JACKSON & SANDS ENGINEERING, Inc.

STRUCTURAL ANALYSIS

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

July 24, 2023

(PC1 SUBMITTAL)

JACKSON & SANDS ENGINEERING, Inc.
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JACKSON & SANDS ENGINEERING, Inc.

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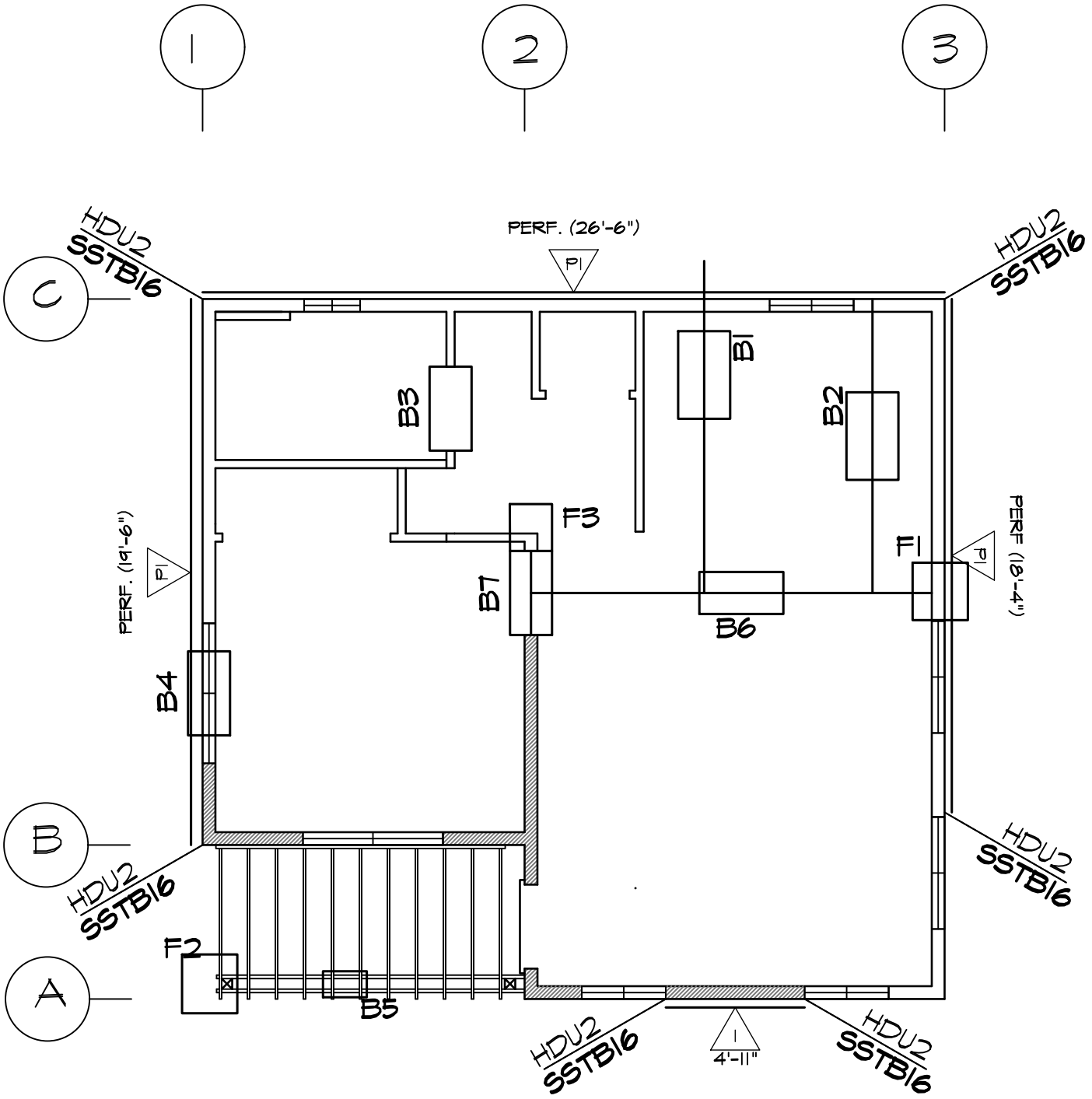
SCOPE OF WORK

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.



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599 SQFT. ADU WALNUT
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-007 599 Walnut

WoodWorks® Shearwalls

SOFTWARE FOR WOOD DESIGN

WoodWorks® Shearwalls 2023

23M-007 599 Walnut.wsw **Apr. 4, 2023 15:29:25**

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		Building Code Capacity Modification	
For Design (ASD)	For Deflection (Strength)	Wind	Seismic
0.70 Seismic + 0.60 Dead	1.00 Seismic + 0.90 Dead	1.00	1.00
0.60 Wind + 0.60 Dead	1.00 Wind + 0.90 Dead		

Service Conditions and Load Duration				Max Shearwall Offset [ft]	
Duration Factor	Temperature Range	Moisture Content		Plan (within story)	Elevation (between stories)
		Fabrication	Service		
-	-	24% (>19%)	10% (<=19%)	0.50	-

Maximum Height-to-width Ratio						
Wood panels		Fiberboard	Lumber		Gypsum	
Blocked	Unblocked		Wind	Seismic	Blocked	Unblocked
3.5	2.0	-	-	-	-	-

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

Shearwall relative rigidity:	Wall capacity
Non-identical materials and construction on the shearline:	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		Seismic	
ASCE 7-16 Directional (All heights)		ASCE 7-16 12.8 Equivalent Lateral Force Procedure	
Design Wind Speed	95 mph	**Risk Category**	Category II - All others
Serviceability Wind Speed	100 mph	**Structure Type**	Regular
Exposure	Exposure C	**Building System**	Bearing Wall
Enclosure	Partially enclosed	**Design Category**	D
Min Wind Loads: Walls	16 psf	**Site Class**	D
Roofs	8 psf		

Topographic Information [ft]		
Shape	Height	Length
-	-	-

Site Location: -

Elev: 0ft

Rigid building - Static analysis

Spectral Response Acceleration	
S1: 0.355g	**Ss:** 0.842g

Fundamental Period	E-W	N-S
T Used	0.134s	0.134s
Approximate Ta	0.134s	0.134s
Maximum T	0.187s	0.187s
Response Factor R	6.50	6.50

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

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]	Hold-down Bolt length [in]
Ceiling	9.00	0.0			
Level 1	0.00	0.0	9.00	3.75	4.5
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 =	0.00	-5.58	**North**	Side	30.0	1.00
Extent X,Y =	26.50	25.08	**South**	Side	30.0	1.00
Ridge Y Location, Offset	6.96	0.00	**East**	Gable	90.0	1.00
Ridge Elevation, Height	16.24	7.24	**West**	Gable	90.0	1.00

SHEATHING MATERIALS by WALL GROUP

Grp	Surf	Material	Ratng	Sheathing Thick in	GU in	Ply	Or	Gvtv lbs/in	Fasteners Size	Type	RS	Eg in	Fd in	Bk	Apply Notes
1	Ext	Struct Sh OSB	24/0	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	0.00	-5.50	19.50	25.00	13.37	-	9.00	-	-
Wall 1-1	Prf	1	0.00	-5.50	19.50	25.00	13.37	-	-	2	2
Segment 1		-	-	-5.50	-5.42	0.08	0.08	108.00	-	-	-
Opening 1		-	-	-5.42	0.08	5.50	5.50	-	9.00	-	-
Segment 2		-	-	0.08	2.92	2.83	1.78	3.18	-	-	-
Opening 2		-	-	2.92	7.92	5.00	5.00	-	9.00	-	-
Segment 3		-	-	7.92	19.50	11.58	11.58	0.78	-	-	-
Line 2											
Level 1											
Line 2	NSW		11.75	-5.50	0.08	5.58	0.00	-	9.00	-	-
Wall 2-1	NSW		11.75	-5.50	0.08	5.58	0.00	1.00	-	2	2
Line 3											
Level 1											
Line 3		1	26.50	-5.50	19.50	25.00	13.50	-	9.00	-	-
Wall 3-1	Prf	1	26.50	-5.50	19.50	25.00	13.50	-	-	2	2
Segment 1		-	-	-5.50	-3.00	2.50	2.50	3.60	-	-	-
Opening 1		-	-	-3.00	1.00	4.00	4.00	-	3.00	-	-
Segment 2		-	-	1.00	4.00	3.00	2.00	3.00	-	-	-
Opening 2		-	-	4.00	8.00	4.00	4.00	-	3.00	-	-
Segment 3		-	-	8.00	19.50	11.50	11.50	0.78	-	-	-

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	-5.50	0.00	26.50	26.50	5.00	-	9.00	-	-
Wall A-1	Seg	1	-5.50	0.00	26.50	26.50	5.00	-	-	2	2
Segment 1		-	-	0.00	0.50	0.50	0.25	18.00	-	2	2
Opening 1		-	-	0.50	11.50	11.00	-	-	9.00	2	2
Segment 2		-	-	11.50	13.67	2.17	1.92	4.15	-	2	2
Opening 2		-	-	13.67	16.67	3.00	-	-	9.00	2	2
Segment 3		-	-	16.67	21.67	5.00	4.75	1.80	-	2	2
Opening 3		-	-	21.67	24.67	3.00	-	-	9.00	2	2
Segment 4		-	-	24.67	26.50	1.83	1.58	4.91	-	2	2
Line B											
Level 1											
Line B	NSW		0.17	0.50	11.67	11.17	0.00	-	9.00	-	-
Wall B-1	NSW		0.17	0.50	11.67	11.17	0.00	1.00	-	2	2
Line C											
Level 1											
Line C		1	19.50	0.00	26.50	26.50	19.90	-	9.00	-	-
Wall C-1	Prf	1	19.50	0.00	26.50	26.50	19.90	-	-	2	2
Segment 1		-	-	0.00	3.75	3.75	3.13	2.40	-	-	-
Opening 1		-	-	3.75	5.75	2.00	2.00	-	3.00	-	-
Segment 2		-	-	5.75	20.42	14.67	14.67	0.61	-	-	-
Opening 2		-	-	20.42	23.42	3.00	3.00	-	3.00	-	-
Segment 3		-	-	23.42	26.50	3.08	2.11	2.92	-	-	-

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	Area	-5.58	6.96	0.0	11.3	7.24
Block 1	W	L Gable	Min	W->E	Wind	Area	-5.58	6.96	0.0	8.0	7.24
Block 1	W	Wall	Min	W->E	Wind	Area	-5.50	19.50	8.0		4.50
Block 1	W	Wall	1	W->E	Wind	Area	-5.50	19.50	11.3		4.50
Block 1	W	R Gable	1	W->E	Wind	Area	6.96	19.50	11.3	0.0	7.24
Block 1	W	R Gable	Min	W->E	Wind	Area	6.96	19.50	8.0	0.0	7.24
Block 1	E	L Gable	Min	W->E	Lee	Area	-5.58	6.96	0.0	8.0	7.24
Block 1	E	L Gable	1	W->E	Lee	Area	-5.58	6.96	0.0	6.9	7.24
Block 1	E	Wall	1	W->E	Lee	Area	-5.50	19.50	6.9		4.50
Block 1	E	Wall	Min	W->E	Lee	Area	-5.50	19.50	8.0		4.50
Block 1	E	R Gable	1	W->E	Lee	Area	6.96	19.50	6.9	0.0	7.24
Block 1	E	R Gable	Min	W->E	Lee	Area	6.96	19.50	8.0	0.0	7.24
Block 1	W	L Gable	Min	E->W	Lee	Area	-5.58	6.96	0.0	8.0	7.24
Block 1	W	L Gable	1	E->W	Lee	Area	-5.58	6.96	0.0	6.9	7.24
Block 1	W	Wall	1	E->W	Lee	Area	-5.50	19.50	6.9		4.50
Block 1	W	Wall	Min	E->W	Lee	Area	-5.50	19.50	8.0		4.50
Block 1	W	R Gable	1	E->W	Lee	Area	6.96	19.50	6.9	0.0	7.24
Block 1	W	R Gable	Min	E->W	Lee	Area	6.96	19.50	8.0	0.0	7.24
Block 1	E	L Gable	1	E->W	Wind	Area	-5.58	6.96	0.0	11.3	7.24
Block 1	E	L Gable	Min	E->W	Wind	Area	-5.58	6.96	0.0	8.0	7.24
Block 1	E	Wall	Min	E->W	Wind	Area	-5.50	19.50	8.0		4.50
Block 1	E	Wall	1	E->W	Wind	Area	-5.50	19.50	11.3		4.50
Block 1	E	R Gable	1	E->W	Wind	Area	6.96	19.50	11.3	0.0	7.24
Block 1	E	R Gable	Min	E->W	Wind	Area	6.96	19.50	8.0	0.0	7.24
Block 1	S	Roof	Min	S->N	Wind	Area	-1.00	27.50	4.0		7.82
Block 1	S	Roof	1	S->N	Wind	Area	-1.00	27.50	2.8		7.82
Block 1	S	Wall	1	S->N	Wind	Area	0.00	26.50	11.3		4.50
Block 1	S	Wall	Min	S->N	Wind	Area	0.00	26.50	8.0		4.50
Block 1	N	Roof	1	S->N	Lee	Area	-1.00	27.50	8.5		7.82
Block 1	N	Roof	Min	S->N	Lee	Area	-1.00	27.50	4.0		7.82
Block 1	N	Wall	1	S->N	Lee	Area	0.00	26.50	7.1		4.50
Block 1	N	Wall	Min	S->N	Lee	Area	0.00	26.50	8.0		4.50
Block 1	S	Roof	1	N->S	Lee	Area	-1.00	27.50	8.5		7.82
Block 1	S	Roof	Min	N->S	Lee	Area	-1.00	27.50	4.0		7.82
Block 1	S	Wall	1	N->S	Lee	Area	0.00	26.50	7.1		4.50
Block 1	S	Wall	Min	N->S	Lee	Area	0.00	26.50	8.0		4.50
Block 1	N	Roof	1	N->S	Wind	Area	-1.00	27.50	2.8		7.82
Block 1	N	Roof	Min	N->S	Wind	Area	-1.00	27.50	4.0		7.82
Block 1	N	Wall	1	N->S	Wind	Area	0.00	26.50	11.3		4.50
Block 1	N	Wall	Min	N->S	Wind	Area	0.00	26.50	8.0		4.50

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.

DEAD LOADS (for hold-down calculations)

Shear Line	Level	Profile	Tributary Width [ft]	Location [ft] Start	Location [ft] End	Mag [lbs,psf,psi] Start	Mag [lbs,psf,psi] End
A	1	Line		0.00	26.50	135.0*	
B	1	Line		0.50	11.67	54.0*	
C	1	Line		0.00	26.50	135.0*	
1	1	Line		-5.50	19.50	135.0*	
2	1	Line		-5.50	0.08	54.0*	
3	1	Line		-5.50	19.50	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	-6.58	20.50	285.0	285.0	
E-W	Roof	Block 1	3	Line	-6.58	20.50	285.0	285.0	
E-W	R Gable	Block 1	1	Line	-5.58	6.96	108.6	0.0	
E-W	L Gable	Block 1	1	Line	6.96	19.50	0.0	108.6	
E-W	L Gable	Block 1	3	Line	-5.58	6.96	108.6	0.0	
E-W	R Gable	Block 1	3	Line	6.96	19.50	0.0	108.6	
N-S	Roof	Block 1		Line	-1.00	27.50	270.8	270.8	
N-S	Roof	Block 1	C	Line	-1.00	27.50	270.8	270.8	
Both	Wall 1-1	n/a	1	Line	-5.50	19.50	67.5	67.5	
Both	Wall 2-1	n/a	2	Line	-5.50	0.08	27.0	27.0	
Both	Wall 3-1	n/a	3	Line	-5.50	19.50	67.5	67.5	
Both	Wall A-1	n/a	A	Line	0.00	26.50	67.5	67.5	
Both	Wall B-1	n/a	B	Line	0.50	11.67	27.0	27.0	
Both	Wall C-1	n/a	C	Line	0.00	26.50	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	-6.58	-5.58	57.1	57.1
E-W	Line	-5.58	-5.50	57.1	57.2
E-W	Point	-5.50	-5.50	179	179
E-W	Line	-5.50	0.08	73.5	83.2
E-W	Line	0.08	6.96	80.5	92.4
E-W	Point	0.17	0.17	30	30
E-W	Line	6.96	19.50	92.4	70.6
E-W	Point	19.50	19.50	179	179
E-W	Line	19.50	20.50	57.1	57.1
N-S	Line	-1.00	0.00	54.3	54.3
N-S	Point	0.00	0.00	306	306
N-S	Line	0.00	0.50	67.8	67.8
N-S	Line	0.50	11.67	70.5	70.5
N-S	Line	11.67	26.50	67.8	67.8
N-S	Point	11.75	11.75	15	15
N-S	Point	26.50	26.50	306	306
N-S	Line	26.50	27.50	54.3	54.3

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.

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	98.3	160.6	1417	-	.93	-	223	0.66		223	3220	0.44
Line 3														
Ln3, Lev1	1	Both	97.7	104.9	1417	-	.93	-	340	1.00		340	4928	0.29

E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf] v	vmax/vft	V [lbs]	Asp-Cub Int	Asp-Cub Ext	Allowable Shear [plf] Int	Ext	Co	C	Cmb	V [lbs]	Resp. Ratio
Line A														
Level 1														
LnA, Lev1	-	Both	-	-	1116	-	-	-	365	-		-	1825	-
Wall A-1	1	Both	-	-	1116	-	1.0	-	365	-		-	1825	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	365	-		365	-	-
Seg. 2	-	Both	0.0	-	0	-	1.0	-	365	-		365	-	-
Seg. 3	-	Both	223.1	-	1116	-	1.0	-	365	-		365	1825	0.61
Seg. 4	-	Both	0.0	-	0	-	1.0	-	365	-		365	-	-
Line C														
LnC, Lev1	1	Both	51.7	55.9	1112	-	.93	-	338	1.00		338	7265	0.15

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											
	V Elem	0.00	-5.54	1	0	6		6	Compression		
1-1	L End	0.00	-5.37	1	0	6		6	Compression	10312	0.00
1-1	L End	0.00	0.21	1	2070	786		1284	HDU2-SDS	3075	0.42
1-1	L End	0.00	0.21	1	-2070	1311		3381	Compression	10312	0.33
1-1	R End	0.00	19.38	1	2070	786		1284	HDU2-SDS	3075	0.42
1-1	R End	0.00	19.38	1	-2070	1311		3381	Compression	10312	0.33
Line 3											
3-1	L End	26.50	-5.37	1	0	169		169	Compression	10312	0.02
3-1	L Op 1	26.50	-3.12	1	0	169		169	Compression	10312	0.02
3-1	L End	26.50	1.13	1	1353	749		604	HDU2-SDS	3075	0.20
3-1	L End	26.50	1.13	1	-1353	1249		2602	Compression	10312	0.25
3-1	R End	26.50	19.38	1	1353	749		604	HDU2-SDS	3075	0.20
3-1	R End	26.50	19.38	1	-1353	1249		2602	Compression	10312	0.25
Line A											
	V Elem	0.12	-5.50	1	0	34		34	Compression		
	V Elem	0.38	-5.50	1	0	34		34	Compression		
	V Elem	11.63	-5.50	1	0	146		146	Compression		
	V Elem	13.54	-5.50	1	0	146		146	Compression		
A-1	R Op 2	16.79	-5.50	1	2114	203		1911	HDU2-SDS	3075	0.62
A-1	R Op 2	16.79	-5.50	1	-2114	338		2451	Compression	10312	0.24
A-1	L Op 3	21.54	-5.50	1	2114	203		1911	HDU2-SDS	3075	0.62
A-1	L Op 3	21.54	-5.50	1	-2114	338		2451	Compression	10312	0.24
	V Elem	24.79	-5.50	1	0	124		124	Compression		
	V Elem	26.38	-5.50	1	0	124		124	Compression		
Line C											
C-1	L End	0.12	19.50	1	-509	1789		2297	Compression	10312	0.22
C-1	R End	26.38	19.50	1	-509	1789		2297	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	Right Opening 1	0.00	0.08		-316	316		
1-1	Left Opening 2	0.00	2.92		-920	920		
1-1	Right Opening 2	0.00	7.92		-1204	1204		
Line 3								
3-1	Right Opening 1	26.50	1.00		-368	368		
3-1	Left Opening 2	26.50	4.00		-328	328		
3-1	Right Opening 2	26.50	8.00		-555	555		
Line A								
A-1	Right Opening 2	16.67	-5.50		-702	702		
A-1	Left Opening 3	21.67	-5.50		203	-203		
Line C								
C-1	Left Opening 1	3.75	19.50		52	-52		
C-1	Right Opening 1	5.75	19.50		-81	81		
C-1	Left Opening 2	20.42	19.50		123	-123		
C-1	Right Opening 2	23.42	19.50		-43	43		

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	160.6	13.37	9.00	16.5	.003	.019	80	.014	.097	0.10	0.22
Line 3														
3-1	1	Both	Ext	104.9	13.50	9.00	16.5	.002	.012	52	.006	.044	0.09	0.15
Line A														
A-1,3	1	Both	Ext	223.1	5.00	9.00	16.5	.010	.026	112	.027	.179	0.31	0.53
Line C														
C-1	1	Both	Ext	55.9	19.90	9.00	16.5	.001	.006	28	.002	.013	0.00	0.02

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	296.5	13.37	9.00	16.5	.005	.034	148	.045	.305	0.13	0.47
Line 3														
3-1	1	Both	Ext	193.8	13.50	9.00	16.5	.003	.023	97	.020	.138	0.10	0.26
Line A														
A-1,3	1	Both	Ext	412.0	5.00	9.00	16.5	.018	.048	206	.084	.564	0.41	1.04
Line C														
C-1	1	Both	Ext	103.2	19.90	9.00	16.5	.001	.012	52	.006	.042	0.00	0.06

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	1284	.037	.000	0.037	-	-	.105	3381	0.01	0.15	0.10
Line 3													
3-1	Both	HDU2-SDS	604	.017	.000	0.017	-	-	.105	2602	0.01	0.13	0.09
Line A													
A-1,3	Both	HDU2-SDS	1911	.055	.000	0.055	-	-	.105	2451	0.01	0.17	0.31
Line C													
C-1	Both	HDU2-SDS	-564	.000	.000	0.000	-	-	.000	2298	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	2371	.068	.000	0.068	-	-	.105	5275	0.01	0.19	0.13
Line 3													
3-1	Both	HDU2-SDS	1115	.032	.000	0.032	-	-	.105	3882	0.01	0.15	0.10
Line A													
A-1,3	Both	HDU2-SDS	3529	.101	.000	0.101	-	-	.105	4277	0.01	0.22	0.41
Line C													
C-1	Both	HDU2-SDS	-1042	.000	.000	0.000	-	-	.000	2922	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		0.47	1		1.08	0.44
	E<->W		1.04	A		1.08	0.96

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.

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	25567	662.5	1793	1793	6493	5820	2331	2331	2331	2331
All	25567	-	2561	2561	-	-	-	-	-	-

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	62.6	102.3	903	-	.93	-	160	0.66		160	2300	0.39
Line 3														
Ln3, Lev1	1	Both	61.4	65.9	890	-	.93	-	243	1.00		243	3520	0.25

E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf] v	vmax/vft	V [lbs]	Asp-Cub Int	Asp-Cub Ext	Allowable Shear [plf] Int	Ext	Co	C	Cmb	V [lbs]	Resp. Ratio
Line A														
Level 1														
LnA, Lev1	-	Both	-	-	908	-	-	-	261	-		-	1304	-
Wall A-1	1^	Both	-	-	908	-	1.0	-	261	-		-	1304	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	261	-		261	-	-
Seg. 2	-	Both	0.0	-	0	-	1.0	-	261	-		261	-	-
Seg. 3	-	Both	181.7	-	908	-	1.0	-	261	-		261	1304	0.70
Seg. 4	-	Both	0.0	-	0	-	1.0	-	261	-		261	-	-
Line C														
LnC, Lev1	1	Both	41.1	44.4	885	-	.93	-	241	1.00		241	5189	0.17

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										
	V Elem	0.00	-5.54	0	6	1	6	Compression		
1-1	L End	0.00	-5.37	0	6	1	6	Compression	10312	0.00
1-1	L End	0.00	0.21	1319	786	119	652	HDU2-SDS	3075	0.21
1-1	L End	0.00	0.21	-1319	1311	119	2749	Compression	10312	0.27
1-1	R End	0.00	19.38	1319	786	119	652	HDU2-SDS	3075	0.21
1-1	R End	0.00	19.38	-1319	1311	119	2749	Compression	10312	0.27
Line 3										
3-1	L End	26.50	-5.37	0	169	15	184	Compression	10312	0.02
3-1	L Op 1	26.50	-3.12	0	169	15	184	Compression	10312	0.02
3-1	L End	26.50	1.13	850	749	114	215	HDU2-SDS	3075	0.07
3-1	L End	26.50	1.13	-850	1249	114	2212	Compression	10312	0.21
3-1	R End	26.50	19.38	850	749	114	215	HDU2-SDS	3075	0.07
3-1	R End	26.50	19.38	-850	1249	114	2212	Compression	10312	0.21
Line A										
	V Elem	0.12	-5.50	0	34	3	37	Compression		
	V Elem	0.38	-5.50	0	34	3	37	Compression		
	V Elem	11.63	-5.50	0	146	13	159	Compression		
	V Elem	13.54	-5.50	0	146	13	159	Compression		
A-1	R Op 2	16.79	-5.50	1721	203	31	1549	HDU2-SDS	3075	0.50
A-1	R Op 2	16.79	-5.50	-1721	338	31	2089	Compression	10312	0.20
A-1	L Op 3	21.54	-5.50	1721	203	31	1549	HDU2-SDS	3075	0.50
A-1	L Op 3	21.54	-5.50	-1721	338	31	2089	Compression	10312	0.20
	V Elem	24.79	-5.50	0	124	11	135	Compression		
	V Elem	26.38	-5.50	0	124	11	135	Compression		
Line C										
C-1	L End	0.12	19.50	-405	1789	163	2356	Compression	10312	0.23
C-1	R End	26.38	19.50	-405	1789	163	2356	Compression	10312	0.23

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			1174	1174		
1-1	Right Opening 1	0.00	0.08	-262	262		
1-1	Left Opening 2	0.00	2.92	-762	762		
1-1	Right Opening 2	0.00	7.92	-997	997		
Line 3							
	Shearline force			1157	1157		
3-1	Right Opening 1	26.50	1.00	-301	301		
3-1	Left Opening 2	26.50	4.00	-268	268		
3-1	Right Opening 2	26.50	8.00	-453	453		
Line A							
	Shearline force			1181	1181		
A-1	Right Opening 2	16.67	-5.50	-743	743		
A-1	Left Opening 3	21.67	-5.50	215	-215		
Line C							
	Shearline force			1150	1150		
C-1	Left Opening 1	3.75	19.50	54	-54		
C-1	Right Opening 1	5.75	19.50	-83	83		
C-1	Left Opening 2	20.42	19.50	127	-127		
C-1	Right Opening 2	23.42	19.50	-44	44		

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	146.2	13.37	9.00	16.5	.002	.017	73	.012	.081	0.10	0.20
Line 3														
3-1	1	Both	Ext	94.2	13.50	9.00	16.5	.002	.011	47	.005	.036	0.08	0.13
Line A														
A-1,3	1	Both	Ext	259.5	5.00	9.00	16.5	.011	.030	130	.035	.238	0.33	0.61
Line C														
C-1	1	Both	Ext	63.5	19.90	9.00	16.5	.001	.007	32	.003	.017	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	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	875	.025	.000	0.025	-	-	.105	3890	0.01	0.14	0.10
Line 3													
3-1	Both	HDU2-SDS	253	.008	.000	0.008	-	-	.105	3125	0.01	0.12	0.08
Line A													
A-1,3	Both	HDU2-SDS	2199	.059	.000	0.059	-	-	.105	2975	0.01	0.17	0.33
Line C													
C-1	Both	HDU2-SDS	-799	.000	.000	0.000	-	-	.000	3315	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		0.20	1	0.58	13.16	0.16	0.45			0.21	0.17
	E<->W		0.61	A	1.86	12.33	0.32	1.00			0.69	0.37

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.

WoodWorks® Shearwalls Detailed Load Generation
23M-007 599 Walnut.wsw Apr. 4, 2023 15:25:28 2023

Design Code: IBC 2021/AWC SDPWS 2021

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	25567	0.651	0.462	1.400	0.187	0.134	1.000

	R	T	SS	SDS	Cscalc	Csmax	Csmin	Cs	V (lbs)
N-S	6.5	0.134	0.84	0.651	0.100	0.530	0.029	0.100	2561
E-W	6.5	0.134	0.84	0.651	0.100	0.530	0.029	0.100	2561

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	25567	230103	1.00	2561	2561	2561	2561

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	0.00	Line	54.3	54.3
N<->S 2	0.00	0.50	Line	67.8	67.8
N<->S 3	0.00	0.00	Point	306	306
N<->S 4	0.50	11.67	Line	70.5	70.5
N<->S 5	11.67	26.50	Line	67.8	67.8
N<->S 6	11.75	11.75	Point	15	15
N<->S 7	26.50	27.50	Line	54.3	54.3
N<->S 8	26.50	26.50	Point	306	306
W<->E 1	-6.58	-5.58	Line	57.1	57.1
W<->E 2	-5.58	-5.50	Line	57.1	57.2
W<->E 3	-5.50	-5.50	Point	179	179
W<->E 4	-5.50	0.08	Line	73.5	83.2
W<->E 5	0.08	6.96	Line	80.5	92.4
W<->E 6	0.17	0.17	Point	30	30
W<->E 7	6.96	19.50	Line	92.4	70.6
W<->E 8	19.50	20.50	Line	57.1	57.1
W<->E 9	19.50	19.50	Point	179	179

WoodWorks® Shearwalls Detailed Load Generation
23M-007 599 Walnut.wsw Apr. 4, 2023 15:25:28 2023

Design Code: IBC 2021/AWC SDPWS 2021

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 enclosed
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)
q - Velocity pressure
G - Gust factor
Cp - External pressure factor
GCp - Combined exposure and gust factor
GCpi - Internal pressure coefficient
Kz - Velocity pressure exposure coefficient
Kd - Wind directionality factor
zg - Ground elevation
h - Mean roof height
z - Height of interest
theta - Roof angle
B - Building width
L - Building length
V - Basic wind speed
Ke - Ground elevation factor
Kzt - Topographic factor
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 = 0.55, Ke = 1.000
Terrain Exposure Constants:
zmin = 15
c = 0.20
zg = 900
hE = 15
epsilon-bar = 0.20
l = 500
alpha = 9.5

Units: ft, lbs, ft/s

MAIN WIND FORCE RESISTING SYSTEM (MWFRS)

MWFRS - Block 1: EW x NS = 26.50 x 25.00 Mean Roof Height = 12.62

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	0.95	0.50
1	North	Leeward	-7.09	16.7	-0.43	-0.50	0.85	12.6	0.85	12.6	1.00	-	30.0	0.95	0.50
Roof	North	Leeward	-8.50	16.7	-0.51	-0.60	0.85	12.6	0.85	12.6	1.00	-	30.0	0.95	0.50
Roof	North	Windward	2.83	16.7	0.17	0.20	0.85	12.6	0.85	12.6	1.00	-	30.0	0.95	0.50
1	East	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	90.0	1.06	0.48
1	East	Leeward	-6.92	16.7	-0.42	-0.49	0.85	12.6	0.85	12.6	1.00	-	90.0	1.06	0.48
1	East	Leeward	-6.92	16.7	-0.42	-0.49	0.85	12.6	0.85	12.6	1.00	-	90.0	1.06	0.48
1	East	Windward	11.34	16.7	0.68	0.80	0.85	11.1	0.85	11.1	1.00	-	90.0	1.06	0.48
1	East	Leeward	-6.92	16.7	-0.42	-0.49	0.85	12.6	0.85	12.6	1.00	-	90.0	1.06	0.48
1	East	Windward	11.34	16.7	0.68	0.80	0.85	11.1	0.85	11.1	1.00	-	90.0	1.06	0.48
1	South	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	30.0	0.95	0.50
1	South	Leeward	-7.09	16.7	-0.43	-0.50	0.85	12.6	0.85	12.6	1.00	-	30.0	0.95	0.50
Roof	South	Leeward	-8.50	16.7	-0.51	-0.60	0.85	12.6	0.85	12.6	1.00	-	30.0	0.95	0.50
Roof	South	Windward	2.83	16.7	0.17	0.20	0.85	12.6	0.85	12.6	1.00	-	30.0	0.95	0.50
1	West	Windward	11.34	16.7	0.68	0.80	0.85	6.8	0.85	6.8	1.00	-	90.0	1.06	0.48
1	West	Leeward	-6.92	16.7	-0.42	-0.49	0.85	12.6	0.85	12.6	1.00	-	90.0	1.06	0.48
1	West	Leeward	-6.92	16.7	-0.42	-0.49	0.85	12.6	0.85	12.6	1.00	-	90.0	1.06	0.48
1	West	Windward	11.34	16.7	0.68	0.80	0.85	11.1	0.85	11.1	1.00	-	90.0	1.06	0.48
1	West	Leeward	-6.92	16.7	-0.42	-0.49	0.85	12.6	0.85	12.6	1.00	-	90.0	1.06	0.48
1	West	Windward	11.34	16.7	0.68	0.80	0.85	11.1	0.85	11.1	1.00	-	90.0	1.06	0.48

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 = 133.0, V/L = 46.9, Co = 0.660, FHS = 14.42, sum (bi) = 13.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 0.08	2.92	7.92
1	2.83	68.8	-262	-18	-253
2	11.58	-129.6	-262	-762	-997
Critical force:			-262	-762	-997

Shear wall 1-1, Level 1
W->E and S->N wind design, flexible diaphragm
vmax = 160.6, V/L = 56.7, Co = 0.660, FHS = 14.42, sum (bi) = 13.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 0.08	2.92	7.92
1	2.83	83.0	-316	-22	-305
2	11.58	-156.4	-316	-920	-1203
Critical force:			-316	-920	-1203

Shear wall 1-1, Level 1
E->W and N->S wind design, flexible diaphragm
vmax = 160.6, V/L = 56.7, Co = 0.660, FHS = 14.42, sum (bi) = 13.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 0.08	2.92	7.92
1	2.83	83.0	316	22	305
2	11.58	-156.4	316	920	1204
Critical force:			316	920	1204

Shear wall 1-1, Level 1
E->W and N->S seismic design, flexible diaphragm
vmax = 133.0, V/L = 46.9, Co = 0.660, FHS = 14.42, sum (bi) = 13.37

Seg w/ vmax	Seg Length	Other v	Drag strut force at 0.08	2.92	7.92
1	2.83	68.8	262	18	253
2	11.58	-129.6	262	762	997
Critical force:			262	762	997

Shear wall 3-1, Level 1
W->E and S->N seismic design, flexible diaphragm
vmax = 85.7, V/L = 46.3, Co = 1.000, FHS = 14.5, sum (bi) = 13.5

Seg w/ vmax	Seg Length	Other v	Drag strut force at 1.00	4.00	8.00
1	3.0	78.3	-301	-182	-368
2	11.5	57.1	-301	-268	-453
Critical force:			-301	-268	-453

Shear wall 3-1, Level 1
W->E and S->N wind design, flexible diaphragm
vmax = 104.9, V/L = 56.7, Co = 1.000, FHS = 14.5, sum (bi) = 13.5

Seg w/ vmax	Seg Length	Other v	Drag strut force at 1.00	4.00	8.00
1	3.0	95.8	-368	-223	-450
2	11.5	70.0	-368	-328	-555
Critical force:			-368	-328	-555

Shear wall 3-1, Level 1
E->W and N->S wind design, flexible diaphragm

vmax = 104.9, V/L = 56.7, Co = 1.000, FHS = 14.5, sum (bi) = 13.5

Seg w/ vmax	Seg Length	Other v	Drag strut force at 1.00	4.00	8.00
1	3.0	95.8	368	224	450
2	11.5	70.0	368	328	555
Critical force:			368	328	555

Shear wall 3-1, Level 1
E->W and N->S seismic design, flexible diaphragm
vmax = 85.7, V/L = 46.3, Co = 1.000, FHS = 14.5, sum (bi) = 13.5

Seg w/ vmax	Seg Length	Other v	Drag strut force at 1.00	4.00	8.00
1	3.0	78.3	301	183	368
2	11.5	57.1	301	268	453
Critical force:			301	268	453

Shear wall C-1, Level 1
W->E and S->N seismic design, flexible diaphragm
vmax = 57.8, V/L = 43.4, Co = 1.000, FHS = 21.5, sum (bi) = 19.9

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.75	5.75	20.42	23.42
1	3.75	52.6	54	-33	102	-28
2	14.67	44.3	3	-83	127	-3
3	3.08	52.8	35	-52	86	-44
Critical force:			54	-83	127	-44

Shear wall C-1, Level 1
W->E and S->N wind design, flexible diaphragm
vmax = 55.9, V/L = 42.0, Co = 1.000, FHS = 21.5, sum (bi) = 19.9

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.75	5.75	20.42	23.42
1	3.75	50.9	52	-32	99	-27
2	14.67	42.8	3	-81	123	-3
3	3.08	51.0	34	-50	83	-43
Critical force:			52	-81	123	-43

Shear wall C-1, Level 1
E->W and N->S wind design, flexible diaphragm
vmax = 55.9, V/L = 42.0, Co = 1.000, FHS = 21.5, sum (bi) = 19.9

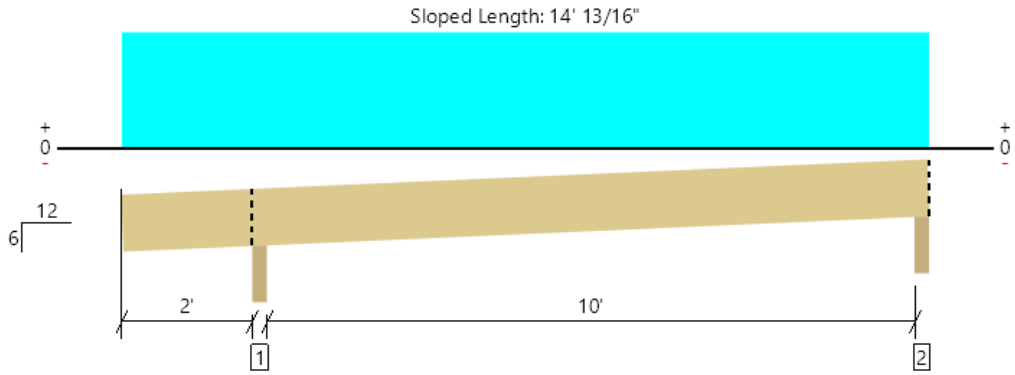
Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.75	5.75	20.42	23.42
1	3.75	50.9	-52	32	-98	27
2	14.67	42.8	-3	81	-123	3
3	3.08	51.0	-34	50	-83	43
Critical force:			-52	81	-123	43

Shear wall C-1, Level 1
E->W and N->S seismic design, flexible diaphragm
vmax = 57.8, V/L = 43.4, Co = 1.000, FHS = 21.5, sum (bi) = 19.9

Seg w/ vmax	Seg Length	Other v	Drag strut force at 3.75	5.75	20.42	23.42
1	3.75	52.6	-54	33	-102	28
2	14.67	44.3	-3	83	-127	3
3	3.08	52.8	-35	52	-86	44
Critical force:			-54	83	-127	44

Level, Roof: Rafter B1

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 : 14' 4 7/16"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 6/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	584 @ 2' 1 3/4"	3669 (3.50")	Passed (16%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	363 @ 2' 10"	1631	Passed (22%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	955 @ 7' 5 1/8"	1700	Passed (56%)	1.25	1.0 D + 1.0 Lr (Alt Spans)
Live Load Defl. (in)	0.153 @ 7' 3 9/16"	0.381	Passed (L/896)	--	1.0 D + 1.0 Lr (Alt Spans)
Total Load Defl. (in)	0.290 @ 7' 3 13/16"	0.572	Passed (L/472)	--	1.0 D + 1.0 Lr (Alt Spans)

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Factored	
1 - Beveled Plate - DF	3.50"	3.50"	1.50"	285	299	584	Blocking
2 - Beveled Plate - DF	3.50"	3.50"	1.50"	194	208	402	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' 7" o/c	
Bottom Edge (Lu)	14' 1" 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 12' 7"	24"	17.0	20.0	Default Load

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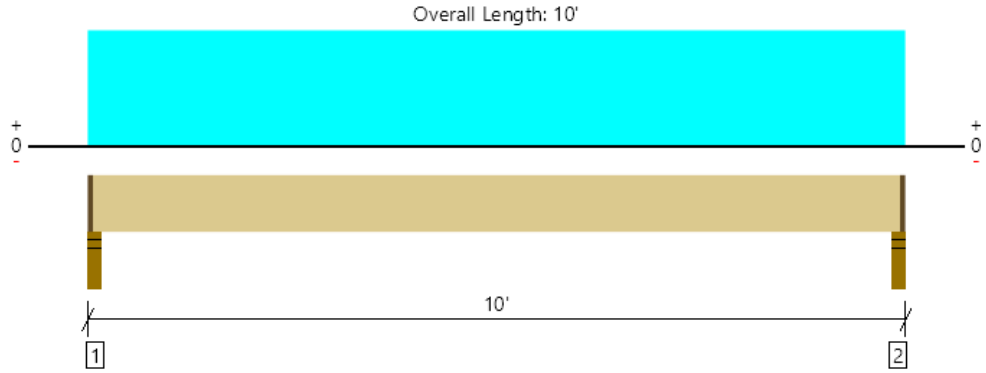
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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

Weyerhaeuser

Level, Roof: Joist B2

1 piece(s) 2 x 8 DF No.2 @ 16" 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)	131 @ 2 1/2"	1434 (2.25")	Passed (9%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	109 @ 10 3/4"	1631	Passed (7%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	306 @ 5'	1700	Passed (18%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.033 @ 5'	0.240	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.066 @ 5'	0.479	Passed (L/999+)	--	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 2021
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 - SPF	3.50"	2.25"	1.50"	67	67	133	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.50"	67	67	133	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)	9' 10" o/c	
Bottom Edge (Lu)	9' 10" 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'	16"	10.0	10.0	Default Load

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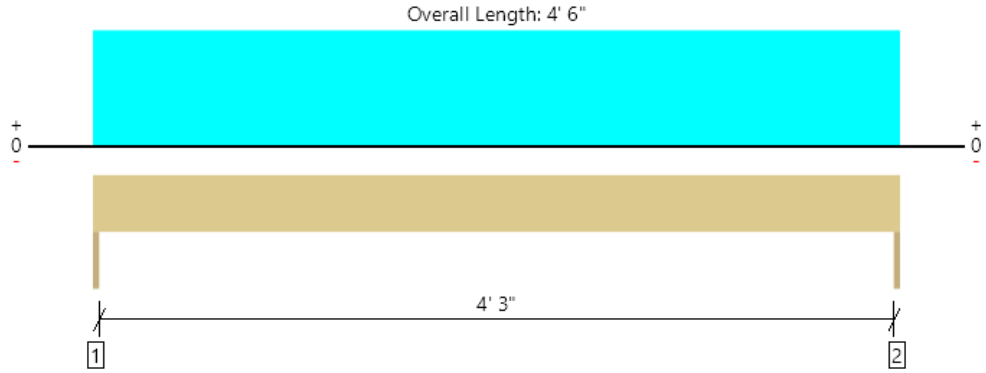
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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

Weyerhaeuser

Level, Int. Header B3

1 piece(s) 4 x 6 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)	463 @ 0	3281 (1.50")	Passed (14%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	343 @ 7"	2888	Passed (12%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	521 @ 2' 3"	2151	Passed (24%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.012 @ 2' 3"	0.112	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.024 @ 2' 3"	0.225	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) 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	1.50"	1.50"	1.50"	237	226	463	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	237	226	463	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 6" o/c	
Bottom Edge (Lu)	4' 6" 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 4' 6"	N/A	4.9	--	
1 - Uniform (PLF)	0 to 4' 6"	N/A	50.3	50.3	Linked from: Roof Joist, Support 1
2 - Uniform (PLF)	0 to 4' 6"	N/A	50.3	50.3	Linked from: Roof Joist, Support 2

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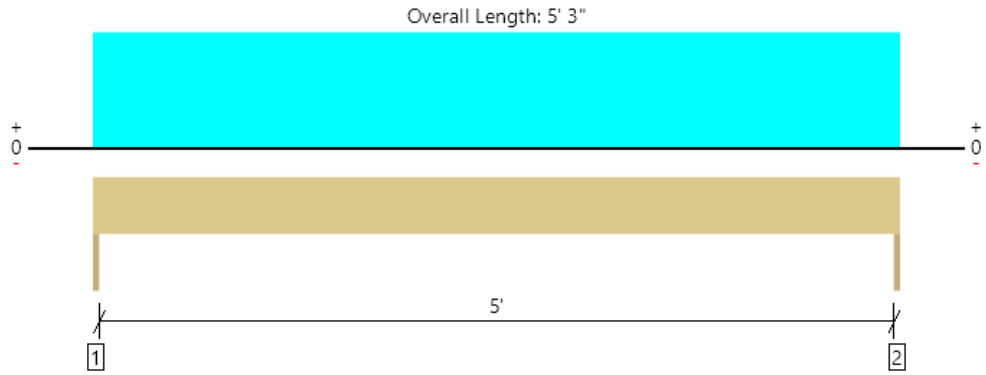
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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

Weyerhaeuser

Level, Typ. Header B4

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)	1058 @ 0	5156 (1.50")	Passed (21%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	756 @ 9"	5844	Passed (13%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	1388 @ 2' 7 1/2"	4028	Passed (34%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.014 @ 2' 7 1/2"	0.131	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.027 @ 2' 7 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 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) 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	1.50"	1.50"	1.50"	533	524	1058	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	533	524	1058	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 3" o/c	
Bottom Edge (Lu)	5' 3" 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' 3"	N/A	10.4	--	
1 - Uniform (PLF)	0 to 5' 3"	N/A	142.5	149.5	Linked from: Roof: Joist B1, Support 1
2 - Uniform (PLF)	0 to 5' 3"	N/A	50.3	50.3	Linked from: Roof Joist, Support 1

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ForteWEB Software Operator	Job Notes
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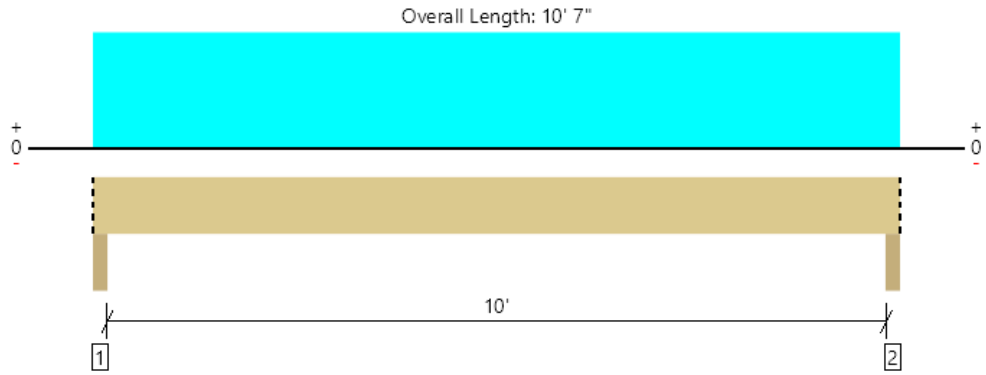
Weyerhaeuser

Level, Porch: Beam B5

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)	505 @ 2"	12031 (3.50")	Passed (4%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	418 @ 11"	5844	Passed (7%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	1254 @ 5' 3 1/2"	4028	Passed (31%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.049 @ 5' 3 1/2"	0.256	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.094 @ 5' 3 1/2"	0.512	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) 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 - Column - SPF	3.50"	3.50"	1.50"	241	265	505	Blocking
2 - Column - SPF	3.50"	3.50"	1.50"	241	265	505	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' 7" o/c	
Bottom Edge (Lu)	10' 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 10' 7"	N/A	10.4	--	
1 - Uniform (PSF)	0 to 10' 7" (Front)	2' 6"	14.0	20.0	Default Load

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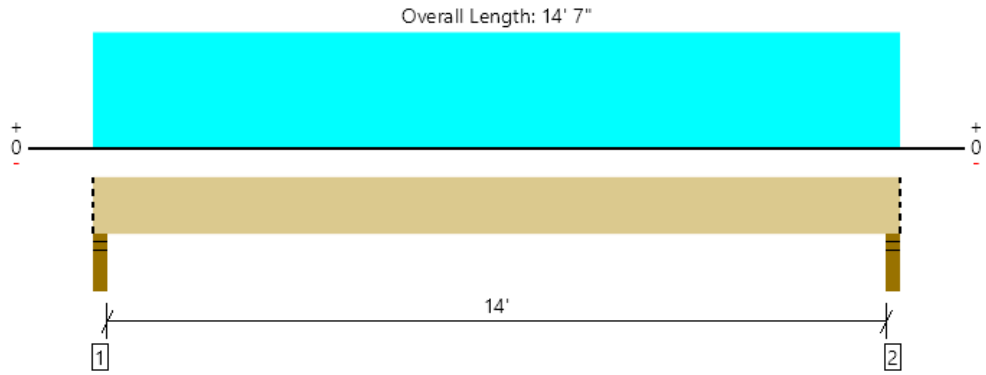
ForteWEB Software Operator	Job Notes
Jeffrey Ford Jackson and Sands (530) 715-7184 jeffrey@jacksonandsandsengineering.com	

Weyerhaeuser

Level, Roof: Beam B6

3 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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)	3727 @ 2"	7809 (3.50")	Passed (48%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	3072 @ 1' 3 3/8"	14807	Passed (21%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	12975 @ 7' 3 1/2"	33465	Passed (39%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.170 @ 7' 3 1/2"	0.356	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.348 @ 7' 3 1/2"	0.712	Passed (L/492)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.67"	1904	1823	3727	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.67"	1904	1823	3727	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)	14' 7" o/c	
Bottom Edge (Lu)	14' 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 14' 7"	N/A	18.2	--	
1 - Uniform (PLF)	0 to 14' 7" (Front)	N/A	142.5	149.5	Linked from: Roof: Rafter B1, Support 1
2 - Uniform (PLF)	0 to 14' 7" (Front)	N/A	50.3	50.3	Linked from: Roof: Joist B2, Support 1
3 - Uniform (PLF)	0 to 14' 7" (Front)	N/A	50.3	50.3	Linked from: Roof: Joist B2, Support 2

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ForteWEB Software Operator	Job Notes
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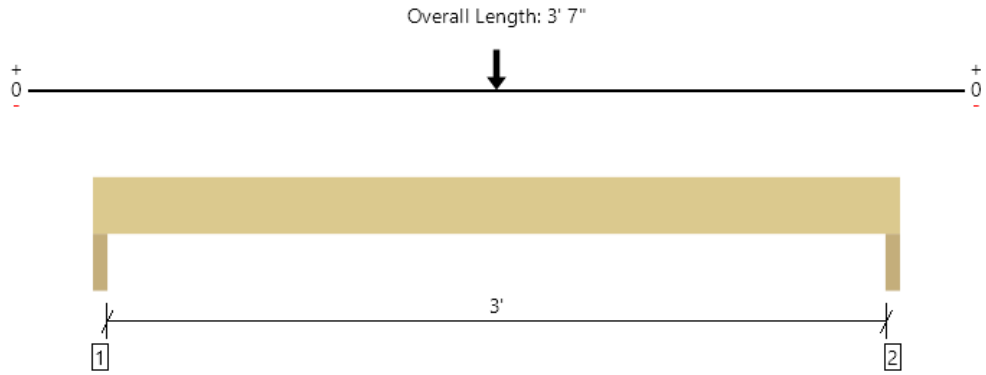
Weyerhaeuser

Level, Wall: Header B7

1 piece(s) 4 x 12 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)	4144 @ 2"	7656 (3.50")	Passed (54%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	4132 @ 1' 2 3/4"	5906	Passed (70%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	6718 @ 1' 9 1/2"	7614	Passed (88%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.008 @ 1' 9 1/2"	0.108	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.015 @ 1' 9 1/2"	0.162	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
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"	1.89"	2126	2018	4144	None
2 - Trimmer - SPF	3.50"	3.50"	1.89"	2126	2018	4144	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 7" o/c	
Bottom Edge (Lu)	3' 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 3' 7"	N/A	10.0	--	
1 - Point (lb)	1' 9 1/2"	N/A	4216	4036	Linked from: Copy of Roof: Beam B8, Support 2

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ForteWEB Software Operator	Job Notes
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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. Ftg. Hip

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

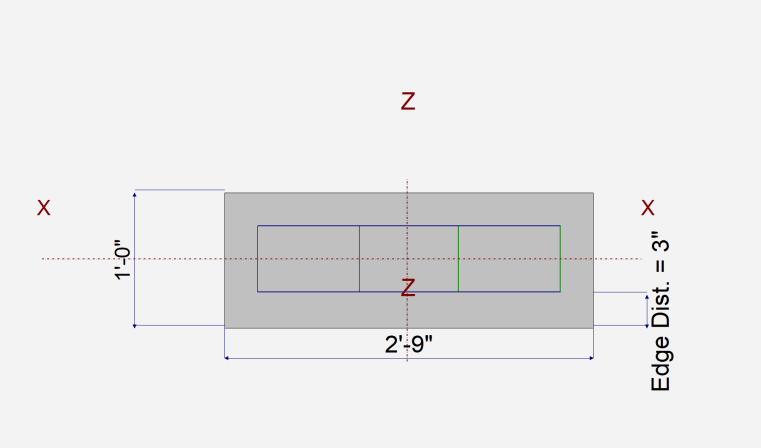
Width parallel to X-X Axis	=	2.750 ft
Length parallel to Z-Z Axis	=	1.0 ft
Footing Thickness	=	12.0 in

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



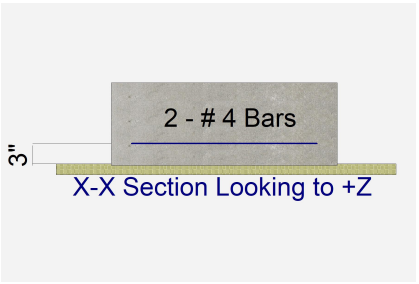
Reinforcing

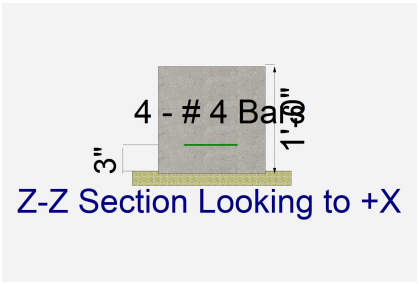
Bars parallel to X-X Axis			
Number of Bars	=		2.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		4.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	Bars along Z-Z Axis
# Bars required within zone	53.3 %
# Bars required on each side of zone	46.7 %





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	1.90	1.819	0.2560	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. Ftg. Hip

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9980	Soil Bearing	1.497 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	0.1219	Z Flexure (+X)	1.872 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr+L
PASS	0.1219	Z Flexure (-X)	1.872 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr+L
PASS	0.02184	X Flexure (+Z)	0.2476 k-ft/ft	11.334 k-ft/ft	+1.20D+1.60Lr+L
PASS	0.02184	X Flexure (-Z)	0.2476 k-ft/ft	11.334 k-ft/ft	+1.20D+1.60Lr+L
PASS	0.1547	1-way Shear (+X)	11.599 psi	75.0 psi	+1.20D+1.60Lr+L
PASS	0.1547	1-way Shear (-X)	11.599 psi	75.0 psi	+1.20D+1.60Lr+L
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	0.08822	2-way Punching	13.233 psi	150.0 psi	+1.20D+1.60Lr+L

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	0.8359	0.8359	n/a	n/a	0.557
X-X, +D+L	1.50	n/a	0.0	0.9290	0.9290	n/a	n/a	0.619
X-X, +D+Lr	1.50	n/a	0.0	1.497	1.497	n/a	n/a	0.998
X-X, +D+0.750Lr+0.750L	1.50	n/a	0.0	1.402	1.402	n/a	n/a	0.935
X-X, +D+0.750L	1.50	n/a	0.0	0.9057	0.9057	n/a	n/a	0.604
X-X, +0.60D	1.50	n/a	0.0	0.5015	0.5015	n/a	n/a	0.334
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.8359	0.8359	0.557
Z-Z, +D+L	1.50	0.0	n/a	n/a	n/a	0.9290	0.9290	0.619
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.497	1.497	0.998
Z-Z, +D+0.750Lr+0.750L	1.50	0.0	n/a	n/a	n/a	1.402	1.402	0.935
Z-Z, +D+0.750L	1.50	0.0	n/a	n/a	n/a	0.9057	0.9057	0.604
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.5015	0.5015	0.334

Overturning Stability

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

All units k

Sliding Stability

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	0.1209	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.40D	0.1209	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+0.50Lr+1.60L	0.1636	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+0.50Lr+1.60L	0.1636	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+1.60L	0.1223	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+1.60L	0.1223	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+1.60Lr+L	0.2476	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+1.60Lr+L	0.2476	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+1.60Lr	0.2359	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+1.60Lr	0.2359	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+L	0.1153	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+L	0.1153	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D	0.1036	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK

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. Ftg. Hip

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, +1.20D	0.1036	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+0.50Lr+L	0.1566	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +1.20D+0.50Lr+L	0.1566	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +0.90D	0.07773	+Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
X-X, +0.90D	0.07773	-Z	Bottom	0.2592	AsMin	0.2909	11.334	OK
Z-Z, +1.40D	0.9144	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.40D	0.9144	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+1.60L	1.237	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+1.60L	1.237	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60L	0.9246	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60L	0.9246	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr+L	1.872	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr+L	1.872	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr	1.784	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr	1.784	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+L	0.8718	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+L	0.8718	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D	0.7838	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D	0.7838	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+L	1.184	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+L	1.184	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +0.90D	0.5878	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +0.90D	0.5878	+X	Bottom	0.2592	AsMin	0.40	15.353	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	5.67 psi	5.67 psi	0.00 psi	0.00 psi	5.67 psi	75.00 psi	0.08	OK
+1.20D+0.50Lr+1.60L	7.67 psi	7.67 psi	0.00 psi	0.00 psi	7.67 psi	75.00 psi	0.10	OK
+1.20D+1.60L	5.73 psi	5.73 psi	0.00 psi	0.00 psi	5.73 psi	75.00 psi	0.08	OK
+1.20D+1.60Lr+L	11.60 psi	11.60 psi	0.00 psi	0.00 psi	11.60 psi	75.00 psi	0.15	OK
+1.20D+1.60Lr	11.05 psi	11.05 psi	0.00 psi	0.00 psi	11.05 psi	75.00 psi	0.15	OK
+1.20D+L	5.40 psi	5.40 psi	0.00 psi	0.00 psi	5.40 psi	75.00 psi	0.07	OK
+1.20D	4.86 psi	4.86 psi	0.00 psi	0.00 psi	4.86 psi	75.00 psi	0.06	OK
+1.20D+0.50Lr+L	7.34 psi	7.34 psi	0.00 psi	0.00 psi	7.34 psi	75.00 psi	0.10	OK
+0.90D	3.64 psi	3.64 psi	0.00 psi	0.00 psi	3.64 psi	75.00 psi	0.05	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	6.46 psi	150.00 psi	0.04309	OK
+1.20D+0.50Lr+1.60L	8.74 psi	150.00 psi	0.0583	OK
+1.20D+1.60L	6.54 psi	150.00 psi	0.04357	OK
+1.20D+1.60Lr+L	13.23 psi	150.00 psi	0.08822	OK
+1.20D+1.60Lr	12.61 psi	150.00 psi	0.08407	OK
+1.20D+L	6.16 psi	150.00 psi	0.04108	OK
+1.20D	5.54 psi	150.00 psi	0.03693	OK
+1.20D+0.50Lr+L	8.37 psi	150.00 psi	0.05581	OK
+0.90D	4.16 psi	150.00 psi	0.0277	OK

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: F2, Porch Ftg.

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

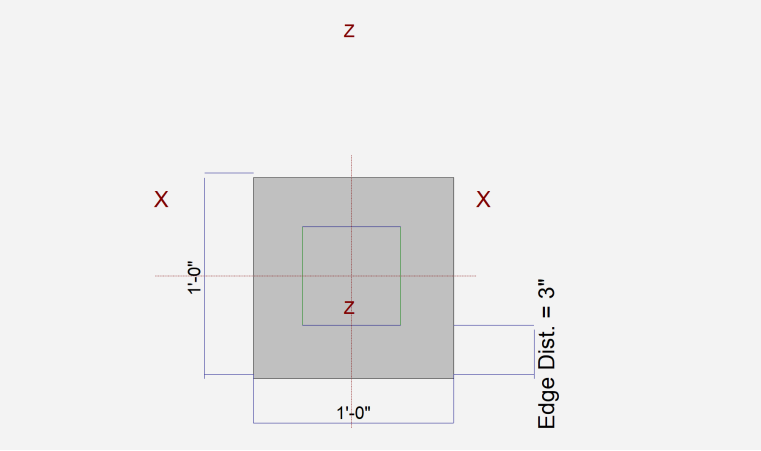
Width parallel to X-X Axis	=	1.0 ft
Length parallel to Z-Z Axis	=	1.0 ft
Footing Thickness	=	12.0 in

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

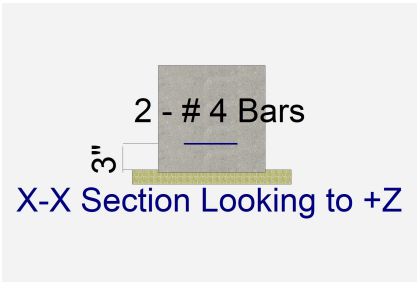


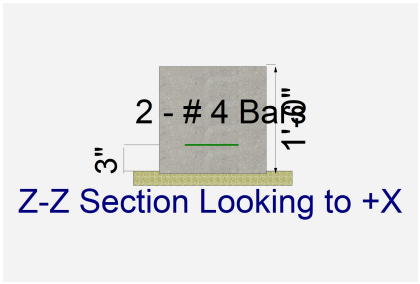
Reinforcing

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	=	0.2110	0.2650		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: F2, Porch Ftg.

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.4140	Soil Bearing	0.6210 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	0.005514	Z Flexure (+X)	0.08465 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr
PASS	0.005514	Z Flexure (-X)	0.08465 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr
PASS	0.005514	X Flexure (+Z)	0.08465 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr
PASS	0.005514	X Flexure (-Z)	0.08465 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	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	0.8829 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	0.3560	0.3560	n/a	n/a	0.237
X-X, +D+Lr	1.50	n/a	0.0	0.6210	0.6210	n/a	n/a	0.414
X-X, +D+0.750Lr	1.50	n/a	0.0	0.5548	0.5548	n/a	n/a	0.370
X-X, +0.60D	1.50	n/a	0.0	0.2136	0.2136	n/a	n/a	0.142
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.3560	0.3560	0.237
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	0.6210	0.6210	0.414
Z-Z, +D+0.750Lr	1.50	0.0	n/a	n/a	n/a	0.5548	0.5548	0.370
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.2136	0.2136	0.142

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	0.03693	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.40D	0.03693	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+0.50Lr	0.04821	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+0.50Lr	0.04821	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D	0.03165	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D	0.03165	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+1.60Lr	0.08465	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +1.20D+1.60Lr	0.08465	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +0.90D	0.02374	+Z	Bottom	0.2592	AsMin	0.40	15.353	OK
X-X, +0.90D	0.02374	-Z	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.40D	0.03693	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.40D	0.03693	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr	0.04821	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr	0.04821	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D	0.03165	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D	0.03165	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr	0.08465	-X	Bottom	0.2592	AsMin	0.40	15.353	OK

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: F2, Porch Ftg.

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	0.08465	+X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +0.90D	0.02374	-X	Bottom	0.2592	AsMin	0.40	15.353	OK
Z-Z, +0.90D	0.02374	+X	Bottom	0.2592	AsMin	0.40	15.353	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	0.39 psi	150.00 psi	0.002567	OK
+1.20D+0.50Lr	0.50 psi	150.00 psi	0.003352	OK
+1.20D	0.33 psi	150.00 psi	0.002201	OK
+1.20D+1.60Lr	0.88 psi	150.00 psi	0.005886	OK
+0.90D	0.25 psi	150.00 psi	0.00165	OK

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: F3, Int. Pier

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

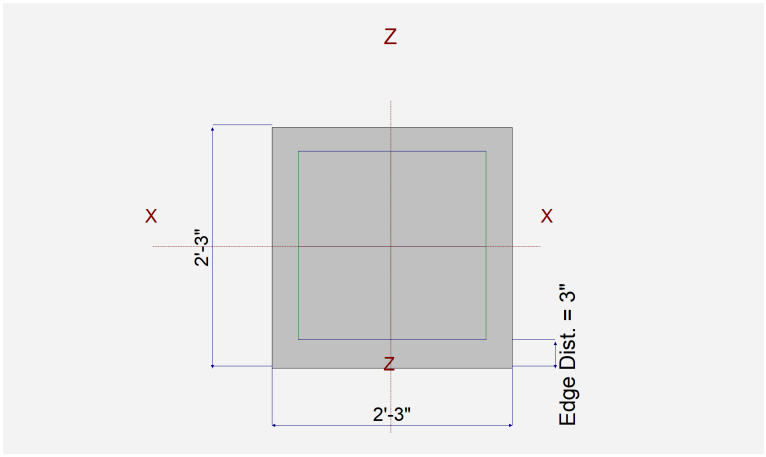
Width parallel to X-X Axis	=	2.250 ft
Length parallel to Z-Z Axis	=	2.250 ft
Footing Thickness	=	12.0 in

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

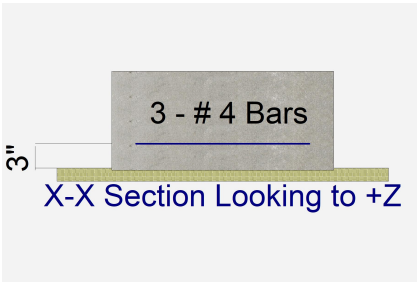


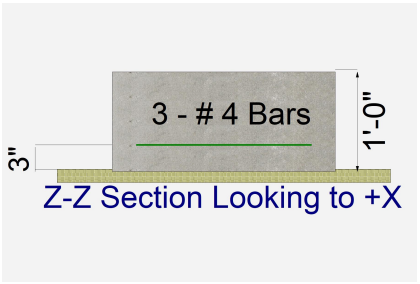
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		3.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		3.0
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	=	3.0	3.0		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: F3, Int. Pier

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8867	Soil Bearing	1.330 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	0.1007	Z Flexure (+X)	1.050 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.1007	Z Flexure (-X)	1.050 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.1007	X Flexure (+Z)	1.050 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.1007	X Flexure (-Z)	1.050 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr
PASS	0.07835	1-way Shear (+X)	5.877 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.07835	1-way Shear (-X)	5.877 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.07835	1-way Shear (+Z)	5.877 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.07835	1-way Shear (-Z)	5.877 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.1529	2-way Punching	22.929 psi	150.0 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	0.7376	0.7376	n/a	n/a	0.492
X-X, +D+Lr	1.50	n/a	0.0	1.330	1.330	n/a	n/a	0.887
X-X, +D+0.750Lr	1.50	n/a	0.0	1.182	1.182	n/a	n/a	0.788
X-X, +0.60D	1.50	n/a	0.0	0.4426	0.4426	n/a	n/a	0.295
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.7376	0.7376	0.492
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.330	1.330	0.887
Z-Z, +D+0.750Lr	1.50	0.0	n/a	n/a	n/a	1.182	1.182	0.788
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.4426	0.4426	0.295

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	0.5250	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.40D	0.5250	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+0.50Lr	0.6375	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+0.50Lr	0.6375	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D	0.450	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D	0.450	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+1.60Lr	1.050	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +1.20D+1.60Lr	1.050	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +0.90D	0.3375	+Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
X-X, +0.90D	0.3375	-Z	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.40D	0.5250	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.40D	0.5250	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr	0.6375	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr	0.6375	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D	0.450	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D	0.450	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +1.20D+1.60Lr	1.050	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK

General Footing

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DESCRIPTION: F3, Int. Pier

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	1.050	+X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +0.90D	0.3375	-X	Bottom	0.2592	AsMin	0.2667	10.424	OK
Z-Z, +0.90D	0.3375	+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	2.94 psi	2.94 psi	2.94 psi	2.94 psi	2.94 psi	75.00 psi	0.04	OK
+1.20D+0.50Lr	3.57 psi	3.57 psi	3.57 psi	3.57 psi	3.57 psi	75.00 psi	0.05	OK
+1.20D	2.52 psi	2.52 psi	2.52 psi	2.52 psi	2.52 psi	75.00 psi	0.03	OK
+1.20D+1.60Lr	5.88 psi	5.88 psi	5.88 psi	5.88 psi	5.88 psi	75.00 psi	0.08	OK
+0.90D	1.89 psi	1.89 psi	1.89 psi	1.89 psi	1.89 psi	75.00 psi	0.03	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	11.46 psi	150.00 psi	0.07643	OK
+1.20D+0.50Lr	13.92 psi	150.00 psi	0.09281	OK
+1.20D	9.83 psi	150.00 psi	0.06551	OK
+1.20D+1.60Lr	22.93 psi	150.00 psi	0.1529	OK
+0.90D	7.37 psi	150.00 psi	0.04913	OK