



April 23, 2022

Bellah Homes
Attn: Paul Miller
1272 SW Arborcrest Circle
Lee's Summit, MO

Re: 3238 SW Pergola Park Drive (Lot 117, New Longview)

Vista Structural Engineering, LLC, was asked to address one item called out during the city's rough-in inspection. It was requested that our firm either approve the existing construction, or if the existing construction is inadequate, provide a cost-effective remediation. The item called out by the city is below, in bold lettering, followed by our response.

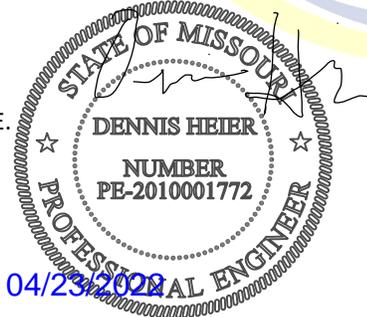
- 1) **The plans call for 3 1/2" schedule 40 columns in three places labeled 'D'. In these locations, 3" schedule 40 steel columns were installed. Are the 3" schedule 40 columns adequate, or is a structural upgrade required?** *Per the attached calculations, the maximum loading on any of the three 'D' footings consists of a dead load of 7.9 kips, live load of 13.7 kips, and snow load of 4.6 kips. We ran an analysis based on this worst case loading for 3" schedule 40 steel pipe column, which has an outside diameter of 3 1/2" and a wall thickness of 0.216". Based on the attached calculations, the 3" schedule 40 steel columns that are installed are adequate to support all imposed design loads. Our footing and column schedule is based on the highest allowable load that can be supported by the footing, which is why the 'D' footing in the schedule has a 3 1/2" schedule 40 steel column paired with it. In this case, the design loading on the footing lands between the maximum allowable loading on the 'C' and 'D' footings in the schedule, and allows for use of a 3" schedule 40 steel column. We recommend approval of the installed columns without any structural upgrade.*

Our firm appreciates the opportunity to serve you. If you have any questions or if you need anything further, please feel free to contact us.

Sincerely,

Vista Structural Engineering, LLC

Dennis Heier, P.E.



VISTA STRUCTURAL ENGINEERING, LLC

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Project Title:
 Engineer:
 Project ID:
 Project Descr:

Steel Beam

Lic. #: KW-06010523

File: NLV107 Castle (Viewpoint).ec6
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 Vista Structural Engineering, LLC

DESCRIPTION: BEAM ABOVE REC AREA

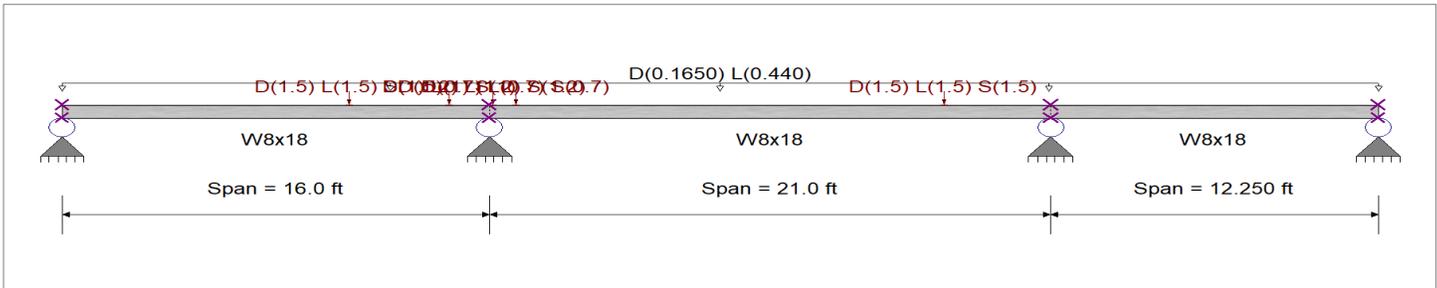
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Strength Design
 Beam Bracing : Completely Unbraced
 Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
 E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight NOT internally calculated and added
 Loads on all spans...

Uniform Load on ALL spans : D = 0.0150, L = 0.040 ksf, Tributary Width = 11.0 ft

Load(s) for Span Number 1

Point Load : D = 1.50, L = 1.50, S = 1.50 k @ 10.750 ft

Point Load : D = 1.0, L = 1.0, S = 1.0 k @ 14.50 ft

Load(s) for Span Number 2

Point Load : D = 1.20, L = 1.20, S = 1.20 k @ 0.10 ft

Point Load : D = 0.70, L = 0.70, S = 0.70 k @ 1.0 ft

Point Load : D = 1.50, L = 1.50, S = 1.50 k @ 17.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.892 : 1	Maximum Shear Stress Ratio =	0.295 : 1
Section used for this span	W8x18	Section used for this span	W8x18
Ma : Applied	30.225 k-ft	Va : Applied	11.049 k
Mn / Omega : Allowable	33.869 k-ft	Vn/Omega : Allowable	37.444 k
Load Combination	+D+L	Load Combination	+D+L
Location of maximum on span	0.000 ft	Location of maximum on span	16.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.316 in	Ratio =	797 >=360
Max Upward Transient Deflection	-0.032 in	Ratio =	4,629 >=360
Max Downward Total Deflection	0.449 in	Ratio =	561 >=180
Max Upward Total Deflection	-0.055 in	Ratio =	2682 >=180

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
D Only															
Dsgn. L = 16.00 ft		1	0.238	0.108	4.93	-10.09	10.09	70.83	42.42	2.09	1.00	4.04	56.17	37.44	
Dsgn. L = 21.00 ft		2	0.294	0.108	4.60	-10.09	10.09	57.38	34.36	2.31	1.00	4.04	56.17	37.44	
Dsgn. L = 12.25 ft		3	0.159	0.042	0.64	-6.73	6.73	70.83	42.42	2.99	1.00	1.56	56.17	37.44	
+D+L															
Dsgn. L = 16.00 ft		1	0.713	0.295	14.05	-30.22	30.22	70.83	42.42	2.22	1.00	11.05	56.17	37.44	



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DESCRIPTION: BEAM ABOVE REC AREA

Load Combination Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 21.00 ft	2	0.892	0.295	14.84	-30.22	30.22	56.56	33.87	2.28	1.00	11.05	56.17	37.44
Dsgn. L = 12.25 ft	3	0.513	0.146	3.07	-21.77	21.77	70.83	42.42	3.00	1.00	5.48	56.17	37.44
+D+S													
Dsgn. L = 16.00 ft	1	0.347	0.168	7.84	-14.14	14.14	67.96	40.70	1.94	1.00	6.29	56.17	37.44
Dsgn. L = 21.00 ft	2	0.420	0.168	6.36	-14.14	14.14	56.21	33.66	2.26	1.00	6.29	56.17	37.44
Dsgn. L = 12.25 ft	3	0.200	0.045	0.31	-8.49	8.49	70.83	42.42	2.74	1.00	1.70	56.17	37.44
+D+0.750L													
Dsgn. L = 16.00 ft	1	0.594	0.248	11.75	-25.19	25.19	70.83	42.42	2.21	1.00	9.30	56.17	37.44
Dsgn. L = 21.00 ft	2	0.740	0.248	12.26	-25.19	25.19	56.88	34.06	2.29	1.00	9.30	56.17	37.44
Dsgn. L = 12.25 ft	3	0.425	0.120	2.46	-18.01	18.01	70.83	42.42	3.00	1.00	4.50	56.17	37.44
+D+0.750L+0.750S													
Dsgn. L = 16.00 ft	1	0.666	0.293	13.53	-28.23	28.23	70.83	42.42	2.13	1.00	10.99	56.17	37.44
Dsgn. L = 21.00 ft	2	0.817	0.293	13.13	-28.23	28.23	57.70	34.55	2.32	1.00	10.99	56.17	37.44
Dsgn. L = 12.25 ft	3	0.456	0.123	2.14	-19.32	19.32	70.83	42.42	3.00	1.00	4.61	56.17	37.44
+0.60D													
Dsgn. L = 16.00 ft	1	0.143	0.065	2.96	-6.05	6.05	70.83	42.42	2.09	1.00	2.42	56.17	37.44
Dsgn. L = 21.00 ft	2	0.176	0.065	2.76	-6.05	6.05	57.38	34.36	2.31	1.00	2.42	56.17	37.44
Dsgn. L = 12.25 ft	3	0.095	0.025	0.39	-4.04	4.04	70.83	42.42	2.99	1.00	0.94	56.17	37.44

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.2948	7.360		0.0000	0.000
+D+L	2	0.4490	11.620	+D+S	-0.0075	0.840
	3	0.0000	11.620	+D+0.750L+0.750S	-0.0548	3.267

Vertical Reactions

Load Combination	Support notation : Far left is #1				Values in KIPS
	Support 1	Support 2	Support 3	Support 4	
Overall MAXimum	4.123	21.606	13.939	1.929	
Overall MINimum	0.333	4.424	1.287	-0.143	
D Only	1.276	7.903	4.387	0.461	
+D+L	4.123	21.606	13.939	1.929	
+D+S	1.608	12.327	5.674	0.318	
+D+0.750L	3.411	18.180	11.551	1.562	
+D+0.750L+0.750S	3.660	21.498	12.516	1.454	
+0.60D	0.765	4.742	2.632	0.277	
L Only	2.847	13.703	9.552	1.468	
S Only	0.333	4.424	1.287	-0.143	



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Steel Beam

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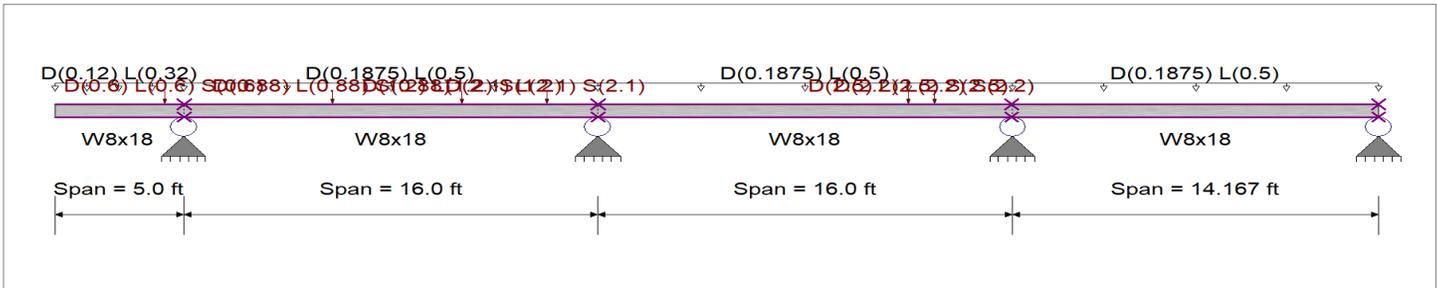
DESCRIPTION: beam at front of stairs on foundation plan

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis : Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 8.0 ft

Point Load : D = 0.60, L = 0.60, S = 0.60 k @ 4.250 ft

Load for Span Number 2

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 12.50 ft

Point Load : D = 0.880, L = 0.880, S = 0.880 k @ 5.750 ft

Point Load : D = 1.20, L = 1.20, S = 1.20 k @ 10.750 ft

Point Load : D = 2.10, L = 2.10, S = 2.10 k @ 14.0 ft

Load for Span Number 3

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 12.50 ft

Point Load : D = 2.50, L = 2.50, S = 2.50 k @ 12.0 ft

Point Load : D = 2.20, L = 2.20, S = 2.20 k @ 13.0 ft

Load for Span Number 4

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 12.50 ft



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Steel Beam

Lic. #: KW-06010523

DESCRIPTION: beam at front of stairs on foundation plan

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.760 : 1	Maximum Shear Stress Ratio =	0.362 : 1
Section used for this span	W8x18	Section used for this span	W8x18
Ma : Applied	32.223 k-ft	Va : Applied	13.562 k
Mn / Omega : Allowable	42.415 k-ft	Vn/Omega : Allowable	37.444 k
Load Combination	+D+0.750L+0.750S	Load Combination	+D+0.750L+0.750S
Location of maximum on span	16.000 ft	Location of maximum on span	16.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2
Maximum Deflection			
Max Downward Transient Deflection	0.255 in	Ratio =	751 >=360
Max Upward Transient Deflection	-0.213 in	Ratio =	562 >=360
Max Downward Total Deflection	0.413 in	Ratio =	465 >=180
Max Upward Total Deflection	-0.359 in	Ratio =	335 >=180

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only														
Dsgn. L = 5.00 ft	5.00 ft	1	0.046	0.056		-1.95	1.95	70.83	42.42	1.00	1.00	2.09	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	2	0.282	0.136	7.04	-11.97	11.97	70.83	42.42	1.00	1.00	5.09	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	3	0.282	0.132	7.72	-11.97	11.97	70.83	42.42	1.00	1.00	4.93	56.17	37.44
Dsgn. L = 14.17 ft	14.17 ft	4	0.195	0.051	1.48	-8.27	8.27	70.83	42.42	1.00	1.00	1.91	56.17	37.44
+D+L														
Dsgn. L = 5.00 ft	5.00 ft	1	0.151	0.170		-6.40	6.40	70.83	42.42	1.00	1.00	6.37	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	2	0.745	0.347	19.15	-31.58	31.58	70.83	42.42	1.00	1.00	12.99	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	3	0.745	0.329	15.89	-31.58	31.58	70.83	42.42	1.00	1.00	12.32	56.17	37.44
Dsgn. L = 14.17 ft	14.17 ft	4	0.554	0.174	7.50	-23.51	23.51	70.83	42.42	1.00	1.00	6.53	56.17	37.44
+D+S														
Dsgn. L = 5.00 ft	5.00 ft	1	0.057	0.077		-2.40	2.40	70.83	42.42	1.00	1.00	2.88	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	2	0.457	0.226	11.06	-19.37	19.37	70.83	42.42	1.00	1.00	8.48	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	3	0.457	0.224	15.19	-19.37	19.37	70.83	42.42	1.00	1.00	8.39	56.17	37.44
Dsgn. L = 14.17 ft	14.17 ft	4	0.292	0.059	0.55	-12.37	12.37	70.83	42.42	1.00	1.00	2.20	56.17	37.44
+D+0.750L														
Dsgn. L = 5.00 ft	5.00 ft	1	0.125	0.141		-5.29	5.29	70.83	42.42	1.00	1.00	5.30	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	2	0.629	0.294	16.12	-26.68	26.68	70.83	42.42	1.00	1.00	11.02	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	3	0.629	0.280	13.84	-26.68	26.68	70.83	42.42	1.00	1.00	10.47	56.17	37.44
Dsgn. L = 14.17 ft	14.17 ft	4	0.464	0.144	5.98	-19.70	19.70	70.83	42.42	1.00	1.00	5.38	56.17	37.44
+D+0.750L+0.750S														
Dsgn. L = 5.00 ft	5.00 ft	1	0.133	0.157		-5.63	5.63	70.83	42.42	1.00	1.00	5.89	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	2	0.760	0.362	19.11	-32.22	32.22	70.83	42.42	1.00	1.00	13.56	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	3	0.760	0.349	19.44	-32.22	32.22	70.83	42.42	1.00	1.00	13.07	56.17	37.44
Dsgn. L = 14.17 ft	14.17 ft	4	0.537	0.149	5.02	-22.77	22.77	70.83	42.42	1.00	1.00	5.59	56.17	37.44
+0.60D														
Dsgn. L = 5.00 ft	5.00 ft	1	0.028	0.034		-1.17	1.17	70.83	42.42	1.00	1.00	1.26	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	2	0.169	0.082	4.22	-7.18	7.18	70.83	42.42	1.00	1.00	3.05	56.17	37.44
Dsgn. L = 16.00 ft	16.00 ft	3	0.169	0.079	4.63	-7.18	7.18	70.83	42.42	1.00	1.00	2.96	56.17	37.44
Dsgn. L = 14.17 ft	14.17 ft	4	0.117	0.031	0.89	-4.96	4.96	70.83	42.42	1.00	1.00	1.15	56.17	37.44

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.750S	-0.3586	0.000
+D+0.750L+0.750S	2	0.4129	7.573		0.0000	0.000
+D+0.750L+0.750S	3	0.2375	10.027	+D+0.750L+0.750S	-0.0180	1.173
+D+L	4	0.0764	9.161	+D+S	-0.0670	4.533

Vertical Reactions

Load Combination	Support notation : Far left is #1					Values in KIPS
	Support 1	Support 2	Support 3	Support 4	Support 5	
Overall MAXimum		9.766	21.247	18.850	3.210	
Overall MINimum		1.386	4.637	3.746	-0.289	
D Only		3.294	7.855	6.844	0.744	
+D+L		9.766	21.073	18.850	3.210	
+D+S		4.680	12.492	10.589	0.455	
+D+0.750L		8.148	17.769	15.848	2.594	
+D+0.750L+0.750S		9.188	21.247	18.658	2.377	
+0.60D		1.976	4.713	4.106	0.446	
L Only		6.473	13.218	12.006	2.466	
S Only		1.386	4.637	3.746	-0.289	

Steel Column

Lic. #: KW-06010523

DESCRIPTION: columns installed at 'D' footings at 3238 SW Pergola Park Drive

Extreme Reactions

Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	21.693										
"	Minimum	4.600										
Reaction, X-X Axis Base	Maximum	7.968										
"	Minimum	7.968										
Reaction, Y-Y Axis Base	Maximum	7.968										
"	Minimum	7.968										
Reaction, X-X Axis Top	Maximum	7.968										
"	Minimum	7.968										
Reaction, Y-Y Axis Top	Maximum	7.968										
"	Minimum	7.968										
Moment, X-X Axis Base	Maximum	7.968										
"	Minimum	7.968										
Moment, Y-Y Axis Base	Maximum	7.968										
"	Minimum	7.968										
Moment, X-X Axis Top	Maximum	7.968										
"	Minimum	7.968										
Moment, Y-Y Axis Top	Maximum	7.968										
"	Minimum	7.968										

Maximum Deflections for Load Combinations

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

Steel Section Properties : HSS 3.500x0.216

Depth	=	3.500 in	I xx	=	2.84 in^4	J	=	5.690 in^4
Design Thick	=	0.201 in	S xx	=	1.63 in^3			
Diameter	=	3.500 in	R xx	=	1.170 in			
Wall Thick	=	0.216 in	Zx	=	2.190 in^3			
Area	=	2.080 in^2	I yy	=	2.840 in^4	C	=	3.250 in^3
Weight	=	7.580 plf	S yy	=	1.630 in^3			
			R yy	=	1.170 in			
Ycg	=	0.000 in						

Steel Column

Lic. # : KW-06010523

DESCRIPTION: columns installed at 'D' footings at 3238 SW Pergola Park Drive

Sketches

