04/26/2024

City of Mercer Island
Community Planning and Development

Attn: David Henderson
Re: 2273 Home Remodel
2273 74th AVE SE, Mercer Island
Structural Correction Comment Response

Mr. Henderson,

The following is the response to structural correction comments for the above referenced project dated on April 3rd, 2024.

Sheet S1.2 Please Show all new point loads and footings. VIF is not approved. Please provide all existing footing sizes and all new proposed footing(s), any doweling details etc.. Please show and provide all support columns for new beams including sizing and any fastening schedule for multi-ply built columns (slenderness) as needed per EOR design.

Response: Please see revised structural drawing. New beam is proposed to be supported on (2)2x built-up post, see Section 3/S2.1. Built-up post to be spliced per section 7/S2.1. Additional notes are now added on plan drawing. Please kindly note that the proposed new 6x10 end support loading is around 2.8 Kips (ASD) max, the loading is considered to be low for concrete slab-on-grade set on soil, using the Shentu method to estimate the allowable bearing pressure accounting concrete strength and elasticity, with 4" concrete slab-on-grade, a point load of 11.5 Kips (ASD) (Factor of Safety = 3.0) would be acceptable, representing a DCR of 2.8/11.5 = 24% capacity utilization. It is my engineering judgement that existing exterior footing and slab-on-grade are acceptable to provide support of the new beam loading, without any retrofit requirement. Existing footing size will not be required to be verified, as any footing size larger than 4" will be structurally acceptable. Note that existing stem wall thickness is at 6" minimum.

I appreciate for your detailed review on the proposed structural design. Should you have any additional comment or question that relates to the permit comment revision, please contact me directly and I will have it resolved immediately.

Sincerely,

Bosco K.W. Cheng, P.E.
206-398-9160
boscocheng@live.com

DATE SIGNED: 04-26-2024

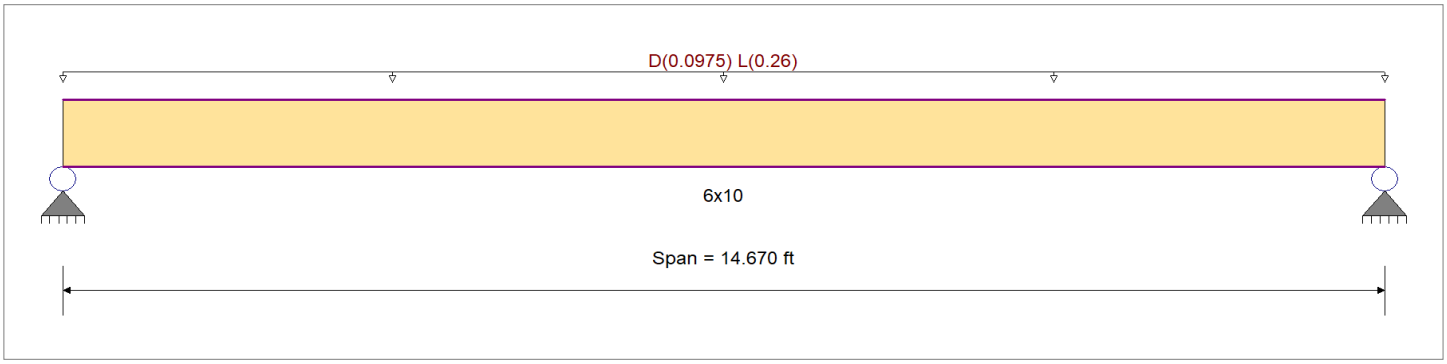
DESCRIPTION: B3

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	Fb +	1300 psi	*E : Modulus of Elasticity*	
Load Combination	ASCE 7-16	Fb -	1300 psi	Ebend- xx	1600 ksi
		Fc - Prll	925 psi	Eminbend - xx	580 ksi
Wood Species :	Douglas Fir-Larch (North)	Fc - Perp	625 psi		
Wood Grade :	No.1	Fv	170 psi		
		Ft	675 psi	Density	30.59 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 6.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.949 : 1	Maximum Shear Stress Ratio	=	0.352 : 1
Section used for this span		**6x10**	Section used for this span		**6x10**
fb: Actual	=	2,131.77 psi	fv: Actual	=	103.28 psi
F'b	=	2,246.40 psi	F'v	=	293.76 psi
Load Combination		+1.20D+1.60L	Load Combination		+1.20D+1.60L
Location of maximum on span	=	7.335 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.433 in	Ratio =	406 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.614 in	Ratio =	286 >=240	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

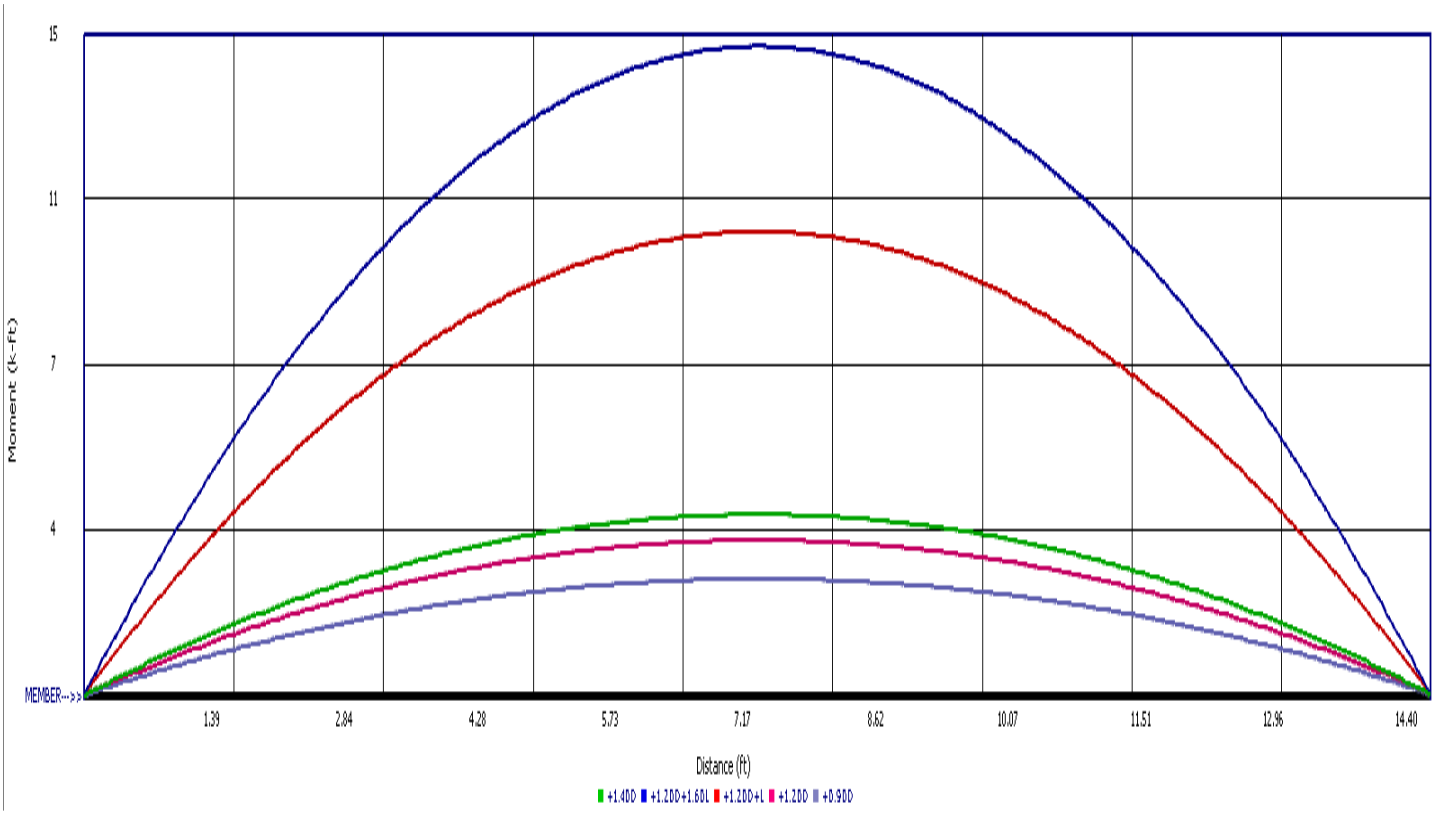
Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	λ	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Mu	fb	Fb	Vu	fv	Fv
+1.40D														0.0	0.00	0.0	0.0
Length = 14.670 ft	1	0.352	0.130	0.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.09	593.3	1,684.8	1.00	28.7	220.3
+1.20D+1.60L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.670 ft	1	0.949	0.352	0.80	1.00	1.00	1.00	1.000	1.00	1.00	1.00	14.70	2,131.8	2,246.4	3.60	103.3	293.8
+1.20D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.670 ft	1	0.678	0.251	0.80	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.50	1,523.0	2,246.4	2.57	73.8	293.8
+1.20D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.670 ft	1	0.226	0.084	0.80	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.51	508.5	2,246.4	0.86	24.6	293.8
+0.90D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.670 ft	1	0.136	0.050	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.63	381.4	2,808.0	0.64	18.5	367.2

DESCRIPTION: B3

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.704	2.704
Max Upward from Load Combinations	2.704	2.704
Max Upward from Load Cases	1.907	1.907
D Only	0.797	0.797
+D+L	2.704	2.704
+D+0.750L	2.227	2.227
+0.60D	0.478	0.478
L Only	1.907	1.907



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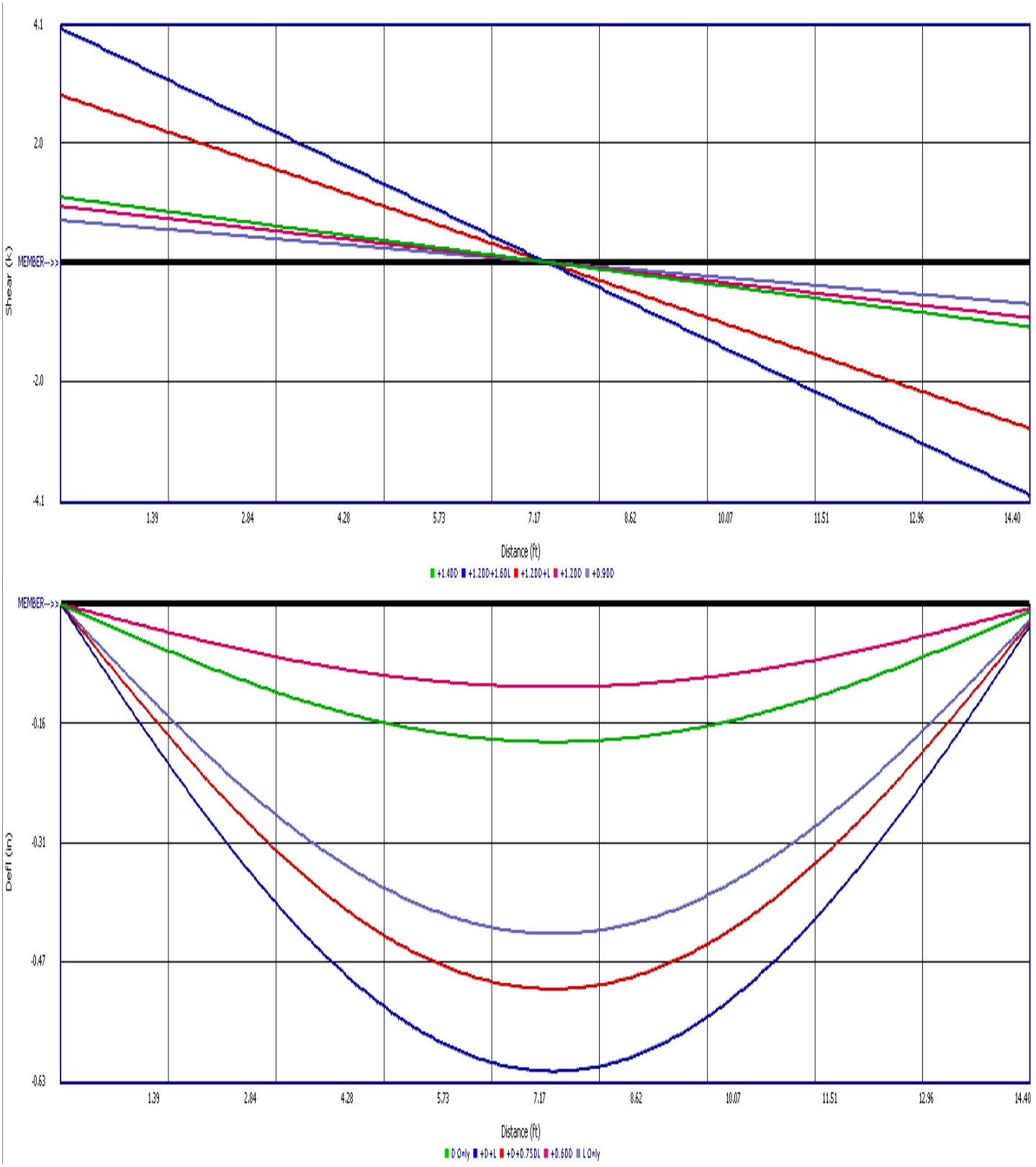

DESCRIPTION: Existing 4" concrete slab point load capacity

Code References

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

Analytical Values

d - Slab Thickness	4.0 in	Ks - Soil Modulus of Subgrade Reac	100.0 pci
FS - Req'd Factor of Safety	3.0 : 1	Ec - Concrete Elastic Modulus	3,122.0 ksi
		f'c - Concrete Compressive Strength	2.0 ksi
		μ - Poisson's Ratio	0.150
		Min. Adjacent Load Distance	30.473 in

Analysis Formulas

Pn = 1.72 [(Ks R1 / Ec) 10,000 + 3.6] Fr d²

Ks = Soil modulus of subgrade reaction
R1 = 50% plate average dimension = sqrt(PlWid * PlLe
Ec = Concrete elastic modulus
Fr - Concrete modulus of rupture = 7.5 * sqrt(f'c)
d - Slab Thickness

Min Adjacent Column Distance = 1.5 * ([Ec d^3 / (12 * (1- u^2) Ks] ^ 1

Ec = Concrete elastic modulus
d - Slab Thickness
u - Poisson's ratio
Ks = Soil modulus of subgrade reaction

Load & Capacity Table

Load ID	Plate (in) Wid	Len	R1 (in)	Applied Concentrated Load on Plate - (kip) D	Lr	L	S	W	E	Governing Ld Comb	Pu (kip)	Pn (kip)	Check
1	1.00	1.00	0.50	11.50						D Only	11.5	34.7	Pass, FS= 3.02 >= 3

ALLOWABLE POINT LOAD ON 4" SOG.