

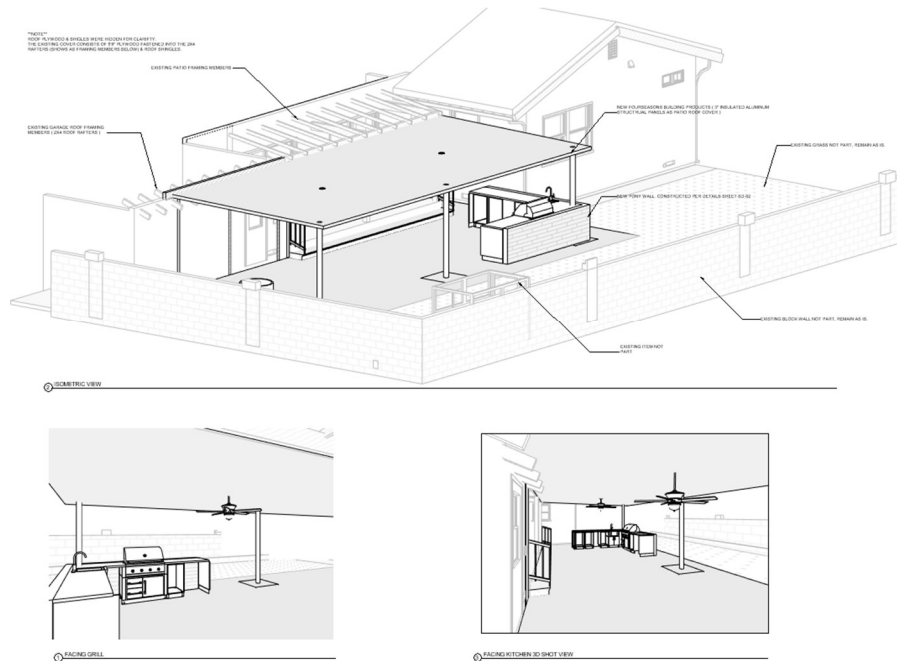
STRUCTURAL CALCULATION REPORT

FOURSEASONS BUILDING PRODUCTS PATIO COVER

STRUCTURAL ANALYSIS

PROJECT ADDRESS

332 SEQUOIA AVE, BREA, CA 9282



PER

ASCE 7-22

The patio cover is located in 332 Sequoia Ave, Brea, CA, USA categorized as Exposure C (assumed to be homogeneous for the selected wind direction). The wind load calculation for the structure is based on the Directional Procedure (Chapter 27 Open Buildings with Monoslope Free Roofs) of ASCE 7-22. Moreover, the structure is classified as Risk Category II. The location is elevated at 323.33 ft above mean sea level.



Exis.Patio Cover		
PATIO Material (Including Built-up Slope Assembly)	3	P.S.F
Sheathing	2.8	P.S.F
RAFTERS	3	P.S.F
		P.S.F
Misc.	1.5	P.S.F
Total Dead Load=	10.3	P.S.F
Total Live Load =	10	P.S.F
TOTAL PATIO ROOF AREA	61.95	
TOTAL PATIO WEIGHT	638.085	LBS
TOTAL PATIO LIVE LOAD	619.5	
Vswind	20.35	PSF
New Patio Cover		
3" INSULATED ROOF COVER	1.5	P.S.F
Sheathing	0	P.S.F
RAFTERS	0	P.S.F
		P.S.F
Misc. (FANS, LIGHTS)	1.5	P.S.F
Total Dead Load=	3	P.S.F
Total Live Load =	10	P.S.F
TOTAL PATIO ROOF AREA	576	4X8 TRI.AREA
TOTAL PATIO WEIGHT	1728	LBS
TOTAL PATIO LIVE LOAD	5760	
Vswind	20.35	PSF

ASCE

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Seismic

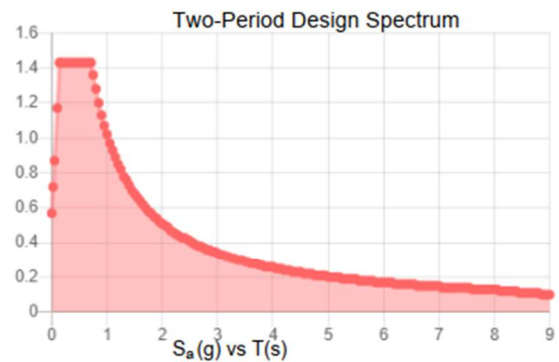
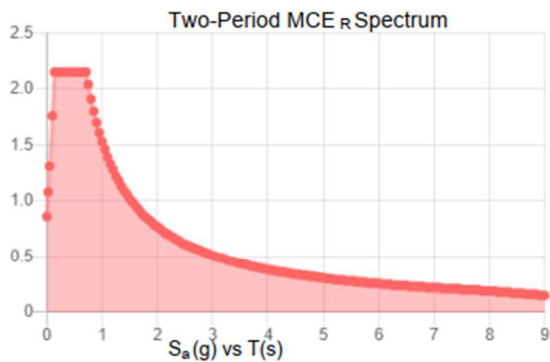
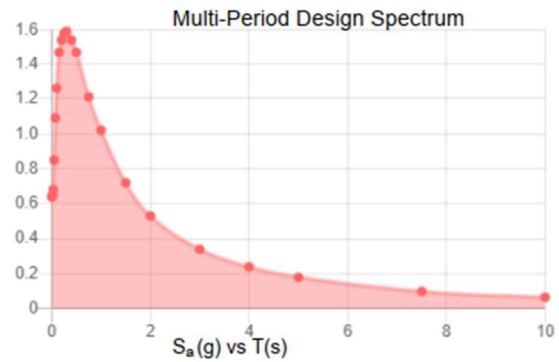
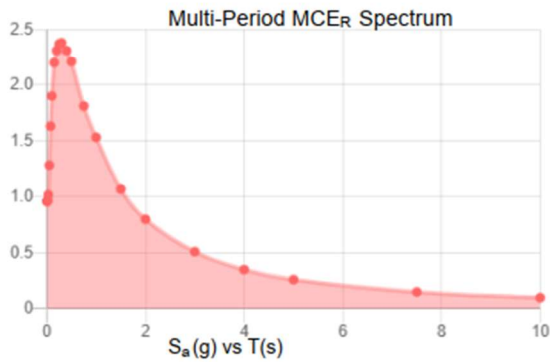
Default

Site Soil Class:

Results:

PGA _M :	0.86	T _L :	8
S _{MS} :	2.15	S _S :	2.01
S _{M1} :	1.53	S ₁ :	0.73
S _{DS} :	1.43	V _{S30} :	260
S _{D1} :	1.02		

Seismic Design Category: D



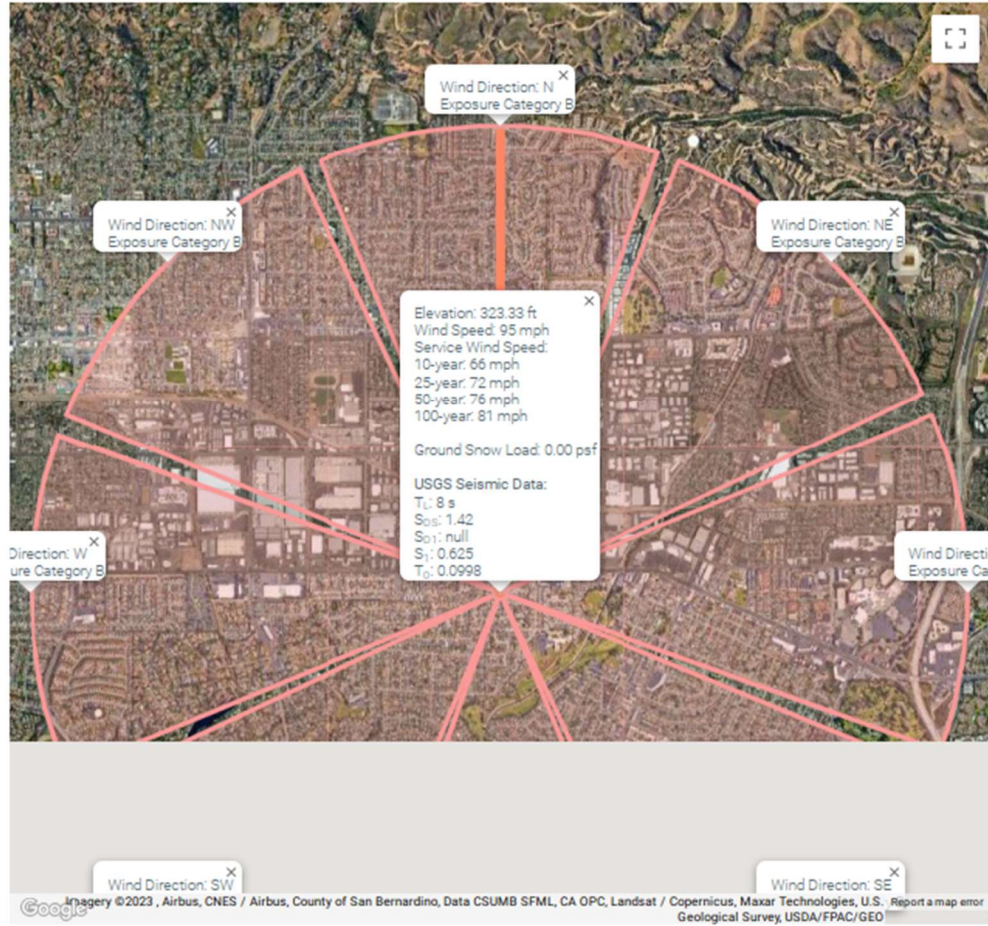
MCE_R Vertical Response Spectrum
Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum
Vertical ground motion data has not yet been made available by USGS.

WIND SPEED MAP

Triangular Interpolation Network (TIN) was used to interpolate the wind speed values between ASCE 7 wind contour with known values. The discrepancy from the code is subject to the discretion of the user.

View Map Contours ▾



Wind Direction	Exposure Category	Velocity Pressure Exposure Coefficient K_z @ 15 ft	Topographic factor K_{zt} @ $z = 0$ ft	Wind Directionality factor K_d	Ground Elevation factor K_e	Basic Wind Speed V , mph	Velocity Pressure q_h , psf
N	C	0.85	1.000	0.850	0.988	95.000	16.498
NE	B	0.57	1.000	0.850	0.988	95.000	11.064
E	B	0.57	1.000	0.850	0.988	95.000	11.064
SE	B	0.57	1.000	0.850	0.988	95.000	11.064
S	B	0.57	1.000	0.850	0.988	95.000	11.064
SW	B	0.57	1.000	0.850	0.988	95.000	11.064
W	B	0.57	1.000	0.850	0.988	95.000	11.064
NW	B	0.57	1.000	0.850	0.988	95.000	11.064

Velocity Pressure Exposure Coefficient, K_z

Section 26.10 K_z - Velocity Pressure Exposure Coefficient
For $z < 15ft$

$$K_z = 2.01 \times (15/z_g)^{2/\alpha}$$

Section 26.10 K_z - Velocity Pressure Exposure Coefficient
For $15ft \leq z \leq z_g$

$$K_z = 2.01 \times (z/z_g)^{2/\alpha}$$

Level	Elevation (ft)	K_z
At h	9.00	0.849

Velocity Pressure, q_h

For the selected wind source direction.

Section 26.10.2 q_h - Velocity Pressure at h

$$q_h = 0.00256 K_{z,h} K_{zt} K_d K_e V^2$$

$$q_h = 16.477 \text{ psf}$$

Where $K_{z,h} = 0.84888$

K_{zt} = Topographic Factor = 1

K_d = Wind Directionality Factor = 0.85

V = Basic Wind Speed = 95 mi/h

K_e = Ground Elevation Factor = 0.98836

Gust Effect Factor, G

Section 26.11 $G = 0.85$ - Gust Effect Factor

The structure is assumed to be rigid.

Net Pressure Coefficients, C_N

Figure 27.3-4 The net pressure coefficients, C_N , are calculated using Figures 27.3-4 of ASCE 7-16 - Clear Wind Flow - as shown in Table below.

Direction	Surface	C_N Case A	C_N Case B
0	Windward	0.720	-1.180
	Leeward	-0.047	-0.073
180	Windward	1.120	-0.380
	Leeward	0.620	0.007
90	$\leq h$ from windward edge	-0.800	0.800
	h to $2h$ from windward edge	-0.600	0.500
	$> 2h$ from windward edge	-0.300	0.300

Design Wind Pressures (MWFRS)

Section 27.3.2 p - Design Wind Pressure
For open buildings

$$p = q_h \times G \times C_N$$

Direction	Surface	p Case A (psf)	p Case B (psf)
90	$\leq h$ from windward edge	-11.204	11.204
	h to $2h$ from windward edge	-8.403	7.003
	$> 2h$ from windward edge	-4.202	4.202

Section 27.3.2
Section 28.3.5 In addition to the pressures for 90°, an additional horizontal wind load on open building should be calculated for wind pressures parallel to the ridge in accordance with Section 28.3.5. We will assume $K_S = 1.0$ and should be adjusted and be reduced based on the actual solidity ratio ϕ and number of frames n - See Figure 28.3-2.

Section 27.3.2
Section 28.3.5 p - Horizontal Wind Loads on Open or Partially Enclosed Buildings

For wind pressure parallel to the ridge (90°)

$$p = q_h \times [(GC_{pf})_{windward} - (GC_{pf})_{leeward}] \times K_B \times K_S$$

Section 27.3.2
Section 28.3.5 K_B - Frame Width Factor

For $L < 100ft$, $K_B = 1.8 - 0.01L$. Otherwise, $K_B = 0.8$.

$$K_B = 1.8 - 0.01 * L \leq 0.8$$

$$K_B = 1.79$$

Where L = Building Length = 0.9994 ft

Section 28.3.5 K_S - Shielding Factor

$$K_S = 0.6 + 0.073 \times (n - 1) + (1.25 \times \phi^{1.8})$$

Section 28.3.5 $K_S = 1$ - Shielding Factor

Assumed to be equal to 1.0 and should be adjusted based on the actual wall solidity ratio ϕ and number of frames n .

Figure 28.3-1
Section 28.3.5 $(GC_{pf})_{windward} = 0.4$

Using Zone 5 from Figure 28.3-1

Figure 28.3-1
Section 28.3.5 $(GC_{pf})_{leeward} = -0.29$

Using Zone 6 from Figure 28.3-1

Section 27.3.2
Section 28.3.5 p - Horizontal Wind Loads on Open or Partially Enclosed Buildings

For wind pressure parallel to the ridge (90°)

$$p = q_h [(GC_{pf})_{windward} - (GC_{pf})_{leeward}] K_B K_S$$

$$p = 20.35 \text{ psf}$$

Where q_h = Velocity Pressure at $h = 16.477$ psf

$$(GC_{pf})_{windward} = 0.4$$

$$(GC_{pf})_{leeward} = -0.29$$

K_B = Frame Width Factor = 1.79

K_S = Shielding Factor = 1

$$K_S = 1$$

$$(GC_{pf})_{windward} = 0.4$$

$$(GC_{pf})_{leeward} = -0.29$$

Wood Beam

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build: 20.23.2.14

ACC & Engineering

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

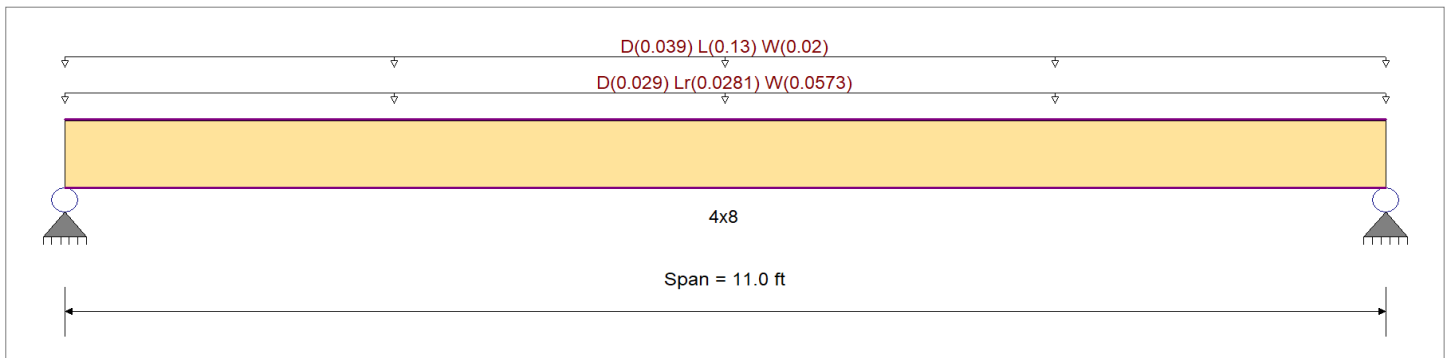
Material Properties

Analysis Method : Load Resistance Factor D
Load Combination : ASCE 7-16

Wood Species : Douglas Fir-Larch (North)
Wood Grade : No. 1/No. 2

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

Fb +	850.0 psi	E : Modulus of Elasticity	
Fb -	850.0 psi	Ebend- xx	1,600.0 ksi
Fc - Prll	1,400.0 psi	Eminbend - xx	580.0 ksi
Fc - Perp	625.0 psi		
Fv	180.0 psi		
Ft	500.0 psi	Density	30.590 pcf



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0290, Lr = 0.02810, W = 0.05730, Tributary Width = 1.0 ft, ((E) PATIO COVER LOAD / ROOF LOAD/ 2X4

Uniform Load : D = 0.0390, L = 0.130, W = 0.020, Tributary Width = 1.0 ft, (LOADS FROM THE NEW PATIO COVER)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio				Maximum Shear Stress Ratio			
Section used for this span	=	0.961	1	Section used for this span	=	0.289	1
fb: Actual	=	1,835.74	psi	fv: Actual	=	89.79	psi
F'b	=	1,909.44	psi	F'v	=	311.04	psi
Load Combination	=	+1.20D+0.50Lr+1.60L		Load Combination	=	+1.20D+0.50Lr+1.60L	
Location of maximum on span	=	5.500ft		Location of maximum on span	=	10.398 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection	0.242 in	Ratio =	544 >=360	Span: 1 : L Only			
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a			
Max Downward Total Deflection	0.422 in	Ratio =	312 >=180	Span: 1 : +D+0.750Lr+0.750L+0.450W			
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a			

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	λ	CM	C _t	CLx	C _F	C _{fu}	C _i	C _r	Mu	fb	Fb	Vu	fv	Fv
+1.20D+0.50Lr+1.60L																	
Length = 11.0 ft	1	0.961	0.289	0.80	1.00	1.00	1.00	1.300	1.00	1.00	1.00	4.69	1,835.7	1,909.4	1.52	89.8	311.0
+1.20D+1.60L																	
Length = 11.0 ft	1	0.918	0.276	0.80	1.00	1.00	1.00	1.300	1.00	1.00	1.00	4.48	1,752.6	1,909.4	1.45	85.7	311.0
+1.20D+1.60Lr+L																	
Length = 11.0 ft	1	0.815	0.245	0.80	1.00	1.00	1.00	1.300	1.00	1.00	1.00	3.98	1,557.0	1,909.4	1.29	76.2	311.0
+1.20D+1.60Lr+0.50W																	
Length = 11.0 ft	1	0.532	0.160	0.80	1.00	1.00	1.00	1.300	1.00	1.00	1.00	2.60	1,016.2	1,909.4	0.84	49.7	311.0
+1.20D+L																	
Length = 11.0 ft	1	0.676	0.203	0.80	1.00	1.00	1.00	1.300	1.00	1.00	1.00	3.30	1,290.9	1,909.4	1.07	63.1	311.0



Wood Beam

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build: 20.23.2.14

ACC & Engineering

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
			M	V	λ	CM	C _t	CLx	C _F	C _{fu}	C _i	C _r	Mu	fb	Fb	Vu	fv	Fv
+1.20D+0.50W						1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1		0.393	0.118	0.80	1.00	1.00	1.00	1.300	1.00	1.00	1.00	1.92	750.1	1,909.4	0.62	36.7	311.0
+1.20D+0.50Lr+L+W						1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1		0.767	0.230	1.00	1.00	1.00	1.00	1.300	1.00	1.00	1.00	4.68	1,831.6	2,386.8	1.52	89.6	388.8
+1.20D+L+W						1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1		0.733	0.220	1.00	1.00	1.00	1.00	1.300	1.00	1.00	1.00	4.47	1,748.4	2,386.8	1.45	85.5	388.8
+0.90D+W						1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1		0.356	0.107	1.00	1.00	1.00	1.00	1.300	1.00	1.00	1.00	2.17	848.6	2,386.8	0.70	41.5	388.8
+0.90D						1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1		0.164	0.049	1.00	1.00	1.00	1.00	1.300	1.00	1.00	1.00	1.00	391.0	2,386.8	0.32	19.1	388.8

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750Lr+0.750L+0.450W	1	0.4225	5.540		0.0000	0.000

Maximum Deflections for Load Combinations

Load Combination	Span	Max. Downward Defl	Location in Span	Max. Upward Defl	Location in Span
D Only	1	0.1367 in	5.540 ft	0.0000 in	0.000 ft
+D+L	1	0.3790 in	5.540 ft	0.0000 in	0.000 ft
+D+Lr	1	0.1891 in	5.540 ft	0.0000 in	0.000 ft
+D+0.750Lr+0.750L	1	0.3577 in	5.540 ft	0.0000 in	0.000 ft
+D+0.750L	1	0.3184 in	5.540 ft	0.0000 in	0.000 ft
+D+0.60W	1	0.2232 in	5.540 ft	0.0000 in	0.000 ft
+D+0.750Lr+0.750L+0.450W	1	0.4225 in	5.540 ft	0.0000 in	0.000 ft
+D+0.750L+0.450W	1	0.3832 in	5.540 ft	0.0000 in	0.000 ft
+0.60D+0.60W	1	0.1685 in	5.540 ft	0.0000 in	0.000 ft
+0.60D	1	0.0820 in	5.540 ft	0.0000 in	0.000 ft
Lr Only	1	0.0524 in	5.540 ft	0.0000 in	0.000 ft
L Only	1	0.2422 in	5.540 ft	0.0000 in	0.000 ft
W Only	1	0.1440 in	5.540 ft	0.0000 in	0.000 ft

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.247	1.247
Max Upward from Load Combinations	1.247	1.247
Max Upward from Load Cases	0.715	0.715
D Only	0.404	0.404
+D+L	1.119	1.119
+D+Lr	0.558	0.558
+D+0.750Lr+0.750L	1.056	1.056
+D+0.750L	0.940	0.940
+D+0.60W	0.659	0.659
+D+0.750Lr+0.750L+0.450W	1.247	1.247
+D+0.750L+0.450W	1.131	1.131
+0.60D+0.60W	0.497	0.497
+0.60D	0.242	0.242
Lr Only	0.155	0.155
L Only	0.715	0.715
W Only	0.425	0.425

Wood Beam

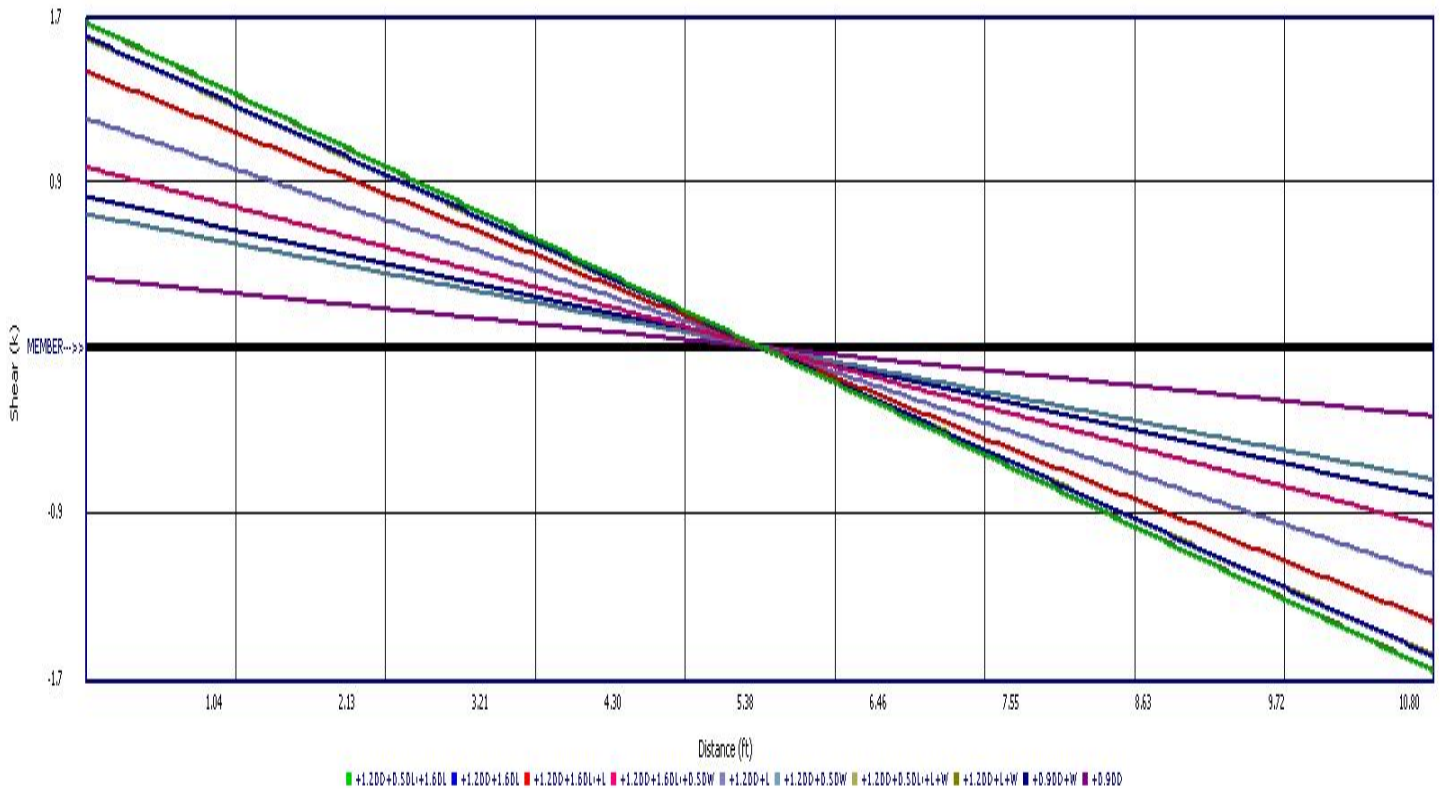
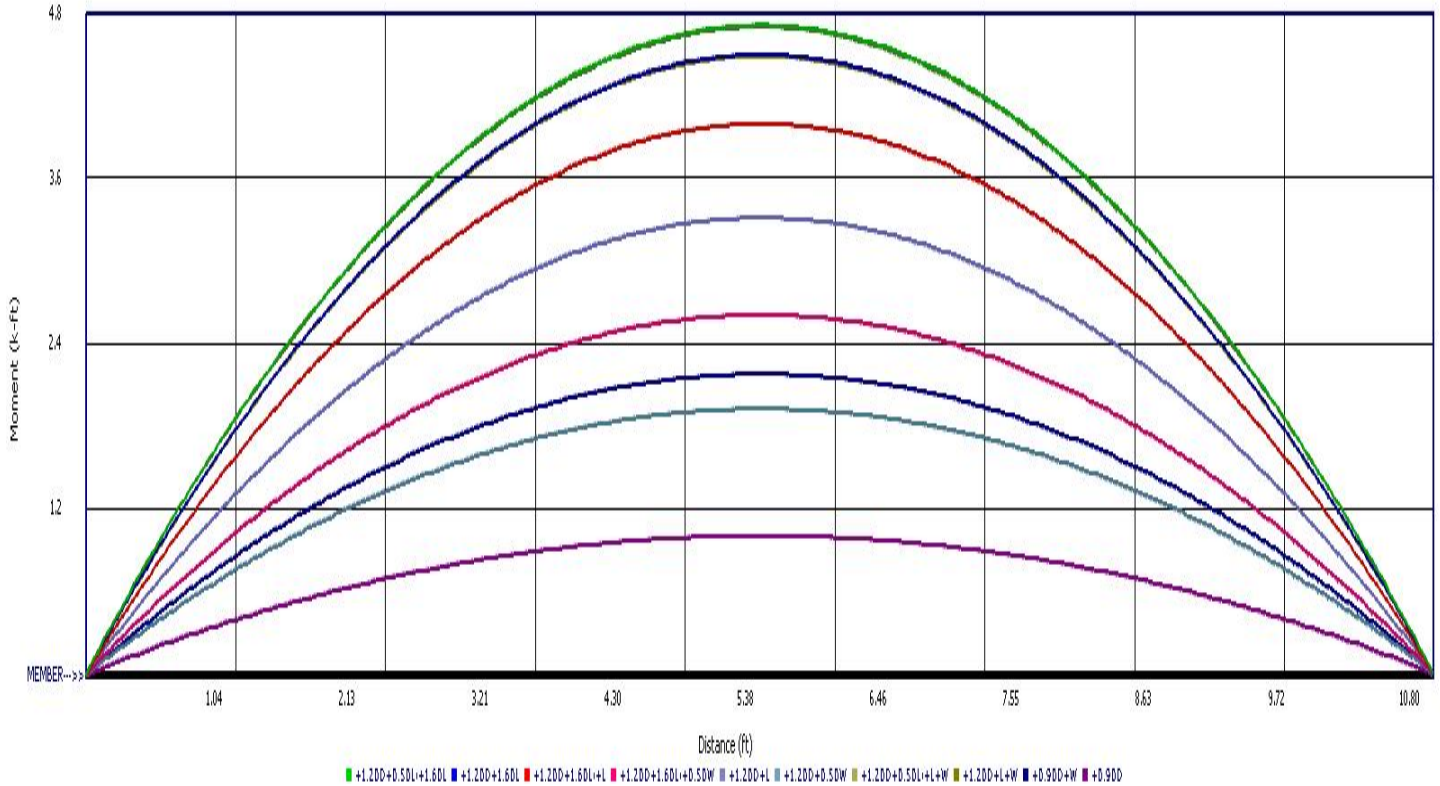
Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build: 20.23.2.14

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK



Wood Beam

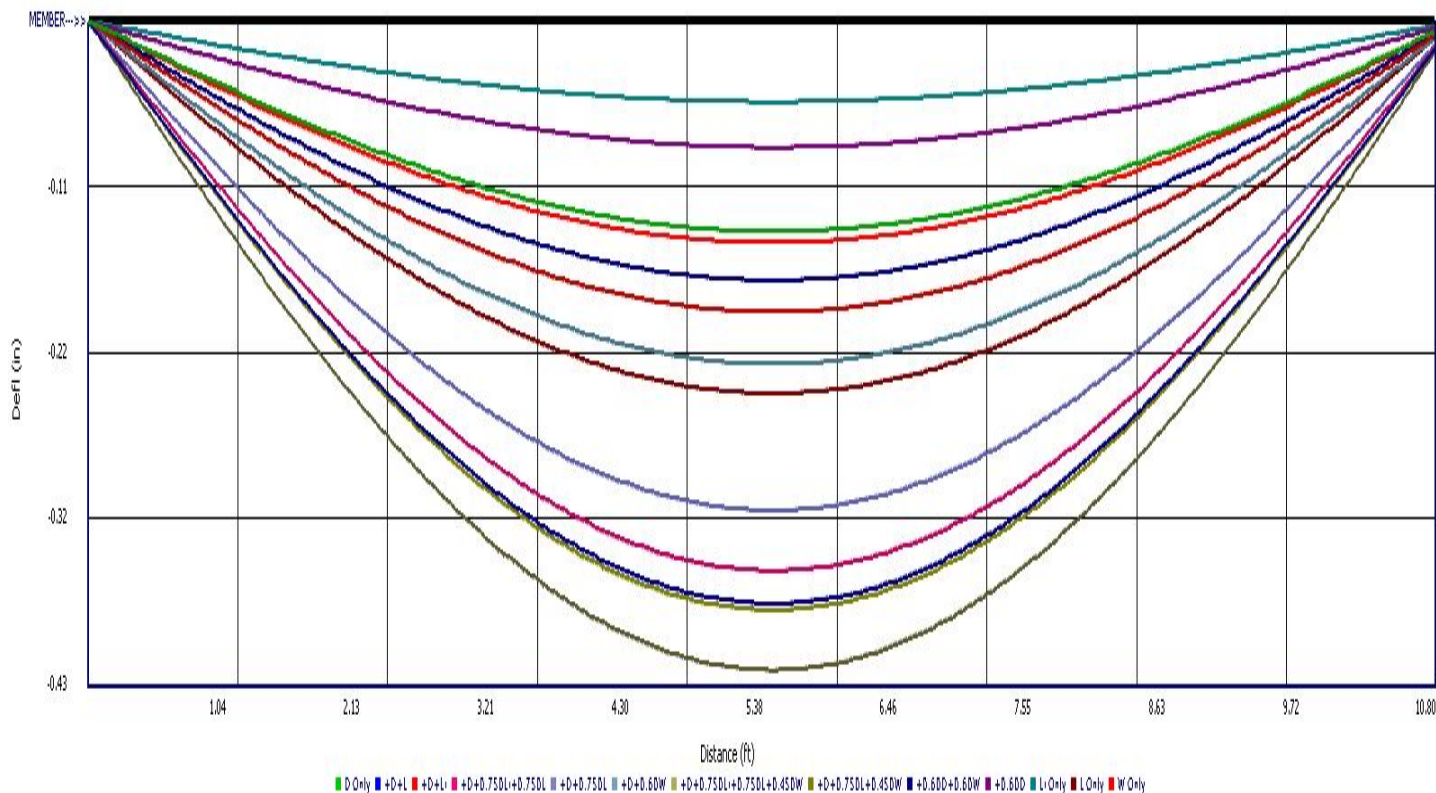
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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK



Beam Span Moments & Shears at Incremental Locations

Load Type/ Combination	Span Location (ft)	Span ID	Shear (k)	Moment (ft-k)
+1.20D+0.50Lr+1.60L	0.00	Span 1	1.706	0.000
+1.20D+0.50Lr+1.60L	1.12	Span 1	1.357	1.721
+1.20D+0.50Lr+1.60L	2.25	Span 1	1.008	3.051
+1.20D+0.50Lr+1.60L	3.37	Span 1	0.660	3.989
+1.20D+0.50Lr+1.60L	4.50	Span 1	0.311	4.534
+1.20D+0.50Lr+1.60L	5.62	Span 1	-0.037	4.688
+1.20D+0.50Lr+1.60L	6.74	Span 1	-0.386	4.450
+1.20D+0.50Lr+1.60L	7.87	Span 1	-0.735	3.821
+1.20D+0.50Lr+1.60L	8.99	Span 1	-1.083	2.799
+1.20D+0.50Lr+1.60L	10.12	Span 1	-1.432	1.385
+1.20D+1.60L	0.00	Span 1	1.628	0.000
+1.20D+1.60L	1.12	Span 1	1.296	1.643
+1.20D+1.60L	2.25	Span 1	0.963	2.913
+1.20D+1.60L	3.37	Span 1	0.630	3.808
+1.20D+1.60L	4.50	Span 1	0.297	4.329
+1.20D+1.60L	5.62	Span 1	-0.036	4.476
+1.20D+1.60L	6.74	Span 1	-0.368	4.249
+1.20D+1.60L	7.87	Span 1	-0.701	3.648
+1.20D+1.60L	8.99	Span 1	-1.034	2.672
+1.20D+1.60L	10.12	Span 1	-1.367	1.323
+1.20D+1.60Lr+L	0.00	Span 1	1.447	0.000
+1.20D+1.60Lr+L	1.12	Span 1	1.151	1.460
+1.20D+1.60Lr+L	2.25	Span 1	0.855	2.588
+1.20D+1.60Lr+L	3.37	Span 1	0.560	3.383
+1.20D+1.60Lr+L	4.50	Span 1	0.264	3.846
+1.20D+1.60Lr+L	5.62	Span 1	-0.032	3.976
+1.20D+1.60Lr+L	6.74	Span 1	-0.327	3.775
+1.20D+1.60Lr+L	7.87	Span 1	-0.623	3.240
+1.20D+1.60Lr+L	8.99	Span 1	-0.919	2.374
+1.20D+1.60Lr+L	10.12	Span 1	-1.214	1.175
+1.20D+1.60Lr+0.50W	0.00	Span 1	0.944	0.000

Wood Beam

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK

Beam Span Moments & Shears at Incremental Locations

Load Type/ Combination	Span Location (ft)	Span ID	Shear (k)	Moment (ft-k)
+1.20D+1.60Lr+0.50W	1.12	Span 1	0.751	0.953
+1.20D+1.60Lr+0.50W	2.25	Span 1	0.558	1.689
+1.20D+1.60Lr+0.50W	3.37	Span 1	0.365	2.208
+1.20D+1.60Lr+0.50W	4.50	Span 1	0.172	2.510
+1.20D+1.60Lr+0.50W	5.62	Span 1	-0.021	2.595
+1.20D+1.60Lr+0.50W	6.74	Span 1	-0.214	2.464
+1.20D+1.60Lr+0.50W	7.87	Span 1	-0.407	2.115
+1.20D+1.60Lr+0.50W	8.99	Span 1	-0.600	1.549
+1.20D+1.60Lr+0.50W	10.12	Span 1	-0.793	0.767
+1.20D+L	0.00	Span 1	1.199	0.000
+1.20D+L	1.12	Span 1	0.954	1.210
+1.20D+L	2.25	Span 1	0.709	2.145
+1.20D+L	3.37	Span 1	0.464	2.805
+1.20D+L	4.50	Span 1	0.219	3.188
+1.20D+L	5.62	Span 1	-0.026	3.297
+1.20D+L	6.74	Span 1	-0.271	3.129
+1.20D+L	7.87	Span 1	-0.517	2.687
+1.20D+L	8.99	Span 1	-0.762	1.968
+1.20D+L	10.12	Span 1	-1.007	0.974
+1.20D+0.50W	0.00	Span 1	0.697	0.000
+1.20D+0.50W	1.12	Span 1	0.555	0.703
+1.20D+0.50W	2.25	Span 1	0.412	1.247
+1.20D+0.50W	3.37	Span 1	0.270	1.630
+1.20D+0.50W	4.50	Span 1	0.127	1.853
+1.20D+0.50W	5.62	Span 1	-0.015	1.916
+1.20D+0.50W	6.74	Span 1	-0.158	1.818
+1.20D+0.50W	7.87	Span 1	-0.300	1.561
+1.20D+0.50W	8.99	Span 1	-0.443	1.144
+1.20D+0.50W	10.12	Span 1	-0.585	0.566
+1.20D+0.50Lr+L+W	0.00	Span 1	1.702	0.000
+1.20D+0.50Lr+L+W	1.12	Span 1	1.354	1.717
+1.20D+0.50Lr+L+W	2.25	Span 1	1.006	3.044
+1.20D+0.50Lr+L+W	3.37	Span 1	0.658	3.980
+1.20D+0.50Lr+L+W	4.50	Span 1	0.311	4.524
+1.20D+0.50Lr+L+W	5.62	Span 1	-0.037	4.678
+1.20D+0.50Lr+L+W	6.74	Span 1	-0.385	4.440
+1.20D+0.50Lr+L+W	7.87	Span 1	-0.733	3.812
+1.20D+0.50Lr+L+W	8.99	Span 1	-1.081	2.793
+1.20D+0.50Lr+L+W	10.12	Span 1	-1.429	1.382
+1.20D+L+W	0.00	Span 1	1.625	0.000
+1.20D+L+W	1.12	Span 1	1.293	1.640
+1.20D+L+W	2.25	Span 1	0.960	2.906
+1.20D+L+W	3.37	Span 1	0.628	3.799
+1.20D+L+W	4.50	Span 1	0.296	4.319
+1.20D+L+W	5.62	Span 1	-0.036	4.465
+1.20D+L+W	6.74	Span 1	-0.368	4.239
+1.20D+L+W	7.87	Span 1	-0.700	3.639
+1.20D+L+W	8.99	Span 1	-1.032	2.666
+1.20D+L+W	10.12	Span 1	-1.364	1.320
+0.90D+W	0.00	Span 1	0.788	0.000
+0.90D+W	1.12	Span 1	0.627	0.796
+0.90D+W	2.25	Span 1	0.466	1.410
+0.90D+W	3.37	Span 1	0.305	1.844
+0.90D+W	4.50	Span 1	0.144	2.096
+0.90D+W	5.62	Span 1	-0.017	2.167
+0.90D+W	6.74	Span 1	-0.178	2.057
+0.90D+W	7.87	Span 1	-0.340	1.766
+0.90D+W	8.99	Span 1	-0.501	1.294
+0.90D+W	10.12	Span 1	-0.662	0.640
+0.90D	0.00	Span 1	0.363	0.000
+0.90D	1.12	Span 1	0.289	0.367
+0.90D	2.25	Span 1	0.215	0.650
+0.90D	3.37	Span 1	0.141	0.850
+0.90D	4.50	Span 1	0.066	0.966
+0.90D	5.62	Span 1	-0.008	0.999
+0.90D	6.74	Span 1	-0.082	0.948



Wood Beam

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build: 20.23.2.14

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK

Beam Span Moments & Shears at Incremental Locations

Load Type/ Combination	Span Location (ft)	Span ID	Shear (k)	Moment (ft-k)
+0.90D	7.87	Span 1	-0.156	0.814
+0.90D	8.99	Span 1	-0.231	0.596
+0.90D	10.12	Span 1	-0.305	0.295

Beam Span Deflections at Incremental Locations

Load Type/ Combination	Span Location (ft)	Span ID	Deflection (in)
Overall MAXimum Envelope	0.00	Span 1	0.000
Overall MAXimum Envelope	1.12	Span 1	0.135
Overall MAXimum Envelope	2.25	Span 1	0.255
Overall MAXimum Envelope	3.37	Span 1	0.348
Overall MAXimum Envelope	4.50	Span 1	0.405
Overall MAXimum Envelope	5.62	Span 1	0.422
Overall MAXimum Envelope	6.74	Span 1	0.398
Overall MAXimum Envelope	7.87	Span 1	0.333
Overall MAXimum Envelope	8.99	Span 1	0.235
Overall MAXimum Envelope	10.12	Span 1	0.111
Overall MAXimum Envelope	11.00	Span 1	0.005
D Only	0.00	Span 1	0.000
D Only	1.12	Span 1	0.044
D Only	2.25	Span 1	0.082
D Only	3.37	Span 1	0.112
D Only	4.50	Span 1	0.131
D Only	5.62	Span 1	0.137
D Only	6.74	Span 1	0.129
D Only	7.87	Span 1	0.108
D Only	8.99	Span 1	0.076
D Only	10.12	Span 1	0.036
D Only	11.00	Span 1	0.002
+D+L	0.00	Span 1	0.000
+D+L	1.12	Span 1	0.121
+D+L	2.25	Span 1	0.228
+D+L	3.37	Span 1	0.312
+D+L	4.50	Span 1	0.363
+D+L	5.62	Span 1	0.379
+D+L	6.74	Span 1	0.357
+D+L	7.87	Span 1	0.299
+D+L	8.99	Span 1	0.211
+D+L	10.12	Span 1	0.100
+D+L	11.00	Span 1	0.004
+D+Lr	0.00	Span 1	0.000
+D+Lr	1.12	Span 1	0.060
+D+Lr	2.25	Span 1	0.114
+D+Lr	3.37	Span 1	0.156
+D+Lr	4.50	Span 1	0.181
+D+Lr	5.62	Span 1	0.189
+D+Lr	6.74	Span 1	0.178
+D+Lr	7.87	Span 1	0.149
+D+Lr	8.99	Span 1	0.105
+D+Lr	10.12	Span 1	0.050
+D+Lr	11.00	Span 1	0.002
+D+0.750Lr+0.750L	0.00	Span 1	0.000
+D+0.750Lr+0.750L	1.12	Span 1	0.114
+D+0.750Lr+0.750L	2.25	Span 1	0.216
+D+0.750Lr+0.750L	3.37	Span 1	0.294
+D+0.750Lr+0.750L	4.50	Span 1	0.343
+D+0.750Lr+0.750L	5.62	Span 1	0.358
+D+0.750Lr+0.750L	6.74	Span 1	0.337
+D+0.750Lr+0.750L	7.87	Span 1	0.282
+D+0.750Lr+0.750L	8.99	Span 1	0.199
+D+0.750Lr+0.750L	10.12	Span 1	0.094
+D+0.750Lr+0.750L	11.00	Span 1	0.004



Wood Beam

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build:20.23.2.14

ACC & Engineering

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK

Beam Span Deflections at Incremental Locations

Load Type/ Combination	Span Location (ft)	Span ID	Deflection (in)
+D+0.750L	0.00	Span 1	0.000
+D+0.750L	1.12	Span 1	0.102
+D+0.750L	2.25	Span 1	0.192
+D+0.750L	3.37	Span 1	0.262
+D+0.750L	4.50	Span 1	0.305
+D+0.750L	5.62	Span 1	0.318
+D+0.750L	6.74	Span 1	0.300
+D+0.750L	7.87	Span 1	0.251
+D+0.750L	8.99	Span 1	0.177
+D+0.750L	10.12	Span 1	0.084
+D+0.750L	11.00	Span 1	0.004
+D+0.60W	0.00	Span 1	0.000
+D+0.60W	1.12	Span 1	0.071
+D+0.60W	2.25	Span 1	0.134
+D+0.60W	3.37	Span 1	0.184
+D+0.60W	4.50	Span 1	0.214
+D+0.60W	5.62	Span 1	0.223
+D+0.60W	6.74	Span 1	0.210
+D+0.60W	7.87	Span 1	0.176
+D+0.60W	8.99	Span 1	0.124
+D+0.60W	10.12	Span 1	0.059
+D+0.60W	11.00	Span 1	0.003
+D+0.750Lr+0.750L+0.450W	0.00	Span 1	0.000
+D+0.750Lr+0.750L+0.450W	1.12	Span 1	0.135
+D+0.750Lr+0.750L+0.450W	2.25	Span 1	0.255
+D+0.750Lr+0.750L+0.450W	3.37	Span 1	0.348
+D+0.750Lr+0.750L+0.450W	4.50	Span 1	0.405
+D+0.750Lr+0.750L+0.450W	5.62	Span 1	0.422
+D+0.750Lr+0.750L+0.450W	6.74	Span 1	0.398
+D+0.750Lr+0.750L+0.450W	7.87	Span 1	0.333
+D+0.750Lr+0.750L+0.450W	8.99	Span 1	0.235
+D+0.750Lr+0.750L+0.450W	10.12	Span 1	0.111
+D+0.750Lr+0.750L+0.450W	11.00	Span 1	0.005
+D+0.750L+0.450W	0.00	Span 1	0.000
+D+0.750L+0.450W	1.12	Span 1	0.122
+D+0.750L+0.450W	2.25	Span 1	0.231
+D+0.750L+0.450W	3.37	Span 1	0.315
+D+0.750L+0.450W	4.50	Span 1	0.367
+D+0.750L+0.450W	5.62	Span 1	0.383
+D+0.750L+0.450W	6.74	Span 1	0.361
+D+0.750L+0.450W	7.87	Span 1	0.302
+D+0.750L+0.450W	8.99	Span 1	0.213
+D+0.750L+0.450W	10.12	Span 1	0.101
+D+0.750L+0.450W	11.00	Span 1	0.004
+0.60D+0.60W	0.00	Span 1	0.000
+0.60D+0.60W	1.12	Span 1	0.054
+0.60D+0.60W	2.25	Span 1	0.102
+0.60D+0.60W	3.37	Span 1	0.139
+0.60D+0.60W	4.50	Span 1	0.162
+0.60D+0.60W	5.62	Span 1	0.168
+0.60D+0.60W	6.74	Span 1	0.159
+0.60D+0.60W	7.87	Span 1	0.133
+0.60D+0.60W	8.99	Span 1	0.094
+0.60D+0.60W	10.12	Span 1	0.044
+0.60D+0.60W	11.00	Span 1	0.002
+0.60D	0.00	Span 1	0.000
+0.60D	1.12	Span 1	0.026
+0.60D	2.25	Span 1	0.049
+0.60D	3.37	Span 1	0.067
+0.60D	4.50	Span 1	0.079
+0.60D	5.62	Span 1	0.082



Wood Beam

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build:20.23.2.14

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DESCRIPTION: EXISTING 4X8 WOOD BEAM LOAD CHECK

Beam Span Deflections at Incremental Locations

Load Type/ Combination	Span Location (ft)	Span ID	Deflection (in)
+0.60D	6.74	Span 1	0.077
+0.60D	7.87	Span 1	0.065
+0.60D	8.99	Span 1	0.046
+0.60D	10.12	Span 1	0.022
+0.60D	11.00	Span 1	0.001
Lr Only	0.00	Span 1	0.000
Lr Only	1.12	Span 1	0.017
Lr Only	2.25	Span 1	0.032
Lr Only	3.37	Span 1	0.043
Lr Only	4.50	Span 1	0.050
Lr Only	5.62	Span 1	0.052
Lr Only	6.74	Span 1	0.049
Lr Only	7.87	Span 1	0.041
Lr Only	8.99	Span 1	0.029
Lr Only	10.12	Span 1	0.014
Lr Only	11.00	Span 1	0.001
L Only	0.00	Span 1	0.000
L Only	1.12	Span 1	0.077
L Only	2.25	Span 1	0.146
L Only	3.37	Span 1	0.199
L Only	4.50	Span 1	0.232
L Only	5.62	Span 1	0.242
L Only	6.74	Span 1	0.228
L Only	7.87	Span 1	0.191
L Only	8.99	Span 1	0.135
L Only	10.12	Span 1	0.064
L Only	11.00	Span 1	0.003
W Only	0.00	Span 1	0.000
W Only	1.12	Span 1	0.046
W Only	2.25	Span 1	0.087
W Only	3.37	Span 1	0.118
W Only	4.50	Span 1	0.138
W Only	5.62	Span 1	0.144
W Only	6.74	Span 1	0.136
W Only	7.87	Span 1	0.114
W Only	8.99	Span 1	0.080
W Only	10.12	Span 1	0.038
W Only	11.00	Span 1	0.002



Wood Column

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build: 20.23.2.14

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DESCRIPTION: EXISTING 4X4 WOOD POST CHECK

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Analysis Method	Load Resistance Factor Design			Wood Section Name	4x4	
End Fixities	Top Fixed, Bottom Fixed			Wood Grading/Manuf.	Graded Lumber	
Overall Column Height	9 ft			Wood Member Type	Sawn	
(Used for non-slender calculations)						
Wood Species				Exact Width	3.50 in	Allow Stress Modification Factors
Wood Grade				Exact Depth	3.50 in	Cf or Cv for Bending 1.0
Fb +	1,500.0 psi	Fv	150.0 psi	Area	12.250 in^2	Cf or Cv for Compression 1.0
Fb -	1,500.0 psi	Ft	1,000.0 psi	Ix	12.505 in^4	Cf or Cv for Tension 1.0
Fc - Prll	1,000.0 psi	Density	33.0 pcf	Iy	12.505 in^4	Cm : Wet Use Factor 1.0
Fc - Perp	1,000.0 psi					Ct : Temperature Fact 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial			Cfu : Flat Use Factor 1.0
	Basic	1,400.0	1,400.0	1,400.0 ksi	Kf : Built-up columns 1.0 NDS 15.3.2	
	Minimum	1,400.0	1,400.0			Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :						
				X-X (width) axis :	Fully braced against buckling ABOUT Y-Y Axis	
				Y-Y (depth) axis :	Fully braced against buckling ABOUT X-X Axis	

Applied Loads

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

Column self weight included : 25.266 lbs * Dead Load Factor

AXIAL LOADS . . .

EXISTING BEAM REACTION AT SUPPORT ONE: Axial Load at 9.0 ft, D = 1.247 k

ADDED LOAD FROM NEW PATIO: Axial Load at 9.0 ft, D = 3.20, L = 0.010, W = 0.020 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2040 : 1**

Load Combination	+1.20D+L+W
Governing NDS Formula	Comp Only, f_c/F_c'
Location of max. above base	0.0 ft
At maximum location values are .	
Applied Axial	5.397 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	2,160.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y	0.0 in	at	0.0 ft	above base
for load combination : n/a				
Along X-X	0.0 in	at	0.0 ft	above base
for load combination : n/a				

Other Factors used to calculate allowable stresses . . .

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.90D
Location of max. above base	0.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	0.0 psi

	Bending	Compression	Tension
LRFD - Format Conversion factor	2.541	2.400	2.700
LRFD - Resistance factor	0.850	0.900	0.800

Load Combination Results

Load Combination	Lambda	Cp	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+1.20D+1.60L	0.000	1.000	0.2034	PASS	0.0 ft	0.0	PASS	0.0 ft
+1.20D+L	0.000	1.000	0.2032	PASS	0.0 ft	0.0	PASS	0.0 ft
+1.20D+0.50W	0.000	1.000	0.2032	PASS	0.0 ft	0.0	PASS	0.0 ft
+1.20D+L+W	0.000	1.000	0.2040	PASS	0.0 ft	0.0	PASS	0.0 ft
+0.90D+W	0.000	1.000	0.1529	PASS	0.0 ft	0.0	PASS	0.0 ft
+0.90D	0.000	1.000	0.1521	PASS	0.0 ft	0.0	PASS	0.0 ft

Wood Column

Project File: 332 SEQUOIA AVE PATIO COVER.ec6

LIC# : KW-06018864, Build: 20.23.2.14

ACC & Engineering

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DESCRIPTION: EXISTING 4X4 WOOD POST CHECK

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
D Only						4.472					
+D+L						4.482					
+D+0.750L						4.480					
+D+0.60W						4.484					
+D+0.750L+0.450W						4.489					
+0.60D+0.60W						2.695					
+0.60D						2.683					
L Only						0.010					
W Only						0.020					

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.60W	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.450W	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D+0.60W	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000ft	0.000 in	0.000 ft
W Only	0.0000 in	0.000ft	0.000 in	0.000 ft

Sketches

