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STRUCTURAL CALCULATION REPORT

CITY OF ANAHEIM
ROOF TOP HVAC COMPONENTS SUPPORT

STRUCTURAL ANALYSIS

FOR PROJECT

ANAHEIM MEAT MARKET

PROJECT ADDRESS

521 S BROOKHURST ST, ANAHEIM, CA 92804

PER

PER ASCE 7-22

IF THE LOAD INCREASE RESULT FROM HVAC COMPONENTS ADDITIONS EXCEED 5% OF THE TOTAL LOAD BEFORE THE ADDITION. THE EXISITING BUILDING TO BE ANALYZED BY CHECKING THE EXISTING RESISTING SYSTEM AGAINST ANY ADDED WEIGHT & REINFORCE STRUCTURE RESISTING SYSTEM ACCORDINGLY, BOTH EXISTING AND NEW SYSTEM SHALL RESIST THE SEISMIC FORCES AND/OR ANY OTHER LATERAL FORCES PER ASCE-7-22.

AFFILIATIONS

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS
CONTRACTORS STATE LICENSE BOARD
SEI STRUCTURAL ENGINEERING INSTITUTE
AWS American Welding Society

DESIGN BY: BEN HAMED, AM.ASCE.,AIA.
REVIEW BY: MOSTAFA BAYOUMI, P.E.

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ASCE Hazards Report

Address:
521 S Brookhurst St
Anaheim, California
92804

Standard: ASCE/SEI 7-22
Risk Category: II
Soil Class: Default

Latitude: 33.82547
Longitude: -117.959444
Elevation: 108.2205744440294 ft (NAVD 88)

Wind

Results:

Wind Speed	95 Vmph
10-year MRI	66 Vmph
25-year MRI	72 Vmph
50-year MRI	76 Vmph
100-year MRI	81 Vmph
300-year MRI	89 Vmph
700-year MRI	95 Vmph
1,700-year MRI	101 Vmph
3,000-year MRI	106 Vmph
10,000-year MRI	115 Vmph
100,000-year MRI	132 Vmph
1,000,000-year MRI	151 Vmph

Data Source: ASCE/SEI 7-22, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Sun Jun 23 2024

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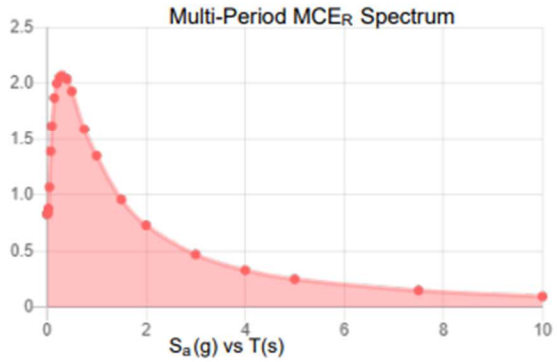
Seismic

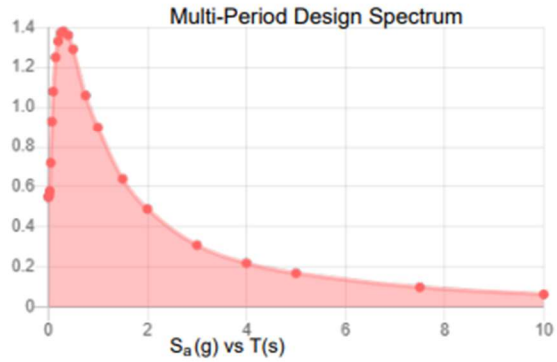
Site Soil Class: Default

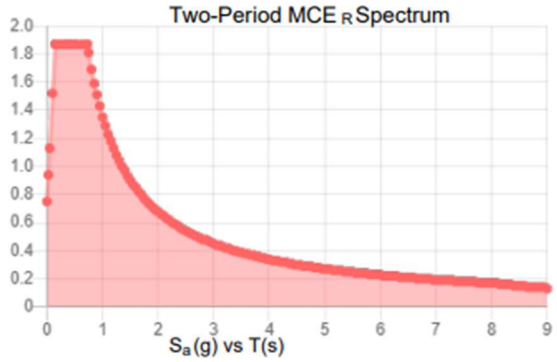
Results:

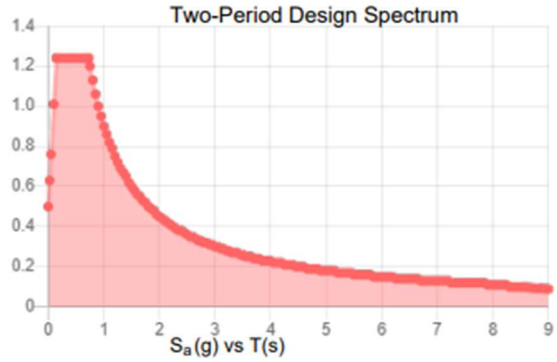
PGA_M :	0.73	T_L :	8
S_{MS} :	1.87	S_S :	1.66
S_{M1} :	1.35	S_1 :	0.65
S_{DS} :	1.24	V_{S30} :	260
S_{D1} :	0.9		

Seismic Design Category: D









MCER 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.

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BUILDING LOAD CALCULATION

DEAD LOAD			LIVE LOAD		
LEVEL	**SOURCE**	**LOAD** (P.S.F)	**LEVEL**	**SOURCE**	**LOAD**
FLOOR & ROOF	PLYWOOD MATERIALS WEIGHT	2.5 P.S.F	ROOF	LIVE LOAD	20 P.S.F
FLOOR & ROOF	INSULATION MATERIALS WEIGHT	1.5 P.S.F	FLOOR	LIVE LOAD	40 P.S.F
FLOOR & ROOF	GYPSUM BOARD MATERIALS WEIGHT	2.7 P.S.F	ROOF	MECHANICAL UNITS WEIGHT	782 LBS
FLOOR & ROOF	FLOORING MATERIALS WEIGHT	2.5 P.S.F	ROOF	MUA UNIT	45 LBS
FLOOR & ROOF	FRAMING MATERIALS WEIGHT	4 P.S.F			
FLOOR & ROOF	MISC.LEVEL	1.8 P.S.F			
TOTAL	DEAD LOAD	20 P.S.F			

- BUILDINC WEIGHT CONTRIBUTING TO SEISMIC = 3900 SQ.FT X 20 P.S.F = 78000 LBS =78 KIP

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	SEISMIC DESIGN CRITERIA & PARAMETERS PER ASCE 7-22		
	Site Classification= (Default)	D	ASCE 7-22 Section 11.4.2
	Risk Category=	II	ASCE 7-22 Table 1.5-1
	Seismic Design Category=	SDC	ASCE 7-22 Section 11.6
	Importance Factor= I=	1	ASCE 7-22 Section 11.5 Table 1.5-2
	Response Modification Factor R=	5	ASCE 7-22 Table 12.2-1 (Existing building system)
	System Overstrength Factor Ω_o=	1.25	ASCE 7-22 Table 12.2-1
	Deflection Amplification Factor C_d=	1.25	ASCE 7-22 Table 12.2-1
	Rho Factor (ρ) ρ=	1.3	ASCE 7-22 Section 12.3.4.2 Reliability Redundancy Facto
	Approximate Fundamental Period T =	0.4	ASCE 7-22 Section 12.8-2
	Long Period T_L=	8	ASCE 7-22 Figure 22-14 to 22-17 ASCE 7 Hazard Report
	Spectral Response Short Period S_s=	1.57	ASCE 7-22 Chapter 22 ASCE 7 Hazard Report
	Spectral Response Long Period S_1=	0.6	ASCE 7-22 Chapter 22 ASCE 7 Hazard Report
	Short Period Site Coefficient F_a=	1. 1	ASCE 7-22 Section 11.4.4 Site Coefficients MCER
	Long Period Site Coefficient F_V=	2.5	ASCE 7-22 Section 11.4.4 Site Coefficients MCER
	Spectral Response Accelerations Short S_{MS}=F_aS_s=	1.13	ASCE 7-22 Section 11.4.4 Site Coefficients MCE_R
	Spectral Response Accelerations Long S_{M1}=F_VS_1=	1.52	ASCE 7-22 Section 11.4.4 Site Coefficients MCER
	Spectral Response Short Period **S_{DS}=**	**1.13**	ASCE 7-22 Section 11.4.5 Design Spectral Acceleration.
	Spectral Response Long Period S_{D1}=	1.01	ASCE 7-16 Section 11.4.5 Design Spectral Acceleration
	$T_s = (S_{D1} / S_{DS})$ T_s=	0.1452	ASCE 7-22 Section 11.4.6
	Coefficient as determined from table 12.8-2 C_t=	0.02	ASCE 7-22 table 12.8-2
	Structural Height as defined in section 11.2 h_n =	16	ASCE 7-22 table 12.8-2
	Coefficient as determined from table 12.8-2 x =	0.75	ASCE 7-22 Section 12.8-2
	Approximate Fundamental Period $T_a = (Ct * h_n^x)$ =	.0144	ASCE 7-22 Section 12.8-8
	Seismic Response Coefficient CS =	**0.254**	ASCE 7-22 Eq. 12.8-2 Seismic Response Coefficient
	Maximum Seismic Response Coefficient C_{Smax} =		ASCE 7-22 Eq. 12.8-3 Maximum
	Minimum Seismic Response Coefficient		ASCE 7-22 Eq. 12.8-5 or 12.8-6 Minimum
	*Site specific ground motion analysis is not required per ASCE 7-22 Section 11.4.8 Exception 2 Seismic Design Category specified from Table 11.4-2		

- $C_t = 0.02$ (updated coefficient)
- $x = 0.75$ (exponent for height)
- $h_n = 14$ feet (total height of the building)

$T_a = 0.02 \times 7.26$

$T_a \approx 0.1452$

From the formula:

$$T_a = C_t \times h_n^x$$

Substituting the values:

$$T_a = 0.02 \times (14^{0.75})$$

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LOADS INCREASE CHECK

Total Dead Load Calculation:

$$D = 20\,\text{psf} \times 3900\,\text{sq ft} = 78,000\,\text{pounds}$$

- Spectral Response Acceleration for short period, $SDS = 1.13$
- Response Modification Factor, $R = 5$
- Importance Factor, $I = 1$
- Site Classification: D
- Risk Category: II
- Seismic Design Category: SDC
- Approximate Fundamental Period: $T = 0.4$

According to ASCE 7-22, Equation 12.8-2 for the seismic response coefficient C_s is:

$$C_s = \frac{S_{DS}}{R/I} \qquad C_s = \frac{1.13}{5/1} = 0.226$$

The seismic base shear V is given by:

$$V = C_s \times W$$

Where W is the total seismic weight (D):

$$V = 0.226 \times 78,000\,\text{pounds} = 17,628\,\text{pounds}$$

Comparison of Seismic Loads

Original Seismic Base Shear:

$$V = 17,628\,\text{pounds}$$

New Seismic Base Shear (with 60-pound addition):

$$V_{new} = 17,641.56\,\text{pounds}$$

Percentage Increase:

$$\%\ \text{Increase} = \frac{V_{new} - V}{V} \times 100$$

$$\%\ \text{Increase} = \frac{17,641.56 - 17,628}{17,628} \times 100 \approx 0.077\%$$

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MECHANICAL EQUIPMENT LOAD CALCULATION PER ASCE 7-22

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Design Engineer by : Ben Hamed
Structural Hand Calculation Sheet

PROJECT: Meat market Anaheim

Roof support HVAC members

* Notes: New make up air unit to be Installed on existing Roof, check to see if load exceeds 5% of existing load ⟹ 45 lbs is negdectable.
- check over turning forces due to siesmic ⟹ o.k
- check connection to match attachment detail ⟹ o.k

over turning

$$F_p = \frac{0.4\,(a_p)\,S_{DS}\,(W_p)\,\times\,(1+2/h)}{R_p/I_p}$$

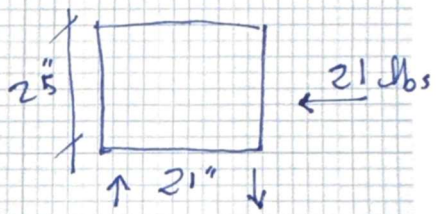
$a_p = 1$ $S_{DS} = 1$

W_p = 45 + say 15 curb = 60 lbs

$R_p = 2.5$ & $I = 1$

z = 14' building heigh + 12" curb height + 13/2 M.A unit C.G = 15.5'

$F_p = 20.2 \simeq 21$ lbs



$M_{OT} = \frac{21\text{ lbs}\,(2.1')}{1.75}$

= 25.2 lbs anchorage applied at both ends

25.2/2 = 13 lbs

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Design Engineer by : Ben Hamed
Structural Hand Calculation Sheet
PROJECT: Meat market anaheim

Connection Design N.D.S

- try 2 ¼" lag screw at each end (corner)

withdrawl value assume Douglas Fir

$W = 218$ lb/in ⟶ Table $G = .49$

$W' = W \times C_M C_t C_{fg} C_{tN} K_F \phi_2 \lambda$ 11.2 A

$C_M = 1$ Table 10.3.3

$C_t = 1$ Table 10.3.4

$C_{fG} = .98$ Table 10.3.6

$C_{TN} = 1$ 11.5.4

$K_F = 2.16/\phi$ Table N_1

$\phi = .65$ Table N_2

$\lambda = .6$ Table N_3

$\therefore W' = 218 \times 1(1)(.98)(1)$
$(216)(.65)(.6) = 180$ lb/in per screw

25.2 lbs < 180 lb

O.K #

Assuming The compression side Take The shear Force and The Tension side Takes The uplift Force
4" lag screws on plan are good

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4X4 WOOD BLOCKING BETWEEN TRUSSES MEMBER LOAD CHECK

Wood Beam

Project File: MEAT MARKET.ec6

LIC# : KW-06018864, Build:20.24.01.31 ACC & Engineering

DESCRIPTION: WOOD BLOCKING LOAD CHECK

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Load Resistance Factor D
Load Combination : IBC 2021

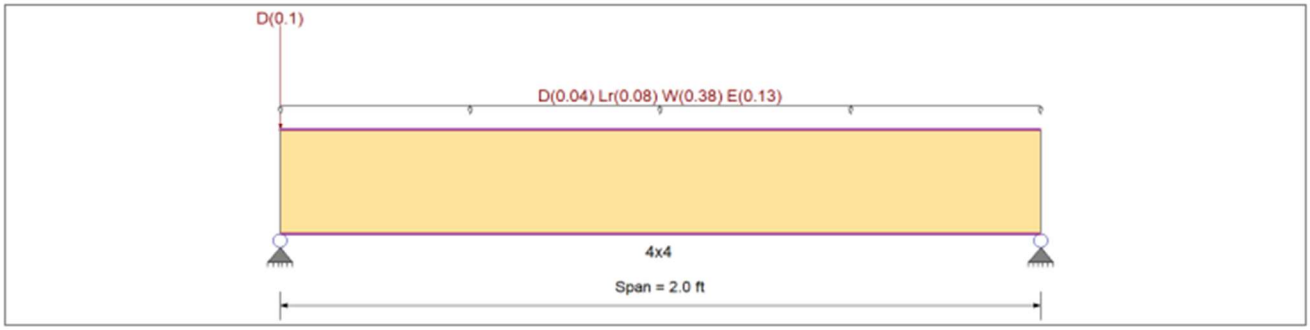
Wood Species : Douglas Fir-South
Wood Grade : No.2

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

Fb +	850 psi
Fb -	850 psi
Fc - Prll	1350 psi
Fc - Perp	520 psi
Fv	180 psi
Ft	525 psi

E : Modulus of Elasticity

Ebend- xx	1200 ksi
Eminbend - xx	440 ksi
Density	28.72 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Point Load : D = 0.10 k @ 0.0 ft, (MAKE UP AIR UNIT WEIGHT)
Uniform Load : D = 0.020, Lr = 0.040, W = 0.190, E = 0.0650 ksf, Tributary Width = 2.0 ft, (MAKE UP AIR UNIT AT 4 SQ.FT TR

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.144 : 1	Maximum Shear Stress Ratio	=	0.106 : 1
Section used for this span		4x4	Section used for this span		4x4
fb: Actual	=	395.42 psi	fv: Actual	=	41.25 psi
F'b	=	2,754.00 psi	F'v	=	388.80 psi
Load Combination		+1.20D+0.50Lr+W	Load Combination		+1.20D+0.50Lr+W
Location of maximum on span	=	1.000 ft	Location of maximum on span	=	1.715 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.009 in	Ratio =	2617 >=360	Span: 1 : W Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.007 in	Ratio =	3637 >=180	Span: 1 : +D+0.750Lr+0.450W
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	λ	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values Mu	fb	Fb	Shear Values Vu	fv	Fv
+1.40D														0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.030	0.022	0.60	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.03	49.9	1,652.4	0.04	5.2	233.3
+1.20D+0.50Lr					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.035	0.026	0.80	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.05	76.4	2,203.2	0.07	8.0	311.0
+1.20D					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.019	0.014	0.80	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.03	42.8	2,203.2	0.04	4.5	311.0
+1.20D+1.60Lr					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.068	0.050	0.80	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.09	150.2	2,203.2	0.13	15.7	311.0
+1.20D+1.60Lr+0.50W					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.141	0.104	0.80	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.18	309.8	2,203.2	0.26	32.3	311.0

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Wood Beam

Project File: MEAT MARKET.ec6

DESCRIPTION: WOOD BLOCKING LOAD CHECK

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	λ	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values Mu	fb	Fb	Shear Values Vu	fv	Fv
+1.20D+0.50W					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.092	0.068	0.80	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.12	202.3	2,203.2	0.17	21.1	311.0
+1.20D+0.50Lr+W					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.144	0.106	1.00	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.24	395.4	2,754.0	0.34	41.2	388.8
+1.20D+W					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.131	0.097	1.00	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.22	361.8	2,754.0	0.31	37.7	388.8
+1.20D+E					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.055	0.041	1.00	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.09	151.9	2,754.0	0.13	15.8	388.8
+0.90D+W					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.128	0.094	1.00	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.21	351.1	2,754.0	0.30	36.6	388.8
+0.90D+E					1.00	1.00	1.00	1.500	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.051	0.038	1.00	1.00	1.00	1.00	1.500	1.00	1.00	1.00	0.08	141.2	2,754.0	0.12	14.7	388.8

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
W Only	1	0.0092	1.007		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.380	0.380
Max Upward from Load Combinations	0.373	0.273
Max Upward from Load Cases	0.380	0.380
D Only	0.142	0.042
+D+Lr	0.222	0.122
+D+0.750Lr	0.202	0.102
+D+0.60W	0.370	0.270
+D+0.70E	0.233	0.133
+D+0.750Lr+0.450W	0.373	0.273
+D+0.450W	0.313	0.213
+D+0.5250E	0.211	0.111
+0.60D+0.60W	0.313	0.253
+0.60D+0.70E	0.176	0.116
Lr Only	0.080	0.080
W Only	0.380	0.380
E Only	0.130	0.130

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END OF REPORT

REGARDS

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REVIEW BY : M.BAYOUMI, P.E.,ASCE.