

Engineering Calculations & Details

[Project]

1491 - AUPPERLE

[Date]

5/11/2020

[Site]

359 NW RUTH LANE
BREMERTON, WA 98311

[Rev]

[Client]



[Scope]

- ☒ Lateral Design
- ☒ Exterior Posts
- ☒ Beam (Vertical) Loads
- ☒ Isolated/Special Footing(s)
- ☒ Foundation Footings (ONLY)
- ☐ Foundation Stem Walls
- ☐ Isolated/Special Conc Wall
and/or Basement Walls
- ☐ Other

Ground Load	Roof Snow Load	Exposure	Seismic Zone	Wind ASD	Wind ULT
N/A	25 PSF	D	D0	85 MPH	110 MPH

Please note both professionals below, collectively with Einstein Design, should be considered the professional of record for the project above. If a change, revision, or clarification is requested/required, **either party**, in their individual capacity, shall be permitted to give direction and act as the professional of record for this project.



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Bremerton, WA, USA

Latitude, Longitude: 47.5650067, -122.6269768



Date	4/30/2020, 3:39:09 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S _S	1.613	MCE _R ground motion. (for 0.2 second period)
S ₁	0.563	MCE _R ground motion. (for 1.0s period)
S _{MS}	1.613	Site-modified spectral acceleration value
S _{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S _{DS}	1.075	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	Site amplification factor at 0.2 second
F _v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.689	MCE _G peak ground acceleration
F _{PGA}	1.1	Site amplification factor at PGA
PGA _M	0.757	Site modified peak ground acceleration
T _L	6	Long-period transition period in seconds
SsRT	1.613	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.784	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	4.339	Factored deterministic acceleration value. (0.2 second)
S1RT	0.563	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.635	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.616	Factored deterministic acceleration value. (1.0 second)
PGAd	1.421	Factored deterministic acceleration value. (Peak Ground Acceleration)
	0.904	Mapped value of the risk coefficient at short periods

Type	Value	Description
C _{RS}		
C _{R1}	0.887	Mapped value of the risk coefficient at a period of 1 s

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**Permit Number: 20-03705**

WoodWorks® Shearwalls 11.1

1491.wsw

Apr. 30, 2020 14:40:08

Project Information

DESIGN SETTINGS

Design Code		Wind Standard		Seismic Standard	
IBC 2015/AWC SDPWS 2015		ASCE 7-10 Directional (All heights)		ASCE 7-10	
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	Temperature	Moisture Content		Plan	Elevation
Factor	Range	Fabrication	Service	(within story)	(between stories)
1.60	T<=100F	15% <=19%	10% <=19%	0.50	-
Maximum Height-to-width Ratio					
Wood panels		Fiberboard	Lumber	Gypsum	
Wind	Seismic		Wind	Blocked	Unblocked
3.5	3.5	-	-	-	-
Ignore non-wood-panel shear resistance contribution...				Collector forces based on...	
Wind		Seismic		Hold-downs	Applied loads
Never		Always		Drag struts	Applied loads
Shearwall Relative Rigidity: Wall capacity					
Perforated shearwall Co factor: SDPWS Table 4.3.3.5					
Non-identical materials and construction on the shearline: Allowed, except for material type					
Deflection Equation: 4-term from SDPWS C4.3.2-2					
Drift limit for wind design: 1 / 500 story height					

SITE INFORMATION

Wind			Seismic		
ASCE 7-10 Directional (All heights)			ASCE 7-10 12.8 Equivalent Lateral Force Procedure		
Design Wind Speed	110 mph		Risk Category	Category II - All others	
Serviceability Wind Speed	85 mph		Structure Type	Regular	
Exposure	Exposure D		Building System	Bearing Wall	
Enclosure	Enclosed		Design Category	D	
Min Wind Loads: Walls	16 psf		Site Class	D	
Roofs	8 psf		Spectral Response Acceleration		
Topographic Information [ft]			S1: 0.563g Ss: 1.613g		
Shape	Height	Length	Fundamental Period	E-W	N-S
-	-	-	T Used	0.137s	0.137s
Site Location: -			Approximate Ta	0.137s	0.137s
Elev: 0ft Avg Air density: 0.0765 lb/cu ft			Maximum T	0.192s	0.192s
Flexible building, gust factor = 0.85			Response Factor R	6.50	6.50
Case 2	E-W loads	N-S loads	Fa: 1.00 Fv: 1.50		
Eccentricity (ft)	7.50	7.43			
Loaded at	75%				

Structural Data

STORY INFORMATION

	Story Elev [ft]	Floor/Ceiling Depth [in]	Wall Height [ft]	Hold-down Length subject to shrinkage [in]	Bolt length [in]
Ceiling	11.83	0.0			
Level 1	2.83	10.0	9.00	13.8	14.5
Foundation	2.00				

BLOCK and ROOF INFORMATION

Block Dimensions [ft]				Face	Type	Roof Panels Slope	Overhang [ft]
Block 1	1 Story	E-W Ridge					
Location X,Y =	0.00	3.00		North	Side	26.5	1.00
Extent X,Y =	50.00	32.00		South	Side	26.5	1.00
Ridge Y Location, Offset	19.00	0.00		East	Gable	90.0	1.00
Ridge Elevation, Height	19.81	7.98		West	Gable	90.0	1.00
Block 2	1 Story	N-S Ridge					
Location X,Y =	0.00	0.50		North	Joined	153.5	1.00
Extent X,Y =	13.00	2.50		South	Gable	90.0	1.00
Ridge X Location, Offset	6.50	0.00		East	Side	26.5	1.00
Ridge Elevation, Height	15.07	3.24		West	Side	26.5	1.00
Block 3	1 Story	N-S Ridge					
Location X,Y =	27.50	-14.50		North	Joined	153.5	1.00
Extent X,Y =	22.50	17.50		South	Gable	90.0	1.00
Ridge X Location, Offset	38.75	0.00		East	Side	26.5	1.00
Ridge Elevation, Height	17.44	5.61		West	Side	26.5	1.00

SHEATHING MATERIALS by WALL GROUP

Grp	Surf	Material	Ratng	Sheathing		Ply	Or	Gvtv lbs/in	Size	Fasteners					Apply Notes
				Thick in	GU in					Type	Df	Eg in	Fd in	Bk	
1	Ext	Struct Sh OSB	24/16	7/16	-	3	Vert	83500	8d	Nail	N	6	12	Y	3

Legend:

Grp – Wall Design Group number, used to reference wall in other tables

Surf – Exterior or interior surface when applied to exterior wall

Ratng – Span rating, see SDPWS Table C4.2.2.2C

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

Gvtv – Shear stiffness in lb/in. of depth from SDPWS Tables C4.2.2A-B

Type – Fastener type from SDPWS Tables 4.3A-D: Nail – common wire nail for structural panels and lumber, cooler or gypsum wallboard nail for GWB, plasterboard nail for gypsum lath, galvanised nail for gypsum sheathing; Box – box nail; Casing – casing nail; Roof – roofing nail; Screw – drywall screw

Size – Common, box, and casing nails: refer to SDPWS Table A1 (casing sizes = box sizes).
Gauges: 11 ga = 0.120" x 1-3/4" (gypsum sheathing, 25/32" fiberboard), 1-1/2" (lath & plaster, 1/2" fiberboard); 13 ga plasterboard = 0.92" x 1-1/8".
Cooler or gypsum 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.

5/8" gypsum sheathing can also use 6d cooler or GWB nail

Df – Deformed nails (threaded or spiral), with increased withdrawal capacity

Eg – Panel edge fastener spacing

Fd – Field spacing interior to panels

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 T4.3A Note 2.

FRAMING MATERIALS and STANDARD WALL by WALL GROUP

Wall Grp	Species	Grade	b in	d in	Spcg in	SG	E psi ⁶	Standard Wall
1	D.Fir-L	Stud	1.50	5.50	16	0.50	1.40	

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.

Notes:

Check manufacture requirements for stud size, grade and specific gravity (G) for all shearwall hold-downs.

Design Summary

SHEARWALL DESIGN**Wind Shear Loads, Flexible Diaphragm**

All shearwalls have sufficient design capacity.

Wind Shear Loads, Rigid Diaphragm

All shearwalls have sufficient design capacity.

Components and Cladding Wind Loads, Out-of-plane Sheathing

All shearwalls have sufficient design capacity.

Components and Cladding Wind Loads, Nail Withdrawal

All shearwalls have sufficient design capacity.

Seismic Loads, Flexible Diaphragm

All shearwalls have sufficient design capacity.

Seismic Loads, Rigid Diaphragm

All shearwalls have sufficient design capacity.

HOLDDOWN DESIGN**Wind Loads, Flexible Diaphragm**

Under-capacity hold-downs were found on the following walls:

Level 1: B-1, C-1, C-2, 1-1, 3-1

Wind Loads, Rigid Diaphragm

Under-capacity hold-downs were found on the following walls:

Level 1: B-1, C-1, C-2, D-1, 1-1, 4-1

Seismic Loads, Flexible Diaphragm

All hold-downs have sufficient design capacity.

Seismic Loads, Rigid Diaphragm

All hold-downs have sufficient design capacity.

This Design Summary does not include failures that occur due to excessive story drift from ASCE 7 CC1.2 (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 C4.2.2D).

SEE CALCULATIONS IN NEXT SECTION

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

SHEAR RESULTS

N-S Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub		Allowable Shear [plf]						Resp. Ratio
			v	vmax	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb	V [lbs]	
Line 1														
Level 1														
Ln1, Lev1	1	S->N	79.4	-	2740	-	1.0	-	364	-		364	12558	0.22
	1	N->S	77.4	-	2670	-	1.0	-	364	-		364	12558	0.21
Line 3														
Ln3, Lev1	-	S->N	-	-	4816	-	-	-	-	-		-	8008	-
	-	N->S	-	-	4657	-	-	-	-	-		-	8008	-
Wall 3-1	1	S->N	218.9	-	4816	-	1.0	-	364	-		364	8008	0.60
	1	N->S	211.7	-	4657	-	1.0	-	364	-		364	8008	0.58
Line 4														
Ln4, Lev1	-	S->N	-	-	2375	-	-	-	-	-		-	17290	-
	-	N->S	-	-	2243	-	-	-	-	-		-	17290	-
Wall 4-1	1	S->N	-	-	2375	-	1.0	-	364	-		-	17290	-
	1	N->S	-	-	2243	-	1.0	-	364	-		-	17290	-
Seg. 1	-	S->N	50.0	-	1300	-	1.0	-	364	-		364	9464	0.14
	-	N->S	47.2	-	1228	-	1.0	-	364	-		364	9464	0.13
Seg. 2	-	S->N	50.0	-	1075	-	1.0	-	364	-		364	7826	0.14
	-	N->S	47.2	-	1015	-	1.0	-	364	-		364	7826	0.13
E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub		Allowable Shear [plf]						Resp. Ratio
			v	vmax	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb	V [lbs]	
Line A														
Level 1														
LnA, Lev1	-	W->E	-	-	1102	-	-	-	-	-		-	1456	-
	-	E->W	-	-	1126	-	-	-	-	-		-	1456	-
Wall A-1	1	W->E	-	-	1102	-	1.0	-	364	-		-	1456	-
	1^	E->W	-	-	1126	-	1.0	-	364	-		-	1456	-
Seg. 1	-	W->E	183.6	-	551	-	.67	-	243	-		243	728	0.76
	-	E->W	187.6	-	563	-	.67	-	243	-		243	728	0.77
Seg. 2	-	W->E	183.6	-	551	-	.67	-	243	-		243	728	0.76
	-	E->W	187.6	-	563	-	.67	-	243	-		243	728	0.77
Line B														
LnB, Lev1	-	W->E	-	-	1870	-	-	-	-	-		-	3276	-
	-	E->W	-	-	1947	-	-	-	-	-		-	3276	-
Wall B-1	1	W->E	-	-	1870	-	1.0	-	364	-		-	3276	-
	1	E->W	-	-	1947	-	1.0	-	364	-		-	3276	-
Seg. 1	-	W->E	207.7	-	935	-	1.0	-	364	-		364	1638	0.57
	-	E->W	216.3	-	973	-	1.0	-	364	-		364	1638	0.59
Seg. 2	-	W->E	207.7	-	935	-	1.0	-	364	-		364	1638	0.57
	-	E->W	216.3	-	973	-	1.0	-	364	-		364	1638	0.59
Line C														
LnC, Lev1	-	W->E	-	-	3056	-	-	-	-	-		-	8352	-
	-	E->W	-	-	3109	-	-	-	-	-		-	8352	-
Wall C-1	1	W->E	-	-	629	-	1.0	-	364	-		-	1719	-
	1	E->W	-	-	640	-	1.0	-	364	-		-	1719	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	364	-		364	-	-
Seg. 2	-	W->E	103.6	-	363	-	.78	-	283	-		283	991	0.37
	-	E->W	105.4	-	369	-	.78	-	283	-		283	991	0.37
Seg. 3	-	W->E	88.8	-	266	-	.67	-	243	-		243	728	0.37
	-	E->W	90.3	-	271	-	.67	-	243	-		243	728	0.37
Wall C-2	1	W->E	-	-	2427	-	1.0	-	364	-		-	6633	-
	1	E->W	-	-	2469	-	1.0	-	364	-		-	6633	-
Seg. 1	-	W->E	103.6	-	363	-	.78	-	283	-		283	991	0.37
	-	E->W	105.4	-	369	-	.78	-	283	-		283	991	0.37
Seg. 2	-	W->E	133.2	-	2065	-	1.0	-	364	-		364	5642	0.37
	-	E->W	135.5	-	2100	-	1.0	-	364	-		364	5642	0.37
Line D														
LnD, Lev1	-	Both	-	-	1917	-	-	-	-	-		-	10394	-
Wall D-1	1	Both	-	-	1917	-	1.0	-	364	-		-	10394	-
Seg. 1	-	Both	59.7	-	239	-	.89	-	324	-		324	1294	0.18
Seg. 2	-	Both	67.1	-	436	-	1.0	-	364	-		364	2366	0.18
Seg. 3	-	Both	67.1	-	436	-	1.0	-	364	-		364	2366	0.18
Seg. 4	-	Both	67.1	-	504	-	1.0	-	364	-		364	2730	0.18
Seg. 5	-	Both	67.1	-	302	-	1.0	-	364	-		364	1638	0.18

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.

Flexible Diaphragm Seismic Design

SEISMIC INFORMATION

Level	Mass [lbs]	Area [sq.ft]	Story Shear [lbs]		Diaphragm Force Fpx [lbs]	
			E-W	N-S	E-W	N-S
1	36311	1950.0	5586	5586	7809	7809
All	36311	-	5586	5586	-	-

*Legend:**Building mass – Sum of all generated and input building masses on level = wx in ASCE 7 equation 12.8-12.**Storey shear – Total unfactored (strength-level) shear force induced at level x, = Fx in ASCE 7 equation 12.8-11.**Diaphragm force Fpx - Unfactored force intended for diaphragm design from Eqn 12.10-1; used by Shearwalls only for drag strut forces, see 12.10.2.1 Exception 2.***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 = 1.08; Ev = 0.215 D unfactored; 0.151 D factored; total dead load factor: 0.6 - 0.151 = 0.449 tension, 1.0 + 0.151 = 1.151 compression.

SHEAR RESULTS (flexible seismic design)

N-S Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub		Allowable Shear [plf]					Resp. Ratio	
			v	vmax	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb	V [lbs]	
Line 1														
Level 1														
Ln1, Lev1	1	Both	31.0	-	1069	-	1.0	-	260	-		260	8970	0.12
Line 3														
Ln3, Lev1	-	Both	-	-	1613	-	-	-	-	-		-	5720	-
Wall 3-1	1	Both	73.3	-	1613	-	1.0	-	260	-		260	5720	0.28
Line 4														
Ln4, Lev1	-	Both	-	-	1228	-	-	-	-	-		-	12350	-
Wall 4-1	1	Both	-	-	1228	-	1.0	-	260	-		-	12350	-
Seg. 1	-	Both	25.8	-	672	-	1.0	-	260	-		260	6760	0.10
Seg. 2	-	Both	25.8	-	556	-	1.0	-	260	-		260	5590	0.10
E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub		Allowable Shear [plf]					Resp. Ratio	
			v	vmax	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb	V [lbs]	
Line A														
Level 1														
LnA, Lev1	-	Both	-	-	472	-	-	-	-	-		-	1040	-
Wall A-1	1	Both	-	-	472	-	1.0	-	260	-		-	1040	-
Seg. 1	-	Both	78.7	-	236	-	.67	-	173	-		173	520	0.45
Seg. 2	-	Both	78.7	-	236	-	.67	-	173	-		173	520	0.45
Line B														
LnB, Lev1	-	Both	-	-	650	-	-	-	-	-		-	2340	-
Wall B-1	1	Both	-	-	650	-	1.0	-	260	-		-	2340	-
Seg. 1	-	Both	72.3	-	325	-	1.0	-	260	-		260	1170	0.28
Seg. 2	-	Both	72.3	-	325	-	1.0	-	260	-		260	1170	0.28
Line C														
LnC, Lev1	-	Both	-	-	1471	-	-	-	-	-		-	5966	-
Wall C-1	1	Both	-	-	303	-	1.0	-	260	-		-	1228	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	260	-		260	-	-
Seg. 2	-	Both	49.9	-	175	-	.78	-	202	-		202	708	0.25
Seg. 3	-	Both	42.7	-	128	-	.67	-	173	-		173	520	0.25
Wall C-2	1	Both	-	-	1168	-	1.0	-	260	-		-	4738	-
Seg. 1	-	Both	49.9	-	175	-	.78	-	202	-		202	708	0.25
Seg. 2	-	Both	64.1	-	994	-	1.0	-	260	-		260	4030	0.25
Line D														
LnD, Lev1	-	Both	-	-	1317	-	-	-	-	-		-	7424	-
Wall D-1	1	Both	-	-	1317	-	1.0	-	260	-		-	7424	-
Seg. 1	-	Both	41.0	-	164	-	.89	-	231	-		231	924	0.18
Seg. 2	-	Both	46.1	-	300	-	1.0	-	260	-		260	1690	0.18
Seg. 3	-	Both	46.1	-	300	-	1.0	-	260	-		260	1690	0.18
Seg. 4	-	Both	46.1	-	346	-	1.0	-	260	-		260	1950	0.18
Seg. 5	-	Both	46.1	-	208	-	1.0	-	260	-		260	1170	0.18

Legend:

W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "A" 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 FHS

vmax - Collector shear force for perforated walls as per SDPWS eqn. 4.3-8 = V/FHS/Co. Full height sheathing (FHS) factored for narrow segments as per 4.3.4.3

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 4.3.3.2. For segment: Aspect ratio adjustment from SDPWS 4.3.3.4.1

Int - Unit shear capacity of interior sheathing; Ext - Unit shear capacity of exterior sheathing. For wall: Unfactored. For segment: Include Cub factor and aspect ratio adjustments.

Co - Adjustment factor for perforated walls from SDPWS Table 4.3.3.5.

C - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using SDPWS 4.3-3.

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 4.3.6.4.2.4.

DATE:	4/29/2020	COMPANY:	--
VITRUVIUS BUILD:	StruCalc	DESIGNED BY:	Carlie Berard
CUSTOMER:	-	REVIEWED BY:	Carlie Berard
PROJECT LOCATION:	-		
LEVEL:	Roof	LOADING:	LRFD
LOCATION:	TYPICAL HEADER	CODE:	2018 International Building Code
TYPE:	ROOF BEAM	NDS:	2018 NDS
MATERIAL:	GLULAMS		
Stress Class Rated 24F-1.8E	24F-V4 DF/DF	(1) 3.5 X 7.5	DRY

TYPICAL HEADER DIAGRAM



BEAM PROPERTIES

Start(ft) 0 End(ft): 6 Pitch: 0/12 Actual Length(ft): 6

Area	Ix	Iy	BSW	Lams	G	Kcr
(in ²)	(in ⁴)	(in ⁴)	(lbf/ft)			Creep Factor
26.25	123.05	26.8	5.99	1	0.5	1

STRENGTH PROPERTIES

	Fbx+	Fbx-	Fby	Ft	Fvx	Fvy	Fc	Fc⊥	Ex	Exmin	Ey	Eymin
	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)
Base Values	2400	1850	1450	1100	265	230	1650	650	1800000	950000	1600000	850000
Adjusted Values	5182	3994	3298	2376	572	497	3564	977	1800000	1421200	1600000	1271600
K _F *φ	2.16	2.16	2.16	2.16	2.16	2.16	2.16	1.5	1	1.5	1	1.5
C _M	1	1	1	1	1	1	1	1	1	1	1	1
C _T	1	1	1	1	1	1	1	1	1	1	1	1

Bending Adjustment Factors C_{vr} = 1

BEAM DATA

		Unbraced Length		Beam End					
Span	Length	Top	Bottom	Elev. Diff	CL(Top)	CL(Bottom)	CL(Left)	CL(Right)	
1	6	0	6	0	1	0.991	0.999	0.999	

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOCATION (ft)	LOAD COMBO	TIME EFFECT λ
Shear Stress Y (psi)	PASS	160	458	6	1.2D+1.6S+L	0.8
Bending Stress Y (psi)	PASS	1539	4145	3	1.2D+1.6S+L	0.8
Deflection (in)	PASS	0.085	0.3	3	Dead + Rf Live	
Bearing Stress (psi)	PASS	229	977	0	1.2D+1.6S+L	0.8

REACTIONS

Y axis	DEAD	LIVE	LIVE ROOF	SNOW	WIND +	WIND -	SEISMIC +	SEISMIC -	ICE	RAIN	EARTH
A	738	0	1200	1200	0	0	0	0	0	0	0
B	738	0	1200	1200	0	0	0	0	0	0	0

Reaction Location

A

B

LOAD LIST

Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction
Uniform (lbf/ft)	240	240	0	6	Dead	Y
Uniform (lbf/ft)	400	400	0	6	Snow	Y
Uniform (lbf/ft)	400	400	0	6	Roof Live	Y
Self Weight (lbf/ft)	5.99	5.99	0	6	Dead	Y

NOTES

Project Name: New Project

Permit Number: 20-03705

2018 International Building Code

LRFD

DATE:	4/29/2020	COMPANY:	--
VITRUVIUS BUILD:	StruCalc	DESIGNED BY:	Carlie Berard
CUSTOMER:	-	REVIEWED BY:	Carlie Berard
PROJECT LOCATION:			
LEVEL:	Roof	LOADING:	LRFD
LOCATION:	BACK PORCH HEADER	CODE:	2018 International Building Code
TYPE:	ROOF BEAM	NDS:	2018 NDS
MATERIAL:	GLULAMS		
Stress Class Rated 24F-1.8E	24F-V4 DF/DF	(1) 5.5 X 9	DRY

BACK PORCH HEADER DIAGRAM



BEAM PROPERTIES

Start(ft) 0 End(ft) 12 Pitch: 0/12 Actual Length(ft): 12

Area	Ix	Iy	BSW	Lams	G	Kcr
(in ²)	(in ⁴)	(in ⁴)	(lbf/ft)			Creep Factor
49.5	334.12	124.78	11.29	1	0.5	1

STRENGTH PROPERTIES

	Fbx+	Fbx-	Fby	Ft	Fvx	Fvy	Fc	Fc⊥	Ex	Exmin	Ey	Eymin
	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)
Base Values	2400	1850	1450	1100	265	230	1650	650	1800000	950000	1600000	850000
Adjusted Values	5182	3994	3232	2376	572	497	3564	977	1800000	1421200	1600000	1271600
K _F *φ	2.16	2.16	2.16	2.16	2.16	2.16	2.16	1.5	1	1.5	1	1.5
C _M	1	1	1	1	1	1	1	1	1	1	1	1
C _T	1	1	1	1	1	1	1	1	1	1	1	1

Bending Adjustment Factors C_{vr} = 1

BEAM DATA

		Unbraced Length		Beam End					
Span	Length	Top	Bottom	Elev. Diff	CL(Top)	CL(Bottom)	CL(Left)	CL(Right)	
1	12	0	12	0					

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOCATION (ft)	LOAD COMBO	TIME EFFECT λ
Shear Stress Y (psi)	PASS	108	458	12	1.2D+1.6S+L	0.8
Bending Stress Y (psi)	PASS	1727	4145	6	1.2D+1.6S+L	0.8
Deflection (in)	PASS	0.319	0.6	6	Dead + Rf Live	
Bearing Stress (psi)	PASS	185	977	0	1.2D+1.6S+L	0.8

REACTIONS

Y axis	DEAD	LIVE	LIVE ROOF	SNOW	WIND +	WIND -	SEISMIC +	SEISMIC -	ICE	RAIN	EARTH
A	968	0	1500	1500	0	0	0	0	0	0	0
B	968	0	1500	1500	0	0	0	0	0	0	0

Reaction Location

A

B

LOAD LIST

Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction
Uniform (lbf/ft)	150	150	0	12	Dead	Y
Uniform (lbf/ft)	250	250	0	12	Snow	Y
Uniform (lbf/ft)	250	250	0	12	Roof Live	Y
Self Weight (lbf/ft)	11.29	11.29	0	12	Dead	Y

NOTES

Project Name: New Project

Permit Number: 20-03705

2018 International Building Code

LRFD

PASS

DATE:	8/26/2019	COMPANY:	
VITRUVIUS BUILD:	StruCalc	DESIGNED BY:	Carlie Berard
CUSTOMER:	LEXAR	REVIEWED BY:	Carlie Berard
PROJECT LOCATION:	, 98226		
LEVEL:		LOADING:	LRFD
LOCATION:	TYPICAL GARAGE HEADER 5.5 X 12 GLBCODE:		2018 International Building Code
TYPE:	FLOOR BEAM	NDS:	2018 NDS
MATERIAL:	GLULAMS		
Stress Class Rated 24F-1.8E	24F-V4 DF/DF	(1) 5.5 X 12	DRY

FLOOR BEAM DIAGRAM



BEAM PROPERTIES

Start(ft) 0 End(ft): 16 Pitch: 0/12 Actual Length(ft): 16

Area	Ix	Iy	BSW	Lams	G	Kcr
(in ²)	(in ⁴)	(in ⁴)	(lb/ft)			Creep Factor
66	792	166.38	15.05	1	0.5	1

STRENGTH PROPERTIES

	Fbx+	Fbx-	Fby	Ft	Fvx	Fvy	Fc	Fc⊥	Ex	Exmin	Ey	Eymin
	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)
Base Values	2400	1850	1450	1100	265	230	1650	650	1800000	950000	1600000	850000
Adjusted Values	5182	3994	3131	2376	572	497	3564	977	1800000	1421200	1600000	1271600
K _F *φ	2.16	2.16	2.16	2.16	2.16	2.16	2.16	1.5	1	1.5	1	1.5
C _M	1	1	1	1	1	1	1	1	1	1	1	1
C _T	1	1	1	1	1	1	1	1	1	1	1	1

Bending Adjustment Factors C_{vr} = 1

BEAM DATA

		UNBRACED LENGTH		BEAM END				
SPAN	LENGTH	TOP	BOTTOM	ELEV. DIFF	CL(Top)	CL(Bottom)	CL(Left)	CL(Right)
1	16	0	16	0	1	0.983	0.999	0.999

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOCATION (ft)	LOAD COMBO	TIME EFFECT λ
Bending Stress Y (psi)	PASS	1333	4145	8	1.2D+1.6L+0.5Lr	0.8
Shear Stress Y (psi)	PASS	83	458	0	1.2D+1.6L+0.5Lr	0.8
Deflection (in)	PASS	0.326	0.8	8	Dead + Live	
Bearing Stress (psi)	PASS	190	977	0	1.2D+1.6L+0.5Lr	0.8

REACTIONS

Y axis	DEAD	V-(lb) LIVE	M-(lb-ft) LIVE ROOF	SNOW	WIND +	WIND -	SEISMIC +	SEISMIC -	ICE	RAIN	EARTH
A	920	1600	0	0	0	0	0	0	0	0	0
B	920	1600	0	0	0	0	0	0	0	0	0

Reaction Location

A

B

LOAD LIST

Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction
Uniform (lb/ft)	200	200	0	16	Live	Y
Uniform (lb/ft)	100	100	0	16	Dead	Y
Self Weight (lb/ft)	15.05	15.05	0	16	Dead	Y

NOTES

Permit Number: 20-03705

DATE:	10/10/2019	COMPANY:	
VITRUVIUS BUILD:	StruCalc	DESIGNED BY:	Carlie Berard
CUSTOMER:	LEXAR	REVIEWED BY:	Carlie Berard
PROJECT LOCATION:	, 98226		
LEVEL:	Main Floor	LOADING:	
LOCATION:	24 X 24 X 12	CODE:	2018 International Building Code
TYPE:	ISOLATED FOOTING	ACI:	ACI 318-14
MATERIAL:	CONCRETE		

2 (ft) X 2 (ft) X 12 (in)	Soil Depth TOF: 2 (ft)	Unreinforced
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MATERIAL PROPERTIES

FOOTING						
fc' (psi)	Ec (psi)	Density (lb/ft ³)	Width (ft)	Length (ft)	Depth (in)	Volume (ft ³)
2500	2880952	145	2	2	12	4

CALCULATION VARIABLES

Bo (in)	Φ-X	Φ-Y
58	0.6	0.6

COLUMN			
Width (in)	Length (in)	Material	Offset (in)
6	6	Wood	0

SOIL					
Bearing Strength (lb/ft ²)	Density (lb/ft ³)	Cohesion	Friction Angle	Depth (ft)	Rankine Coefficient (Kp)
1500	140	0	30	2	3

REBAR		
fy (psi)	Es (psi)	Size #
40000	2.9E+07	4

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOAD COMBO
Soil Bearing Pressure (lb/ft ²)	PASS	1250	1500	D+S
Crushing (lb/ft)	PASS	211	1381	1.2D+1.6S+L
Two Way Shear (Punching) (lb/ft)	PASS	7600	73950	1.2D+1.6S+L
One Way Shear Y (lb/ft)	PASS	158	15300	1.2D+1.6S+L
Moment X (lb-ft)	PASS	1069	5000	1.2D+1.6S+L
One Way Shear X (lb/ft)	PASS	158	15300	1.2D+1.6S+L
Moment Y (lb-ft)	PASS	1069	5000	1.2D+1.6S+L

LOAD LIST

Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction
Point (lb/ft)	1000	-	0	-	Dead	Z
Point (lb/ft)	1500	-	0	-	Roof Live	Z
Point (lb/ft)	4000	-	0	-	Snow	Z

NOTES

PASS

DATE:	12/23/2019	COMPANY:	
VITRUVIUS BUILD:	StruCalc	DESIGNED BY:	Carlie Berard
CUSTOMER:	Lexar	REVIEWED BY:	Carlie Berard
PROJECT LOCATION:	, ***		
LEVEL:		LOADING:	
LOCATION:	24 x 36 x 24	CODE:	2018 International Building Code
TYPE:	ISOLATED FOOTING	ACI:	ACI 318-14
MATERIAL:	CONCRETE		

2 (ft) X 3 (ft) X 24 (in)	Soil Depth TOF: 0 (ft)	False
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MATERIAL PROPERTIES

FOOTING						
fc' (psi)	Ec (psi)	Density (lb/ft ³)	Width (ft)	Length (ft)	Depth (in)	Volume (ft ³)
2500	2880952	145	2	3	24	12

CALCULATION VARIABLES		
Bo (in)	Φ-X	Φ-Y
53	0.9	0.6

COLUMN			
Width (in)	Length (in)	Material	Offset (in)
4	4	Wood	0

SOIL					
Bearing Strength (lb/ft ²)	Density (lb/ft ³)	Cohesion	Friction Angle	Depth (ft)	Rankine Coefficient (Kp)
1500	140	0	30	0	3

REBAR				
# Bars Long	# Bars Short	fy (psi)	Es (psi)	Size #
6	11	40000	2.9E+07	4

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOAD COMBO
Soil Bearing Pressure (lb/ft ²)	PASS	1333	1500	D+S
Crushing (lb/ft)	PASS	750	1381	1.2D+1.6S+L
Two Way Shear (Punching) (lb/ft)	PASS	12000	162975	1.2D+1.6S+L
Moment X (lb/ft)	PASS	3556	72106	1.2D+1.6S+L
Moment Y (lb/ft)	PASS	2083	36300	1.2D+1.6S+L

LOAD LIST

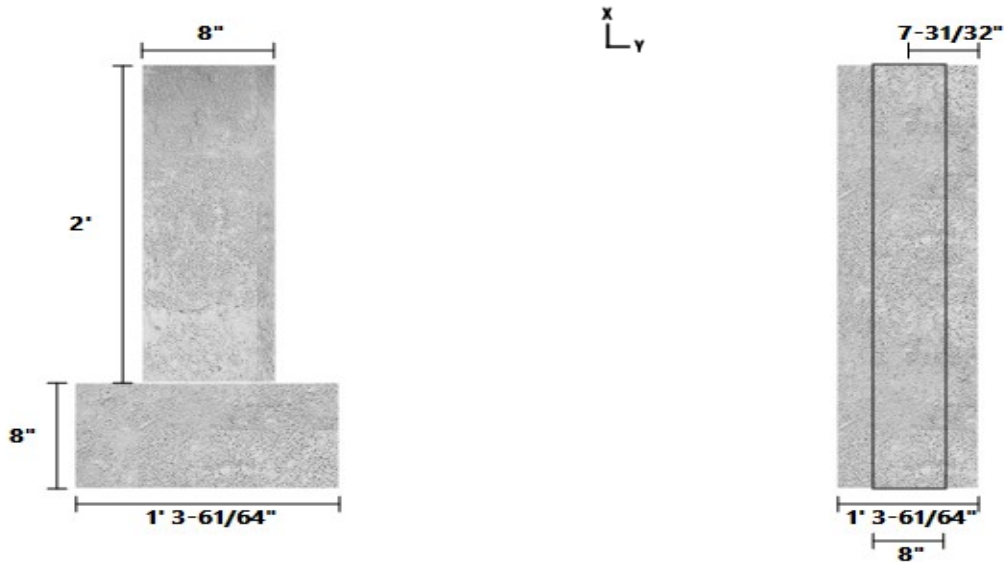
Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction
Point (lb/ft)	6000	-	0	-	Snow	Z
Point (lb/ft)	2000	-	0	-	Dead	Z

NOTES

Permit Number: 20-03705

DATE:	4/29/2020	COMPANY:	--
VITRUVIUS BUILD:	StruCalc	DESIGNED BY:	Carlie Berard
CUSTOMER:	-	REVIEWED BY:	Carlie Berard
PROJECT LOCATION:	-		
LEVEL:	Main Floor	LOADING:	
LOCATION:	New Continuous Footing F1	CODE:	2018 International Building Code
TYPE:	CONTINUOUS FOOTING	ACI:	ACI 318-14
MATERIAL:	CONCRETE		
1.33 (ft) Wide X 8 (in) Deep	Soil Depth TOF: 0 (ft)	Unreinforced (Plain) Concrete	

New Continuous Footing F1 DIAGRAMS



MATERIAL PROPERTIES

FOOTING					
fc' (psi)	Ec (psi)	Density (lb/ft ³)	Width (ft)	Depth (in)	
2500	2880952	145	1.33	8	
STEM WALL					
width (in)	Height (in)	Material	Offset (in)		
8	24	Concrete	0		
SOIL					
Bearing Strength (lb/ft ²)	Density (lb/ft ³)	Cohesion	Friction Angle	Depth (ft)	Rankine Coefficient (Kp)
1500	140	0	30	0	0
REBAR					
Bar Size #	Transv. Spacing (in)	# Longit. Bars	fy (psi)	Es (psi)	
None	None	None	40000	2.9E+07	

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOAD COMBO
Soil Bearing Pressure (lb/ft ²)	PASS	50	1500	D+0.75L+0.75S
One-Way Shear Y (lb/ft)	PASS	92	4050	1.2D+1.6S+L
Moment Y (lb-ft)	PASS	72	900	1.2D+1.6S+L

LOAD LIST

Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction
Uniform (lb/ft)	400	400	0	0	Roof Live	Z
Uniform (lb/ft)	240	240	0	0	Dead	Z
Uniform (lb/ft)	400	400	0	0	Snow	Z
Uniform (lb/ft)	280	280	0	0	Live	Z
Uniform (lb/ft)	105	105	0	0	Dead	Z
Uniform (lb/ft)	135	135	0	0	Dead	Z
Stemwall Weight (lb/ft)	5.33	5.33	0	1	Dead	Z

Footing is designed as plain concrete. Designer shall verify that all applicable code provisions for plain concrete are satisfied.

DATE:		1/28/2020		COMPANY:	
VITRUVIUS BUILD:		StruCalc		DESIGNED BY:	
CUSTOMER:		-		REVIEWED BY:	
PROJECT LOCATION:		-		Carlie Berard	
LEVEL:				LOADING:	
LOCATION:		6X6 POST W/2FT EMBED		CODE:	
TYPE:		EMBEDDED POST		NDS:	
MATERIAL:		SOLID SAWN		2018 International Building Code	
				2018 NDS	
Douglas Fir-Larch	No. 2	(1) 5.5 X 5.5	DRY		INCISED

6X6 POST W/2FT EMBED DIAGRAM



COLUMN PROPERTIES

Start(ft) 0 End(ft) 9 Pitch: 0/12 Length(ft): 11.17

Area	I _x	I _y	BSW	Lams	G	K _{cr}
(in ²)	(in ⁴)	(in ⁴)	(lb/ft)			Creep Factor
30.25	76.26	76.26	6.9	1	0.5	1

STRENGTH PROPERTIES

	F _b (psi)	F _t (psi)	F _v (psi)	F _c (psi)	F _c ⊥ (psi)	E (psi) x10 ³	E _{min} (psi) x10 ³
Base Values	750	475	170	700	625	1300	470
Adjusted Values	600	380	136	560	625	1235	446
C _M	1	1	1	1	1	1	1
C _T	1	1	1	1	1	1	1
C _i	0.8	0.8	0.8	0.8	1	0.95	0.95
C _F	1	1	1	1	1	1	1

Bending Adjustment Factors C_{fu} = 1.05 C_r = 1

COLUMN DATA

		Unbraced Length		Column End					
Span	Length	X	Y	Offset	CP	K(X)	K(Y)	Slr(X)	Slr(Y)
1	9	9	0	0	0.184	2.1	2.1	41.24	0.38

EMBEDDED POST

Embedment Depth	Footing Width	Lateral Strength	Slab Restraint
(ft)	(ft)	(lb/ft ²)	
2.17	2	150	Yes

PASS-FAIL

	PASS/FAIL	MAGNITUDE	STRENGTH	LOCATION (ft)	LOAD COMBO	DURATION FACTOR CD
Bending Stress Y (psi)	PASS	312	958	0	D+0.6W(+)	1.6
Shear Stress Y (psi)	PASS	4	218	0	D+0.6W(+)	1.6
Deflection (in)	PASS	0.558	0.6	9	Wind	
Compressive Stress (psi)	PASS	35	158	0	D	0.9
Bending-Compression (Unit)	PASS	0	1	0	D+0.6W(+)	1.6

REACTIONS		V-(lbf)	M-(lbf-ft)	Location: 6X6 POST W/2FT EMBED								Page 4
Z axis	DEAD	LIVE	LIVE ROOF	SNOW	WIND +	WIND -	SEISMIC +	SEISMIC -	ICE	RAIN	EARTH	
A	1062	0	0	0	0	0	0	0	0	0	0	
B	0	0	0	0	0	0	0	0	0	0	0	
Y axis												
A	0	0	0	0	150	0	0	0	0	0	0	
B	0	0	0	0	0	0	0	0	0	0	0	
M@x												
A	0	0	0	0	1200	0	0	0	0	0	0	
B	0	0	0	0	0	0	0	0	0	0	0	
Reaction Location												
A												
B												
LOAD LIST												
Type	Left Magnitude	Right Magnitude	Load Start (ft)	Load End (ft)	Load Type	Direction						
Point (lbf)	-1000	-	9	-	Dead	Z						
Point (lbf)	150	-	8	-	Wind(+)	Y						
Self Weight (lbf/ft)	6.9	6.9	0	9	Dead	Z						