from SDPWS Eqn. 4.3-8.
Dead – Dead load resisting component, factored for ASD by 0.60 for tension and 1.0 for compression
Uplift – Uplift wind load component, factored for ASD by 0.60
Cmb'd – Sum of ASD-factored overturning, dead and uplift forces. May also include the uplift force t from perforated walls from SDPWS 4.3.6.4.2.1 when openings are staggered.
Hold-down – Device model number from hold-down database; "Compression" for bearing of end stud pack on bottom plate
Cap – Hold-downs: Allowable ASD tension load from database; Compression: allowable ASD bearing force = Ct CM Cb Fcp A; A = cross sectional area of end studs. Refer to Framing materials table for details
Crit. Resp. – Critical Response = Combined ASD force / Allowable ASD tension load

Notes:
Refer to the Shear Line Dimensions table for wall height h, effective segment length beff and perforated wall adjusted sum of bi, to the Story Table for joist depth, and to the Shear Results table for perforated factor Co.
Most severe of wind load cases is used for overturning calculation.
Designer is responsible for design of connection from wall to floor or foundation for shear force shown in Shear Results table. Refer to SDPWS 4.3.6.4.3 for foundation anchor bolt requirements.

COLLECTOR FORCES (rigid wind design)

Level 1 Line-Wall	Position on Wall or Opening	Location [ft] X	Location [ft] Y	Load Case	Drag Strut Force [lbs] --->	Drag Strut Force [lbs] <---	Strap/Blocking Force [lbs] --->	Strap/Blocking Force [lbs] <---
Line 1								
1-1	Left Opening 1	0.25	-29.50		-28	28		
1-1	Right Opening 1	0.25	-27.83		151	-151		
1-1	Left Opening 2	0.25	-18.50		-80	80		
1-1	Right Opening 2	0.25	-17.25		55	-55		
1-1	Left Opening 3	0.25	-10.75		-74	74		
1-1	Right Opening 3	0.25	-9.58		52	-52		
1-1	Left Opening 1	0.25	-29.50				54	54
1-1	Right Opening 1	0.25	-27.83				286	286
1-1	Left Opening 2	0.25	-18.50				150	150
1-1	Right Opening 2	0.25	-17.25				105	105
1-1	Left Opening 3	0.25	-10.75				139	139
1-1	Right Opening 3	0.25	-9.58				98	98
Line A								
A-1	Left Opening 1	5.08	-31.25		-412	412		
A-1	Right Opening 1	13.17	-31.25		448	-448		
A-1	Left Opening 1	5.08	-31.25				779	779
A-1	Right Opening 1	13.17	-31.25				846	846
Line B								
B-1	Left Opening 1	1.75	-5.00		-42	42		
B-1	Right Opening 1	4.75	-5.00		210	-210		
B-1	Left Opening 2	12.17	-5.00		-123	123		
B-1	Right Opening 2	14.42	-5.00		66	-66		
B-1	Left Opening 1	1.75	-5.00				90	90
B-1	Right Opening 1	4.75	-5.00				446	446
B-1	Left Opening 2	12.17	-5.00				261	261
B-1	Right Opening 2	14.42	-5.00				141	141

Legend:
Line-Wall - Shearline and wall number
Position…- Side of opening or wall end that drag strut is attached to
Location - Co-ordinates in Plan View
Load Case - Results are for critical load case:
ASCE 7 All heights Case 1 or 2
ASCE 7 Low-rise corner; Case A or B
Drag strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression.
Based on ASD-factored shearline force (vmax from 4.3.6.4.1.1 for perforated walls)
Strap/Blocking Force – For FTAO walls, force transferred from above and below opening to shearwall pier.
-> Due to shearline force in the west-to-east or south-to-north direction
<- Due to shearline force in the east-to-west or north-to-south direction

Out-of-plane Wind Design

COMPONENTS AND CLADDING by SHEARLINE

North-South Shearlines			Sheathing [psf]			Fastener Withdrawal [lbs]					Service Cond Factors	
			Force	Cap	Force/	Force		Cap	Force/Cap			
Line	Lev	Grp			Cap	End	Int		End	Int	Temp	Moist
1	1	1	26.6	228.1	0.12	35.4	28.7	72.3	0.49	0.40	1.00	1.00
2	1	1	26.6	228.1	0.12	35.4	28.7	72.3	0.49	0.40	1.00	1.00

East-West Shearlines			Sheathing [psf]			Fastener Withdrawal [lbs]					Service Cond Factors	
			Force	Cap	Force/	Force		Cap	Force/Cap			
Line	Lev	Grp			Cap	End	Int		End	Int	Temp	Moist
A	1	1	26.6	228.1	0.12	35.4	28.7	72.3	0.49	0.40	1.00	1.00
B	1	1	26.6	228.1	0.12	35.4	28.7	72.3	0.49	0.40	1.00	1.00

Legend:
Grp - Wall Design Group (results for all design groups for rigid, flexible design listed for each wall)
Sheathing:
Force - C&C end zone exterior pressures using negative (suction) coefficient in ASCE 7 Figure 30.3-1 added to interior pressure using coefficients from Table 26.13-1
Cap - Out-of-plane capacity of exterior sheathing from SDPWS Tables 3.2.1A/B, divided by 1.6 for short-term ASD loads as per 3.2.1. Assumes continuous over 2 spans (table note 3).
Fastener Withdrawal:
Force - Force tributary to each nail in end zone and interior zone
Cap - Factored withdrawal capacity of individual nail according to NDS 12.2-3

Rigid Diaphragm Seismic Design

SEISMIC INFORMATION

Level	Mass [lbs]	Area [sq.ft]	Story Shear Fx [lbs] E-W	Story Shear Fx [lbs] N-S	Shear Resistance [lbs] E-W	Shear Resistance [lbs] N-S	Diaphragm Force [lbs] E-W Fpx	Diaphragm Force [lbs] E-W Design	Diaphragm Force [lbs] N-S Fpx	Diaphragm Force [lbs] N-S Design
1	13360	476.9	1413	1413	8719	6270	1837	1837	1837	1837
All	13360	–	1413	1413	–	–	–	–	–	–

Legend:
Mass – Sum of all generated and input building masses on level = wx in ASCE 7 Eqn. 12.8-12.
Story Shear – Total ASD-factored shear force induced at level x from Eqn. 12.8-11.
Shear Resistance – Lateral design strength of all shear-resisting elements on story, for use in weak story evaluation (4.1.8).
Diaphragm Force – used by Shearwalls only for drag strut forces, as per Exception to 12.10.2.1.
Fpx - Minimum ASD-factored force for diaphragm design from Eqns. 12.10-1, -2, and -3.
Design = The greater of the story shear and Fpx + transfer forces from discontinuous shearlines, factored by overstrength (omega) as per 12.10.1.1.
Omega = 3.0 as per 12.2-1.

Redundancy Factor p (rho):
E-W 1.00, N-S 1.00
Automatically calculated according to ASCE 7 12.3.4.2.

Vertical Earthquake Load Ev
Ev = 0.2 Sds D; Sds = 0.98; Ev = 0.196 D unfactored; 0.137 D factored; total dead load factor: 0.6 - 0.137 = 0.463 tension, 1.0 + 0.137 = 1.137 compression.

SHEAR RESULTS (rigid seismic design)

N-S Shearlines	W Gp	For Dir	ASD Shear Force [plf] v	vmax/vft	V [lbs]	Asp-Cub Int	Asp-Cub Ext	Allowable Shear [plf] Int	Ext	Co	C	Cmb	V [lbs]	Resp. Ratio
Line 1														
Level 1														
Ln1, Lev1	–	Both	–	–	1413	–	–	–	–	–		–	6270	–
Wall 1-1	1	Both	–	–	1413	1.0	1.0	0	242	–	S	–	6270	–
Seg. 1	–	Both	61.9	44.7	108	1.0	.78	0	189	–		189	330	0.33
Open. 1	–	Both	–	114.4	191	–	–	0	242	–		242	404	0.47
Seg. 2	–	Both	66.2	39.9	618	1.0	1.0	0	242	–		242	2263	0.27
Open. 2	–	Both	–	114.4	143	–	–	0	242	–		242	303	0.47
Seg. 3	–	Both	63.7	42.7	414	1.0	1.0	0	242	–		242	1576	0.26
Open. 3	–	Both	–	114.4	133	–	–	0	242	–		242	283	0.47
Seg. 4	–	Both	59.5	47.4	273	1.0	1.0	0	242	–		242	1111	0.25

E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf] v	vmax/vft	V [lbs]	Asp-Cub Int	Asp-Cub Ext	Allowable Shear [plf] Int	Ext	Co	C	Cmb	V [lbs]	Resp. Ratio
Line A														
Level 1														
LnA, Lev1	–	Both	–	–	706	–	–	–	–	–		–	4405	–
Wall A-1	1	Both	–	–	706	1.0	1.0	0	242	–	S	–	4405	–
Seg. 1	–	Both	70.1	3.8	339	1.0	1.0	0	242	–		242	1172	0.29
Open. 1	–	Both	–	82.6	668	–	–	0	242	–		242	1960	0.34
Seg. 2	–	Both	70.1	3.8	368	1.0	1.0	0	242	–		242	1273	0.29
Line B														
LnB, Lev1	–	Both	–	–	706	–	–	–	–	–		–	4314	–
Wall B-1	1	Both	–	–	706	1.0	1.0	0	242	–	S	–	4314	–
Seg. 1	–	Both	52.0	27.3	78	1.0	.75	0	182	–		182	273	0.29
Open. 1	–	Both	–	73.5	220	–	–	0	242	–		242	727	0.30
Seg. 2	–	Both	59.6	20.4	442	1.0	1.0	0	242	–		242	1798	0.25
Open. 2	–	Both	–	73.5	165	–	–	0	242	–		242	546	0.30
Seg. 3	–	Both	46.5	32.1	186	1.0	1.0	0	242	–		242	970	0.19

Legend:
W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "^" means that this wall is critical for all walls in the Standard Wall group.
For Dir – Direction of seismic force along shearline.
v – Design shear force on segment = ASD-factored shear force per unit length of full-height sheathing (FHS)
vmax/vft - Perforated walls: Collector and in-plane anchorage force as per SDPWS eqn. 4.3-9 = V/FHS/Co. FHS is factored for narrow segments as per 4.3.3.4
FTAO walls: Shear force in piers above and below either openings or piers beside opening(s). Aspect ratio factor does not apply to these piers.
V – ASD factored shear force. For shearline: total shearline force. For wall: total of all segments on wall. For segment: force on segment
Asp/Cub – Unblocked wood structural panel factor Cub from SDPWS 4.3.5.3 or Aspect Ratio factor from 4.3.5.5.1, which for perforated walls is sum bi / FHS from 4.3.5.6 with bi defined in 4.3.3.4. For multi-segment walls, wall row shows Cub and segment rows show Asp. For single-segment walls and perforated walls, value shown is Asp for blocked walls and Cub for unblocked walls.
Int, Ext - Nominal unit shear capacity of interior and exterior sheathing, factored by Table 4.3-1 Note 3 for framing specific gravity and Note 10 for presence of hold-downs. For wall segments, also include unblocked factor Cub and aspect ratio adjustments.
Co - Adjustment factor for perforated walls from SDPWS Equation 4.3-6.
C - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using Eqns. 4.3-3,-4.
Cmb - Combined interior and exterior unit shear capacity including perforated wall factor Co.
V – Total factored shear capacity of shearline, wall or segment.
Crit Resp – Response ratio = v/Cmb = design shear force/unit shear capacity. "W" indicates that the wind design criterion was critical in selecting wall.

Notes:
Refer to Elevation View diagrams for individual level for uplift anchorage force t for perforated walls given by SDPWS 4.3.6.4.2,1.
The contribution to shear resistance from gypsum, fiberboard, or lumber sheathing is taken as zero because of the Design setting for ignoring contribution was set. Refer to the Sheathing Materials table for the wall groups affected.

Hold-Down and Compression Design (rigid seismic design)

Level 1 Line-Wall	Posit'n	Location [ft] X	Location [ft] Y	Tensile Hold-down or Compressive Stud Force [lbs] Shear	Dead	Ev	Cmb'd	Hold-down	Cap [lbs]	Crit Resp.
Line 1										
1-1	L End	0.25	-31.12	615	669	153	99	CS16	1705	0.06
1-1	L End	0.25	-31.12	615	1116	153	1884	Compression	6682	0.28
1-1	R End	0.25	-5.12	615	669	153	99	CS16	1705	0.06
1-1	R End	0.25	-5.12	615	1116	153	1884	Compression	7518	0.25
Line A										
A-1	L End	0.38	-31.25	335	435	100	0	Not required	1705	0.00
A-1	L End	0.38	-31.25	335	840	115	1291	Compression	6682	0.19
A-1	R End	18.29	-31.25	335	435	100	0	Not required	1705	0.00
A-1	R End	18.29	-31.25	335	840	115	1291	Compression	7518	0.17
Line B										
B-1	L End	0.38	-5.00	335	435	100	0	Not required	1705	0.00
B-1	L End	0.38	-5.00	335	840	115	1291	Compression	6682	0.19
B-1	R End	18.29	-5.00	335	435	100	0	Not required	1705	0.00
B-1	R End	18.29	-5.00	335	840	115	1291	Compression	7518	0.17

Legend:
Line-Wall:
At wall or opening – Shearline and wall number
At vertical element – Shearline
Posit'n – Position of stud pack that hold-down is attached to:
V Elem – Vertical element: column or strengthened studs required where not at wall end or opening
L or R End – At left or right wall end
L or R Op n – At left or right side of opening n
t @ Op n – Uplift force t at opening n from offset opening in perforated wall above, from SDPWS 4.3.6.4.2.1
Location – Co-ordinates in Plan View
Tensile Hold-down or Compressive Stud Force – Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.
Shear – Overturning component = V x h / beff from SDPWS Eqn. 4.3-7; V = force on segment, ASD-factored by 0.70; h = wall height , beff = wall segment length – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width). For perforated walls = V x h / Co sum (bi) from SDPWS Eqn. 4.3-8.
Dead – Dead load resisting component, factored for ASD by 0.60 for tension and 1.0 for compression
Ev – Vertical seismic load effect from ASCE 7 12.4.2.2 = -0.2 Sds x ASD factor x unfactored D = 0.229 SDS x factored D. Refer to Seismic Information table for more details.
Cmb'd – Sum of ASD-factored overturning, dead and vertical seismic forces. May also include the uplift force t from perforated walls from SDPWS 4.3.6.4.2.1 when openings are staggered.
Hold-down – Device model number from hold-down database; "Compression" for bearing of end stud pack on bottom plate
Cap – Hold-downs: Allowable ASD tension load from database; Compression: Allowable ASD bearing force = Ct CM Cb Fcp A; A = cross sectional area of end studs. Refer to Framing materials table for details.
Crit. Resp. – Critical Response = Combined ASD force/Allowable ASD tension load

Notes:
Combined force from ASCE 7 2.4.1 load combination 10 = - (0.6D - 0.7Ev + 0.7Eh); Eh (from 12.4.2.1) = - shear overturning force
Refer to the Shear Line Dimensions table for wall height h, effective segment length beff and perforated wall adjusted sum of bi, to the Story Table for joist depth, and to the Shear Results table for perforated factor Co.
Designer is responsible for design of connection from wall to floor or foundation for shear force shown in Shear Results table. Refer to SDPWS 4.3.6.4.3 for foundation anchor bolt requirements.

COLLECTOR FORCES (rigid seismic design)

Level 1 Line-Wall	Position on Wall or Opening	Location [ft] X	Location [ft] Y	Drag Strut Force [lbs] --->	Drag Strut Force [lbs] <---	Strap/Blocking Force [lbs] --->	Strap/Blocking Force [lbs] <---
Line 1							
	Shearline force			1837	1837		
1-1	Left Opening 1	0.25	-29.50	-21	21		
1-1	Right Opening 1	0.25	-27.83	110	-110		
1-1	Left Opening 2	0.25	-18.50	-58	58		
1-1	Right Opening 2	0.25	-17.25	40	-40		
1-1	Left Opening 3	0.25	-10.75	-54	54		
1-1	Right Opening 3	0.25	-9.58	38	-38		
1-1	Left Opening 1	0.25	-29.50			30	30
1-1	Right Opening 1	0.25	-27.83			161	161
1-1	Left Opening 2	0.25	-18.50			84	84
1-1	Right Opening 2	0.25	-17.25			59	59
1-1	Left Opening 3	0.25	-10.75			78	78
1-1	Right Opening 3	0.25	-9.58			55	55
Line A							
	Shearline force			918	918		
A-1	Left Opening 1	5.08	-31.25	-220	220		
A-1	Right Opening 1	13.17	-31.25	239	-239		
A-1	Left Opening 1	5.08	-31.25			320	320
A-1	Right Opening 1	13.17	-31.25			348	348
Line B							
	Shearline force			918	918		
B-1	Left Opening 1	1.75	-5.00	-23	23		
B-1	Right Opening 1	4.75	-5.00	112	-112		
B-1	Left Opening 2	12.17	-5.00	-66	66		
B-1	Right Opening 2	14.42	-5.00	35	-35		
B-1	Left Opening 1	1.75	-5.00			37	37
B-1	Right Opening 1	4.75	-5.00			183	183
B-1	Left Opening 2	12.17	-5.00			107	107
B-1	Right Opening 2	14.42	-5.00			58	58

Legend:
Line-Wall - Shearline and wall number
Position…- Side of opening or wall end that drag strut is attached to
Location - Co-ordinates in Plan View
Drag strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression.
Based on ASD-factored shearline force shown. For SDC C-F, it is the greater of the design shearline force and the diaphragm force Fpx, added to shearline force from story above and to forces transferred from discontinuous shearlines factored by overstrength (omega) as per 12.10.1.1. Refer to Seismic Information table for diaphragm forces and omega factor.
For SDC D-F, if any horizontal irregularities are input, or if vertical irregularity 4 detected or input, 25% increase from 12.3.3.4 applied.
For perforated walls, this force is converted to vmax using 4.3.6.4.1.1.
Strap/Blocking Force – For FTAO walls, force transferred from above and below opening to shearwall pier.
-> Due to shearline force in the west-to-east or south-to-north direction
<- Due to shearline force in the east-to-west or north-to-south direction

Project Title:
Engineer:
Project ID:
Project Descr:

ASCE 7-16 Seismic Base Shear

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: Load to concrete piers

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

Gridded Ss & S1values from ASCE 7-16

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.424 g, 0.2 sec response

S_1 = 0.4949 g, 1.0 sec response

Location : Mercer Island, WA 98040

Latitude = 47.569 deg North

Longitude = 122.232 deg West

For the closest datapoint grid location . . .

Latitude = 47.570 deg North

Longitude = 122.230 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) — *ASCE 7-16 Table 20.3-1*

Site Coefficients Fa & Fv — Fa = 1.20 — *ASCE 7-16 Table 11.4-1 & 11.4-2*

(using straight-line interpolation from table val — Fv = 1.81

Maximum Considered Earthquake Accelerat

S_{MS} = Fa * Ss = 1.709 — *ASCE 7-16 Eq. 11.4-1*

S_{M1} = Fv * S1 = 0.893 — *ASCE 7-16 Eq. 11.4-2*

Design Spectral Acceleration

$S_{DS} = S_{MS} * 2/3$ = 1.139 — *ASCE 7-16 Eq. 11.4-3*

$S_{D1} = S_{M1} * 2/3$ = 0.596 — *ASCE 7-16 Eq. 11.4-4*

Seismic Design Category = **D** — *SCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Cantilevered column systems detailed to conform to specific classification 4.Intermediate reinforced concrete moment frames**

Response Modification Coefficient " R " = 1.50

System Overstrength Factor " Wo " = 1.25

Deflection Amplification Factor " Cd " = 1.50

NOTE! See ASCE 7-16 for all applicable footnc

Building height Limits :

Category "A & B" Limit:	Limit = 35
Category "C" Limit:	Limit = 35
Category "D" Limit:	Not Permitted
Category "E" Limit:	Not Permitted
Category "F" Limit:	Not Permitted

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcula All Other Structural Systems

" Ct " value = 0.020 " hn " : Height from base to highest level 6.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.077 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sele = 0.077

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.139	From Eq. 12.8-2, Preliminary Cs	=	0.759
" R " : Response Modification Factor	=	1.50	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	5.178
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.050

Cs : Seismic Response Coefficient = = **0.7595**

Project Title:
Engineer:
Project ID:
Project Descr:

ASCE 7-16 Seismic Base Shear

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.7595 from 12.8.1.1

W (see Sum Wi below) = 16.50 k

Seismic Base Shear V = Cs * W = 12.53 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	16.50	6.00	99.00	1.0000	12.53	12.53	0.00

Sum Wi = 16.50 k Sum Wi * Hi = 99.00 k-ft Total Base Shear = 12.53 k

Base Moment = 75.2 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	16.50	12.53	12.53	16.50	12.53	3.76	7.52	7.52	12.53

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: Morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

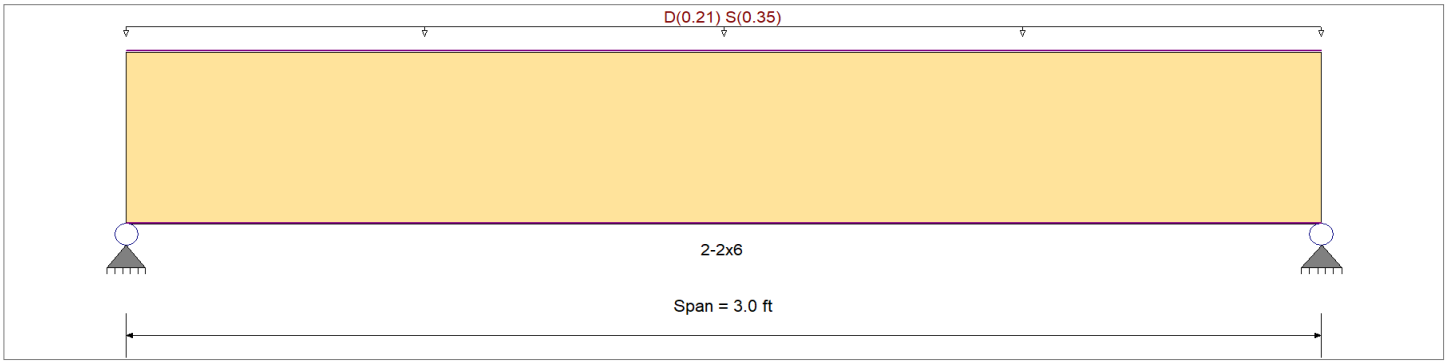
DESCRIPTION: North Headers

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	850 psi	*E : Modulus of Elasticity*	
Load Combination :	IBC 2021	Fb -	850 psi	Ebend- xx	1300 ksi
		Fc - Prll	1300 psi	Eminbend - xx	470 ksi
Wood Species :	Hem-Fir	Fc - Perp	405 psi		
Wood Grade :	No.2	Fv	150 psi		
		Ft	525 psi	Density	26.84 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 14.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.393 : 1	Maximum Shear Stress Ratio	=	0.310 : 1
Section used for this span		2-2x6	Section used for this span		2-2x6
fb: Actual	=	499.83 psi	fv: Actual	=	53.51 psi
F'b	=	1,270.75 psi	F'v	=	172.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	1.500 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.012 in	Ratio =	3033 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.019 in	Ratio =	1896 >=180	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.188	0.149	0.90	1.00	1.00	1.00	1.300	1.00	1.00	1.00	0.24	187.4	994.5	0.22	20.1	135.0
+D+S					1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.393	0.310	1.15	1.00	1.00	1.00	1.300	1.00	1.00	1.00	0.63	499.8	1,270.8	0.59	53.5	172.5
+D+0.750S					1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.332	0.262	1.15	1.00	1.00	1.00	1.300	1.00	1.00	1.00	0.53	421.7	1,270.8	0.50	45.1	172.5
+0.60D					1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.064	0.050	1.60	1.00	1.00	1.00	1.300	1.00	1.00	1.00	0.14	112.5	1,768.0	0.13	12.0	240.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: Morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: North Headers

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0190	1.511		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.840	0.840
Max Upward from Load Combinations	0.840	0.840
Max Upward from Load Cases	0.525	0.525
D Only	0.315	0.315
+D+S	0.840	0.840
+D+0.750S	0.709	0.709
+0.60D	0.189	0.189
S Only	0.525	0.525

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: South Header

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

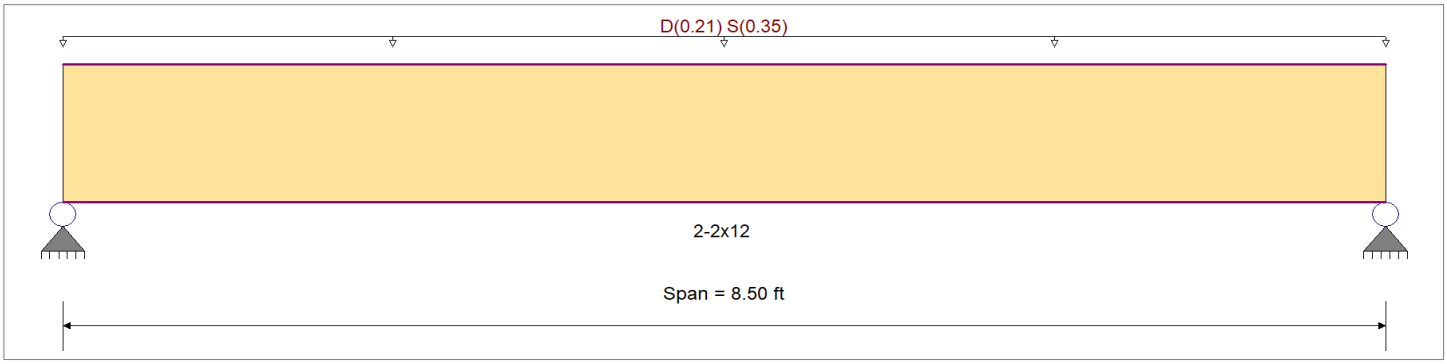
Wood Species : Hem-Fir
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	850.0 psi
Fb -	850.0 psi
Fc - Prll	1,300.0 psi
Fc - Perp	405.0 psi
Fv	150.0 psi
Ft	525.0 psi

E : Modulus of Elasticity

Ebend- xx	1,300.0 ksi
Eminbend - xx	470.0 ksi
Density	26.840 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 14.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.981 : 1	Maximum Shear Stress Ratio	=	0.479 : 1
Section used for this span		2-2x12	Section used for this span		2-2x12
fb: Actual	=	959.05 psi	fv: Actual	=	82.61 psi
F'b	=	977.50 psi	F'v	=	172.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	4.250 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.089 in	Ratio =	1141 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.143 in	Ratio =	713 >=180	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 8.50 ft	1	0.470	0.229	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.90	359.6	765.0	0.70	31.0	135.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 8.50 ft	1	0.981	0.479	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	5.06	959.1	977.5	1.86	82.6	172.5
+D+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 8.50 ft	1	0.828	0.404	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.27	809.2	977.5	1.57	69.7	172.5
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 8.50 ft	1	0.159	0.077	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.14	215.8	1,360.0	0.42	18.6	240.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: South Header

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1430	4.281		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.380	2.380
Max Upward from Load Combinations	2.380	2.380
Max Upward from Load Cases	1.488	1.488
D Only	0.893	0.893
+D+S	2.380	2.380
+D+0.750S	2.008	2.008
+0.60D	0.536	0.536
S Only	1.488	1.488

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: Beams across piers

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

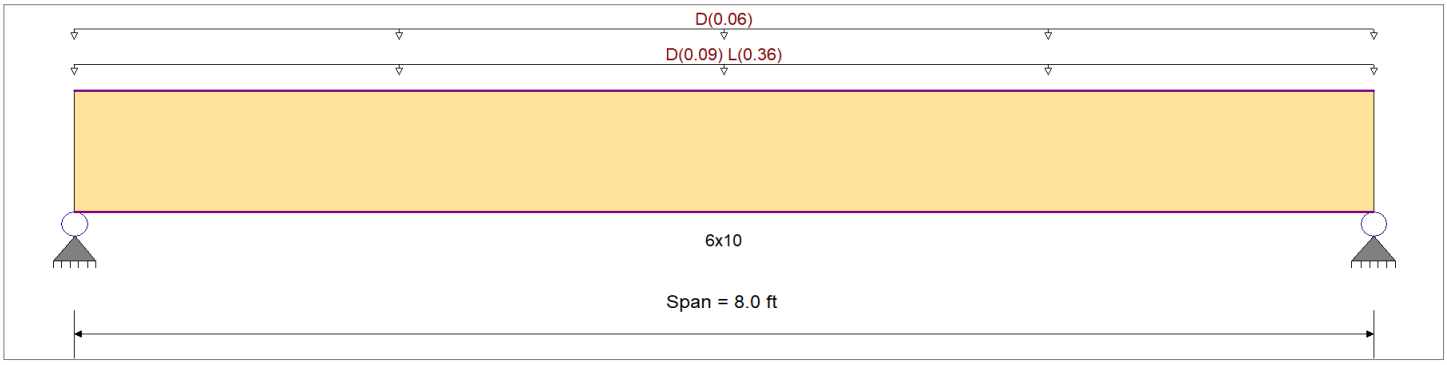
Wood Species : Douglas Fir-Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	900.0 psi
Fb -	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	31.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.010, L = 0.040 ksf, Tributary Width = 9.0 ft
Uniform Load : D = 0.0060 ksf, Tributary Width = 10.0 ft, (wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.822 : 1	Maximum Shear Stress Ratio	=	0.327 : 1
Section used for this span		6x10	Section used for this span		6x10
fb: Actual	=	591.81 psi	fv: Actual	=	47.02 psi
F'b	=	720.00 psi	F'v	=	144.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.000 ft	Location of maximum on span	=	7.212 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.056 in	Ratio =	1718 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.079 in	Ratio =	1212 >=180	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 8.0 ft	1	0.269	0.107	0.90	1.00	1.00	1.00	1.000	1.00	0.80	1.00	1.20	174.1	648.0	0.48	13.8	129.6
+D+L					1.00	1.00	1.00	1.000	1.00	0.80	1.00			0.0	0.00	0.0	0.0
Length = 8.0 ft	1	0.822	0.327	1.00	1.00	1.00	1.00	1.000	1.00	0.80	1.00	4.08	591.8	720.0	1.64	47.0	144.0
+D+0.750L					1.00	1.00	1.00	1.000	1.00	0.80	1.00			0.0	0.00	0.0	0.0
Length = 8.0 ft	1	0.542	0.215	1.25	1.00	1.00	1.00	1.000	1.00	0.80	1.00	3.36	487.4	900.0	1.35	38.7	180.0
+0.60D					1.00	1.00	1.00	1.000	1.00	0.80	1.00			0.0	0.00	0.0	0.0
Length = 8.0 ft	1	0.091	0.036	1.60	1.00	1.00	1.00	1.000	1.00	0.80	1.00	0.72	104.4	1,152.0	0.29	8.3	230.4

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: Beams across piers

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0791	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.040	2.040
Max Upward from Load Combinations	2.040	2.040
Max Upward from Load Cases	1.440	1.440
D Only	0.600	0.600
+D+L	2.040	2.040
+D+0.750L	1.680	1.680
+0.60D	0.360	0.360
L Only	1.440	1.440

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: morishima.ec6

DESCRIPTION: Typical Pier

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	Yes
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	1.50	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

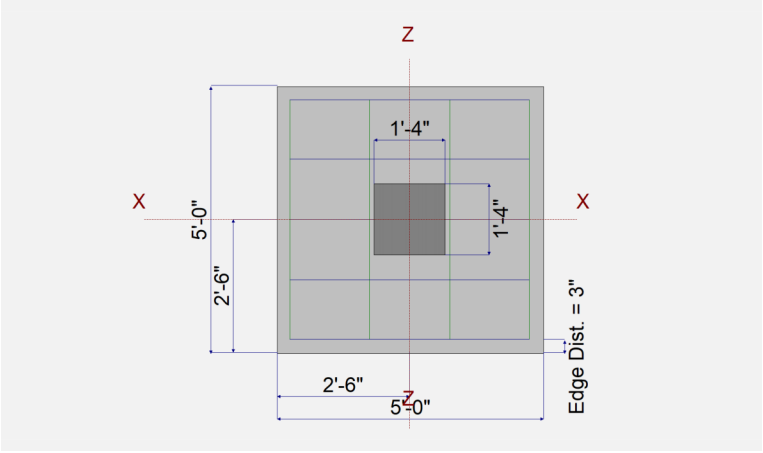
Width parallel to X-X Axis	=	5.0 ft
Length parallel to Z-Z Axis	=	5.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	54.0 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



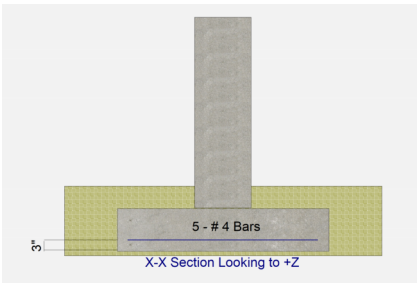
Reinforcing

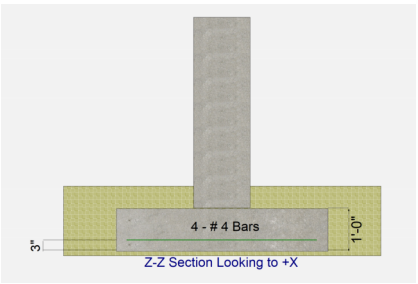
Bars parallel to X-X Axis			
Number of Bars	=		5
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		4
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation n/a

# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	0.50							k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=					2.518	1.413		k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: Typical Pier

DESIGN SUMMARY

Design N.G.

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8793	Soil Bearing	1.319 ksf	1.50 ksf	+0.60D+0.60W about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	1.185	Overturning - Z-Z	8.309 k-ft	9.843 k-ft	+0.60D+0.60W
PASS	1.609	Sliding - X-X	1.511 k	2.431 k	+0.60D+0.60W
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
FAIL	As < Min	Z Flexure (+X)	0.1470 k-ft/ft	7.924 k-ft/ft	+1.40D
FAIL	As < Min	Z Flexure (-X)	0.1470 k-ft/ft	7.924 k-ft/ft	+1.40D
FAIL	As < Min	X Flexure (+Z)	0.1470 k-ft/ft	6.367 k-ft/ft	+1.40D
FAIL	As < Min	X Flexure (-Z)	0.1470 k-ft/ft	6.367 k-ft/ft	+1.40D
PASS	0.1107	1-way Shear (+X)	9.092 psi	82.158 psi	+0.90D+W
PASS	0.02975	1-way Shear (-X)	2.444 psi	82.158 psi	+1.20D+W
PASS	0.01085	1-way Shear (+Z)	0.8910 psi	82.158 psi	+1.40D
PASS	0.01085	1-way Shear (-Z)	0.8910 psi	82.158 psi	+1.40D
PASS	0.01712	2-way Punching	2.813 psi	164.317 psi	+1.20D+W

Top reinforcing mat required (see 'Bending' tab).

Hand check required for anchor pullout.

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.50	n/a	0.0	0.2625	0.2625	n/a	n/a	0.175
X-X, +D+0.60W	1.50	n/a	0.0	0.2625	0.2625	n/a	n/a	0.175
X-X, +D+0.70E	1.50	n/a	0.0	0.2625	0.2625	n/a	n/a	0.175
X-X, +D+0.450W	1.50	n/a	0.0	0.2625	0.2625	n/a	n/a	0.175
X-X, +D+0.5250E	1.50	n/a	0.0	0.2625	0.2625	n/a	n/a	0.175
X-X, +0.60D+0.60W	1.50	n/a	0.0	0.1575	0.1575	n/a	n/a	0.105
X-X, +0.60D+0.70E	1.50	n/a	0.0	0.1575	0.1575	n/a	n/a	0.105
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.2625	0.2625	0.175
Z-Z, +D+0.60W	1.50	15.195	n/a	n/a	n/a	0.0	0.7044	0.470
Z-Z, +D+0.70E	1.50	9.948	n/a	n/a	n/a	0.003978	0.5210	0.347
Z-Z, +D+0.450W	1.50	11.396	n/a	n/a	n/a	0.0	0.5613	0.374
Z-Z, +D+0.5250E	1.50	7.461	n/a	n/a	n/a	0.06861	0.4564	0.304
Z-Z, +0.60D+0.60W	1.50	25.325	n/a	n/a	n/a	0.0	1.319	0.879
Z-Z, +0.60D+0.70E	1.50	16.580	n/a	n/a	n/a	0.0	0.4659	0.311

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+0.60W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.70E	None	0.0 k-ft	Infinity	OK
X-X, +D+0.450W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.5250E	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.60W	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.60W	8.309 k-ft	16.406 k-ft	1.974	OK
Z-Z, +D+0.70E	5.440 k-ft	16.406 k-ft	3.016	OK
Z-Z, +D+0.450W	6.232 k-ft	16.406 k-ft	2.632	OK
Z-Z, +D+0.5250E	4.080 k-ft	16.406 k-ft	4.021	OK
Z-Z, +0.60D+0.60W	8.309 k-ft	9.843 k-ft	1.185	OK
Z-Z, +0.60D+0.70E	5.440 k-ft	9.843 k-ft	1.809	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: morishima.ec6

DESCRIPTION: Typical Pier

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.0 k	3.219 k	No Sliding	OK
X-X, +D+0.60W	1.511 k	3.219 k	2.130	OK
X-X, +D+0.70E	0.9891 k	3.219 k	3.254	OK
X-X, +D+0.450W	1.133 k	3.219 k	2.841	OK
X-X, +D+0.5250E	0.7418 k	3.219 k	4.339	OK
X-X, +0.60D+0.60W	1.511 k	2.431 k	1.609	OK
X-X, +0.60D+0.70E	0.9891 k	2.431 k	2.458	OK
Z-Z, D Only	0.0 k	3.219 k	No Sliding	OK
Z-Z, +D+0.60W	0.0 k	3.219 k	No Sliding	OK
Z-Z, +D+0.70E	0.0 k	3.219 k	No Sliding	OK
Z-Z, +D+0.450W	0.0 k	3.219 k	No Sliding	OK
Z-Z, +D+0.5250E	0.0 k	3.219 k	No Sliding	OK
Z-Z, +0.60D+0.60W	0.0 k	2.431 k	No Sliding	OK
Z-Z, +0.60D+0.70E	0.0 k	2.431 k	No Sliding	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.1470	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.40D	0.1470	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D	0.1260	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D	0.1260	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D+0.50W	0.1260	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D+0.50W	0.1260	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D+W	0.1260	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D+W	0.1260	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D+E	0.1260	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +1.20D+E	0.1260	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +0.90D+W	0.09451	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +0.90D+W	0.09451	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +0.90D+E	0.09451	+Z	Bottom	0.2592	AsMin	0.160	6.367	OK
X-X, +0.90D+E	0.09451	-Z	Bottom	0.2592	AsMin	0.160	6.367	OK
Z-Z, +1.40D	0.1470	-X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.40D	0.1470	+X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D	0.1260	-X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D	0.1260	+X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D+0.50W	0.2951	-X	Top	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D+0.50W	0.5485	+X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D+W	0.4033	-X	Top	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D+W	1.323	+X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D+E	0.3374	-X	Top	0.2592	AsMin	0.20	7.924	OK
Z-Z, +1.20D+E	0.6057	+X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +0.90D+W	0.3025	-X	Top	0.2592	AsMin	0.20	7.924	OK
Z-Z, +0.90D+W	1.677	+X	Bottom	0.2592	AsMin	0.20	7.924	OK
Z-Z, +0.90D+E	0.3007	-X	Top	0.2592	AsMin	0.20	7.924	OK
Z-Z, +0.90D+E	0.6227	+X	Bottom	0.2592	AsMin	0.20	7.924	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.89 psi	0.89 psi	0.89 psi	0.89 psi	0.89 psi	82.16 psi	0.01	OK
+1.20D	0.76 psi	0.76 psi	0.76 psi	0.76 psi	0.76 psi	82.16 psi	0.01	OK
+1.20D+0.50W	1.87 psi	3.41 psi	0.76 psi	0.76 psi	3.41 psi	82.16 psi	0.04	OK
+1.20D+W	2.44 psi	8.41 psi	0.76 psi	0.76 psi	8.41 psi	82.16 psi	0.10	OK
+1.20D+E	2.16 psi	3.77 psi	0.76 psi	0.76 psi	3.77 psi	82.16 psi	0.05	OK
+0.90D+W	1.83 psi	9.09 psi	0.57 psi	0.57 psi	9.09 psi	82.16 psi	0.11	OK
+0.90D+E	1.83 psi	3.89 psi	0.57 psi	0.57 psi	3.89 psi	82.16 psi	0.05	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	2.00 psi	164.32 psi	0.01218	OK
+1.20D	1.72 psi	164.32 psi	0.01044	OK
+1.20D+0.50W	1.72 psi	164.32 psi	0.01045	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: morishima.ec6

LIC# : KW-06012329, Build:20.23.08.30 Jordan Jones Engineer (c) ENERCALC INC 1983-2023

DESCRIPTION: Typical Pier

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.20D+W	2.81 psi	164.32 psi	0.01712	OK
+1.20D+E	1.73 psi	164.32 psi	0.01054	OK
+0.90D+W	2.44 psi	164.32 psi	0.01483	OK
+0.90D+E	1.48 psi	164.32 psi	0.009	OK