JACKSON & SANDS ENGINEERING, Inc.

STRUCTURAL ANALYSIS

For:
City of Orland ADU's Mirr.
Orland, CA
450 SQFT
Project # 23M-007

September 22, 2023

(PC1 SUBMITTAL)

JACKSON & SANDS ENGINEERING, Inc.
1250 East Ave. #10
Chico, CA 95926
info@jacksonandsandsengineering.com

JACKSON & SANDS ENGINEERING, Inc.

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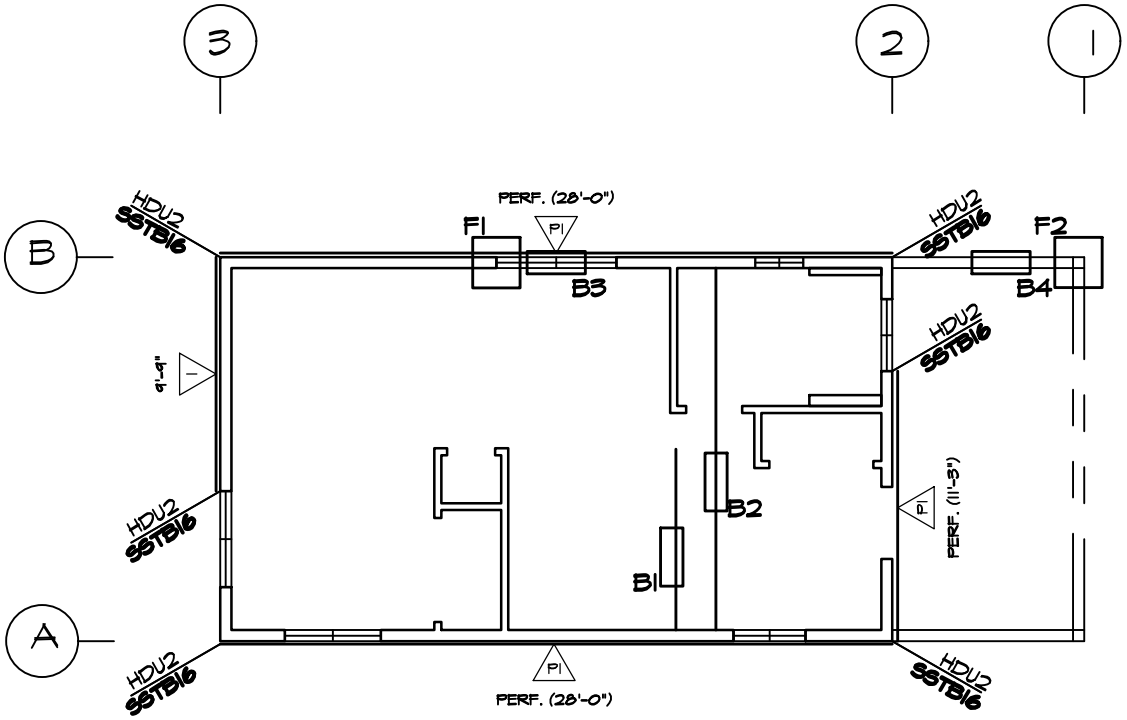
SCOPE OF WORK

Scope

The following Structural Analysis is for a new light-wood framed single family residence to be built on a new slab-on-grade floor. Analysis of structure was performed with respect to the forces of seismic and wind and gravity using the applicable chapters of the A.S.C.E. 7-16. The structural design of this project used two methods for lateral restraint system: Perforated shear wall design (SDPWS 2021 sec. 4.3.5.3) and segmented shear wall design (SDPWS 2021 sec. 4.3.5.1). Analysis and design for gravity loads were performed to verify beam design per AWC NDS 2021 for wood members.

Analysis

The building was analyzed as 1 diaphragm and idealized as flexible for a simplified analysis. The footings and beams were designed with appropriate design loads using the Enercalc and Forte web software.



PROJECT LAYOUT

N/A

JACKSON & SANDS ENGINEERING, Inc.
1250 EAST AVE. #10
CHICO, CA 95926
Phone: (530) 715-7184

450 SQFT. ADU, MIRROR
123 MY WAY
ORLAND, CA

JOB # 23M-007

Design Loads / Criteria

Gravity Loads:	Per ASCE 7-16		
Roof Dead Loads:	Comp Roofing	5	psf
	1/2" Roof ply	1.8	psf
Slope= 6 /12	Framing	1.5	psf
27 Degrees	Insulation	1	psf
	1/2" covering	2.8	psf
	Solar	3	psf
	Misc	1	psf
	Total =	16.1	psf
	Total Sloped=	19.00	psf
Roof Live Loads	Construction=	20	psf
	Ground Snow=	0	psf
	Flat Roof Snow=	0	psf
	Sloped Roof Snow=	0.0	psf
Exterior Wall Dead Load	Wood	2.00	psf
	3/8" ply	2.40	psf
	2x6 Framing	1.70	psf
	1/2" sheetrock	2.20	psf
	Insulation	1.10	psf
	Misc	1.00	psf
	Wall total=	11.00	psf
Interior wall dead load	2x Framing	1.7	psf
	1/2" sheetrock	4.4	psf
	Misc	1	psf
	Wall total=	8	psf

SEISMIC		
ASCE 7-16		
EQUIVALENT LATERAL		
FORCE PROCEEDURE		
Design Category:	D (default)	
I =	II	
Ss =	0.842	
S1 =	0.355	
SMS =	1.01	
SM1 =	null	
SDS =	0.673	
SD1 =	null	
TL =	16	
R0 =	1.3	
R =	6.5	

SNOW LOAD		
Sloped Roof	0.0	PSF
Seismic =	0	PSF

WIND		
MAIN WIND FORCE RESISTING SYSTEM,		
ALL HEIGHTS METHOD ASCE 7-16		
CHAPTERS 26 & 27		
WIND SPEED =	95	MPH
EXPOSURE =	C	
ENCLOSURE =	ENCLOSED	

Orland, CA 95963, USA

Latitude, Longitude: 39.7473803, -122.1963748

Date	4/4/2023, 3:10:58 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.842	MCE_R ground motion. (for 0.2 second period)
S_1	0.355	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.01	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.673	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	0.373	MCE_G peak ground acceleration
F_{PGA}	1.227	Site amplification factor at PGA
PGA_M	0.457	Site modified peak ground acceleration
T_L	16	Long-period transition period in seconds
SsRT	0.842	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.928	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.355	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.397	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.373	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.907	Mapped value of the risk coefficient at short periods

Job #23M-007 450

WoodWorks® Shearwalls

SOFTWARE FOR WOOD DESIGN

WoodWorks® Shearwalls 2023

23M-007 450 adu.wsw **Apr. 6, 2023 17:33:30**

Project Information

DESIGN SETTINGS

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

Load Combinations

For Design (ASD)	For Deflection (Strength)
0.70 Seismic + 0.60 Dead	1.00 Seismic + 0.90 Dead
0.60 Wind + 0.60 Dead	1.00 Wind + 0.90 Dead

Building Code Capacity Modification

Wind	Seismic
1.00	1.00

Service Conditions and Load Duration

Duration Factor	Temperature Range	Moisture Content Fabrication	Moisture Content Service
1.60	T<=100F	24% (>19%)	10% (<=19%)

Max Shearwall Offset [ft]

Plan (within story)	Elevation (between stories)
0.50	-

Maximum Height-to-width Ratio

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

Ignore shear resistance contribution of...

Wall segments	Seismic
Side with invalid aspect ratio	Any gypsum, lumber, fiberboard

Forces based on...

Hold-downs	Applied loads
Drag struts	Applied loads

Shearwall relative rigidity:	Wall capacity
Non-identical materials and construction on the shearline:	Not allowed
Deflection Equation:	4-term from SDPWS C4.3.4-1
Drift limit for wind design:	1 / 100 story height
FTAO strap:	Continuous at top of highest opening and bottom of lowest

SITE INFORMATION

Wind
ASCE 7-16 Directional (All heights)

Design Wind Speed	95 mph
Serviceability Wind Speed	100 mph
Exposure	Exposure C
Enclosure	Partially open
Min Wind Loads: Walls	16 psf
Roofs	8 psf

Topographic Information [ft]

Shape	Height	Length
-	-	-

Site Location: -

Elev: 0ft
Rigid building - Static analysis

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

Seismic
ASCE 7-16 12.8 Equivalent Lateral Force Procedure

Risk Category	Category II - All others
Structure Type	Regular
Building System	Bearing Wall
Design Category	D
Site Class	D

Spectral Response Acceleration
S1: 0.350g **Ss:** 0.840g

Fundamental Period	E-W	N-S
T Used	0.123s	0.123s
Approximate Ta	0.123s	0.123s
Maximum T	0.173s	0.173s
Response Factor R	6.50	6.50

Fa: 1.16 **Fv:** 1.95

Structural Data

STORY INFORMATION

	Story Elev [ft]	Floor/Ceiling Depth [in]	Wall Height [ft]	Hold-down Length subject to shrinkage [in]	Bolt length [in]
Ceiling	9.00	0.0			
Level 1	0.00	0.0	9.00	0.5	5.25
Foundation	0.00				

BLOCK and ROOF INFORMATION

Block Dimensions [ft]			Roof Panels Face	Type	Slope	Overhang [ft]
Block 1	1 Story	E-W Ridge				
Location X,Y =	8.00	0.00	**North**	Side	30.0	1.50
Extent X,Y =	28.00	16.00	**South**	Side	30.0	1.50
Ridge Y Location, Offset	8.00	0.00	**East**	Gable	90.0	1.00
Ridge Elevation, Height	13.62	4.62	**West**	Gable	90.0	0.00
Block 2	1 Story	E-W Ridge				
Location X,Y =	0.00	0.00	**North**	Side	30.0	1.50
Extent X,Y =	8.00	16.00	**South**	Side	30.0	1.50
Ridge Y Location, Offset	8.00	0.00	**East**	Gable	90.0	0.00
Ridge Elevation, Height	13.62	4.62	**West**	Gable	90.0	1.00

SHEATHING MATERIALS by WALL GROUP

Grp	Surf	Material	Sheathing Ratng	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	3/8	-	-	Horz	77500	8d	Box	N	6	12	Y	3

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:
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.

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	D.Fir-L	No.2	1.50	5.50	16	0.50	1.60	625	

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	8.00	0.00	16.00	16.00	7.47	-	9.00	-	-
Wall 1-1	Prf	1	8.00	0.00	16.00	16.00	7.47	-	-	2	2
Segment 1		-	-	0.00	3.50	3.50	2.72	2.57	-	-	-
Opening 1		-	-	3.50	6.50	3.00	3.00	-	4.00	-	-
Segment 2		-	-	6.50	11.25	4.75	4.75	1.89	-	-	-
Opening 2		-	-	11.25	14.25	3.00	3.00	-	4.00	-	-
Segment 3		-	-	14.25	16.00	1.75	1.75	5.14	-	-	-
Line 2											
Level 1											
Line 2		1	36.00	0.00	16.00	16.00	9.75	-	9.00	-	-
Wall 2-1	Seg	1	36.00	0.00	16.00	16.00	9.75	-	-	2	2
Segment 1		-	-	0.00	2.25	2.25	2.00	4.00	-	2	2
Opening 1		-	-	2.25	6.25	4.00	-	-	4.00	2	2
Segment 2		-	-	6.25	16.00	9.75	9.50	0.92	-	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	0.00	8.00	36.00	28.00	19.25	-	9.00	-	-
Wall A-1	Prf	1	0.00	8.00	36.00	28.00	19.25	-	-	2	2
Segment 1		-	-	8.00	11.67	3.67	2.99	2.45	-	-	-
Opening 1		-	-	11.67	14.67	3.00	3.00	-	4.00	-	-
Segment 2		-	-	14.67	29.25	14.58	14.58	0.62	-	-	-
Opening 2		-	-	29.25	33.25	4.00	4.00	-	4.00	-	-
Segment 3		-	-	33.25	36.00	2.75	1.68	3.27	-	-	-
Line B											
Level 1											
Line B		1	16.00	8.00	36.00	28.00	20.37	-	9.00	-	-
Wall B-1	Prf	1	16.00	8.00	36.00	28.00	20.37	-	-	2	2
Segment 1		-	-	8.00	11.75	3.75	3.13	2.40	-	-	-
Opening 1		-	-	11.75	13.75	2.00	2.00	-	4.00	-	-
Segment 2		-	-	13.75	19.50	5.75	5.75	1.57	-	-	-
Opening 2		-	-	19.50	24.50	5.00	5.00	-	4.00	-	-
Segment 3		-	-	24.50	36.00	11.50	11.50	0.78	-	-	-

Legend:
Type – Seg = Segmented, Prf = Perforated, FT = FTAO (force transfer around openings), NSW = non-shearwall
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	L Gable	1	W->E	Wind	Line	0.00	8.00	0.0	52.4	
Block 1	W	L Gable	Min	W->E	Wind	Line	0.00	8.00	0.0	37.0	
Block 1	W	Wall	Min	W->E	Wind	Line	0.00	16.00	36.0		
Block 1	W	Wall	1	W->E	Wind	Line	0.00	16.00	51.0		
Block 1	W	R Gable	1	W->E	Wind	Line	8.00	16.00	52.4	0.0	
Block 1	W	R Gable	Min	W->E	Wind	Line	8.00	16.00	37.0	0.0	
Block 1	E	L Gable	1	W->E	Lee	Line	0.00	8.00	0.0	22.9	
Block 1	E	Wall	1	W->E	Lee	Line	0.00	16.00	22.3		
Block 1	E	L Gable	Min	W->E	Lee	Line	0.00	8.00	0.0	37.0	
Block 1	E	Wall	Min	W->E	Lee	Line	0.00	16.00	36.0		
Block 1	E	R Gable	Min	W->E	Lee	Line	8.00	16.00	37.0	0.0	
Block 1	E	R Gable	1	W->E	Lee	Line	8.00	16.00	22.9	0.0	
Block 1	W	L Gable	1	E->W	Lee	Line	0.00	8.00	0.0	22.9	
Block 1	W	L Gable	Min	E->W	Lee	Line	0.00	8.00	0.0	37.0	
Block 1	W	Wall	Min	E->W	Lee	Line	0.00	16.00	36.0		
Block 1	W	Wall	1	E->W	Lee	Line	0.00	16.00	22.3		
Block 1	W	R Gable	1	E->W	Lee	Line	8.00	16.00	22.9	0.0	
Block 1	W	R Gable	Min	E->W	Lee	Line	8.00	16.00	37.0	0.0	
Block 1	E	Wall	1	E->W	Wind	Line	0.00	16.00	51.0		
Block 1	E	L Gable	1	E->W	Wind	Line	0.00	8.00	0.0	52.4	
Block 1	E	Wall	Min	E->W	Wind	Line	0.00	16.00	36.0		
Block 1	E	L Gable	Min	E->W	Wind	Line	0.00	8.00	0.0	37.0	
Block 1	E	R Gable	Min	E->W	Wind	Line	8.00	16.00	37.0	0.0	
Block 1	E	R Gable	1	E->W	Wind	Line	8.00	16.00	52.4	0.0	
Block 1	S	Wall	1	S->N	Wind	Line	8.00	36.00	51.0		
Block 1	S	Roof	Min	S->N	Wind	Line	8.00	37.00	21.9		
Block 1	S	Wall	Min	S->N	Wind	Line	8.00	36.00	36.0		
Block 1	S	Roof	1	S->N	Wind	Line	8.00	37.00	15.5		
Block 1	N	Roof	1	S->N	Lee	Line	8.00	37.00	46.6		
Block 1	N	Wall	1	S->N	Lee	Line	8.00	36.00	31.9		
Block 1	N	Roof	Min	S->N	Lee	Line	8.00	37.00	21.9		
Block 1	N	Wall	Min	S->N	Lee	Line	8.00	36.00	36.0		
Block 1	S	Roof	1	N->S	Lee	Line	8.00	37.00	46.6		
Block 1	S	Wall	1	N->S	Lee	Line	8.00	36.00	31.9		
Block 1	S	Wall	Min	N->S	Lee	Line	8.00	36.00	36.0		
Block 1	S	Roof	Min	N->S	Lee	Line	8.00	37.00	21.9		
Block 1	N	Roof	Min	N->S	Wind	Line	8.00	37.00	21.9		
Block 1	N	Wall	Min	N->S	Wind	Line	8.00	36.00	36.0		
Block 1	N	Roof	1	N->S	Wind	Line	8.00	37.00	15.5		
Block 1	N	Wall	1	N->S	Wind	Line	8.00	36.00	51.0		
Block 2	W	L Gable	Min	W->E	Wind	Line	0.00	8.00	0.0	37.0	
Block 2	W	L Gable	1	W->E	Wind	Line	0.00	8.00	0.0	52.4	
Block 2	W	R Gable	1	W->E	Wind	Line	8.00	16.00	52.4	0.0	
Block 2	W	R Gable	Min	W->E	Wind	Line	8.00	16.00	37.0	0.0	
Block 2	E	L Gable	Min	W->E	Lee	Line	0.00	8.00	0.0	37.0	
Block 2	E	L Gable	1	W->E	Lee	Line	0.00	8.00	0.0	32.7	
Block 2	E	R Gable	1	W->E	Lee	Line	8.00	16.00	32.7	0.0	
Block 2	E	R Gable	Min	W->E	Lee	Line	8.00	16.00	37.0	0.0	
Block 2	W	L Gable	1	E->W	Lee	Line	0.00	8.00	0.0	32.7	
Block 2	W	L Gable	Min	E->W	Lee	Line	0.00	8.00	0.0	37.0	
Block 2	W	R Gable	1	E->W	Lee	Line	8.00	16.00	32.7	0.0	
Block 2	W	R Gable	Min	E->W	Lee	Line	8.00	16.00	37.0	0.0	
Block 2	E	L Gable	1	E->W	Wind	Line	0.00	8.00	0.0	52.4	
Block 2	E	L Gable	Min	E->W	Wind	Line	0.00	8.00	0.0	37.0	
Block 2	E	R Gable	Min	E->W	Wind	Line	8.00	16.00	37.0	0.0	
Block 2	E	R Gable	1	E->W	Wind	Line	8.00	16.00	52.4	0.0	
Block 2	S	Roof	1	S->N	Wind	Line	-1.00	8.00	15.5		
Block 2	S	Roof	Min	S->N	Wind	Line	-1.00	8.00	21.9		
Block 2	N	Roof	1	S->N	Lee	Line	-1.00	8.00	46.6		
Block 2	N	Roof	Min	S->N	Lee	Line	-1.00	8.00	21.9		
Block 2	S	Roof	Min	N->S	Lee	Line	-1.00	8.00	21.9		
Block 2	S	Roof	1	N->S	Lee	Line	-1.00	8.00	46.6		
Block 2	N	Roof	Min	N->S	Wind	Line	-1.00	8.00	21.9		
Block 2	N	Roof	1	N->S	Wind	Line	-1.00	8.00	15.5		

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	21.3	26.3
Block 1	West	Windward	1	21.3	26.3
Block 1	West	Windward	1	21.3	26.3
Block 1	East	Leeward	1	21.3	26.3
Block 1	East	Leeward	1	21.3	26.3
Block 1	East	Leeward	1	21.3	26.3
Block 1	West	Leeward	1	21.3	26.3
Block 1	West	Leeward	1	21.3	26.3
Block 1	West	Leeward	1	21.3	26.3
Block 1	East	Windward	1	21.3	26.3
Block 1	East	Windward	1	21.3	26.3
Block 1	East	Windward	1	21.3	26.3
Block 1	South	Windward	1	21.3	26.3
Block 1	South	Windward	1	21.3	26.3
Block 1	South	Windward	1	21.3	26.3
Block 1	North	Leeward	1	21.3	26.3
Block 1	North	Leeward	1	21.3	26.3
Block 1	North	Leeward	1	21.3	26.3
Block 1	South	Leeward	1	21.3	26.3
Block 1	South	Leeward	1	21.3	26.3
Block 1	South	Leeward	1	21.3	26.3
Block 1	North	Windward	1	21.3	26.3
Block 1	North	Windward	1	21.3	26.3
Block 1	North	Windward	1	21.3	26.3

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		8.00	36.00	135.0*	
B	1	Line		8.00	36.00	135.0*	
1	1	Line		0.00	16.00	135.0*	
2	1	Line		0.00	16.00	135.0*	

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	-1.50	17.50	280.0	280.0	
E-W	Roof	Block 1	2	Line	-1.50	17.50	300.0	300.0	
E-W	Roof	Block 2		Line	-1.50	17.50	100.0	100.0	
E-W	Roof	Block 2	1	Line	-1.50	17.50	80.0	80.0	
E-W	R Gable	Block 1	1	Line	0.00	8.00	69.3	0.0	
E-W	L Gable	Block 1	1	Line	8.00	16.00	0.0	69.3	
E-W	L Gable	Block 1	2	Line	0.00	8.00	69.3	0.0	
E-W	R Gable	Block 1	2	Line	8.00	16.00	0.0	69.3	
E-W	R Gable	Block 2		Line	0.00	8.00	69.3	0.0	
E-W	L Gable	Block 2		Line	8.00	16.00	0.0	69.3	
E-W	L Gable	Block 2	1	Line	0.00	8.00	69.3	0.0	
E-W	R Gable	Block 2	1	Line	8.00	16.00	0.0	69.3	
N-S	Roof	Block 1	A	Line	8.00	37.00	190.0	190.0	
N-S	Roof	Block 1	B	Line	8.00	37.00	190.0	190.0	
N-S	Roof	Block 2	A	Line	-1.00	8.00	190.0	190.0	
N-S	Roof	Block 2	B	Line	-1.00	8.00	190.0	190.0	
Both	Wall 1-1	n/a	1	Line	0.00	16.00	67.5	67.5	
Both	Wall 2-1	n/a	2	Line	0.00	16.00	67.5	67.5	
Both	Wall A-1	n/a	A	Line	8.00	36.00	67.5	67.5	
Both	Wall B-1	n/a	B	Line	8.00	36.00	67.5	67.5	

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	-1.50	0.00	76.0	76.0
E-W	Point	0.00	0.00	189	189
E-W	Line	0.00	8.00	89.4	117.1
E-W	Line	8.00	16.00	117.1	89.4
E-W	Point	16.00	16.00	189	189
E-W	Line	16.00	17.50	76.0	76.0
N-S	Line	-1.00	8.00	38.0	38.0
N-S	Point	0.00	0.00	55	55
N-S	Point	8.00	8.00	219	219
N-S	Line	8.00	36.00	51.5	51.5
N-S	Point	36.00	36.00	163	163
N-S	Line	36.00	37.00	38.0	38.0

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, Flexible 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, Flexible Diaphragm
All shearwalls have sufficient design capacity.

HOLD-DOWN DESIGN

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

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

COMPRESSION FORCE DESIGN

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

Seismic Loads, Flexible 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).

Flexible 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	1^	Both	188.4	226.5	1554	-	.91	-	304	0.92		304	2505	0.62
Line 2														
Ln2, Lev1	-	Both	-	-	1256	-	-	-	365	-		-	3559	-
Wall 2-1	1	Both	-	-	1256	-	1.0	-	365	-		-	3559	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	365	-		365	-	-
Seg. 2	-	Both	128.8	-	1256	-	1.0	-	365	-		365	3559	0.35

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	1	Both	35.1	41.5	737	-	.92	-	309	0.92		309	6486	0.11
Line B														
LnB, Lev1	1	Both	35.1	39.2	737	-	.97	-	327	0.92		327	6865	0.11

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 – For wall: Unblocked structural wood panel factor Cub from SDPWS 4.3.5.3. For segment or FTAO pier: Aspect ratio factor from SDPWS 4.3.5.5.1. For perforated wall: Either Cub or sum bi / FHS, where bi is segment length adjusted per SDPWS 4.3.3.4.
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 (flexible 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	8.00	0.12	1	2650	456		2195	HDU2-SDS	3075	0.71
1-1	L End	8.00	0.12	1	-2650	759		3409	Compression	10312	0.33
1-1	R End	8.00	11.13	1	2650	456		2195	HDU2-SDS	3075	0.71
1-1	R End	8.00	11.13	1	-2650	759		3409	Compression	10312	0.33
1-1	R Op 2	8.00	14.38	1	0	118		118	Compression	10312	0.01
1-1	R End	8.00	15.88	1	0	118		118	Compression	10312	0.01
Line 2											
	V Elem	36.00	0.12	1	0	152		152	Compression		
	V Elem	36.00	2.13	1	0	152		152	Compression		
2-1	R Op 1	36.00	6.38	1	1541	395		1146	HDU2-SDS	3075	0.37
2-1	R Op 1	36.00	6.38	1	-1541	658		2199	Compression	11601	0.19
2-1	R End	36.00	15.88	1	1541	395		1146	HDU2-SDS	3075	0.37
2-1	R End	36.00	15.88	1	-1541	658		2199	Compression	10312	0.21
Line A											
A-1	L End	8.13	0.00	1	-378	1890		2268	Compression	10312	0.22
A-1	R End	35.88	0.00	1	-378	1890		2268	Compression	10312	0.22
Line B											
B-1	L End	8.13	16.00	1	-357	1890		2247	Compression	10312	0.22
B-1	R End	35.88	16.00	1	-357	1890		2247	Compression	10312	0.22

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:
HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 6 1/4" x 2.5" SDS heavy-duty screws; 5/8" anchor bolt.
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 (flexible 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	8.00	3.50		453	-453		
1-1	Right Opening 1	8.00	6.50		161	-161		
1-1	Left Opening 2	8.00	11.25		461	-461		
Line 2								
2-1	Right Opening 1	36.00	6.25		-491	491		
Line A								
A-1	Left Opening 1	11.67	0.00		56	-56		
A-1	Right Opening 1	14.67	0.00		-100	100		
A-1	Left Opening 2	29.25	0.00		121	-121		
A-1	Right Opening 2	33.25	0.00		-42	42		
Line B								
B-1	Left Opening 1	11.75	16.00		48	-48		
B-1	Right Opening 1	13.75	16.00		-38	38		
B-1	Left Opening 2	19.50	16.00		48	-48		
B-1	Right Opening 2	24.50	16.00		-148	148		

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

MWFRS DEFLECTION (flexible wind design)

These deflections are used to determine shearwall stiffness for force distribution

Wall, segment	W Gp	Dir	Srf	v plf	b ft	h ft	Bending A sq.in	Bending Defl in	Shear Defl in	Nail slip Vn lbs	Nail slip en in	Nail slip Defl in	Hold Defl in	Total Defl in
Level 1														
Line 1														
1-1	1	Both	Ext	226.5	7.47	9.00	16.5	.007	.026	113	.027	.184	0.11	0.32
Line 2														
2-1,2	1	Both	Ext	128.8	9.75	9.00	16.5	.003	.015	64	.010	.064	0.05	0.13
Line A														
A-1	1	Both	Ext	41.5	19.25	9.00	16.5	.000	.005	21	.001	.008	0.00	0.02
Line B														
B-1	1	Both	Ext	39.2	20.37	9.00	16.5	.000	.005	20	.001	.007	0.00	0.01

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B.

W Gp – Wall design group, refer to Sheathing and Framing Materials tables.

Dir – Force direction.

Srf – Wall surface = Int(erior) or Ext(erior) for perimeter walls, 1 or 2 for interior partitions.

v – ASD shear force per unit distance on wall segment.

Unblocked walls = v / Cub as per SDPWS 4.3.4.3, Cub = Unblocked factor from 4.3.5.3, shown in the Shear Results table.

Perforated walls = vmax from Eqn. 4.3-9, as per 4.3.4.2.

FTAO walls = Unit shear force in pier beside opening(s).

b – Wall or segment length.

Segmented wall or FTAO wall segments = Width of wall segment between openings.

Perforated wall = Sum of FHS segments, modified as in 4.3.3.4 per 4.3.4.2.

FTAO wall = Length of wall including openings.

h – Wall height.

FTAO piers = Distance from bottom of opening to top of wall; for end segments, results using that distance and the wall height are averaged.

Defl – Horizontal shear wall deflection due to given term:

Bending = 8vh^3 / EAb; A = Effective cross sectional area of segment end stud(s), E = stud mod. of elasticity in Framing Materials table

For i studs at one end and j at the other, A = 2 (i^2 j + j^2 i) / (i + j)^2 x area of one stud, based on Ex. C4.3.4-3

Shear = vh / Gvtv; Gvtv = Shear stiffness from C4.3.4, shown in Sheathing Materials table.

Nail slip = 0.75 h x en; en from Table C4.2.3D, of form aVn^b for WSP, varies linearly to published value for other materials.

Vn – ASD shear force per nail along panel edge.

Hold – Anchorage system (hold-down) = da x h / beff.

da = Vertical hold-down displacement; refer to Hold-down Displacement table for components.

beff = Effective wall segment length = b - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width)

beff is given in the Shear Wall Dimensions table.

For FTAO walls, hold-down device at end of wall is applied to all segments, as per APA T555.

Total Defl – Deflection from bending + shear + nail slip + hold-down, as per Eqn. 4.3-2.

For FTAO walls, the average of the values for the segments, as per APA T555.

SERVICEABILITY DEFLECTION (flexible wind design)

These deflections are used to determine story drift

Wall, segment	W Gp	Dir	Srf	v plf	b ft	h ft	Bending A sq.in	Bending Defl in	Shear Defl in	Nail slip Vn lbs	Nail slip en in	Nail slip Defl in	Hold Defl in	Total Defl in
Level 1														
Line 1														
1-1	1	Both	Ext	418.3	7.47	9.00	16.5	.012	.049	209	.086	.580	0.18	0.82
Line 2														
2-1,2	1	Both	Ext	237.9	9.75	9.00	16.5	.005	.028	119	.030	.202	0.08	0.31
Line A														
A-1	1	Both	Ext	76.6	19.25	9.00	16.5	.001	.009	38	.004	.024	0.00	0.04
Line B														
B-1	1	Both	Ext	72.3	20.37	9.00	16.5	.001	.008	36	.003	.022	0.00	0.03

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B.

W Gp – Wall design group, refer to Sheathing and Framing Materials tables.

Dir – Force direction.

Srf – Wall surface = Int(erior) or Ext(erior) for perimeter walls, 1 or 2 for interior partitions.

v – Shear force per unit distance on wall segment using 1.0 Wa = wind load based on serviceability wind speeds from ASCE 7 CC.2.2, Figs. CC.2-1 - CC.2-4.

Unblocked walls = v / Cub as per SDPWS 4.3.4.3, Cub = Unblocked factor from 4.3.5.3, shown in the Shear Results table.

Perforated walls = vmax from Eqn. 4.3-9, as per 4.3.4.2.

FTAO walls = Unit shear force in pier beside opening(s).

b – Wall or segment length.

Segmented wall or FTAO wall segments = Width of wall segment between openings.

Perforated wall = Sum of FHS segments, modified as in 4.3.3.4 per 4.3.4.2.

FTAO wall = Length of wall including openings.

h – Wall height.

FTAO piers = Distance from bottom of opening to top of wall; for end segments, results using that distance and the wall height are averaged.

Defl – Horizontal shear wall deflection due to given term:

Bending = 8vh^3 / EAb; A = Effective cross sectional area of segment end stud(s), E = stud mod. of elasticity in Framing Materials table

For i studs at one end and j at the other, A = 2 (i^2 j + j^2 i) / (i + j)^2 x area of one stud, based on Ex. C4.3.4-3

Shear = vh / Gvtv; Gvtv = Shear stiffness from C4.3.4, shown in Sheathing Materials table.

Nail slip = 0.75 h x en; en from Table C4.2.3D, of form aVn^b for WSP, varies linearly to published value for other materials.

Vn – Serviceability shear force per nail along panel edge.

Hold – Anchorage system (hold-down) = da x h / beff.

da = Vertical hold-down displacement; refer to Hold-down Displacement table for components.

beff = Effective wall segment length = b - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width)

beff is given in the Shear Wall Dimensions table.

For FTAO walls, hold-down device at end of wall is applied to all segments, as per APA T555.

Total Defl – Deflection from bending + shear + nail slip + hold-down, as per Eqn. 4.3-2.

For FTAO walls, the average of the values for the segments, as per APA T555.

MWFRS HOLD-DOWN DISPLACEMENT (flexible wind design)

These displacements are used to determine deflections for force distribution

Wall, segment	Dir	Hold-down	Tension force lbs	Vert. Displacement Manuf in	Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1													
Line 1													
1-1	Both	HDU2-SDS	2195	.063	.000	0.063	-	-	.014	3410	0.01	0.09	0.11
Line 2													
2-1,2	Both	HDU2-SDS	1146	.033	.000	0.033	-	-	.014	2199	0.01	0.05	0.05
Line A													
A-1	Both	HDU2-SDS	-756	.000	.000	0.000	-	-	.000	2268	0.01	0.01	0.00
Line B													
B-1	Both	HDU2-SDS	-777	.000	.000	0.000	-	-	.000	2247	0.01	0.01	0.00

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

Dir – Force direction

Tens., Comp. force – Accumulated ASD hold-down tension force T and end stud compression force C from overturning, dead loads and wind uplift

da – Vertical displacements due to the following components:

Vert. Displacement – Elongation when slippage calculated separately; displacement when combined elongation/slippage used

Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation

*Unless marked with * = (ASD uplift force / ASD hold-down capacity) x max ASD elongation or displacement*

** - Maximum strength-level elongation or displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.*

Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = TL / (Ab x Es)

Ab = bolt cross-sectional area

Es = steel modulus = 29000000 psi

L = Lb – Lh

Lb = Total bolt length shown in Storey Information table

Lh = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database

Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation

Nails = en from SDPWS Table C4.2.3D using values for wood structural panels

Bolts = Vf / (270,000 D^1.5) (NDS 11.3.6); D = bolt diameter, Vf = Tension force T / number of fasteners

Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.

Shrinkage = 0.002 x (24% fabrication – 10% in-service moisture contents) x Ls

Ls = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Story Information table

Crush – Deformation of bottom plate at compression end of wall segment

= 0.02" x [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2 r^3, r > 1]

r = fcp / Fcp'; Fcp' = Ct CM Fcp; fcp = C / A, A = cross sectional area of end studs

Total da – Vert. Displacement + Slippage + Shrink + Crush + Extra

Horz Defl – Anchorage deflection term in SDPWS Eqn. C.4.3.4-1 = h / beff x da

h = Wall height. For end segments in FTAO walls, h is the average of the wall height and the distance from the bottom of opening to top of wall

beff = Effective wall segment length = b - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width)

h and b are shown in Deflection table, beff in the Shear Wall Dimensions table

SERVICEABILITY HOLD-DOWN DISPLACEMENT (flexible wind design)

These displacements are used to determine deflections for story drift

Wall, segment	Dir	Hold-down	Tension force lbs	Vert. Displacement Manuf in	Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1													
Line 1													
1-1	Both	HDU2-SDS	4053	.116	.000	0.116	-	-	.014	5736	0.02	0.15	0.18
Line 2													
2-1,2	Both	HDU2-SDS	2116	.061	.000	0.061	-	-	.014	3574	0.01	0.08	0.08
Line A													
A-1	Both	HDU2-SDS	-1397	.000	.000	0.000	-	-	.000	2792	0.01	0.01	0.00
Line B													
B-1	Both	HDU2-SDS	-1435	.000	.000	0.000	-	-	.000	2753	0.01	0.01	0.00

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

Dir – Force direction

Tens., Comp. force – Accumulated hold-down tension force T and end stud compression force C from overturning, dead loads and wind uplift using load combination D + Wa from ASCE 7 CC.2.2

Wa = wind load based on serviceability wind speeds from ASCE 7 CC.2.2, Figs. CC.2-1 - CC.2-4

da – Vertical displacements due to the following components:

Vert. Displacement – Elongation when slippage calculated separately; displacement when combined elongation/slippage used

Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation

*Unless marked with * = (ASD uplift force / ASD hold-down capacity) x max strength-level elongation or displacement*

** - Maximum strength-level elongation or displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.*

Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = TL / (Ab x Es)

Ab = bolt cross-sectional area

Es = steel modulus = 29000000 psi

L = Lb – Lh

Lb = Total bolt length shown in Storey Information table

Lh = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database

Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation

Nails = en from SDPWS Table C4.2.3D using values for wood structural panels

Bolts = Vf / (270,000 D^1.5) (NDS 11.3.6); D = bolt diameter, Vf = Tension force T / number of fasteners

Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.

Shrinkage = 0.002 x (24% fabrication – 10% in-service moisture contents) x Ls

Ls = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Story Information table

Crush – Deformation of bottom plate at compression end of wall segment

= 0.02" x [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2 r^3, r > 1]

r = fcp / Fcp'; Fcp' = Ct CM Fcp; fcp = C / A, A = cross sectional area of end studs

Total da – Vert. Displacement + Slippage + Shrink + Crush + Extra

Horz Defl – Anchorage deflection term in SDPWS Eqn. C.4.3.4-1 = h / beff x da

h = Wall height. For end segments in FTAO walls, h is the average of the wall height and the distance from the bottom of opening to top of wall

beff = Effective wall segment length = b - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width)

h and b are shown in Deflection table, beff in the Shear Wall Dimensions table

STORY DRIFT (flexible wind design)

Level	Dir	Wall height ft	Actual Story Drift (in) Max defl	Line	Allowable Story Drift hs ft	Drift in	Ratio
1		9.00			9.00		
	N<->S		0.82	1		1.08	0.76
	E<->W		0.04	A		1.08	0.03

Legend:
Max defl – Largest deflection for any shearline on level in this direction; refer to Serviceability Deflections table
Line – Shearline with largest deflection on level in this direction
hs – Story height = Height of walls plus joist depth between this level and the one above.
Drift = Allowable story drift on this level = story height / 100
Ratio - Proportion of allowable story drift experienced, on this level in this 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	15.8	178.1	0.09	21.1	17.1	23.4	0.90	0.73	1.00	0.25
2	1	1	15.8	178.1	0.09	21.1	17.1	23.4	0.90	0.73	1.00	0.25

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	15.8	178.1	0.09	21.1	17.1	23.4	0.90	0.73	1.00	0.25
B	1	1	15.8	178.1	0.09	21.1	17.1	23.4	0.90	0.73	1.00	0.25

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

Flexible 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	22597	448.0	1581	1581	9536	4331	2055	2055	2055	2055
All	22597	-	2258	2258	-	-	-	-	-	-

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 = 2.5 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 = 0.65; Ev = 0.130 D unfactored; 0.091 D factored; total dead load factor: 0.6 - 0.091 = 0.509 tension, 1.0 + 0.091 = 1.091 compression.

SHEAR RESULTS (flexible 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	1	Both	113.4	136.3	936	-	.91	-	217	0.92		217	1789	0.52
Line 2														
Ln2, Lev1	-	Both	-	-	645	-	-	-	261	-		-	2542	-
Wall 2-1	1	Both	-	-	645	-	1.0	-	261	-		-	2542	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	261	-		261	-	-
Seg. 2	-	Both	66.2	-	645	-	1.0	-	261	-		261	2542	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	1	Both	37.6	44.5	790	-	.92	-	221	0.92		221	4633	0.17
Line B														
LnB, Lev1	1	Both	37.6	42.0	790	-	.97	-	233	0.92		233	4903	0.16

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 – For wall: Unblocked structural wood panel factor Cub from SDPWS 4.3.5.3. For segment or FTAO pier: Aspect ratio factor from SDPWS 4.3.5.5.1. For perforated wall: Either Cub or sum bi / FHS, where bi is segment length adjusted per SDPWS 4.3.3.4.
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.

Hold-Down and Compression Design (flexible 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	8.00	0.12	1595	456	69	1208	HDU2-SDS	3075	0.39
1-1	L End	8.00	0.12	-1595	759	69	2423	Compression	10312	0.23
1-1	R End	8.00	11.13	1595	456	69	1208	HDU2-SDS	3075	0.39
1-1	R End	8.00	11.13	-1595	759	69	2423	Compression	10312	0.23
1-1	R Op 2	8.00	14.38	0	118	11	129	Compression	10312	0.01
1-1	R End	8.00	15.88	0	118	11	129	Compression	10312	0.01
Line 2										
	V Elem	36.00	0.12	0	152	14	166	Compression		
	V Elem	36.00	2.13	0	152	14	166	Compression		
2-1	R Op 1	36.00	6.38	792	395	60	457	HDU2-SDS	3075	0.15
2-1	R Op 1	36.00	6.38	-792	658	60	1509	Compression	11601	0.13
2-1	R End	36.00	15.88	792	395	60	457	HDU2-SDS	3075	0.15
2-1	R End	36.00	15.88	-792	658	60	1509	Compression	10312	0.15
Line A										
A-1	L End	8.13	0.00	-405	1890	172	2467	Compression	10312	0.24
A-1	R End	35.88	0.00	-405	1890	172	2467	Compression	10312	0.24
Line B										
B-1	L End	8.13	16.00	-383	1890	172	2445	Compression	10312	0.24
B-1	R End	35.88	16.00	-383	1890	172	2445	Compression	10312	0.24

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 = 0.152 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:
HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 6 1/4" x 2.5" SDS heavy-duty screws; 5/8" anchor bolt.
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 (flexible seismic design)

Level 1 Line-Wall	Position on Wall or Opening	Location [ft] X	Y	Drag Strut Force [lbs] --->	<---	Strap/Blocking Force [lbs] --->	<---
Line 1							
	Shearline force			1216	1216		
1-1	Left Opening 1	8.00	3.50	354	-354		
1-1	Right Opening 1	8.00	6.50	126	-126		
1-1	Left Opening 2	8.00	11.25	361	-361		
Line 2							
	Shearline force			839	839		
2-1	Right Opening 1	36.00	6.25	-328	328		
Line A							
	Shearline force			1028	1028		
A-1	Left Opening 1	11.67	0.00	77	-77		
A-1	Right Opening 1	14.67	0.00	-139	139		
A-1	Left Opening 2	29.25	0.00	169	-169		
A-1	Right Opening 2	33.25	0.00	-58	58		
Line B							
	Shearline force			1028	1028		
B-1	Left Opening 1	11.75	16.00	67	-67		
B-1	Right Opening 1	13.75	16.00	-53	53		
B-1	Left Opening 2	19.50	16.00	68	-68		
B-1	Right Opening 2	24.50	16.00	-206	206		

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 horizontal torsional irregularities 2, 3, or 4 are input, or 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

DEFLECTION (flexible seismic design)

Wall, segment	W Gp	Dir	Srf	v plf	b ft	h ft	Bending A sq.in	Bending Defl in	Shear Defl in	Nail slip Vn lbs	Nail slip en in	Nail slip Defl in	Hold Defl in	Total Defl in
Level 1														
Line 1														
1-1	1	Both	Ext	194.8	7.47	9.00	16.5	.006	.023	97	.021	.139	0.09	0.25
Line 2														
2-1,2	1	Both	Ext	94.5	9.75	9.00	16.5	.002	.011	47	.005	.036	0.04	0.08
Line A														
A-1	1	Both	Ext	63.5	19.25	9.00	16.5	.001	.007	32	.003	.017	0.00	0.03
Line B														
B-1	1	Both	Ext	60.0	20.37	9.00	16.5	.001	.007	30	.002	.015	0.00	0.03

Legend:
Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B.
W Gp – Wall design group, refer to Sheathing and Framing Materials tables.
Dir – Force direction.
Srf – Wall surface = Int(erior) or Ext(erior) for perimeter walls, 1 or 2 for interior partitions.
v – Unfactored (strength-level) shear force per unit distance on wall segment = ASD force / 0.70, as per ASCE 7 12.8.6,.
Unblocked walls = v / Cub as per SDPWS 4.3.4.3, Cub = Unblocked factor from 4.3.5.3, shown in the Shear Results table.
Perforated walls = vmax from Eqn. 4.3-9, as per 4.3.4.2.
FTAO walls = Unit shear force in pier beside opening(s).
b – Wall or segment length.
Segmented wall or FTAO wall segments = Width of wall segment between openings.
Perforated wall = Sum of FHS segments, modified as in 4.3.3.4 per 4.3.4.2.
FTAO wall = Length of wall including openings.
h – Wall height.
FTAO piers = Distance from bottom of opening to top of wall; for end segments, results using that distance and the wall height are averaged.
Defl – Horizontal shear wall deflection due to given term:
Bending = 8vh^3 / EAb; A = Effective cross sectional area of segment end stud(s), E = stud mod. of elasticity in Framing Materials table
For i studs at one end and j at the other, A = 2 (i^2 j + j^2 i) / (i + j)^2 x area of one stud, based on Ex. C4.3.4-3
Shear = vh / Gvtv; Gvtv = Shear stiffness from C4.3.4, shown in Sheathing Materials table.
Nail slip = 0.75 h x en; en from Table C4.2.3D, of form aVn^b for WSP, varies linearly to published value for other materials.
Vn – Strength-level shear force per nail along panel edge.
Hold – Anchorage system (hold-down) = da x h / beff.
da = Vertical hold-down displacement; refer to Hold-down Displacement table for components.
beff = Effective wall segment length = b - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width)
beff is given in the Shear Wall Dimensions table.
For FTAO walls, hold-down device at end of wall is applied to all segments, as per APA T555.
Total Defl – Deflection from bending + shear + nail slip + hold-down, as per Eqn. 4.3-2.
For FTAO walls, the average of the values for the segments, as per APA T555.

HOLD-DOWN DISPLACEMENT (flexible seismic design)

Wall, segment	Dir	Hold-down	Tension force lbs	Vert. Displacement Manuf in	Vert. Displacement Add in	Vert. Displacement da in	Slippage Vf lbs	Slippage da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1													
Line 1													
1-1	Both	HDU2-SDS	1694	.046	.000	0.046	-	-	.014	3440	0.01	0.07	0.09
Line 2													
2-1,2	Both	HDU2-SDS	624	.018	.000	0.018	-	-	.014	2138	0.01	0.04	0.04
Line A													
A-1	Both	HDU2-SDS	-877	.000	.000	0.000	-	-	.000	3470	0.01	0.01	0.00
Line B													
B-1	Both	HDU2-SDS	-909	.000	.000	0.000	-	-	.000	3438	0.01	0.01	0.00

Legend:
Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B
Dir – Force direction
Tens., Comp. force – Accumulated strength-level hold-down tension force T and end compression force C from overturning, dead loads and vertical earthquake loads
da – Vertical displacements due to the following components:
Vert. Displacement – Elongation when slippage calculated separately; displacement when combined elongation/slippage used
Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation
*Unless marked with * = (ASD uplift force / ASD hold-down capacity) x max strength-level elongation or displacement*
** - Maximum strength-level elongation or displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.*
Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = TL / (Ab x Es)
Ab = bolt cross-sectional area
Es = steel modulus = 29000000 psi
L = Lb – Lh
Lb = Total bolt length shown in Storey Information table
Lh = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database
Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation
Nails = en from SDPWS Table C4.2.3D using values for wood structural panels
Bolts = Vf / (270,000 D^1.5) (NDS 11.3.6); D = bolt diameter, Vf = Tension force T / number of fasteners
Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.
Shrinkage = 0.002 x (24% fabrication – 10% in-service moisture contents) x Ls
Ls = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Story Information table
Crush – Deformation of bottom plate at compression end of wall segment
= 0.02" x [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2 r^3, r > 1]
r = fcp / Fcp'; Fcp' = Ct CM Fcp; fcp = C / A, A = cross sectional area of end studs
Total da – Vert. Displacement + Slippage + Shrink + Crush + Extra
Horz Defl – Anchorage deflection term in SDPWS Eqn. C.4.3.4-1 = h / beff x da
h = Wall height. For end segments in FTAO walls, h is the average of the wall height and the distance from the bottom of opening to top of wall
beff = Effective wall segment length = b - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width)
h and b are shown in Deflection table, beff in the Shear Wall Dimensions table

STORY DRIFT (flexible seismic design)

Level	Dir	Wall height ft	Actual Story Drift (in) Max dxe	Line	Max dx	Center of Mass	C of M dxe	C of M dx	Allowable Story Drift hsx ft	Delta a in	Ratio Max	Ratio C of M
1		9.00							9.00	2.70		
	N<->S		0.25	1	0.97	10.56	0.19	0.71			0.36	0.26
	E<->W		0.03	A	0.12	8.00	0.03	0.11			0.04	0.04

ASCE 7 Eqn. 12.8-15: dx = dxe x Cd / Ie
Deflection amplification factor Cd from Table 12.2-1 = (E-W), 4.0 (N-S)
Importance factor Ie = 1.00

Legend:
Max dxe – Largest deflection for any shearline on level in this direction; refer to Deflections table
Line – Shearline with largest deflection on level in this direction
hsx – Story height in ASCE Table 12.12-1 = Height of walls plus joist depth between this level and the one above.
Max dx – Largest amplified deflection on level in this direction using ASCE 7 Eq'n 12.8-15
C of M dxe - Deflection at the center of mass of this level; from interpolating deflections at adjacent shearlines.
C of M dx - Amplified deflection at center of mass using Eq'n 12.8-15. Does not include differences between top and bottom diaphragm deflection.
Delta a = Allowable story drift on this level from ASCE 7 Table 12.12-1
Ratio - Proportion of allowable story drift experienced, on this level in this direction.

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SEISMIC LOAD GENERATION
ASCE 7-16 12.8 Equivalent Lateral Force Procedure

Site Information:
Risk Category II - All others
SFRS = Bearing wall structure
Regular
Site class D
S1 = 0.35, (Fv = 1.95)
SS = 0.84, (Fa = 1.16)
Seismic Design Category D
Ta: Calculated - refer to Equations and to Base Shear table, below
R: Refer to Base Shear table below

Legend:

V - Total design base shear	Cvx - Vertical distribution factor, level x
Vx - Design story shear, level x	R - Response modification factor
Fx - Lateral force induced in level x	Ie - Seismic importance factor
Fpx - Diaphragm design force, level x	Cu - Coefficient for upper limit on period T
W - Total seismic dead load on structure	Cs - Seismic design coefficient
wx - Dead load tributary to story x	SDS - Design short period spectral acceleration
hx - Ceiling height of level x (floor of x+1)	SD1 - Design 1s spectral response acceleration
hn - Height of structure to mid-roof	SS - Mapped short period spectral acceleration
Fi,wi,hi,Vi - Fx, etc. summed over levels	S1 - Mapped 1s spectral response acceleration
Vjx - Design force on shearline j, level x	Fa - Acceleration-based site coefficient
Vpjx - Diaphragm design shearline force	Fv - Velocity-based site coefficient
Vdjx - Vert. discontinuous shearline force	T - Fundamental period of vibration
Vcjx - Collector shearline force	Tmax - Maximumum period of vibration
Fe,Fpe,we - Force,load from mass element e	Ta - Approximate period of vibration
Fej,Fpej - Portion of Fe,Fpe applied to line j	Omega - Overstrength factor
SDC - Seismic Design Category	SFRS - Seismic force resisting system

Equations:

Fx	= Cvx V	Eqn 12.8-11 (SDC B-F)
Fx	= 0.01 wx	Eqn 1.4-1 (SDC A)
Fpx	= wx SUM(Fi)/SUM(wi), i = x to n	Eqn 12.10-1
V	= Cs W	Eqn 12.8-1
Vx	= SUM(Fi),i = x to n	Eqn 12.8-13
Cvx	= hx^k wx/SUM(wi hi^k) i = 1 to n	Eqn 12.8-12
k	= k(T)	Note, 12.8-12
Cscalc	= Sds Ie/R	Eqn 12.8-2
Csmax	= Sd1 Ie/(R T)	Eqn 12.8-3
Csmin	= max (0.044 Ie Sds, 0.01)	Eqn 12.8-5
Csmin	= 0.5 S1 Ie/R (Sds >= 0.6g)	Eqn 12.8-6
Ta	= Ct hn^(3/4), hn in m	Eqn 12.8-7
Ie	= Ie(risk category)	Table 1.5-2
Tmax	= Ta Cu	12.8.2
Cu	= Cu(SD1)	Table 12.8-1
SDS	= 2/3 Fa SS	Eqns 11.4-1,4-3
SD1	= 2/3 Fv S1	Eqns 11.4-2,4-4
Fa	= Fa(SS, Site Class)	Table 11.4-1
Fv	= Fv(S1, Site Class)	Table 11.4-2
SDC	= SDC(SDS, SD1, occupancy)	Tables 11.6-1,6-2
Omega	= Omega(SFRS)	Table 12.2-1
Fe	= Fx we / wx	Assumption
Fpe	= Fpx we / wx	Assumption
Vjx (flexible diaphragm)	= SUM(Fej) + Vj,x+1	12.8.4
Vjx (rigid diaphragm)	=	See Torsional Analysis Details, F = Vx, CL = centroid of Fe's and Vj,x+1's
Vpjx	= Vjx using Fpe, and Omega * Vdj,x+1	12.10.1.1
Vcjx	= Vjx	12.10.2 (SDC A,B)
Vcjx	= max(Vjx,Vpjx)	12.10.2.1 - Exception (SDC C-F)

User Input and Source:

Site Classes A-F	Table 20.3-1
Risk Category	Table 1.5-1
Fa and Fv for site profile F, maybe E	Site specific study
R (also calculated)	Table 12.2-1
T (also calculated using Ta)	deformational analysis
Irregularities	12.3.2,3; Tables 12.3-1,2
SFRS	Table 12.2-1

Total Design Base Shear:

Ie	SDC	W (lbs)	SDS	SD1	Cu	Tmax	Ta	k
1.00	D	22597	0.650	0.455	1.400	0.173	0.123	1.000

	R	T	SS	SDS	Cscalc	Csmax	Csmin	Cs	V (lbs)
N-S	6.5	0.123	0.84	0.650	0.100	0.568	0.029	0.100	2258
E-W	6.5	0.123	0.84	0.650	0.100	0.568	0.029	0.100	2258

The first SDS value shown, used for Seismic Design Category, diaphragm design force limits, and out-of-plane forces, is not limited by ASCE 7 12.8.1.3.
SDS values shown in lower table are for Cs and Ev calculations and may implement 12.8.1.3.

Manually added or modified seismic loads and forces do not contribute to base shear.

Distribution of Base Shear to Levels:

Level	hx (ft)	wx (lbs)	hx * wx (ft-lbs)	Cvx	Fx (lbs) N-S	Fx (lbs) E-W	Vx (lbs) N-S	Vx (lbs) E-W
1	9.00	22597	203373	1.00	2258	2258	2258	2258

Manually added or modified seismic loads and forces are not included in the distribution of base shear.

Unfactored seismic loads for Level 1 -

Dir. No.	Start	End	Profile	Magnitude (lbs, plf) From	To
N<->S 1	-1.00	8.00	Line	38.0	38.0
N<->S 2	0.00	0.00	Point	55	55
N<->S 3	8.00	36.00	Line	51.5	51.5
N<->S 4	8.00	8.00	Point	219	219
N<->S 5	36.00	37.00	Line	38.0	38.0
N<->S 6	36.00	36.00	Point	163	163
W<->E 1	-1.50	0.00	Line	76.0	76.0
W<->E 2	0.00	8.00	Line	89.4	117.1
W<->E 3	0.00	0.00	Point	189	189
W<->E 4	8.00	16.00	Line	117.1	89.4
W<->E 5	16.00	17.50	Line	76.0	76.0
W<->E 6	16.00	16.00	Point	189	189

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WIND LOAD GENERATION
MWFRS Procedure: ASCE 7-16 Directional (All heights)
C&C Procedure: ASCE 7 Ch. 30 Part 1 (h <= 60 ft.)

Site Information:
Enclosure = Partially open
Internal gust factor Cgi = 2.0
Occupancy = Category II - All others
Exposure = Exposure C
Rigid building - Static analysis
Case 2 Loads at 75%
Eccentricity N-S loads = 15%, E-W loads = 15%
Ground Elevation: = 0 feet

Legend:

p - Design wind pressure (see Equations)	h - Mean roof height
q - Velocity pressure	z - Height of interest
G - Gust factor	theta - Roof angle
Cp - External pressure factor	B - Building width
GCp - Combined exposure and gust factor	L - Building length
GCpi - Internal pressure coefficient	V - Basic wind speed
Kz - Velocity pressure exposure coefficient	Ke - Ground elevation factor
Kd - Wind directionality factor	Kzt - Topographic factor

zg - Ground elevation
c, zmin, epsilon-bar, l - Terrain exposure constants used to calculate G
hE, zg, alpha - Terrain exposure constants used to calculate K

Equations:
MWFRS Pressure Equation: p = q * G * Cp
C&C Pressure Equation: p = q * (GCp - GCpi)
Other Equations: q = 0.00256 * Kz * Kd * Kzt * Ke * V^2
Ke = e^(-0.0000362 zg)
Kz = 2.01 * (max(z, hE) / zg) ^ (2 / a))
Gz = min(0.85, 0.925 * (1 + 5.8 * (c * (max(0.6 * h, zmin) / 33) ^ (-1/6)) * ((1 / (1 + 0.63 * (((B + h) / (l * ((max(0.6 * h, zmin) / 33)) ^ (e))) ^ (0.63)))) ^ (1/2))) / (1 + 5.8 * (c * (max(0.6 * h, zmin) / 33) ^ (-1/6))))

Data (all loads):
Kd = 0.85, GCpi = 0.18, Ke = 1.000
Terrain Exposure Constants:

zmin	= 15	epsilon-bar	= 0.20
c	= 0.20	l	= 500
zg	= 900	alpha	= 9.5
hE	= 15		

Units: ft, lbs, ft/s

MAIN WIND FORCE RESISTING SYSTEM (MWFRS)

MWFRS - Block 1: EW x NS = 28.00 x 16.00 Mean Roof Height = 11.31

Level	Face	Direction	p	q	GCp	Cp	Gz	z-G	Kz	z-K	Kzt	z-Kzt	theta	L/B	h/L
1	North	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	30.0	0.57	0.71
1	North	Leeward	-7.09	16.7	-0.43	-0.50	0.85	11.3	0.85	11.3	1.00	-	30.0	0.57	0.71
Roof	North	Leeward	-8.50	16.7	-0.51	-0.60	0.85	11.3	0.85	11.3	1.00	-	30.0	0.57	0.71
Roof	North	Windward	2.83	16.7	0.17	0.20	0.85	11.3	0.85	11.3	1.00	-	30.0	0.57	0.71
1	East	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	90.0	1.75	0.40
1	East	Leeward	-4.96	16.7	-0.30	-0.35	0.85	11.3	0.85	11.3	1.00	-	90.0	1.75	0.40
1	East	Leeward	-4.96	16.7	-0.30	-0.35	0.85	11.3	0.85	11.3	1.00	-	90.0	1.75	0.40
1	East	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	1.75	0.40
1	East	Leeward	-4.96	16.7	-0.30	-0.35	0.85	11.3	0.85	11.3	1.00	-	90.0	1.75	0.40
1	East	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	1.75	0.40
1	South	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	30.0	0.57	0.71
1	South	Leeward	-7.09	16.7	-0.43	-0.50	0.85	11.3	0.85	11.3	1.00	-	30.0	0.57	0.71
Roof	South	Leeward	-8.50	16.7	-0.51	-0.60	0.85	11.3	0.85	11.3	1.00	-	30.0	0.57	0.71
Roof	South	Windward	2.83	16.7	0.17	0.20	0.85	11.3	0.85	11.3	1.00	-	30.0	0.57	0.71
1	West	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	90.0	1.75	0.40
1	West	Leeward	-4.96	16.7	-0.30	-0.35	0.85	11.3	0.85	11.3	1.00	-	90.0	1.75	0.40
1	West	Leeward	-4.96	16.7	-0.30	-0.35	0.85	11.3	0.85	11.3	1.00	-	90.0	1.75	0.40
1	West	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	1.75	0.40
1	West	Leeward	-4.96	16.7	-0.30	-0.35	0.85	11.3	0.85	11.3	1.00	-	90.0	1.75	0.40
1	West	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	1.75	0.40

MWFRS - Block 2: EW x NS = 8.00 x 16.00 Mean Roof Height = 11.31

Level	Face	Direction	p	q	GCp	Cp	Gz	z-G	Kz	z-K	Kzt	z-Kzt	theta	L/B	h/L
Roof	North	Leeward	-8.50	16.7	-0.51	-0.60	0.85	11.3	0.85	11.3	1.00	-	30.0	2.00	0.71
Roof	North	Windward	2.83	16.7	0.17	0.20	0.85	11.3	0.85	11.3	1.00	-	30.0	2.00	0.71
1	East	Leeward	-7.09	16.7	-0.43	-0.50	0.85	11.3	0.85	11.3	1.00	-	90.0	0.50	1.41
1	East	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	0.50	1.41
1	East	Leeward	-7.09	16.7	-0.43	-0.50	0.85	11.3	0.85	11.3	1.00	-	90.0	0.50	1.41
1	East	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	0.50	1.41
Roof	South	Leeward	-8.50	16.7	-0.51	-0.60	0.85	11.3	0.85	11.3	1.00	-	30.0	2.00	0.71
Roof	South	Windward	2.83	16.7	0.17	0.20	0.85	11.3	0.85	11.3	1.00	-	30.0	2.00	0.71
1	West	Leeward	-7.09	16.7	-0.43	-0.50	0.85	11.3	0.85	11.3	1.00	-	90.0	0.50	1.41
1	West	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	0.50	1.41
1	West	Leeward	-7.09	16.7	-0.43	-0.50	0.85	11.3	0.85	11.3	1.00	-	90.0	0.50	1.41
1	West	Windward	11.34	16.7	0.68	0.80	0.85	10.4	0.85	10.4	1.00	-	90.0	0.50	1.41

COMPONENTS AND CLADDING (C&C)

C&C - Block 1: EW x NS = 28.00 x 16.00 Mean Roof Height = 11.31

Level	Face	Direction	p	q	GCp	Cp	Gz	z-G	Kz	z-K	Kzt	z-Kzt	theta	L/B	h/L
1	North E	Leeward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	North	Leeward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	North E	Windward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	North	Windward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	East E	Leeward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	East	Leeward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	East E	Windward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	East	Windward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	South E	Leeward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	South	Leeward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	South E	Windward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	South	Windward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	30.0	0.57	0.71
1	West E	Leeward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	West	Leeward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	West E	Windward	-26.34	16.7	-1.40	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40
1	West	Windward	-21.34	16.7	-1.10	0.00	0.00	0.0	0.85	11.3	1.00	-	90.0	1.75	0.40

C&C - Block 2: EW x NS = 8.00 x 16.00 Mean Roof Height = 11.31

Level	Face	Direction	p	q	GCp	Cp	Gz	z-G	Kz	z-K	Kzt	z-Kzt	theta	L/B	h/L

PERFORATED SHEARWALL DRAG STRUT FORCE CALCULATION

V - Total shear line force(lbs)
Vw - Total force on perforated shear wall(lbs)
V / L - Diaphragm shear force(plf)
v - Unit shear wall force(plf)
vmax - Perforated shear wall force = Vw / Co / sum(bi) (plf)
sum(bi) - Sum of wall segment lengths adjusted for narrow segments(ft)
FHS - Sum of full - height segment lengths on wall(ft)
L - Length of shear line, including gaps and openings(ft)
Co - perforated wall shear capacity adjustment factor
Seg w / vmax - Wall segment for which v is set to vmax.
Other v - Force on the other wall segments = (Vw - vmax * bs) / (FHS - bs)
Drag strut force at - Sum of(V / L - v) * di along shear line(lbs), where di is the length of segments, openings or gaps.Locations shown are from start of shear line.
Critical force - Largest drag strut force at each location derived from setting v = vmax on each segment independently(lbs)

Shear wall 1-1, Level 1
W->E and S->N seismic design, flexible diaphragm
vmax = 177.2, V/L = 76.0, Co = 0.918, FHS = 8.25, sum (bi) = 7.47

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.50	6.50	11.25
1	3.5	125.4	354	126	361
2	4.75	107.0	108	-120	361
Critical force:			354	126	361

Shear wall 1-1, Level 1
W->E and S->N wind design, flexible diaphragm
vmax = 226.5, V/L = 97.1, Co = 0.918, FHS = 8.25, sum (bi) = 7.47

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.50	6.50	11.25
1	3.5	160.3	453	161	461
2	4.75	136.7	138	-153	461
Critical force:			453	161	461

Shear wall 1-1, Level 1
E->W and N->S wind design, flexible diaphragm
vmax = 226.5, V/L = 97.1, Co = 0.918, FHS = 8.25, sum (bi) = 7.47

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.50	6.50	11.25
1	3.5	160.3	-453	-161	-461
2	4.75	136.7	-138	153	-461
Critical force:			-453	-161	-461

Shear wall 1-1, Level 1
E->W and N->S seismic design, flexible diaphragm
vmax = 177.2, V/L = 76.0, Co = 0.918, FHS = 8.25, sum (bi) = 7.47

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.50	6.50	11.25
1	3.5	125.4	-354	-126	-361
2	4.75	107.0	-108	120	-361
Critical force:			-354	-126	-361

Shear wall A-1, Level 1
W->E and S->N seismic design, flexible diaphragm
vmax = 57.8, V/L = 36.7, Co = 0.923, FHS = 21.0, sum (bi) = 19.25

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.67	14.67	29.25	33.25
1	3.67	47.0	77	-33	118	-28
2	14.58	28.7	-29	-139	169	22
3	2.75	47.6	40	-70	89	-58
Critical force:			77	-139	169	-58

Shear wall A-1, Level 1
W->E and S->N wind design, flexible diaphragm
vmax = 41.5, V/L = 26.3, Co = 0.923, FHS = 21.0, sum (bi) = 19.25

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.67	14.67	29.25	33.25
1	3.67	33.7	56	-23	85	-20
2	14.58	20.6	-21	-100	121	16
3	2.75	34.1	29	-50	64	-42
Critical force:			56	-100	121	-42

Shear wall A-1, Level 1
E->W and N->S wind design, flexible diaphragm
vmax = 41.5, V/L = 26.3, Co = 0.923, FHS = 21.0, sum (bi) = 19.25

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.67	14.67	29.25	33.25
1	3.67	33.7	-55	23	-85	20
2	14.58	20.6	21	100	-121	-16
3	2.75	34.1	-29	50	-64	42
Critical force:			-55	100	-121	42

Shear wall A-1, Level 1
E->W and N->S seismic design, flexible diaphragm
vmax = 57.8, V/L = 36.7, Co = 0.923, FHS = 21.0, sum (bi) = 19.25

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.67	14.67	29.25	33.25
1	3.67	47.0	-77	33	-118	28
2	14.58	28.7	29	139	-169	-22
3	2.75	47.6	-40	70	-89	58
Critical force:			-77	139	-169	58

Shear wall B-1, Level 1
W->E and S->N seismic design, flexible diaphragm
vmax = 54.6, V/L = 36.7, Co = 0.923, FHS = 21.0, sum (bi) = 20.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.75	13.75	19.50	24.50
1	3.75	47.7	67	-6	57	-126
2	5.75	46.8	38	-35	68	-116
3	11.5	42.0	20	-53	-23	-206
Critical force:			67	-53	68	-206

Shear wall B-1, Level 1
W->E and S->N wind design, flexible diaphragm
vmax = 39.2, V/L = 26.3, Co = 0.923, FHS = 21.0, sum (bi) = 20.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.75	13.75	19.50	24.50
1	3.75	34.2	48	-4	41	-91
2	5.75	33.5	27	-25	48	-83
3	11.5	30.1	14	-38	-16	-148
Critical force:			48	-38	48	-148

Shear wall B-1, Level 1
E->W and N->S wind design, flexible diaphragm
vmax = 39.2, V/L = 26.3, Co = 0.923, FHS = 21.0, sum (bi) = 20.37

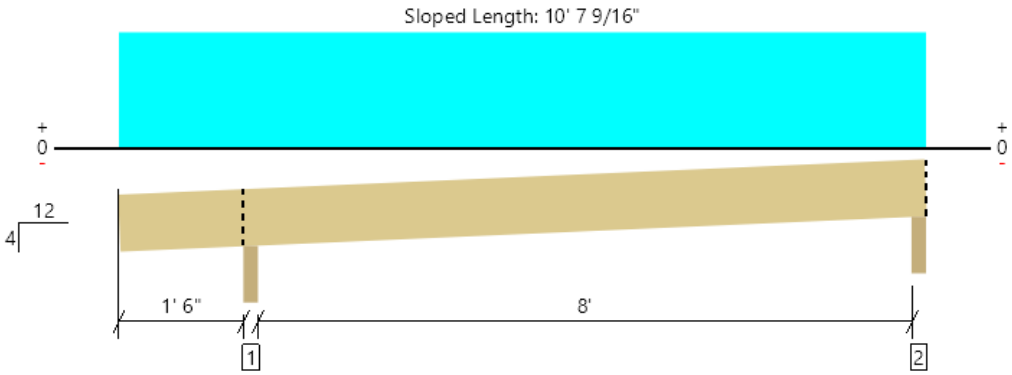
Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.75	13.75	19.50	24.50
1	3.75	34.2	-48	4	-41	91
2	5.75	33.5	-27	26	-48	83
3	11.5	30.1	-14	38	16	148
Critical force:			-48	38	-48	148

Shear wall B-1, Level 1
E->W and N->S seismic design, flexible diaphragm
vmax = 54.6, V/L = 36.7, Co = 0.923, FHS = 21.0, sum (bi) = 20.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 11.75	13.75	19.50	24.50
1	3.75	47.7	-67	6	-57	126
2	5.75	46.8	-38	36	-67	116
3	11.5	42.0	-20	53	23	206
Critical force:			-67	53	-67	206

Level, B1: Roof Rafter

1 piece(s) 2 x 8 DF No.2 @ 24" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Member Length : 10' 9 15/16"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 4/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	487 @ 1' 7 3/4"	2352 (3.50")	Passed (21%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	293 @ 2' 4 3/8"	1631	Passed (18%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	654 @ 5' 10 5/8"	1700	Passed (38%)	1.25	1.0 D + 1.0 Lr (Alt Spans)
Live Load Defl. (in)	0.057 @ 5' 9 7/16"	0.434	Passed (L/999+)	--	1.0 D + 1.0 Lr (Alt Spans)
Total Load Defl. (in)	0.115 @ 5' 9 5/8"	0.578	Passed (L/908)	--	1.0 D + 1.0 Lr (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.50"	250	237	487	Blocking
2 - Beveled Plate - SPF	3.50"	3.50"	1.50"	175	170	345	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 8" o/c	
Bottom Edge (Lu)	10' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
1 - Uniform (PSF)	0 to 10' 1"	24"	20.0	20.0	Default Load

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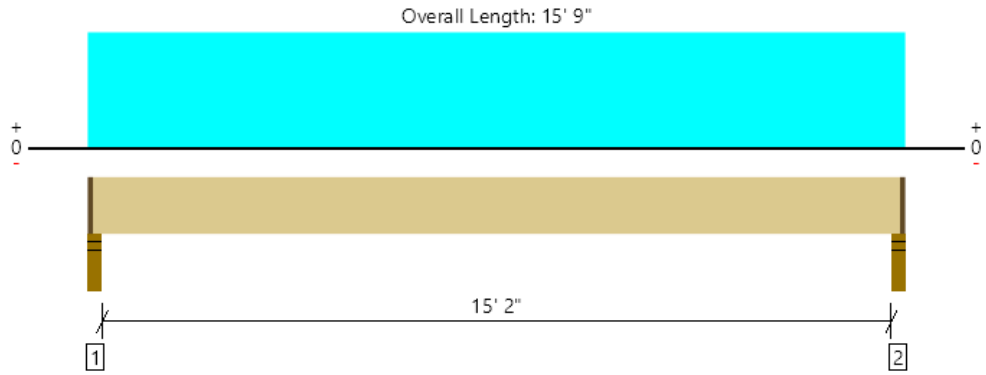
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jeffrey Ford Jackson and Sands (530) 715-7184 jeffrey@jacksonandsandsengineering.com	

Weyerhaeuser

Level, B2: Roof Joist

1 piece(s) 2 x 8 DF No.2 @ 24" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	342 @ 2 1/2"	2109 (2.25")	Passed (16%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	307 @ 10 3/4"	1631	Passed (19%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	1293 @ 7' 10 1/2"	1700	Passed (76%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.326 @ 7' 10 1/2"	0.383	Passed (L/564)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.718 @ 7' 10 1/2"	0.767	Passed (L/256)	--	1.0 D + 1.0 Lr (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Factored	
1 - Stud wall - DF	3.50"	2.25"	1.50"	189	158	347	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	189	158	347	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 11" o/c	
Bottom Edge (Lu)	15' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
1 - Uniform (PSF)	0 to 15' 9"	24"	12.0	10.0	Default Load

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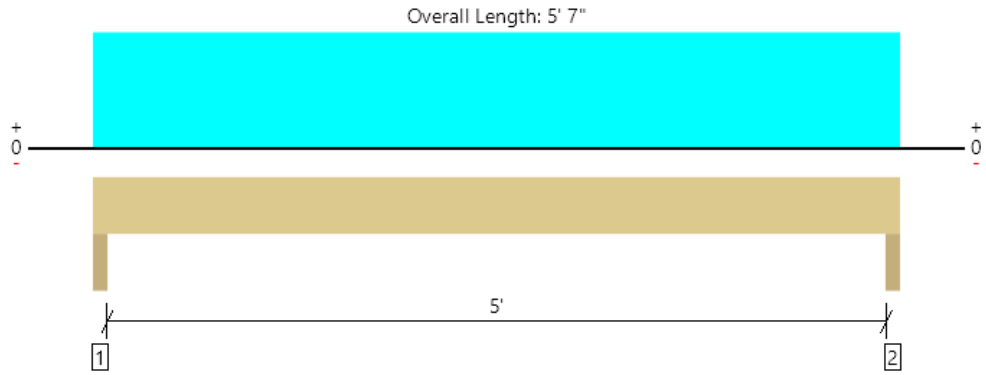
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jeffrey Ford Jackson and Sands (530) 715-7184 jeffrey@jacksonandsandsengineering.com	

Weyerhaeuser

Level, B3: Typ. Header

1 piece(s) 6 x 8 DF No.2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1460 @ 2"	12031 (3.50")	Passed (12%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	980 @ 11"	5844	Passed (17%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	1801 @ 2' 9 1/2"	4028	Passed (45%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.016 @ 2' 9 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.036 @ 2' 9 1/2"	0.262	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Factored	
1 - Trimmer - SPF	3.50"	3.50"	1.50"	792	667	1460	None
2 - Trimmer - SPF	3.50"	3.50"	1.50"	792	667	1460	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 7" o/c	
Bottom Edge (Lu)	5' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 5' 7"	N/A	10.4	--	
1 - Uniform (PSF)	0 to 5' 7"	8'	22.4	20.0	Default Load
2 - Uniform (PLF)	0 to 5' 7"	N/A	94.5	79.0	Linked from: B2: Roof Joist, Support 1

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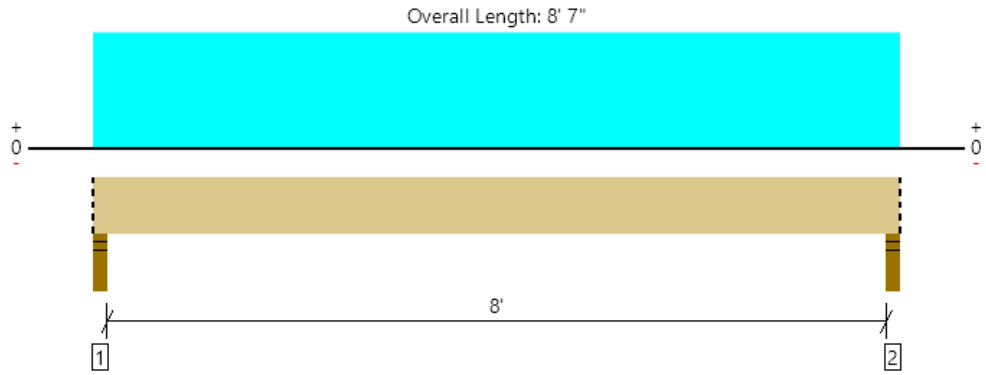
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jeffrey Ford Jackson and Sands (530) 715-7184 jeffrey@jacksonandsandsengineering.com	

Weyerhaeuser

Level, B4: Porch Beam

1 piece(s) 6 x 10 DF No.2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2256 @ 2"	8181 (3.50")	Passed (28%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	1686 @ 1' 1"	7402	Passed (23%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	4472 @ 4' 3 1/2"	7540	Passed (59%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.049 @ 4' 3 1/2"	0.275	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.107 @ 4' 3 1/2"	0.412	Passed (L/923)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	1230	1026	2256	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	1230	1026	2256	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 7" o/c	
Bottom Edge (Lu)	8' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 8' 7"	N/A	13.2	--	
1 - Uniform (PSF)	0 to 8' 7" (Top)	8'	22.4	20.0	Default Load
2 - Uniform (PLF)	0 to 8' 7" (Top)	N/A	94.5	79.0	Linked from: B2: Roof Joist, Support 1

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ForteWEB Software Operator	Job Notes
Jeffrey Ford Jackson and Sands (530) 715-7184 jeffrey@jacksonandsandsengineering.com	

Weyerhaeuser

General Footing

Project File: 23M-007 Orland ADU's.ec6

LIC# : KW-06012341, Build:20.23.2.14 Jackson & Sands Engineering (c) ENERCALC INC 1983-2022

DESCRIPTION: F1, Cont. Footing

Code References

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

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	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	:	No
Use Pedestal wt for stability, mom & shear	:	No

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	=	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

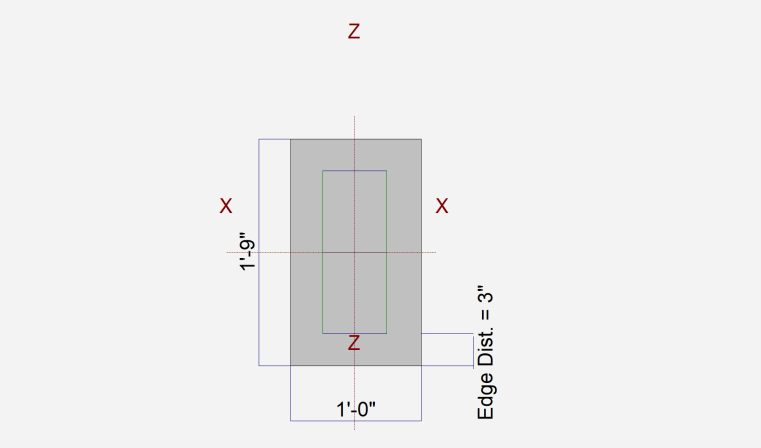
Width parallel to X-X Axis	=	1.0 ft
Length parallel to Z-Z Axis	=	1.750 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



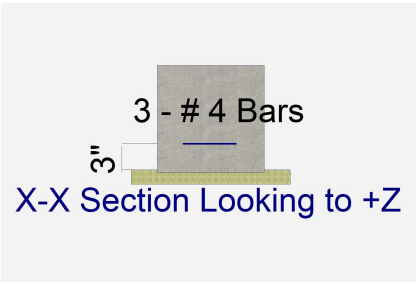
Reinforcing

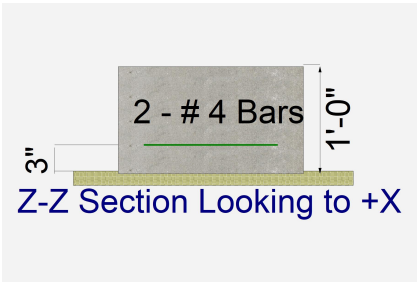
Bars parallel to X-X Axis			
Number of Bars	=		3
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		2.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	Bars along X-X Axis
# Bars required within zone	72.7 %
# Bars required on each side of zone	27.3 %





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	0.6740	1.460		0.0				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

Project File: 23M-007 Orland ADU's.ec6

LIC# : KW-06012341, Build:20.23.2.14 Jackson & Sands Engineering (c) ENERCALC INC 1983-2022

DESCRIPTION: F1, Cont. Footing

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9093	Soil Bearing	1.364 ksf	1.50 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
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
PASS	0.01694	Z Flexure (+X)	0.2246 k-ft/ft	13.263 k-ft/ft	+1.20D+1.60Lr
PASS	0.01694	Z Flexure (-X)	0.2246 k-ft/ft	13.263 k-ft/ft	+1.20D+1.60Lr
PASS	0.04481	X Flexure (+Z)	0.6879 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr
PASS	0.04481	X Flexure (-Z)	0.6879 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	0.02718	1-way Shear (+Z)	2.038 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.02718	1-way Shear (-Z)	2.038 psi	75.0 psi	+1.20D+1.60Lr
PASS	n/a	2-way Punching	6.608 psi	75.0 psi	+1.20D+1.60Lr

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	0.5301	0.5301	n/a	n/a	0.353
X-X, +D+Lr	1.50	n/a	0.0	1.364	1.364	n/a	n/a	0.909
X-X, +D+0.750Lr	1.50	n/a	0.0	1.156	1.156	n/a	n/a	0.771
X-X, +0.60D	1.50	n/a	0.0	0.3181	0.3181	n/a	n/a	0.212
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.5301	0.5301	0.353
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.364	1.364	0.909
Z-Z, +D+0.750Lr	1.50	0.0	n/a	n/a	n/a	1.156	1.156	0.771
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.3181	0.3181	0.212

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

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	0.2064	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.40D	0.2064	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+0.50Lr	0.3366	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+0.50Lr	0.3366	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D	0.1769	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D	0.1769	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+1.60Lr	0.6879	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+1.60Lr	0.6879	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +0.90D	0.1327	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +0.90D	0.1327	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.40D	0.06740	-X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +1.40D	0.06740	+X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +1.20D+0.50Lr	0.1099	-X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +1.20D+0.50Lr	0.1099	+X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +1.20D	0.05777	-X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +1.20D	0.05777	+X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +1.20D+1.60Lr	0.2246	-X	Bottom	0.2592	AsMin	0.3429	13.263	OK

General Footing

Project File: 23M-007 Orland ADU's.ec6

DESCRIPTION: F1, Cont. Footing

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
Z-Z, +1.20D+1.60Lr	0.2246	+X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +0.90D	0.04333	-X	Bottom	0.2592	AsMin	0.3429	13.263	OK
Z-Z, +0.90D	0.04333	+X	Bottom	0.2592	AsMin	0.3429	13.263	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	0.00 psi	0.61 psi	0.61 psi	0.61 psi	75.00 psi	0.01	OK
+1.20D+0.50Lr	0.00 psi	0.00 psi	1.00 psi	1.00 psi	1.00 psi	75.00 psi	0.01	OK
+1.20D	0.00 psi	0.00 psi	0.52 psi	0.52 psi	0.52 psi	75.00 psi	0.01	OK
+1.20D+1.60Lr	0.00 psi	0.00 psi	2.04 psi	2.04 psi	2.04 psi	75.00 psi	0.03	OK
+0.90D	0.00 psi	0.00 psi	0.39 psi	0.39 psi	0.39 psi	75.00 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	1.98 psi	150.00 psi	0.01322	OK
+1.20D+0.50Lr	3.23 psi	150.00 psi	0.02156	OK
+1.20D	1.70 psi	150.00 psi	0.01133	OK
+1.20D+1.60Lr	6.61 psi	150.00 psi	0.04405	OK
+0.90D	1.28 psi	150.00 psi	0.008497	OK

General Footing

Project File: 23M-007 Orland ADU's.ec6

LIC# : KW-06012341, Build:20.23.2.14 Jackson & Sands Engineering

DESCRIPTION: F2, Pier Footing: Porch

Code References

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

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	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	:	No
Use Pedestal wt for stability, mom & shear	:	No

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	=	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

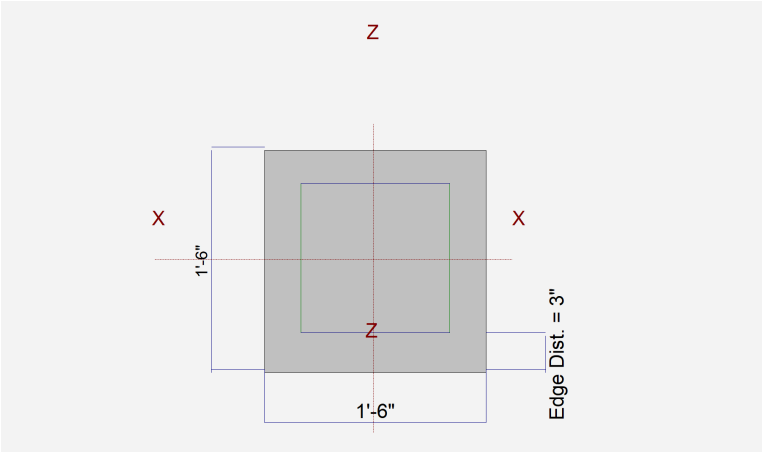
Width parallel to X-X Axis	=	1.50 ft
Length parallel to Z-Z Axis	=	1.50 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in

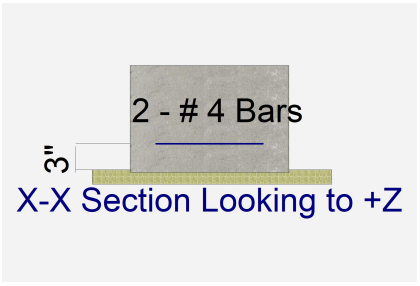


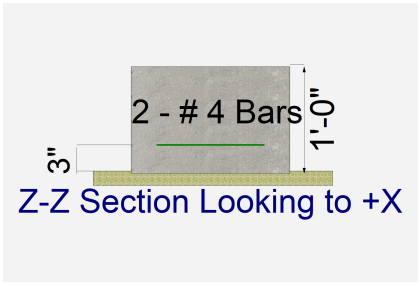
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		2.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		2.0
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	=	1.230	1.026		0.0				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

Project File: 23M-007 Orland ADU's.ec6

LIC# : KW-06012341, Build:20.23.2.14 Jackson & Sands Engineering

DESCRIPTION: F2, Pier Footing: Porch

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7653	Soil Bearing	1.148 ksf	1.50 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
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
PASS	0.03739	Z Flexure (+X)	0.3897 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.03739	Z Flexure (-X)	0.3897 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.03739	X Flexure (+Z)	0.3897 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.03739	X Flexure (-Z)	0.3897 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	n/a	1-way Shear (+Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	2-way Punching	7.217 psi	75.0 psi	+1.20D+1.60Lr

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	0.6917	0.6917	n/a	n/a	0.461
X-X, +D+Lr	1.50	n/a	0.0	1.148	1.148	n/a	n/a	0.765
X-X, +D+0.750Lr	1.50	n/a	0.0	1.034	1.034	n/a	n/a	0.689
X-X, +0.60D	1.50	n/a	0.0	0.4150	0.4150	n/a	n/a	0.277
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.6917	0.6917	0.461
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.148	1.148	0.765
Z-Z, +D+0.750Lr	1.50	0.0	n/a	n/a	n/a	1.034	1.034	0.689
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.4150	0.4150	0.277

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

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	0.2153	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.40D	0.2153	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+0.50Lr	0.2486	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+0.50Lr	0.2486	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D	0.1845	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D	0.1845	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+1.60Lr	0.3897	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+1.60Lr	0.3897	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +0.90D	0.1384	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +0.90D	0.1384	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.40D	0.2153	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.40D	0.2153	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr	0.2486	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr	0.2486	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D	0.1845	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D	0.1845	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D+1.60Lr	0.3897	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK

General Footing

Project File: 23M-007 Orland ADU's.ec6

DESCRIPTION: F2, Pier Footing: Porch

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
Z-Z, +1.20D+1.60Lr	0.3897	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +0.90D	0.1384	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +0.90D	0.1384	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60Lr	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+0.90D	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	3.99 psi	150.00 psi	0.02657	OK
+1.20D+0.50Lr	4.60 psi	150.00 psi	0.03069	OK
+1.20D	3.42 psi	150.00 psi	0.02278	OK
+1.20D+1.60Lr	7.22 psi	150.00 psi	0.04811	OK
+0.90D	2.56 psi	150.00 psi	0.01708	OK