|| mail:PO Box 4260, Bedford, WY 83112 || ph:916-838-1973 or 307-883-6515 ||
|| web:covenantengineers.com || email:merritt@covenantengineers.com ||

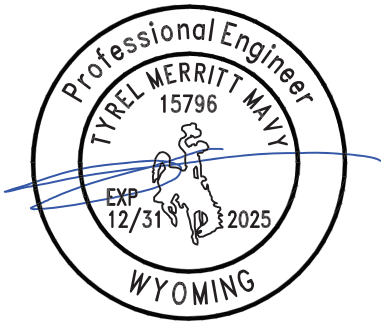
Covenant Engineering

"WHEN INTEGRITY COUNTS…"

STRUCTURAL CALCULATIONS

FOR

672 Sunset Dr.
(N) Residence
Alpine, WY



Job #P25006
March 12, 2025

2021 International Building Code

INDEX

SUMMARY

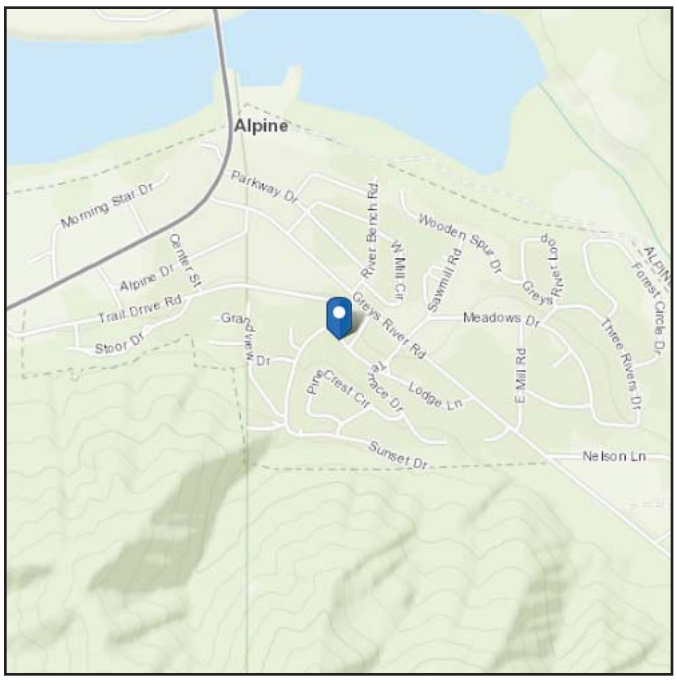
This set of structural calculations is being provided in support of the proposed new residence to be constructed at the referenced project address. Based on the enclosed calculations, it appears that the structural plans and details provided are adequate to address the required site conditions.

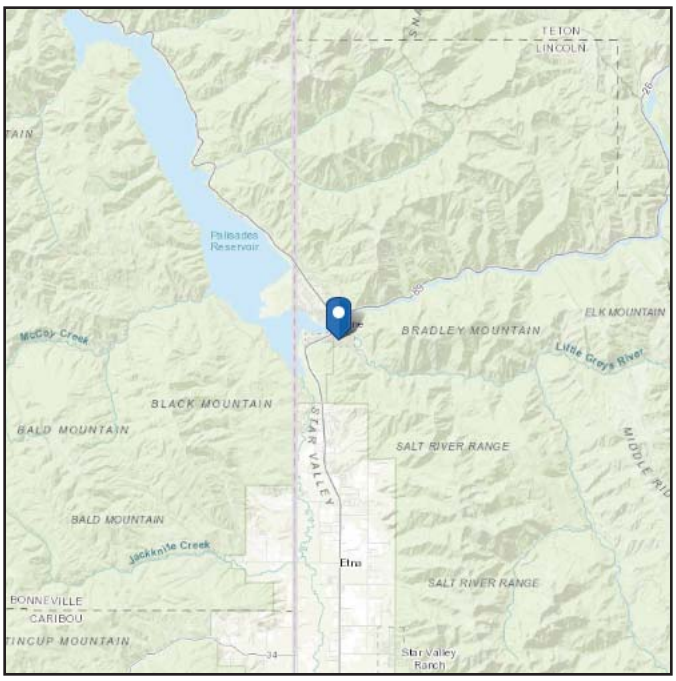
ASCE Hazards Report

Address:
672 Sunset Dr
Alpine, Wyoming
83128

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

Latitude: 43.159887
Longitude: -111.013363
Elevation: 5696.35845 ft (NAVD 88)





Wind

Results:

Wind Speed	105 Vmph
10-year MRI	75 Vmph
25-year MRI	81 Vmph
50-year MRI	86 Vmph
100-year MRI	91 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Mon Mar 10 2025

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

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

AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

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

Results:

S_S :	1.109	S_{D1} :	N/A
S_1 :	0.341	T_L :	6
F_a :	1.2	PGA :	0.477
F_v :	N/A	PGA_M :	0.572
S_{MS} :	1.331	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.887	C_v :	1.322

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

Data Accessed: Mon Mar 10 2025

Date Source: USGS Seismic Design Maps

Snow

Results:

Mapped Elevation:	5696.4 ft
Data Source:	ASCE/SEI 7-16, Table 7.2-8
Date Accessed:	Mon Mar 10 2025

In "Case Study" areas, site-specific case studies are required to establish ground snow loads. Extreme local variations in ground snow loads in these areas preclude mapping at this scale.

Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2 percent annual probability of being exceeded (50-year mean recurrence interval).

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

Snow load values are mapped to a 0.5 mile resolution. This resolution can create a mismatch between the mapped elevation and the site-specific elevation in topographically complex areas. Engineers should consult the local authority having jurisdiction in locations where the reported ‘elevation’ and ‘mapped elevation’ differ significantly from each other.

Roof Uniform Snow Load = 100 psf per Jurisdiction

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Dead Loads for: (N) Residence

Typ Roof Dead Load	psf
Roofing	4.0
Shtg	1.9
Mfr Trusses @ 24"	2.5
Clng	2.8
Misc	0.8
	12.0

Ext Wall Dead Load	psf
Siding	4.0
Wall Sht'g	1.5
Studs	1.6
Gyp Board	2.2
Misc	2.7
	12.0

Porch Roof Dead Load	psf
Roofing	4.0
Shtg	1.9
Rafters @ 24"	1.4
Misc	0.7
	8.0

Interior Wall Dead Load	psf
Framing	1.6
Gyp Board x 2	5.6
Misc	2.8
	10.0

Other

Roof Live, 10.00:12	14.0
Roof Uniform Snow	100.0

Seismic Mass

Roof Mass

$Slope_{Roof}$ = 10.00:12
$Dl_{add'l\ (part)}$ = 5.0 psf
$Snow_{(20\%)}$ = 20.0 psf
Roof Area = 858 sf
Perimeter = 106 ft
$h\text{-}trib_{wall}$ = 5.0 ft
W_{EQ} = 49.6 k

Porch Roof Mass

$Slope_{Roof}$ = 0.25:12
$Dl_{add'l\ (part)}$ = 0.0 psf
$Snow_{(20\%)}$ = 20.0 psf
Roof Area = 306 sf
Perimeter = 0.0 ft
$h\text{-}trib_{wall}$ = 0.0 ft
W_{EQ} = 8.6 k

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Seismic Demand for: (N) Residence

LFRS: All other bldgs
Occupancy: I
Site Class: D-Default
I_{EQ} = 1.00
R-Factor = 6.50
Ω_0 = 3.00
C_d = 4.00

S_S = 1.109
S_1 = 0.341
F_a = 1.200
F_v = 1.000
S_{DS} = 0.887
S_{D1} = 0.227
$S_{DS,Des}$ = 0.887

T_{modal} = 0.00 sec
T_L = 6.00 sec
T_a = 0.10 sec
T_{Max} = 0.13 sec
T_S = 0.256
T_o = 0.051
☑ No Irregularities?

☐ Extreme Torsion Irregularity?
☑ >35%V Complies w/Table 12.3-3?
☑ Regular in plan at all levels?
☐ 2 bays ES Ea Direction?

$C_{s,Design}$ (12.8-2) = **0.136**
$C_{s,Max}$ (12.8-3 & 4) = 0.368
$C_{s,Min}$ (12.8-5) = 0.010
$C_{s,Min,.6g}$ (12.8-6) = 0.000

Base Shear & Story Distribution

SEISMIC DESIGN CATEGORY 'D' (Dynamic Procedure Not Required) ρ = 1.0 Exp 'k' = 1.00

$Level_x$	$h_{x\ (ft)}$	$W_{x\ (k)}$	$W_x h_x^k$	$W_x h_x^k / \Sigma W_i h_i^k$	$F_{x\ (k)}$	$F_{x\ (ASD)}$	A_{flr} (sf)	w_{EQ} (psf)	$w_{EQ\ (ASD)}$
Roof	8.0	58.2	465	100.0%	**7.94**	**5.67**	682	11.6	8.3
	Σ=	58.2	465	100%	**7.94**	**5.67**			

Diaphragm Loading

$Level_x$	$F_{px\ (k)}$	$F_{px\text{-}min}$	$F_{px\text{-}max}$	$F_{px\ (k)}$	$F_{px\ (ASD)}$	w_{EQ} (psf)	$w_{EQ\ (ASD)}$	$Diaph/_{Base}$
Roof	7.94	10.32	20.64	**10.32**	**7.37**	15.1	10.8	1.30

Vertical Seismic Demand

$E_v = 0.2 \times S_{DS} \times D = 0.18 \times D$

Out-Of-Plane Demand

☐ Conc./Masonry Walls
☐ Flexible Diaphragm

	Walls	Anchorage	Anchorage to Concrete
LRFD	0.35Wp	0.35Wp	0.89Wp (444 plf min)
ASD	0.25Wp	0.25Wp	0.63Wp (317 plf min)

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

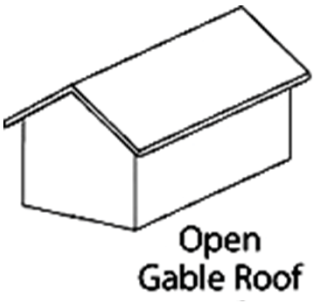
LRFD Wind Design - MWFRS For: (N) Residence

Structure Criteria

Structure Type: All other structural systems
Roof Type: Gable, Open
Roof Pitch: 10.0:12
Structure Ht AGL: 22.3 ft
Mean Rf Ht AGL: 16.5 ft
Add'l Floors AGL: 0 Floors
Least Plan Dim: 22.0 ft
Greatest Plan Dim: 31.0 ft
f_0, (Manual): 0.00 Hz
f_0, (Approx): 6.11 Hz
Flexibility Class: Rigid
Building Class: Class 1
Enclosure Class: Enclosed

Roof Ht: 22.3 ft
Eave Ht: 10.8 ft

Roof Type



Site Criteria

Basic Wind Speed: 110 mph
Exposure Category: C
Directionality Factor, K_d: 0.85
Topographic Factor, K_{zt}: 1.00
Gust Effect Factor, G: 1.00
Internal Press. Coeff, GC_{pi}: 0.18

Procedure Checks:

Torsionally Regular: Yes
Simple Diaphragm: Yes
Aprox. Symetrical: Yes
Flat, Gable Or Hip Roof: Yes

Ch. 27 Part 1 Allowed
Ch. 27 Part 2 Allowed
Ch. 28 Part 1 Allowed
Ch. 28 Part 2 Allowed

Definitions (Reference ASCE 7-10, 26.2)

Flexible: Slender buildings that have a fundamental natural frequency less than 1 Hz.

Low Rise: Enclosed or partially enclosed buildings that comply with the following conditions:
1. Mean roof height *h* less than or equal to 60 ft.
2. Mean roof height *h* does not exceed least horizontal dimension.

Simple Diaphragm: A building in which both windward and leeward wind loads are transmitted by roof and vertically spanning wall assemblies, through continuous floor and roof diaphragms, to the MWFRS.

Torsionally Regular: A bullding with the MWFRS about each principal axis proportioned so that the maximum displacement at each story under Case 2, the torsional wind load case, does not exceed the maximum displacement at the same location under Case 1, the basic wind load case.

Open: A building having each wall at least 80 percent open.

Enclosed: A building that does not comply with the requirements for open or partially enclosed buildings.

Partially Enclosed: A building that complies with both of the following conditions:
1. The total area of openings in a wall that receives positive external pressure exceeds the sum of the areas of openings in the balance of the building envelope (walls and roof) by more than 10 percent.
2. The total area of openings in a wall that receives positive external pressure exceeds 4 ft^2 or 1 percent of the area of that wall, whichever is smaller, and the percentage of openings in the balance of the building envelope does not exceed 20 percent.

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

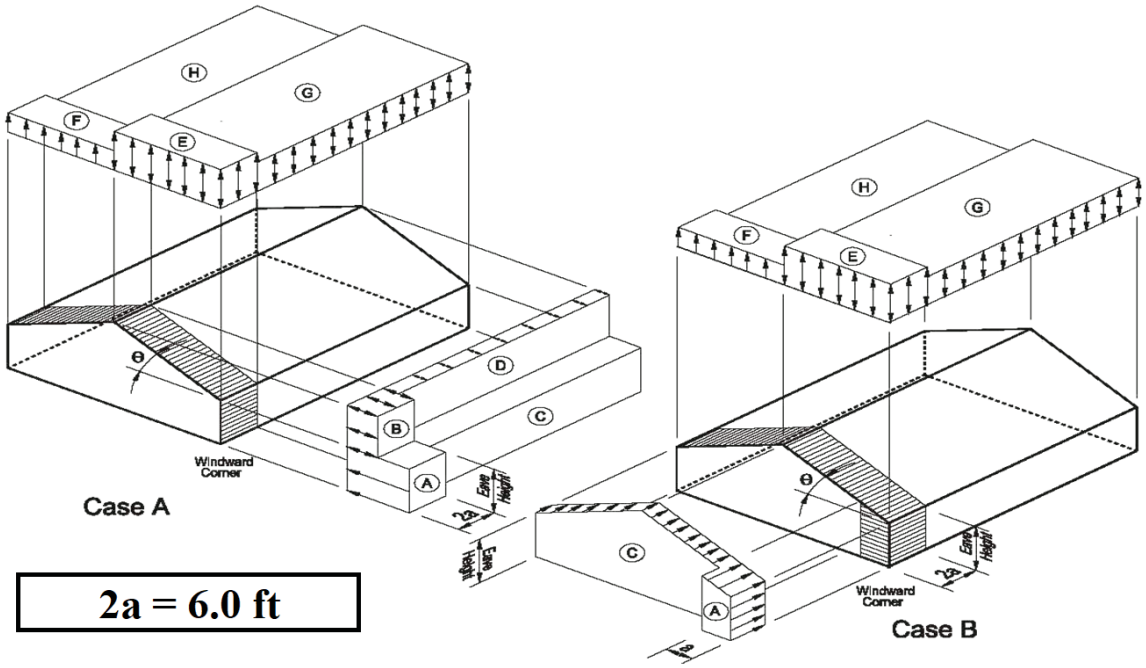
ASCE 7-27 Part 2 Enclosed Simple Diaphragm Buildings For: (N) Residence

Wind Zone Pressure Factors	
Basic Wind Speed: 110 mph	Mean Roof Ht: 22.3 ft
Exposure Category: C	Roof Slope: 39.8°
Topographic Factor, K_{zt}: 1.00	Adjustment Factor, λ : 1.32

Ht	λ
20.0 ft	1.29
22.3 ft	1.32
25.0 ft	1.35

Load Case: 1

Maximum Envelope Pressures		Horizontal Pressures				Vertical Roof Pressures				Eave Overhangs	
		End Zones		Interior Zones		End Zones		Interior Zones		End	Interior
		Wall	Pitched Rf	Wall	Pitched Rf	Windward	Leeward	Windward	Leeward	Zone	Zone
Wind Zones:		A	B	C	D	E	F	G	H	E_{OH}	G_{OH}
(Below)	45.1°	21.6	14.8	17.2	11.8	1.7	-13.1	0.6	-11.3	-7.6	-8.7
P_{S30} (psf)	39.8°	21.6	14.8	17.2	11.8	1.7	-13.1	0.6	-11.3	-7.6	-8.7
(Abv)	45.1°	21.6	14.8	17.2	11.8	1.7	-13.1	0.6	-11.3	-7.6	-8.7
P_S (psf) =		**28.4**	**19.5**	**22.7**	**15.5**	**2.2**	**-17.3**	**0.8**	**-14.9**	**-10.0**	**-11.5**



2a = 6.0 ft

Notes:
1. Pressures shown are applied to the horizontal and vertical projections, for exposure B, at h=30 ft (9.1m). Adjust to other exposures and heights with adjustment factor λ.
2. The load patterns shown shall be applied to each corner of the building in turn as the reference corner. (See Figure 28.4-1)
3. For Case B use $\theta = 0°$.
4. Load cases 1 and 2 must be checked for $25° < \theta \leq 45°$. Load case 2 at 25° is provided only for interpolation between 25° and 30°.
5. Plus and minus signs signify pressures acting toward and away from the projected surfaces, respectively.
6. For roof slopes other than those shown, linear interpolation is permitted.
7. The total horizontal load shall not be less than that determined by assuming $p_S = 0$ in zones B & D.
8. Where zone E or G falls on a roof overhang on the windward side of the building, use E_{OH} and G_{OH} for the pressure on the horizontal projection of the overhang. Overhangs on the leeward and side edges shall have the basic zone pressure applied.
9. Notation:
   a: 10 percent of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft (0.9 m).
   h: Mean roof height, in feet (meters), except that eave height shall be used for roof angles <10°.
   θ: Angle of plane of roof from horizontal, in degrees.

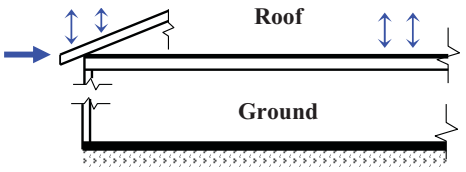
Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

ASCE 7-27 Part 2 Enclosed Simple Diaphragm Buildings For: (N) Residence

This sheet provides a summary of all wind forces at the levels indicated, based on Part 2 of the envelope procedure as indicated in the previous pages. Gable or parapet loads, where applicable, are included in the main roof level loads.

	LRFD	ASD	Uplift End Zone	Uplift Typ Int
Gable End Int	**130 plf**	**78 plf (71 plf)**	**2.2 psf**	**0.8 psf**
Gable End EZ Add'l	**200 lbs**	**120 lbs (109 lbs)**	**1.3 psf (ASD)**	**0.5 psf (ASD)**
Roof Typ Int	**300 plf**	**180 plf (164 plf)**		
Roof EZ Add'l	**460 lbs**	**276 lbs (251 lbs)**		



OK To Reduce To Match Actual Wind Speed By [105/110]^2 = 0.91

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Typical Solid Wood Framing Checks *(See NDS For Solid Beam Design Equations)*

MEMBER DATA	Mark/Descr		**Rafter**		**Gable 4-8**	**Gable 4-8**	**Eave 3-0**	**Eave 3-0**
	Material		DF-L No. 2		DF-L No. 2	DF-L No. 2	DF-L No. 2	DF-L No. 2
	Section		2x6		4x8	2x8	4x8	2x8
	Lams		1		1	2	1	2
	Span		**4.00 ft**		**4.83 ft**	**4.83 ft**	**3.25 ft**	**3.25 ft**
	Fix		None		None	None	None	None
	Duration		Snow		Snow	Snow	Snow	Snow
	Repetetive		Yes		No	No	No	No
	Incised		No		No	No	No	No
	Weak Axis		No		No	No	No	No
	Self-Wt		No		Yes	Yes	Yes	Yes
LOADS	ROOF	DL	**8.00 psf**		**12.00 psf**	**12.00 psf**	**12.00 psf**	**12.00 psf**
		LL	**120.00 psf**		**100.00 psf**	**100.00 psf**	**100.00 psf**	**100.00 psf**
		Trib	**2.00 ft**		**3.00 ft**	**3.00 ft**	**13.00 ft**	**13.00 ft**
	FLR	DL	0.00 psf		0.00 psf	0.00 psf	0.00 psf	0.00 psf
		LL	0.00 psf		0.00 psf	0.00 psf	0.00 psf	0.00 psf
		Trib	0.00 ft		0.00 ft	0.00 ft	0.00 ft	0.00 ft
	OTH	DL	0.00 psf		**12.00 psf**	**12.00 psf**	**12.00 psf**	**12.00 psf**
		Trib	0.00 ft		**5.00 ft**	**5.00 ft**	**2.00 ft**	**2.00 ft**
DESIGN CHECKS	w_u		256.0 plf		402.4 plf	401.5 plf	1486.4 plf	1485.5 plf
	Gov Load		D+Lr/S		D+Lr/S	D+Lr/S	D+Lr/S	D+Lr/S
	V		512.0 lbs		971.8 lbs	969.6 lbs	2415.4 lbs	2413.9 lbs
	f_v		93.1 psi		57.4 psi	66.9 psi	142.8 psi	166.5 psi
	F_v'		207.0 psi		207.0 psi	207.0 psi	207.0 psi	207.0 psi
	$f_v<F_v'$?		**OK**		**OK**	**OK**	**OK**	**OK**
	M		512.0 ft-lb		1173.4 ft-lb	1170.8 ft-lb	1962.5 ft-lb	1961.3 ft-lb
	f_b		812.4 psi		459.2 psi	534.6 psi	768.1 psi	895.5 psi
	F_b'		1547.3 psi		1345.5 psi	1242.0 psi	1345.5 psi	1242.0 psi
	$f_b<F_b'$?		**OK**		**OK**	**OK**	**OK**	**OK**
	Δ_L		0.04 in		0.02 in	0.02 in	0.02 in	0.02 in
			L/1155		L/2806	L/2405	L/2125	L/1822
	$\Delta_{L,allow}$		**L/240**		**L/240**	**L/240**	**L/360**	**L/360**
	Δ_{Tot}		0.05 in		0.03 in	0.04 in	0.02 in	0.03 in
			L/1050		L/1856	L/1595	L/1749	L/1501
	$\Delta_{Tot,allow}$		**L/180**		**L/180**	**L/180**	**L/240**	**L/240**
	$\Delta<\Delta_{Allow}$?		**OK**		**OK**	**OK**	**OK**	**OK**
SUPPORT DATA	b		1.50 in		3.50 in	3.00 in	3.50 in	3.00 in
	d		5.50 in		7.25 in	14.50 in	7.25 in	14.50 in
	A_s		8.25 in²		25.38 in²	21.75 in²	25.38 in²	21.75 in²
	S		7.56 in³		30.66 in³	26.28 in³	30.66 in³	26.28 in³
	I		20.80 in⁴		111.15 in⁴	95.27 in⁴	111.15 in⁴	95.27 in⁴
	w_{self}		2.1 plf		6.4 plf	5.5 plf	6.4 plf	5.5 plf
	F_v		180 psi		180 psi	180 psi	180 psi	180 psi
	F_b		900 psi		900 psi	900 psi	900 psi	900 psi
	E		1.60E+06 psi		1.60E+06 psi	1.60E+06 psi	1.60E+06 psi	1.60E+06 psi
	E'		1.60E+06 psi		1.60E+06 psi	1.60E+06 psi	1.60E+06 psi	1.60E+06 psi
	C_D		1.15		1.15	1.15	1.15	1.15
	C_r		1.15		1.00	1.00	1.00	1.00
	C_{fu}		1.00		1.00	1.00	1.00	1.00
	$C_{F/V}$		1.30		1.30	1.20	1.30	1.20
	C_i		1.00		1.00	1.00	1.00	1.00
	$C_{i,E}$		1.00		1.00	1.00	1.00	1.00

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Typical Solid Wood Framing Checks

(See NDS For Solid Beam Design Equations)

MEMBER DATA	Mark/Descr		**Eave 6-0**	**Eave 6-0**	**Gable 12-0**	**Gable 12-0**	**Porch 12-6**	**Porch 12-6**
	Material		24F-V4 DF/DF	2.0E LVL	24F-V4 DF/DF	2.0E LVL	24F-V4 DF/DF	VLAM 2.0 3100
	Section		GLB 3.125x10.5	LVL 1.75x9.25	GLB 3.125x15	LVL 1.75x14	GLB 3.125x15	VLAM 3.5x14
	Lams		1	2	1	2	1	1
	Span		**6.25 ft**	**6.25 ft**	**12.00 ft**	**12.00 ft**	**12.50 ft**	**12.50 ft**
	Fix		None	None	None	None	None	None
	Duration		Snow	Snow	Snow	Snow	Snow	Snow
	Repetetive		No	No	No	No	No	No
	Incised		No	No	No	No	No	No
	Weak Axis		No	No	No	No	No	No
	Self-Wt		Yes	Yes	Yes	Yes	Yes	Yes
LOADS	ROOF	DL	**12.00 psf**	**12.00 psf**	**12.00 psf**	**12.00 psf**	**8.00 psf**	**8.00 psf**
		LL	**100.00 psf**	**100.00 psf**	**100.00 psf**	**100.00 psf**	**120.00 psf**	**120.00 psf**
		Trib	**13.00 ft**	**13.00 ft**	**6.00 ft**	**6.00 ft**	**5.00 ft**	**5.00 ft**
	FLR	DL	0.00 psf	0.00 psf	0.00 psf	0.00 psf	0.00 psf	0.00 psf
		LL	0.00 psf	0.00 psf	0.00 psf	0.00 psf	0.00 psf	0.00 psf
		Trib	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
	OTH	DL	**12.00 psf**	**12.00 psf**	**12.00 psf**	**12.00 psf**	0.00 psf	0.00 psf
		Trib	**2.00 ft**	**2.00 ft**	**2.50 ft**	**2.50 ft**	0.00 ft	0.00 ft
DESIGN CHECKS	w_u		1488.3 plf	1488.2 plf	713.8 plf	714.3 plf	651.8 plf	652.6 plf
	Gov Load		D+Lr/S	D+Lr/S	D+Lr/S	D+Lr/S	D+Lr/S	D+Lr/S
	V		4650.8 lbs	4650.5 lbs	4282.9 lbs	4286.1 lbs	4073.8 lbs	4078.8 lbs
	f_v		212.6 psi	215.5 psi	137.1 psi	131.2 psi	130.4 psi	124.9 psi
	F_v'		264.5 psi	327.8 psi	264.5 psi	327.8 psi	264.5 psi	327.8 psi
	$f_v<F_v'$?		**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
	M		7266.9 ft-lb	7266.4 ft-lb	12848.6 ft-lb	12858.3 ft-lb	12730.7 ft-lb	12746.1 ft-lb
	f_b		1518.6 psi	1747.0 psi	1315.7 psi	1349.6 psi	1303.6 psi	1337.8 psi
	F_b'		2127.5 psi	3097.7 psi	2075.4 psi	2928.0 psi	2075.4 psi	3049.1 psi
	$f_b<F_b'$?		**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
	Δ_L		0.09 in	0.10 in	0.20 in	0.17 in	0.23 in	0.21 in
			L/811	L/776	L/723	L/823	L/640	L/728
	$\Delta_{L,allow}$		**L/360**	**L/360**	**L/240**	**L/240**	**L/360**	**L/360**
	Δ_{Tot}		0.11 in	0.12 in	0.26 in	0.22 in	0.26 in	0.23 in
			L/666	L/637	L/563	L/640	L/567	L/644
	$\Delta_{Tot,allow}$		**L/240**	**L/240**	**L/180**	**L/180**	**L/240**	**L/240**
	$\Delta<\Delta_{Allow}$?		**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
SUPPORT DATA	b		3.13 in	3.50 in	3.13 in	3.50 in	3.13 in	3.50 in
	d		10.50 in	18.50 in	15.00 in	28.00 in	15.00 in	14.00 in
	A_s		32.81 in²	32.38 in²	46.88 in²	49.00 in²	46.88 in²	49.00 in²
	S		57.42 in³	49.91 in³	117.19 in³	114.33 in³	117.19 in³	114.33 in³
	I		301.46 in⁴	230.84 in⁴	878.91 in⁴	800.33 in⁴	878.91 in⁴	800.33 in⁴
	w_{self}		8.3 plf	8.2 plf	11.8 plf	12.3 plf	11.8 plf	12.6 plf
	F_v		230 psi	285 psi	230 psi	285 psi	230 psi	285 psi
	F_b		1850 psi	2600 psi	1850 psi	2600 psi	1850 psi	3100 psi
	E		1.60E+06 psi	2.00E+06 psi	1.60E+06 psi	2.00E+06 psi	1.60E+06 psi	2.00E+06 psi
	E'		1.60E+06 psi	2.00E+06 psi	1.60E+06 psi	2.00E+06 psi	1.60E+06 psi	2.00E+06 psi
	C_D		1.15	1.15	1.15	1.15	1.15	1.15
	C_r		1.00	1.00	1.00	1.00	1.00	1.00
	C_{fu}		1.00	1.00	1.00	1.00	1.00	1.00
	$C_{F/V}$		1.00	1.04	0.98	0.98	0.98	0.86
	C_i		1.00	1.00	1.00	1.00	1.00	1.00
	$C_{i,E}$		1.00	1.00	1.00	1.00	1.00	1.00

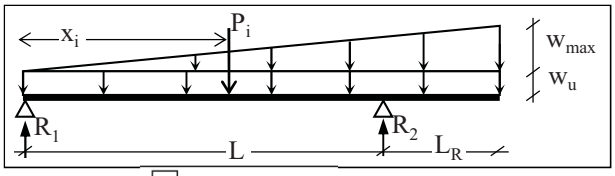
Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Beam Calculation For: ***Porch 12-6 GLB***

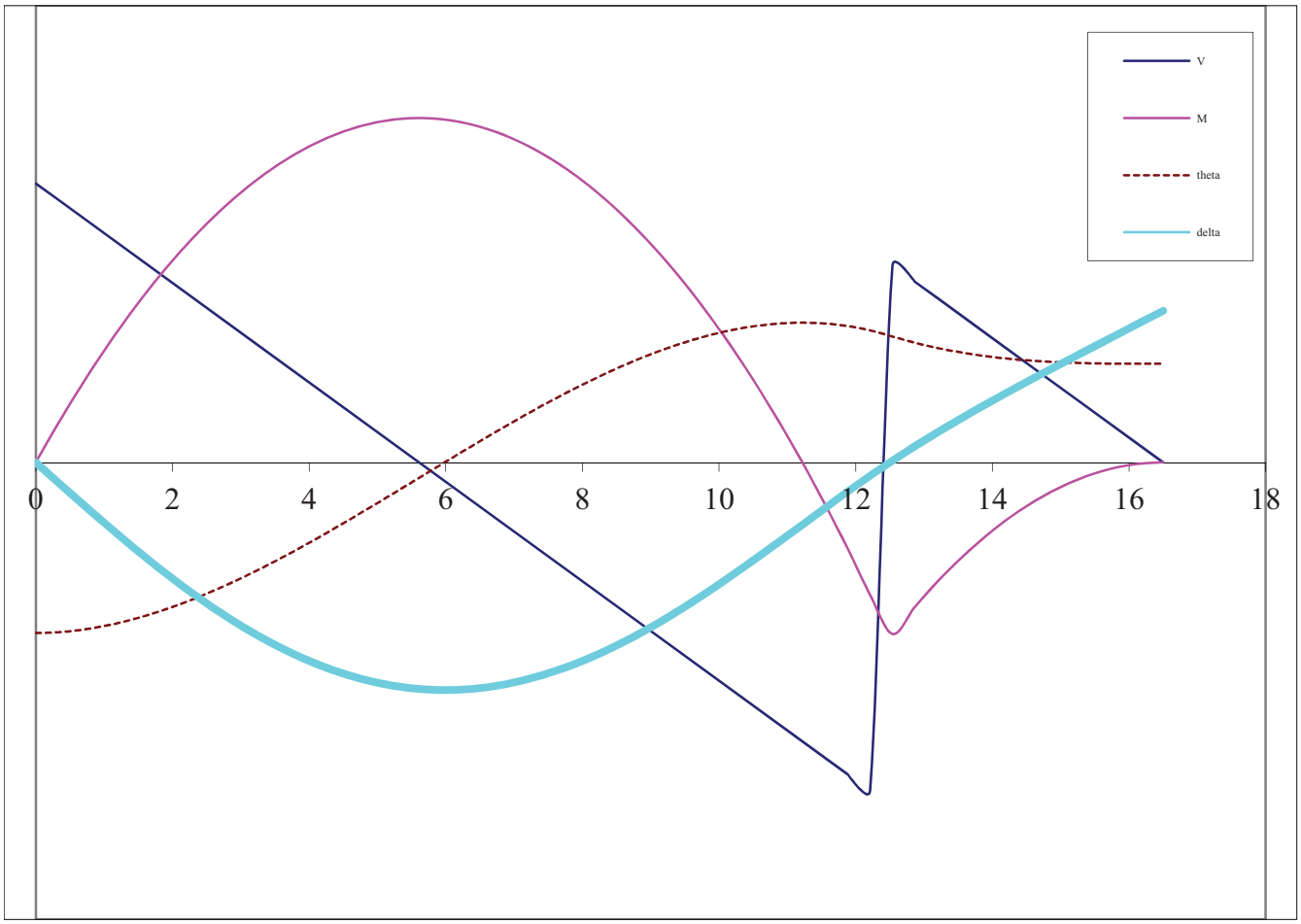
EI = 1.41E+09 lb-in^2
w_u = 653 plf
w_{max} = 0 plf
P_1 = 0 lbs @ 0.00 ft
P_2 = 0 lbs @ 0.00 ft
P_3 = 0 lbs @ 0.00 ft
P_4 = 0 lbs @ 0.00 ft
P_5 = 0 lbs @ 0.00 ft
P_6 = 0 lbs @ 0.00 ft
P_7 = 0 lbs @ 0.00 ft
P_8 = 0 lbs @ 0.00 ft
P_9 = 0 lbs @ 0.00 ft
Σ_{loads} = **10775 lbs**
Σ_{rxns} = **10775 lbs**

L_C =	L_R =
12.50 ft	4.00 ft



Left	Alt. Support?	Right
Pin		Pin
	Δ = 0.19″	Δ = 0.13″
R_1 =		R_2 =
3663 lbs		**7111 lbs**

θ_{max} = **4.33E-03** V_{max} = **4482 lbs**
Δ_{max} = **0.19"** M_{min} = **-5206 lb-ft**
L/Δ_{max} = **L/747** M_{max} = **10276 lb-ft**



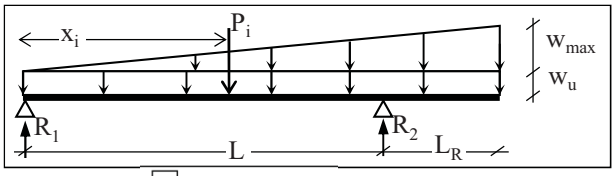
Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Beam Calculation For: ***Porch 12-6 VLAM***

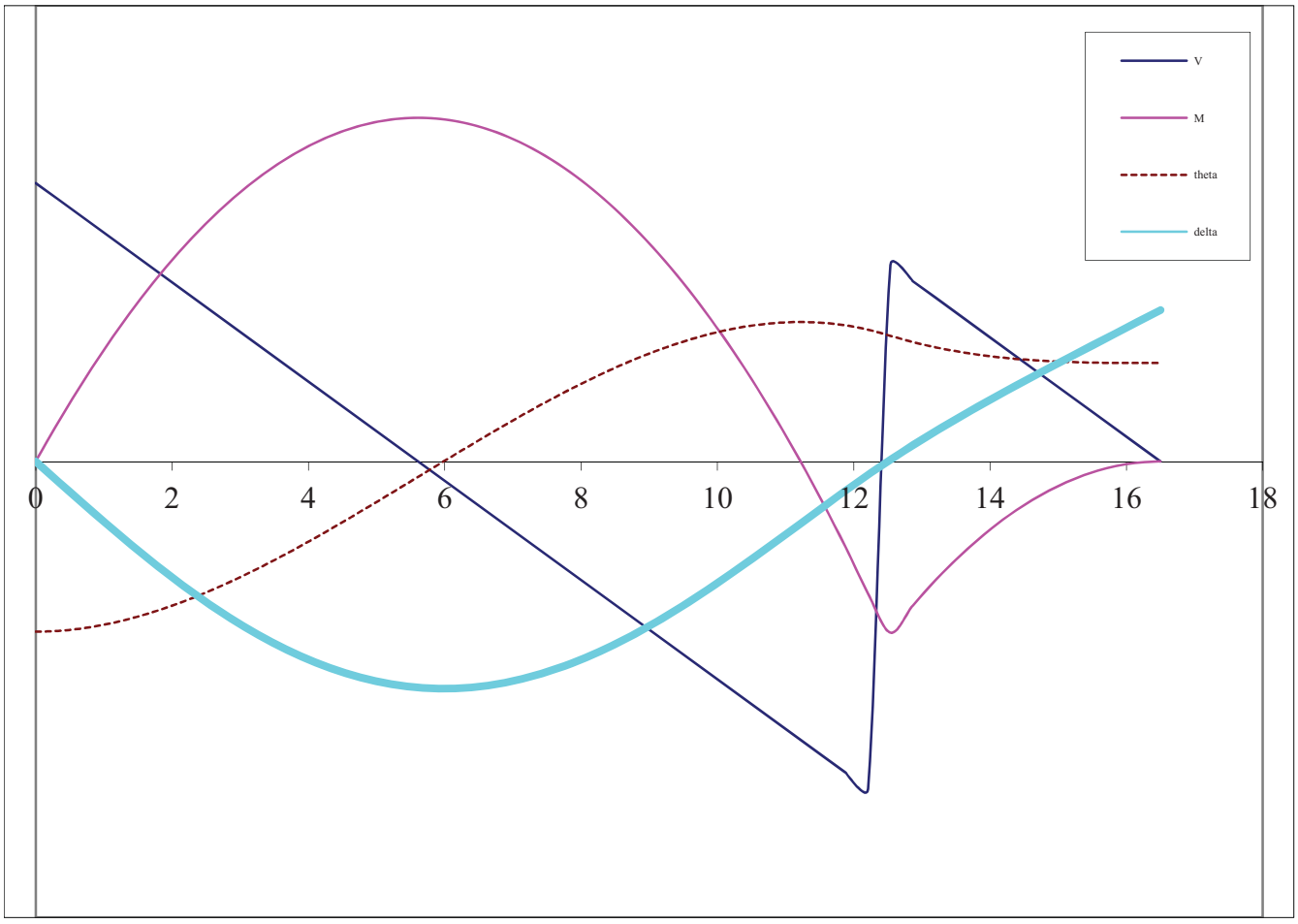
EI = 1.60E+09 lb-in^2
w_u = 653 plf
w_{max} = 0 plf
P_1 = 0 lbs @ 0.00 ft
P_2 = 0 lbs @ 0.00 ft
P_3 = 0 lbs @ 0.00 ft
P_4 = 0 lbs @ 0.00 ft
P_5 = 0 lbs @ 0.00 ft
P_6 = 0 lbs @ 0.00 ft
P_7 = 0 lbs @ 0.00 ft
P_8 = 0 lbs @ 0.00 ft
P_9 = 0 lbs @ 0.00 ft
Σ_{loads} = **10775 lbs**
Σ_{rxns} = **10775 lbs**

L_C = 12.50 ft
L_R = 4.00 ft



Left: Pin — R_1 = **3663 lbs** — Δ = 0.17″
Alt. Support? ☐
Right: Pin — R_2 = **7111 lbs** — Δ = 0.11″

θ_{max} = **3.80E-03**
Δ_{max} = **0.17"**
L/Δ_{max} = **L/850**
V_{max} = **4482 lbs**
M_{min} = **-5206 lb-ft**
M_{max} = **10276 lb-ft**



Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Continuous Foundations (ASD)

Allowable Brng Pressures D+L: 1500 psf Seismic S_{DS}: **0.887**
D+E_v: 2000 psf Ftg Width Increment: **1 in**

Line/Descr		Typ Eave	Max Eave	Typ Gable	Max Gable			
ROOF	D	**12.00 psf**	**12.00 psf**	**12.00 psf**	**12.00 psf**			
	L_r/S/R	**100.00 psf**	**100.00 psf**	**100.00 psf**	**100.00 psf**			
	Trib	**13.00 ft**	**13.00 ft**	**3.00 ft**	**9.25 ft**			
FLR	D	0.00 psf	0.00 psf	0.00 psf	0.00 psf			
	L	0.00 psf	0.00 psf	0.00 psf	0.00 psf			
	Trib	0.00 ft	0.00 ft	0.00 ft	0.00 ft			
OTH	D	0.00 psf	**8.00 psf**	0.00 psf	**8.00 psf**			
	Lr/S/R	0.00 psf	**120.00 psf**	0.00 psf	**120.00 psf**			
	Trib	0.00 ft	**3.00 ft**	0.00 ft	**3.00 ft**			
OTH	DL	**12.00 psf**	**12.00 psf**	**12.00 psf**	**12.00 psf**			
	Trib	**10.00 ft**	**10.00 ft**	**10.00 ft**	**10.00 ft**			
UNIF	w_{Max}	1576.0 plf	1960.0 plf	456.0 plf	1540.0 plf			
	Gov Load	D+Lr	D+Lr	D+Lr	D+Lr			
	b_{min}	1.05 ft	1.31 ft	0.30 ft	1.03 ft			
EQ	w_{D+Ev}	310.3 plf	337.3 plf	175.4 plf	286.7 plf			
	b_{min}	0.16 ft	0.17 ft	0.09 ft	0.14 ft			
Min Ftg Width		**1.08 ft**	**1.33 ft**	**0.33 ft**	**1.08 ft**			

Line/Descr								
ROOF	D							
	L_r/S/R							
	Trib							
FLR	D							
	L							
	Trib							
OTH	D							
	L							
	Trib							
OTH	DL							
	Trib							
UNIF	w_u							
	Gov Load							
	b_{min}							
EQ	w_{D+Ev}							
	b_{min}							
Use Ftg Width								

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

Pad Foundations (ASD) based on entering point loads (i.e. post/beam reactions)

Allowable Brng Pressures D+L: 1500 psf D+E_v: 2000 psf

Seismic S_{DS}: **0.887**
Ftg Width Increment: **1 in**

Loc/Descr		Post Pad	Mid Pad	Corner Pad				
RF	P_D	**444 lbs**	**387 lbs**	**255 lbs**				
	$P_{Lr/S/R}$	**6666 lbs**	**5805 lbs**	**3825 lbs**				
FLR	P_D	0 lbs	0 lbs	0 lbs				
	P_L	0 lbs	0 lbs	0 lbs				
OTH	P_{D1}	0 lbs	0 lbs	0 lbs				
	P_{D2}	0 lbs	0 lbs	0 lbs				
	P_L	0 lbs	0 lbs	0 lbs				
E/W	$P_{E/W}$	0 lbs	0 lbs	0 lbs				
UNIF	P_{Max}	7110 lbs	6192 lbs	4080 lbs				
	Gov Load	D+Lr	D+Lr	D+Lr				
	A_{min}	4.7 sf	4.1 sf	2.7 sf				
E/W	$P_{D+E/W}$	499 lbs	387 lbs	255 lbs				
	A_{min}	0.2 sf	0.2 sf	0.1 sf				
Sq Ftg Dim		2.25 ft	2.08 ft	1.67 ft				

Loc/Descr								
RF	P_D							
	$P_{Lr/S/R}$							
FLR	P_D							
	P_L							
OTH	P_{D1}							
	P_{D2}							
	P_L							
EQ	P_{EQ}							
UNIF	P_{Max}							
	Gov Load							
	A_{min}							
EQ	P_{D+Ev}							
	A_{min}							
Sq Ftg Dim								

Covenant Engineering

Date: 3/10/2025
Engineer: TMM
Project #: P25006
Project Name: Eplin 672 Sunset Dr. Alpine Residence

Lateral Shearwall Design Summary

Level	Line	Method	v_{SW} (plf)	SW	v_{Dia} (plf)	F_{HD} (lbs)	HD	F_{strap} (lbs)	Strap	Orient
Roof	1	FTAO	375	B	230	1783	LSTHD8-6	1414	CS16	Horiz
"	3	FTAO	501	C	106	2048	LSTHD8-6	948	CS16	Horiz
"	A	SEGMENT	167	A	108	1673	LSTHD8-6	n/a	n/a	n/a
"	B	SEGMENT	343	B	115	0	LSTHD8-6	2879	n/a	n/a

SHEARWALLS

A	(260 plf)	7/16 Thk w/8d @ 6/12"
B	(380 plf)	7/16 Thk w/8d @ 4/12
C	(640 plf)	7/16 Thk w/8d @ 2/12 o/3" Nom, Blk All Panel Edges

ROD HOLD-DOWNS

LSTHD8-6	(2250 lbs)	LSTHD8 w/(16) 0.148 x 3 1/4 To Dbl 2x in 6" Min Stemwall
HTT4-2x	(3000 lbs)	HTT4 w/(18) 0.148 x 1 1/2 To 2x & 5/8 Rod

STRAPS

CS20	(1030 lbs)	CS20 w/(12) 0.148 x 2 1/2 (6") or (14) 0.131 x 2 1/2 (9")
CS16	(1705 lbs)	CS16 w/(20) 0.148 x 2 1/2 (11") or (22) 0.131 x 2 1/2 (13")
CS14	(2490 lbs)	CS14 w/(26) 0.148 x 2 1/2 (15") or (30) 0.131 x 2 1/2 (16")
CMSTC16	(4690 lbs)	CMSTC16 w/(50) 0.148 x 3 1/4 (20")
CMST14	(6475 lbs)	CMST14 w/(56) 0.162 x 2 1/2 (26")or (66) 0.148 x 2 1/2 (30")

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

ASD Lateral Load Line Reactions - Based On Assumed Relative Stiffness

*Story shears are worst-case demands, considering both directions independently to determine the critical load values. Distribution of total shear has been performed approximately equally based on total shearwall lengths for each principal direction. The individual shearwall reactions have been linked to this overall summary page, and are based on the average shearwall demand times the total shearwall length for each shearwall line. Observed differences in shearwall types & nailing is due in large part to the variations in shearwall design methods, in order to reduce the number of hold-downs required.

Level: Roof

$V_{E\text{-}W,W}$ = 5.59 k $V_{E\text{-}W,EQ}$ = 5.67 k

Line	Σ_{SW}	V_W	V_{EQ}
1	12.08 ft	3821 lbs	3878 lbs
3	5.58 ft	1765 lbs	1792 lbs

$\Sigma_{SW,\ E\text{-}W}$ = 17.66 ft
$v_{E\text{-}W,W}$ = 316.3 plf
$v_{E\text{-}W,EQ}$ = 321.1 plf

Wind - Critical Case, Plan E-W
Width = 31 ft
w_{unif} = 164 plf
P_{EZ} = 251 lbs
$V_{E\text{-}W,W}$ = 5.59 k

$V_{N\text{-}S,W}$ = 1.78 k $V_{N\text{-}S,EQ}$ = 5.67 k

Line	Σ_{SW}	V_W	V_{EQ}
A	24.75 ft	921 lbs	2934 lbs
B	23.08 ft	859 lbs	2736 lbs

$\Sigma_{SW,\ N\text{-}S}$ = 47.83 ft
$v_{N\text{-}S,W}$ = 37.2 plf
$v_{N\text{-}S,EQ}$ = 118.5 plf

Wind - Critical Case, Plan N-S
Width = 22 ft
w_{unif} = 71 plf
P_{EZ} = 109 lbs
$V_{N\text{-}S,W}$ = 1.78 k

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

ASD Diaphragm/ASD Shearwall Design for Grid Line 1 @ Roof, See FTAO

ASD Diaphragm/ASD Shearwall Design for Grid Line **1** @ **Roof, See FTAO**

EQ Modifiers	Roof, See FTAO		Level(s) Above	
ρ = **1.00**	V_{wind} = **3821#**	DL_{wall} = **12.0 psf**	V_{wind} = **0#**	H_{wall} = **0.0 ft**
$^{diaph}/_{base}$ = **1.30**	V_{EQ} = **3878#**	DL_{story} = **12.0 psf**	V_{EQ} = **0#**	DL_{story} = **0.0 psf**
RM_{Factor} = **0.6D**	H_{plate} = **10.0 ft**	$Trib_{story}$ = **4.0 ft**	$H_{plate\text{-}eff}$ = **0.0 ft**	$Trib_{story}$ = **0.0 ft**

◉ Segmented ○ Perforated
SW ☐ LRFD? Diaph ☐ LRFD?
C_0 = 1.00
\# bays = 2.4

Diaphragm:	Shearwall:
l_{dia} = 21.92 ft	l_{sw} = 12.08 ft
v_{dia} = **230 plf**	v_{sw} = **321 plf**
$F_{coll\text{-}max}$ = **558#**	Δ_{sw} = #N/A

Diaphragm: **Unblocked (Case 1), C-C, C-D 15/32 w/8d o/2x Nom. Framing, BN@6", EN@6" (240plf)**
Shear Wall: **########**

	ID/ SW?	Length (ft)	SW_{Ratio} 3.5:1	F_{Coll} (#)	$H_{open(ft)}$ / $P_{DL\text{-}Add'l(\#)}$	Unfct'd $RM_{(k\text{-}ft)}$	Wind $OTM_{(k\text{-}ft)}$	Wind $P_{up\text{-}Add'l(\#)}$	Wind $*F_{HD(\#)}$	EQ $OTM_{(k\text{-}ft)}$	EQ $P_{up\text{-}Add'l(\#)}$	EQ $*F_{HD(\#)}$	Minimum Holdown Type: Anchor-Bolt	Foundation Strap	Floor Strap
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	2.17	NG!	313	--- ---	0.40	6.86	--- ---	3968 3897	6.97	--- ---	4030 3959			
Open		4.92	---	-558	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	7.08	OK	463	--- ---	4.21	22.39	--- ---	2949 2949	22.73	--- ---	3000 3000			
Open		4.92	---	-408	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	2.83	NG!	0	--- ---	0.67	8.95	--- ---	3598 3669	9.09	--- ---	3656 3726			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

ASD Diaphragm/ASD Shearwall Design for Grid Line 3 @ Roof, See FTAO

ASD Diaphragm/ASD Shearwall Design for Grid Line **3** @ **Roof, See FTAO**

EQ Modifiers	Roof, See FTAO		Level(s) Above	
ρ = **1.00**	V_{wind} = **1765#**	DL_{wall} = **12.0 psf**	V_{wind} = **0#**	H_{wall} = **0.0 ft**
$^{diaph}/_{base}$ = **1.30**	V_{EQ} = **1792#**	DL_{story} = **12.0 psf**	V_{EQ} = **0#**	DL_{story} = **0.0 psf**
RM_{Factor} = **0.6D**	H_{plate} = **10.0 ft**	$Trib_{story}$ = **4.0 ft**	$H_{plate-eff}$ = **0.0 ft**	$Trib_{story}$ = **0.0 ft**

◉ Segmented ○ Perforated
C_0 = 1.00
\# bays = 1.1

SW ☐ LRFD?
Diaph ☐ LRFD?

Diaphragm:	Shearwall:
l_{dia} = 21.91 ft	l_{sw} = 5.58 ft
v_{dia} = **106 plf**	v_{sw} = **321 plf**
$F_{coll-max}$ = **1070#**	Δ_{sw} = #N/A

Diaphragm: **Unblocked, C-C, C-D 15/32 w/8d o/2x Nom. Framing, BN@6", EN@6" (180plf)**
Shear Wall: ########

	ID/ SW?	Length (ft)	SW_{Ratio} 3.5:1	F_{Coll} (#)	$H_{open(ft)}$ / $P_{DL-Add'l(\#)}$	Unfct'd $RM_{(k-ft)}$	Wind $OTM_{(k-ft)}$	Wind $P_{up-Add'l(\#)}$	Wind $*F_{HD(\#)}$	EQ $OTM_{(k-ft)}$	EQ $P_{up-Add'l(\#)}$	EQ $*F_{HD(\#)}$	Minimum Holdown Type: Anchor-Bolt	Foundation Strap	Floor Strap
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.83	---	-68	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		12.25	---	-1070	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	3.25	OK	-292	--- ---	0.89	10.28	--- ---	3368 3498	10.43	--- ---	3424 3554			
Open		3.25	---	-558	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	2.33	NG!	0	--- ---	0.46	7.37	--- ---	3831 3878	7.48	--- ---	3892 3938			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

ASD Diaphragm/ASD Shearwall Design for Grid Line A @ Roof

ASD Diaphragm/ASD Shearwall Design for Grid Line **A** @ **Roof**

EQ Modifiers	Roof		Level(s) Above	
ρ = **1.00**	V_{wind} = **921#**	DL_{wall} = **12.0 psf**	V_{wind} = **0#**	H_{wall} = **0.0 ft**
$^{diaph}/_{base}$ = **1.30**	V_{EQ} = **2934#**	DL_{story} = **12.0 psf**	V_{EQ} = **0#**	DL_{story} = **0.0 psf**
RM_{Factor} = **0.6D**	H_{plate} = **10.0 ft**	$Trib_{story}$ = **13.0 ft**	$H_{plate-eff}$ = **0.0 ft**	$Trib_{story}$ = **0.0 ft**

○ Segmented
◉ Perforated
C_0 = 0.71
bays = 5.0

SW ☐ LRFD?
Diaph ☐ LRFD?

Diaphragm:	Shearwall:
l_{dia} = 35.17 ft	l_{sw} = 24.75 ft
v_{dia} = **108 plf**	v_{sw} = **167 plf**
$F_{coll-max}$ = **504#**	Δ_{sw} = 0.26 in

Diaphragm: **Unblocked, C-C, C-D 15/32 w/8d o/2x Nom. Framing, BN@6", EN@6" (180plf)**
Shear Wall: **Other Grades 7/16 w/8d, EN@6"oc, (260plf)**

	ID/ SW?	Length (ft)	SW_{Ratio} 2.0:1	F_{Coll} (#)	$H_{open(ft)}$ / $P_{DL-Add'l(\#)}$	Unfct'd $RM_{(k-ft)}$	Wind $OTM_{(k-ft)}$	Wind $P_{up-Add'l(\#)}$	Wind $*F_{HD(\#)}$	EQ $OTM_{(k-ft)}$	EQ $P_{up-Add'l(\#)}$	EQ $*F_{HD(\#)}$	Minimum Holdown Type: Anchor-Bolt	Foundation Strap	Floor Strap
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	10.17	OK	504	--- ---	---	13.00	--- ---	525 ---	41.40	--- ---	1673 ---			
Open		6.25	---	-232	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	14.58	OK	491	--- ---	---	13.00	--- ---	--- 525	41.40	--- ---	--- 1673			
Open		0.00	---	491	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	4.17	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- ---	---	---	--- ---	--- ---	---	--- ---	--- ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---

Covenant Engineering

Date: **3/10/2025**
Engineer: **TMM**
Project #: **P25006**
Project Name: **Eplin 672 Sunset Dr. Alpine Residence**

ASD Diaphragm/ASD Shearwall Design for Grid Line B @ Roof

ASD Diaphragm/ASD Shearwall Design for Grid Line **B** @ **Roof**

EQ Modifiers	Roof		Level(s) Above	
ρ = **1.00**	V_{wind} = **859#**	DL_{wall} = **12.0 psf**	V_{wind} = **0#**	H_{wall} = **0.0 ft**
$^{diaph}/_{base}$ = **1.30**	V_{EQ} = **2736#**	DL_{story} = **12.0 psf**	V_{EQ} = **0#**	DL_{story} = **0.0 psf**
RM_{Factor} = **0.6D**	H_{plate} = **10.0 ft**	$Trib_{story}$ = **13.0 ft**	$H_{plate\text{-}eff}$ = **0.0 ft**	$Trib_{story}$ = **0.0 ft**

○ Segmented ◉ Perforated
C_0 = 0.85
\# bays = 4.6

SW ☐ LRFD?
Diaph ☐ LRFD?

Diaphragm:	Shearwall:
l_{dia} = 30.91 ft	l_{sw} = 23.08 ft
v_{dia} = **115 plf**	v_{sw} = **140 plf**
$F_{coll\text{-}max}$ = **582#**	Δ_{sw} = 0.22 in

Diaphragm: **Unblocked, C-C, C-D 15/32 w/8d o/2x Nom. Framing, BN@6", EN@6" (180plf)**

Shear Wall: **Other Grades 7/16 w/8d, EN@6"oc, (260plf)**

	ID/ SW?	Length (ft)	SW_{Ratio} 2.0:1	F_{Coll} (#)	$H_{open(ft)}$ / $P_{DL\text{-}Add'l(\#)}$	Unfct'd $RM_{(k\text{-}ft)}$	Wind $OTM_{(k\text{-}ft)}$	Wind $P_{up\text{-}Add'l(\#)}$	Wind $*F_{HD(\#)}$	EQ $OTM_{(k\text{-}ft)}$	EQ $P_{up\text{-}Add'l(\#)}$	EQ $*F_{HD(\#)}$	Minimum Holdown Type: Anchor-Bolt	Foundation Strap	Floor Strap
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	16.33	OK	578	--- / ---	---	10.12	--- / ---	438 / ---	32.23	--- / ---	1396 / ---			
Open		2.25	---	343	---	---	---	---	---	---	---	---	---	---	---
Shear Wall	--- ☑	6.75	OK	582	--- / ---	---	10.12	--- / ---	--- / 286	32.23	--- / ---	--- / 1244			
Open		3.25	---	243	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	2.33	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---
Wall	--- ☐	0.00	---	0	--- / ---	---	---	--- / ---	--- / ---	---	--- / ---	--- / ---			
Open		0.00	---	0	---	---	---	---	---	---	---	---	---	---	---

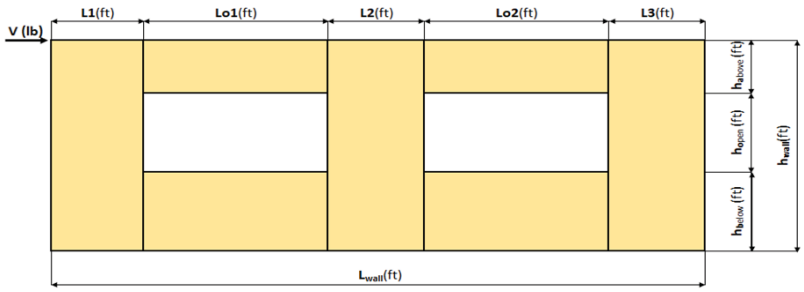
Force Transfer Around Openings Calculator

TWO OPENINGS

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2021 IBC	**Date:**	
Designer:	TMM		
Client:	Eplin		
Project:	672 Sunset Dr. Alpine Residence		
Wall Line:	Line 1		



Shear Wall Calculation Variables

V	3878 lbf	Opening 1		Opening 2		Adj. Factor Method =	1.25-0.125h/bs
L1	2.17 ft	h_a1	2.08 ft	h_a2	2.08 ft	Wall Pier Aspect Ratio	Adj. Factor
L2	7.08 ft	h_o1	5.33 ft	h_o2	5.33 ft	P1=h_o/L1= 2.46	0.943
L3	2.83 ft	h_b1	2.67 ft	h_b2	2.67 ft	P2=h_o/L2= 0.75	N/A
h_{wall}	10.08 ft	Lo1	4.92 ft	Lo2	4.92 ft	P3=h_o/L3= 1.88	N/A
L_{wall}	21.92 ft						

1. Hold-down forces: H = Vh_{wall}/L_{wall} 1783 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(h_a1+h_b1) = 375 plf

Second opening: va2 = vb2 = H/(h_a2+h_b2) = 375 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 1847 lbf

Second opening: O2 = va2 x (Lo2) = 1847 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 433 lbf

F2 = O1(L2)/(L1+L2) = 1414 lbf

F3 = O2(L2)/(L2+L3) = 1320 lbf

F4 = O2(L3)/(L2+L3) = 527 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 1.15 ft

T2 = (L2*Lo1)/(L1+L2) = 3.77 ft

T3 = (L2*Lo2)/(L2+L3) = 3.51 ft

T4 = (L3*Lo2)/(L2+L3) = 1.41 ft

6. Unit shear beside opening

v1 = (V/L)(L1+T1)/L1 = 271 plf

v2 = (V/L)(T2+L2+T3)/L2 = 359 plf

v3 = (V/L)(T4+L3)/L3 = 265 plf

Check v1*L1+v2*L2+v3*L3=V? 3878 lbf **OK**

7. Resistance to corner forces

R1 = v1*L1 = 588 lbf

R2 = v2*L2 = 2541 lbf

R3 = v3*L3 = 749 lbf

8. Difference corner force + resistance

R1-F1 = 155 lbf

R2-F2-F3 = -193 lbf

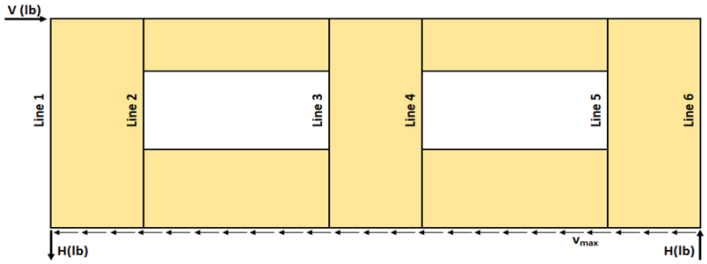
R3-F4 = 222 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = 71 plf

vc2 = (R2-F2-F3)/L2 = -27 plf

vc3 = (R3-F4)/L3 = 78 plf



Check Summary of Shear Values for Two Openings

Line 1: vc1(h_a1+h_b1)+v1(h_o1)=H?		339	1445	1783 lbf
Line 2: va1(h_a1+h_b1)-vc1(h_a1+h_b1)-v1(h_o1)=0?	1783	339	1445	0
Line 3: vc2(h_a1+h_b1)+v2(h_o1)-va1(h_a1+h_b1)=0?	-129	1913	1783	0
Line 4: va2(h_a2+h_b2)-v2(h_o2)-vc2(h_a2+h_b2)=0?	1783	1913	-129	0
Line 5: va2(h_a2+h_b2)-vc3(h_a2+h_b2)-v3(h_o2)=0?	1783	372	1411	0
Line 6: vc3(h_a2+h_b2)+ v3(h_o2) = H?		372	1411	1783 lbf

Design Summary*

Req. Sheathing Capacity	375 plf	**4-Term Deflection**		**3-Term Deflection**	
Req. Strap Force	1414 lbf	**4-Term Story Drift %**		**3-Term Story Drift %**	
Req. HD Force	1783 lbf				
Req. Shear Wall Anchorage Force	177 plf				

***The Design Summary assumes that the shear wall is designed as blocked.**

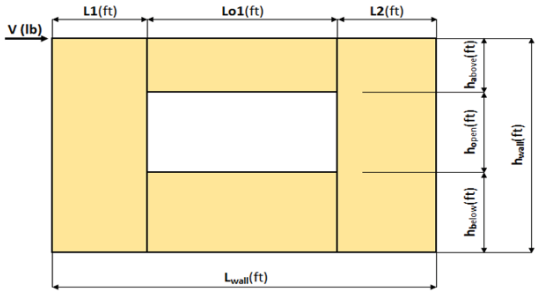
Force Transfer Around Openings Calculator

ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2021 IBC	**Date:**	
Designer:	TMM		
Client:	Eplin		
Project:	672 Sunset Dr. Alpine Residence		
Wall Line:	Line 3		



Shear Wall Calculation Variables

V	1792 lbf		Opening 1
L1	3.25 ft	h_a	2.17 ft
L2	2.33 ft	h_o	6.00 ft
h_{wall}	10.09 ft	h_b	1.92 ft
L_{wall}	8.83 ft	Lo1	3.25 ft

Adj. Factor Method =	1.25-0.125h/bs
Wall Pier Aspect Ratio	Adj. Factor
P1=h_o/L1= 1.85	N/A
P2=h_o/L2= 2.58	0.928

1. Hold-down forces: H = Vh_{wall}/L_{wall} 2048 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(h_a+h_b) = 501 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 1627 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 948 lbf

F2 = O1(L2)/(L1+L2) = 679 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 1.89 ft

T2 = (L2*Lo1)/(L1+L2) = 1.36 ft

6. Unit shear beside opening

v1 = (V/L)(L1+T1)/L1 = 321 plf

v2 = (V/L)(T2+L2)/L2 = 321 plf

Check v1*L1+v2*L2=V? 1792 lbf **OK**

7. Resistance to corner forces

R1 = v1*L1 = 1044 lbf

R2 = v2*L2 = 748 lbf

8. Difference corner force + resistance

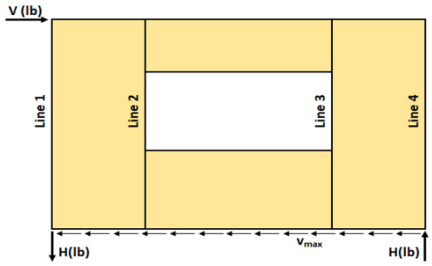
R1-F1 = 96 lbf

R2-F2 = 69 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = 30 plf

vc2 = (R2-F2)/L2 = 30 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(h_a+h_b)+v1(h_o)=H?		121	1927	2048 lbf
Line 2: va1(h_a+h_b)-vc1(h_a+h_b)-v1(h_o)=0?	2048	121	1927	0
Line 3: va1(h_a+h_b)-vc2(h_a+h_b)-v1(h_o)=0?	2048	121	1927	0
Line 4: vc2(h_a+h_b)+v2(h_o)=H?		121	1927	2048 lbf

Design Summary*

Req. Sheathing Capacity	501 plf	**4-Term Deflection**		**3-Term Deflection**	
Req. Strap Force	948 lbf	**4-Term Story Drift %**		**3-Term Story Drift %**	
Req. HD Force (H)	2048 lbf				
Req. Shear Wall Anchorage Force (v_{max})	203 plf				

***The Design Summary assumes that the shear wall is designed as blocked.**