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BARNETT ADDITION
7530 86TH AVE SE, MERCER ISLAND, WA 98040
RESPONSE TO CITY COMMENTS

PROJECT NO: 20201 DATE:10/26/21
PREPARED BY: BASRI BASRI PE, SE

Project Description

5. Please provide method to resolve lateral forces along this line. If the diaphragm is intended to cantilever, please provide a method to resolve rotational force resultant.
RESPONSE: THERE ARE (4) CANTILEVER 6X6 POSTS WITH SIMPSON RIGID POST BASE (MPB66Z) TO RESIST LATERAL FORCES ALONG THIS LINE. PLEASE SEE ATTACHED CALCULATIONS FOR POST, BASE AND FOOTING. PLEASE SEE ALSO UPDATED STRUCTURAL DRAWINGS.

6. Please revise beam design for tributary width of 15' (approximately 750 plf). Beam design B1-1 rev has the correct loading, but not the correct beam span. Beam design B1-1 has the correct span, but the wrong loading. Please confirm no roof load is supported along this line, i.e., roof framing is open web trusses bearing on the exterior walls.
RESPONSE: PLEASE SEE ATTACHED BEAM CALCULATIONS USING W10X22 STEEL BEAM OR 5.125X16.5 GLULAM BEAM

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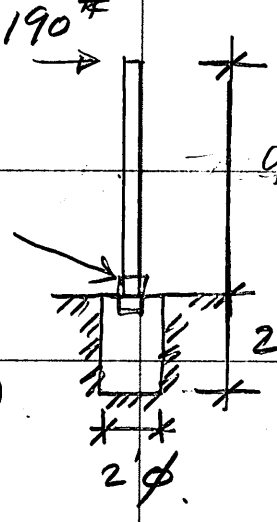
Job No: 20201
Project Name: BARNETT ADDITION
Sheet No:
Sheet Title:
Made By: BB Revision:
Date: 10/26/21

ROOF CANOPY SEISMIC DESIGN
E = SEISMIC OF CANOPY ROOF (462 SF)
E = 2.1^k (SEE ATTACHED SEISMIC CALCULATION)

SEISMIC FORCE (SERVICE LEVEL) = $\frac{2.1}{1.4}$ = 1.5^k.
SEISMIC ALONG OUTSIDE EDGE = 1.5^k/2 = 0.75^k
NUMBER OF COLUMNS W/ RIGID BASE = 4.

SEISMIC FORCE AT EACH COLUMN =
= 0.75^k $\times \frac{1}{4}$ = 0.19^k = 190$^\#$



SIMPSON MPBZ 6X6 POST BASE (MPB66Z)

PLEASE SEE ATTACHED CALCULATION
6X6 POST IS SUFFICIENT
2'ϕ X 2'-6" DEEP IS OK
BENDING CAPACITY OF MBP66Z = 2795 LB-FT
MOMENT = 190$^\#$ x 9'.
= 1710 LB-FT OK

CANTILEVER POST 6X6 DESIGN

Project: BARNETT ADDITION

Location: CANTILEVER POST
Column
[2015 International Building Code(2012 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 12.4%

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CAUTIONS
* This column has been designed as a cantilever.
* Note that the length of the column inputed should include the portion of the column below grade above the point of fixity. See IBC 1805.7 for lateral soil bearing calculations.

DEFLECTIONS

Deflection due to lateral loads only:	Defl = 0.8 IN = L/135	
Live Load Deflection Criteria:	L/120	

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	1000	lb
Dead Load:	Vert-DL-Rxn =	59	lb
Total Load:	Vert-TL-Rxn =	1059	lb

HORIZONTAL REACTIONS

Total Reaction at Top of Column:	TL-Rxn-Top =	0	lb
Total Reaction at Bottom of Column:	TL-Rxn-Bottom =	189	lb

COLUMN DATA

Total Column Length:	9	ft
Unbraced Length (X-Axis) Lx:	9	ft
Unbraced Length (Y-Axis) Ly:	9	ft
Column End Condtion-K (e):	2.1	
Axial Load Duration Factor	1.00	
Lateral Load Duration Factor (Wind/Seismic)	1.60	

COLUMN PROPERTIES
#2 - Douglas-Fir-Larch

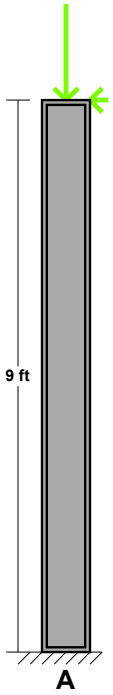
	Base Values	Adjusted
Compressive Stress:	Fc = 700 psi	Fc' = 217 psi
	Cd=1.60 Cp=0.19	
Bending Stress (X-X Axis):	Fbx = 750 psi	Fbx' = 1200 psi
	Cd=1.60 CF=1.00	
Bending Stress (Y-Y Axis):	Fby = 750 psi	Fby' = 1200 psi
	Cd=1.60 CF=1.00	
Modulus of Elasticity:	E = 1300 ksi	E' = 1300 ksi

Column Section (X-X Axis):	dx =	5.5	in
Column Section (Y-Y Axis):	dy =	5.5	in
Area:	A =	30.25	in2
Section Modulus (X-X Axis):	Sx =	27.73	in3
Section Modulus (Y-Y Axis):	Sy =	27.73	in3
Slenderness Ratio:	Lex/dx =	41.24	
	Ley/dy =	41.24	

Column Calculations (Controlling Case Only):
Controlling Load Case: Axial Dead Load and Lateral loads (D + W or E)

Actual Compressive Stress:	Fc =	2	psi
Allowable Compressive Stress:	Fc' =	217	psi
Eccentricity Moment (X-X Axis):	Mx-ex =	0	ft-lb
Eccentricity Moment (Y-Y Axis):	My-ey =	0	ft-lb
Moment Due to Lateral Loads (X-X Axis):	Mx =	1701	ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	My =	0	ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	Fbx =	736	psi
Allowable Bending Stress (X-X Axis):	Fbx' =	1200	psi
Bending Stress Lateral Loads Only (Y-Y Axis):	Fby =	0	psi
Allowable Bending Stress (Y-Y Axis):	Fby' =	1200	psi
Combined Stress Factor:	**CSF =**	**0.62**	

LOADING DIAGRAM



AXIAL LOADING

Live Load:	PL =	1000	lb
Dead Load:	PD =	0	lb
Column Self Weight:	CSW =	59	lb
Total Load:	PT =	1059	lb

LATERAL LOADING (Dy Face)

Uniform Lateral Load:	wL-Lat =	0	plf
Point Load:		One	
Live Load:		189	lb
Location:		0	ft

NOTES

POLE FOUNDATION ANALYSIS

For Free-Top (Unconstrained) Rigid Round Piers Using UBC / IBC Method
Subjected Vertical Load, Horizontal Load, and/or Moment

Job Name:		Subject:			
Job Number:		Originator:		Checker:	

Input Data:

Pier Data:

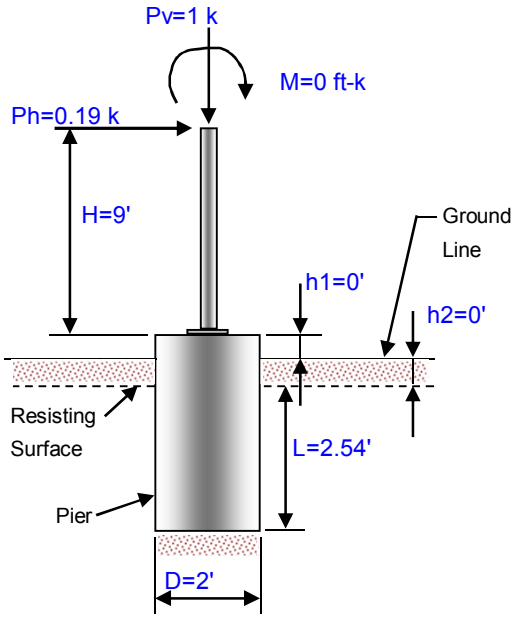
Pier Foundation Diameter, D =	2.000	ft.
Pier Height Above Soil, h1 =	0.000	ft.

Soil Data:

Unit Weight of Soil, γ =	0.120	kcf
Angle of Internal Friction, ϕ =	38.00	deg.
Depth to Resisting Surface, h2 =	0.000	ft.
Allow. Soil Bearing Pressure, Pa =	1.500	ksf

Pier Loadings:

Axial Load, Pv =	1.000	kips
Horizontal Load, Ph =	0.190	kips
Distance from Ph to Top/Pier, H =	9.000	ft.
Externally Applied Moment, M =	0.000	ft-kips



Results:

Pier Embedment and Total Length:

Pe =	0.190	kips	Pe = Ph+(M/(H+h1+h2)) ("equivalent total" horizontal load)
Kp =	4.204		Kp = TAN^2(45+ϕ/2) (passive pressure coefficient)
Pp =	1.280	ksf	Pp = Kp*γ*L (passive pressure at bottom of pier)
S1 =	0.427	ksf	S1 = Pp/3 (passive pressure at 1/3 embedment depth)
A =	0.521		A = 2.34*Pe/(S1*D)
L =	2.54	ft.	L = A/2*(1+SQRT(1+(4.36*(H+h1+h2)/A))) (UBC 1997 Eqn. 6-1, p. 2-45)
Lt =	2.54	ft.	Lt = h1+h2+L (total length) (IBC 2003 Eqn. 18.1, p. 370)

Pier End Bearing Pressure:

Af =	3.14	ft.^2	Af = π*D^2/4 (pier base area)
Wf =	1.20	kips	Wf = (Af*Lt)*0.150 (pier weight)
ΣPv =	2.20	kips	ΣPv = Pv+Wf (total vertical load)
P(bot) =	0.699	ksf	P(bot) = ΣPv/Af **Pa>=P(bot), O.K.**

Reference: 1997 Uniform Building Code (UBC), Section 1806.8, page 2-45
2003 International Building Code (IBC), Section 1805.7.2.1, pages 370-371

Comments:

Nomenclature

STEEL BEAM W10X22

Project: BARNETT ADDITION

Location: B1-1 steel
Multi-Span Floor Beam
[2015 International Building Code(AISC 14th Ed ASD)]
A992-50 W10x22 x 18.0 FT
Section Adequate By: 7.1%
Controlling Factor: Deflection

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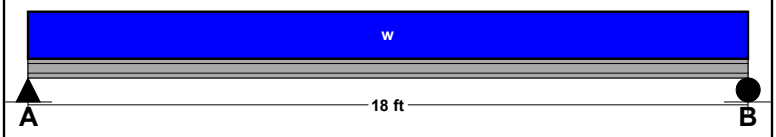
DEFLECTIONS	Center
Live Load	0.41 IN L/522
Dead Load	0.15 in
Total Load	0.56 IN L/385

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS	A	B
Live Load	5400 lb	5400 lb
Dead Load	1908 lb	1908 lb
Total Load	7308 lb	7308 lb
Bearing Length	0.66 in	0.66 in

BEAM DATA	Center
Span Length	18 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	18 ft

LOADING DIAGRAM



FLOOR LOADING		Center	
Floor Live Load	FLL =	40	psf
Floor Dead Load	FDL =	12	psf
Floor Tributary Width Side One	TW1 =	15	ft
Floor Tributary Width Side Two	TW2 =	0	ft
Wall Load	WALL =	10	plf

BEAM LOADING	Center	
Reduced Floor Live Load	40	psf
Total Live Load	600	plf
Total Dead Load	190	plf
Beam Self Weight	22	plf
Total Load	812	plf

STEEL PROPERTIES
W10x22 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	10.2	in
Web Thickness:	tw =	0.24	in
Flange Width:	bf =	5.75	in
Flange Thickness:	tf =	0.36	in
Distance to Web Toe of Fillet:	k =	0.66	in
Moment of Inertia About X-X Axis:	Ix =	118	in4
Section Modulus About X-X Axis:	Sx =	23.2	in3
Plastic Section Modulus About X-X Axis:	Zx =	26	in3

Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	7.99	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	37	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length - for lateral-torsional buckling:	Lp =	4.7	ft
Nominal Flexural Strength w/ safety factor:	Mn =	64870	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	37	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	48960	lb

Controlling Moment: 32886 ft-lb
9.0 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -7308 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	110.21 in4	118 in4
Moment:	32886 ft-lb	64870 ft-lb
Shear:	-7308 lb	48960 lb

NOTES

GLULAM BEAM 5.125X16.5

Project: BARNETT ADDITION

Location: B1-1 WOOD
Multi-Span Floor Beam
[2015 International Building Code(2012 NDS)]
5.125 IN x 16.5 IN x 18.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 3.4%
Controlling Factor: Deflection

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DEFLECTIONS	Center	
Live Load	0.41	IN L/526
Dead Load	0.17	in
Total Load	0.58	IN L/372

Live Load Deflection Criteria: L/480 Total Load Deflection Criteria: L/360

REACTIONS	A		B	
Live Load	5400	lb	5400	lb
Dead Load	2235	lb	2235	lb
Total Load	7635	lb	7635	lb
Bearing Length	2.29	in	2.29	in

BEAM DATA	Center	
Span Length	18	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	18	ft
Floor Duration Factor	1.00	
Camber Adj. Factor	0	
Camber Required	0	
Notch Depth	0.00	

MATERIAL PROPERTIES

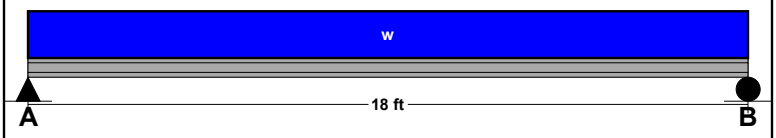
24F-V4 - Visually Graded Western Species

	Base Values			Adjusted		
Bending Stress:	Fb =	2400	psi	*Controlled by:*		
	Fb_cmpr =	1850	psi	Fb' =	2361	psi
	Cd=1.00 Cv=0.98					
Shear Stress:	Fv =	265	psi	Fv' =	265	psi
	Cd=1.00					
Modulus of Elasticity:	E =	1800	ksi	E' =	1800	ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	650	psi	Fc - ⊥' =	650	psi

Controlling Moment: 34357 ft-lb
9.0 Ft from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: -7635 lb
At right support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd		Provided	
Section Modulus:	174.63	in3	232.55	in3
Area (Shear):	43.22	in2	84.56	in2
Moment of Inertia (deflection):	1855	in4	1918.51	in4
Moment:	34357	ft-lb	45751	ft-lb
Shear:	-7635	lb	14939	lb

LOADING DIAGRAM



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Floor Live Load	FLL =	40	psf
Floor Dead Load	FDL =	12	psf
Floor Tributary Width Side One	TW1 =	15	ft
Floor Tributary Width Side Two	TW2 =	0	ft
Wall Load	WALL =	50	plf

BEAM LOADING	Center	
Reduced Floor Live Load	40	psf
Total Live Load	600	plf
Total Dead Load	230	plf
Beam Self Weight	18	plf
Total Load	848	plf

NOTES