I.L. GROSS
STRUCTURAL
ENGINEERS

Bickel Residence

Mercer island, WA

Remodeling and Addition to existing Single-Family Residence

Supplimental Calculations
for Permit review

Structural Design Calculations Prepared for
John Bickel and BC+J Architecture

April 12, 2023

FB-7 Design - Revised 12/2022 w/ HOOPER POST

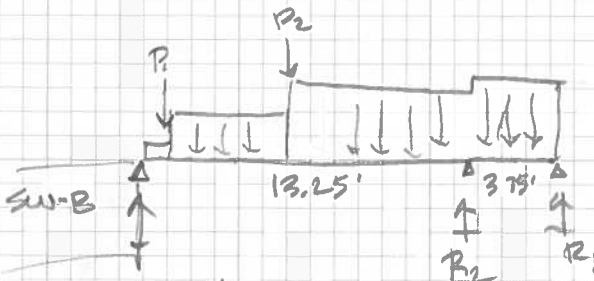
Replaces original FB-7 & FB-10 w/ New Stair Layout

Span = 13.25' + 3.75'

TA = 2'R + 4' SW + 0-1'
7.5' RD + 3' WW 1'-6'
7½' FL 2 + 9' WWS + 4' R 6'-17'
+ 3' STAIR 13.25'-17'

+P1 @ 1' = 1.45^{k}D
(FB-6) 0.3^{k}L
1.73^{k}S
0.6^{k}E

+P2 @ 6' = 2.47^{k}D
(FB4+R) 0.[illegible]L
2.6^{k}S



PSL 5½ x 11¼

R1 = 3.35^{k}D
2.18^{k}L
3.44^{k}S
0.54^{k}E

R2 = 7.09^{k}D
5.58^{k}L
5.57^{k}S
0.12^{k}E
Σ = 15.4^k

R3 = -1.95^{k}D
-0.9^{k}L
-1.95^{k}S
-0.06^{k}E

6x6 POST OK

FB-9 adjacent reaction
= 2.6^{k}D
2.25^{k}L
1.6^{k}S

∴ No Net uplift @ R3

I.L. GROSS STRUCTURAL ENGINEERS	FB-7 Revised Design — SHEET TITLE / SCALE	12/2022 DATE
	Bichel Residence MS/MB PROJECT / DESIGNED BY	
	Bichel MS CLIENT / CHECKED	SHEET

www.ilgross.com

Mark Speidel, PE, SE
I.L. Gross Structural Engineers LLC
www.ilgross.com

Project Title: Bickell Residence
Engineer: Mark Speidel
Project ID:
Project Descr: Remodeling of existing SFR

Wood Beam

Project File: Bickell Remodel.ec6

DESCRIPTION: Floor Beam FB-7 REVISED Design

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2018

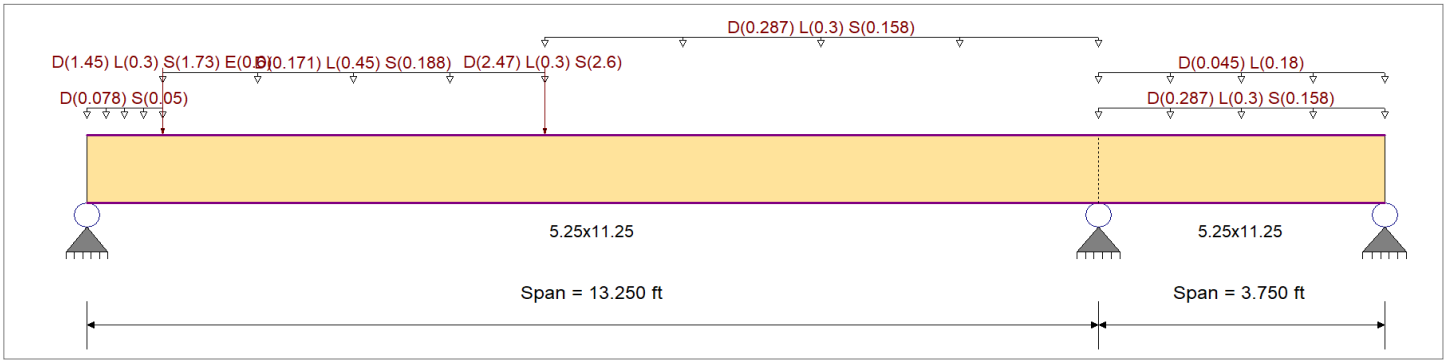
Wood Species : Trus Joist
Wood Grade : Parallam PSL 2.2E

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

Fb +	2,900.0 psi
Fb -	2,900.0 psi
Fc - Prll	2,900.0 psi
Fc - Perp	625.0 psi
Fv	290.0 psi
Ft	2,025.0 psi

E : Modulus of Elasticity

Ebend- xx	2,200.0 ksi
Eminbend - xx	1,118.19 ksi
Density	45.070 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
- Uniform Load : D = 0.0780, S = 0.050 k/ft, Extent = 0.0 -->> 1.0 ft, Tributary Width = 1.0 ft, (2' R + 4'SW)
- Uniform Load : D = 0.1710, L = 0.450, S = 0.1880 k/ft, Extent = 1.0 -->> 6.0 ft, Tributary Width = 1.0 ft, (7.5' RD+ 3" WW)
- Uniform Load : D = 0.2870, L = 0.30, S = 0.1580 k/ft, Extent = 6.0 -->> 13.250 ft, Tributary Width = 1.0 ft, (7.5' F+9'WW +4'R)
- Point Load : D = 1.450, L = 0.30, S = 1.730, E = 0.60 k @ 1.0 ft, (P1)
- Point Load : D = 2.470, L = 0.30, S = 2.60 k @ 6.0 ft, (P2)

Load for Span Number 2
- Uniform Load : D = 0.2870, L = 0.30, S = 0.1580 , Tributary Width = 1.0 ft, (7.5' F+9'WW +4'R)
- Uniform Load : D = 0.0150, L = 0.060 ksf, Tributary Width = 3.0 ft, (stair loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.691 : 1	Maximum Shear Stress Ratio	=	0.583 : 1
Section used for this span		5.25x11.25	Section used for this span		5.25x11.25
fb: Actual	=	2,320.76 psi	fv: Actual	=	194.49 psi
F'b	=	3,358.98 psi	F'v	=	333.50 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	5.996 ft	Location of maximum on span	=	12.362 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.155 in	Ratio =	1026 >=400	Span: 1 : S Only
Max Upward Transient Deflection	-0.009 in	Ratio =	4877 >=400	Span: 2 : S Only
Max Downward Total Deflection	0.371 in	Ratio =	428 >=240	Span: 1 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	-0.022 in	Ratio =	2044 >=240	Span: 2 : +D+0.750L+0.750S+0.5250E

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.410	0.346	0.90	1.00	1.00	1.00	1.007	1.00	1.00	1.00	9.95	1,078.5	2,628.8	3.56	90.3	261.0
Length = 3.750 ft	2	0.403	0.346	0.90	1.00	1.00	1.00	1.007	1.00	1.00	1.00	9.77	1,058.2	2,628.8	2.94	90.3	261.0

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Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+L					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.616	0.538	1.00	1.00	1.00	1.00	1.007	1.00	1.00	1.00	16.61	1,800.3	2,920.8	6.14	155.9	290.0
Length = 3.750 ft	2	0.616	0.538	1.00	1.00	1.00	1.00	1.007	1.00	1.00	1.00	16.61	1,800.3	2,920.8	5.22	155.9	290.0
+D+S					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.623	0.507	1.15	1.00	1.00	1.00	1.007	1.00	1.00	1.00	19.31	2,092.4	3,359.0	6.66	169.1	333.5
Length = 3.750 ft	2	0.587	0.507	1.15	1.00	1.00	1.00	1.007	1.00	1.00	1.00	18.19	1,971.6	3,359.0	5.34	169.1	333.5
+D+0.750L					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.442	0.385	1.25	1.00	1.00	1.00	1.007	1.00	1.00	1.00	14.90	1,614.8	3,651.1	5.49	139.5	362.5
Length = 3.750 ft	2	0.442	0.385	1.25	1.00	1.00	1.00	1.007	1.00	1.00	1.00	14.90	1,614.8	3,651.1	4.65	139.5	362.5
+D+0.750L+0.750S					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.691	0.583	1.15	1.00	1.00	1.00	1.007	1.00	1.00	1.00	21.42	2,320.8	3,359.0	7.66	194.5	333.5
Length = 3.750 ft	2	0.685	0.583	1.15	1.00	1.00	1.00	1.007	1.00	1.00	1.00	21.22	2,299.8	3,359.0	6.45	194.5	333.5
+D+0.70E					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.234	0.199	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	10.11	1,095.4	4,673.4	3.64	92.5	464.0
Length = 3.750 ft	2	0.230	0.199	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	9.93	1,075.8	4,673.4	2.98	92.5	464.0
+D+0.750L+0.750S+0.5250E					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.499	0.423	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	21.53	2,333.5	4,673.4	7.72	196.2	464.0
Length = 3.750 ft	2	0.495	0.423	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	21.35	2,313.0	4,673.4	6.48	196.2	464.0
+0.60D					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.138	0.117	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	5.97	647.1	4,673.4	2.13	54.2	464.0
Length = 3.750 ft	2	0.136	0.117	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	5.86	634.9	4,673.4	1.76	54.2	464.0
+0.60D+0.70E					1.00	1.00	1.00	1.007	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.250 ft	1	0.142	0.128	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	6.13	664.0	4,673.4	2.34	59.3	464.0
Length = 3.750 ft	2	0.140	0.128	1.60	1.00	1.00	1.00	1.007	1.00	1.00	1.00	6.02	652.6	4,673.4	1.81	59.3	464.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.3709	5.848		0.0000	0.000
	2	0.0000	5.848	+D+0.750L+0.750S+0.5250E	-0.0220	1.550

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	7.844	15.514	
Max Upward from Load Combinations	7.844	15.514	
Max Upward from Load Cases	3.439	7.089	
Max Downward from all Load Conditio			-4.138
Max Downward from Load Combinations			-4.138
Max Downward from Load Cases (Resis			-1.951
D Only	3.351	7.089	-1.947
+D+L	5.526	12.665	-2.873
+D+S	6.790	12.659	-3.899
+D+0.750L	4.983	11.271	-2.642
+D+0.750L+0.750S	7.562	15.449	-4.105
+D+0.70E	3.727	7.176	-1.990
+D+0.750L+0.750S+0.5250E	7.844	15.514	-4.138
+0.60D	2.011	4.253	-1.168
+0.60D+0.70E	2.387	4.341	-1.212
L Only	2.175	5.576	-0.926
S Only	3.439	5.570	-1.951
E Only	0.537	0.125	-0.062

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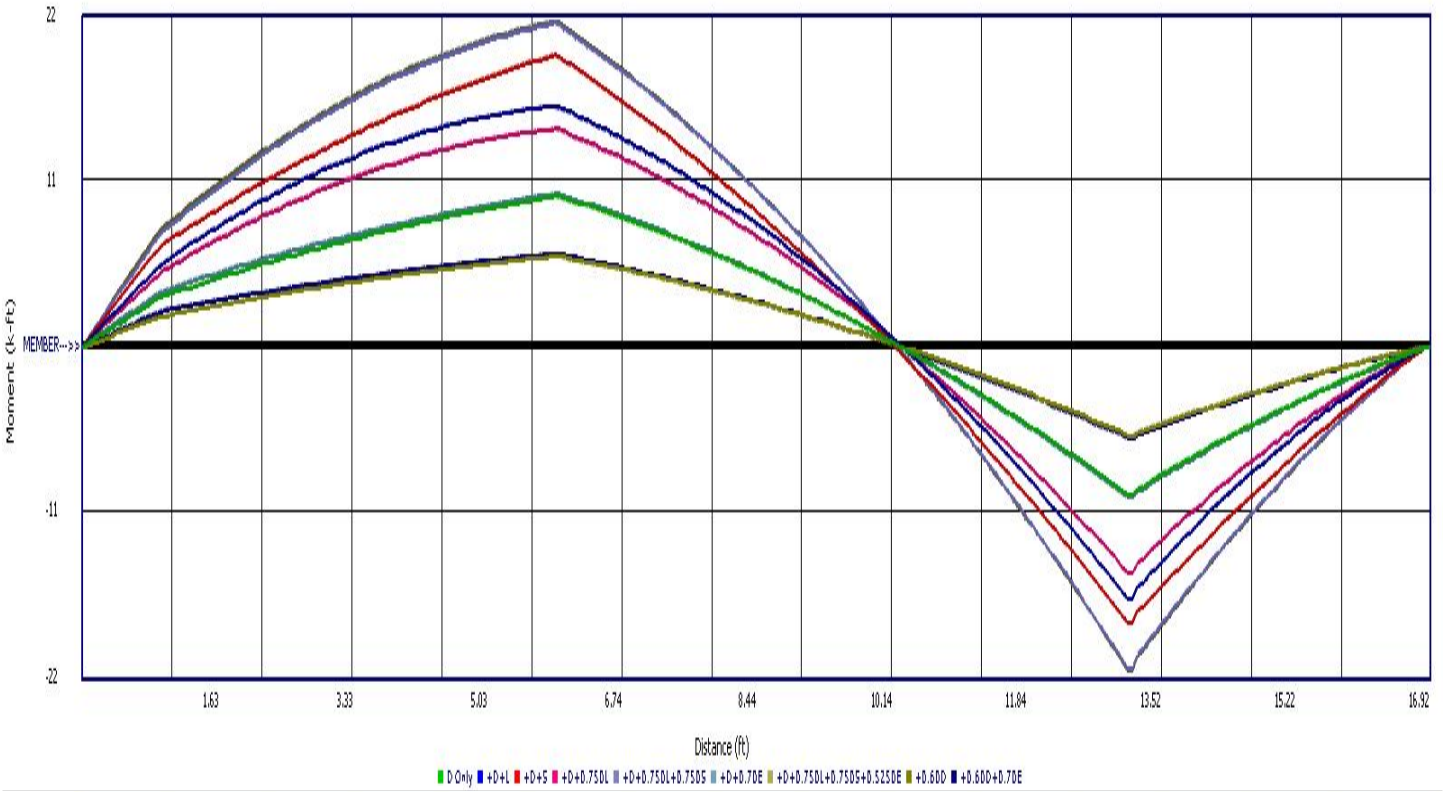

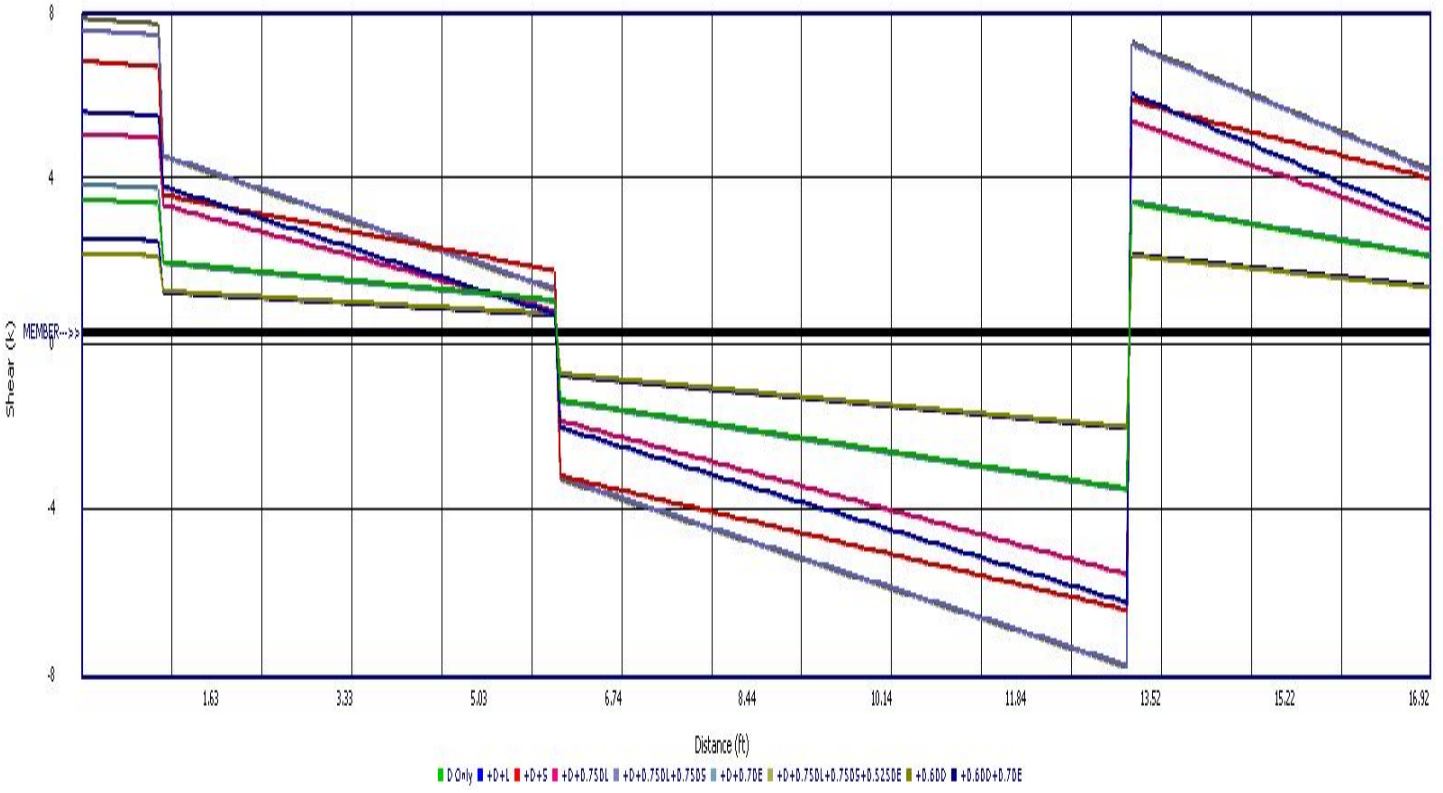

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