



I.L. GROSS
STRUCTURAL ENGINEERS

Lorenzini Waterfront Residence

Mercer Island, WA

New Single-Family Residence

STRUCTURAL DESIGN CALCULATIONS
FOR Robert Edson Swain Architecture



December 18, 2020

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Design Criteria

Mercer Island, WA

2015 International building Code/International Residential Code
2010 ASCE 7

Seismic analysis

I = 1.0
Ss= 1%
S1= 53%
Sds= 92%
Sd1= 53%
R = 6.5

Seismic Design Category D

Wind analysis

Wind Speed (V3s) mph 110
Exposure C
Importance Factor I = 1.0
topographic Factor Kzt = 1.00

Live Loads

Roof	25 psf snow	Office	50 psf
Residential	40 psf	Garage	50 psf
Stairs / Corridors	60 psf		

Dead Loads**Wing Roof Assmably**

Roofing	4 psf
1/2" CDX plywood sheathing	1.4 psf
finish ceiling	2.8 psf
roof trusses at 24"	2.5 psf
Insulation	2.0 psf
Beams and Framing	1.0 psf
Misc.	0.8 psf
	14.5 psf

Exterior Light Framed Walls

Siding	3.5 psf
Rainscreen	0.5 psf
GWB finish	2.5 psf
1/2" CDX plywood sheathing	1.4 psf
2x6 studs @ 16" o.c.	1.5 psf
Insulation	1.5 psf
Misc	1.1 psf
	12.0 psf

Center Roof Assmably

Roofing	4 psf
1/2" CDX plywood sheathing	1.4 psf
finish ceiling	3.5 psf
Roof Framing	3.0 psf
Insulation	1.5 psf
Beams and Framing	1.5 psf
Misc.	1.1 psf
	16.0 psf

Interior Light Framed Walls

GWB Finish Ea Side	5.2 psf
2x4 studs @ 16" oc	1.1 psf
insulation	1 psf
M&E Allowance	0.5 psf
Misc	0.7 psf
	8.5 psf

Typical Floor

Finish Floor	5.0 psf
Finished Ceiling	2.8 psf
3/4" plywood subfloor	2.2 psf
11 7/8" I joist framing	2.5 psf
Insulation	2.0 psf
beams & framing	1.0 psf
Misc M&E	1.0 psf
	16.5 psf

Concrete walls

Finish	5 psf
8" concrete wall	95 psf
	100 psf

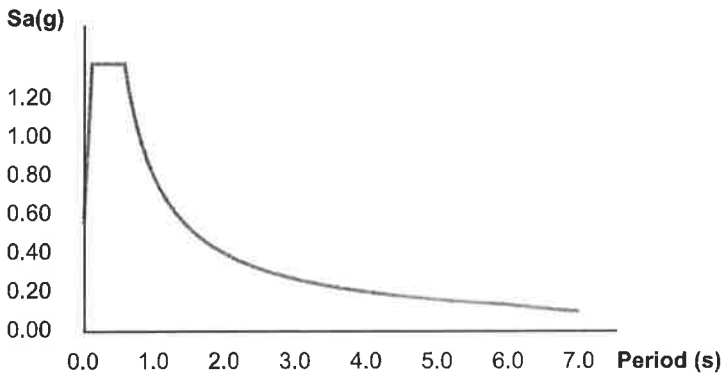
Soil bearing pressure = 2000 psf at shallow footings, 3000 psf at deep footings over 36" below grade(per Geotech)

Search Information

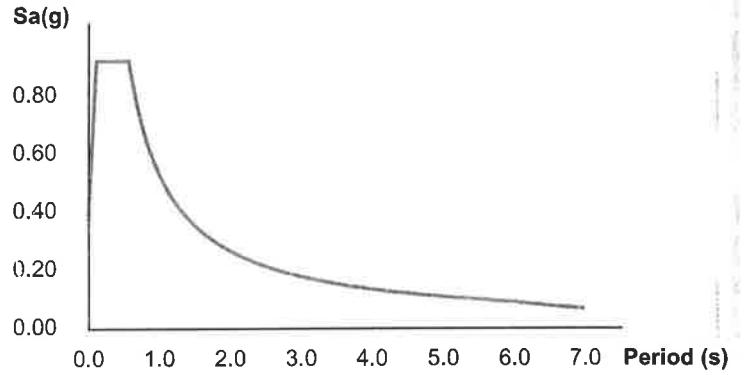
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Coordinates: 47.5806779, -122.2089714
Elevation: 31 ft
Timestamp: 2020-06-22T21:27:30.738Z
Hazard Type: Seismic
Reference Document: ASCE7-10
Risk Category: II
Site Class: D



MCE_R Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.38	MCE _R ground motion (period=0.2s)
S_1	0.53	MCE _R ground motion (period=1.0s)
S_{MS}	1.38	Site-modified spectral acceleration value
S_{M1}	0.795	Site-modified spectral acceleration value
S_{DS}	0.92	Numeric seismic design value at 0.2s SA
S_{D1}	0.53	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s

CR _S	0.961	Coefficient of risk (0.2s)
CR ₁	0.936	Coefficient of risk (1.0s)
PGA	0.567	MCE _G peak ground acceleration
F _{PGA}	1	Site amplification factor at PGA
PGA _M	0.567	Site modified peak ground acceleration
T _L	6	Long-period transition period (s)
SsRT	1.38	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.435	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.009	Factored deterministic acceleration value (0.2s)
S1RT	0.53	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.567	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.26	Factored deterministic acceleration value (1.0s)
PGAd	1.158	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).

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Seismic Design

Lorenzini House

International Building Code Section 1613

ASCE7 Chapter 12

Maximum Considered Earthquake Spectral Response Acceleration Parameters

Ss = 1% Sds = 92%
 S1 = 53% Sd1 = 53%

Site Class **D** assumed **MCE**

Section 1616

Design Spectral Response Acceleration Parameters

(IBC 1613.5.4)

5% damped design

Approximate Fundamental Period

$T = Ct(hn)^x$

(ASCE7 12.8.2.1)
table 12.8-2

Where: Ct = 0.02
 Hn = 21
 x = 0.75

$T = 0.196 \text{ sec}$

General Resonse Spectrum

(ASCE7 11.4.5)

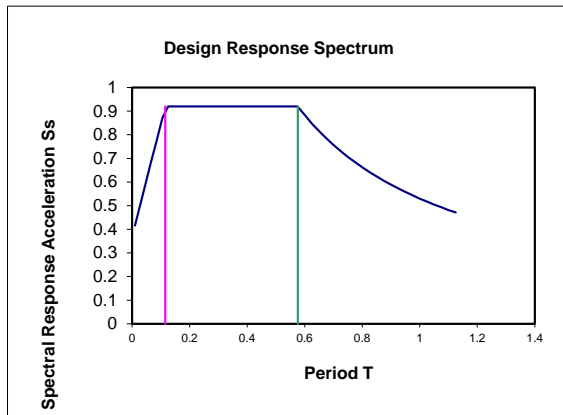
$T_0 = 0.2 * S_{D1} / S_{DS} = 0.12 \text{ sec}$

$T_s = S_{D1} / S_{DS} = 0.58 \text{ sec}$

$T_L = 6 \text{ sec}$
figure 22-12

Sa = 4.61997 11.4-5 if T, T_0
 Sa = 0.92 if $T_0 < T < T_s$
 Sa = 2.70135 11.4-6 if $T_s < T < T_L$
 Sa = 82.6111 11.4-7 if $T > T_L$

Sa = 0.92



Ss = 0.920

Importance Factor I = 1
 Seismic Use Group= II

(ASCE-7 Table 9.1.3)

Seismic Design Category

D Table 11.6-1
 D Table 11.6-2

(ASCE-7 Table 11.6)

IBC Building Classification: Regular Building

(ASCE7 12.3.2)

Seismic Design

Lorenzini House

Equivalent Lateral Force Procedure

Requirements to use the Equivalent Lateral Force Procedure:
 Regular Building
 $T < 3.5 T_s$ okay

Building Type

Building Bearing Wall System, Light framed walls sheathed with wood structural panels.

$R = 6.5$ $W_o = 2.5$ $C_d = 4$ (ASCE7 Table 12.2.1)

Seismic Base Shear

$V = C_s W$ (ASCE7 Eq 12.8-1)

$C_s = \frac{S_{DS}}{R/I}$ $C_s = 0.142$ (ASCE7 Eq 12.8-2)

but need not be greater than,

$C_s = \frac{S_{D1}}{T(R/I)}$ For $T < T_L = 0.416$ (ASCE7 Eq 12.8-3)

$C_s = \frac{S_{D1} T_L}{T^2(R/I)}$ For $T > T_L = 12.7$ (ASCE7 Eq 12.8-4)
 $C_s \text{ max} = 0.416$

but shall not be less than:

$C_s = .044 * S_{Ds} / (R/I_e)$ $C_s \text{ min} = 0.0003$

$C_s = 0.5 * S_{d1} / (R/I_e)$

Therefore: $C_s = 0.142 W$

Total W = **251.5** kips

$V = 35.60$ kips

Redundancy Factor

$E = \rho E_h + E_v$ (ASCE7 EQ 12.3.4)

where $\rho = 1.3$ unless criteria of table 12.3-3 are met for SDC D,E,F

$\rho = 1.0$ for Seismic Design Categories A,B,C

$\rho = 1.30$

Therefore:

$E = 46.28$ kips

Building Weight

Roof = 14.5 psf	Roof 139.90 k
Floor = 16.5 psf	Main 111.60 k
Walls = 11 psf	B 0.00 k
	Total Building Wt 251.5

SEISMIC DISTRIBUTION

level	W (kips)	h (ft)	Wh (kip-ft)	STRENGTH / LFRD		ALLOW. STRESS DESIGN		
				Wh Σ Wh	story shear (kips)	Σ (kips)	story shear (kips)	Σ (kips)
Roof	139.9	21	2937.9	0.79	36.56	36.56	26.11	26.11
Main	111.6	7	781.2	0.21	9.72	46.28	6.94	33.06
B	0.0	0	0.0	0.00	0.00	46.28	0.00	33.06
	0 kips		0.0					

Lateral Force Summary

Force	Vb (k)	Controlling force
E/W Wind	37.5	---
N/S Wind	38.5	---
Seismic	46.3	CONTROLS

Diaphragm Forces and Distribution

Per ASCE 7-10, Section 12.10.1.1

$F_{px} = (\sum F_i / \sum W_i) * W_{px}$ per 12.10.1.1, for internal diaphragm forces $\rho = 1.0$

per ASCE 12.10, $F_{px} \text{ Min} = 0.2 * S_{DS} * I_x * W_{px} = 0.184 W_{px}$
 per ASCE 12.10, $F_{px} \text{ Max} = 0.4 * S_{DS} * I_x * W_{px} = 0.368 W_{px}$

level	W (kips)	h (ft)	Wh (kip-ft)	Wh Σ Wh	STRENGTH / LRFD		ALLOW. STRESS DESIGN	
					story shear (kips)	Σ (kips)	story shear (kips)	Σ (kips)
Roof	139.9	21	2937.9	0.79	36.56	36.56	26.11	26.11
Main	111.6	7	781.2	0.21	9.72	46.28	6.94	33.06
B	0.0	0	0.0	0.00	0.00	46.28	0.00	33.06
		0 kips	0.0					

LRDF Diaphragm Force Distribution

Level	W _i	F _i	Σ F _i	Σ W _i	F _{px} Min	F _{px} Max	F _{px} Calc	F _{px}
Roof	139.90	28.1	28.1	139.93	25.74	51.48	28.12	28.12
Main	111.60	7.5	35.6	251.53	20.53	41.07	15.80	20.53
B	0.00	0.0	35.6	251.53	0.00	0.00	0.00	0.00

ASD Diaphragm Force Distribution

Level	W _i	F _i	Σ F _i	Σ W _i	F _{px} Min	F _{px} Max	F _{px} Calc	F _{px}
Roof	139.90	20.1	20.1	139.93	18.02	36.04	20.08	20.08
Main	111.60	5.3	25.4	251.53	14.37	28.75	11.28	14.37
B	0.00	0.0	25.4	251.53	0.00	0.00	0.00	0.00

Typical Diaphragm Capacities:

15/32" CDX Plywood with 8d Common Nails spaced at		3/4" CDX Plywood with 10d Common Nails spaced at	
6-6-12 unblockec	180 plf	6-6-12 unblocked	215 plf
6-6-12 blocked	270	6-6-12 blocked	320
4-6-12 blocked	385	4-6-12 blocked	425
2.5-4-12 blocked	530	2.5-4-12 blocked	640
2-3-12 blocked	600	2-3-12 3x block	820

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Wind Analysis Using Directional MSFRS "All-Heights" procedure per 2010 ASCE 7-10
 for V= 110 mph Exp C

$P = q_s * K_z * G * C_p$

$q_s = .00256 * K_d * K_z * V^2$

Wind Speed	105	110	115	120	125	130	135	140	145
q_s	24.0	26.3	28.8	31.3	34.0	36.8	39.7	42.6	45.8

MWFRS loads area desc. Cp (enclosed building)

Windward Walls	0.8
Leeward Walls	0.3
Parapet Wall	1.3

WINDWARD Roof	Site Specific Conditions			
	Kzt=	1.00	G=	0.85
Flat	0	1.3	Kd=	0.85
	2	1.1	Kz based on height	
	4	0.7	Exposure Cat	B
	5	0.5	15	0.57
	6	0.4	20	0.60
	7	0.3	25	0.66
	8	0.2	30	0.70
	12	0.3	40	0.76
		0.7	50	0.81
		0.7	60	0.85
		0.6	70	0.89

Roof height 25 ft
 Roof Slope 4 in 12 theta= 0.32 rad

Design Wind Pressures

Wind Area Pressures	ht (ft)	Kz	Cp	G	qs	Pnet=	includes windward and leeward pressures
Windward Walls	0-15'	0.85	0.8	0.85	26.33	22.0	psf
	15-20'	0.90	0.8	0.85	26.33	22.6	psf
	20-25'	0.94	0.8	0.85	26.33	23.1	psf
	25-30'	0.98	0.8	0.85	26.33	23.7	psf
	30-40'	1.04	0.8	0.85	26.33	24.5	psf
Side Walls	40-50'	1.09	0.8	0.85	26.33	25.1	psf
	17.5	0.85	0.7	0.85	26.33	13.3	psf
Net Horizontal Roof pressure	25	0.94	0.70	0.85	26.33	8.6	psf
Leeward Roof Pressure	25	0.94	0.60	0.85	26.33	12.6	psf
Leeward Walls	25	0.94	0.3	0.85	26.33	10.8	psf
Parapet Walls	25	0.94	1.3	0.85	26.33	27.3	psf

North - South Direction Wind Loading

High Roof		Height=	26	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	48		8.6		0.42
High Wall Area (sf)	135		23.7		3.20
Main Wall Area (sf)	235		23.1		5.44
Low zone Wall Area	144		22.6		3.26

Story Shear 12.31 kips

N Wing Roof		Height=	20	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	34		8.6		0.29
High Wall Area (sf)	0		23.1		0.00
Main Wall Area (sf)	56		22.6		1.27
Low zone Wall Area	33		22.0		0.72

Story Shear 2.29 kips

S Wing Roof		Height=	20	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	21		8.6		0.18
High Wall Area (sf)	0		23.1		0.00
Main Wall Area (sf)	72		22.6		1.63
Low zone Wall Area	32		22.0		0.70

Story Shear 2.51 kips

1st Floor		Height=	7	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	0		8.6		0.00
High Wall Area (sf)	92		22.6		2.08
Main Wall Area (sf)	506		22.0		11.11
Low zone Wall Area	372		22.0		8.17

Story Shear 21.36 kips

Total Wind Load
 North - South Direction $V_w N-S=$ 38.47 kips

East-West Direction Wind Loading

High Roof		Height=	26	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	123		8.6		1.06
High Wall Area (sf)	55		23.7		1.30
Main Wall Area (sf)	20		23.1		0.46
Low zone Wall Area (\$	0		22.6		0.00

Story Shear 2.83 kips

N Wing Roof		Height=	20	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	146		8.6		1.26
High Wall Area (sf)	0		23.1		0.00
Main Wall Area (sf)	210		22.6		4.75
Low zone Wall Area (\$	309		22.0		6.78

Story Shear 12.80 kips

S Wing Roof		Height=	20	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	108		8.6		0.93
High Wall Area (sf)	0		23.1		0.00
Main Wall Area (sf)	200		22.6		4.53
Low zone Wall Area (\$	40		22.0		0.88

Story Shear 6.34 kips

1st Floor		Height=	7	Wind Pnet	Shear (k)
Zone	Area		psf		
Roof Area (sf)	0		8.6		0.00
High Wall Area (sf)	0		22.6		0.00
Main Wall Area (sf)	480		22.0		10.54
Low zone Wall Area (\$	229		22.0		5.03

Story Shear 15.57 kips

Total Wind Load
 East - West Direction $V_w E-W=$ 37.54 kips

BUILDING MASS

ROOF EL = 21' AUG

- 1718# N. WING x 14.5 #/ft = 24.9k
- + 1980# Center Roof x 16 #/ft = 31.7
- + 2007# S. WING x 14.5 #/ft = 29.1
- + 250# LOW ROOF x 15 #/ft = 3.9
- + 1420# EXT WALL x 12 #/ft = 17.8
- + 485# GLAZING WALL x 9 #/ft = 4.4
- + 1492# INT WALL x 8.5 #/ft = 12.7
- + 154# CHIMNEY BLOCK x 100 #/ft = 15.4k

$\Sigma = 139.9k$

MAIN FLOOR (FRAMED AREAS ONLY) EL = 7'

- 1080# EX FLOOR O/C S x 14 #/ft = 15.1k
- + 1704# EX FLOOR O/C BEAM x 16.5 #/ft = 11.6
- + 1110# New FLOOR x 16.5 #/ft = 18.3
- + 868# DECKS (w/ TOPPING) x 34 #/ft = 29.5
- + 954# EXT WALL x 12 #/ft = 11.4
- + 1897# INT WALL x 8.5 #/ft = 16.1
- + 485# GLAZING WALL x 9 #/ft = 4.4
- + 520# CS Bearing walls x 10 #/ft = 5.2

$\Sigma = 111.6k$

BUILDING MASS FOR SEISMIC = 251.5k

$V_E = (C_s = 0.142) \times p_{cl,3} \times W = \underline{46.3k}$



I.L. GROSS
STRUCTURAL ENGINEERS

SHEET TITLE

SCALE

DATE

PROJECT

DESIGNED BY

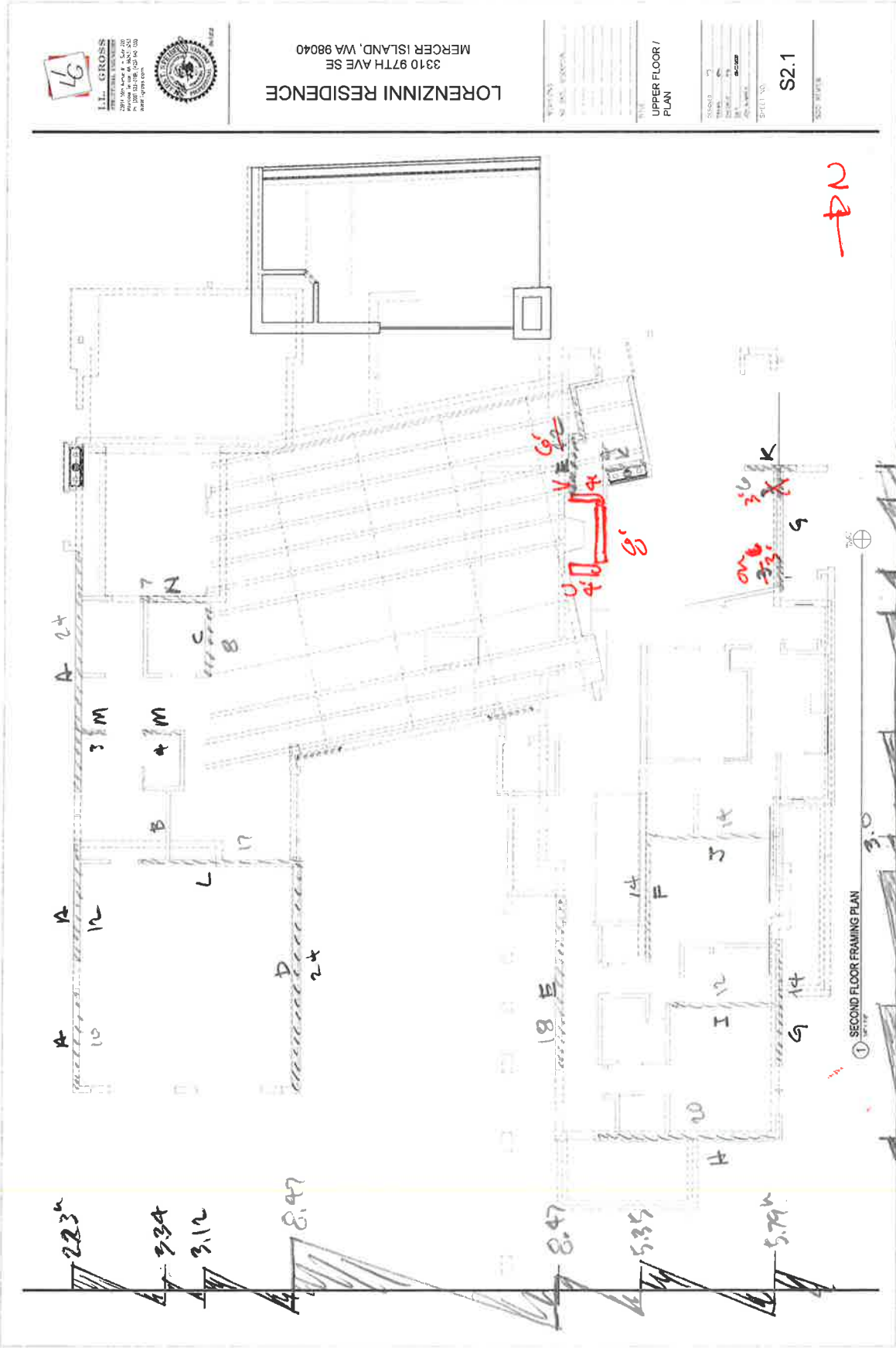
CLIENT

CHECKED

SHEET

MAIN FLOOR SW PLAN
 1/16" = 1'-0"

ROOF DIAGRAM ONTO MAIN FLOOR SW
 VRS 36.56M (SERVANT)



Lorenzini House

Shear wall analysis

LRFD Wood Shear Wall Design

loads
 wall weight= 12 psf roof weight= 14.5 psf
 conc wall= 75 psf floor weight= 16.5 psf

SW SCHEDULE CAP (plf)

W6	416
W4	600
W3	780
W2	1020
2W4	1215
2W3	1560
TOO HIGH	1600

Holdowns Capacity Straps Capacity

ABs ok	0.6 k	LSTA24	1.2 k
HDU2	3.5 k	LSTA36	2 k
HDU4	5.9 k	MSTC40	3.9 k
HDU5	7.3 k	MSTC66	7.5 k
HDU8	10.2 k	MST72	8.7 k
HDU11	14.4 k	HDU8	10.2 k

Capacities are adjusted fro LRFD values

SW - A N/S Direction

Roof- Upper Floor

H=	12.0	Mot=	26.8 k-ft
L=	46.0	C=	0.6 k
Vapp=	2.2	Mres=	206.2 k-ft
WW=	6.0	T=	0.0 k
TA=	5.0	2w/h=	7.7
Weight=	3.0	Co=	1.0

Shear VLF= 48.5

W6 LSTA24

SW - B N/S Direction

Roof- Upper Floor

H=	10.0	Mot=	33.4 k-ft
L=	8.0	C=	4.2 k
Vapp=	3.3	Mres=	7.6 k-ft
WW=	0.9	T=	3.2 k
TA=	10.0	2w/h=	1.6
Weight=	1.0	Co=	1.0

Shear VLF= 417.5

W4 MSTC40

Upper- Main Floor

H=	6.0	Mot=	44.0 k-ft
L=	46.0	C=	1.0 k
Vapp=	0.7	Mres=	306.1 k-ft
WW=	8.9	T=	0.0 k
TA=	2.0	2w/h=	15.3
Weight=	4.4	Co=	1.0

Shear VLF= 62.6

W6 ABs ok

Upper- Main Floor

H=	6.0	Mot=	58.4 k-ft
L=	12.0	C=	4.9 k
Vapp=	0.8	Mres=	18.3 k-ft
WW=	1.6	T=	3.3 k
TA=	2.0	2w/h=	4.0
Weight=	1.4	Co=	1.0

Shear VLF= 347.5

W6 HDU2

SW - C		N/S Direction	
Roof- Upper Floor			
H=	10.0	Mot=	31.2 k-ft
L=	8.0	C=	3.9 k
Vapp=	3.1	Mres=	6.8 k-ft
WW=	0.9	T=	3.1 k
TA=	8.0	2w/h=	1.6
Weight=	0.8	Co=	1.0
Shear VLF= 390.0		W6 MSTC40	

SW - D		N/S Direction	
Roof- Upper Floor			
H=	9.0	Mot=	76.2 k-ft
L=	24.0	C=	3.2 k
Vapp=	8.5	Mres=	50.5 k-ft
WW=	2.3	T=	1.1 k
TA=	6.0	2w/h=	5.3
Weight=	1.9	Co=	1.0
Shear VLF= 352.9		W6 LSTA24	

Upper- Main Floor			
H=	6.0	Mot=	54.9 k-ft
L=	9.0	C=	6.1 k
Vapp=	0.8	Mres=	11.5 k-ft
WW=	1.4	T=	4.8 k
TA=	2.0	2w/h=	3.0
Weight=	1.1	Co=	1.0
Shear VLF= 438.9		W4 HDU4	

Upper- Main Floor			
H=	4.0	Mot=	117.2 k-ft
L=	34.0	C=	3.4 k
Vapp=	1.8	Mres=	113.7 k-ft
WW=	3.8	T=	0.1 k
TA=	2.0	2w/h=	17.0
Weight=	2.9	Co=	1.0
Shear VLF= 301.5		W6 ABs ok	

SW - E		N/S Direction	
Roof- Upper Floor			
H=	12.0	Mot=	101.6 k-ft
L=	24.0	C=	4.2 k
Vapp=	8.5	Mres=	59.9 k-ft
WW=	3.1	T=	1.7 k
TA=	6.0	2w/h=	4.0
Weight=	1.9	Co=	1.0
Shear VLF= 352.9		W6 LSTA36	

SW - F		N/S Direction	
Roof- Upper Floor			
H=	10.0	Mot=	53.5 k-ft
L=	14.0	C=	3.8 k
Vapp=	5.4	Mres=	20.8 k-ft
WW=	1.5	T=	2.3 k
TA=	8.0	2w/h=	2.8
Weight=	1.5	Co=	1.0
Shear VLF= 382.1		W6 MSTC40	

Upper- Main Floor			
H=	9.0	Mot=	183.2 k-ft
L=	40.0	C=	4.6 k
Vapp=	0.6	Mres=	225.1 k-ft
WW=	7.0	T=	0.0 k
TA=	4.0	2w/h=	8.9
Weight=	4.3	Co=	1.0
Shear VLF= 226.5		W6 ABs ok	

Upper- Main Floor			
H=	9.0	Mot=	105.9 k-ft
L=	20.0	C=	5.3 k
Vapp=	0.5	Mres=	72.9 k-ft
WW=	3.5	T=	1.6 k
TA=	8.0	2w/h=	4.4
Weight=	3.8	Co=	1.0
Shear VLF= 291.0		W6 HDU2	

SW - G N/S Direction

Roof- Upper Floor

H=	12.0	Mot=	69.5 k-ft
L=	20.0	C=	3.5 k
Vapp=	5.8	Mres=	41.6 k-ft
WW=	2.6	T=	1.7 k
TA=	6.0	2w/h=	3.3
Weight=	1.6	Co=	0.8
Shear VLF=	361.9		W6 LSTA36

SW - H E/W Direction

Roof- Upper Floor

H=	11.0	Mot=	25.3 k-ft
L=	20.0	C=	1.3 k
Vapp=	2.3	Mres=	34.2 k-ft
WW=	2.4	T=	0.0 k
TA=	4.0	2w/h=	3.6
Weight=	1.0	Co=	1.0
Shear VLF=	115.0		W6 LSTA24

Upper- Main Floor

H=	9.0	Mot=	129.1 k-ft
L=	16.0	C=	8.1 k
Vapp=	0.8	Mres=	49.5 k-ft
WW=	4.1	T=	5.0 k
TA=	2.0	2w/h=	3.6
Weight=	2.0	Co=	1.0
Shear VLF=	413.8		W6 HDU4

Upper- Main Floor

H=	9.0	Mot=	68.1 k-ft
L=	22.0	C=	3.1 k
Vapp=	2.5	Mres=	68.3 k-ft
WW=	4.5	T=	0.0 k
TA=	2.0	2w/h=	4.9
Weight=	1.7	Co=	1.0
Shear VLF=	215.9		W6 ABs ok

Concrete Wall at basement

SW - I E/W Direction

Roof- Upper Floor

H=	10.0	Mot=	45.5 k-ft
L=	12.0	C=	3.8 k
Vapp=	4.6	Mres=	11.5 k-ft
WW=	1.3	T=	3.5 k
TA=	4.0	2w/h=	2.4
Weight=	0.6	Co=	0.8
Shear VLF=	474.0		W4 MSTC40

Drag Strut Below

SW - K E/W Direction

Roof- Upper Floor

H=	12.0	Mot=	63.6 k-ft
L=	6.0	C=	10.6 k
Vapp=	5.3	Mres=	3.7 k-ft
WW=	0.8	T=	10.0 k
TA=	6.0	2w/h=	1.0
Weight=	0.5	Co=	1.0
Shear VLF=	883.3		W2 HDU8

SW - J E/W Direction

Roof- Upper Floor

H=	10.0	Mot=	30.0 k-ft
L=	14.0	C=	2.1 k
Vapp=	3.0	Mres=	15.7 k-ft
WW=	1.5	T=	1.3 k
TA=	4.0	2w/h=	2.8
Weight=	0.7	Co=	0.8
Shear VLF=	267.9		W6 LSTA36

Drag Strut Below

Upper- Main Floor

H=	9.0	Mot=	121.0 k-ft
L=	10.0	C=	12.1 k
Vapp=	1.1	Mres=	12.6 k-ft
WW=	1.7	T=	10.8 k
TA=	2.0	2w/h=	2.2
Weight=	0.8	Co=	1.0
Shear VLF=	638.0		W3 HDU11

Concrete Wall at Basement

SW - L N/S Direction

Roof- Upper Floor

H=	12.0	Mot=	117.0 k-ft
L=	17.0	C=	6.9 k
Vapp=	9.8	Mres=	26.3 k-ft
WW=	2.2	T=	6.7 k
TA=	4.0	2w/h=	2.8
Weight=	0.9	Co=	0.8
Shear VLF= 716.9		W3 MSTC66	

SW - M E/W Direction

Roof- Upper Floor

H=	11.0	Mot=	58.1 k-ft
L=	7.0	C=	8.3 k
Vapp=	5.3	Mres=	4.2 k-ft
WW=	0.8	T=	7.7 k
TA=	4.0	2w/h=	1.3
Weight=	0.4	Co=	1.0
Shear VLF= 754.3		W3 MST72	

Upper- Main Floor

H=	9.0	Mot=	212.2 k-ft
L=	16.0	C=	13.3 k
Vapp=	0.8	Mres=	41.0 k-ft
WW=	3.8	T=	10.7 k
TA=	2.0	2w/h=	3.6
Weight=	1.4	Co=	1.0
Shear VLF= 661.3		W3 HDU11	

Upper- Main Floor

H=	6.0	Mot=	95.8 k-ft
L=	12.0	C=	8.0 k
Vapp=	1.0	Mres=	20.4 k-ft
WW=	1.6	T=	6.3 k
TA=	8.0	2w/h=	4.0
Weight=	1.8	Co=	1.0
Shear VLF= 523.3		W4 HDU5	

SW - N N/S Direction

Roof- Upper Floor

H=	10.0	Mot=	36.0 k-ft
L=	7.0	C=	5.1 k
Vapp=	3.6	Mres=	3.9 k-ft
WW=	0.8	T=	4.6 k
TA=	4.0	2w/h=	1.4
Weight=	0.4	Co=	1.0
Shear VLF= 514.3		W4 MSTC66	

SW - O E/W Direction

Main Floor- Basement

H=	9.0	Mot=	40.3 k-ft
L=	6.0	C=	6.7 k
Vapp=	4.5	Mres=	2.2 k-ft
WW=	0.6	T=	6.4 k
TA=	2.0	2w/h=	1.3
Weight=	0.2	Co=	1.0
Shear VLF= 746.7		W3 HDU5	

Upper- Main Floor

H=	6.0	Mot=	65.4 k-ft
L=	14.0	C=	4.7 k
Vapp=	1.3	Mres=	25.8 k-ft
WW=	1.7	T=	2.8 k
TA=	8.0	2w/h=	4.7
Weight=	2.0	Co=	1.0
Shear VLF= 350.0		W6 HDU2	

SW - P E/W Direction

Main Floor- Basement

H=	9.0	Mot=	28.9 k-ft
L=	8.0	C=	3.6 k
Vapp=	3.2	Mres=	3.9 k-ft
WW=	0.8	T=	3.1 k
TA=	2.0	2w/h=	1.8
Weight=	0.2	Co=	1.0
Shear VLF= 401.3		W6 HDU2	

SW - Q		E/W Direction	
Main Floor - Crawspace			
H=	6.0	Mot=	6.0 k-ft
L=	22.0	C=	0.3 k
Vapp=	1.0	Mres=	22.0 k-ft
WW=	1.4	T=	0.0 k
TA=	2.0	2w/h=	7.3
Weight=	0.6	Co=	1.0
Shear VLF=	45.5		W6 ABs ok

SW - R		E/W Direction	
Main Floor- Basement			
H=	9.0	Mot=	16.7 k-ft
L=	14.0	C=	1.2 k
Vapp=	1.9	Mres=	12.1 k-ft
WW=	1.4	T=	0.3 k
TA=	2.0	2w/h=	3.1
Weight=	0.4	Co=	1.0
Shear VLF=	132.9		W6 ABs ok

SW - S		N/S Direction	
Main Floor - Crawspace			
H=	8.0	Mot=	13.8 k-ft
L=	18.0	C=	0.8 k
Vapp=	1.7	Mres=	22.5 k-ft
WW=	1.6	T=	0.0 k
TA=	4.0	2w/h=	4.5
Weight=	0.9	Co=	1.0
Shear VLF=	95.6		W6 ABs ok

SW - T		E/W Direction	
Main Floor- Basement			
H=	9.0	Mot=	14.1 k-ft
L=	17.0	C=	0.8 k
Vapp=	1.6	Mres=	17.8 k-ft
WW=	1.7	T=	0.0 k
TA=	2.0	2w/h=	3.8
Weight=	0.4	Co=	1.0
Shear VLF=	92.4		W6 ABs ok

SW - U		E/W Direction	
Roof- Upper Floor			
H=	10.0	Mot=	24.0 k-ft
L=	4.0	C=	6.0 k
Vapp=	2.4	Mres=	1.3 k-ft
WW=	0.4	T=	7.1 k
TA=	4.0	2w/h=	0.8
Weight=	0.2	Co=	1.0
Shear VLF=	750.0		W3 HDU5

SW - V		E/W Direction	
Roof- Upper Floor			
H=	11.0	Mot=	26.4 k-ft
L=	4.0	C=	6.6 k
Vapp=	2.4	Mres=	1.4 k-ft
WW=	0.5	T=	8.6 k
TA=	4.0	2w/h=	0.7
Weight=	0.2	Co=	1.0
Shear VLF=	825.0		W2 HDU8

Upper- Main Floor			
H=	9.0	Mot=	54.6 k-ft
L=	6.0	C=	9.1 k
Vapp=	1.0	Mres=	5.8 k-ft
WW=	1.0	T=	8.1 k
TA=	8.0	2w/h=	1.3
Weight=	0.9	Co=	1.0
Shear VLF=	566.7		W4 HDU8

Upper- Main Floor			
H=	9.0	Mot=	59.7 k-ft
L=	6.0	C=	10.0 k
Vapp=	1.3	Mres=	5.9 k-ft
WW=	1.1	T=	9.0 k
TA=	8.0	2w/h=	1.3
Weight=	0.9	Co=	1.0
Shear VLF=	616.7		W3 HDU8

LORENZINI SCH. ROOF

DL = 16 psf
SL = 25 psf (est)
WL = 18 psf

RAFTERS/PURLINS

Span = 11' TA = 32%
(max)

GL 3 1/2 x 6 ON

DR 6 x 6 Purlins ON

High Beams

Span = 3' 0" + 8' + 24' + 6' 0"

TA = 10' ROOF

DL = 160 PL + self wt

SL = 250

WL = 180

M = ϕ @ 16'
= 4'2" past truss/Bm

GL 5 1/2 x 15

24F-V8

R₁ = 380 lb
550 kS
280 kW

R₂ = 4 kb
5.6 kS
3.8 kW

R₃ = 3.0 kb
4.2 kS
4.0 kW

WATERFRONT BEAM

Span = 8' + 30'

TA = 5' clear story

DL = 45

WL = 60 PL

PL = 8', 18', 28', 38'

= 3" D
4.2 kS
4.0 kW

(2) MC 12 x 45 w/ HSS 8 x 6 x 3/8

D_T = 0.52" A_L = 0.23" SNOW



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SHEET TITLE

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BEAM @ 'low' END

Span = 28'

TA = 2' CW

DL = 22

WL = 36 PIF

+ Plc @ 16' or 24'

= 390 lbs

550 lbs

250 lbs

(2) MC 10x25 on

Middle Span Truss

30' SPAN

Base 8' CW



BTM CHORD

LOADS - DL = 25
WL = 36

Bm Pz 4' x 7'

5.6 k/s

3.0 k/w



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PROJECT

DESIGNED BY

CLIENT

CHECKED

SHEET



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

Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

General Section Property Calculator

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I.L. GROSS STRUCTURAL ENGINEERS

DESCRIPTION: Double MC 12x45 with HSS composite Beam

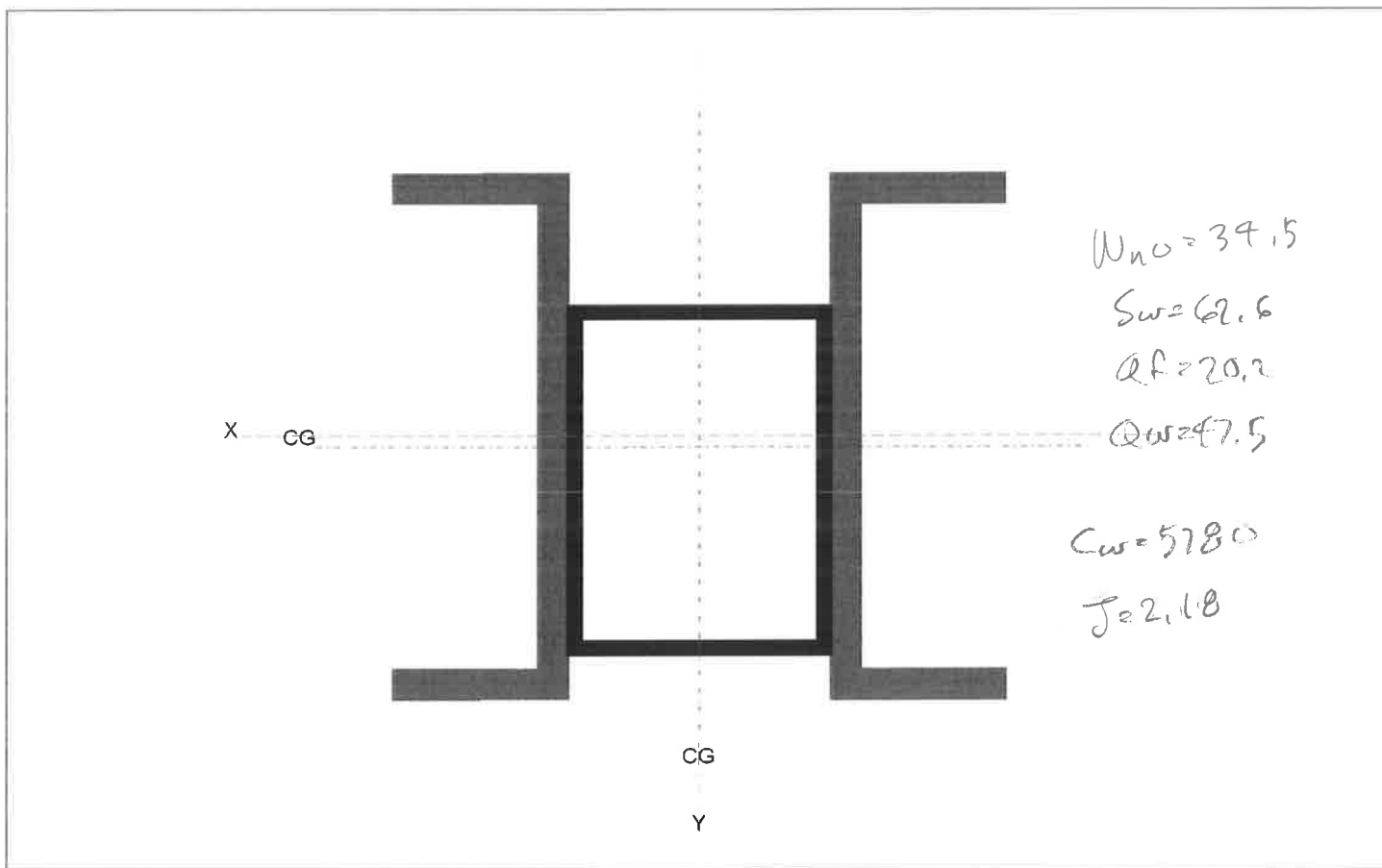
Final Section Properties

Total Area	:	35.251 in ²	lxx	:	585.63 in ⁴	Sxx : - Y	:	101.928 in ³
Calculated final C.G. distance from Datum :			lyy	:	508.48 in ⁴	Sxx : +Y	:	93.633 in ³
X cg Dist.	:	0.0 in	Zxx	:	127.883 in ³	Syy : - X	:	72.952 in ³
Y cg Dist.	:	-0.2545 in	Zyy	:	125.407 in ³	Syy : +X	:	72.952 in ³
Edge Distances from CG. :						r xx	:	4.076 in
+X	:	6.970 in	+Y	:	6.254 in	r yy	:	3.798 in
-X	:	-6.970 in	-Y	:	-5.746 in			

Rotation of All Components @ Angle : 0.00 deg CCW

Minumim Section Properties

Rotation Angle (CCW)	90.0 deg CCW	I: Moment of Inertia	508.48 in ⁴
r: Radius of Gyration	3.798 in	S: Modulus	72.961 in ³
		Z: Plastic Modulus	125.407 in ³



Steel Shapes

MC12x45 : 1	Area =	13.140 in ²	Rotation =	0 deg CCW
			Xcg =	4.000 in
			Ycg =	0.000 in
MC12x45 : 2	Area =	13.140 in ²	Rotation =	180 deg CCW
			Xcg =	-4.000 in
			Ycg =	0.000 in

CENTER WING ROOF FRAMING

DL=16 SL=24" w/ sloped deck

RAFTERS (DL=14 1/2")

TYP SPAN=3'
END SPAN=6' & 6' cant
2x10 @ 24" o/c

PITCHED 'UP' ROOF

RAFTERS: SPAN=5' + 4' + 2 1/2' OH
TA=24"

2x6 @ 24" o/c

BM @ TRANSITION

SPAN=10'
TA=5' R : DL=120
SL=125 P/L

(2) 2x10
R=380#
G30#S

BM @ GLAZING

SPAN=10'
TA=5' R
DL=70
SL=105 P/L

HSS 4x4x3/16

R=400#
G30#S

PURLINS

SPAN=10'
TA=32" o/c

6x6 OH

MAIN ROOF BM

SPAN=10' + 22'
TA=10' R 0-6'
2' ceiling 6'-14'
10' R 14'-32'

P1 @ 6' = 800#
1060#S

P2 @ 14' = 760#
1260#S

DL=160/20/160
SL=210/0/210 P/L
LL=100/20/100

GL 5'8x15 BM

R1 = 120#
30#L
160#S

R2 = 4310#
1640#L
5260#S

R3 = 1610#
890#L
1940#S

BM @ Overhang Ends

SPAN=10'
TA=9' R
DL=126
SL=190 P/L

R=680#
950#S



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Center Wing Roof P.1

SHEET TITLE SCALE

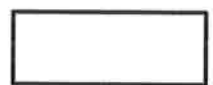
Lorenzini Res.

PROJECT DESIGNED BY

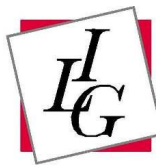
BES

CLIENT CHECKED

DATE



SHEET



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

Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

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Description : Schematic Roof Framing

Wood Beam Design : Rafters in Insulation Space

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

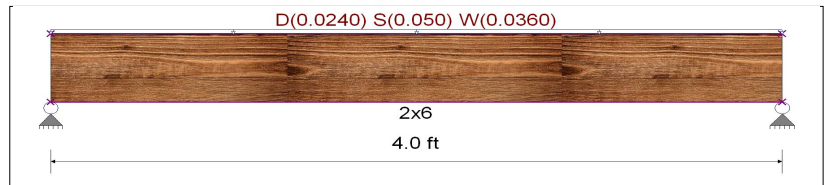
Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0120, S = 0.0250, W = 0.0180 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.179** : 1
 fb : Actual : 240.52 psi at 2.000 ft in Span # 1
 Fb : Allowable : 1,345.50 psi
 Load Comb : +D+S+H
 Max fv/FvRatio = **0.103** : 1
 fv : Actual : 21.31 psi at 0.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S+H



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.05			0.10	0.07		
Right Support	0.05			0.10	0.07		

Max Deflections

Transient Downward	0.009 in	Total Downward	0.014 in
Ratio	5516	Ratio	3469
LC: S Only 0.750L+0.750S+0.450W+			
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC: LC:			

Wood Beam Design : Roof Purlins

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3.125x6, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

Unif Load: D = 0.0160, S = 0.0250, W = 0.0180 k/ft, Trib= 3.0 ft

Design Summary

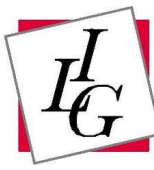
Max fb/Fb Ratio = **0.431** : 1
 fb : Actual : 1,190.64 psi at 5.500 ft in Span # 1
 Fb : Allowable : 2,760.00 psi
 Load Comb : +D+S+H
 Max fv/FvRatio = **0.162** : 1
 fv : Actual : 49.43 psi at 0.000 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S+H



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.26			0.41	0.30		
Right Support	0.26			0.41	0.30		

Max Deflections

Transient Downward	0.245 in	Total Downward	0.420 in
Ratio	538	Ratio	313
LC: S Only 0.750L+0.750S+0.450W+			
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC: LC:			



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Multiple Simple Beam

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Wood Beam Design : Roof Purlins (Sawn)

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Douglas Fir - Larch**

Wood Grade : **No.2**

Fb - Tension	875 psi	Fc - Prll	600 psi	Fv	170 psi	Ebend- xx	1300 ksi	Density	31.21 pcf
Fb - Compr	875 psi	Fc - Perp	625 psi	Ft	425 psi	Eminbend - xx	470 ksi		

Applied Loads

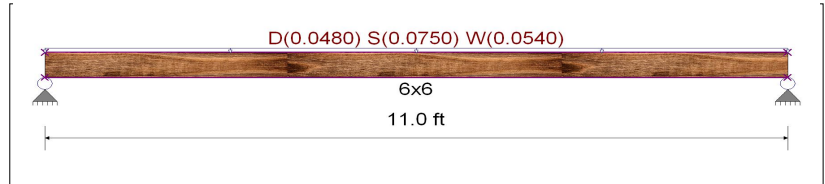
Unif Load: D = 0.0160, S = 0.0250, W = 0.0180 k/ft, Trib = 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.800** : 1
 fb : Actual : 805.09 psi at 5.500 ft in Span # 1
 Fb : Allowable : 1,006.25 psi
 Load Comb : +D+S+H

Max fv/FvRatio = **0.158** : 1
 fv : Actual : 30.86 psi at 0.000 ft in Span # 1
 Fv : Allowable : 195.50 psi
 Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.26			0.41	0.30		
Right Support	0.26			0.41	0.30		



Max Deflections

Transient Downward	0.251 in	Total Downward	0.429 in
Ratio	526	Ratio	307
	LC: S Only	0.750L+0.750S+0.450W+	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:	LC:	



Wood Beam

Lic. #: KW-06008133

DESCRIPTION: Main Roof Beam

CODE REFERENCES

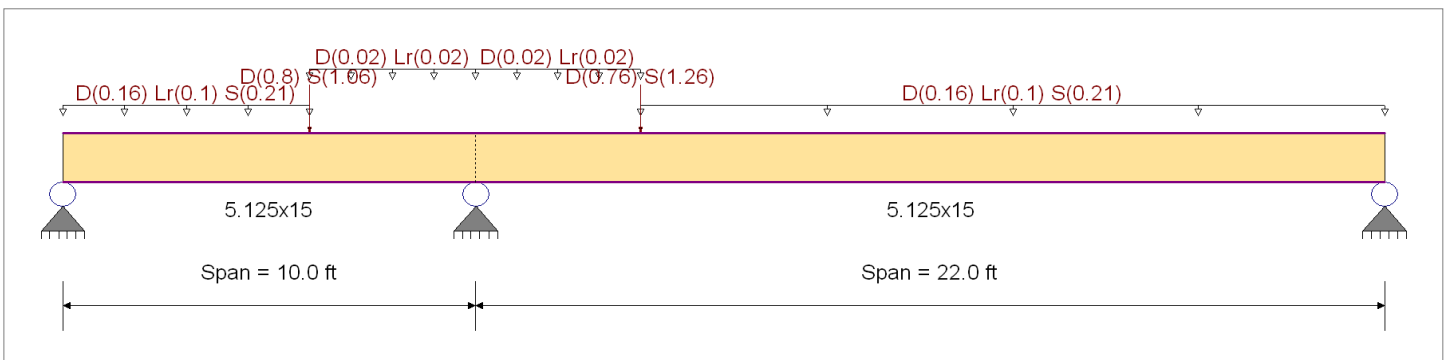
Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	E : Modulus of Elasticity
Load Combination ASCE 7-10	Fb -	2400 psi	Ebend- xx
	Fc - Prll	1650 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy
Wood Grade : 24F - V8	Fv	265 psi	Eminbend - yy
	Ft	1100 psi	Density
			31.21 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 loads

Load for Span Number 1

Uniform Load : D = 0.0160, Lr = 0.010, S = 0.0210 ksf, Extent = 0.0 --> 6.0 ft, Tributary Width = 10.0 ft, (Roof)

Uniform Load : D = 0.020, Lr = 0.020 k/ft, Extent = 6.0 --> 10.0 ft, Tributary Width = 1.0 ft, (Open space)

Point Load : D = 0.80, S = 1.060 k @ 6.0 ft, (P1)

Load for Span Number 2

Uniform Load : D = 0.0160, Lr = 0.010, S = 0.0210 ksf, Extent = 4.0 --> 22.0 ft, Tributary Width = 10.0 ft, (Roof)

Uniform Load : D = 0.020, Lr = 0.020 k/ft, Extent = 0.0 --> 4.0 ft, Tributary Width = 1.0 ft, (open roof)

Point Load : D = 0.760, S = 1.260 k @ 4.0 ft, (P2)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.481 : 1	Maximum Shear Stress Ratio	=	0.354 : 1
Section used for this span	=	5.125x15	Section used for this span	=	5.125x15
	=	1,291.86 psi		=	107.88 psi
	=	2,686.57 psi		=	304.75 psi
Load Combination	=	+D+S	Load Combination	=	+D+S
Location of maximum on span	=	0.000ft	Location of maximum on span	=	10.000ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.263 in	Ratio =		1004 >=360
Max Upward Transient Deflection		-0.025 in	Ratio =		4808 >=360
Max Downward Total Deflection		0.476 in	Ratio =		554 >=240
Max Upward Total Deflection		-0.044 in	Ratio =		2717 >=240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	C _d	C _{FV}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v		
D Only																			
	Length = 10.0 ft	1	0.266	0.199	0.90	1.000	1.00	1.00	1.00	1.00	1.00	9.21	575.21	2160.00	0.00	2.43	47.41	238.50	
	Length = 22.0 ft	2	0.274	0.199	0.90	0.973	1.00	1.00	1.00	1.00	1.00	9.21	575.21	2102.53	0.00	2.43	47.41	238.50	
+D+Lr																			
	Length = 10.0 ft	1	0.276	0.200	1.25	1.000	1.00	1.00	1.00	1.00	1.00	13.27	828.61	3000.00	0.00	3.40	66.32	331.25	



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Wood Beam

File: Lorenzini Residence.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.2.28
I.L. GROSS STRUCTURAL ENGINEERS

Lic. #: KW-06008133

DESCRIPTION: **Main Roof Beam**

Load Combination Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
		M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	f _b	F ['] _b	V	f _v	F ['] _v
Length = 22.0 ft +D+S	2	0.284	0.200	1.25	0.973	1.00	1.00	1.00	1.00	1.00	13.27	828.61	2920.18	3.40	66.32	331.25
Length = 10.0 ft	1	0.468	0.354	1.15	1.000	1.00	1.00	1.00	1.00	1.00	20.69	1,291.86	2760.00	5.53	107.88	304.75
Length = 22.0 ft +D+0.750Lr	2	0.481	0.354	1.15	0.973	1.00	1.00	1.00	1.00	1.00	20.69	1,291.86	2686.57	5.53	107.88	304.75
Length = 10.0 ft	1	0.255	0.186	1.25	1.000	1.00	1.00	1.00	1.00	1.00	12.26	765.26	3000.00	3.16	61.59	331.25
Length = 22.0 ft +D+0.750S	2	0.262	0.186	1.25	0.973	1.00	1.00	1.00	1.00	1.00	12.26	765.26	2920.18	3.16	61.59	331.25
Length = 10.0 ft	1	0.403	0.304	1.15	1.000	1.00	1.00	1.00	1.00	1.00	17.82	1,112.70	2760.00	4.75	92.76	304.75
Length = 22.0 ft +0.60D	2	0.414	0.304	1.15	0.973	1.00	1.00	1.00	1.00	1.00	17.82	1,112.70	2686.57	4.75	92.76	304.75
Length = 10.0 ft	1	0.090	0.067	1.60	1.000	1.00	1.00	1.00	1.00	1.00	5.53	345.12	3840.00	1.46	28.45	424.00
Length = 22.0 ft	2	0.092	0.067	1.60	0.973	1.00	1.00	1.00	1.00	1.00	5.53	345.12	3737.83	1.46	28.45	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0000	0.000	+D+S	-0.0442	6.704
	2	0.4757	12.045		0.0000	6.704

Maximum Deflections for Load Combinations

Load Combination	Span	Max. Downward Defl	Location in Span	Max. Upward Defl	Location in Span
D Only	2	0.2129 in	12.045 ft	0.0000 in	0.000 ft
+D+Lr	2	0.3237 in	12.045 ft	0.0000 in	0.000 ft
+D+S	2	0.4757 in	12.045 ft	0.0000 in	0.000 ft
+D+0.750Lr	2	0.2960 in	12.045 ft	0.0000 in	0.000 ft
+D+0.750S	2	0.4100 in	12.045 ft	0.0000 in	0.000 ft
+0.60D	2	0.1277 in	12.045 ft	0.0000 in	0.000 ft
Lr Only	2	0.1108 in	12.168 ft	0.0000 in	0.000 ft
S Only	2	0.2628 in	11.922 ft	0.0000 in	0.000 ft

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

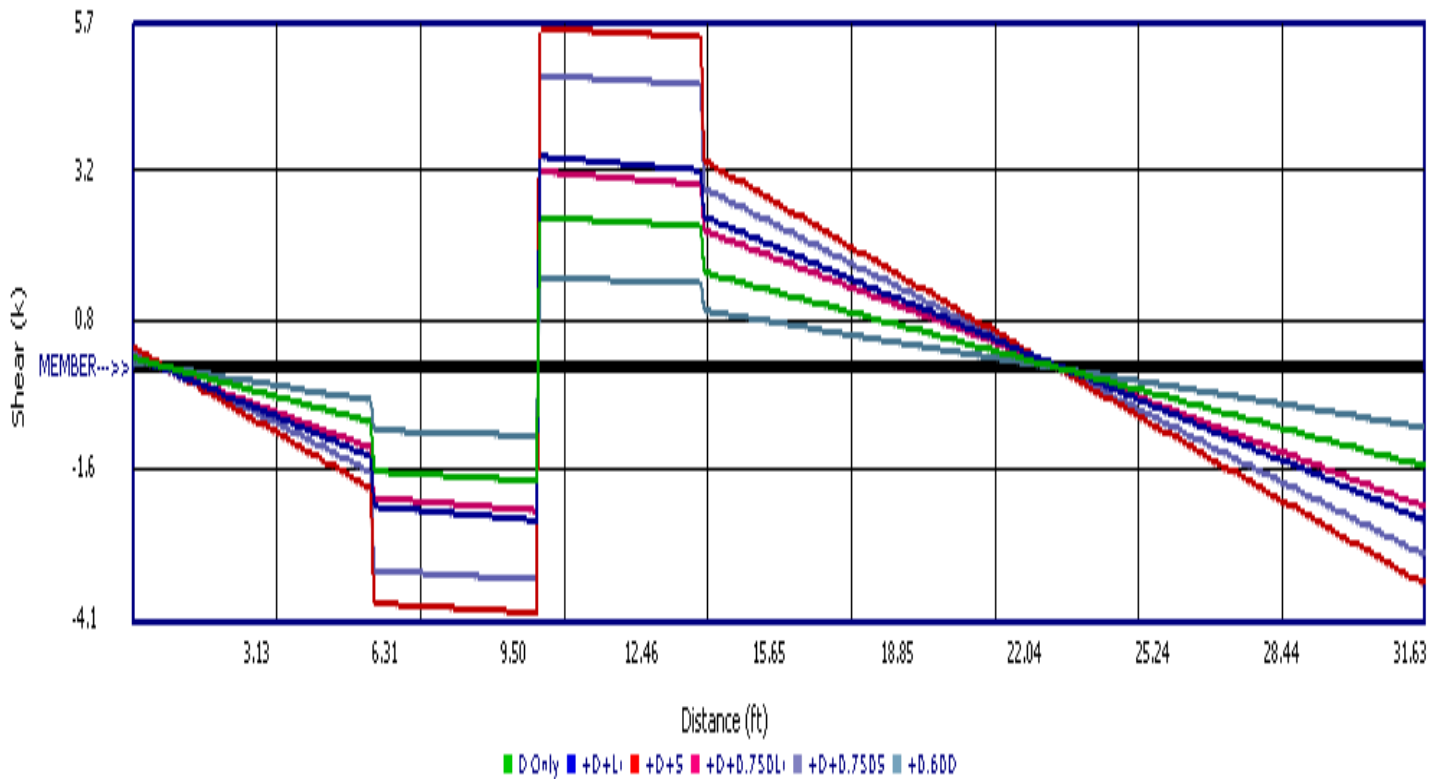
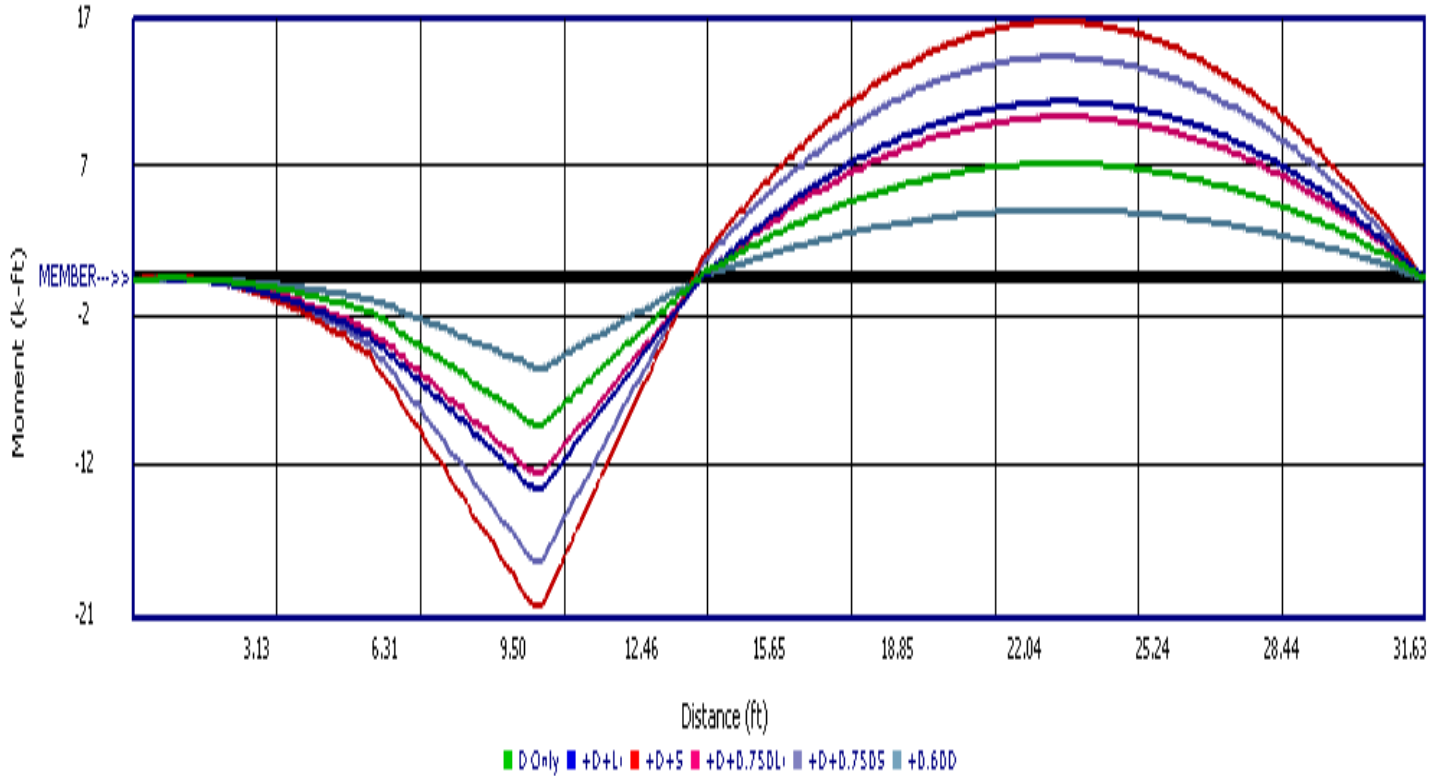
Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.328	9.572	3.553
Overall MINimum	0.158	5.261	1.941
D Only	0.170	4.311	1.612
+D+Lr	0.200	5.955	2.498
+D+S	0.328	9.572	3.553
+D+0.750Lr	0.193	5.544	2.277
+D+0.750S	0.289	8.257	3.068
+0.60D	0.102	2.587	0.967
Lr Only	0.030	1.643	0.886
S Only	0.158	5.261	1.941



Wood Beam

Lic. #: KW-06008133

DESCRIPTION: Main Roof Beam

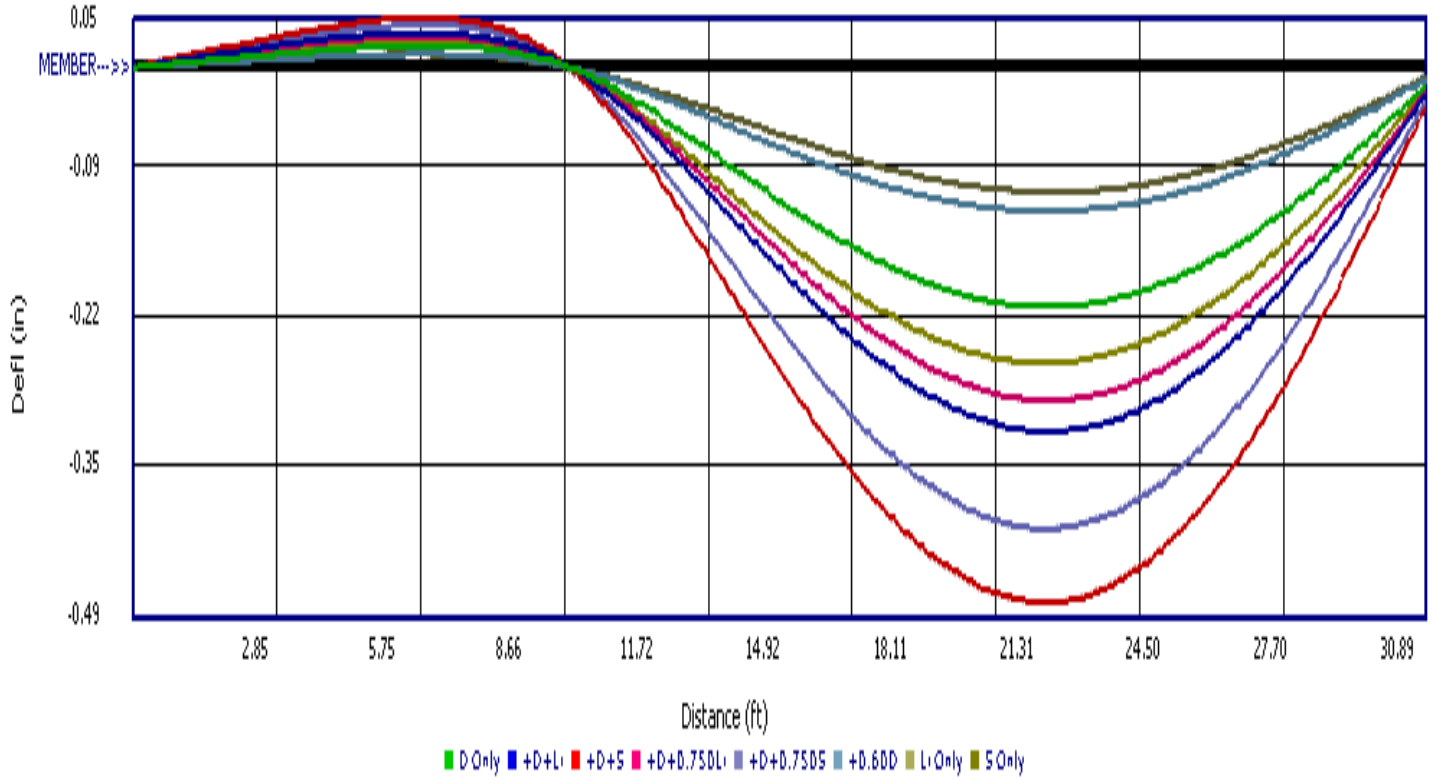




Wood Beam

Lic. #: KW-06008133

DESCRIPTION: Main Roof Beam





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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

File: Lorenzini Residence.ec6
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 I.L. GROSS STRUCTURAL ENGINEERS

Lic. #: KW-06002858

Description : Center Roof Framing

Wood Beam Design : Rrafters AT 6' OH

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DouglasFir-Larch

Wood Grade : No.2

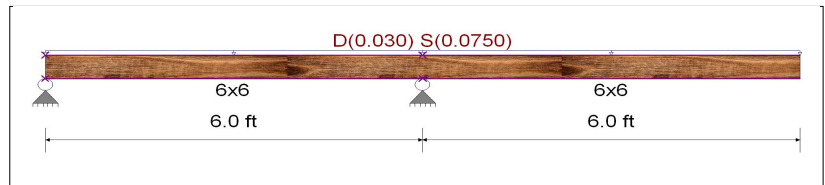
Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.010, S = 0.0250 k/ft, Trib= 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.840** : 1
 fb : Actual : 868.98 psi at 6.000 ft in Span # 1
 Fb : Allowable : 1,035.00 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.160** : 1
 fv : Actual : 33.19 psi at 6.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.00			0.00			
Right Support	0.44			0.90			

Max Deflections

Transient Downward	0.344 in	Total Downward	0.511 in
Ratio	418	Ratio	280
	LC: S Only		LC: +D+S
Transient Upward	-0.027 in	Total Upward	-0.041 in
Ratio	2642	Ratio	1776
	LC: S Only		LC: +D+S

Wood Beam Design : Purlins

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DouglasFir-Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 2.660 ft

Design Summary

Max fb/Fb Ratio = **0.576** : 1
 fb : Actual : 596.64 psi at 5.000 ft in Span # 1
 Fb : Allowable : 1,035.00 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.121** : 1
 fv : Actual : 24.98 psi at 9.567 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.22			0.33			
Right Support	0.22			0.33			

Max Deflections

Transient Downward	0.123 in	Total Downward	0.204 in
Ratio	973	Ratio	586
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



Multiple Simple Beam

Lic. #: KW-06002858

Wood Beam Design : Pitched Roof Rafters

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **DouglasFir-Larch**

Wood Grade : **No.2**

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.294** : 1
 fb : Actual : 395.64 psi at 4.000 ft in Span # 1
 Fb : Allowable : 1,345.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.164** : 1
 fv : Actual : 33.96 psi at 3.560 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.04			0.06			
Right Support	0.16			0.26			

Max Deflections			
Transient Downward	0.022 in	Total Downward	0.036 in
Ratio	2680	Ratio	1680
	LC: S Only		LC: +D+S
Transient Upward	-0.001 in	Total Upward	-0.002 in
Ratio	9999	Ratio	9999
	LC: S Only		LC: +D+S

Wood Beam Design : Pitched Roof BM at Transition

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-2x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **DouglasFir-Larch**

Wood Grade : **No.2**

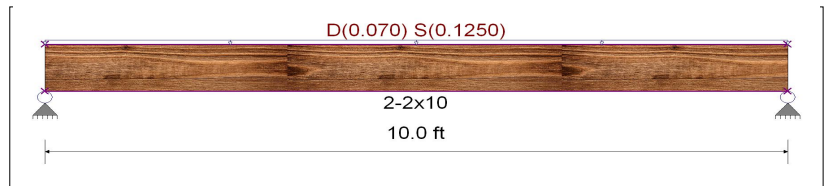
Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.619** : 1
 fb : Actual : 704.80 psi at 5.000 ft in Span # 1
 Fb : Allowable : 1,138.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.222** : 1
 fv : Actual : 46.00 psi at 9.233 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.38			0.63			
Right Support	0.38			0.63			

Max Deflections			
Transient Downward	0.089 in	Total Downward	0.144 in
Ratio	1343	Ratio	835
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



Multiple Simple Beam

Lic. #: KW-06002858

Steel Beam Design : Pitched Roof BM at Glazing windows

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **HSS3x3x1/4, Fully Braced**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

Fy = 46.0 ksi E = 29,000.0 ksi

Applied Loads

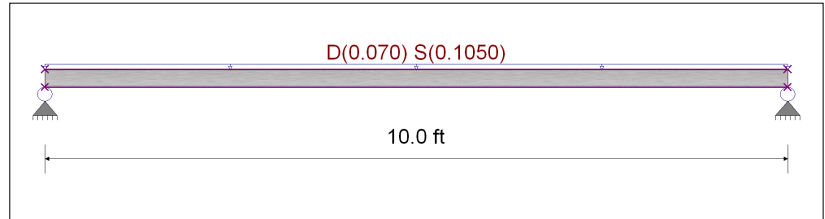
Beam self weight calculated and added to loads
 Unif Load: D = 0.0140, S = 0.0210 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.404** : 1
 Mu : Applied 2.297 k-ft at 5.000 ft in Span # 1
 Mn / Omega : Allow 5.693 k-ft
 Load Comb : +D+S

Max fv/FvRatio = **0.052** : 1
 Vu : Applied 0.9189 k at 0.000 ft in Span # 1
 Vn / Omega : Allow 17.721 k
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.39			0.53		
Right Support	0.39			0.53		



H	Max Deflections		
	Transient Downward	0.271 in	Total Downward 0.475 in
	Ratio	442	252
		LC: S Only	LC: +D+S
	Transient Upward	0.000 in	Total Upward 0.000 in
	Ratio	9999	Ratio 9999
		LC:	LC:

Steel Beam Design : Nano Wal Header

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **HSS4x4x3/16, Fully Braced**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

Fy = 46.0 ksi E = 29,000.0 ksi

Applied Loads

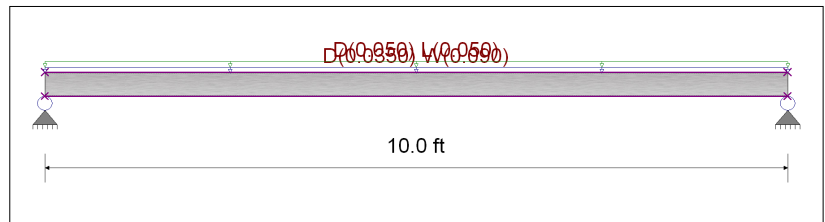
Beam self weight calculated and added to loads
 Unif Load: D = 0.0070, W = 0.0180 k/ft, Trib= 5.0 ft
 Unif Load: D = 0.050, L = 0.050 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.256** : 1
 Mu : Applied 2.155 k-ft at 5.000 ft in Span # 1
 Mn / Omega : Allow 8.424 k-ft
 Load Comb : +D+0.750L+0.450W

Max fv/FvRatio = **0.043** : 1
 Vu : Applied 0.8620 k at 0.000 ft in Span # 1
 Vn / Omega : Allow 20.003 k
 Load Comb : +D+0.750L+0.450W

Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.47	0.25			0.45	
Right Support	0.47	0.25			0.45	



H	Max Deflections		
	Transient Downward	0.113 in	Total Downward 0.217 in
	Ratio	1061	554
		LC: W Only	LC: +D+0.750L+0.450W
	Transient Upward	0.000 in	Total Upward 0.000 in
	Ratio	9999	Ratio 9999
		LC:	LC:



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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

File: Lorenzini Residence.ec6
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Lic. #: KW-06002858

Wood Beam Design : Nano Wal Header (Wood)

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **5.5x6, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V8

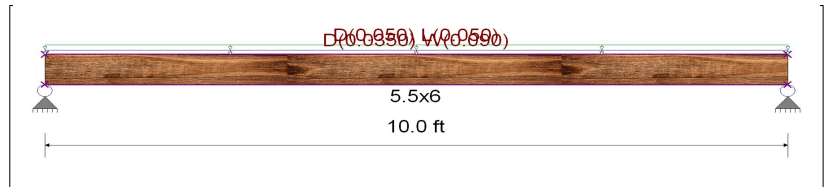
Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	2400 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0070, W = 0.0180 k/ft, Trib= 5.0 ft
 Unif Load: D = 0.050, L = 0.050 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.269** : 1
 fb : Actual : 646.15 psi at 5.000 ft in Span # 1
 Fb : Allowable : 2,400.00 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.111** : 1
 fv : Actual : 29.29 psi at 9.533 ft in Span # 1
 Fv : Allowable : 265.00 psi
 Load Comb : +D+L



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.46	0.25			0.45		
Right Support	0.46	0.25			0.45		

Max Deflections			
Transient Downward	0.114 in	Total Downward	0.216 in
Ratio	1050	Ratio	555
	LC: W Only	LC: +D+0.750L+0.450W	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:	LC:	

STEEL BEAMS @ CENTER ROOF

Bm 1 @ Water front

Span = 6'0" + 5' + 28'6" + 6'

TA = 7'2" GLAZING + 5' sliding Nano wall

DL = 103

CL = 50 (11' → 37')

PL @ 6' = 680 lb
950 lb

PL @ 11', 20', 30',

= 2970 lb

890 lb

3,340 lb

PL @ 39' = 2290 lb
890 lb
2890 lb

DOUBLE MC 12x45 w/ HSS 8x6x3/8
w/ Δ limit to 1/4" @ Nano wall

R₁ = 2.1 kD
1.6 kL
2.7 kS

R₂ = 14.8 kD
4.2 kL
11.9 kS

R₃ = 14.2 kD
3.7 kL
10.4 kS

R₄ = 4.4 kD
-1.3 kL
-3.7 kS

STEEL BM #2 @ ENTRY

SPAN = 12' + 22'

TA = 4' R + 5' GLAZING WALL

DL = 100

CL = 30 PIF

SL = 100

P₁ @ 2' = 170 lb
30 lb
160 lb

P₂ @ 12', 21', 30'

= 1.12 kD

.5 kL

1.0 kS

DBL MC 8x20
w/ HSS 6x4x3/8

ENTRY STOREFRONT BM

SPAN = 10'

TA = 5' GLAZING WALL + Nano wall

Δ limit = 1/4"

DL = 85

CL = 50 PIF

HSS 4x4x3/16
OR GL 5'x6'

R = 470 lb
250 lb
850 lb

R₁ = 90 lb
200 lb
160 lb

R₂ = 5.37 kD
1.63 kL
4.63 kS

R₃ = 2.33 kD
.8 kL
1.95 kS



I.L. GROSS
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SHEET TITLE

SCALE

DATE

PROJECT

DESIGNED BY

CLIENT

CHECKED

SHEET



Steel Beam

Lic. # : KW-06008133

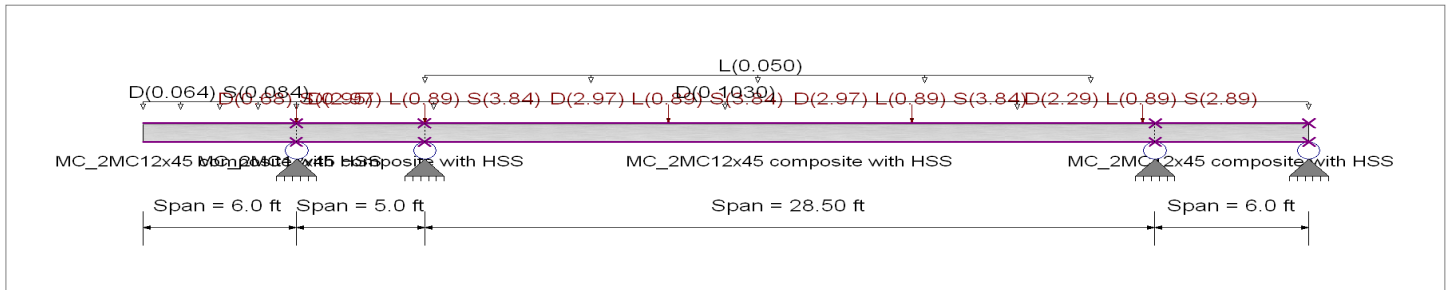
DESCRIPTION: **STL BM #1 at Waterfront**

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : **Allowable Strength Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling**
 Bending Axis : **Major Axis Bending**
 Fy : Steel Yield : **41.0 ksi**
 E: Modulus : **29,000.0 ksi**



Applied Loads

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

Beam self weight calculated and added to loading
 Loads on all spans...
 Uniform Load on ALL spans : D = 0.1030 k/ft

Partial Length Uniform Load : L = 0.050 k/ft, Extent = 11.0 --> 37.0 ft

Load for Span Number 1
 Uniform Load : D = 0.0160, S = 0.0210 ksf, Tributary Width = 4.0 ft, (roof)

Load(s) for Span Number 2
 Point Load : D = 0.680, S = 0.950 k @ 0.0 ft, (P1)

Load(s) for Span Number 3
 Point Load : D = 2.970, L = 0.890, S = 3.840 k @ 0.0 ft, (P2)
 Point Load : D = 2.970, L = 0.890, S = 3.840 k @ 9.50 ft, (P2)
 Point Load : D = 2.970, L = 0.890, S = 3.840 k @ 19.0 ft, (P2.3)
 Point Load : D = 2.290, L = 0.890, S = 2.890 k @ 28.0 ft, (P3)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.203 : 1	Maximum Shear Stress Ratio =	0.121 : 1
Section used for this span	MC_2MC12x45 composi	Section used for this span	MC_2MC12x45 composi
Ma : Applied	53.231 k-ft	Va : Applied	15.170 k
Mn / Omega : Allowable	261.637 k-ft	Vn/Omega : Allowable	125.504 k
Load Combination	+D+0.750L+0.750S	Load Combination	+D+0.750L+0.750S
Location of maximum on span	5.000ft	Location of maximum on span	28.500 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 3
Maximum Deflection			
Max Downward Transient Deflection	0.100 in	Ratio =	3,414 >=520
Max Upward Transient Deflection	-0.005 in	Ratio =	13,586 >=520
Max Downward Total Deflection	0.237 in	Ratio =	1446 >=320
Max Upward Total Deflection	-0.012 in	Ratio =	5840 >=320

Maximum Forces & Stresses for Load Combinations



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

Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Steel Beam

File: Lorenzini Residence.ec6
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I.L. GROSS STRUCTURAL ENGINEERS

Lic. # : KW-06008133

DESCRIPTION: **STL BM #1 at Waterfront**

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 = 6.00 ft	1	0.020	0.036		-5.16	5.16	436.93	261.64	1.00	1.00	4.51	209.59	125.50
Dsgn. L = 5.00 ft	2	0.117	0.049	-0.00	-30.48	30.48	436.93	261.64	1.00	1.00	6.19	209.59	125.50
Dsgn. L = 28.50 ft	3	0.117	0.067	20.92	-30.50	30.50	436.93	261.64	1.00	1.00	8.40	209.59	125.50
Dsgn. L = 6.00 ft	4	0.117	0.046		-30.50	30.50	436.93	261.64	1.00	1.00	5.75	209.59	125.50
+D+L													
Dsgn. L = 6.00 ft	1	0.020	0.049		-5.16	5.16	436.93	261.64	1.00	1.00	6.15	209.59	125.50
Dsgn. L = 5.00 ft	2	0.148	0.062	-0.00	-38.71	38.71	436.93	261.64	1.00	1.00	7.80	209.59	125.50
Dsgn. L = 28.50 ft	3	0.148	0.086	26.48	-38.71	38.71	436.93	261.64	1.00	1.00	10.75	209.59	125.50
Dsgn. L = 6.00 ft	4	0.147	0.056		-38.53	38.53	436.93	261.64	1.00	1.00	7.09	209.59	125.50
+D+S													
Dsgn. L = 6.00 ft	1	0.026	0.069		-6.68	6.68	436.93	261.64	1.00	1.00	8.63	209.59	125.50
Dsgn. L = 5.00 ft	2	0.201	0.080	-0.00	-52.59	52.59	436.93	261.64	1.00	1.00	10.07	209.59	125.50
Dsgn. L = 28.50 ft	3	0.201	0.120	36.00	-52.67	52.67	436.93	261.64	1.00	1.00	15.08	209.59	125.50
Dsgn. L = 6.00 ft	4	0.201	0.075		-52.67	52.67	436.93	261.64	1.00	1.00	9.45	209.59	125.50
+D+0.750L													
Dsgn. L = 6.00 ft	1	0.020	0.046		-5.16	5.16	436.93	261.64	1.00	1.00	5.74	209.59	125.50
Dsgn. L = 5.00 ft	2	0.140	0.059	-0.00	-36.65	36.65	436.93	261.64	1.00	1.00	7.40	209.59	125.50
Dsgn. L = 28.50 ft	3	0.140	0.081	25.09	-36.65	36.65	436.93	261.64	1.00	1.00	10.16	209.59	125.50
Dsgn. L = 6.00 ft	4	0.140	0.054		-36.52	36.52	436.93	261.64	1.00	1.00	6.76	209.59	125.50
+D+0.750L+0.750S													
Dsgn. L = 6.00 ft	1	0.024	0.070		-6.30	6.30	436.93	261.64	1.00	1.00	8.83	209.59	125.50
Dsgn. L = 5.00 ft	2	0.203	0.082	-0.00	-53.23	53.23	436.93	261.64	1.00	1.00	10.32	209.59	125.50
Dsgn. L = 28.50 ft	3	0.203	0.121	36.40	-53.23	53.23	436.93	261.64	1.00	1.00	15.17	209.59	125.50
Dsgn. L = 6.00 ft	4	0.203	0.076		-53.15	53.15	436.93	261.64	1.00	1.00	9.53	209.59	125.50
+0.60D													
Dsgn. L = 6.00 ft	1	0.012	0.022		-3.10	3.10	436.93	261.64	1.00	1.00	2.70	209.59	125.50
Dsgn. L = 5.00 ft	2	0.070	0.030	-0.00	-18.29	18.29	436.93	261.64	1.00	1.00	3.71	209.59	125.50
Dsgn. L = 28.50 ft	3	0.070	0.040	12.55	-18.30	18.30	436.93	261.64	1.00	1.00	5.04	209.59	125.50
Dsgn. L = 6.00 ft	4	0.070	0.028		-18.30	18.30	436.93	261.64	1.00	1.00	3.45	209.59	125.50

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0390	0.000	+D+0.750L+0.750S	0.0000	0.000
	2	0.0000	0.000		-0.0095	2.833
+D+0.750L+0.750S	3	0.2365	14.440	0.0000	2.833	
	4	0.0000	14.440	+D+0.750L+0.750S	-0.0123	2.560

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		-5.338	26.778	24.696	-8.189	
Overall MINimum		-1.263	4.154	3.687	-1.337	
D Only		-2.106	14.776	14.149	-4.415	
+D+L		-3.750	18.930	17.836	-5.752	
+D+S		-4.771	26.624	24.525	-8.110	
+D+0.750L		-3.339	17.892	16.914	-5.418	
+D+0.750L+0.750S		-5.338	26.778	24.696	-8.189	
+0.60D		-1.263	8.866	8.489	-2.649	
L Only		-1.645	4.154	3.687	-1.337	
S Only		-2.665	11.848	10.376	-3.694	



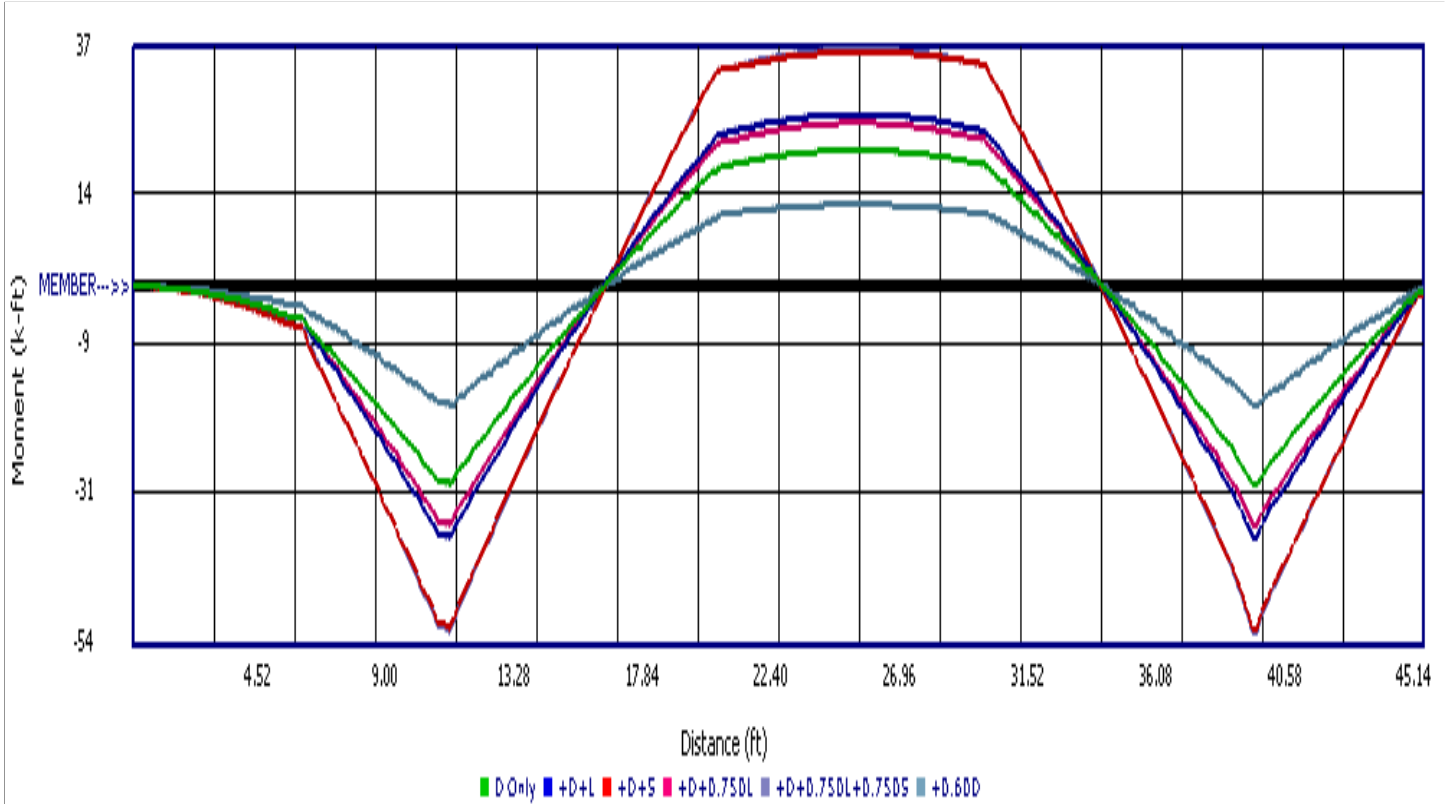
Steel Beam

Lic. #: KW-06008133

DESCRIPTION: STL BM #1 at Waterfront

Steel Section Properties : MC_2MC12x45 composite with HSS

Depth	=	12.000 in	I xx	=	585.63 in ⁴	J	=	2.180 in ⁴
Web Thick	=	0.710 in	S xx	=	93.63 in ³	Cw	=	5,780.00 in ⁶
Flange Width	=	14.020 in	R xx	=	4.076 in	Ro	=	4.880 in
Flange Thick	=	0.700 in	Zx	=	127.883 in ³	H	=	11.500 in
Area	=	35.251 in ²	I yy	=	508.480 in ⁴	Wno	=	34.500 in ²
Weight	=	119.850 plf	S yy	=	72.952 in ³	Sw	=	62.600 in ⁴
Kdesign	=	1.250 in	R yy	=	3.798 in	Qf	=	20.200 in ³
			Zy	=	125.407 in ³	Qw	=	47.500 in ³
rts	=	3.798 in				Wn2	=	23.000
Ycg	=	6.000 in				Sw2	=	26.000
Xcg	=	6.970 in				Sw3	=	26.000
Xp	=	7.000 in						
Eo	=	0.845 in						

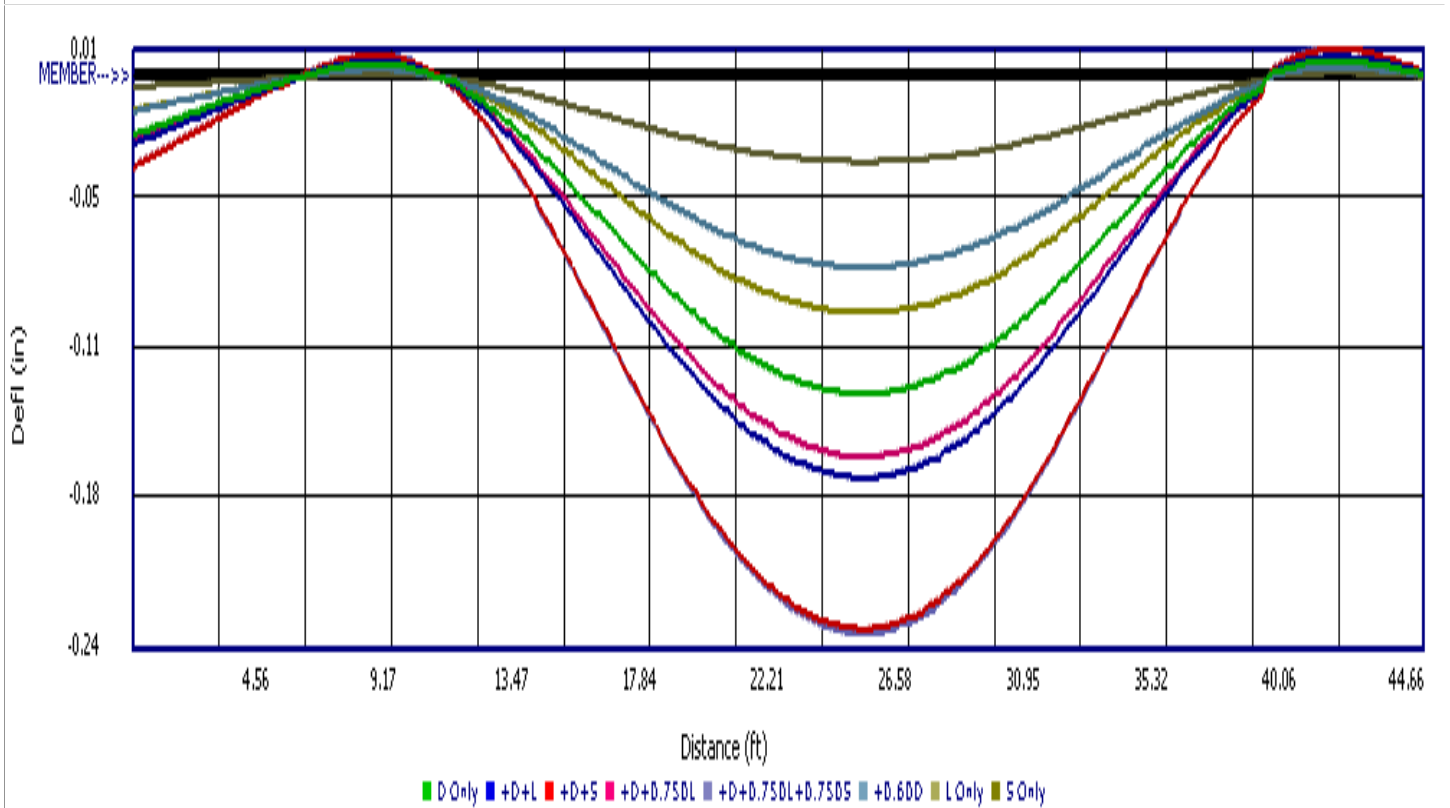
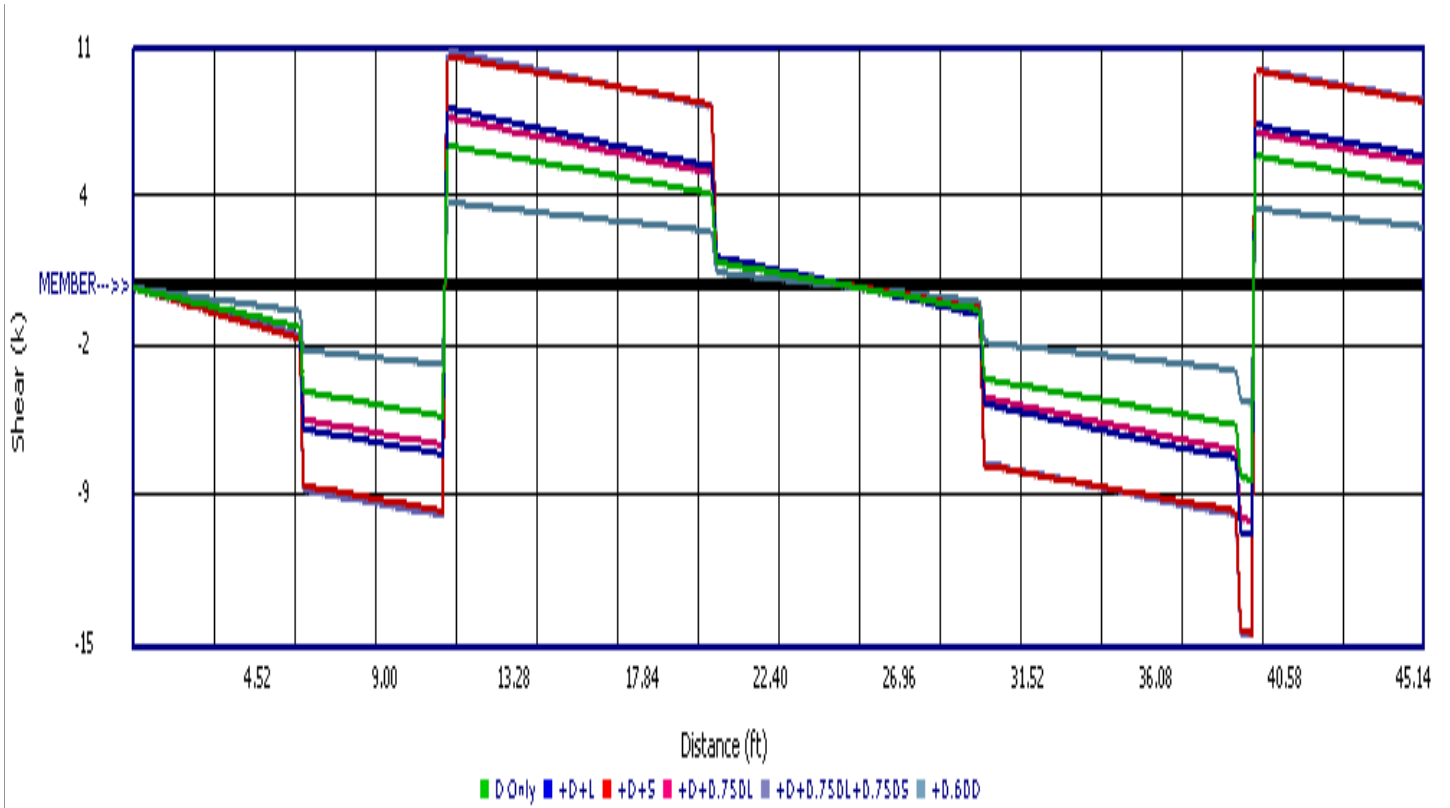




Steel Beam

Lic. #: KW-06008133

DESCRIPTION: STL BM #1 at Waterfront





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Project Title: **Lorenzini Waterfront Home**
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Steel Beam

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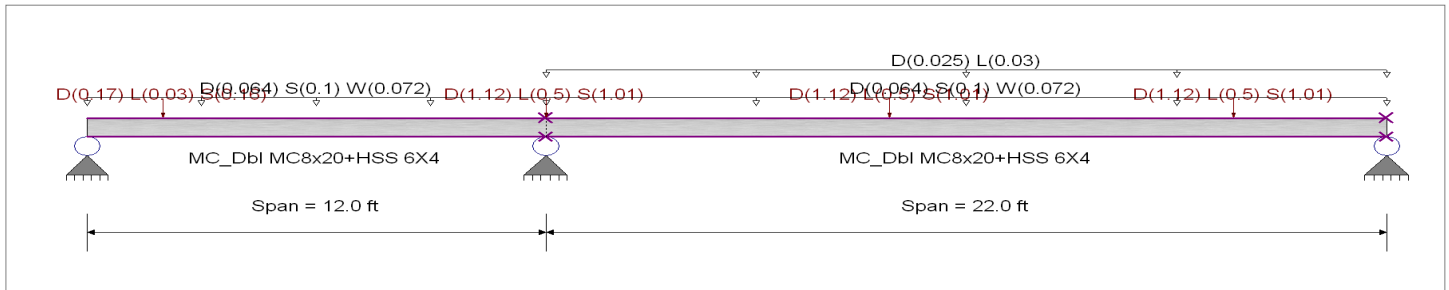
DESCRIPTION: **Center Roof Steel BM #2 at Entry**

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : **Allowable Strength Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling**
 Bending Axis : **Major Axis Bending**
 Fy : Steel Yield : **41.0 ksi**
 E: Modulus : **29,000.0 ksi**



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 = 0.0160, S = 0.0250, W = 0.0180 ksf, Tributary Width = 4.0 ft, (roof)

Point Load : D = 0.170, L = 0.030, S = 0.160 k @ 2.0 ft, (P1)

Load for Span Number 2

Uniform Load : D = 0.0160, S = 0.0250, W = 0.0180 ksf, Tributary Width = 4.0 ft, (roof)

Uniform Load : D = 0.0250, L = 0.030 k/ft, Tributary Width = 1.0 ft, (Glazing)

Point Load : D = 1.120, L = 0.50, S = 1.010 k @ 0.0 ft, (P2.1)

Point Load : D = 1.120, L = 0.50, S = 1.010 k @ 9.0 ft, (P2.2)

Point Load : D = 1.120, L = 0.50, S = 1.010 k @ 18.0 ft, (P2.3)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.236 : 1	Maximum Shear Stress Ratio =	0.062 : 1
Section used for this span	MC_Dbl MC8x20+HSS 6X	Section used for this span	MC_Dbl MC8x20+HSS 6X
Ma : Applied	21.584 k-ft	Va : Applied	5.815 k
Mn / Omega : Allowable	91.595 k-ft	Vn/Omega : Allowable	94.275 k
Load Combination	+D+0.750L+0.750S+0.450W	Load Combination	+D+0.750L+0.750S+0.450W
Location of maximum on span	12.000ft	Location of maximum on span	12.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.161 in	Ratio =	1,639 >=480.
Max Upward Transient Deflection	-0.022 in	Ratio =	6,564 >=480.
Max Downward Total Deflection	0.405 in	Ratio =	652 >=360.
Max Upward Total Deflection	-0.057 in	Ratio =	2520 >=360.

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 = 12.00 ft		1	0.123	0.032		-11.25	11.25	152.96	91.60	1.00	1.00	3.04	157.44	94.28
Dsgn. L = 22.00 ft		2	0.123	0.032	11.03	-11.25	11.25	152.96	91.60	1.00	1.00	3.04	157.44	94.28
+D+L												p.37 / 158		
Dsgn. L = 12.00 ft		1	0.158	0.041		-14.43	14.43	152.96	91.60	1.00	1.00	3.90	157.44	94.28



Steel Beam

Lic. # : KW-06008133

DESCRIPTION: **Center Roof Steel BM #2 at Entry**

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 = 22.00 ft		2	0.158	0.041	14.51	-14.43	14.51	152.96	91.60	1.00	1.00	3.90	157.44	94.28
+D+S														
Dsgn. L = 12.00 ft		1	0.217	0.056		-19.88	19.88	152.96	91.60	1.00	1.00	5.31	157.44	94.28
Dsgn. L = 22.00 ft		2	0.217	0.056	19.46	-19.88	19.88	152.96	91.60	1.00	1.00	5.31	157.44	94.28
+D+0.750L														
Dsgn. L = 12.00 ft		1	0.149	0.039		-13.64	13.64	152.96	91.60	1.00	1.00	3.69	157.44	94.28
Dsgn. L = 22.00 ft		2	0.149	0.039	13.64	-13.64	13.64	152.96	91.60	1.00	1.00	3.69	157.44	94.28
+D+0.750L+0.750S														
Dsgn. L = 12.00 ft		1	0.220	0.057		-20.11	20.11	152.96	91.60	1.00	1.00	5.39	157.44	94.28
Dsgn. L = 22.00 ft		2	0.220	0.057	19.96	-20.11	20.11	152.96	91.60	1.00	1.00	5.39	157.44	94.28
+D+0.60W														
Dsgn. L = 12.00 ft		1	0.144	0.038	0.01	-13.22	13.22	152.96	91.60	1.00	1.00	3.61	157.44	94.28
Dsgn. L = 22.00 ft		2	0.144	0.038	12.75	-13.22	13.22	152.96	91.60	1.00	1.00	3.61	157.44	94.28
+D+0.750L+0.450W														
Dsgn. L = 12.00 ft		1	0.165	0.044		-15.11	15.11	152.96	91.60	1.00	1.00	4.11	157.44	94.28
Dsgn. L = 22.00 ft		2	0.165	0.044	14.93	-15.11	15.11	152.96	91.60	1.00	1.00	4.11	157.44	94.28
+D+0.750L+0.750S+0.450W														
Dsgn. L = 12.00 ft		1	0.236	0.062		-21.58	21.58	152.96	91.60	1.00	1.00	5.81	157.44	94.28
Dsgn. L = 22.00 ft		2	0.236	0.062	21.25	-21.58	21.58	152.96	91.60	1.00	1.00	5.81	157.44	94.28
+0.60D+0.60W														
Dsgn. L = 12.00 ft		1	0.095	0.025	0.02	-8.72	8.72	152.96	91.60	1.00	1.00	2.39	157.44	94.28
Dsgn. L = 22.00 ft		2	0.095	0.025	8.34	-8.72	8.72	152.96	91.60	1.00	1.00	2.39	157.44	94.28
+0.60D														
Dsgn. L = 12.00 ft		1	0.074	0.019		-6.75	6.75	152.96	91.60	1.00	1.00	1.82	157.44	94.28
Dsgn. L = 22.00 ft		2	0.074	0.019	6.62	-6.75	6.75	152.96	91.60	1.00	1.00	1.82	157.44	94.28

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+0.450W	-0.0572	7.488
+D+0.750L+0.750S+0.450W	2	0.4049	12.056		0.0000	7.488

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-0.278	11.320	4.877
Overall MINimum	0.014	1.631	0.643
D Only	-0.038	5.885	2.527
+D+L	-0.278	7.516	3.327
+D+S	-0.024	10.514	4.475
+D+0.750L	-0.218	7.108	3.127
+D+0.750L+0.750S	-0.208	10.580	4.587
+D+0.60W	0.057	6.872	2.913
+D+0.750L+0.450W	-0.147	7.849	3.416
+D+0.750L+0.750S+0.450W	-0.136	11.320	4.877
+0.60D+0.60W	0.073	4.518	1.902
+0.60D	-0.023	3.531	1.516
L Only	-0.240	1.631	0.799
S Only	0.014	4.629	1.947
W Only	0.159	1.646	0.643

Steel Section Properties : MC_Dbl MC8x20+HSS 6X4

Depth	=	8.000 in	I xx	=	140.54 in^4	J	=	0.882 in^4
Web Thick	=	0.800 in	S xx	=	38.47 in^3	Cw	=	726.00 in^6
Flange Width	=	10.000 in	R xx	=	2.810 in	Ro	=	7.160 in
Flange Thick	=	0.500 in	Zx	=	44.770 in^3	H	=	7.500 in
Area	=	17.940 in^2	I yy	=	125.690 in^4	Wno	=	0.000 in^2
Weight	=	62.300 plf	S yy	=	24.700 in^3	Sw	=	0.000 in^4
Kdesign	=	1.125 in	R yy	=	2.650 in	Qf	=	0.000 in^3
			Zy	=	43.260 in^3	Qw	=	0.000 in^3
rts	=	1.020 in				Wn2	=	0.000
Ycg	=	4.000 in				Sw2	=	0.000
Xcg	=	0.100 in				Sw3	=	0.000
Xp	=	0.346 in						

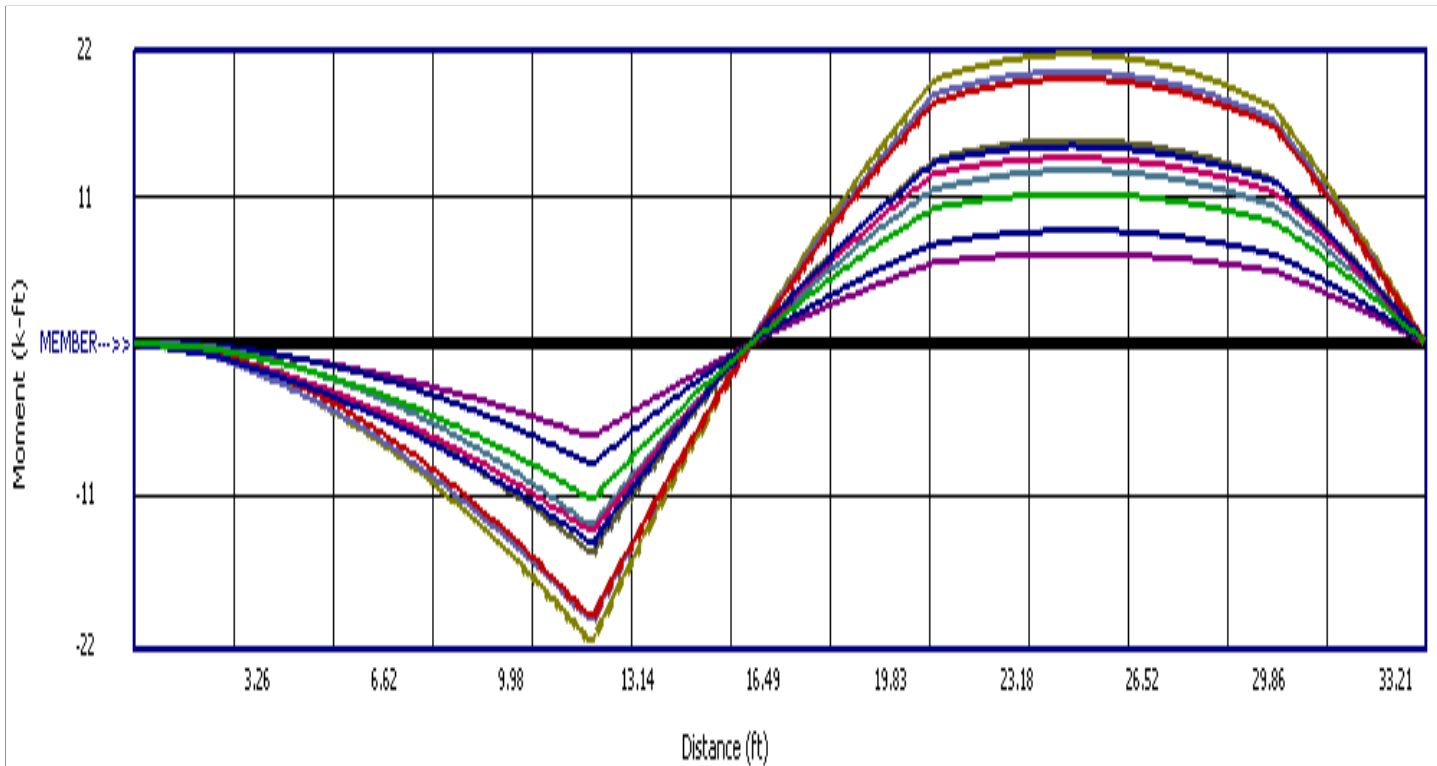


Steel Beam

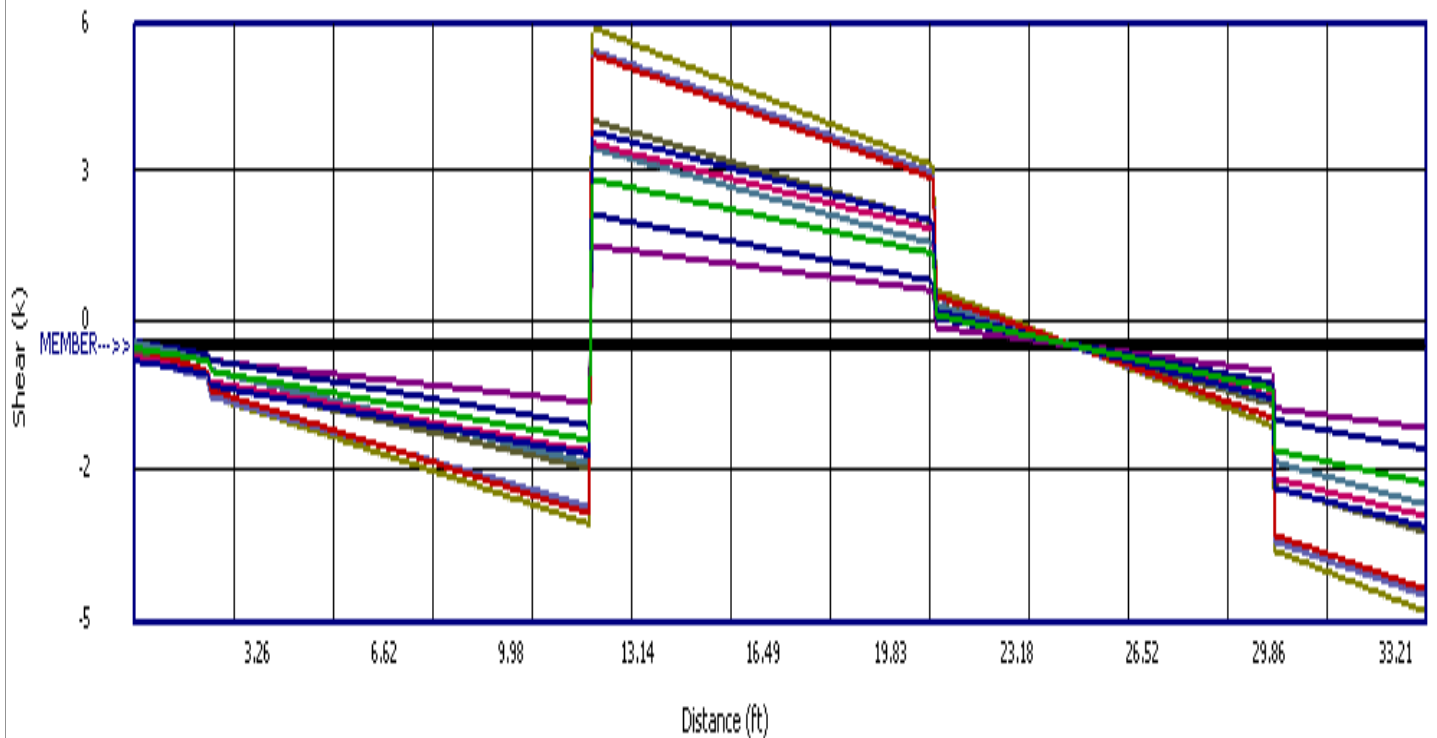
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DESCRIPTION: Center Roof Steel BM #2 at Entry



■ D Q only
 ■ +D+L
 ■ +D+S
 ■ +D+0.75DL
 ■ +D+0.75DL+0.75DS
 ■ +D+0.6DW
 ■ +D+0.75DL+0.45DW
 ■ +D+0.75DL+0.75DS+0.45DW
 ■ +D.6DD+0.6DW
 ■ +D.6DD



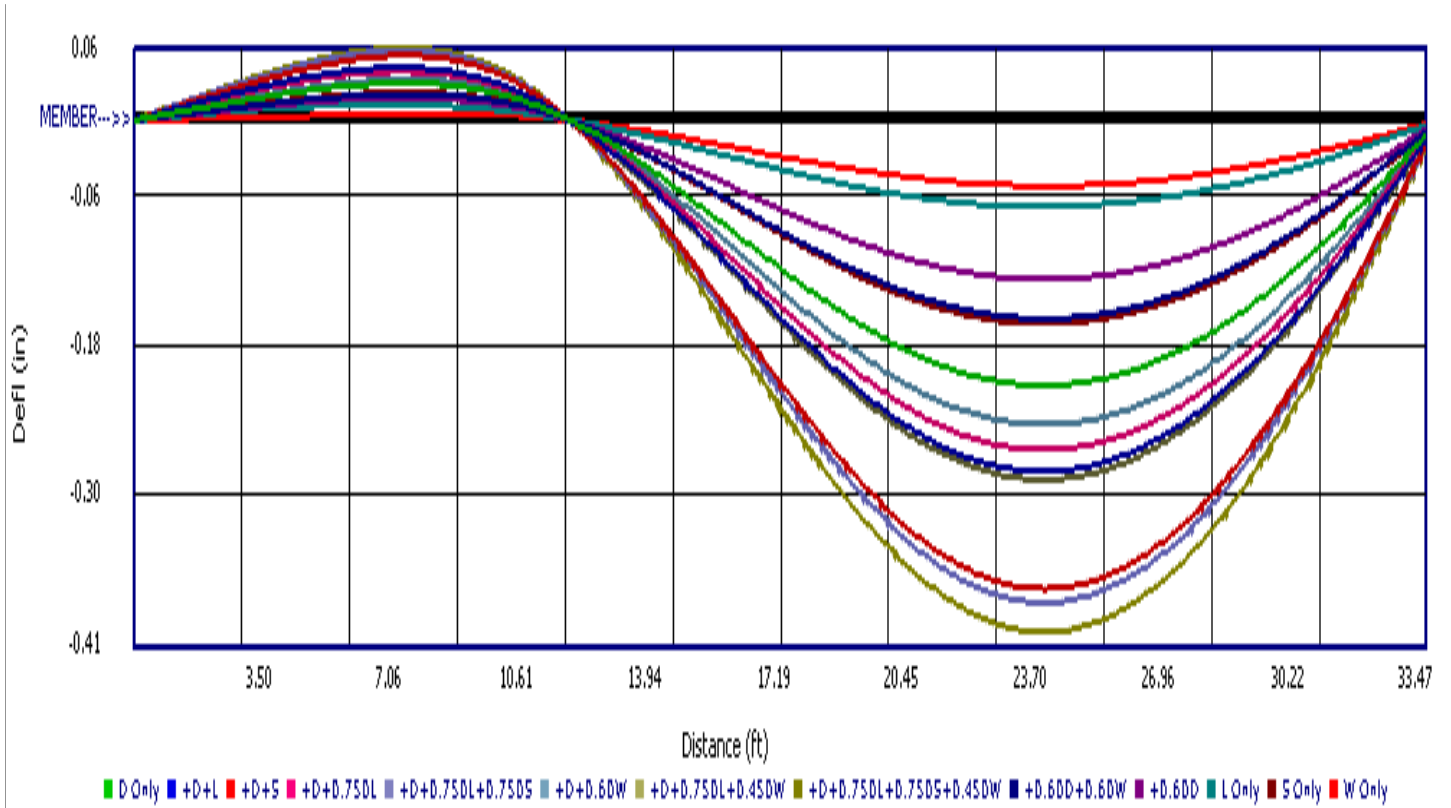
■ D Q only
 ■ +D+L
 ■ +D+S
 ■ +D+0.75DL
 ■ +D+0.75DL+0.75DS
 ■ +D+0.6DW
 ■ +D+0.75DL+0.45DW
 ■ +D+0.75DL+0.75DS+0.45DW
 ■ +D.6DD+0.6DW
 ■ +D.6DD



Steel Beam

Lic. #: KW-06008133

DESCRIPTION: Center Roof Steel BM #2 at Entry





General Section Property Calculator

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DESCRIPTION: **Double MC 12x45 with HSS composite Beam**

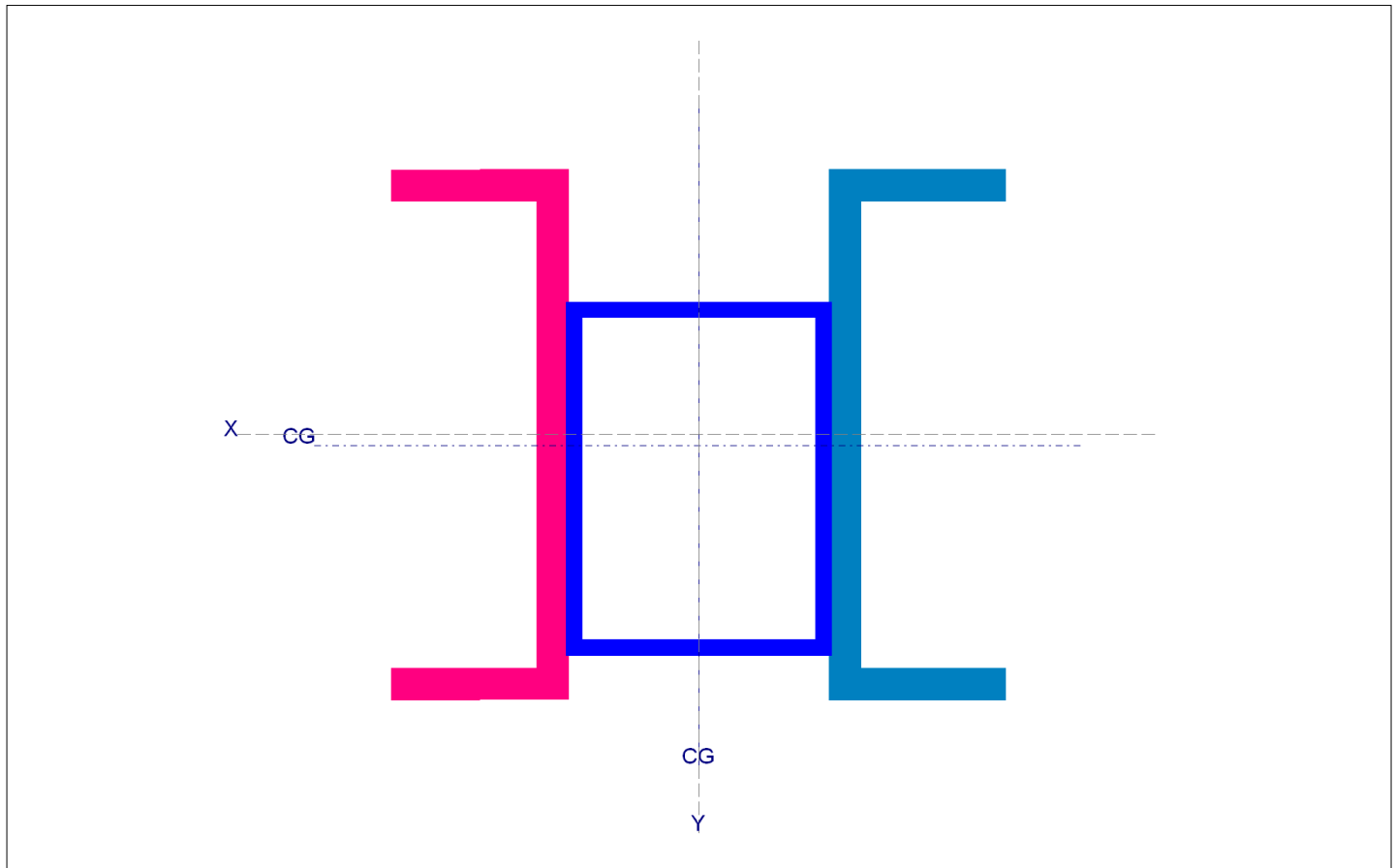
Final Section Properties

Total Area :	35.251 in ²	Ixx :	585.63 in ⁴	Sxx : - Y :	101.928 in ³
Calculated final C.G. distance from Datum :		Iyy :	508.48 in ⁴	Sxx : +Y :	93.633 in ³
X cg Dist. :	0.0 in	Zxx :	127.883 in ³	Syy : - X :	72.953 in ³
Y cg Dist. :	-0.2545 in	Zyy :	125.407 in ³	Syy : +X :	72.953 in ³
Edge Distances from CG. :				r xx :	4.076 in
+X :	6.970 in	+Y :	6.254 in	r yy :	3.798 in
-X :	-6.970 in	-Y :	-5.746 in		



Rotation of All Components @ Angle : 0.00 deg CCW

Minimum Section Properties

Rotation Angle (CCW)	90.0 deg CCW	I: Moment of Inertia	508.48 in ⁴
r: Radius of Gyration	3.798 in	S: Modulus	73.031 in ³
		Z: Plastic Modulus	125.407 in ³



Steel Shapes

 MC12x45 : 1	Area =	13.140 in ²	Rotation =	0 deg CCW
			Xcg =	4.000 in
			Ycg =	0.000 in
 MC12x45 : 2	Area =	13.140 in ²	Rotation =	180 deg CCW
			Xcg =	-4.000 in
			Ycg =	0.000 in



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Project Title: **Lorenzini Waterfront Home**
Engineer: **Mark Speidel**
Project ID:
Project Descr: **SFR Remodeling**

General Section Property Calculator

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I.L. GROSS STRUCTURAL ENGINEERS

Lic. # : KW-06008133

DESCRIPTION: **Double MC 12x45 with HSS composite Beam**

HSS8x6x3/8 : 3

Area =

8.971 in²

Rotation =

0 deg CCW

Xcg = 0.000 in

Ycg = -1.000 in



General Section Property Calculator

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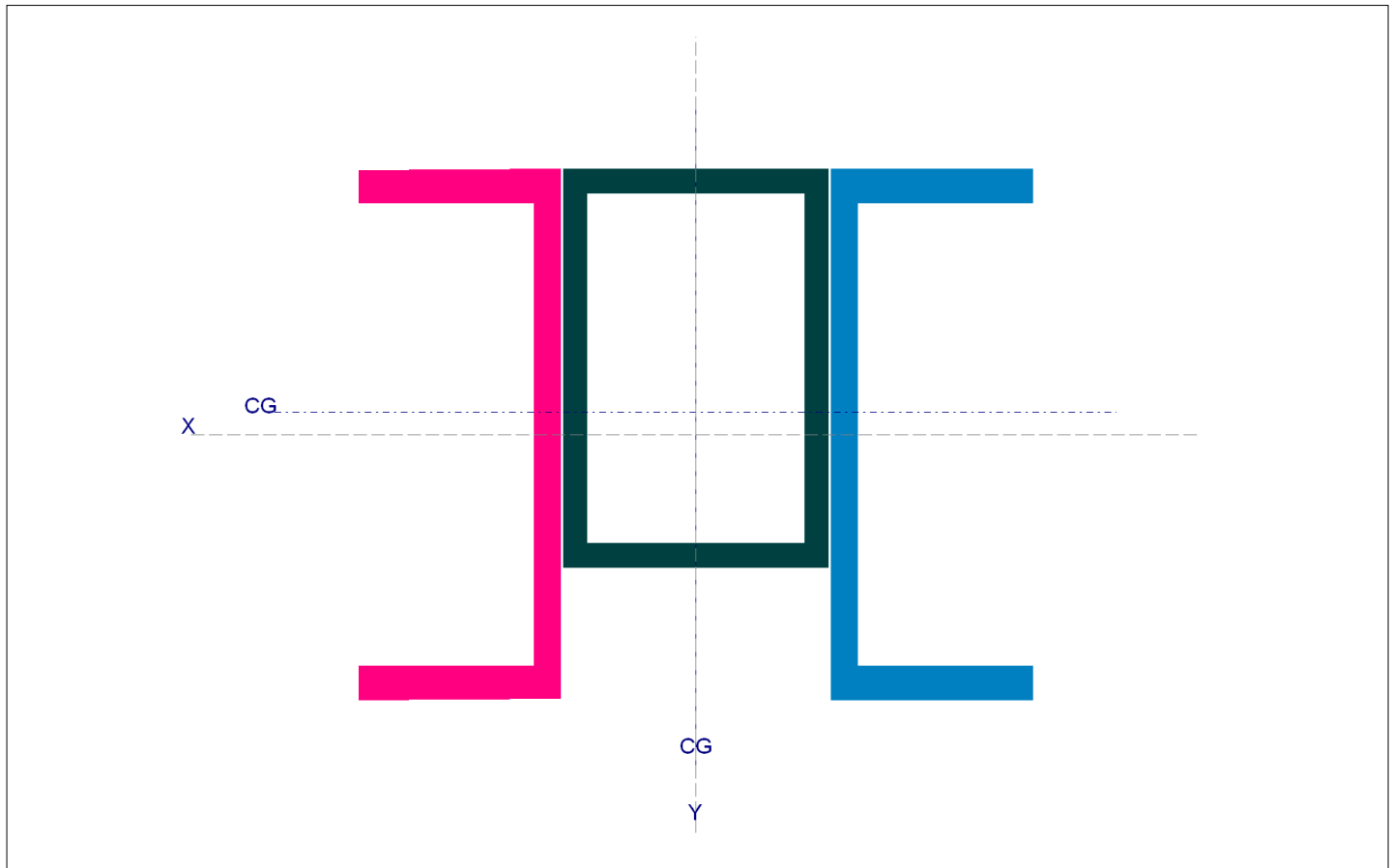
Lic. # : KW-06002858

DESCRIPTION: **Composite BM 2 at Entry Double MC8**

Final Section Properties

Total Area :	17.839 in ²	lxx :	140.539 in ⁴	Sxx : - Y :	32.335 in ³
Calculated final C.G. distance from Datum :		lyy :	125.686 in ⁴	Sxx : +Y :	38.466 in ³
X cg Dist. :	0.0 in	Zxx :	44.771 in ³	Syy : - X :	24.693 in ³
Y cg Dist. :	0.3464 in	Zyy :	43.262 in ³	Syy : +X :	24.693 in ³
Edge Distances from CG. :				r xx :	2.807 in
+X :	5.090 in	+Y :	3.654 in	r yy :	2.654 in
-X :	-5.090 in	-Y :	in		

Rotation of All Components @ Angle : 0.00 deg CCW



Steel Shapes

MC8x20 : 1	Area =	5.830 in ²	Rotation =	0 deg CCW
			Xcg =	2.900 in
			Ycg =	0.000 in
MC8x20 : 2	Area =	5.830 in ²	Rotation =	180 deg CCW
			Xcg =	-2.900 in
			Ycg =	0.000 in



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Mountlake Terrace, WA
www.ilgross.com

Project Title: **Lorenzini Waterfront Home**
Engineer: **Mark Speidel**
Project ID:
Project Descr: **SFR Remodeling**

General Section Property Calculator

File: Lorenzini Residence.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
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Lic. # : KW-06002858

DESCRIPTION: **Composite BM 2 at Entry Double MC8**

HSS6x4x3/8 : 3

Area =

6.179 in²

Rotation =

0 deg CCW

Xcg =

0.000 in

Ycg =

1.000 in



General Section Property Calculator

File: Lorenzini Residence.ec6
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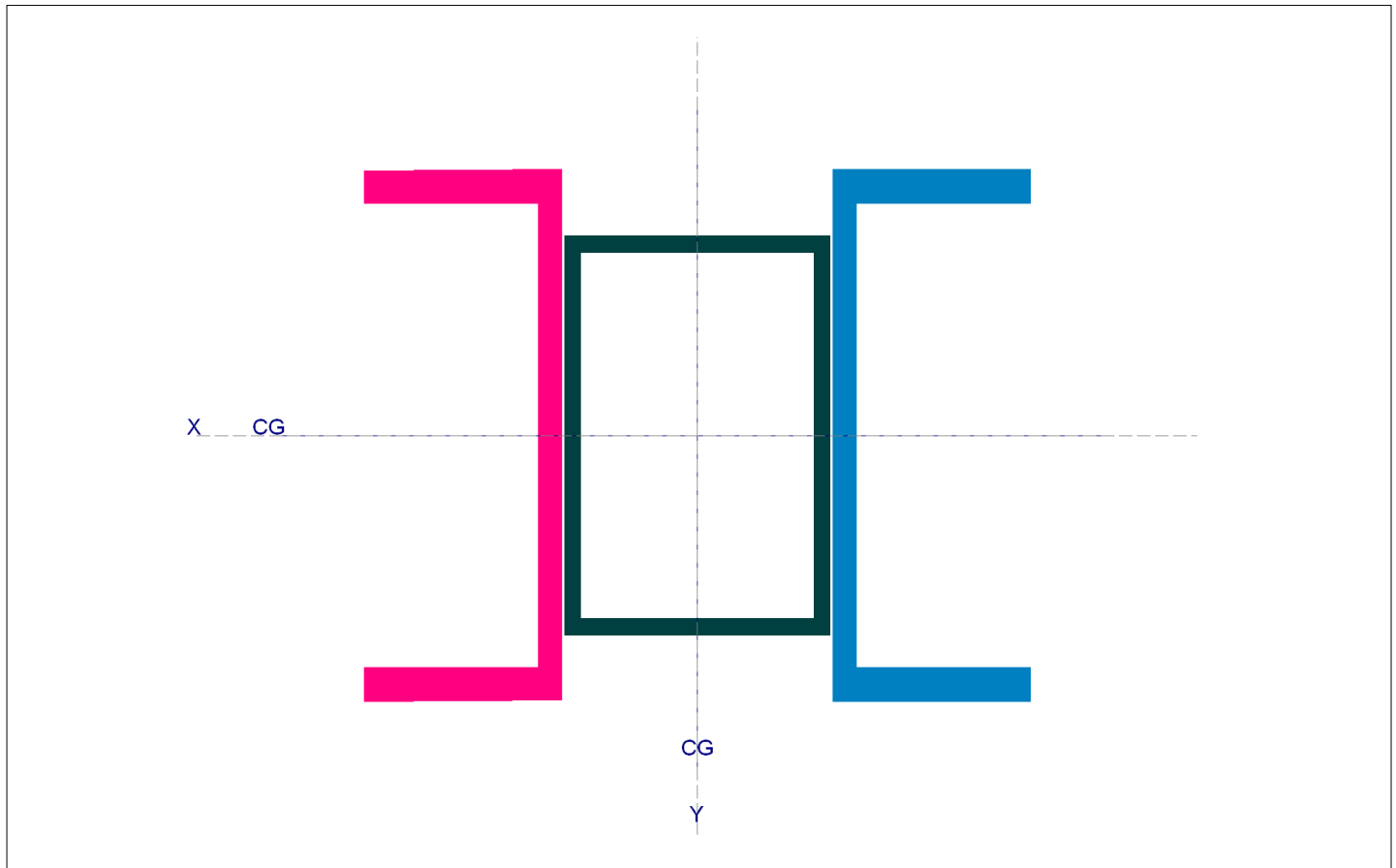
DESCRIPTION: **Composite BM 3 at Terrace Double MC8x18.7**

Final Section Properties

Total Area :	15.205 in ²	lxx :	124.983 in ⁴	Sxx : - Y :	31.246 in ³
Calculated final C.G. distance from Datum :		lyy :	114.824 in ⁴	Sxx : +Y :	31.246 in ³
X cg Dist. :	0.0 in	Zxx :	39.528 in ³	Syy : - X :	22.823 in ³
Y cg Dist. :	0.0 in	Zyy :	38.560 in ³	Syy : +X :	22.823 in ³
Edge Distances from CG. :				r xx :	2.867 in
+X :	5.031 in	+Y :	4.0 in	r yy :	2.748 in
-X :	-5.031 in	-Y :	-4.0 in		

Rotation of All Components @ Angle : 0.00 deg CCW

Minumim Section Properties			
Rotation Angle (CCW)	90.0 deg CCW	I: Moment of Inertia	114.824 in ⁴
r: Radius of Gyration	2.748 in	S: Modulus	22.861 in ³
		Z: Plastic Modulus	38.560 in ³



Steel Shapes

	MC8x18.7 : 1	Area =	5.451 in ²	Rotation =	0 deg CCW
				Xcg =	2.900 in
				Ycg =	0.000 in
	MC8x18.7 : 2	Area =	5.451 in ²	Rotation =	180 deg CCW
				Xcg =	-2.900 in
				Ycg =	0.000 in



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General Section Property Calculator

File: Lorenzini Residence.ec6
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I.L. GROSS STRUCTURAL ENGINEERS

Lic. # : KW-06002858

DESCRIPTION: **Composite BM 3 at Terrace Double MC8x18.7**

HSS6x4x1/4 : 3

Area =

4.303 in²

Rotation =

0 deg CCW

Xcg =

0.000 in

Ycg =

0.000 in



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Project Title: **Lorenzini Waterfront Home**
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 Project ID:
 Project Descr: **SFR Remodeling**

Steel Column

File: Lorenzini Residence.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.2.28
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Lic. #: KW-06008133

DESCRIPTION: **Steel Column at roof Truss**

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-10

General Information

Steel Section Name :	HSS 4.500x0.375	Overall Column Height	15.0 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	42.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 248.045 lbs * Dead Load Factor

AXIAL LOADS . . .

Frame Reaction: Axial Load at 15.0 ft, Xecc = 2.50 in, Yecc = 0.40 in, D = 13.10, L = 3.60, S = 14.40 k

BENDING LOADS . . .

column horizontal Force: Lat. Point Load at 13.0 ft creating Mx-x, D = 0.670, S = 1.250 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =	0.8915 : 1	Maximum Load Reactions . .	
Load Combination	+D+S	Top along X-X	0.3819 k
Location of max. above base	12.987 ft	Bottom along X-X	0.3819 k
At maximum location values are . . .		Top along Y-Y	1.725 k
Pa : Axial	27.748 k	Bottom along Y-Y	0.1949 k
Pn / Omega : Allowable	76.109 k	Maximum Load Deflections . . .	
Ma-x : Applied	2.531 k-ft	Along Y-Y	0.2480 in at 8.658 ft above base
Mn-x / Omega : Allowable	12.638 k-ft	for load combination : +D+S	
Ma-y : Applied	-4.960 k-ft	Along X-X	-0.5036 in at 8.758 ft above base
Mn-y / Omega : Allowable	12.638 k-ft	for load combination : +D+S	
PASS Maximum Shear Stress Ratio =	0.05025 : 1		
Load Combination	+D+S		
Location of max. above base	13.087 ft		
At maximum location values are . . .			
Va : Applied	1.725 k		
Vn / Omega : Allowable	34.329 k		

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Maximum Shear Ratios					
	Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Stress Ratio	Status	Location
D Only	0.338	PASS	15.00 ft	1.51	1.66	81.63	81.63	0.018	PASS	13.09 ft
+D+L	0.507	PASS	15.00 ft	1.51	1.66	81.63	81.63	0.018	PASS	13.09 ft
+D+S	0.891	PASS	12.99 ft	1.51	1.66	81.63	81.63	0.050	PASS	13.09 ft
+D+0.750L	0.479	PASS	15.00 ft	1.51	1.66	81.63	81.63	0.018	PASS	13.09 ft
+D+0.750L+0.750S	0.832	PASS	12.99 ft	1.51	1.66	81.63	81.63	0.042	PASS	13.09 ft
+0.60D	0.203	PASS	15.00 ft	1.51	1.66	81.63	81.63	0.011	PASS	13.09 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	13.348	0.182	0.182		0.060	0.610				
+D+L	16.948	0.232	0.232		0.052	0.618				
+D+S	27.748	0.382	0.382		0.195	1.725				
+D+0.750L	16.048	0.219	0.219		0.054	0.616				
+D+0.750L+0.750S	26.848	0.369	0.369		0.155	1.452				
+0.60D	8.009	0.109	0.109		0.036	0.366				
L Only	3.600	0.050	0.050		-0.008	0.008				



Steel Column

Lic. #: KW-06008133

DESCRIPTION: **Steel Column at roof Truss**

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
S Only	14.400	0.200	0.200	0.135	1.115				

Extreme Reactions

Item	Extreme Value	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
		@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
Axial @ Base	Maximum	27.748	0.382	0.382	0.195	1.725				
"	Minimum	3.600	0.050	0.050	-0.008	0.008	-0.917			-5.729
Reaction, X-X Axis Base	Maximum	27.748	0.382	0.382	0.195	1.725	-0.917			-5.729
"	Minimum	3.600	0.050	0.050	-0.008	0.008	-0.120			-0.750
Reaction, Y-Y Axis Base	Maximum	27.748	0.382	0.382	0.195	1.725	-0.917			-5.729
"	Minimum	3.600	0.050	0.050	-0.008	0.008	-0.120			-0.750
Reaction, X-X Axis Top	Maximum	27.748	0.382	0.382	0.195	1.725	-0.917			-5.729
"	Minimum	3.600	0.050	0.050	-0.008	0.008	-0.120			-0.750
Reaction, Y-Y Axis Top	Maximum	13.348	0.182	0.182	0.060	0.610	-0.437			-2.729
"	Minimum	3.600	0.050	0.050	-0.008	0.008	-0.120			-0.750
Moment, X-X Axis Base	Maximum	13.348		0.182	0.060	0.610	-0.437			-2.729
"	Minimum	13.348		0.182	0.060	0.610	-0.437			-2.729
Moment, Y-Y Axis Base	Maximum	13.348	0.182	0.182	0.060	0.610	-2.729			-0.437
"	Minimum	13.348	0.182	0.182	0.060	0.610	-2.729			-0.437
Moment, X-X Axis Top	Maximum	3.600	0.050	0.050	-0.008	0.008	-0.120			-0.750
"	Minimum	27.748	0.382	0.382	0.195	1.725	-0.917			-5.729
Moment, Y-Y Axis Top	Maximum	3.600	0.050	0.050	-0.008	0.008	-0.120			-0.750
"	Minimum	27.748	0.382	0.382	0.195	1.725	-0.917			-5.729

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	-0.2399	in	8.758	ft	0.076	in	8.557	ft
+D+L	-0.3058	in	8.758	ft	0.066	in	8.557	ft
+D+S	-0.5036	in	8.758	ft	0.248	in	8.658	ft
+D+0.750L	-0.2893	in	8.758	ft	0.068	in	8.557	ft
+D+0.750L+0.750S	-0.4871	in	8.758	ft	0.197	in	8.557	ft
+0.60D	-0.1439	in	8.758	ft	0.046	in	8.557	ft
L Only	-0.0659	in	8.758	ft	-0.011	in	8.758	ft
S Only	-0.2637	in	8.758	ft	0.172	in	8.658	ft

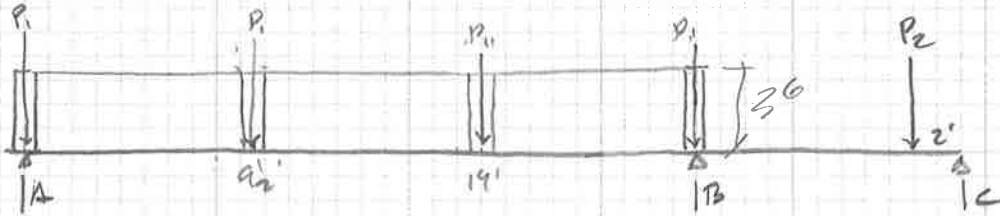
Sketches



CENTER ROOF TRUSS

SPAN = 28'-6" + 11'

H = 3'-6" @ 1ST SPAN ONLY



UNIFORM LOADS

TC = 4 1/2" R = 65 DL
113 SL

$P_1 = 4.3^k_D + 1.6^k_L + 5.2^k_S$
from Main G.L.B.
R2

BC = SW + CEILING 5'
DL = 20 + SW
LL = 50 P1L

$P_2 = 260^k_D$
563^k_S

Δ LIMITS

$\Delta_{DL} = l/4000 = 0.86"$

$\Delta_{SL} = l/360 = 0.95"$

$\Delta_{D+L+S} = l/2500 = 1.14"$

Δ ACTUAL

0.432"

0.461"

0.76"

FINAL MEMBER SIZES

TC = HES 6x6 x 1/2
END VEIGT HES 4x4 x 1/2
MID VEIGT HES 4x4 x 3/8
BC = W8 x 40

REACTIONS

$R_A = 10.9^k_D$
11.7^k_S
3.2^k_L

$R_B = 13.1^k_D$
14.4^k_S
3.6^k_L

$R_C = 2.4^k_D$
.04^k_S
.3^k_L



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SHEET TITLE

SCALE

DATE

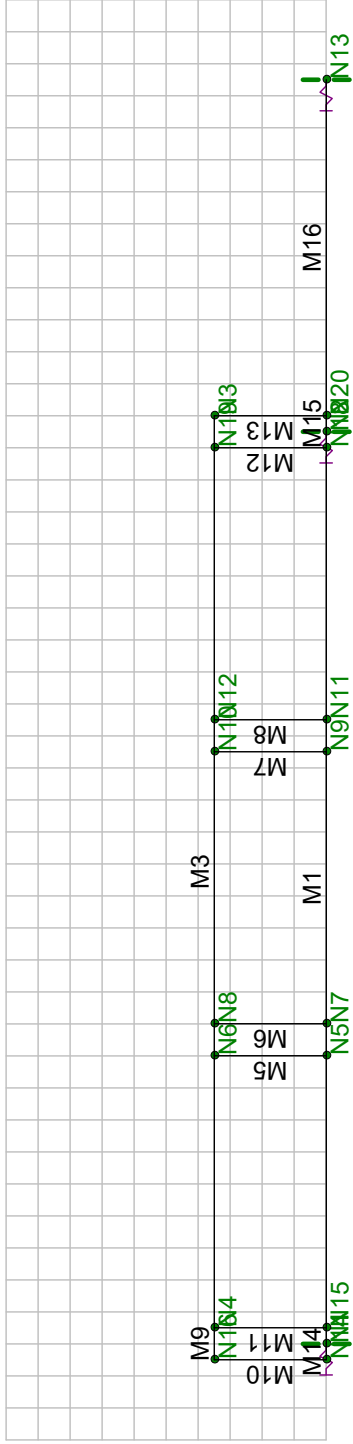
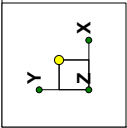
PROJECT

DESIGNED BY

CLIENT

CHECKED

SHEET



IL Gross Structural Engineers

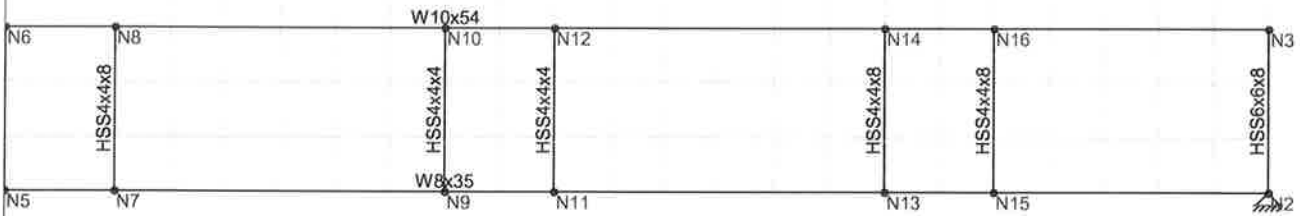
Mark Speidel

Lorenzini Roof Truss
Truss Elevation

SK - 1

July 1, 2020 at 5:33 PM

Roof Truss Veirendale.r3d



IL Gross Structural Engine...

Mark Speidel

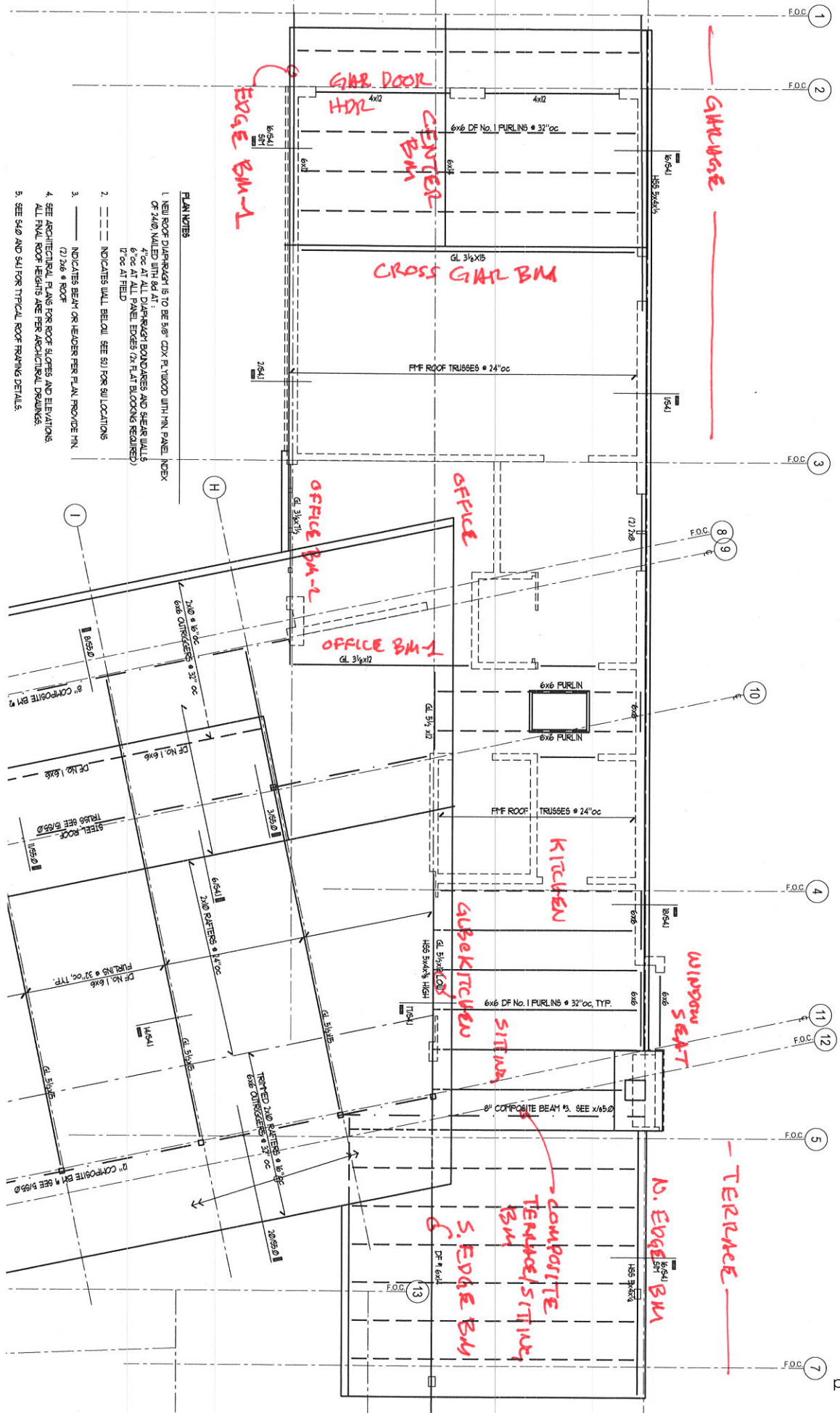
Lorenzini Roof Truss
Schematic Truss Elevation

SK - 1

May 2, 2019 at 4:54 PM

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WEST ROOF
FRAMING KEYPLAN
(CUTS)



- PLAN NOTES**
1. NEW ROOF DIAPHRAGM IS TO BE 5/8" CDX PLYWOOD WITH 1/4" PANEL INDEX OF 24" @ NAILED WITH 8d AT 12" oc AT ALL DIAPHRAGM BOUNDARIES AND SEAM WALLS 6" oc AT ALL PANEL EDGES (2x FLAT BLOCKING REQUIRED) 17" oc AT FIELD
 2. --- INDICATES WALL BEHOLD. SEE S11 FOR QU LOCATIONS
 3. --- INDICATES BEAM OR JOIST PER PLAN. PROVIDE MIN (2) 2x6 @ ROOF
 4. SEE ARCHITECTURAL PLANS FOR ROOF SLOPES AND ELEVATIONS. ALL FINAL ROOF HEIGHTS ARE PER ARCHITECTURAL DRAWINGS.
 5. SEE S40 AND S41 FOR TYPICAL ROOF RAINING DETAILS.

WEST WING ROOF FRAMING

DL = 14.5 #4 SL = 2.5 #4

C EXPOSED FRAMING

PURLINS: TA = 2.75" MAX

SPAN = 14' + 10'

DL = 43
SL = 75 #12

6x6 DF #1
PURLINS ON
C 2'-9" #12

ROOF BMS @ GARAGE

CENTER BM

SPAN = 10' + 5'

TA = 12' R 0-13'

DL = 174
SL = 300 #12

GL 3x8x12
OR DF 6x12

R₁ = 820 #5 R₂ = 1560 #5
1320 #5 2540 #5

EDGE BM 1

SPAN = 14' + 5" cant

TA = 12' R 0-4', 7' R 4'-17'

DL = 174 / 102
SL = 300 / 175

+ PL 4 1/2 1430 #5
1470 #5

GL 3x8x12 ON

R₁ = 2000 #5 R₂ = 1600 #5
2650 #5 2300 #5

6x12 ON @ South Wall

CROSS @ GAR. BM

SPAN = 24'

TA = 3' R + 2' WW

DL = 74
SL = 75 #12

PL 1 1/2 820 #5
1320 #5

GL 5x8x15

R₁ = 1430 #5
1470 #5

R₂ = 1570 #5
1700 #5

GAR. DOOR HEADER

SPAN = 9' TA = 3' R + 2' WW

DL = 67.5
SL = 75

PL 1 1/2 1560 #5
2540 #5

DF 4x12

R₁ = 1730 #5
2600 #5

R₂ = 520 #5
620 #5

TYP HEADERS @ TRUSSED ROOF

TA = 12' R

DL = 174 SL = 300 #12

SPAN ≤ 13' → 4x4 OR (2) 2x6

R = 260 #5
450 #5

SPAN ≤ 5 1/2' → 6x6 OR (2) 2x8

R = 490 #5
830 #5



W. Wing Roof P.1

SHEET TITLE

Lorenzini

PROJECT

BE's

CLIENT

SCALE

MARK

DESIGNED BY

CHECKED

6/7/2020

DATE

SHEET

I.L. GROSS
STRUCTURAL ENGINEERS



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 Mountlake Terrace, WA
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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

File: Lorenzini Residence.ec6
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Lic. #: KW-06002858

Description : North Wing Roof Framing p.1

Wood Beam Design : Purlins at exposed roof

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x6, Sawn, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.1

Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

Applied Loads

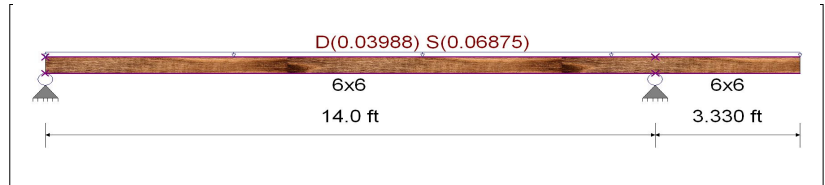
Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 2.750 ft

Design Summary

Max fb/Fb Ratio = **0.891** : 1
 fb : Actual : 1,025.06 psi at 6.580 ft in Span # 1
 Fb : Allowable : 1,150.00 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.192** : 1
 fv : Actual : 39.84 psi at 14.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.26			0.45			
Right Support	0.43			0.74			



Max Deflections

Transient Downward	0.400 in	Total Downward	0.532 in
Ratio	420	Ratio	316
	LC: S Only		LC: +D+0.750S
Transient Upward	-0.256 in	Total Upward	-0.340 in
Ratio	312	Ratio	234
	LC: S Only		LC: +D+0.750S

Wood Beam Design : Center N-S Garage roof BM

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x12, Sawn, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.1

Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.01450, S = 0.0250 k/ft, 0.0 ft to 13.0 ft, Trib= 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.430** : 1
 fb : Actual : 494.78 psi at 4.550 ft in Span # 1
 Fb : Allowable : 1,150.00 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.306** : 1
 fv : Actual : 63.30 psi at 10.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.84			1.37			
Right Support	1.62			2.54			



Max Deflections

Transient Downward	0.045 in	Total Downward	0.061 in
Ratio	2660	Ratio	1965
	LC: S Only		LC: +D+0.750S
Transient Upward	-0.050 in	Total Upward	-0.065 in
Ratio	2400	Ratio	1848
	LC: S Only		LC: +D+0.750S



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Multiple Simple Beam

File: Lorenzini Residence.ec6
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Steel Beam Design : Edge N-S Garage roof BM 1 at N wall

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **HSS5x4x1/2, Fully Braced**

Using Allowable Strength Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Fy = 46.0 ksi E = 29,000.0 ksi

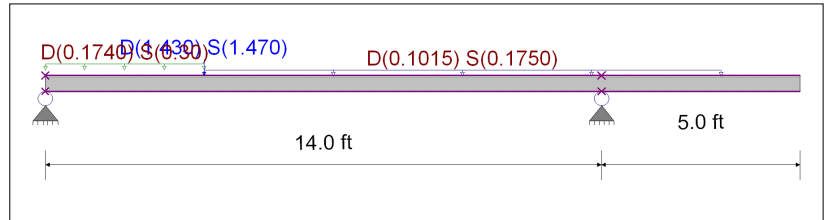
Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, 4.0 ft to 17.0 ft, Trib= 7.0 ft
 Unif Load: D = 0.01450, S = 0.0250 k/ft, 0.0 to 4.0 ft, Trib= 12.0 ft
 Point: D = 1.430, S = 1.470 k @ 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.599** : 1
 Mu : Applied 14.988 k-ft at 4.060 ft in Span # 1
 Mn / Omega : Allow 25.020 k-ft
 Load Comb : +D+S

Max fv/FvRatio = **0.086** : 1
 Vu : Applied 4.747 k at 0.000 ft in Span # 1
 Vn / Omega : Allow 55.409 k
 Load Comb : +D+S



Max Reactions (k) D L Lr S W E H

Left Support 2.10 2.65

Right Support 1.82 2.30

Max Deflections

Transient Downward	0.438 in	Total Downward	0.679 in
Ratio	383		247
	LC: S Only		LC: +D+0.750S
Transient Upward	-0.429 in	Total Upward	-0.654 in
Ratio	278		182
	LC: S Only		LC: +D+0.750S



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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

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Wood Beam Design : Garage roof N-S Cross Beam

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **5.125x15, GLB, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

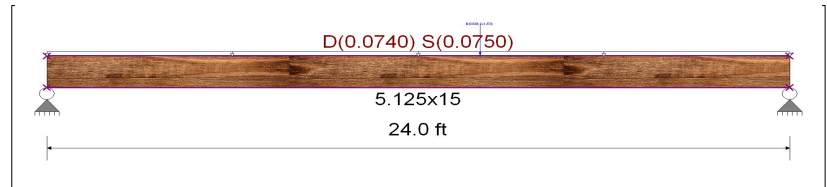
Beam self weight calculated and added to loads

Unif Load: D = 0.0740, S = 0.0750 k/ft, Trib= 1.0 ft

Point: D = 0.820, S = 1.370 k @ 14.0 ft

Design Summary

Max fb/Fb Ratio = **0.571** : 1
 fb : Actual : 1,521.72 psi at 14.000 ft in Span # 1
 Fb : Allowable : 2,663.29 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.196** : 1
 fv : Actual : 59.84 psi at 22.800 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.43			1.47			
Right Support	1.57			1.70			

Max Deflections			
Transient Downward	0.471 in	Total Downward	0.768 in
Ratio	611	Ratio	375
LC: S Only		LC: +D+0.750S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : Garage Door Header

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **4x12, Sawn, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

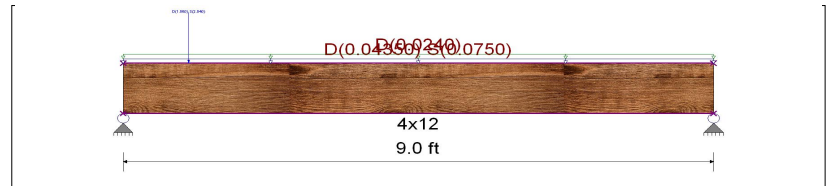
Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Point: D = 1.560, S = 2.540 k @ 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.609** : 1
 fb : Actual : 693.43 psi at 1.470 ft in Span # 1
 Fb : Allowable : 1,138.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.796** : 1
 fv : Actual : 164.73 psi at 0.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.73			2.60			
Right Support	0.52			0.62			

Max Deflections			
Transient Downward	0.050 in	Total Downward	0.075 in
Ratio	2142	Ratio	1432
LC: S Only		LC: +D+0.750S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



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Multiple Simple Beam

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Wood Beam Design : Typical 3' header at trussed roof

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **4x4, Sawn, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension 900.0 psi Fc - Prll 1,350.0 psi Fv 180.0 psi Ebend- xx 1,600.0 ksi Density 31.210 pcf
 Fb - Compr 900.0 psi Fc - Perp 625.0 psi Ft 575.0 psi Eminbend - xx 580.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.580** : 1
 fb : Actual : 900.50 psi at 1.500 ft in Span # 1
 Fb : Allowable : 1,552.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.423** : 1
 fv : Actual : 87.55 psi at 0.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k) D L Lr S W E H
 Left Support 0.26 0.45
 Right Support 0.26 0.45

Max Deflections
 Transient Downward 0.027 in Total Downward 0.037 in
 Ratio 1310 Ratio 978
 LC: S Only LC: +D+0.750S
 Transient Upward 0.000 in Total Upward 0.000 in
 Ratio 9999 Ratio 9999
 LC: LC:

Wood Beam Design : Typical 5.5' header at trussed roof

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-2x8, Sawn, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension 900.0 psi Fc - Prll 1,350.0 psi Fv 180.0 psi Ebend- xx 1,600.0 ksi Density 31.210 pcf
 Fb - Compr 900.0 psi Fc - Perp 625.0 psi Ft 575.0 psi Eminbend - xx 580.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.665** : 1
 fb : Actual : 826.51 psi at 2.750 ft in Span # 1
 Fb : Allowable : 1,242.00 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.439** : 1
 fv : Actual : 90.79 psi at 0.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k) D L Lr S W E H
 Left Support 0.49 0.83
 Right Support 0.49 0.83

Max Deflections
 Transient Downward 0.041 in Total Downward 0.055 in
 Ratio 1620 Ratio 1203
 LC: S Only LC: +D+0.750S
 Transient Upward 0.000 in Total Upward 0.000 in
 Ratio 9999 Ratio 9999
 LC: LC:



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Project Title: **Lorenzini Waterfront Home**
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 Project Descr: **SFR Remodeling**

Multiple Simple Beam

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Wood Beam Design : Edge N-S Garage roof BM 2 w/o PL

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x12, Sawn, Fully Braced**

Using Allowable Stress Design with 7-10 <no Lateral> Load Combinations, Major Axis Bending

Wood Species : **Douglas Fir - Larch**

Wood Grade : **No.1**

Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.312** : 1
 fb : Actual : 359.08 psi at 10.000 ft in Span # 1
 Fb : Allowable : 1,150.00 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.176** : 1
 fv : Actual : 36.48 psi at 9.050 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.43			0.66			
Right Support	1.30			1.97			



Max Deflections

Transient Downward	0.020 in	Total Downward	0.028 in
Ratio	6038	Ratio	4288
	LC: S Only		LC: +D+0.750S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

West Wing Roof p.2

Hall Header

Span = 6'
 TA = 13'R + 5'WW
 DL = 257
 SL = 325 PIF (2) 2x10
 R₁ = 122
 R₂ = 271#b
 925#s

OFFICE BM 1

Span = 12'
 TA = 5'R + 3'WW
 DL = 110
 SL = 125 PIF + PL = 3' = 271#b
 925#s
 GL 3'8" x 9"
 R₁ = 1290#b
 1410#s R₂ = 910#b
 920#s

OFFICE BM 2

Span = 12' + 2' cant
 TA = 6' R 0-8',
 6' R 8'-12'
 3' R 12'-14' + PL = 14' = 910#b
 (OB + 1) 920#s
 DL = 95/97/44
 SL = 163/150/25 PIF
 GL 3'8" x 9"
 R₁ = 430#b
 800#s R₂ = 1750#b
 2170#s

HEAVENLY C. WINDOW SEAT

Span = 6'
 High = 7'1" R 4x6 OK
 DL = 101
 SL = 175 PIF R = 320#b
 530#s
 Low = 2'R + 4' GLAZING 4x6 OK
 DL = 57
 SL = 50 PIF R = 250#b
 150#s

TERRACE NORTH BM

Span = 11' + 5' cant
 TA = 7'R 6x10 OK
 DL = 101
 SL = 175 PIF
 R₁ = 490#b
 760#s R₂ = 1310#b
 2040#s (4x4 OK)

SITING / TERRACE BM

Span = 13' + 22' + 3' Revised
 TA = 7'R + 5' GLAZING 0-13'
 10'R 13'-18'
 12'R 18'-34' PIF 16'
 = 512#b
 800#s
 DL = 137/145/174
 SL = 175/220/264 PIF
 GL 5 1/2" x 13 1/2"
 R₁ = 280#b
 150#s R₂ = 4490#b
 6040#s
 R₃ = 1820#b
 2480#s



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West Wing Roof p.2

SHEET TITLE

Lorenzini D

PROJECT

RES

CLIENT

SCALE

MOCK

DESIGNED BY

MC

CHECKED

6/2020

DATE



SHEET



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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

File: Lorenzini Residence.ec6
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Description : North Wing Roof Framing p.2

Wood Beam Design : Hallway Header

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-2x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DouglasFir-Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 7.0 ft
 Unif Load: D = 0.0160, S = 0.0210 k/ft, Trib= 6.0 ft
 Unif Load: D = 0.0120 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.619** : 1
 fb : Actual : 704.96 psi at 3.000 ft in Span # 1
 Fb : Allowable : 1,138.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.327** : 1
 fv : Actual : 67.62 psi at 5.240 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.77			0.90			
Right Support	0.77			0.90			

Max Deflections			
Transient Downward	0.028 in	Total Downward	0.052 in
Ratio	2583	Ratio	1392
LC: S Only		LC: +D+S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : Office BM 1

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3.125x9, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

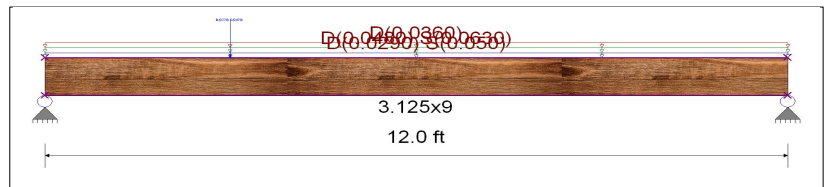
Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 2.0 ft
 Unif Load: D = 0.0160, S = 0.0210 k/ft, Trib= 3.0 ft
 Unif Load: D = 0.0120 k/ft, Trib= 3.0 ft
 Point: D = 0.770, S = 0.970 k @ 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.742** : 1
 fb : Actual : 2,046.68 psi at 4.120 ft in Span # 1
 Fb : Allowable : 2,760.00 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.443** : 1
 fv : Actual : 134.96 psi at 0.000 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.29			1.41			
Right Support	0.91			0.92			

Max Deflections			
Transient Downward	0.278 in	Total Downward	0.539 in
Ratio	517	Ratio	267
LC: S Only		LC: +D+S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



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Multiple Simple Beam

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Wood Beam Design : Office BM 1

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3.125x9, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

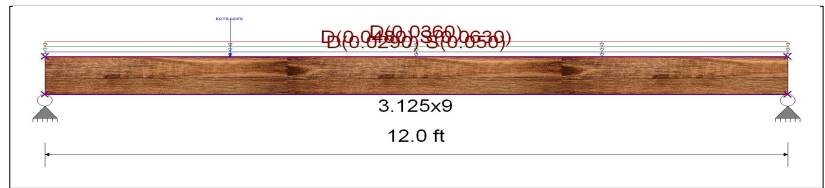
Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 2.0 ft
 Unif Load: D = 0.0160, S = 0.0210 k/ft, Trib= 3.0 ft
 Unif Load: D = 0.0120 k/ft, Trib= 3.0 ft
 Point: D = 0.770, S = 0.970 k @ 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.742** : 1
 fb : Actual : 2,046.68 psi at 4.120 ft in Span # 1
 Fb : Allowable : 2,760.00 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.443** : 1
 fv : Actual : 134.96 psi at 0.000 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E
Left Support	1.29			1.41		
Right Support	0.91			0.92		



Max Deflections

Transient Downward	0.278 in	Total Downward	0.539 in
Ratio	517	Ratio	267
LC: S Only		LC: +D+S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : Office BM 2

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3.125x7.5, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

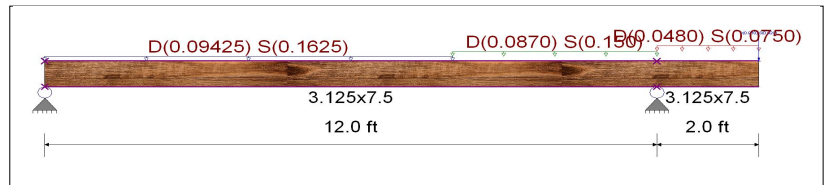
Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, 0.0 ft to 8.0 ft, Trib= 6.50 ft
 Unif Load: D = 0.01450, S = 0.0250 k/ft, 8.0 to 12.0 ft, Trib= 6.0 ft
 Unif Load: D = 0.0160, S = 0.0250 k/ft, 12.0 to 14.0 ft, Trib= 3.0 ft
 Point: D = 0.910, S = 0.920 k @ 14.0 ft

Design Summary

Max fb/Fb Ratio = **0.754** : 1
 fb : Actual : 1,604.00 psi at 12.000 ft in Span # 1
 Fb : Allowable : 2,127.50 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.421** : 1
 fv : Actual : 128.43 psi at 12.000 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.43			0.80		
Right Support	1.75			2.17		



Max Deflections

Transient Downward	0.224 in	Total Downward	0.308 in
Ratio	642	Ratio	468
LC: S Only		LC: +D+S	
Transient Upward	-0.038 in	Total Upward	-0.010 in
Ratio	1268	Ratio	4766
LC: S Only		LC: +D+S	



Multiple Simple Beam

Lic. #: KW-06002858

Wood Beam Design : Window Seat - High Header

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **4x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.638** : 1
 fb : Actual : 858.92 psi at 3.000 ft in Span # 1
 Fb : Allowable : 1,345.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.270** : 1
 fv : Actual : 55.99 psi at 5.560 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.32			0.53			
Right Support	0.32			0.53			

Max Deflections			
Transient Downward	0.066 in	Total Downward	0.106 in
Ratio	1089	Ratio	679
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Window Seat - Low Header

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **4x6, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

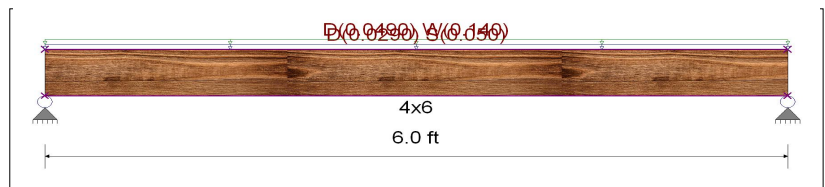
Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 2.0 ft
 Unif Load: D = 0.0070, W = 0.020 k/ft, Trib= 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.301** : 1
 fb : Actual : 404.47 psi at 3.000 ft in Span # 1
 Fb : Allowable : 1,345.50 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.127** : 1
 fv : Actual : 26.37 psi at 5.560 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.25			0.15	0.42		
Right Support	0.25			0.15	0.42		

Max Deflections			
Transient Downward	0.053 in	Total Downward	0.069 in
Ratio	1362	Ratio	1043
	LC: W Only		LC: +D+0.750S+0.450W
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



Multiple Simple Beam

Lic. #: KW-06002858

Steel Beam Design : Terrace - North Beam

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **HSS5x4x1/4, Fully Braced**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

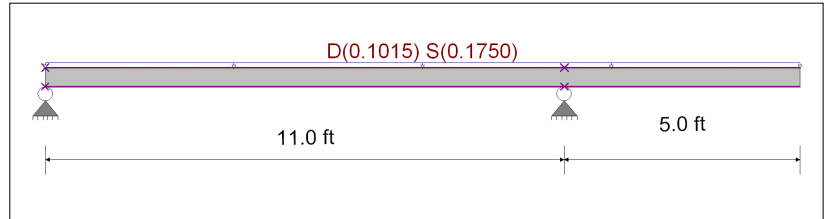
Fy = 46.0 ksi E = 29,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.244** : 1
 Mu : Applied 3.630 k-ft at 11.000 ft in Span # 1
 Mn / Omega : Allow 14.897 k-ft
 Load Comb : +D+S
 Max fv/FvRatio = **0.058** : 1
 Vu : Applied 1.927 k at 11.000 ft in Span # 1
 Vn / Omega : Allow 33.124 k
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.50			0.76		
Right Support	1.34			2.04		

H	Max Deflections		
	Transient Downward	0.077 in	Total Downward 0.128 in
	Ratio	1716	1034
		LC: S Only	LC: +D+S
	Transient Upward	-0.003 in	Total Upward -0.006 in
	Ratio	9999	Ratio 9999
		LC: S Only	LC: +D+S

Steel Beam Design : Terrace - South Edge BM Stl Channel Option

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **C10x15.3, Braced @ 1/4 Points**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

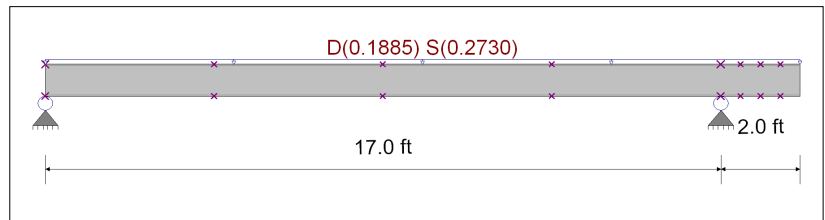
Fy = 36.0 ksi E = 29,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0210 k/ft, Trib= 13.0 ft

Design Summary

Max fb/Fb Ratio = **0.594** : 1
 Mu : Applied 16.751 k-ft at 8.415 ft in Span # 1
 Mn / Omega : Allow 28.192 k-ft
 Load Comb : +D+S
 Max fv/FvRatio = **0.132** : 1
 Vu : Applied 4.109 k at 17.000 ft in Span # 1
 Vn / Omega : Allow 31.042 k
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	1.71			2.29		
Right Support	2.16			2.90		

H	Max Deflections		
	Transient Downward	0.256 in	Total Downward 0.447 in
	Ratio	796	455
		LC: S Only	LC: +D+S
	Transient Upward	-0.093 in	Total Upward -0.162 in
	Ratio	516	Ratio 294
		LC: S Only	LC: +D+S

Steel Beam Design : Terrace - South Edge BM (HSS)

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **HSS10x4x1/4, Braced @ 1/4 Points**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

Fy = 46.0 ksi E = 29,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0210 k/ft, Trib= 13.0 ft



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 I.L. Gross Structural
 Engineers, LLC
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 www.ilgross.com

Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

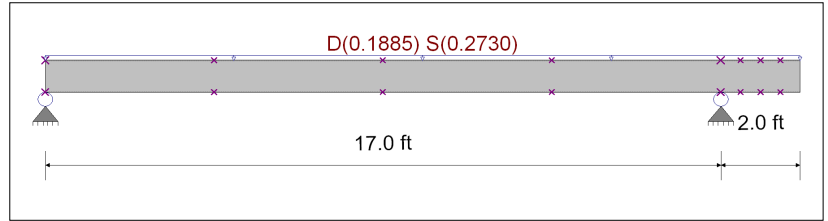
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Design Summary

Max fb/Fb Ratio = **0.390** : 1
 Mu : Applied 17.000 k-ft at 8.415 ft in Span # 1
 Mn / Omega : Allow 43.613 k-ft
 Load Comb : +D+S

Max fv/FvRatio = **0.058** : 1
 Vu : Applied 4.170 k at 17.000 ft in Span # 1
 Vn / Omega : Allow 71.632 k
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	1.77			2.29		
Right Support	2.24			2.90		

H	Max Deflections		
	Transient Downward	0.231 in	Total Downward 0.409 in
	Ratio	883	498
		LC: S Only	LC: +D+S
	Transient Upward	-0.084 in	Total Upward -0.149 in
	Ratio	572	322
		LC: S Only	LC: +D+S

SITING/TERRACE FRAMING + Rev'd 1/2020

North Edge BM

Span = 11' + 5' cant

TA = 2' R

DL = 101

SL = 175 PL

HSS 5x4x1/4

R₁ = 500 lb
760 kS

R₂ = 1340 lb
2040 kS

LOW GUB C KITCHEN

Span = 12' + 4'

TA = 7' R + 5' GLAZING

DL = 136.5

SL = 175 PL

+ DL = 15' = .74 lb
1.07 kS

6x12 OR
(DF)

R₁ = 720 lb
840 kS

R₂ = 2110 lb
2530 kS

R₃ = 320 lb
510 kS

SOUTH EDGE BM

Span = 17' + 2' cant

TA = 13' R

DL = 182

SL = 273 PL

DF 6x14 OR

GL 5 1/2 x 12

OR HSS 10x4x1/4

R₁ = 627 lb
2.29 kS

R₂ = 2,240 lb
2.90 kS

COMPOSITE BM ACROSS

SITING/TERRACE GLAZING WALL

Span = 20'

TA = 4' R + 5' → 2' GLAZING WALL
+ Sliding Nano Wall

DL = 113 → 80 PL + 50 PL WW
SL = 100

LL = 50 PL + PL = 13.5'

= 2,094 lb
2.80 kS

(2) MC 8x18.7 + HSS 6x4x1/4



I.L. GROSS
STRUCTURAL ENGINEERS

Roof Framing over Siting/Terrace

SHEET TITLE

Lorenzini 15

PROJECT

RTE'S

CLIENT

SCALE

Mark

DESIGNED BY

CHECKED

1/1/2020

DATE



SHEET



General Section Property Calculator

File: Lorenzini Residence.ec6
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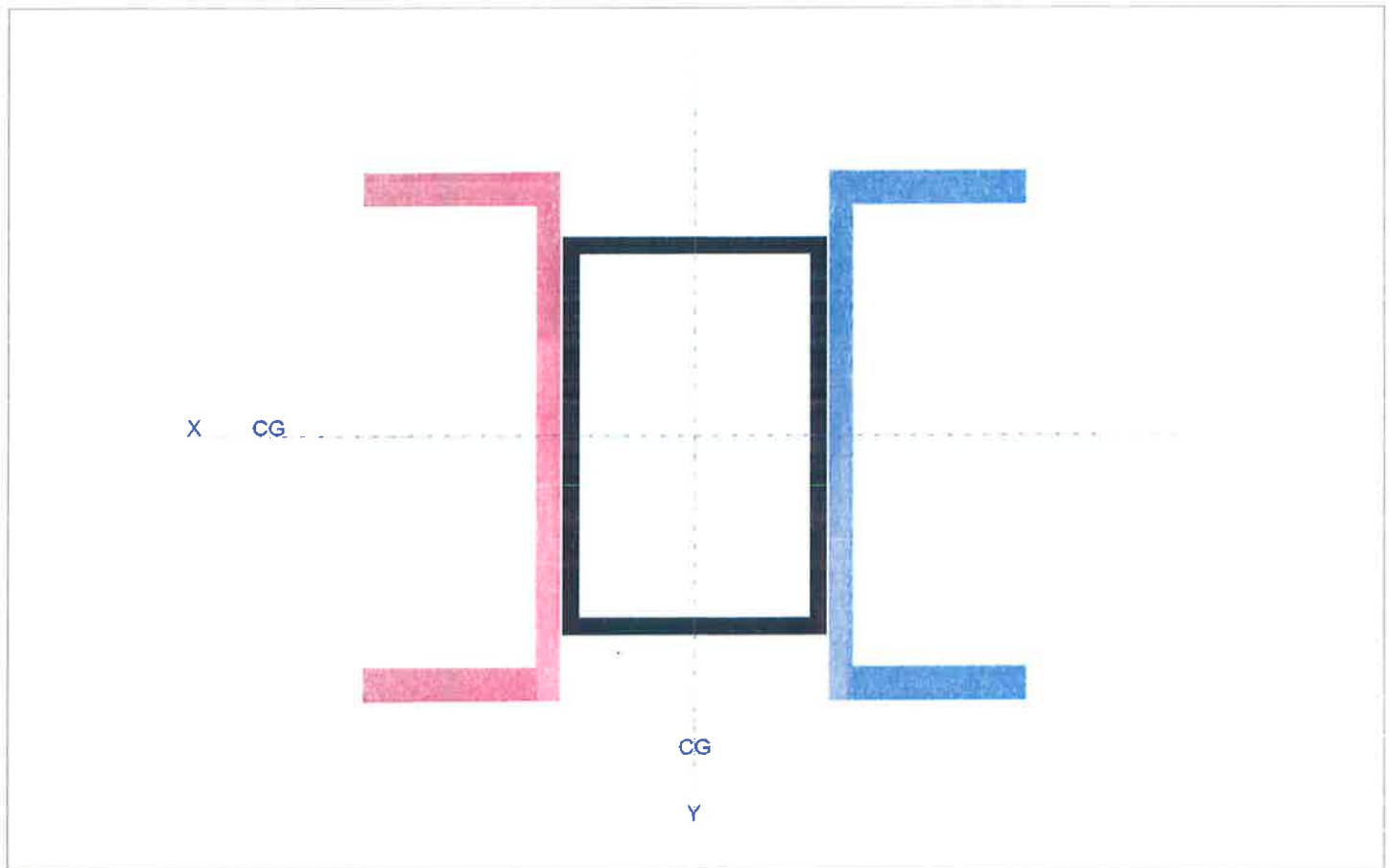
DESCRIPTION: **Composite BM 3 at Terrace Double MC8**

Final Section Properties

Total Area	:	15.205 in ²	lxx	:	124.983 in ⁴	Sxx : -Y	:	31.246 in ³
Calculated final C.G. distance from Datum :			lyy	:	114.824 in ⁴	Sxx : +Y	:	31.246 in ³
X cg Dist.	:	0.0 in	Zxx	:	39.528 in ³	Syy : -X	:	22.823 in ³
Y cg Dist.	:	0.0 in	Zyy	:	38.560 in ³	Syy : +X	:	22.823 in ³
Edge Distances from CG. :						r xx	:	2.867 in
+X	:	5.031 in	+Y	:	4.0 in	r yy	:	2.748 in
-X	:	-5.031 in	-Y	:	-4.0 in			

Minimum Section Properties

Rotation of All Components @ Angle :	0.00 deg CCW	Rotation Angle (CCW)	90.0 deg CCW	I: Moment of Inertia	114.824 in ⁴
		r: Radius of Gyration	2.748 in	S: Modulus	22.861 in ³
				Z: Plastic Modulus	38.560 in ³



Steel Shapes

	MC8x18.7 : 1	Area =	5.451 in ²	Rotation =	0 deg CCW
				Xcg =	2.900 in
				Ycg =	0.000 in
	MC8x18.7 : 2	Area =	5.451 in ²	Rotation =	180 deg CCW
				Xcg =	-2.900 in
				Ycg =	0.000 in



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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

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Lic. #: KW-06002858

Steel Beam Design : Composite Beam at Terrace/Sitting Room

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **MC_Dbl MC8x20+HSS 6X4, Braced @ 1/4 Points**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

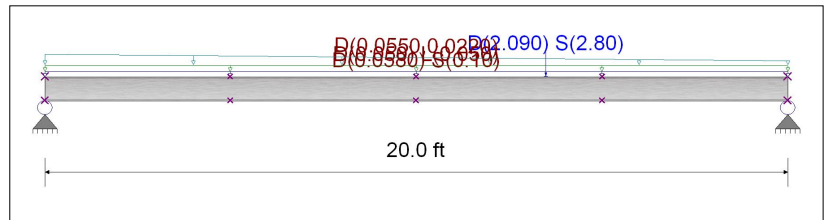
Fy = 36.0 ksi E = 29,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 4.0 ft
 Unif Load: D = 0.050, L = 0.050 k/ft, Trib= 1.0 ft
 Point: D = 2.090, S = 2.80 k @ 13.50 ft
 Unif Load: D= 0.0550->0.0220 k/ft, 0.0 to 20.0 ft

Design Summary

Max fb/Fb Ratio = **0.434** : 1
 Mu : Applied 34.902 k-ft at 13.467 ft in Span # 1
 Mn / Omega : Allow 80.425 k-ft
 Load Comb : +D+S
 Max fv/FvRatio = **0.077** : 1
 Vu : Applied 6.334 k at 20.000 ft in Span # 1
 Vn / Omega : Allow 82.778 k
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	2.82	0.50		1.91		
Right Support	3.44	0.50		2.89		

Max Deflections			
Transient Downward	0.256 in	Total Downward	0.567 in
Ratio	935		423
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



Wood Beam

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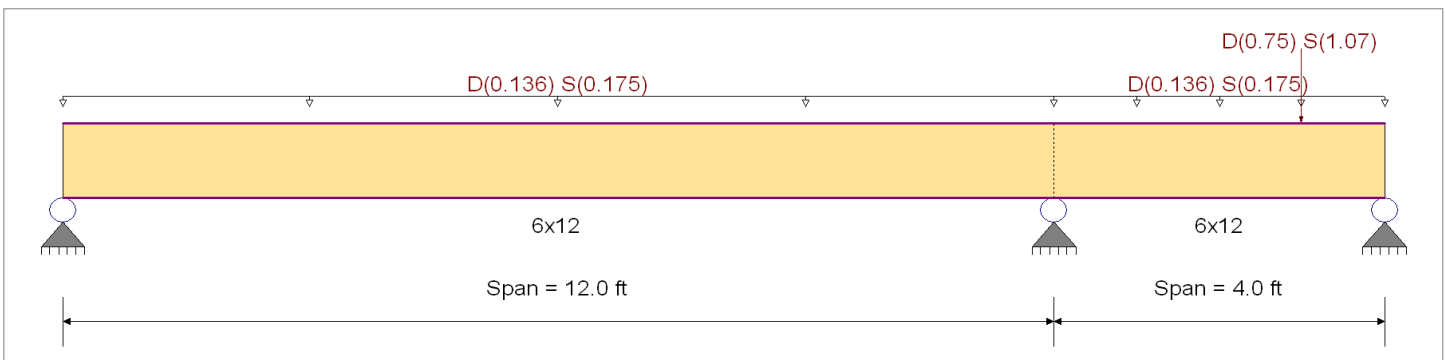
DESCRIPTION: **Beam at Low Roof over Kitchen**

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design	Fb +	1000 psi	E : <i>Modulus of Elasticity</i>	
Load Combination ASCE 7-10	Fb -	1000 psi	Ebend- xx	1700 ksi
Wood Species : Douglas Fir - Larch	Fc - Prll	1500 psi	Eminbend - xx	620 ksi
Wood Grade : No.1	Fc - Perp	625 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling	Fv	180 psi		
	Ft	675 psi		



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.1360, S = 0.1750, Tributary Width = 1.0 ft, (uniform)

Load for Span Number 2

Uniform Load : D = 0.1360, S = 0.1750, Tributary Width = 1.0 ft, (uniform)

Point Load : D = 0.750, S = 1.070 k @ 3.0 ft, (P1)

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.410 : 1	Maximum Shear Stress Ratio	=	0.234 : 1		
Section used for this span	=	6x12	Section used for this span	=	6x12		
	=	471.09psi		=	48.38 psi		
	=	1,150.00psi		=	207.00 psi		
Load Combination	=	+D+S	Load Combination	=	+D+S		
Location of maximum on span	=	12.00ft	Location of maximum on span	=	11.061 ft		
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1		
Maximum Deflection							
Max Downward Transient Deflection		0.036 in	Ratio =		3988 >=360		
Max Upward Transient Deflection		-0.002 in	Ratio =		25724 >=360		
Max Downward Total Deflection		0.067 in	Ratio =		2141 >=240		
Max Upward Total Deflection		-0.004 in	Ratio =		13307 >=240		

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
D Only	Length = 12.0 ft	1	0.240	0.138	0.90	1.000	1.00	1.00	1.00	1.00	1.00	2.18	216.17	900.00	0.94	22.29	162.00
	Length = 4.0 ft	2	0.240	0.138	0.90	1.000	1.00	1.00	1.00	1.00	2.18	216.17	900.00	0.89	22.29	162.00	
+D+S	Length = 12.0 ft	1	0.410	0.234	1.15	1.000	1.00	1.00	1.00	1.00	4.76	471.09	1150.00	2.04	48.38	207.00	
	Length = 4.0 ft	2	0.410	0.234	1.15	1.000	1.00	1.00	1.00	1.00	4.76	471.09	1150.00	1.99	48.38	207.00	
+D+0.750S	Length = 12.0 ft	1	0.354	0.202	1.15	1.000	1.00	1.00	1.00	1.00	4.12	407.36	1150.00	1.77	41.86	207.00	
	Length = 4.0 ft	2	0.354	0.202	1.15	1.000	1.00	1.00	1.00	1.00	4.12	407.36	1150.00	1.72	41.86	207.00	



Wood Beam

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DESCRIPTION: Beam at Low Roof over Kitchen

Load Combination Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
		M	V	C _d	C _{FV}	C _i	C _r	C _m	C _t	C _L	M	f _b	F ['] b	V	f _v	F ['] v
+0.60D					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.081	0.046	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.31	129.70	1600.00	0.56	13.37	288.00
Length = 4.0 ft	2	0.081	0.046	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.31	129.70	1600.00	0.54	13.37	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0672	5.363		0.0000	0.000
	2	0.0000	5.363	+D+S	-0.0036	1.296

Maximum Deflections for Load Combinations

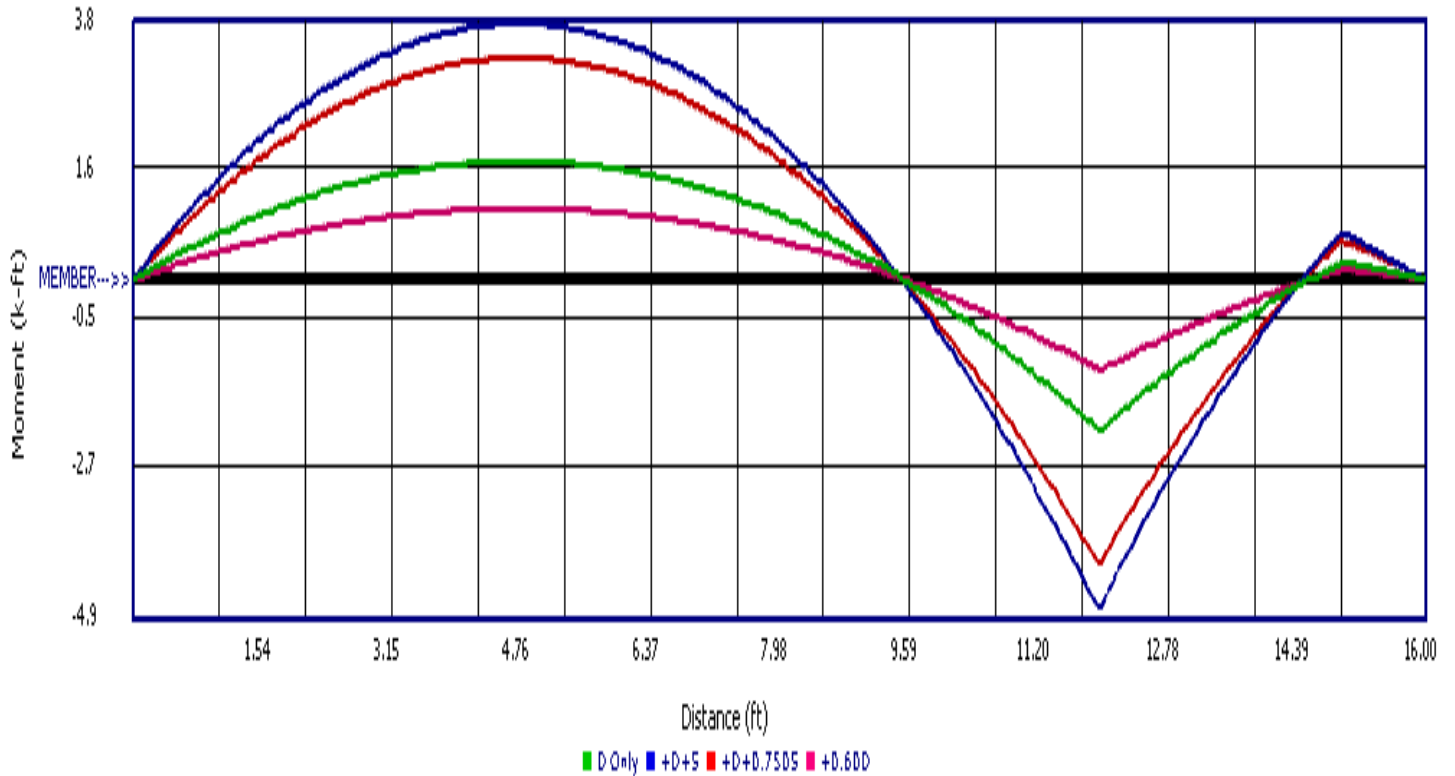
Load Combination	Span	Max. Downward Defl	Location in Span	Max. Upward Defl	Location in Span
D Only	1	0.0311 in	5.363 ft	0.0000 in	0.000 ft
+D+S	1	0.0672 in	5.363 ft	0.0000 in	0.000 ft
+D+0.750S	1	0.0582 in	5.363 ft	0.0000 in	0.000 ft
+0.60D	1	0.0187 in	5.363 ft	0.0000 in	0.000 ft
S Only	1	0.0361 in	5.363 ft	0.0000 in	0.000 ft

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	1.552	4.639	0.825
Overall MINimum	0.835	2.526	0.509
D Only	0.716	2.113	0.316
+D+S	1.552	4.639	0.825
+D+0.750S	1.343	4.008	0.697
+0.60D	0.430	1.268	0.190
S Only	0.835	2.526	0.509

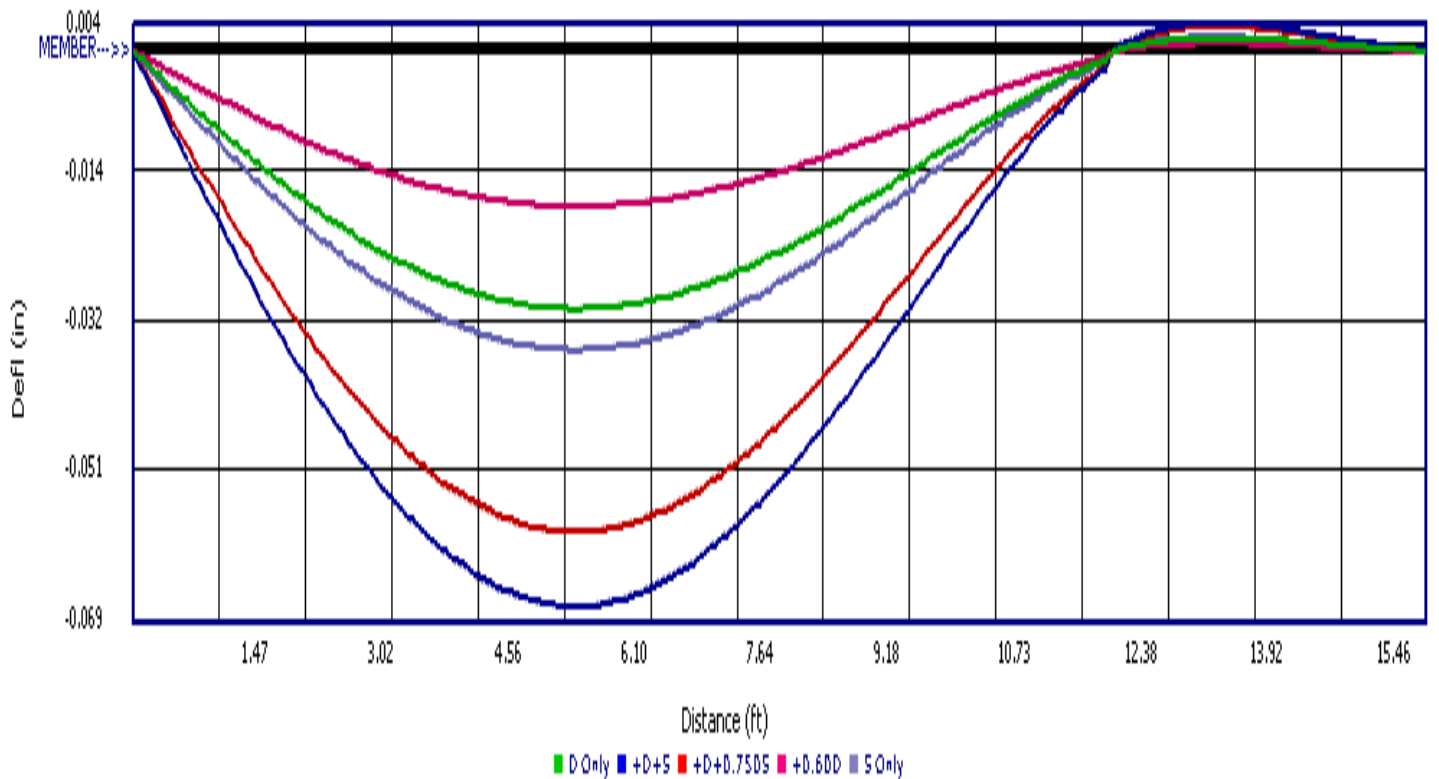
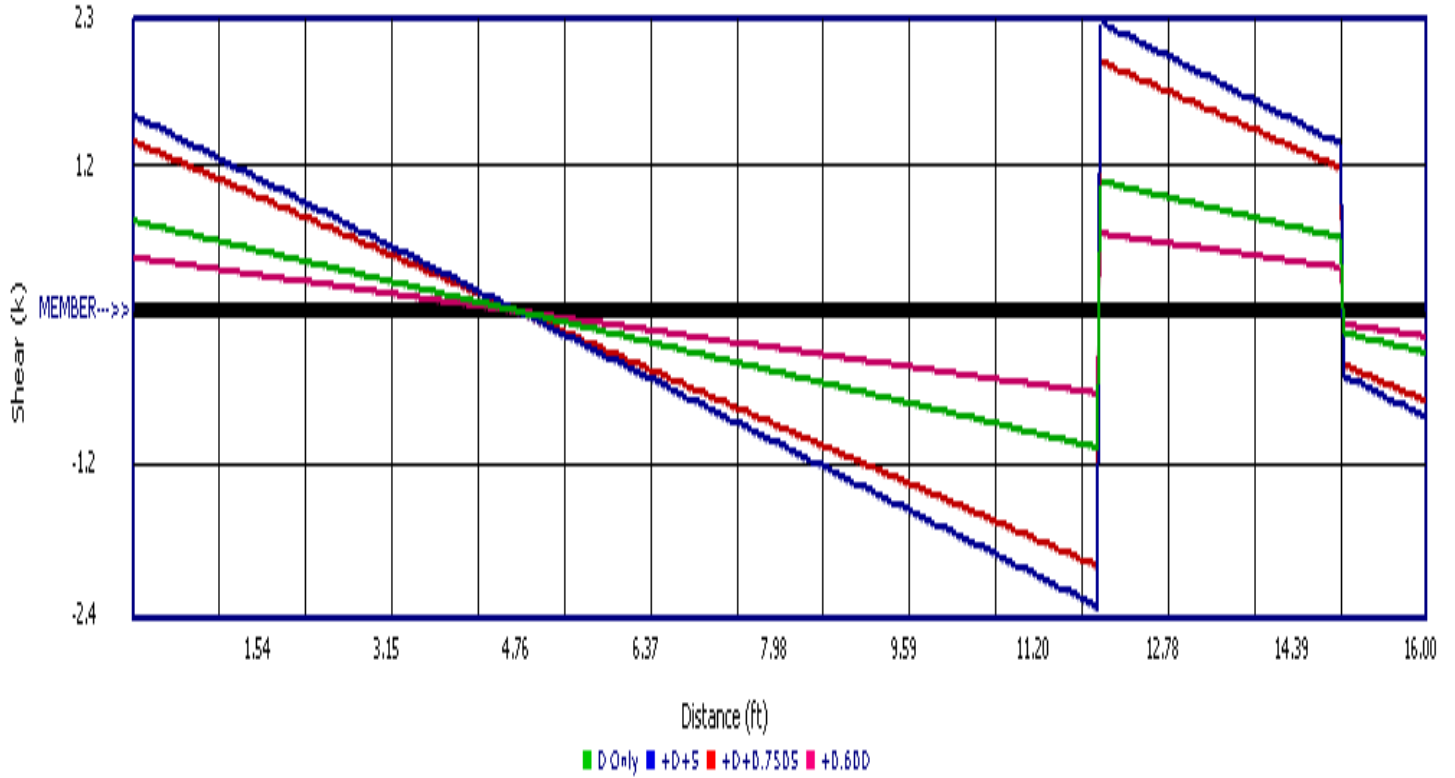




Wood Beam

Lic. #: KW-06002858

DESCRIPTION: Beam at Low Roof over Kitchen





Wood Beam

Lic. # : KW-06008133

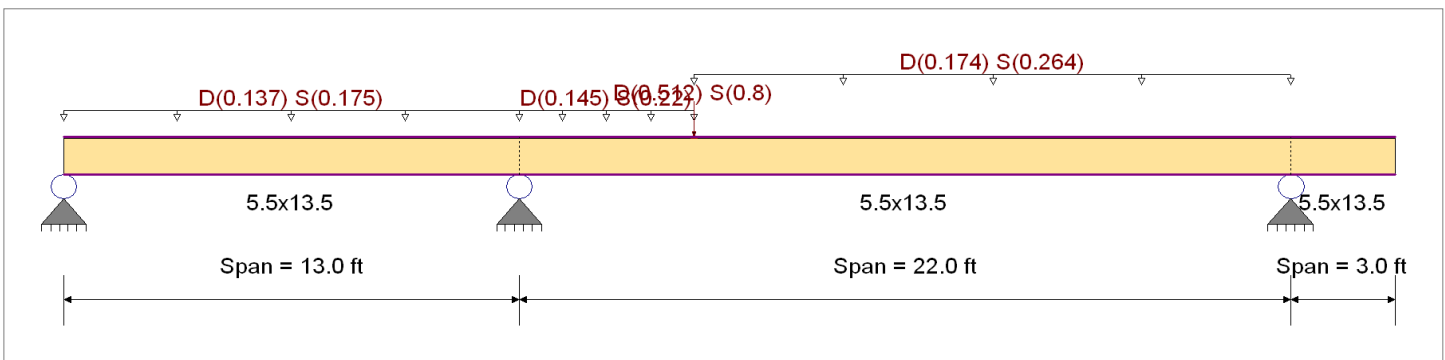
DESCRIPTION: **Roof Beam across Sitting and Terrace Spaces**

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	E : Modulus of Elasticity
Load Combination ASCE 7-10	Fb -	2400 psi	Ebend- xx
Wood Species : DF/DF	Fc - Prll	1650 psi	Eminbend - xx
Wood Grade : 24F - V8	Fc - Perp	650 psi	Ebend- yy
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling	Fv	265 psi	Eminbend - yy
	Ft	1100 psi	Density
			31.21 pcf



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.1370, S = 0.1750, Tributary Width = 1.0 ft, (unifrom load 1)

Load for Span Number 2

Uniform Load : D = 0.1450, S = 0.220 k/ft, Extent = 0.0 --> 5.0 ft, Tributary Width = 1.0 ft, (unifrom load 2)

Uniform Load : D = 0.1740, S = 0.2640 k/ft, Extent = 5.0 --> 22.0 ft, Tributary Width = 1.0 ft, (unifrom load 3)

Point Load : D = 0.5120, S = 0.80 k @ 5.0 ft, (PL 1)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.591 : 1	Maximum Shear Stress Ratio	=	0.416 : 1
Section used for this span	=	5.5x13.5	Section used for this span	=	5.5x13.5
	=	1,594.16 psi		=	126.63 psi
	=	2,695.92 psi		=	304.75 psi
Load Combination	=	+D+S	Load Combination	=	+D+S
Location of maximum on span	=	0.000 ft	Location of maximum on span	=	13.000 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.443 in	Ratio =	596 >=300	
Max Upward Transient Deflection		-0.209 in	Ratio =	344 >=300	
Max Downward Total Deflection		0.751 in	Ratio =	351 >=200	
Max Upward Total Deflection		-0.355 in	Ratio =	202 >=200	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios								Moment Values			Shear Values				
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	f _b	F ^{'b}	V	f _v	F ^{'v}	
D Only																		
	Length = 13.0 ft	1	0.310	0.220	0.90	1.000	1.00	1.00	1.00	1.00	1.00	9.33	670.21	2160.00	0.00	0.00	0.00	238.50
	Length = 22.0 ft	2	0.318	0.220	0.90	0.977	1.00	1.00	1.00	1.00	1.00	9.33	670.21	2109.85	2.60	52.53	238.50	
	Length = 3.0 ft	3	0.002	0.220	0.90	1.000	1.00	1.00	1.00	1.00	1.00	0.07	5.20	2160.00	0.03	52.53	238.50	
+D+S																		
	Length = 13.0 ft	1	0.578	0.416	1.15	1.000	1.00	1.00	1.00	1.00	1.00	22.19	1,594.16	2760.00	0.00	0.00	0.00	304.75
	Length = 22.0 ft	2	0.591	0.416	1.15	0.977	1.00	1.00	1.00	1.00	1.00	22.19	1,594.16	2695.92	6.27	126.63	304.75	
	Length = 3.0 ft	3	0.002	0.416	1.15	1.000	1.00	1.00	1.00	1.00	1.00	0.07	5.20	2760.00	0.03	126.63	304.75	



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Wood Beam

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DESCRIPTION: **Roof Beam across Sitting and Terrace Spaces**

Load Combination Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
		M	V								M	fb	F'b	V	fv	F'v
+D+0.750S				1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 13.0 ft	1	0.494	0.355	1.15	1.000	1.00	1.00	1.00	1.00	1.00	18.98	1,363.17	2760.00	5.35	108.10	304.75
Length = 22.0 ft	2	0.506	0.355	1.15	0.977	1.00	1.00	1.00	1.00	1.00	18.98	1,363.17	2695.92	5.35	108.10	304.75
Length = 3.0 ft	3	0.002	0.355	1.15	1.000	1.00	1.00	1.00	1.00	1.00	0.07	5.20	2760.00	0.03	108.10	304.75
+0.60D				1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 13.0 ft	1	0.105	0.074	1.60	1.000	1.00	1.00	1.00	1.00	1.00	5.60	402.12	3840.00	1.56	31.52	424.00
Length = 22.0 ft	2	0.107	0.074	1.60	0.977	1.00	1.00	1.00	1.00	1.00	5.60	402.12	3750.84	1.56	31.52	424.00
Length = 3.0 ft	3	0.001	0.074	1.60	1.000	1.00	1.00	1.00	1.00	1.00	0.04	3.12	3840.00	0.02	31.52	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S	-0.1078	8.521
+D+S	2	0.7513	12.017		0.0000	8.521
	3	0.0000	12.017	+D+S	-0.3551	3.000

Maximum Deflections for Load Combinations

Load Combination	Span	Max. Downward Defl	Location in Span	Max. Upward Defl	Location in Span
D Only	2	0.3085 in	12.017 ft	0.0000 in	0.000 ft
+D+S	2	0.7513 in	12.017 ft	0.0000 in	0.000 ft
+D+0.750S	2	0.6406 in	12.017 ft	0.0000 in	0.000 ft
+0.60D	2	0.1851 in	12.017 ft	0.0000 in	0.000 ft
S Only	2	0.4429 in	11.832 ft	0.0000 in	0.000 ft

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

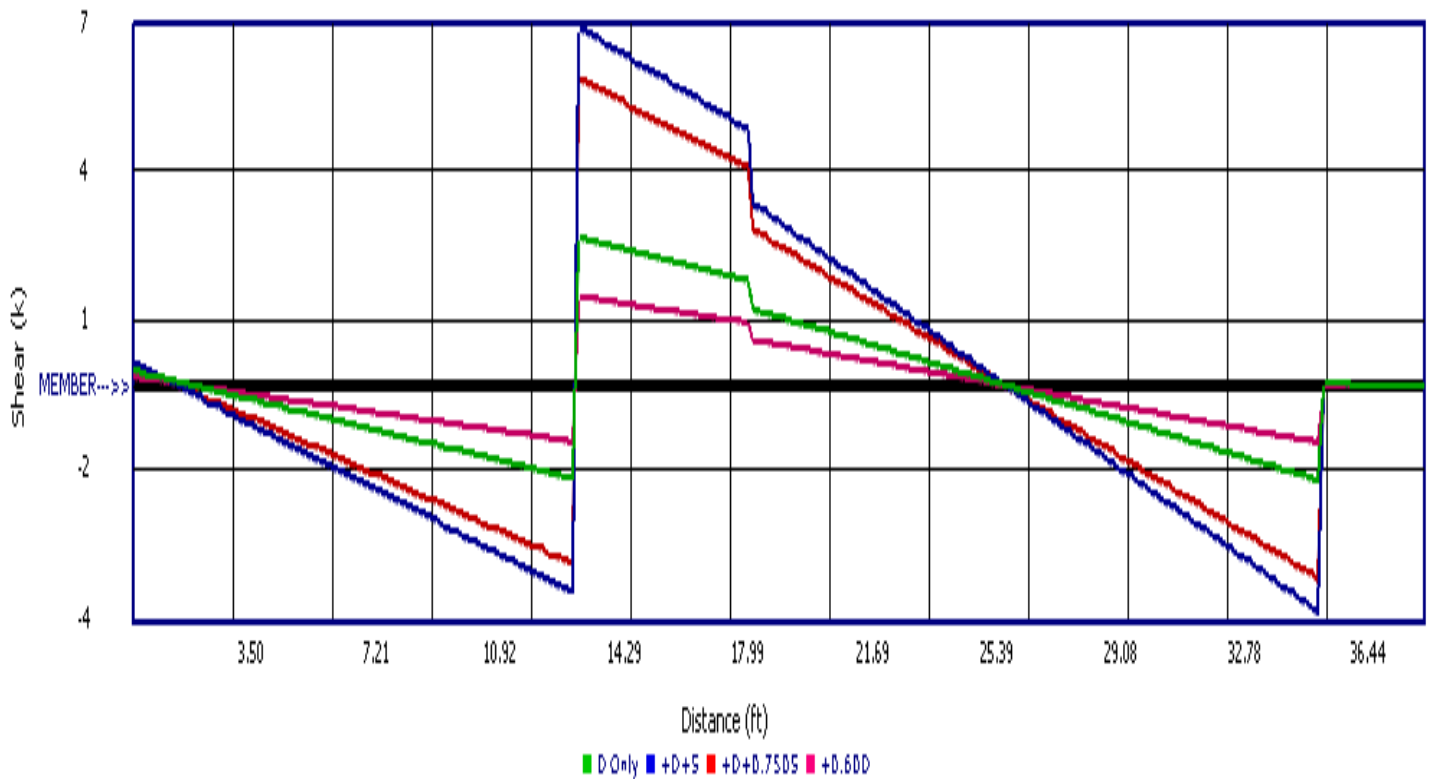
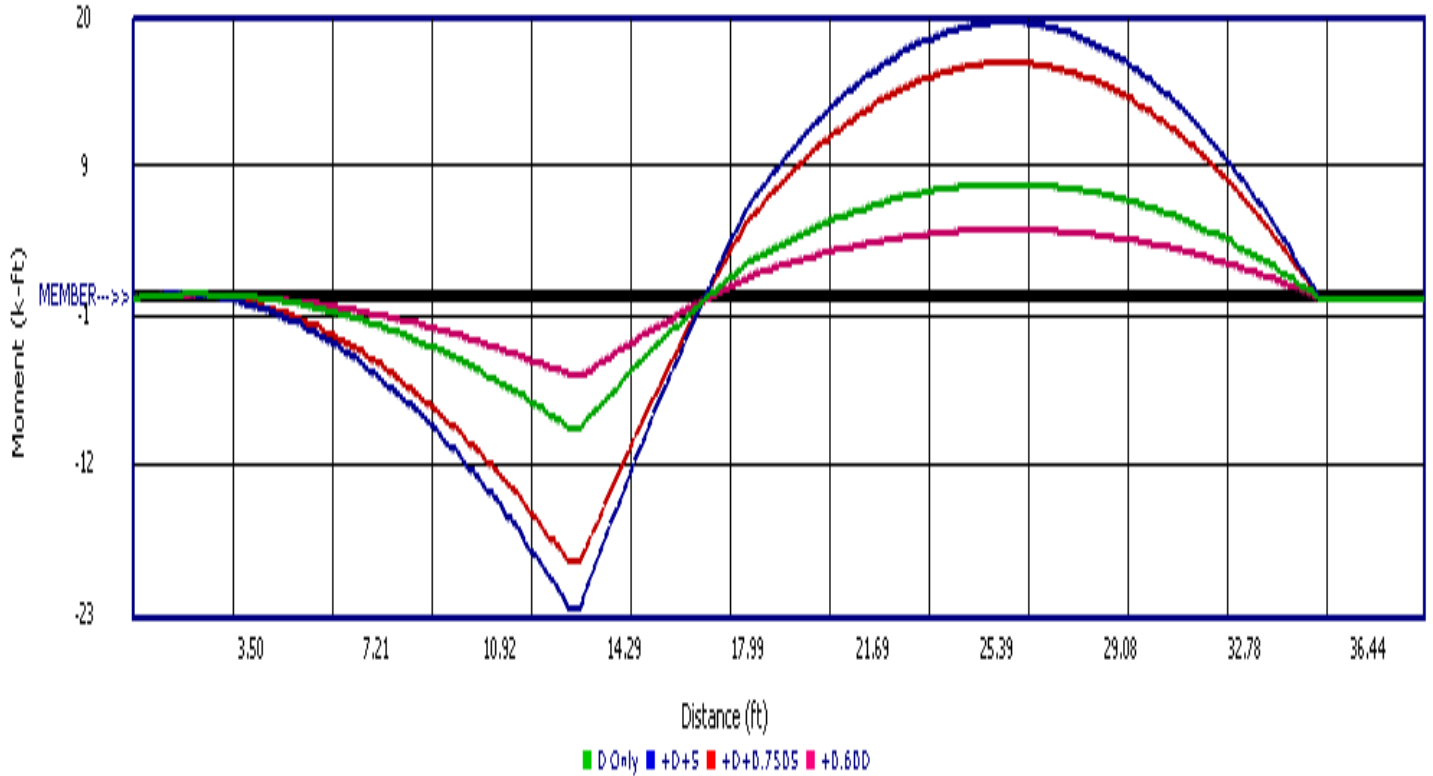
Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	0.425	10.531	4.294	
Overall MINimum	0.148	6.039	2.476	
D Only	0.277	4.492	1.818	
+D+S	0.425	10.531	4.294	
+D+0.750S	0.388	9.021	3.675	
+0.60D	0.166	2.695	1.091	
S Only	0.148	6.039	2.476	



Wood Beam

Lic. #: KW-06008133

DESCRIPTION: Roof Beam across Sitting and Terrace Spaces

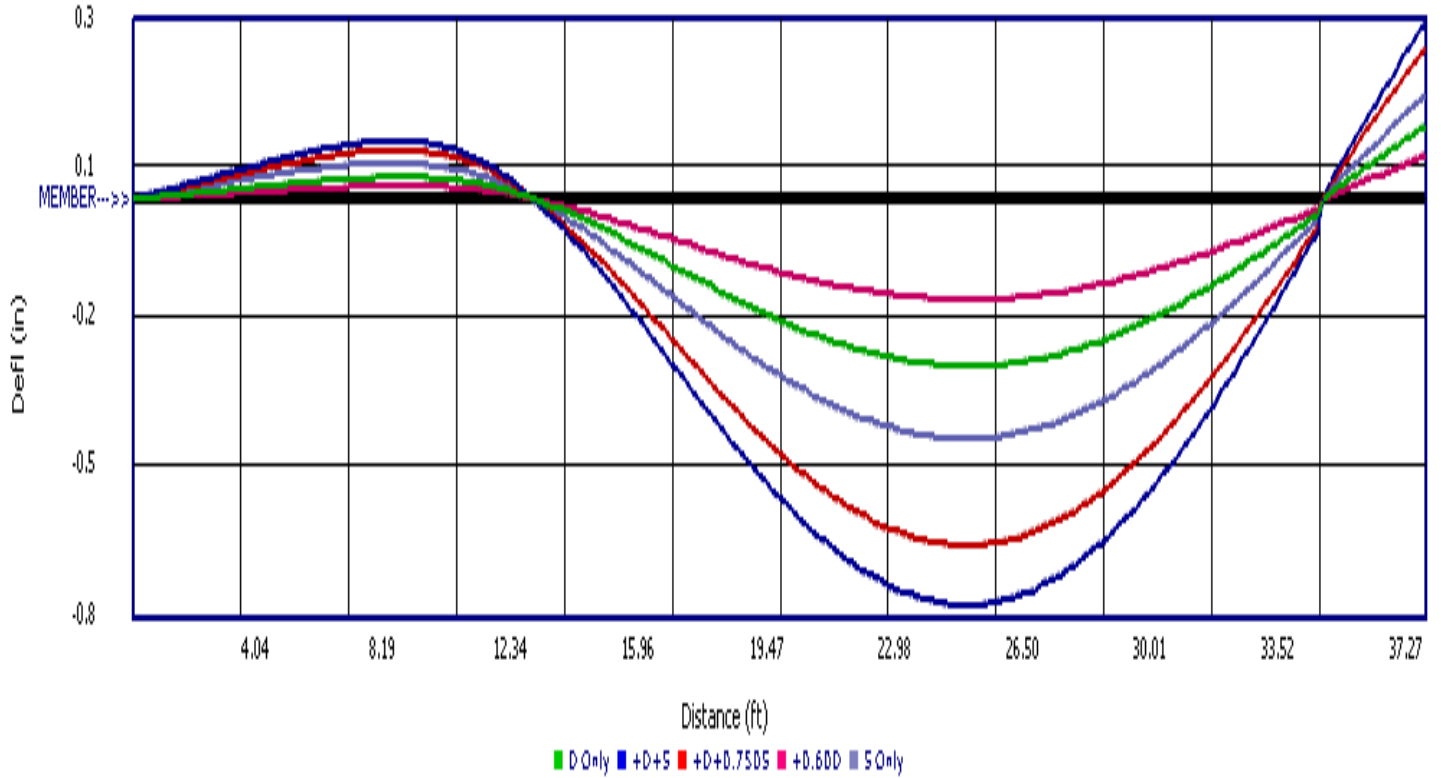




Wood Beam

Lic. #: KW-06008133

DESCRIPTION: Roof Beam across Sitting and Terrace Spaces



EAST WING ROOF

EAST END FRAMING

PATIO SOUTH EDGE BM

Span = 11' + 4'

TA = 7' R

DL = 102

SL = 175 PIF

6x10 OR

R₁ = 480#
840#S

R₂ = 1040#
1790#S

PATIO NORTH EDGE BM

Span = 14'

TA = 10' R

DL = 145

SL = 250

6x10 DF#2

R₁ = R₂ = 1090#
1420#S

TRANSITION BM @ CHANGING RM

Span = 13'

TA = 6' R + 5' WW

DL = 152

SL = 150 PIF

4x12

OR GL 5 1/2 x 7 1/2

R₁ = R₂ = 1040#
980#S

TRANSITION BM OVER BDRM

Span = 20'

TA = 9' R + 3' WW

DL = 167

SL = 225 PIF

GL 5 1/2 x 15

R₁ = R₂ = 1840#
2250#S

SLIDING DOOR HEADER

Span = 10'

TA = 4' R + 3' WW

DL = 94

SL = 100 PIF

4x10

R₁ = R₂ = 520#
500#S

HEADER AT HIGH/LOW ROOF
OF MASTER BATH

Span = 11'

TA = 8' R + 4' WW + 3' LR

DL = 209

SL = 243 PIF

GL 3 1/2 x 9

R₁ = R₂ = 1200#
1340#S



East Wing Roof Framing p.1

SHEET TITLE

Lorenzini TJ

PROJECT

Bob Swam

CLIENT

SCALE

Mark

DESIGNED BY

CHECKED

6/20/20

DATE



SHEET

I.L. GROSS
STRUCTURAL ENGINEERS



Multiple Simple Beam

Lic. #: KW-06008133

Description : South Wing Roof Framing p.1

Wood Beam Design : Patio- South Edge Beam

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DouglasFir-Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

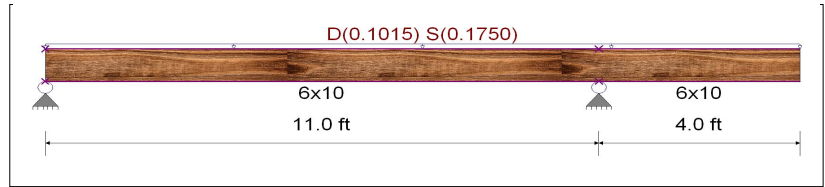
Unif Load: D = 0.01450, S = 0.0250 k/ft, Trib= 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.441** : 1
 fb : Actual : 456.79 psi at 4.785 ft in Span # 1
 Fb : Allowable : 1,035.00 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.209** : 1
 fv : Actual : 43.32 psi at 10.230 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.48			0.84			
Right Support	1.04			1.79			



Max Deflections

Transient Downward	0.063 in	Total Downward	0.100 in
Ratio	2081	Ratio	1317
	LC: S Only		LC: +D+S
Transient Upward	-0.035 in	Total Upward	-0.055 in
Ratio	2748	Ratio	1738
	LC: S Only		LC: +D+S

Wood Beam Design : Patio- North Edge Beam

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.1

Fb - Tension	1350 psi	Fc - Prll	925 psi	Fv	170 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	1350 psi	Fc - Perp	625 psi	Ft	675 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.01450, S = 0.0210 k/ft, Trib= 10.0 ft

Design Summary

Max fb/Fb Ratio = **0.839** : 1
 fb : Actual : 1,301.83 psi at 7.000 ft in Span # 1
 Fb : Allowable : 1,552.50 psi
 Load Comb : +D+S

Max fv/FvRatio = **0.336** : 1
 fv : Actual : 65.76 psi at 13.253 ft in Span # 1
 Fv : Allowable : 195.50 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.09			1.47			
Right Support	1.09			1.47			



Max Deflections

Transient Downward	0.290 in	Total Downward	0.506 in
Ratio	578	Ratio	331
	LC: S Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



Multiple Simple Beam

Lic. #: KW-06008133

Wood Beam Design : Transition BM at changing Room

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **5.125x7.5, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.1520, S = 0.150 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.593** : 1
 fb : Actual : 1,637.34 psi at 6.500 ft in Span # 1
 Fb : Allowable : 2,760.00 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.234** : 1
 fv : Actual : 71.37 psi at 12.393 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.04			0.98			
Right Support	1.04			0.98			

Max Deflections			
Transient Downward	0.299 in	Total Downward	0.618 in
Ratio	522	Ratio	252
LC: S Only			
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:			

Wood Beam Design : Transition BM Over Master Bedroom

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **5.125x15, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

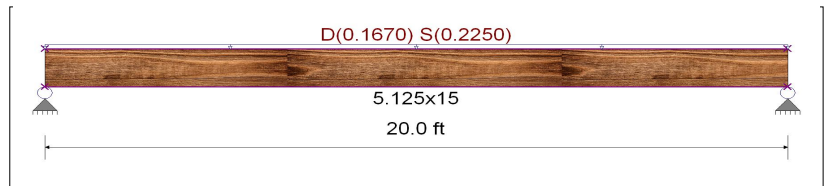
Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.1670, S = 0.2250 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.470** : 1
 fb : Actual : 1,275.82 psi at 10.000 ft in Span # 1
 Fb : Allowable : 2,712.30 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.230** : 1
 fv : Actual : 70.17 psi at 18.800 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.84			2.25			
Right Support	1.84			2.25			

Max Deflections			
Transient Downward	0.314 in	Total Downward	0.570 in
Ratio	764	Ratio	421
LC: S Only			
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:			



Multiple Simple Beam

Lic. #: KW-06008133

Wood Beam Design : Sliding Door Header

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **4x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0150, S = 0.0250 k/ft, Trib= 4.0 ft

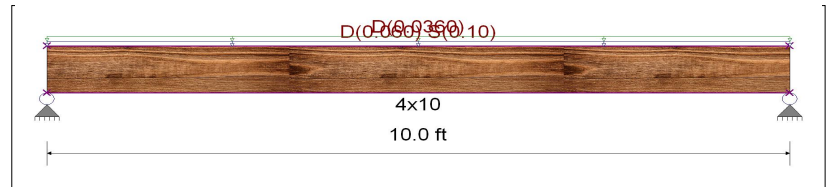
Unif Load: D = 0.0120 k/ft, Trib= 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.491** : 1
 fb : Actual : 610.13 psi at 5.000 ft in Span # 1
 Fb : Allowable : 1,242.00 psi
 Load Comb : +D+S

Max fv/Fv Ratio = **0.192** : 1
 fv : Actual : 39.82 psi at 9.233 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.52			0.50			
Right Support	0.52			0.50			



Max Deflections

Transient Downward	0.061 in	Total Downward	0.124 in
Ratio	1959	Ratio	965
LC: S Only		LC: +D+S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : Header at High/Low roof transition over Master Bath

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3.125x9, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.01450, S = 0.0210 k/ft, Trib= 8.0 ft

Unif Load: D = 0.0120 k/ft, Trib= 4.0 ft

Unif Load: D = 0.0160, S = 0.0250 k/ft, Trib= 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.719** : 1
 fb : Actual : 1,983.74 psi at 5.500 ft in Span # 1
 Fb : Allowable : 2,760.00 psi
 Load Comb : +D+S

Max fv/Fv Ratio = **0.385** : 1
 fv : Actual : 117.22 psi at 0.000 ft in Span # 1
 Fv : Allowable : 304.75 psi
 Load Comb : +D+S

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.20			1.34			
Right Support	1.20			1.34			



Max Deflections

Transient Downward	0.236 in	Total Downward	0.447 in
Ratio	560	Ratio	295
LC: S Only		LC: +D+S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

MAIN FLOOR FRAMING DL=16" O/C LL=40" TYP

New Joists

c Center Framing

Span = 12' + 12' + 10'

TA=16" O/C LL=50" TYP

11 3/8" TJI 210' @ 16" O/C

c New Deck w/ TYPING

DL=35" O/C LL=60 SL=25

SPAN=12' MAX

2x12 @ 36" O/C

New INFILL JOISTS @ E. Wing

Span = 14', TA=16" O/C

11 3/8" TJI 230' @ 16" O/C

New BM @ LIVING RM CRAWSPACE

TA=12' F SPAN=7' x 2

DL=112

LL=600 P1F

LVL 3 1/2 x 9 1/2" ON

R₁ = R₂ = 210 #5
2100 #C

→ 4x4 Post w/ 24" x 24" FTG ON

HEADER @ CHANGING ROOMS

SPAN=5' TA=6' F + 6' DECK + 12' CRAW

DL=450

LL=600 P1F

SL=150

LVL 3 1/2 x 9 1/2" ON

R₁ = R₂ = 290 #5

1650 #C

390 #5

HEADER @ CHANGING ROOM EDGE

SPAN=9' TA=6' DECK + TRAILING

DL=220

LL=410 P1F

SL=150

WOOD → LVL 3 1/2 x 9 1/2"

CONC → 12 x 9" BM w/ (2) #4T
#(2) #5 B

R₁ = R₂ = 1470 #5

1940 #C

670 #5



I.L. GROSS
STRUCTURAL ENGINEERS

MAIN FLOOR FRAMING P1

SHEET TITLE

LOZZENZINI

PROJECT

RES

CLIENT

SCALE

MARK

DESIGNED BY

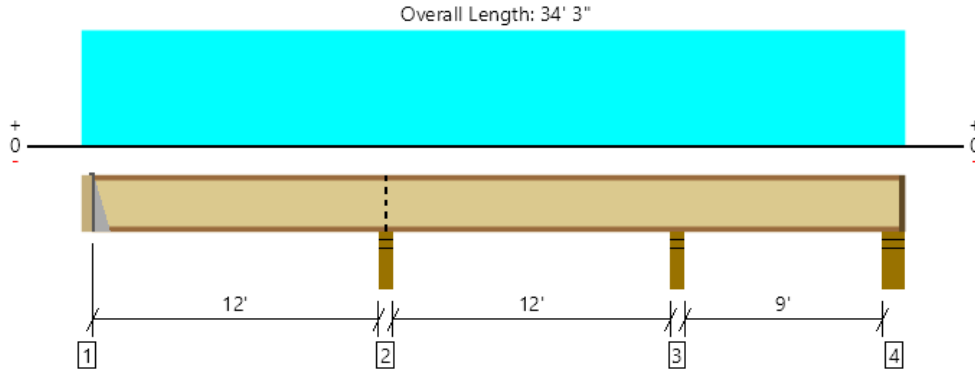
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DATE



SHEET

Main Floor, Center- New Living Rm joists
1 piece(s) 11 7/8" TJI @ 210 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1462 @ 12' 4 1/4"	2145 (3.50")	Passed (68%)	1.00	1.0 D + 1.0 L (Adj Spans)
Shear (lbs)	696 @ 12' 2 1/2"	1821	Passed (38%)	1.00	1.0 D + 1.0 L (Adj Spans)
Moment (Ft-lbs)	-1715 @ 12' 4 1/4"	3795	Passed (45%)	1.00	1.0 D + 1.0 L (Adj Spans)
Live Load Defl. (in)	0.099 @ 5' 11 7/8"	0.304	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.120 @ 5' 11"	0.607	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	59	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" HF ledgerOnMasonry	2.50"	Hanger ¹	1.75" / - ²	106	446/-31	552/-31	See note ¹
2 - Stud wall - SPF	3.50"	3.50"	3.50"	298	1164	1462	Blocking
3 - Stud wall - SPF	3.50"	3.50"	3.50"	246	1028	1274	None
4 - Stud wall - DF	5.50"	4.00"	1.75"	81	381/-65	462/-65	1 1/2" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- ¹ See Connector grid below for additional information and/or requirements.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 3" o/c	
Bottom Edge (Lu)	5' 8" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	ITS2.06/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

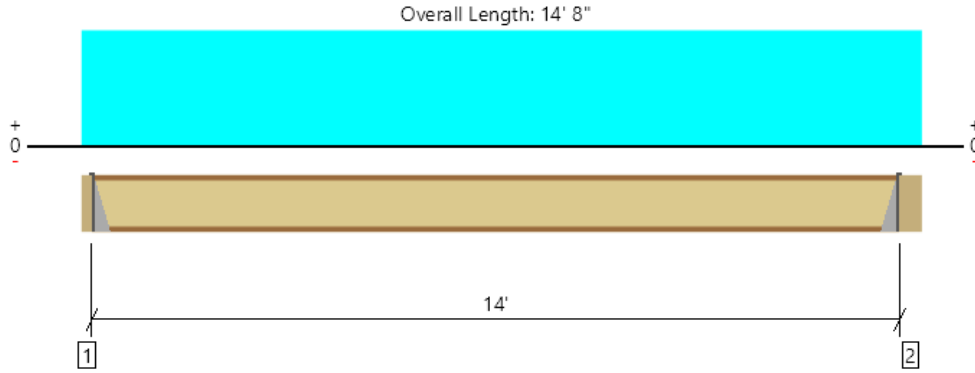
Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 34' 3"	16"	16.0	60.0	Living Room

Member Notes
Center Wing Floor Joists

FortewEB Software Operator	Job Notes
Mark Speidel I.L. Gross Structural Engineers, LLC (425) 640-7333 marks@ilgross.com	



Main Floor, East Wing - Infill Joists
 1 piece(s) 11 7/8" TJI @ 210 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	541 @ 2 1/2"	1005 (1.75")	Passed (54%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	541 @ 2 1/2"	1655	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1895 @ 7' 2 1/2"	3795	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.143 @ 7' 2 1/2"	0.350	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.207 @ 7' 2 1/2"	0.700	Passed (L/813)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	53	40	Passed	--	--

System : Floor
 Member Type : Joist
 Building Use : Residential
 Building Code : IBC 2015
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" HF ledgerOnMasonry	2.50"	Hanger ¹	1.75" / - ²	173	384	557	See note ¹
2 - Hanger on 11 7/8" DF beam	5.50"	Hanger ¹	1.75" / - ²	179	398	577	See note ¹

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- ¹ See Connector grid below for additional information and/or requirements.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 4" o/c	
Bottom Edge (Lu)	14' o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie							
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories	
1 - Top Mount Hanger	ITS2.06/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		
2 - Top Mount Hanger	ITS2.06/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

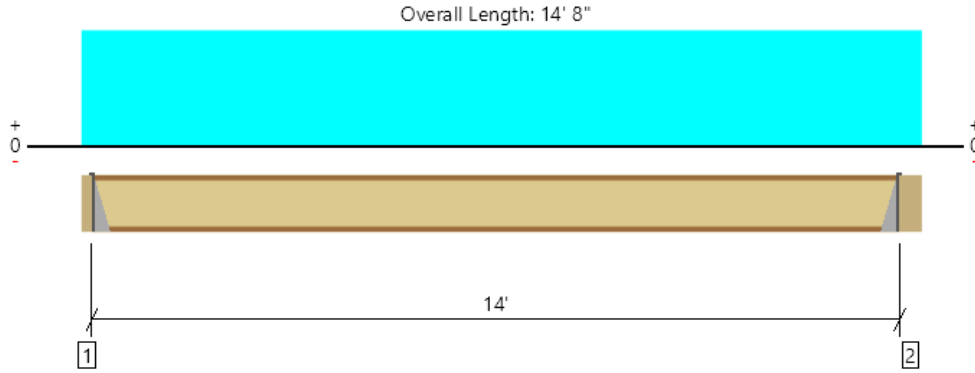
Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 14' 8"	16"	18.0	40.0	Living Room

Member Notes
New Floor Joists at East Wing

ForteWEB Software Operator	Job Notes
Mark Speidel I.L. Gross Structural Engineers, LLC (425) 640-7333 marks@ilgross.com	



Main Floor, East Wing - 9.5in Joists
1 piece(s) 9 1/2" TJI® 110 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	541 @ 2 1/2"	910 (1.75")	Passed (59%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	541 @ 2 1/2"	1220	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1895 @ 7' 2 1/2"	2500	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.258 @ 7' 2 1/2"	0.350	Passed (L/650)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.375 @ 7' 2 1/2"	0.700	Passed (L/449)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	42	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 9 1/2" HF ledgerOnMasonry	2.50"	Hanger ¹	1.75" / - ²	173	384	557	See note ¹
2 - Hanger on 9 1/2" DF beam	5.50"	Hanger ¹	1.75" / - ²	179	398	577	See note ¹

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- ¹ See Connector grid below for additional information and/or requirements.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 7" o/c	
Bottom Edge (Lu)	14' o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie							
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories	
1 - Top Mount Hanger	ITS1.81/9.5	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		
2 - Top Mount Hanger	ITS1.81/9.5	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 14' 8"	16"	18.0	40.0	Living Room

Member Notes
East Wing - 9.5" joists checks

ForteWEB Software Operator	Job Notes
Mark Speidel I.L. Gross Structural Engineers, LLC (425) 640-7333 marks@ilgross.com	





Multiple Simple Beam

Lic. #: KW-06002858

Description : Main Floor - Typical Framing

Wood Beam Design : Deck Joists

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3x8, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Hem Fir

Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

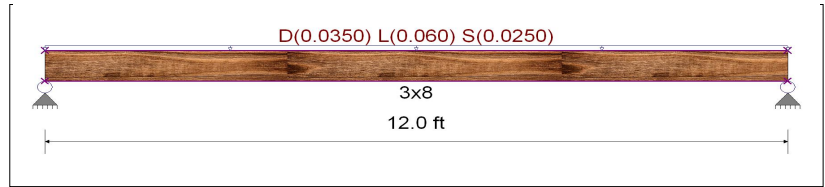
Unif Load: D = 0.0350, L = 0.060, S = 0.0250 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.799** : 1
 fb : Actual : 936.94 psi at 6.000 ft in Span # 1
 Fb : Allowable : 1,173.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.283** : 1
 fv : Actual : 42.46 psi at 11.400 ft in Span # 1
 Fv : Allowable : 150.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.21	0.36		0.15			
Right Support	0.21	0.36		0.15			



Max Deflections

Transient Downward	0.273 in	Total Downward	0.449 in
Ratio	528	Ratio	320
	LC: L Only		LC: +D+0.750L+0.750S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : Living Room Floor BM

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 2.0 E

Fb - Tension	2,600.0 psi	Fc - Prll	2,510.0 psi	Fv	285.0 psi	Ebend- xx	2,000.0 ksi	Density	42.010 pcf
Fb - Compr	2,600.0 psi	Fc - Perp	750.0 psi	Ft	1,555.0 psi	Eminbend - xx	1,016.54 ksi		

Applied Loads

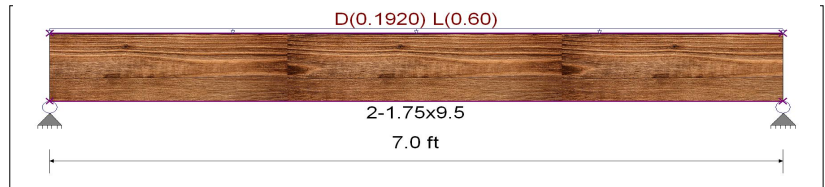
Beam self weight calculated and added to loads
 Unif Load: D = 0.0160, L = 0.050 k/ft, Trib= 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.414** : 1
 fb : Actual : 1,119.27 psi at 3.500 ft in Span # 1
 Fb : Allowable : 2,704.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.346** : 1
 fv : Actual : 98.74 psi at 6.230 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.71	2.10					
Right Support	0.71	2.10					



Max Deflections

Transient Downward	0.065 in	Total Downward	0.087 in
Ratio	1289	Ratio	964
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Multiple Simple Beam

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Wood Beam Design : Typical Header at Changing Rooms

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **MicroLam LVL 1.9 E**

Fb - Tension 2,600.0 psi Fc - Prll 2,510.0 psi Fv 285.0 psi Ebend- xx 1,900.0 ksi Density 42.010 pcf
 Fb - Compr 2,600.0 psi Fc - Perp 750.0 psi Ft 1,555.0 psi Eminbend - xx 965.71 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0160, L = 0.050 k/ft, Trib= 6.0 ft

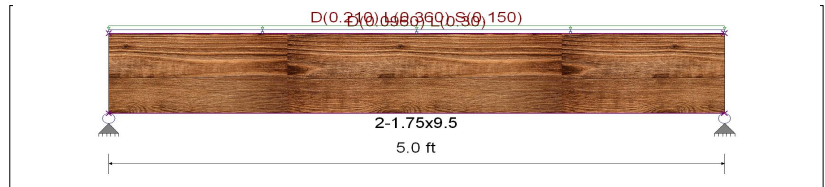
Unif Load: D = 0.0350, L = 0.060, S = 0.0250 k/ft, Trib= 6.0 ft

Design Summary

Max fb/Fb Ratio = **0.257** : 1
 fb : Actual : 695.00 psi at 2.500 ft in Span # 1
 Fb : Allowable : 2,704.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.265** : 1
 fv : Actual : 75.56 psi at 4.217 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.79	1.65		0.38			
Right Support	0.79	1.65		0.38			



Max Deflections

Transient Downward	0.020 in	Total Downward	0.029 in
Ratio	3055	Ratio	2066
LC: L Only		LC: +D+L	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : 9' Header at Changing Room

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **MicroLam LVL 1.9 E**

Fb - Tension 2,600.0 psi Fc - Prll 2,510.0 psi Fv 285.0 psi Ebend- xx 1,900.0 ksi Density 42.010 pcf
 Fb - Compr 2,600.0 psi Fc - Perp 750.0 psi Ft 1,555.0 psi Eminbend - xx 965.71 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.020, L = 0.050 k/ft, Trib= 1.0 ft

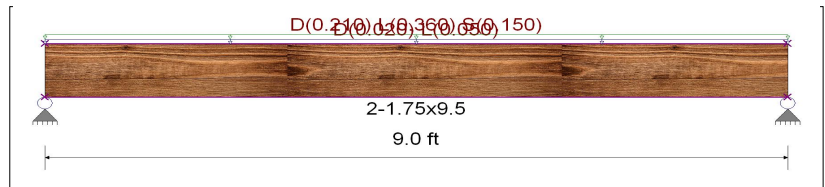
Unif Load: D = 0.0350, L = 0.060, S = 0.0250 k/ft, Trib= 6.0 ft

Design Summary

Max fb/Fb Ratio = **0.555** : 1
 fb : Actual : 1,499.43 psi at 4.500 ft in Span # 1
 Fb : Allowable : 2,704.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.383** : 1
 fv : Actual : 109.03 psi at 0.000 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.08	1.85		0.68			
Right Support	1.08	1.85		0.68			



Max Deflections

Transient Downward	0.128 in	Total Downward	0.206 in
Ratio	843	Ratio	524
LC: L Only		LC: +D+0.750L+0.750S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

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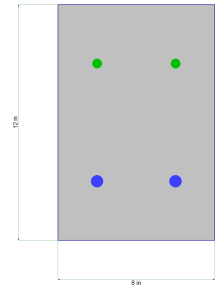
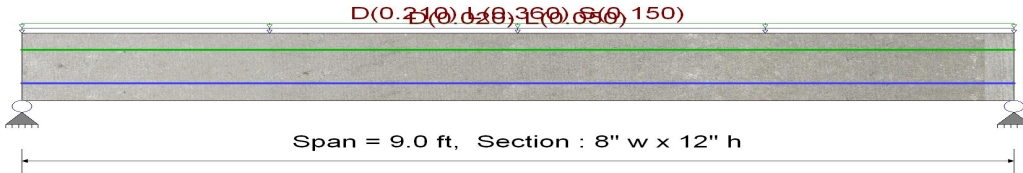
Concrete Beam Design : 9' Header at Changing Room (concrete)

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Rectangular Beam : 8.0 in wide x 12.0 in high

Using Ultimate Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

f'c = 2.50 ksi fy Main Stl = 60.0 ksi E Main Stl = 29,000.0 ksi Density 145.0 pcf
 E Conc = 3,122.0 ksi fy Stirrups = 40.0 ksi E Stirrups = 29,000.0 ksi ϕ Values Bending 0.90
 fr = 375.0 ksi β = 0.850 Shear 0.750



Cross Section & Reinforcing Details

2-#5 at 3.0 in from Bottom, from 0.0 to 9.0 ft in this span 2-#4 at 3.0 in from Top, from 0.0 to 9.0 ft in this span

Shear Stirrup Requirements

Stirrup Bar Size = # 3 Number of Resisting Legs Per Stirrup = 2

#3 stirrups (2 legs) at 4.50 in o/c from 0.00 to 1.35 ft along span, Condition : $\Phi V_c/2 < V_u \leq \Phi V_c$
 No Stirrups Required from 1.40 to 7.60 ft along span, Condition : $V_u < \Phi V_c/2$
 #3 stirrups (2 legs) at 4.50 in o/c from 7.65 to 9.00 ft along span, Condition : $\Phi V_c/2 < V_u \leq \Phi V_c$

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.020, L = 0.050 k/ft, Trib= 1.0 ft
 Unif Load: D = 0.0350, L = 0.060, S = 0.0250 k/ft, Trib= 6.0 ft

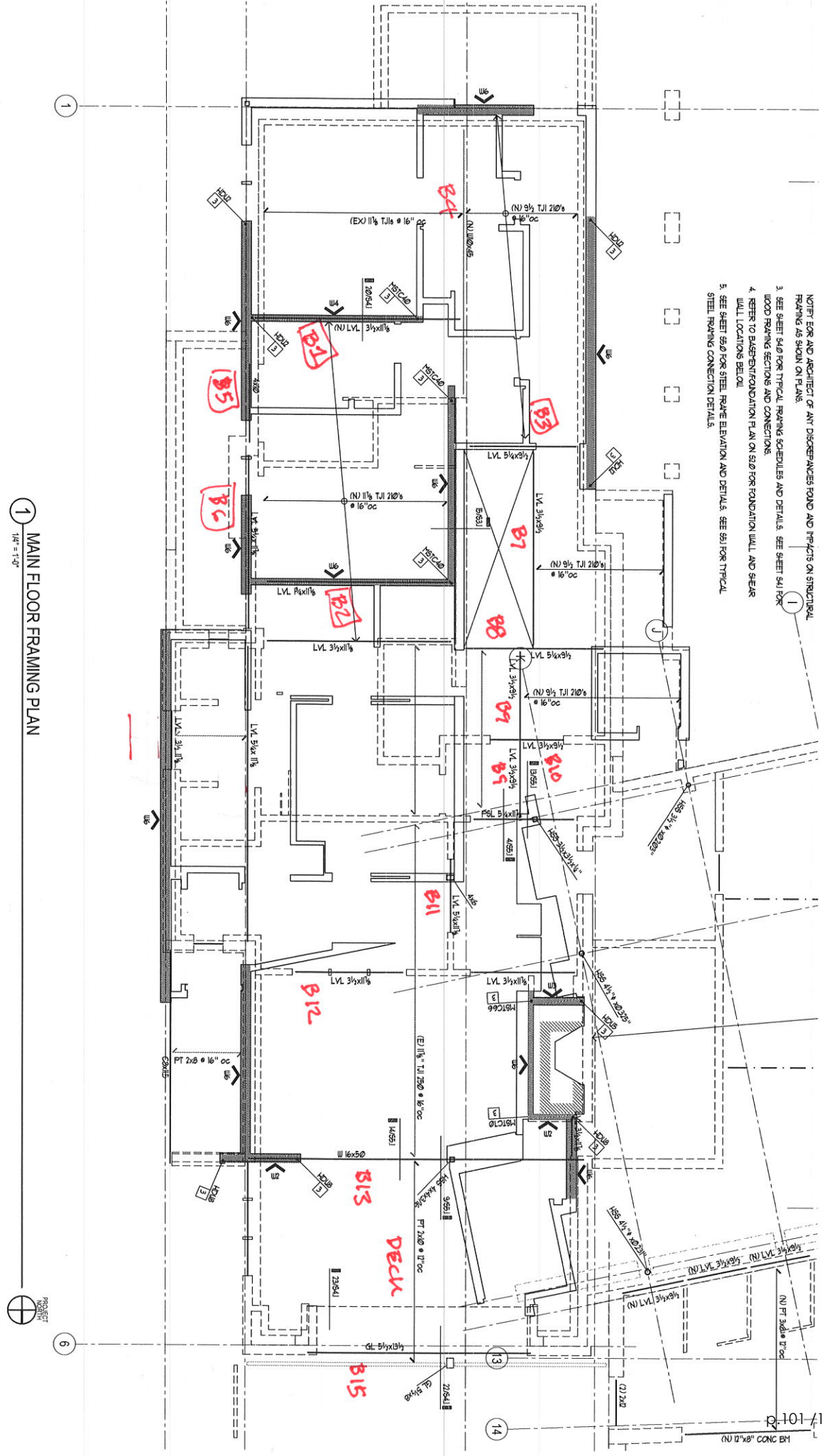
Design Summary

Max fb/Fb Ratio = **0.512** : 1
 Mu : Applied 11.370 k-ft at 4.500 ft in Span # 1
 Mn * Phi : Allowable 22.213 k-ft
 Load Comb : +1.20D+1.60L+0.50S

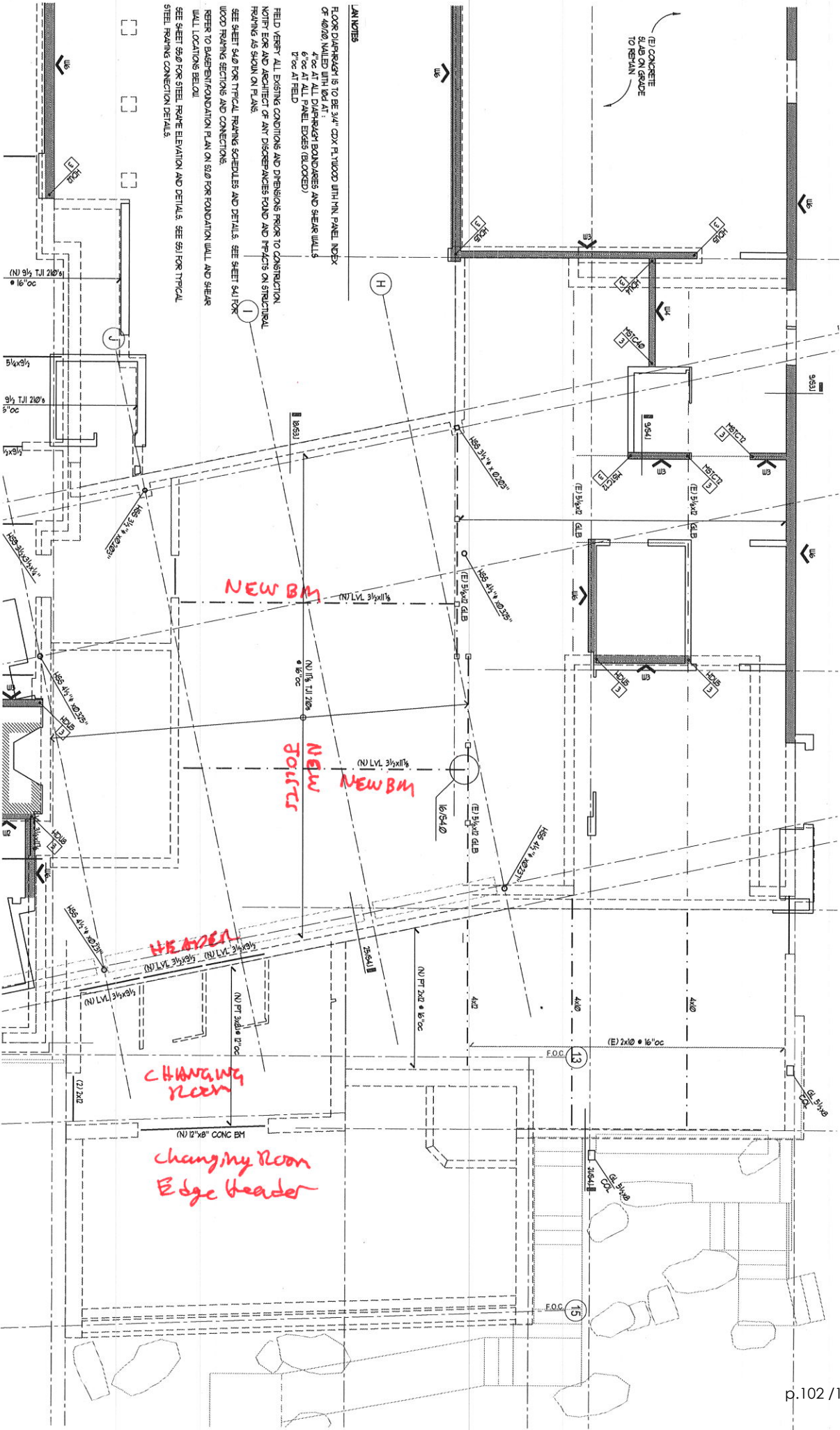
Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.47		1.84	0.67			
Right Support	1.47		1.85	0.68			
Max Deflections							
Transient Downward		0.017 in			Total Downward		0.045 in
Ratio		6456			Ratio		2406
		LC: L Only			LC: +D+0.750L+0.750S		
Transient Upward		0.000 in			Total Upward		0.000 in
Ratio		9999			Ratio		9999
		LC:			LC:		LC:

MAIN FLOOR FRAMING
EAST WINDY KEY

1. NOTE FOR AND ARCHITECT OF ANY DISCREPANCIES FOUND AND POINTS ON STRUCTURAL FRAMING AS SHOWN ON PLANS.
2. SEE SHEET S410 FOR TYPICAL FRAMING SCHEDULES AND DETAILS. SEE SHEET S411 FOR WOOD FRAMING SECTIONS AND CONNECTIONS.
3. REFER TO BASEMENT FOUNDATION PLAN ON S10 FOR FOUNDATION WALL AND BEAR WALL LOCATIONS BELOW.
4. SEE SHEET S50 FOR STEEL PLATE ELEVATION AND DETAILS. SEE S51 FOR TYPICAL STEEL FRAMING CONNECTION DETAILS.



1 MAIN FLOOR FRAMING PLAN
1/4" = 1'-0"



AN NOTES

FLOOR DIAPHRAGM IS TO BE 3/4" CDX PLYWOOD WITH MIN. PANEL INDEX OF 40/20 VALUED WITH 1/2" x 1/2" x 1/2" BRACK BOLTS AND SHEAR WALLS 6" OC AT ALL PANEL EDGES (BLOCKED) 2" OC AT FIELD

FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO CONSTRUCTION NOTIFY EOR AND ARCHITECT OF ANY DISCREPANCIES FOUND AND IMPACTS ON STRUCTURAL FRAMING AS SHOWN ON PLANS.

SEE SHEET 540 FOR TYPICAL FRAMING SCHEDULES AND DETAILS. SEE SHEET 541 FOR WOOD FRAMING SECTIONS AND CONNECTIONS.

REFER TO BASEMENT FOUNDATION PLAN ON 520 FOR FOUNDATION WALL AND SHEAR WALL LOCATIONS BELOW.

SEE SHEET 550 FOR STEEL FRAME ELEVATION AND DETAILS. SEE 591 FOR TYPICAL STEEL FRAMING CONNECTION DETAILS.

(E) CONCRETE SLAB ON GRADE TO REMAIN

MAIN FLOOR REMAINS WEST WINDOW KEY

EAST WING B1

B1 @ SW-2

SPAN = 14'6"

TA = 133'F + 10'SW + 4'R

DL = 190

LL = 53

SL = 100

ST = 76

PL @ 3' = 2.5k_{ST}
 $\times \frac{3}{2} = 1.95$

3 1/2 x 11 3/4 LVL

R₁ = 1.4k_b
 1.4k_L
 1.6k_S + 2.1k_{ST}

R₂ = 1.4k_b
 1.4k_L
 1.6k_S
 1.7k_{ST}

B2 @ SW-2

Span = 14'

TA = 133'F + 10'SW + 2'R

DL = 161

LL = 53 PL

SL = 50

ST = 35

1 3/4 x 11 3/4 LVL

R₁ = R₂ = 1130k_b
 400k_L
 300k_S

B3 @ STAIRS

SPAN = 9'

TA = 13'8" - 5'

6'5" - 9' + stair PL

PL @ 5' = 400k_b

DL = 208/96

572k_L

LL = 520/300

LVL 3 1/2 x 11 3/4

R₁ = 1.07k_b
 2.4k_L

R₂ = 0.86k_b
 1.97k_L

B4 over Party Room

Span = 19'

TA = 112'F + 9'WW + 9'R

DL = 409

PL @ 13' = 1.4k_b

LL = 460 PL

B1 1.4k_L

SL = 190

1.6k_S

2.8k_{ST}

PSL 2x16 OR W10x45

R₁ = 4.6k_b

R₂ = 5.1k_b

4.5k_L

4.6k_L

2.3k_S

2.6k_S

0.9k_{ST}

1.9k_{ST}

B5 @ New Garden

Span = 5'

TA = 7'F + 14'WW + 7'R

DL = 378

LL = 290

4x10

SL = 175

R₁ & R₂ = 960k_b
 700k_L
 440k_S

B6 @ New Garden

Span = 11'

TA = 7'F + 14'WW + 7'R

DL = 373

LL = 290 PL

SL = 175

PL @ 7' = 1130k_b

(B4-2) 400k_L

+ SWJ 300k_S

2100k_{ST}

2k_L

LVL 3 1/2 x 11 3/4

R₁ = 2.6k_b
 1.2k_L
 1.1k_S
 0.8k_{ST}

R₂ = 2.9k_b
 1.8k_L
 1.2k_S
 1.3k_{ST}



I.L. GROSS
 STRUCTURAL ENGINEERS

MAIN FLOOR - EAST WING Framing P.1

SHEET TITLE

Lorenzini

PROJECT

RES

CLIENT

SCALE

MARK

DESIGNED BY

CHECKED

7/2020

DATE



SHEET



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

Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

File: Lorenzini Residence.ec6
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Lic. #: KW-06002858

Description : Main Floor - East Wing Beams p.1

Wood Beam Design : BM-1

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x11.87, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 1.9 E

Fb - Tension	2,600.0 psi	Fc - Prll	2,510.0 psi	Fv	285.0 psi	Ebend- xx	1,900.0 ksi	Density	42.010 pcf
Fb - Compr	2,600.0 psi	Fc - Perp	750.0 psi	Ft	1,555.0 psi	Eminbend - xx	965.71 ksi		

Applied Loads

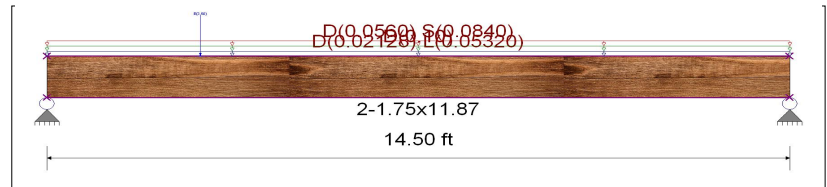
Beam self weight calculated and added to loads
 Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 1.330 ft
 Unif Load: D = 0.010 k/ft, Trib= 10.0 ft
 Unif Load: D = 0.0140, S = 0.0210 k/ft, Trib= 4.0 ft
 Point: E = 3.50 k @ 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.528** : 1
 fb : Actual : 2,197.73 psi at 3.045 ft in Span # 1
 Fb : Allowable : 4,160.00 psi
 Load Comb : +1.133D+1.365E

Max fv/FvRatio = **0.407** : 1
 fv : Actual : 185.41 psi at 0.000 ft in Span # 1
 Fv : Allowable : 456.00 psi
 Load Comb : +1.133D+1.365E

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.37	0.39		0.61		2.78	
Right Support	1.37	0.39		0.61		0.72	



Max Deflections

Transient Downward	0.249 in	Total Downward	0.444 in
Ratio	699	Ratio	392
	LC: E Only		+0.750L+0.750S+0.5250E
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : BM-2

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **1.75x11.87, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 1.9 E

Fb - Tension	2600 psi	Fc - Prll	2510 psi	Fv	285 psi	Ebend- xx	1900 ksi	Density	42.01 pcf
Fb - Compr	2600 psi	Fc - Perp	750 psi	Ft	1555 psi	Eminbend - xx	965.71 ksi		

Applied Loads

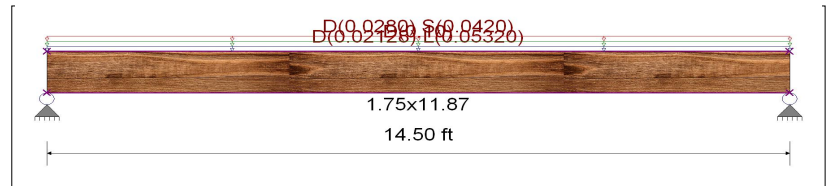
Beam self weight calculated and added to loads
 Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 1.330 ft
 Unif Load: D = 0.010 k/ft, Trib= 10.0 ft
 Unif Load: D = 0.0140, S = 0.0210 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.615** : 1
 fb : Actual : 1,599.07 psi at 7.250 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.332** : 1
 fv : Actual : 94.58 psi at 13.533 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.13	0.39		0.30			
Right Support	1.13	0.39		0.30			



Max Deflections

Transient Downward	0.115 in	Total Downward	0.489 in
Ratio	1517	Ratio	356
	LC: L Only		LC: +D+0.750L+0.750S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



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 Project Descr: **SFR Remodeling**

Multiple Simple Beam

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Wood Beam Design : BM-3

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **MicroLam LVL 1.9 E**

Fb - Tension 2,600.0 psi Fc - Prll 2,510.0 psi Fv 285.0 psi Ebend- xx 1,900.0 ksi Density 42.010 pcf
 Fb - Compr 2,600.0 psi Fc - Perp 750.0 psi Ft 1,555.0 psi Eminbend - xx 965.71 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 6.0 ft

Unif Load: D = 0.0160, L = 0.040 k/ft, 0.0 to 5.0 ft, Trib= 7.0 ft

Unif Load: L = 0.060 k/ft, 5.0 to 9.0 ft, Trib= 1.0 ft

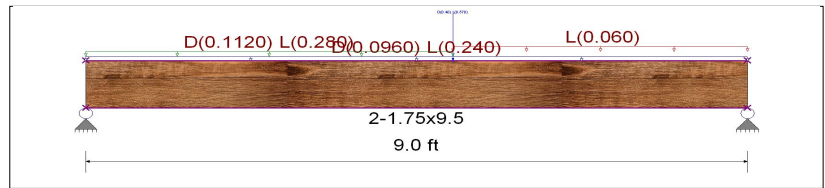
Point: D = 0.40, L = 0.570 k @ 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.710** : 1
 fb : Actual : 1,844.87 psi at 4.680 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.456** : 1
 fv : Actual : 129.94 psi at 0.000 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.06	2.40					
Right Support	0.85	1.97					



Max Deflections

Transient Downward	0.165 in	Total Downward	0.241 in
Ratio	653	Ratio	448
LC: L Only		LC: +D+L	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BM-4

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **7x16, Parallam PSL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **Parallam PSL 2.2E**

Fb - Tension 2,900.0 psi Fc - Prll 2,900.0 psi Fv 290.0 psi Ebend- xx 2,200.0 ksi Density 45.070 pcf
 Fb - Compr 2,900.0 psi Fc - Perp 625.0 psi Ft 2,025.0 psi Eminbend - xx 1,118.19 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 11.50 ft

Unif Load: D = 0.010 k/ft, Trib= 9.0 ft

Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 9.0 ft

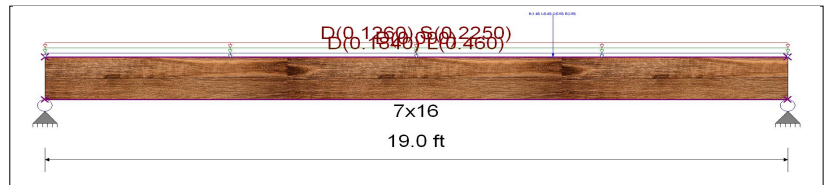
Point: D = 1.40, L = 0.40, S = 0.60, E = 2.80 k @ 13.0 ft

Design Summary

Max fb/Fb Ratio = **0.658** : 1
 fb : Actual : 1,847.00 psi at 10.133 ft in Span # 1
 Fb : Allowable : 2,808.86 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.395** : 1
 fv : Actual : 114.43 psi at 17.670 ft in Span # 1
 Fv : Allowable : 290.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	4.58	4.50		2.33		0.88	
Right Support	5.09	4.64		2.55		1.92	



Max Deflections

Transient Downward	0.273 in	Total Downward	0.673 in
Ratio	833	Ratio	338
LC: L Only		+0.750L+0.750S+0.5250E	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

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Steel Beam Design : BM-4 (WF option)

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **W10x45, Fully Braced**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

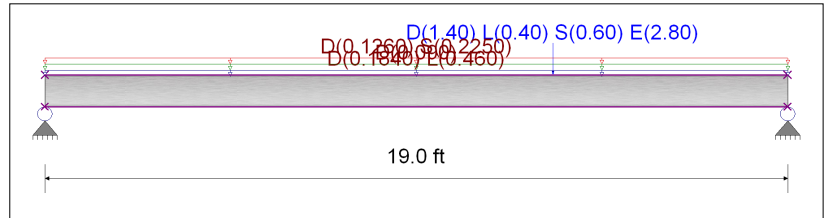
Fy = 50.0 ksi E = 29,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 11.50 ft
 Unif Load: D = 0.010 k/ft, Trib= 9.0 ft
 Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 9.0 ft
 Point: D = 1.40, L = 0.40, S = 0.60, E = 2.80 k @ 13.0 ft

Design Summary

Max fb/Fb Ratio = **0.453** : 1
 Mu : Applied 62.069 k-ft at 11.147 ft in Span # 1
 Mn / Omega : Allow 136.976 k-ft
 Load Comb : +1.10D+0.750L+0.750S+1.024E
 Max fv/FvRatio = **0.185** : 1
 Vu : Applied 13.061 k at 19.000 ft in Span # 1
 Vn / Omega : Allow 70.70 k
 Load Comb : +1.10D+0.750L+0.750S+1.024E



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	4.67	4.50		2.33		0.88
Right Support	5.19	4.64		2.55		1.92

Max Deflections	H	LC: L Only	Total
Transient Downward	0.200 in	+0.750L+0.750S+0.5250E	0.496 in
Ratio	1140		459
Transient Upward	0.000 in		0.000 in
Ratio	9999		9999
	LC:		LC:



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Wood Beam Design : BM-5

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **4x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Douglas Fir - Larch**

Wood Grade : **No.2**

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 7.0 ft
 Unif Load: D = 0.0120 k/ft, Trib= 14.0 ft
 Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.463** : 1
 fb : Actual : 499.65 psi at 2.500 ft in Span # 1
 Fb : Allowable : 1,080.00 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.297** : 1
 fv : Actual : 53.41 psi at 4.233 ft in Span # 1
 Fv : Allowable : 180.00 psi
 Load Comb : +D+L



Max Deflections

Transient Downward	0.011 in	Total Downward	0.028 in
Ratio	5598	Ratio	2158
	LC: L Only		LC: +D+0.750L+0.750S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.96	0.70		0.44			
Right Support	0.96	0.70		0.44			

Wood Beam Design : BM-6

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x11.87, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **MicroLam LVL 2.0 E**

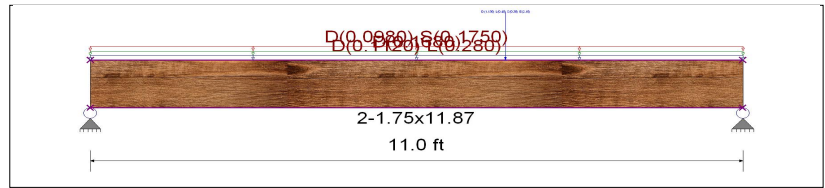
Fb - Tension	2,600.0 psi	Fc - Prll	2,510.0 psi	Fv	285.0 psi	Ebend- xx	2,000.0 ksi	Density	42.010 pcf
Fb - Compr	2,600.0 psi	Fc - Perp	750.0 psi	Ft	1,555.0 psi	Eminbend - xx	1,016.54 ksi		

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0160, L = 0.040 k/ft, Trib= 7.0 ft
 Unif Load: D = 0.0120 k/ft, Trib= 14.0 ft
 Unif Load: D = 0.0140, S = 0.0250 k/ft, Trib= 7.0 ft
 Point: D = 1.130, L = 0.40, S = 0.30, E = 2.10 k @ 7.0 ft

Design Summary

Max fb/Fb Ratio = **0.753** : 1
 fb : Actual : 1,958.67 psi at 6.343 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.509** : 1
 fv : Actual : 145.10 psi at 10.047 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L



Max Deflections

Transient Downward	0.113 in	Total Downward	0.370 in
Ratio	1171	Ratio	356
	LC: L Only		+0.750L+0.750S+0.5250E
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.56	1.69		1.07		0.76	
Right Support	2.86	1.79		1.15		1.34	

EAST WING FLOOR FRAMING P.2

BM-7 c stairs

Span = 14'
 TA = 2' 0" - 7'
 4' 7" - 14' + railing

DL = 90 / 160
 LL = 130 / 210 PIR
3 1/2 x 9 1/2" LVL

R₁ = 750 lb
 1050 lb
 R₂ = 1000 lb
 1330 lb

BM-8

Span = 10'
 TA = 2' F + railing 5' - 10'

DL = 70 + 20
 LL = 80 + 50

+ P₁ c 5' = 1000 lb
 B-7 1330 lb
 + P₂ c 6' = 420 lb
 B-9 480 lb

R₁ = 1,040 lb
 1,320 lb
 R₂ = 1,180 lb
 1,540 lb
5 1/4 x 9 1/2" LVL

B-9

Span = 6'
 TA = 7' F
 DL = 140
 LL = 160

R₁ = R₂ = 420 lb
 480 lb

3 1/2 x 9 1/2" LVL

B-10 Handic. Vestibule

Span = 5'
 TA = 2' 0" - 3'
 6' 8" - 5'

DL = 70 / 210
 LL = 80 / 240
 P₁ c 3' = 890 lb
 960 lb
 3 1/2 x 9 1/2" LVL
 OR

R₁ = 600 lb
 650 lb
 R₂ = 930 lb
 1030 lb

BM-11 w/ PL FROM ABOVE
 Next to closed

Span = 8'

TA = 6' + 2' 4" - 8'
 DL = 210 + 70
 LL = 240 + 80
 P₁ c 3' = 380 lb
 (ENTRY 13M) 240 lb
 140 lb

LVL 5 1/4 x 9 1/2"
 P₂ c 4' = 420 lb
 480 lb

R₁ = 1440 lb
 1430 lb
 20 lb
 R₂ = 1440 lb
 1530 lb
 50 lb

BM-12 e doorway (D3C)

Span = 8', TA = 12' F + 2' w/w

DL = 330
 LL = 480

LVL 3 1/2 x 11 3/8

R₁ = R₂ = 2100 lb
 1920 lb



Main Floor BMS - E. Wing P.2

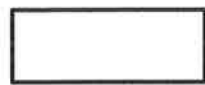
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DATE



SHEET

EAST WING P.3

B-13C Exercise RM

SPAN = 21'

TA = 6' F + 6' terrace 0.19'

6' R + 6' BTW + 9' WW 14' = 19'

2' F + 6' BTW 19' - 2'

W 14 x 68

OR W 16 x 50

DL = 237 / 1336 / 156

P₁ = 4' = 520#

500#S
4500#S7

LL = 620 / 500 / 320

SL = 150 / 0 / 0

P₂ = 14' = 2930#
3720#S

R₁ = 4.72#
6.59#L
3.04#S
3.64#E

R₂ = 4.95#
5.93#L
3.3#S
0.9#E

B14 - cant patio part support

SPAN = 12' + 2' cant

TA = 2' patio

DL = 45

PL = 14' = 1020#

LL = 120

1470#S

SL = 50

6x10

R₁ = 140#
200#L
-220#S

R₂ = 1720#
780#L
1760#S

B15 @ Private Terrace Edge

SPAN = 10'

TA = 8' terrace

DL = 160

+ PL = 10' = 1720#

LL = 480

.98#L

SL = 200

1.76#S

GL 5 1/2 x 13 1/2

R₁ = 1820#
3840#L
210#S

R₂ = 2020#
3840#L
1080#S



MAIN FLOOR - EAST WING Bmw P.3

SHEET TITLE

SCALE

DATE

Lorenzini Water JT

MS

PROJECT

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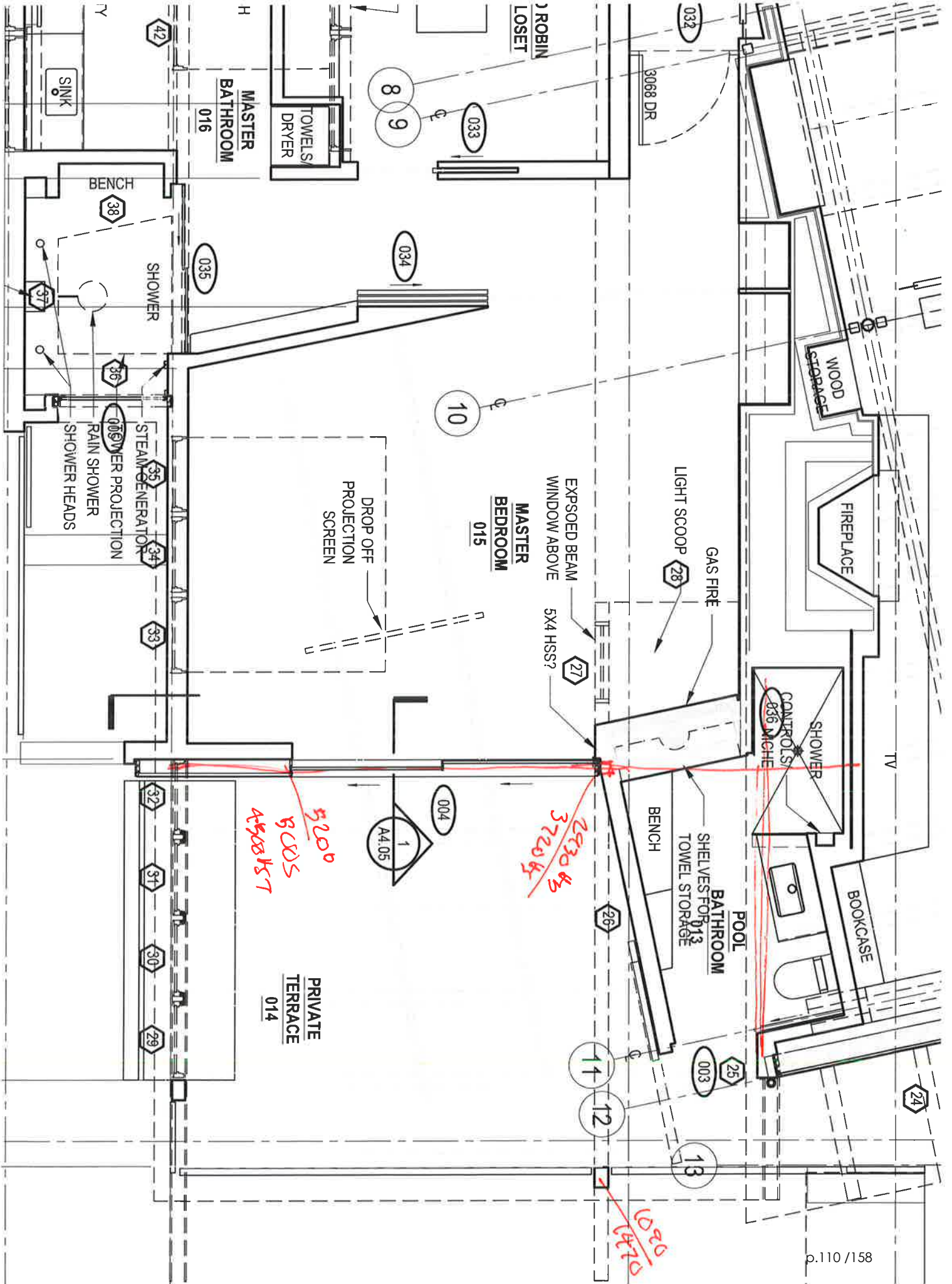
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Project Title: Lorenzini Waterfront Home
 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

File: Lorenzini Residence.ec6
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Description : Main Floor - East Wing Beams p.2

Wood Beam Design : BM-7 at Stairs

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 2.0 E

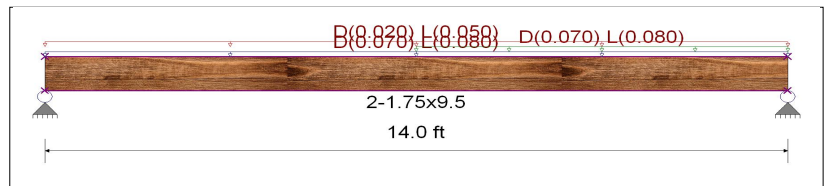
Fb - Tension	2600 psi	Fc - Prll	2510 psi	Fv	285 psi	Ebend- xx	2000 ksi	Density	42.01 pcf
Fb - Compr	2600 psi	Fc - Perp	750 psi	Ft	1555 psi	Eminbend - xx	1016.535 ksi		

Applied Loads

Unif Load: D = 0.0350, L = 0.040 k/ft, Trib= 2.0 ft
 Unif Load: D = 0.0350, L = 0.040 k/ft, 7.0 to 14.0 ft, Trib= 2.0 ft
 Unif Load: D = 0.020, L = 0.050 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.642** : 1
 fb : Actual : 1,668.64 psi at 7.700 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.325** : 1
 fv : Actual : 92.54 psi at 13.253 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.75	1.05				
Right Support	1.00	1.33				

Max Deflections			
Transient Downward	0.295 in	Total Downward	0.513 in
Ratio	568	Ratio	327
LC: L Only		LC: +D+L	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BM-8

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **3-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 2.0 E

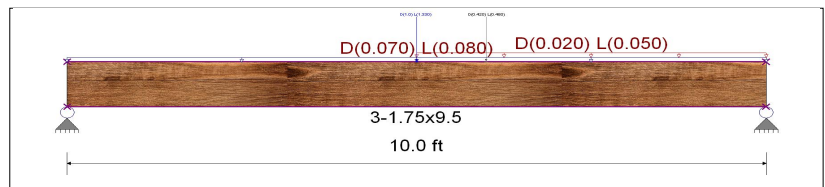
Fb - Tension	2600 psi	Fc - Prll	2510 psi	Fv	285 psi	Ebend- xx	2000 ksi	Density	42.01 pcf
Fb - Compr	2600 psi	Fc - Perp	750 psi	Ft	1555 psi	Eminbend - xx	1016.535 ksi		

Applied Loads

Unif Load: D = 0.0350, L = 0.040 k/ft, Trib= 2.0 ft
 Unif Load: D = 0.020, L = 0.050 k/ft, 5.0 to 10.0 ft, Trib= 1.0 ft
 Point: D = 1.0, L = 1.330 k @ 5.0 ft
 Point: D = 0.420, L = 0.480 k @ 6.0 ft

Design Summary

Max fb/Fb Ratio = **0.581** : 1
 fb : Actual : 1,510.09 psi at 5.000 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.269** : 1
 fv : Actual : 76.66 psi at 9.233 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	1.04	1.32				
Right Support	1.18	1.54				

Max Deflections			
Transient Downward	0.118 in	Total Downward	0.209 in
Ratio	1019	Ratio	573
LC: L Only		LC: +D+L	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



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Wood Beam Design : BM-9

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 2.0 E

Fb - Tension	2600 psi	Fc - Prll	2510 psi	Fv	285 psi	Ebend- xx	2000 ksi	Density	42.01 pcf
Fb - Compr	2600 psi	Fc - Perp	750 psi	Ft	1555 psi	Eminbend - xx	1016.535 ksi		

Applied Loads

Beam self weight calculated and added to loads

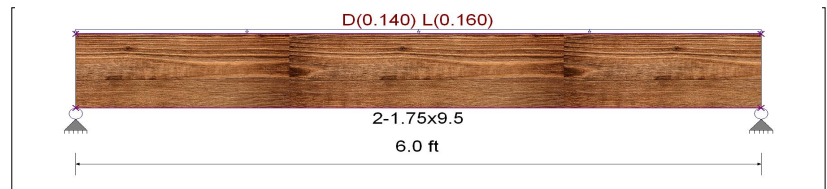
Unif Load: D = 0.0350, L = 0.040 k/ft, Trib= 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.122** : 1
 fb : Actual : 317.67 psi at 3.000 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.109** : 1
 fv : Actual : 31.02 psi at 5.220 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.45	0.48					
Right Support	0.45	0.48					



Max Deflections

Transient Downward	0.009 in	Total Downward	0.018 in
Ratio	7677	Ratio	3966
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : BM-10

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Trus Joist

Wood Grade : MicroLam LVL 2.0 E

Fb - Tension	2600 psi	Fc - Prll	2510 psi	Fv	285 psi	Ebend- xx	2000 ksi	Density	42.01 pcf
Fb - Compr	2600 psi	Fc - Perp	750 psi	Ft	1555 psi	Eminbend - xx	1016.535 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0350, L = 0.040 k/ft, 0.0 ft to 3.0 ft, Trib= 2.0 ft

Unif Load: D = 0.0350, L = 0.040 k/ft, 3.0 to 5.0 ft, Trib= 6.0 ft

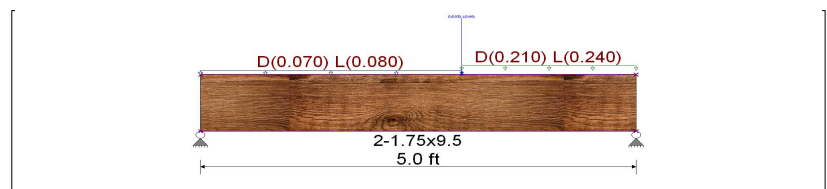
Point: D = 0.850, L = 0.960 k @ 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.264** : 1
 fb : Actual : 686.35 psi at 3.000 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.254** : 1
 fv : Actual : 72.41 psi at 4.217 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.60	0.65					
Right Support	0.93	1.03					



Max Deflections

Transient Downward	0.012 in	Total Downward	0.023 in
Ratio	4979	Ratio	2614
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



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Multiple Simple Beam

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Wood Beam Design : BM-11 under closet

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x9.5, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **MicroLam LVL 2.0 E**

Fb - Tension 2600 psi Fc - Prll 2510 psi Fv 285 psi Ebend- xx 2000 ksi Density 42.01 pcf
 Fb - Compr 2600 psi Fc - Perp 750 psi Ft 1555 psi Eminbend - xx 1016.535 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0350, L = 0.040 k/ft, Trib= 6.0 ft

Unif Load: D = 0.0350, L = 0.040 k/ft, 4.0 to 8.0 ft, Trib= 2.0 ft

Point: D = 0.380, L = 0.240, S = 0.140 k @ 3.0 ft

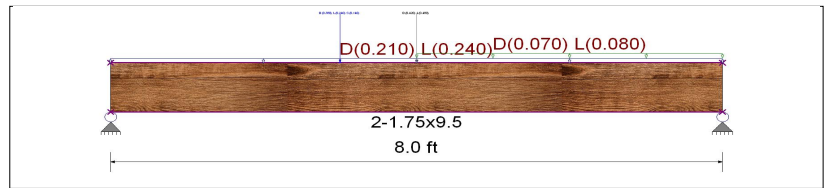
Point: D = 0.420, L = 0.480 k @ 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.614** : 1
 fb : Actual : 1,597.30 psi at 4.000 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.396** : 1
 fv : Actual : 112.77 psi at 7.227 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.40	1.43		0.09			
Right Support	1.44	1.53		0.05			



Max Deflections

Transient Downward	0.078 in	Total Downward	0.153 in
Ratio	1234	Ratio	625
LC: L Only		LC: +D+L	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BM-12

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2-1.75x11.87, Microllam LVL, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Trus Joist**

Wood Grade : **MicroLam LVL 2.0 E**

Fb - Tension 2600 psi Fc - Prll 2510 psi Fv 285 psi Ebend- xx 2000 ksi Density 42.01 pcf
 Fb - Compr 2600 psi Fc - Perp 750 psi Ft 1555 psi Eminbend - xx 1016.535 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0350, L = 0.040 k/ft, Trib= 12.0 ft

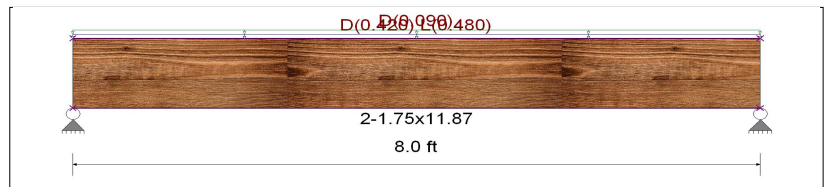
Unif Load: D = 0.010 k/ft, Trib= 9.0 ft

Design Summary

Max fb/Fb Ratio = **0.450** : 1
 fb : Actual : 1,169.52 psi at 4.000 ft in Span # 1
 Fb : Allowable : 2,600.00 psi
 Load Comb : +D+L

Max fv/FvRatio = **0.382** : 1
 fv : Actual : 108.98 psi at 0.000 ft in Span # 1
 Fv : Allowable : 285.00 psi
 Load Comb : +D+L

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.09	1.92					
Right Support	2.09	1.92					



Max Deflections

Transient Downward	0.046 in	Total Downward	0.095 in
Ratio	2108	Ratio	1009
LC: L Only		LC: +D+L	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



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 Engineer: Mark Speidel
 Project ID:
 Project Descr: SFR Remodeling

Multiple Simple Beam

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Steel Beam Design : BM-13 over exercise RM

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **W16x50, Fully Braced**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

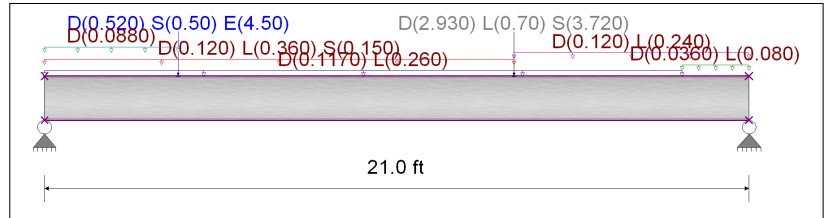
Fy = 50.0 ksi E = 29,000.0 ksi

Applied Loads

- Beam self weight calculated and added to loads
- Unif Load: D = 0.0180, L = 0.040 k/ft, 0.0 ft to 19.0 ft, Trib= 6.50 ft
- Unif Load: D = 0.0180, L = 0.040 k/ft, 19.0 to 21.0 ft, Trib= 2.0 ft
- Unif Load: D = 0.020, L = 0.060, S = 0.0250 k/ft, 0.0 to 14.0 ft, Trib= 6.0 ft
- Unif Load: D = 0.020, L = 0.040 k/ft, 14.0 to 21.0 ft, Trib= 6.0 ft
- Point: D = 0.520, S = 0.50, E = 4.50 k @ 4.0 ft
- Point: D = 2.930, L = 0.70, S = 3.720 k @ 14.0 ft
- Unif Load: D = 0.0880 k/ft, 0.0 to 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.353** : 1
 Mu : Applied 81.083 k-ft at 11.410 ft in Span # 1
 Mn / Omega : Allow 229.541 k-ft
 Load Comb : +1.092D+0.750L+0.750S+1.024E
 Max fv/FvRatio = **0.130** : 1
 Vu : Applied 16.111 k at 0.000 ft in Span # 1
 Vn / Omega : Allow 123.880 k
 Load Comb : +1.092D+0.750L+0.750S+1.024E



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	4.72	6.59		3.04		3.64
Right Support	4.95	5.93		3.28		0.86

H	Max Deflections		
	Transient Downward	0.145 in	Total Downward 0.313 in
	Ratio	1732	806
		LC: L Only	+0.750L+0.750S+0.5250E
	Transient Upward	0.000 in	Total Upward 0.000 in
	Ratio	9999	9999
		LC:	LC:



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Multiple Simple Beam

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Wood Beam Design : BM-14 cant patio support

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **6x10, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **Douglas Fir - Larch**

Wood Grade : **No.2**

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

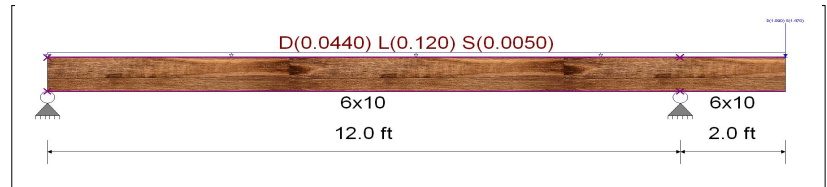
Beam self weight calculated and added to loads

Unif Load: D = 0.0220, L = 0.060, S = 0.00250 k/ft, Trib = 2.0 ft

Point: D = 1.090, S = 1.470 k @ 14.0 ft

Design Summary

Max fb/Fb Ratio = **0.734** : 1
 fb : Actual : 760.13 psi at 12.000 ft in Span # 1
 Fb : Allowable : 1,035.00 psi
 Load Comb : +D+S
 Max fv/FvRatio = **0.365** : 1
 fv : Actual : 75.59 psi at 12.000 ft in Span # 1
 Fv : Allowable : 207.00 psi
 Load Comb : +D+S



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.14	0.70		-0.22		
Right Support	1.72	0.98		1.76		

Max Deflections

Transient Downward	0.084 in	Total Downward	0.110 in
Ratio	650	Ratio	434
	LC: S Only		LC: +D+S
Transient Upward	-0.072 in	Total Upward	-0.091 in
Ratio	1154	Ratio	1586
	LC: L Only		LC: +D+S

Wood Beam Design : BM-15 at Terrace Edge

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **5.5x13.5, GLB, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : **DF/DF**

Wood Grade : **24F - V4**

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.020, L = 0.060, S = 0.00250 k/ft, Trib = 8.0 ft

Point: D = 1.090, S = 1.470 k @ 10.0 ft

Design Summary

Max fb/Fb Ratio = **0.730** : 1
 fb : Actual : 1,752.08 psi at 8.640 ft in Span # 1
 Fb : Allowable : 2,400.00 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.396** : 1
 fv : Actual : 104.95 psi at 14.880 ft in Span # 1
 Fv : Allowable : 265.00 psi
 Load Comb : +D+L



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	1.82	3.84		0.71		
Right Support	2.09	3.84		1.08		

Max Deflections

Transient Downward	0.351 in	Total Downward	0.552 in
Ratio	547	Ratio	347
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:



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 Project Descr: **SFR Remodeling**

Steel Column

File: Lorenzini Residence.ec6
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DESCRIPTION: **Steel Column supporting Roof BM-1**

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-10

General Information

Steel Section Name :	HSS 4x0.250	Overall Column Height	15 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	42.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 12 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 12 ft, K = 1.0	

Applied Loads

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

Column self weight included : 150.0 lbs * Dead Load Factor
 AXIAL LOADS . . .
 Reaction from BM-1: Axial Load at 15.0 ft, D = 14.80, L = 4.20, S = 11.90 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =	0.7978 : 1	Maximum Load Reactions . . .	
Load Combination	+D+0.750L+0.750S	Top along X-X	0.0 k
Location of max.above base	0.0 ft	Bottom along X-X	0.0 k
At maximum location values are . . .		Top along Y-Y	0.0 k
Pa : Axial	27.025 k	Bottom along Y-Y	0.0 k
Pn / Omega : Allowable	33.876 k	Maximum Load Deflections . . .	
Ma-x : Applied	0.0 k-ft	Along Y-Y	0.0 in at 0.0 ft above base
Mn-x / Omega : Allowable	6.937 k-ft	for load combination :	
Ma-y : Applied	0.0 k-ft	Along X-X	0.0 in at 0.0 ft above base
Mn-y / Omega : Allowable	6.937 k-ft	for load combination :	
PASS Maximum Shear Stress Ratio =	0.0 : 1		
Load Combination	0.0		
Location of max.above base	0.0 ft		
At maximum location values are . . .			
Va : Applied	0.0 k		
Vn / Omega : Allowable	0.0 k		

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location					Stress Ratio	Status	Location
D Only	0.441	PASS	0.00 ft	1.00	1.00	108.27	108.27	0.000	PASS	0.00 ft
+D+L	0.565	PASS	0.00 ft	1.00	1.00	108.27	108.27	0.000	PASS	0.00 ft
+D+S	0.793	PASS	0.00 ft	1.00	1.00	108.27	108.27	0.000	PASS	0.00 ft
+D+0.750L	0.534	PASS	0.00 ft	1.00	1.00	108.27	108.27	0.000	PASS	0.00 ft
+D+0.750L+0.750S	0.798	PASS	0.00 ft	1.00	1.00	108.27	108.27	0.000	PASS	0.00 ft
+0.60D	0.265	PASS	0.00 ft	1.00	1.00	108.27	108.27	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	14.950									
+D+L	19.150									
+D+S	26.850									
+D+0.750L	18.100									
+D+0.750L+0.750S	27.025									
+0.60D	8.970									
L Only	4.200									
S Only	11.900									



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 Project Descr: **SFR Remodeling**

Steel Column

File: Lorenzini Residence.ec6
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DESCRIPTION: **Steel Column supporting Roof BM-1**

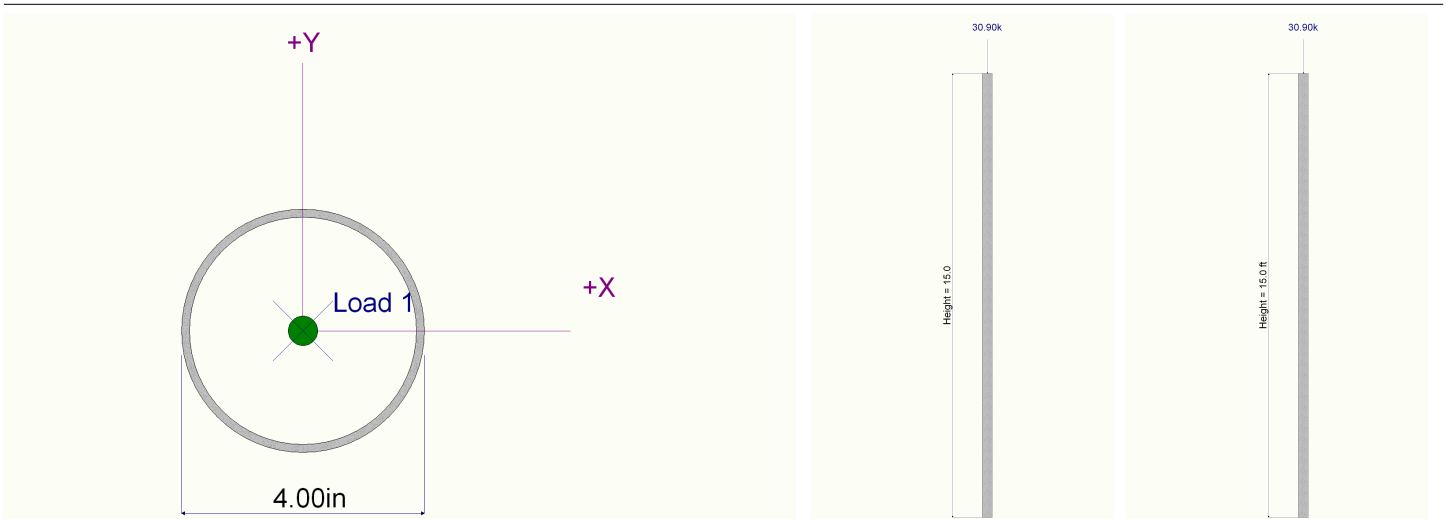
Extreme Reactions

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		27.025										
"	Minimum		4.200										
Reaction, X-X Axis Base	Maximum		14.950										
"	Minimum		14.950										
Reaction, Y-Y Axis Base	Maximum		14.950										
"	Minimum		14.950										
Reaction, X-X Axis Top	Maximum		14.950										
"	Minimum		14.950										
Reaction, Y-Y Axis Top	Maximum		14.950										
"	Minimum		14.950										
Moment, X-X Axis Base	Maximum		14.950										
"	Minimum		14.950										
Moment, Y-Y Axis Base	Maximum		14.950										
"	Minimum		14.950										
Moment, X-X Axis Top	Maximum		14.950										
"	Minimum		14.950										
Moment, Y-Y Axis Top	Maximum		14.950										
"	Minimum		14.950										

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

Sketches





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Steel Column

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Lic. #: KW-06008133

DESCRIPTION: **Steel Column supporting Roof BM-2**

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-10

General Information

Steel Section Name :	HSS 3.500x0.203	Overall Column Height	12 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	42.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 12 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 12 ft, K = 1.0	

Applied Loads

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

Column self weight included : 85.858 lbs * Dead Load Factor

AXIAL LOADS . . .

Reaction from BM-1: Axial Load at 12.0 ft, Xecc = 0.250 in, Yecc = 0.250 in, D = 5.370, L = 1.630, S = 4.630 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =	0.6031 : 1	Maximum Load Reactions . . .	
Load Combination	+D+0.750L+0.750S	Top along X-X	0.01747 k
Location of max.above base	11.919 ft	Bottom along X-X	0.01747 k
At maximum location values are . . .		Top along Y-Y	0.01747 k
Pa : Axial	10.151 k	Bottom along Y-Y	0.01747 k
Pn / Omega : Allowable	19.607 k	Maximum Load Deflections . . .	
Ma-x : Applied	-0.2083 k-ft	Along Y-Y	-0.04312 in at 7.007 ft above base
Mn-x / Omega : Allowable	4.338 k-ft	for load combination : +D+0.750L+0.750S	
Ma-y : Applied	-0.2083 k-ft	Along X-X	-0.04312 in at 7.007 ft above base
Mn-y / Omega : Allowable	4.338 k-ft	for load combination : +D+0.750L+0.750S	
PASS Maximum Shear Stress Ratio =	0.001176 : 1		
Load Combination	+D+0.750L+0.750S		
Location of max.above base	0.0 ft		
At maximum location values are . . .			
Va : Applied	0.01747 k		
Vn / Omega : Allowable	14.863 k		

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location					Stress Ratio	Status	Location
D Only	0.324	PASS	11.92 ft	1.66	1.66	123.08	123.08	0.001	PASS	0.00 ft
+D+L	0.421	PASS	11.92 ft	1.66	1.66	123.08	123.08	0.001	PASS	0.00 ft
+D+S	0.599	PASS	11.92 ft	1.66	1.66	123.08	123.08	0.001	PASS	0.00 ft
+D+0.750L	0.397	PASS	11.92 ft	1.66	1.66	123.08	123.08	0.001	PASS	0.00 ft
+D+0.750L+0.750S	0.603	PASS	11.92 ft	1.66	1.66	123.08	123.08	0.001	PASS	0.00 ft
+0.60D	0.167	PASS	0.00 ft	1.66	1.66	123.08	123.08	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction			X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	5.456	0.009	0.009	-0.009	0.009						
+D+L	7.086	0.012	0.012	-0.012	0.012						
+D+S	10.086	0.017	0.017	-0.017	0.017						
+D+0.750L	6.678	0.011	0.011	-0.011	0.011						
+D+0.750L+0.750S	10.151	0.017	0.017	-0.017	0.017						
+0.60D	3.274	0.006	0.006	-0.006	0.006						
L Only	1.630	0.003	0.003	-0.003	0.003						
S Only	4.630	0.008	0.008	-0.008	0.008						



Steel Column

Lic. # : KW-06008133

DESCRIPTION: Steel Column supporting Roof BM-2

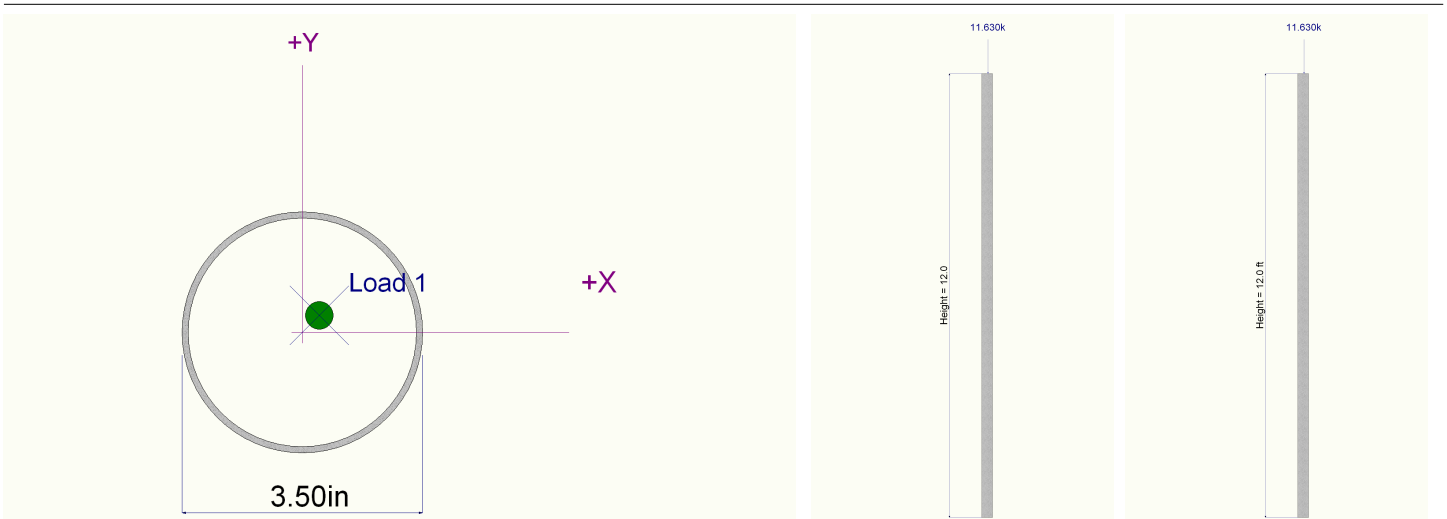
Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	10.151	0.017	0.017	-0.017	0.017							
"	Minimum	1.630	0.003	0.003	-0.003	0.003							
Reaction, X-X Axis Base	Maximum	10.151	0.017	0.017	-0.017	0.017							
"	Minimum	1.630	0.003	0.003	-0.003	0.003							
Reaction, Y-Y Axis Base	Maximum	1.630	0.003	0.003	-0.003	0.003							
"	Minimum	10.151	0.017	0.017	-0.017	0.017							
Reaction, X-X Axis Top	Maximum	10.151	0.017	0.017	-0.017	0.017							
"	Minimum	1.630	0.003	0.003	-0.003	0.003							
Reaction, Y-Y Axis Top	Maximum	10.151	0.017	0.017	-0.017	0.017							
"	Minimum	1.630	0.003	0.003	-0.003	0.003							
Moment, X-X Axis Base	Maximum	5.456		0.009	-0.009	0.009							
"	Minimum	5.456		0.009	-0.009	0.009							
Moment, Y-Y Axis Base	Maximum	5.456	0.009	0.009	-0.009	0.009							
"	Minimum	5.456	0.009	0.009	-0.009	0.009							
Moment, X-X Axis Top	Maximum	5.456	0.009	0.009	-0.009	0.009							
"	Minimum	5.456	0.009	0.009	-0.009	0.009							
Moment, Y-Y Axis Top	Maximum	5.456	0.009	0.009	-0.009	0.009							
"	Minimum	5.456	0.009	0.009	-0.009	0.009							

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	-0.0230 in	7.007 ft	-0.023 in	7.007 ft
+D+L	-0.0300 in	7.007 ft	-0.030 in	7.007 ft
+D+S	-0.0428 in	7.007 ft	-0.043 in	7.007 ft
+D+0.750L	-0.0282 in	7.007 ft	-0.028 in	7.007 ft
+D+0.750L+0.750S	-0.0431 in	7.007 ft	-0.043 in	7.007 ft
+0.60D	-0.0138 in	7.007 ft	-0.014 in	7.007 ft
L Only	-0.0070 in	7.007 ft	-0.007 in	7.007 ft
S Only	-0.0198 in	7.007 ft	-0.020 in	7.007 ft

Sketches





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 Engineer: Mark Speidel
 Project ID:
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Multiple Simple Beam

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Lic. #: KW-06002858

Description : Main Floor - East Wing bathroom deck

Wood Beam Design : Joists

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

BEAM Size : **2x8, Sawn, Fully Braced**

Using Allowable Stress Design with ASCE 7-10 Load Combinations, Major Axis Bending

Wood Species : Hem Fir

Wood Grade : No.2

Fb - Tension	850 psi	Fc - Prll	1300 psi	Fv	150 psi	Ebend- xx	1300 ksi	Density	26.84 pcf
Fb - Compr	850 psi	Fc - Perp	405 psi	Ft	525 psi	Eminbend - xx	470 ksi		

Applied Loads

Unif Load: D = 0.020, L = 0.060, S = 0.0250 k/ft, Trib= 1.330 ft

Design Summary

Max fb/Fb Ratio = **0.466** : 1
 fb : Actual : 437.24 psi at 3.000 ft in Span # 1
 Fb : Allowable : 938.40 psi
 Load Comb : +D+L
 Max fv/FvRatio = **0.294** : 1
 fv : Actual : 35.22 psi at 5.400 ft in Span # 1
 Fv : Allowable : 120.00 psi
 Load Comb : +D+L



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.08	0.24		0.10		
Right Support	0.08	0.24		0.10		

Max Deflections

Transient Downward	0.038 in	Total Downward	0.053 in
Ratio	1905	Ratio	1365
	LC: L Only	LC: +D+0.750L+0.750S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:	LC:	

Steel Beam Design : Edge Beam - Channel

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **C8x11.5, Fully Braced**

Using Allowable Strength Design with ASCE 7-10 Load Combinations, Major Axis Bending

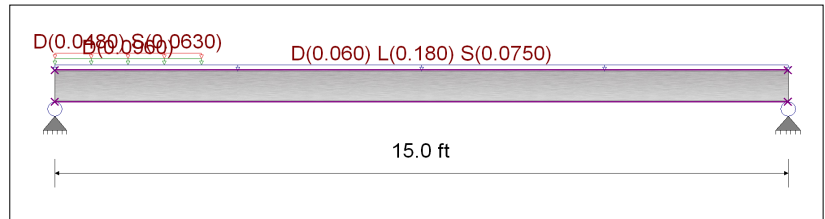
Fy = 36.0 ksi E = 29,000.0 ksi

Applied Loads

Unif Load: D = 0.020, L = 0.060, S = 0.0250 k/ft, Trib= 3.0 ft
 Unif Load: D = 0.0120 k/ft, 0.0 to 3.0 ft, Trib= 8.0 ft
 Unif Load: D = 0.0160, S = 0.0210 k/ft, 0.0 to 3.0 ft, Trib= 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.434** : 1
 Mu : Applied 7.503 k-ft at 7.250 ft in Span # 1
 Mn / Omega : Allow 17.299 k-ft
 Load Comb : +D+0.750L+0.750S
 Max fv/FvRatio = **0.105** : 1
 Vu : Applied 2.401 k at 0.000 ft in Span # 1
 Vn / Omega : Allow 22.764 k
 Load Comb : +D+0.750L+0.750S



Max Reactions (k)	D	L	Lr	S	W	E
Left Support	0.84	1.35		0.73		
Right Support	0.49	1.35		0.58		

Max Deflections

Transient Downward	0.219 in	Total Downward	0.327 in
Ratio	823	Ratio	550
	LC: L Only	LC: +D+0.750L+0.750S	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:	LC:	



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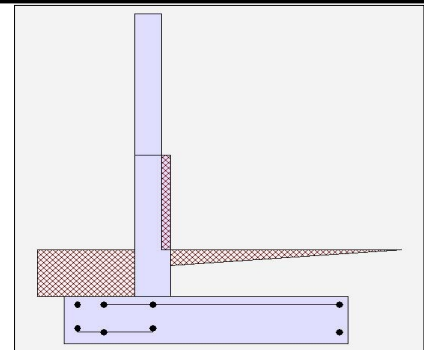
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	1.00 ft
Wall height above soil	=	5.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	12.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	3,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	312.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	32.0 psf
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	405.0 #/ft
...Height to Top	=	3.50 ft
...Height to Bottom	=	1.50 ft
Load Type	=	Earth (H) (Service Level)
Wind on Exposed Stem	=	0.0 psf (Service Level)

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type	=	Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	50.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	2.68 OK
Sliding	=	1.54 OK
Total Bearing Load	=	2,874 lbs
...resultant ecc.	=	10.05 in
Soil Pressure @ Toe	=	1,047 psf OK
Soil Pressure @ Heel	=	31 psf OK
Allowable	=	3,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,441 psf
ACI Factored @ Heel	=	43 psf
Footing Shear @ Toe	=	4.9 psi OK
Footing Shear @ Heel	=	9.7 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	1,078.5 lbs
less 100% Passive Force	= -	531.0 lbs
less 100% Friction Force	= -	1,129.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 3.00	Stem OK 0.00
Wall Material Above "Ht"	= Concrete	Concrete
Design Method	= LRFD	LRFD
Thickness	= 6.00	8.00
Rebar Size	= # 4	# 5
Rebar Spacing	= 12.00	12.00
Rebar Placed at	= Center	Center
Design Data		
fb/FB + fa/Fa	= 0.032	0.656
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	324.0 1,482.8
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	81.0 3,328.8
Moment....Allowable	ft-# =	2,487.6 5,069.7
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	9.0 30.9
Shear.....Allowable	psi =	75.0 75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	3.00 4.00

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	75.0 100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0 2,500.0
Fy	psi =	60,000.0 60,000.0

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000



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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0067 in2/ft		
(4/3) * As :	0.009 in2/ft	Min Stem T&S Reinf Area 0.432 in2	
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in2/ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1296 in2/ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.2 in2/ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.4064 in2/ft	#6@ 36.67 in	#6@ 73.33 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2009 in2/ft		
(4/3) * As :	0.2679 in2/ft	Min Stem T&S Reinf Area 0.576 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.2009 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.31 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.5419 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Dimensions & Strengths

Toe Width	=	1.33 ft
Heel Width	=	4.00
Total Footing Width	=	5.33
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,441	43 psf
Mu' : Upward	=	1,171	1,856 ft-#
Mu' : Downward	=	321	4,507 ft-#
Mu: Design	=	850	2,650 ft-#
Actual 1-Way Shear	=	4.93	9.69 psi
Allow 1-Way Shear	=	40.00	75.00 psi
Toe Reinforcing	=	# 7 @ 17.99 in	
Heel Reinforcing	=	# 6 @ 15.99 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	1.38	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in



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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
Heel Active Pressure =	70.0	0.67	46.7	Soil Over Heel =	366.7	3.66	1,343.2
Surcharge over Heel =	198.5	1.00	198.5	Sloped Soil Over Heel =			
Surcharge Over Toe =				Surcharge Over Heel =	1,040.0	3.66	3,809.9
Adjacent Footing Load =				Adjacent Footing Load =			
Added Lateral Load =	810.0	3.50	2,835.0	Axial Dead Load on Stem =	50.0	1.66	83.2
Load @ Stem Above Soil =				* Axial Live Load on Stem =	50.0	1.66	83.2
				Soil Over Toe =		0.67	
				Surcharge Over Toe =	42.6	0.67	28.3
Total	1,078.5	O.T.M.	3,080.2	Stem Weight(s) =	525.0	1.63	854.5
				Earth @ Stem Transitions =			
				Footing Weight =	799.5	2.67	2,130.7
Resisting/Overturning Ratio		=	2.68	Key Weight =		2.50	
Vertical Loads used for Soil Pressure =		2,873.7 lbs		Vert. Component =			
				Total =	2,823.7 lbs	R.M.=	8,249.7

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.033 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.



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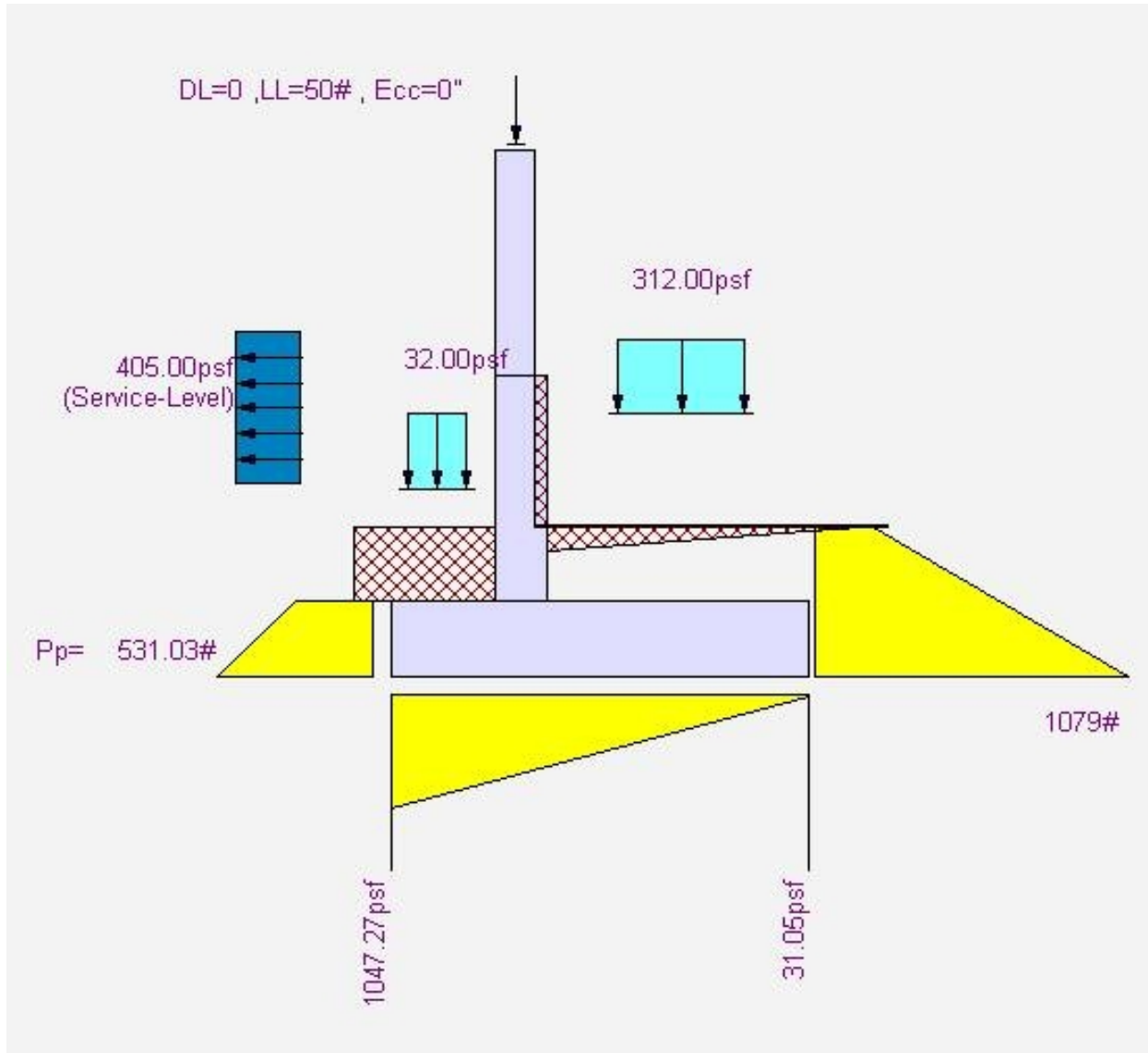
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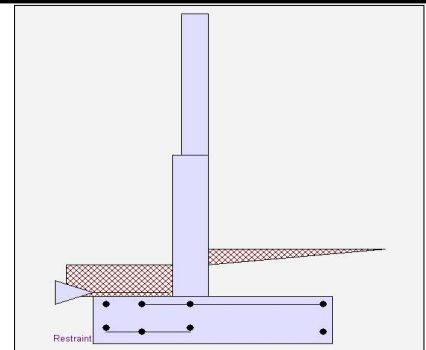
Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	1.00 ft
Wall height above soil	=	5.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	3,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	325.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	50.0 psf
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	315.0 #/ft
...Height to Top	=	3.50 ft
...Height to Bottom	=	1.50 ft
Load Type	=	Earth (H) (Service Level)
Wind on Exposed Stem	=	0.0 psf (Service Level)

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	50.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	2.49 OK
Slab Resists All Sliding !		
Total Bearing Load	=	2,500 lbs
...resultant ecc.	=	9.01 in
Soil Pressure @ Toe	=	1,112 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	3,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,526 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	6.7 psi OK
Footing Shear @ Heel	=	8.5 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	906.8 lbs
-----------------------	---	-----------

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 3.00	Stem OK 0.00
Wall Material Above "Ht"	= Concrete	Concrete
Design Method	= LRFD	LRFD
Thickness	= 6.00	8.00
Rebar Size	= # 4	# 5
Rebar Spacing	= 12.00	12.00
Rebar Placed at	= Center	Center
Design Data		
fb/FB + fa/Fa	= 0.024	0.514
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs = 252.0	1,201.5
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# = 63.0	2,612.1
Moment....Allowable	ft-# = 2,487.6	5,069.7
Shear.....Actual		
Service Level	psi =	
Strength Level	psi = 7.0	25.0
Shear.....Allowable	psi = 75.0	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in = 3.00	4.00

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf = 75.0	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	= Medium Weight	
Masonry Design Method	= ASD	

Concrete Data

f'c	psi = 2,500.0	2,500.0
Fy	psi = 60,000.0	60,000.0



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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0052 in ² /ft	
(4/3) * As :	0.007 in ² /ft	Min Stem T&S Reinf Area 0.432 in ²
200bd/fy : 200(12)(3)/60000 :	0.12 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in ² /ft
0.0018bh : 0.0018(12)(6) :	0.1296 in ² /ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1296 in ² /ft	#4@ 16.67 in #4@ 33.33 in
Provided Area :	0.2 in ² /ft	#5@ 25.83 in #5@ 51.67 in
Maximum Area :	0.4064 in ² /ft	#6@ 36.67 in #6@ 73.33 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1577 in ² /ft	
(4/3) * As :	0.2102 in ² /ft	Min Stem T&S Reinf Area 0.576 in ²
200bd/fy : 200(12)(4)/60000 :	0.16 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.16 in ² /ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.31 in ² /ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.5419 in ² /ft	#6@ 27.50 in #6@ 55.00 in

Footing Dimensions & Strengths

Toe Width	=	1.50 ft
Heel Width	=	3.00
Total Footing Width	=	4.50
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,526	0 psf
Mu' : Upward	= 1,526	715 ft-#
Mu' : Downward	= 392	2,265 ft-#
Mu: Design	= 1,134	1,550 ft-#
Actual 1-Way Shear	= 6.69	8.50 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= # 7 @ 17.99 in	
Heel Reinforcing	= # 6 @ 15.99 in	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
 Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
 Key: No key defined

Min footing T&S reinf Area	1.17	in ²
Min footing T&S reinf Area per foot	0.26	in ² /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in



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Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....			=RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	70.0	0.67	46.7	Soil Over Heel	256.7	3.33	855.6
Surcharge over Heel	206.8	1.00	206.8	Sloped Soil Over Heel			
Surcharge Over Toe				Surcharge Over Heel	758.3	3.33	2,527.8
Adjacent Footing Load				Adjacent Footing Load			
Added Lateral Load	630.0	3.50	2,205.0	Axial Dead Load on Stem	50.0	1.83	91.7
Load @ Stem Above Soil				* Axial Live Load on Stem	50.0	1.83	91.7
				Soil Over Toe	110.0	0.75	82.5
				Surcharge Over Toe	75.0	0.75	56.3
Total	906.8	O.T.M.	2,458.5	Stem Weight(s)	525.0	1.87	981.3
				Earth @ Stem Transitions			
				Footing Weight	675.0	2.25	1,518.8
Resisting/Overturning Ratio			= 2.49	Key Weight		2.50	
Vertical Loads used for Soil Pressure =		2,500.0 lbs		Vert. Component			
				Total =	2,450.0 lbs	R.M.=	6,113.8

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.041 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.



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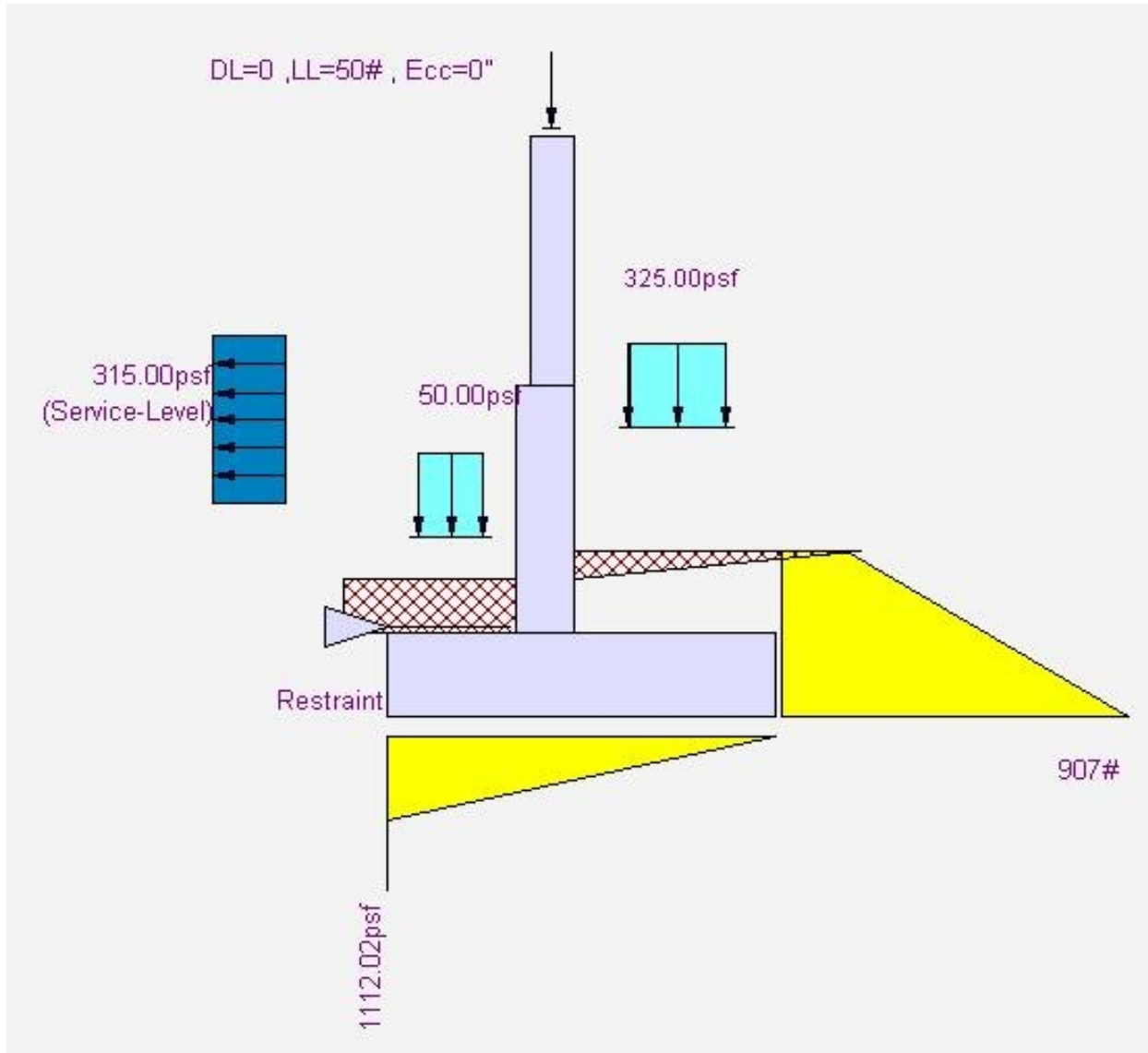
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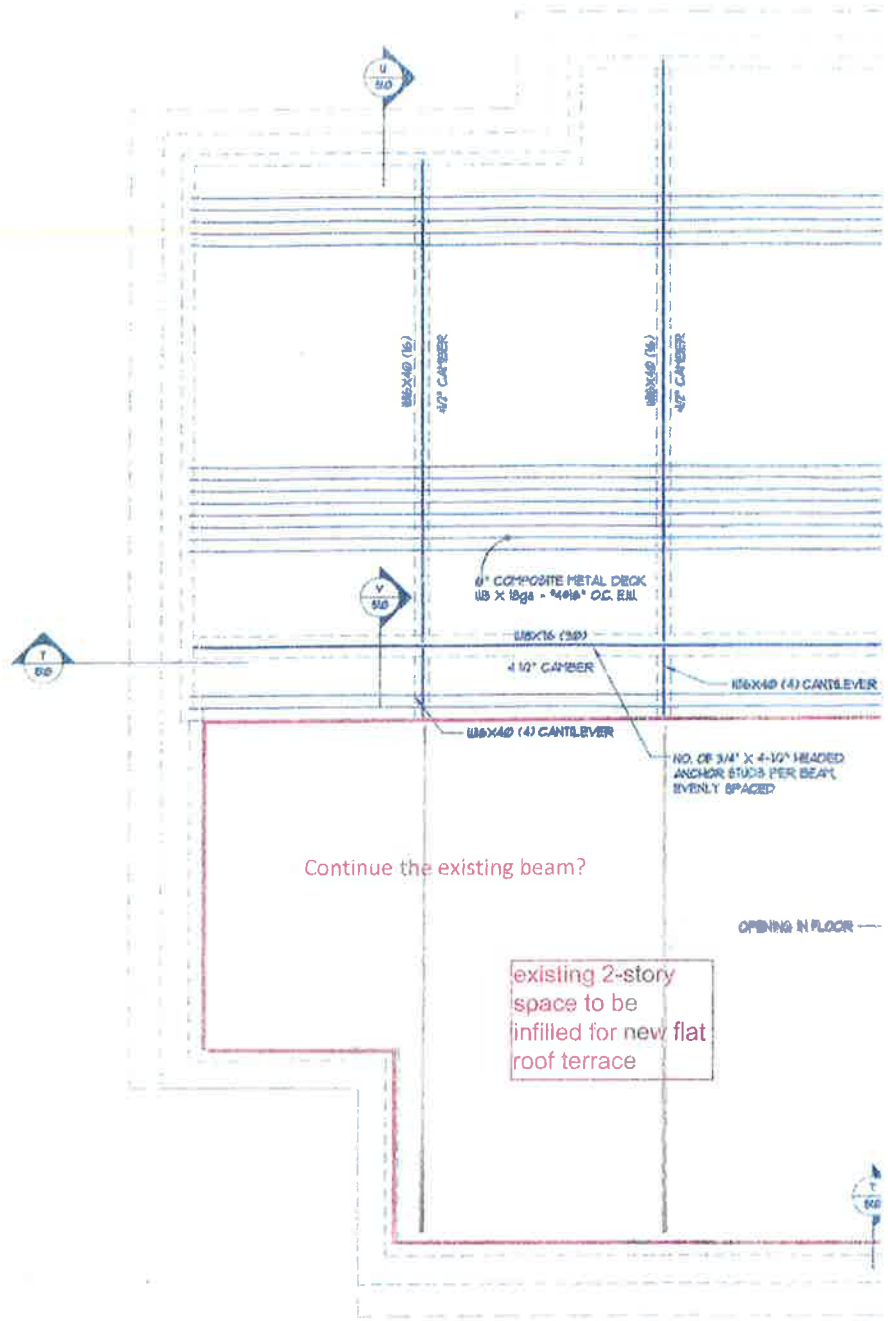
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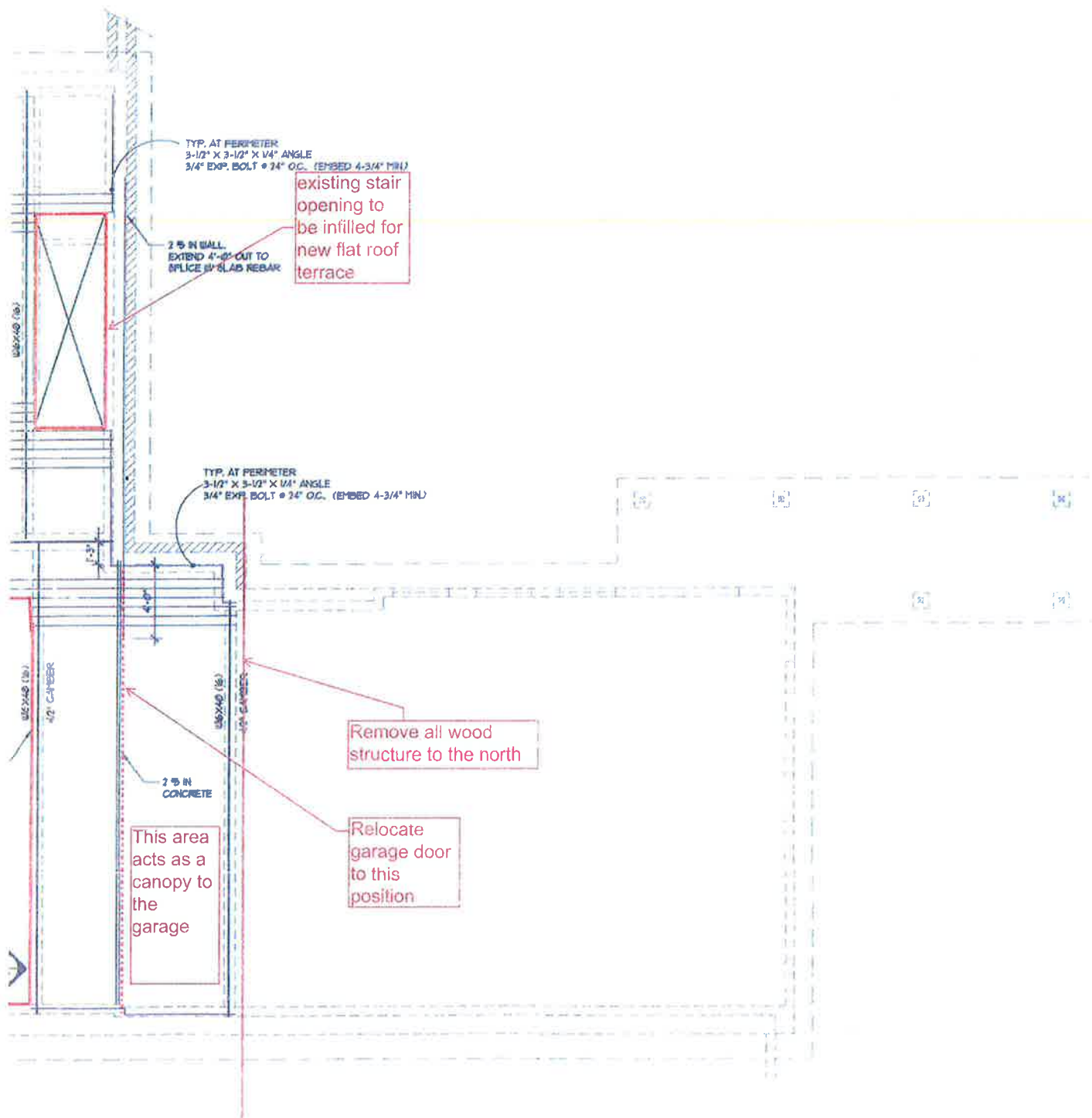
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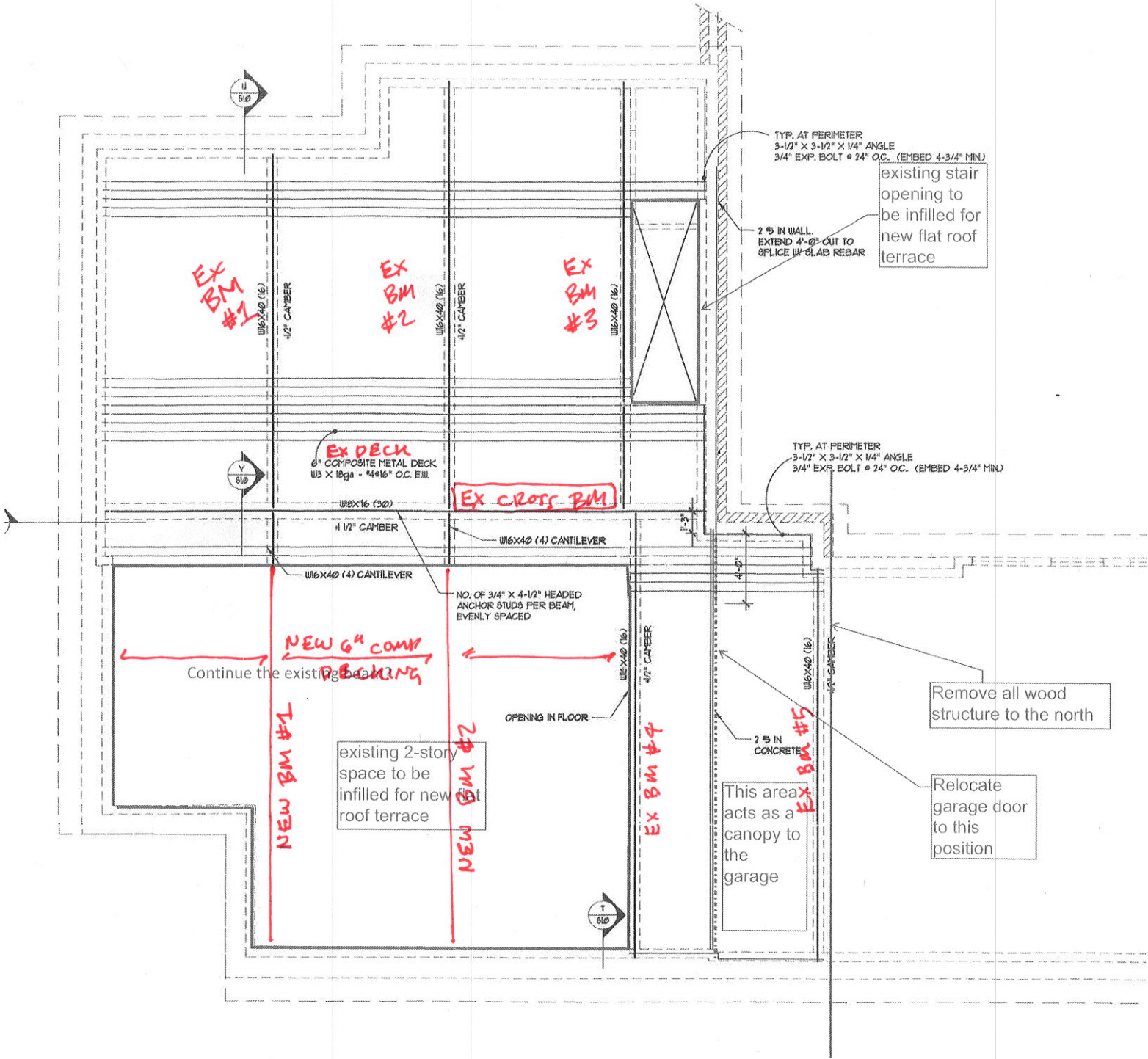


GARAGE- FLOOR FRAMING PLAN

1/4"=1'-0"



**DETACHED GARAGE
NEW/REVISED FRAMING**



Revised FRAMING @ Detached Garage

EX FLOOR - 6" COMPOSITE W/3 Deck
 DL = 50#
 106#

+ 5/8" FINISH
 + 2" INS $\Sigma = 60\#$
 + 1 1/2" M&E
 + 2" BEAMS

NEW ROOF TERRACE LL = 60# + 25 1/4 SL

EX W 16x40 COMPOSITE BEAMS

#1 SPAN = 20.5' + 3' CANT
 TA = 10' F

DL = 600
 LL = 600 PIF
 SL = 250

R = 6.5#
 6.15#
 2.56#

#4 SPAN = 25'
 TA = 7 1/2'
 DL = 450
 LL = 450 PIF
 SL = 188

R = 6.13#
 5.63#
 2.35#

#2 SPAN = 24.5' + 3' CANT
 TA = 10'

DL = 600
 LL = 600 PIF
 SL = 250

R = 7.84#
 7.35#
 3.06#

#5 SPAN = 22'
 TA = 5'
 DL = 300
 LL = 300 PIF
 SL = 125

R = 3.74#
 3.30#
 1.38#

#3 SPAN = 24.5'
 TA = 7 1/2'

DL = 450
 LL = 450 PIF
 SL = 188

R = 6.01#
 5.51#
 2.30#



I.L. GROSS
 STRUCTURAL ENGINEERS

Ex Framing Checks @ Garage Terrace

SHEET TITLE

Lorenzini

PROJECT

RES

CLIENT

SCALE

MJ

DESIGNED BY

CHECKED

DATE



SHEET

NEW INFILL FRAMING & Open Space

BM-1

Span = 22'
 TA = 10' 0-14'
 6' 14'-22'

W16x26 OK

DL = 600/360
 LL = 600/360
 SL = 250/150

R₁ = 6.5k_D
 6.3k_L
 2.6k_S

R₂ = 5.3k_D
 5.0k_L
 2.1k_S

BM-2

Span = 22'
 TA = 10'

DL = 600

LL = 600 PIF
 SL = 250

W16x26 OK

R₁ = R₂ = 6.9k_D
 6.6k_L
 2.7k_S

EX CROSS BM (W18x76)

Span = 35'
 TA = 4' P
 DL = 240
 LL = 240 PIF
 SL = 100

P₁ @ 10' = 11.86k_D

6.91k_L
 4.16k_S

P₂ @ 20' = 14.74k_D

8.65k_L
 5.76k_S

P₃ @ 30' = 6.01k_D

3.42k_L
 2.30k_S

P₄ @ 31' = 6.13k_D

3.49k_L
 2.35k_S

LL Red - K_{LL} = 0.62

eg uniform LL = 37#/p

EX BM IS 96% Stressed

Δ = 1.91" total

ex c = 1.5"

∴ Δ = 0.41" = 1/1020 ✓



I.L. GROSS
 STRUCTURAL ENGINEERS

SHEET TITLE

SCALE

DATE

PROJECT

DESIGNED BY

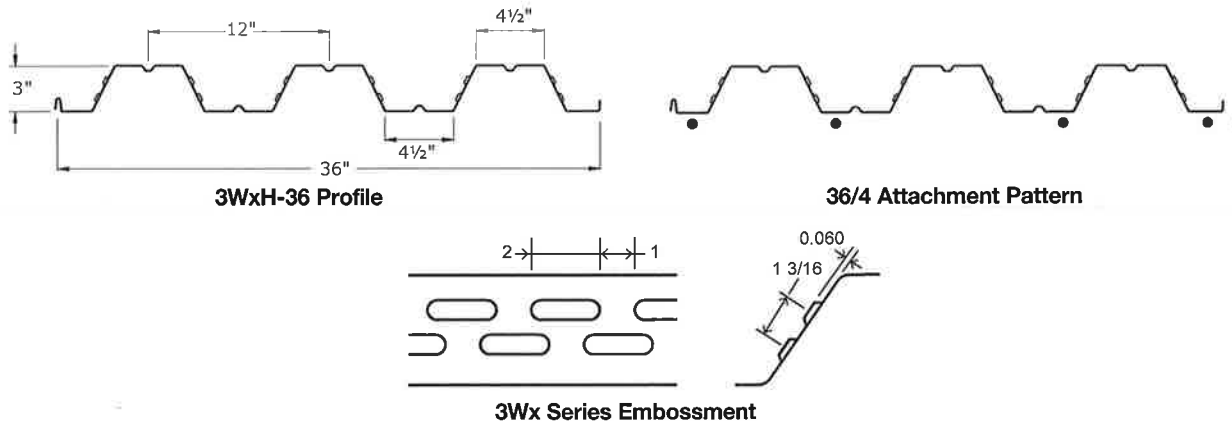
CLIENT

CHECKED

SHEET

TABLE OF CONTENTS

2.1 3WxH-36



Panel Properties

Gage	Panel Properties				Gross Section Properties				
	Weight	Base Metal Thickness	Yield Strength	Tensile Strength	Area	Moment of Inertia	Distance to N.A. from Bottom	Section Modulus	Radius of Gyration
	w psf	t in	F _y ksi	F _u ksi					
22	1.70	0.0290	50	65	0.504	0.770	1.48	0.497	1.236
21	1.92	0.0330	50	65	0.556	0.850	1.48	0.548	1.236
20	2.09	0.0359	50	65	0.605	0.927	1.48	0.595	1.236
19	2.43	0.0420	50	65	0.708	1.083	1.48	0.695	1.236
18	2.76	0.0478	50	65	0.806	1.233	1.49	0.789	1.236
16	3.43	0.0598	50	65	1.008	1.540	1.49	0.984	1.236

Gage	Effective Section Modulus at F _y					Effective Moment of Inertia for Deflection			
	Compression	Bending				Moment of Inertia	Moment of Inertia	Uniform Load Only	
		Area	Section Modulus	Distance to N.A. from Bottom	Section Modulus			Distance to N.A. from Bottom	I _d = (2I _e +I _o)/3
	A _c in ² /ft	S _{e+} in ³ /ft	y _b in	S _{e-} in ³ /ft	y _b in	I _{e+} in ⁴ /ft	I _{e-} in ⁴ /ft	I ₊ in ⁴ /ft	I ₋ in ⁴ /ft
22	0.309	0.392	1.33	0.404	1.63	0.727	0.720	0.741	0.737
21	0.362	0.452	1.36	0.465	1.61	0.823	0.813	0.832	0.826
20	0.414	0.510	1.39	0.524	1.59	0.910	0.900	0.916	0.909
19	0.532	0.636	1.43	0.654	1.55	1.083	1.073	1.083	1.077
18	0.651	0.761	1.46	0.781	1.52	1.233	1.230	1.233	1.231
16	0.887	0.984	1.49	0.982	1.50	1.540	1.540	1.540	1.540

Reactions at Supports (plf) Based on Web Crippling

Gage	Condition	Bearing Length of Webs							
		Allowable (R _n /Ω)				Factored (ΦR _n)			
		1"	2"	4"	6"	1"	2"	4"	6"
22	End	296	368	471	550	452	564	721	842
	Interior	522	630	783	900	776	937	1164	1338
21	End	379	470	598	697	580	719	915	1066
	Interior	667	801	990	1135	993	1191	1472	1688
20	End	424	524	666	775	649	802	1020	1186
	Interior	746	893	1101	1261	1110	1329	1638	1876
19	End	600	737	930	1078	918	1127	1423	1650
	Interior	1054	1252	1532	1747	1568	1863	2280	2599
18	End	743	908	1141	1320	1137	1389	1746	2020
	Interior	1305	1542	1878	2136	1941	2294	2794	3178
16	End	1143	1383	1723	1983	1749	2116	2636	3034
	Interior	2008	2350	2834	3206	2986	3495	4216	4768

Web Crippling Constraints h=2.16" r=0.125" θ=54.4°



Composite Steel Beam

Lic. #: KW-06002858

DESCRIPTION: Existing Garage BM - #1

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-10

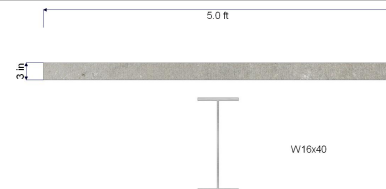
Material Properties

Analysis Method : **Allowable Stress Design**

Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**

Load Combination **ASCE 7-10**

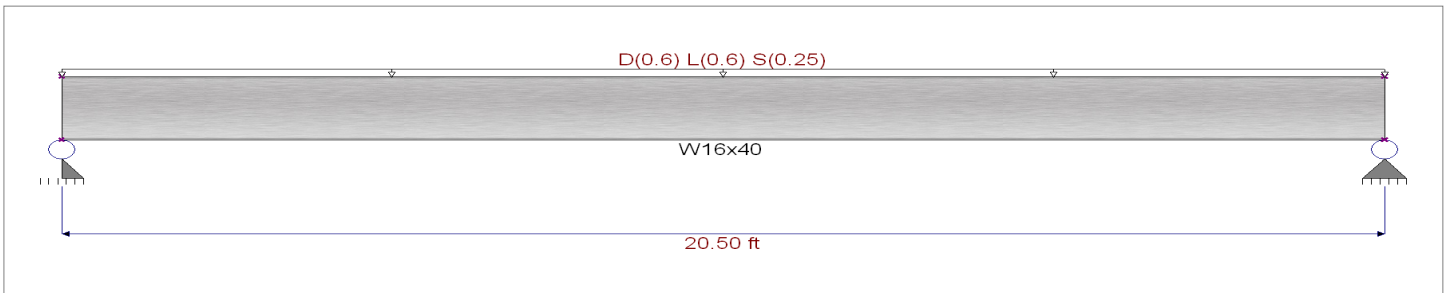
Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is SHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	10.180 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.60, L = 0.60, S = 0.250 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio = **0.271** : 1
 Steel section **W16x40**

MAX Shear Ratio = **0.134** : 1
 Vu : Applied **13.096 k**
 Vn/Omega : Allow **97.60 k**
 Location of maximum **0.0 ft**
 Load Combination **+0.60D**

Design OK
DEFLECTIONS
 FINAL Composite
 Max Downward **0.202 in**
 Max Upward **0.000 in**
 Defl Ratio **1215**
+D+0.750L+0.750S

Composite
 % Composite Action **25 %**
 Mu : Applied **67.114 k-ft**
 Mn / Omega : Allow **248.061 k-ft**
 Location of maximum **10.181 ft**
 Load Combination **+0.60D**

Transient Composite
 Max Downward **0.095 in**
 Max Upward **0.000 in**
 Defl Ratio **2589**
L Only

Pre-Composite
 Mu : Applied **0 k-ft**
 Mn * Phi : Allowable **0 k-ft**

NonComposite
 Max Downward **0.011 in**
 Max Upward **0.000 in**
 Defl Ratio **22907**
PreCompDL+PreCompLL

Shear Stud Requirements

From Support 1 to 10.18 ft use 12 studs.

From 10.18 ft to Support 2 use 12 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Overall Maximums							
Span L = 20.5 ft	1	0.271	0.134	67.11	248.06	13.10	97.60



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Composite Steel Beam

File: Lorenzini Residence.ec6
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I.L. GROSS STRUCTURAL ENGINEERS

Lic. # : KW-06002858

DESCRIPTION: Existing Garage BM - #1

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
D Only							
Span L = 20.5 ft	1	0.136	0.067	33.63	248.06	6.56	97.60
+D+L							
Span L = 20.5 ft	1	0.263	0.130	65.14	248.06	12.71	97.60
+D+S							
Span L = 20.5 ft	1	0.188	0.093	46.76	248.06	9.12	97.60
+D+0.750L							
Span L = 20.5 ft	1	0.231	0.114	57.27	248.06	11.17	97.60
+D+0.750L+0.750S							
Span L = 20.5 ft	1	0.271	0.134	67.11	248.06	13.10	97.60
+0.60D							
Span L = 20.5 ft	1	0.081	0.040	20.18	248.06	3.94	97.60

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-13-1	I per C-13-2	
D Only	Downward	1	0.1014	10.319	874.675	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.1964	10.319	874.675	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.1410	10.319	874.675	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.1726	10.319	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.2023	10.319	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.0608	10.319	874.675	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
L Only	Downward	1	0.0950	10.319	874.675	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0396	10.319	874.675	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	13.096	13.096
D Only	6.562	6.562
+D+L	12.712	12.712
+D+S	9.124	9.124
+D+0.750L	11.174	11.174
+D+0.750L+0.750S	13.096	13.096
+0.60D	3.937	3.937
L Only	6.150	6.150
S Only	2.563	2.563

Steel Section Properties : W16x40

Depth	=	16.000 in	I xx	=	518.00 in^4	I yy	=	28.900 in^4
Web Thick	=	0.305 in	S xx	=	64.70 in^3	S yy	=	8.250 in^3
Flange Width	=	7.000 in	R xx	=	6.630 in	R yy	=	1.570 in
Flange Thick	=	0.505 in	Zx	=	73.000 in^3	Zy	=	12.700 in^3
Area	=	11.800 in^2	J	=	0.794 in^4			
Weight	=	40.167 plf						

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum On Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		100.0	15.813	459.000	46	617.16	518.0	1,683.3	1,324.8
	PNA in Flange		95.0	15.780	436.050	43	605.70	518.0	1,683.3	1,311.0
	PNA in Flange		90.0	15.747	413.100	41	594.17	518.0	1,683.3	1,295.6
	PNA in Flange		85.0	15.715	390.150	39	582.59	518.0	1,683.3	1,278.6
	PNA in Flange		80.0	15.682	367.200	37	570.95	518.0	1,683.3	1,259.7
	PNA in Flange		75.0	15.649	344.250	34	559.26	518.0	1,683.3	1,238.8
	PNA in Flange		70.0	15.616	321.300	32	547.51	518.0	1,683.3	1,215.7
	PNA in Flange		65.0	15.583	298.350	30	535.71	518.0	1,683.3	1,190.3
	PNA in Flange		60.0	15.551	275.400	28	523.85	518.0	1,683.3	1,162.4
	PNA in Flange		55.0	15.518	252.450	25	511.94	518.0	1,683.3	1,131.8
	PNA in Flange		50.0	15.485	229.500	23	499.98	518.0	1,683.3	1,098.2



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Composite Steel Beam

File: Lorenzini Residence.ec6
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Lic. # : KW-06002858

DESCRIPTION: Existing Garage BM - #1

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		45.0	14.513	206.550	21	480.01	518.0	1,683.3	1,061.3
	PNA in Web		40.0	13.761	183.600	19	465.73	518.0	1,683.3	1,020.9
	PNA in Web		35.0	13.008	160.650	16	450.01	518.0	1,683.3	976.5
	PNA in Web		30.0	12.256	137.700	14	432.86	518.0	1,683.3	928.0
	PNA in Web		25.0	11.503	114.750	12	414.26	518.0	1,683.3	874.7
Span 1										



Composite Steel Beam

Lic. #: KW-06002858

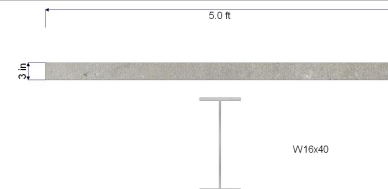
DESCRIPTION: Existing Garage BM - #2

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

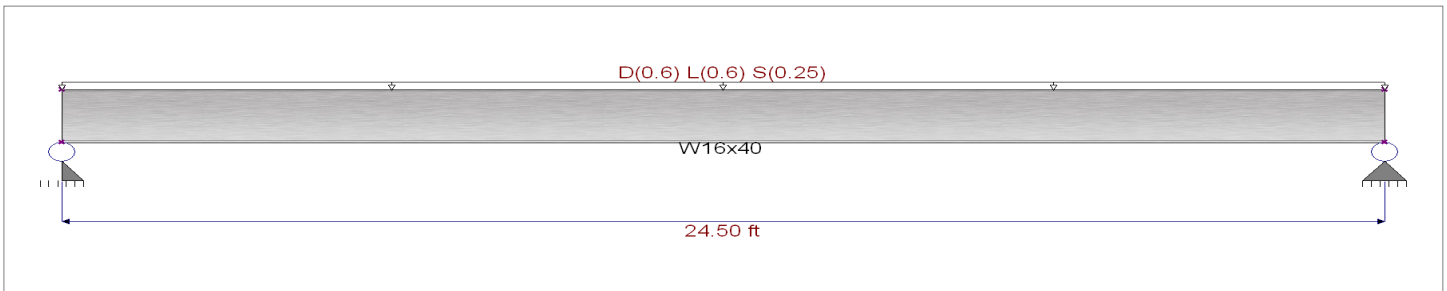
Analysis Method : **Allowable Stress Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**
 Load Combination **ASCE 7-10**
 Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is SHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	10.180 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.60, L = 0.60, S = 0.250 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio =	0.386 : 1	MAX Shear Ratio =	0.160 : 1
Steel section	W16x40	Vu : Applied	15.651 k
Composite		Vn/Omega : Allow	97.60 k
% Composite Action	25 %	Location of maximum	0.0 ft
Mu : Applied	95.861 k-ft	Load Combination	+0.60D
Mn / Omega : Allow	248.061 k-ft		
Location of maximum	12.168 ft		
Load Combination	+0.60D		
Pre-Composite			
Mu : Applied	0 k-ft		
Mn * Phi : Allowable	0 k-ft		

Design OK

DEFLECTIONS

FINAL Composite	
Max Downward	0.413 in
Max Upward	0.000 in
Defl Ratio	712
+D+0.750L+0.750S	
Transient Composite	
Max Downward	0.194 in
Max Upward	0.000 in
Defl Ratio	1516
L Only	
NonComposite	
Max Downward	0.011 in
Max Upward	0.000 in
Defl Ratio	22907
PreCompDL+PreCompLL	

Shear Stud Requirements

From Support 1 to 12.17 ft use 12 studs.
 From 12.17 ft to Support 2 use 12 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Overall Maximums							
Span L = 24.5 ft	1	0.386	0.160	95.86	248.06	15.65	97.60



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 Project Descr: **SFR Remodeling**

Composite Steel Beam

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Lic. # : KW-06002858

DESCRIPTION: Existing Garage BM - #2

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
D Only							
Span L = 24.5 ft	1	0.194	0.080	48.03	248.06	7.84	97.60
+D+L							
Span L = 24.5 ft	1	0.375	0.156	93.05	248.06	15.19	97.60
+D+S							
Span L = 24.5 ft	1	0.269	0.112	66.79	248.06	10.90	97.60
+D+0.750L							
Span L = 24.5 ft	1	0.330	0.137	81.79	248.06	13.35	97.60
+D+0.750L+0.750S							
Span L = 24.5 ft	1	0.386	0.160	95.86	248.06	15.65	97.60
+0.60D							
Span L = 24.5 ft	1	0.116	0.048	28.82	248.06	4.71	97.60

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-13-1	I per C-13-2	
D Only	Downward	1	0.2068	12.332	874.675	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.4006	12.332	874.675	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.2876	12.332	874.675	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.3522	12.332	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.4127	12.332	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.1241	12.332	874.675	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
L Only	Downward	1	0.1938	12.332	874.675	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0808	12.332	874.675	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	15.651	15.651
D Only	7.842	7.842
+D+L	15.192	15.192
+D+S	10.905	10.905
+D+0.750L	13.355	13.355
+D+0.750L+0.750S	15.651	15.651
+0.60D	4.705	4.705
L Only	7.350	7.350
S Only	3.063	3.063

Steel Section Properties : W16x40

Depth	=	16.000 in	I xx	=	518.00 in^4	I yy	=	28.900 in^4
Web Thick	=	0.305 in	S xx	=	64.70 in^3	S yy	=	8.250 in^3
Flange Width	=	7.000 in	R xx	=	6.630 in	R yy	=	1.570 in
Flange Thick	=	0.505 in	Zx	=	73.000 in^3	Zy	=	12.700 in^3
Area	=	11.800 in^2	J	=	0.794 in^4			
Weight	=	40.167 plf						

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum On Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		100.0	15.813	459.000	46	617.16	518.0	1,683.3	1,324.8
	PNA in Flange		95.0	15.780	436.050	43	605.70	518.0	1,683.3	1,311.0
	PNA in Flange		90.0	15.747	413.100	41	594.17	518.0	1,683.3	1,295.6
	PNA in Flange		85.0	15.715	390.150	39	582.59	518.0	1,683.3	1,278.6
	PNA in Flange		80.0	15.682	367.200	37	570.95	518.0	1,683.3	1,259.7
	PNA in Flange		75.0	15.649	344.250	34	559.26	518.0	1,683.3	1,238.8
	PNA in Flange		70.0	15.616	321.300	32	547.51	518.0	1,683.3	1,215.7
	PNA in Flange		65.0	15.583	298.350	30	535.71	518.0	1,683.3	1,190.3
	PNA in Flange		60.0	15.551	275.400	28	523.85	518.0	1,683.3	1,162.4
	PNA in Flange		55.0	15.518	252.450	25	511.94	518.0	1,683.3	1,131.8
	PNA in Flange		50.0	15.485	229.500	23	499.98	518.0	1,683.3	1,098.2



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Composite Steel Beam

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DESCRIPTION: Existing Garage BM - #2

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		45.0	14.513	206.550	21	480.01	518.0	1,683.3	1,061.3
	PNA in Web		40.0	13.761	183.600	19	465.73	518.0	1,683.3	1,020.9
	PNA in Web		35.0	13.008	160.650	16	450.01	518.0	1,683.3	976.5
	PNA in Web		30.0	12.256	137.700	14	432.86	518.0	1,683.3	928.0
	PNA in Web		25.0	11.503	114.750	12	414.26	518.0	1,683.3	874.7
Span 1										



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Composite Steel Beam

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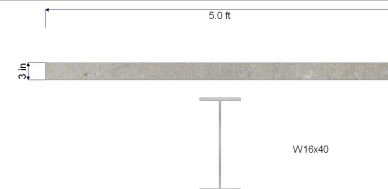
DESCRIPTION: Existing Garage BM - #3

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

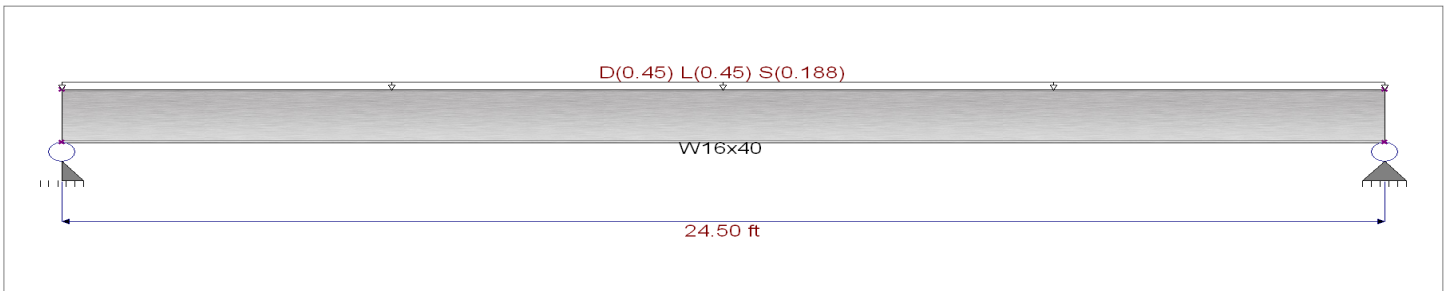
Analysis Method : **Allowable Stress Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**
 Load Combination **ASCE 7-10**
 Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is SHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	10.180 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.450, L = 0.450, S = 0.1880 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio =	0.293 : 1	MAX Shear Ratio =	0.122 : 1
Steel section	W16x40	Vu : Applied	11.866 k
Composite		Vn/Omega : Allow	97.60 k
% Composite Action	25 %	Location of maximum	0.0 ft
Mu : Applied	72.677 k-ft	Load Combination	+0.60D
Mn / Omega : Allow	248.061 k-ft		
Location of maximum	12.332 ft		
Load Combination	+0.60D		
Pre-Composite			
Mu : Applied	0 k-ft		
Mn * Phi : Allowable	0 k-ft		

Design OK

DEFLECTIONS

FINAL Composite	
Max Downward	0.313 in
Max Upward	0.000 in
Defl Ratio	939
+D+0.750L+0.750S	
Transient Composite	
Max Downward	0.145 in
Max Upward	0.000 in
Defl Ratio	2022
L Only	
NonComposite	
Max Downward	0.011 in
Max Upward	0.000 in
Defl Ratio	22907
PreCompDL+PreCompLL	

Shear Stud Requirements

From Support 1 to 12.33 ft use 12 studs.
 From 12.33 ft to Support 2 use 12 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Overall Maximums							
Span L = 24.5 ft	1	0.293	0.122	72.68	248.06	11.87	97.60



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Composite Steel Beam

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DESCRIPTION: Existing Garage BM - #3

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
D Only							
Span L = 24.5 ft	1	0.148	0.062	36.78	248.06	6.00	97.60
+D+L							
Span L = 24.5 ft	1	0.284	0.118	70.54	248.06	11.52	97.60
+D+S							
Span L = 24.5 ft	1	0.205	0.085	50.88	248.06	8.31	97.60
+D+0.750L							
Span L = 24.5 ft	1	0.250	0.104	62.10	248.06	10.14	97.60
+D+0.750L+0.750S							
Span L = 24.5 ft	1	0.293	0.122	72.68	248.06	11.87	97.60
+0.60D							
Span L = 24.5 ft	1	0.089	0.037	22.07	248.06	3.60	97.60

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-13-1	I per C-13-2	
D Only	Downward	1	0.1583	12.332	874.675	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.3037	12.332	874.675	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.2191	12.332	874.675	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.2674	12.332	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.3129	12.332	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.0950	12.332	874.675	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
L Only	Downward	1	0.1454	12.332	874.675	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0607	12.332	874.675	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	11.866	11.866
D Only	6.005	6.005
+D+L	11.517	11.517
+D+S	8.308	8.308
+D+0.750L	10.139	10.139
+D+0.750L+0.750S	11.866	11.866
+0.60D	3.603	3.603
L Only	5.513	5.513
S Only	2.303	2.303

Steel Section Properties : W16x40

Depth	=	16.000 in	I xx	=	518.00 in^4	I yy	=	28.900 in^4
Web Thick	=	0.305 in	S xx	=	64.70 in^3	S yy	=	8.250 in^3
Flange Width	=	7.000 in	R xx	=	6.630 in	R yy	=	1.570 in
Flange Thick	=	0.505 in	Zx	=	73.000 in^3	Zy	=	12.700 in^3
Area	=	11.800 in^2	J	=	0.794 in^4			
Weight	=	40.167 plf						

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum On Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		100.0	15.813	459.000	46	617.16	518.0	1,683.3	1,324.8
	PNA in Flange		95.0	15.780	436.050	43	605.70	518.0	1,683.3	1,311.0
	PNA in Flange		90.0	15.747	413.100	41	594.17	518.0	1,683.3	1,295.6
	PNA in Flange		85.0	15.715	390.150	39	582.59	518.0	1,683.3	1,278.6
	PNA in Flange		80.0	15.682	367.200	37	570.95	518.0	1,683.3	1,259.7
	PNA in Flange		75.0	15.649	344.250	34	559.26	518.0	1,683.3	1,238.8
	PNA in Flange		70.0	15.616	321.300	32	547.51	518.0	1,683.3	1,215.7
	PNA in Flange		65.0	15.583	298.350	30	535.71	518.0	1,683.3	1,190.3
	PNA in Flange		60.0	15.551	275.400	28	523.85	518.0	1,683.3	1,162.4
	PNA in Flange		55.0	15.518	252.450	25	511.94	518.0	1,683.3	1,131.8
	PNA in Flange		50.0	15.485	229.500	23	499.98	518.0	1,683.3	1,098.2



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 Project Descr: **SFR Remodeling**

Composite Steel Beam

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DESCRIPTION: Existing Garage BM - #3

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		45.0	14.513	206.550	21	480.01	518.0	1,683.3	1,061.3
	PNA in Web		40.0	13.761	183.600	19	465.73	518.0	1,683.3	1,020.9
	PNA in Web		35.0	13.008	160.650	16	450.01	518.0	1,683.3	976.5
	PNA in Web		30.0	12.256	137.700	14	432.86	518.0	1,683.3	928.0
	PNA in Web		25.0	11.503	114.750	12	414.26	518.0	1,683.3	874.7
Span 1										



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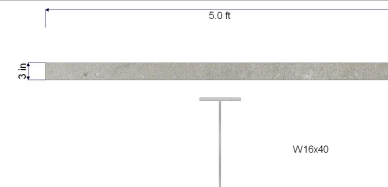
DESCRIPTION: Existing Garage BM - #4

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

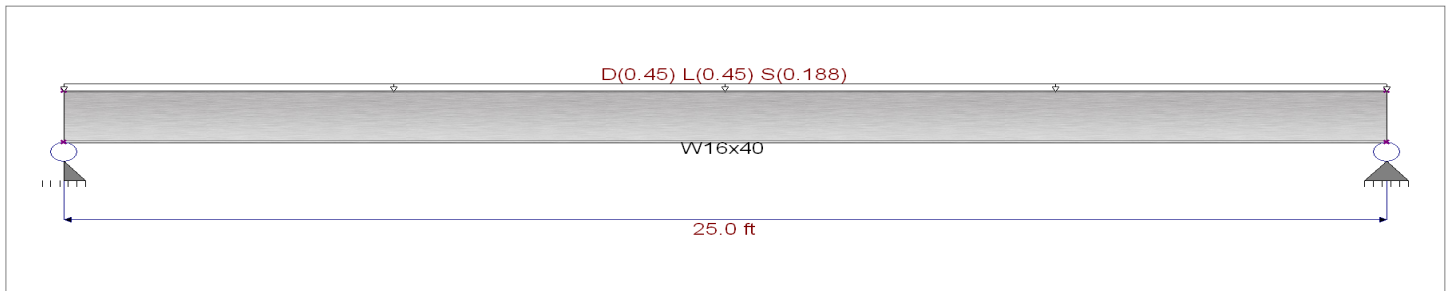
Analysis Method : **Allowable Stress Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**
 Load Combination **ASCE 7-10**
 Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is SHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	10.180 k
Metal Deck . . .	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.450, L = 0.450, S = 0.1880 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio =	0.305 : 1	MAX Shear Ratio =	0.124 : 1
Steel section	W16x40	Vu : Applied	12.108 k
Composite		Vn/Omega : Allow	97.60 k
% Composite Action	25 %	Location of maximum	0.0 ft
Mu : Applied	75.674 k-ft	Load Combination	+0.60D
Mn / Omega : Allow	248.061 k-ft		
Location of maximum	12.416 ft		
Load Combination	+0.60D		
Pre-Composite			
Mu : Applied	0 k-ft		
Mn * Phi : Allowable	0 k-ft		

Design OK

DEFLECTIONS

FINAL Composite	
Max Downward	0.339 in
Max Upward	0.000 in
Defl Ratio	884
+D+0.750L+0.750S	
Transient Composite	
Max Downward	0.158 in
Max Upward	0.000 in
Defl Ratio	1903
L Only	
NonComposite	
Max Downward	0.011 in
Max Upward	0.000 in
Defl Ratio	22907
PreCompDL+PreCompLL	

Shear Stud Requirements

From Support 1 to 12.42 ft use 12 studs.
 From 12.42 ft to Support 2 use 12 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Overall Maximums							
Span L = 25 ft	1	0.305	0.124	75.67	248.06	12.11	97.60



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DESCRIPTION: Existing Garage BM - #4

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
D Only							
Span L = 25 ft	1	0.154	0.063	38.29	248.06	6.13	97.60
+D+L							
Span L = 25 ft	1	0.296	0.120	73.45	248.06	11.75	97.60
+D+S							
Span L = 25 ft	1	0.214	0.087	52.98	248.06	8.48	97.60
+D+0.750L							
Span L = 25 ft	1	0.261	0.106	64.66	248.06	10.35	97.60
+D+0.750L+0.750S							
Span L = 25 ft	1	0.305	0.124	75.67	248.06	12.11	97.60
+0.60D							
Span L = 25 ft	1	0.093	0.038	22.98	248.06	3.68	97.60

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-13-1	I per C-13-2	
D Only	Downward	1	0.1717	12.584	874.675	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.3293	12.584	874.675	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.2375	12.584	874.675	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.2899	12.584	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.3393	12.584	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.1030	12.584	874.675	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
L Only	Downward	1	0.1576	12.584	874.675	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0658	12.584	874.675	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	12.108	12.108
D Only	6.127	6.127
+D+L	11.752	11.752
+D+S	8.477	8.477
+D+0.750L	10.346	10.346
+D+0.750L+0.750S	12.108	12.108
+0.60D	3.676	3.676
L Only	5.625	5.625
S Only	2.350	2.350

Steel Section Properties : W16x40

Depth	=	16.000 in	I xx	=	518.00 in^4	I yy	=	28.900 in^4
Web Thick	=	0.305 in	S xx	=	64.70 in^3	S yy	=	8.250 in^3
Flange Width	=	7.000 in	R xx	=	6.630 in	R yy	=	1.570 in
Flange Thick	=	0.505 in	Zx	=	73.000 in^3	Zy	=	12.700 in^3
Area	=	11.800 in^2	J	=	0.794 in^4			
Weight	=	40.167 plf						

Composite Section Properties

Span Number	Analysis Plastic N. A. Location	Type	% Shear Connection	Plastic N.A. from Bottom	Sum On Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		100.0	15.813	459.000	46	617.16	518.0	1,683.3	1,324.8
	PNA in Flange		95.0	15.780	436.050	43	605.70	518.0	1,683.3	1,311.0
	PNA in Flange		90.0	15.747	413.100	41	594.17	518.0	1,683.3	1,295.6
	PNA in Flange		85.0	15.715	390.150	39	582.59	518.0	1,683.3	1,278.6
	PNA in Flange		80.0	15.682	367.200	37	570.95	518.0	1,683.3	1,259.7
	PNA in Flange		75.0	15.649	344.250	34	559.26	518.0	1,683.3	1,238.8
	PNA in Flange		70.0	15.616	321.300	32	547.51	518.0	1,683.3	1,215.7
	PNA in Flange		65.0	15.583	298.350	30	535.71	518.0	1,683.3	1,190.3
	PNA in Flange		60.0	15.551	275.400	28	523.85	518.0	1,683.3	1,162.4
	PNA in Flange		55.0	15.518	252.450	25	511.94	518.0	1,683.3	1,131.8
	PNA in Flange		50.0	15.485	229.500	23	499.98	518.0	1,683.3	1,098.2



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Composite Steel Beam

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Lic. # : KW-06002858

DESCRIPTION: Existing Garage BM - #4

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		45.0	14.513	206.550	21	480.01	518.0	1,683.3	1,061.3
	PNA in Web		40.0	13.761	183.600	19	465.73	518.0	1,683.3	1,020.9
	PNA in Web		35.0	13.008	160.650	16	450.01	518.0	1,683.3	976.5
	PNA in Web		30.0	12.256	137.700	14	432.86	518.0	1,683.3	928.0
	PNA in Web		25.0	11.503	114.750	12	414.26	518.0	1,683.3	874.7
Span 1										



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Composite Steel Beam

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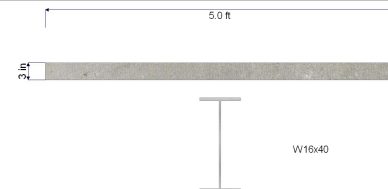
DESCRIPTION: Existing Garage BM - #5

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

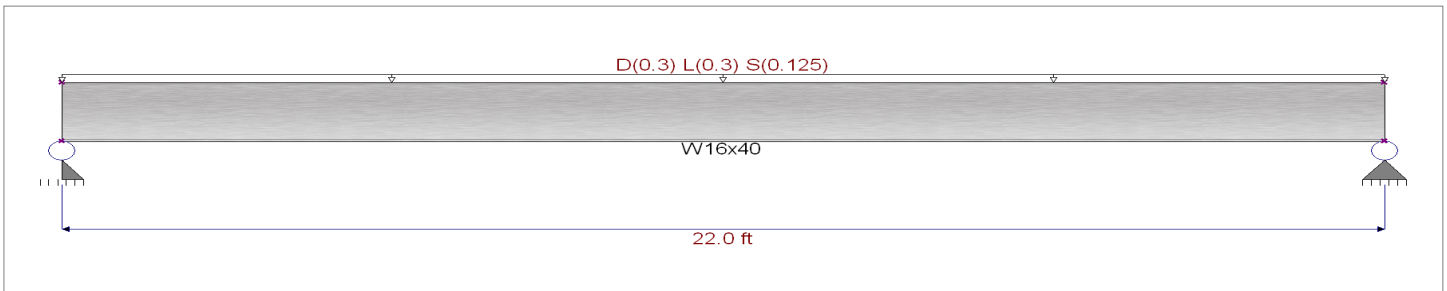
Analysis Method : **Allowable Stress Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**
 Load Combination **ASCE 7-10**
 Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is SHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	10.180 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.30, L = 0.30, S = 0.1250 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio =	0.161 : 1	MAX Shear Ratio =	0.074 : 1
Steel section	W16x40	Vu : Applied	7.248 k
Composite		Vn/Omega : Allow	97.60 k
% Composite Action	25 %	Location of maximum	0.0 ft
Mu : Applied	39.863 k-ft	Load Combination	+0.60D
Mn / Omega : Allow	248.061 k-ft		
Location of maximum	10.926 ft		
Load Combination	+0.60D		
Pre-Composite			
Mu : Applied	0 k-ft		
Mn * Phi : Allowable	0 k-ft		

Design OK

DEFLECTIONS

FINAL Composite	
Max Downward	0.138 in
Max Upward	0.000 in
Defl Ratio	1907
+D+0.750L+0.750S	
Transient Composite	
Max Downward	0.063 in
Max Upward	0.000 in
Defl Ratio	4189
L Only	
NonComposite	
Max Downward	0.011 in
Max Upward	0.000 in
Defl Ratio	22907
PreCompDL+PreCompLL	

Shear Stud Requirements

From Support 1 to 10.93 ft use 12 studs.
 From 10.93 ft to Support 2 use 12 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Overall Maximums							
Span L = 22 ft	1	0.161	0.074	39.86	248.06	7.25	97.60



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Composite Steel Beam

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DESCRIPTION: Existing Garage BM - #5

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
D Only							
Span L = 22 ft	1	0.083	0.038	20.58	248.06	3.74	97.60
+D+L							
Span L = 22 ft	1	0.156	0.072	38.73	248.06	7.04	97.60
+D+S							
Span L = 22 ft	1	0.113	0.052	28.14	248.06	5.12	97.60
+D+0.750L							
Span L = 22 ft	1	0.138	0.064	34.19	248.06	6.22	97.60
+D+0.750L+0.750S							
Span L = 22 ft	1	0.161	0.074	39.86	248.06	7.25	97.60
+0.60D							
Span L = 22 ft	1	0.050	0.023	12.35	248.06	2.25	97.60

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-13-1	I per C-13-2	
D Only	Downward	1	0.0714	11.074	874.675	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.1345	11.074	874.675	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.0977	11.074	874.675	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.1187	11.074	874.675	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.1384	11.074	874.675	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.0429	11.074	874.675	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
L Only	Downward	1	0.0630	11.074	874.675	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0263	11.074	874.675	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	874.675	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	7.248	7.248
D Only	3.742	3.742
+D+L	7.042	7.042
+D+S	5.117	5.117
+D+0.750L	6.217	6.217
+D+0.750L+0.750S	7.248	7.248
+0.60D	2.245	2.245
L Only	3.300	3.300
S Only	1.375	1.375

Steel Section Properties : W16x40

Depth	=	16.000 in	I xx	=	518.00 in^4	I yy	=	28.900 in^4
Web Thick	=	0.305 in	S xx	=	64.70 in^3	S yy	=	8.250 in^3
Flange Width	=	7.000 in	R xx	=	6.630 in	R yy	=	1.570 in
Flange Thick	=	0.505 in	Zx	=	73.000 in^3	Zy	=	12.700 in^3
Area	=	11.800 in^2	J	=	0.794 in^4			
Weight	=	40.167 plf						

Composite Section Properties

Span Number	Analysis Plastic N. A. Location	Type	% Shear Connection	Plastic N.A. from Bottom	Sum On Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		100.0	15.813	459.000	46	617.16	518.0	1,683.3	1,324.8
	PNA in Flange		95.0	15.780	436.050	43	605.70	518.0	1,683.3	1,311.0
	PNA in Flange		90.0	15.747	413.100	41	594.17	518.0	1,683.3	1,295.6
	PNA in Flange		85.0	15.715	390.150	39	582.59	518.0	1,683.3	1,278.6
	PNA in Flange		80.0	15.682	367.200	37	570.95	518.0	1,683.3	1,259.7
	PNA in Flange		75.0	15.649	344.250	34	559.26	518.0	1,683.3	1,238.8
	PNA in Flange		70.0	15.616	321.300	32	547.51	518.0	1,683.3	1,215.7
	PNA in Flange		65.0	15.583	298.350	30	535.71	518.0	1,683.3	1,190.3
	PNA in Flange		60.0	15.551	275.400	28	523.85	518.0	1,683.3	1,162.4
	PNA in Flange		55.0	15.518	252.450	25	511.94	518.0	1,683.3	1,131.8
	PNA in Flange		50.0	15.485	229.500	23	499.98	518.0	1,683.3	1,098.2



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 Project Descr: **SFR Remodeling**

Composite Steel Beam

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DESCRIPTION: Existing Garage BM - #5

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		45.0	14.513	206.550	21	480.01	518.0	1,683.3	1,061.3
	PNA in Web		40.0	13.761	183.600	19	465.73	518.0	1,683.3	1,020.9
	PNA in Web		35.0	13.008	160.650	16	450.01	518.0	1,683.3	976.5
	PNA in Web		30.0	12.256	137.700	14	432.86	518.0	1,683.3	928.0
	PNA in Web		25.0	11.503	114.750	12	414.26	518.0	1,683.3	874.7
Span 1										



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Composite Steel Beam

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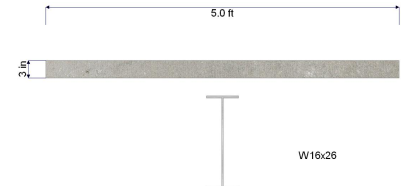
DESCRIPTION: **New Composite Beam 1**

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

Material Properties

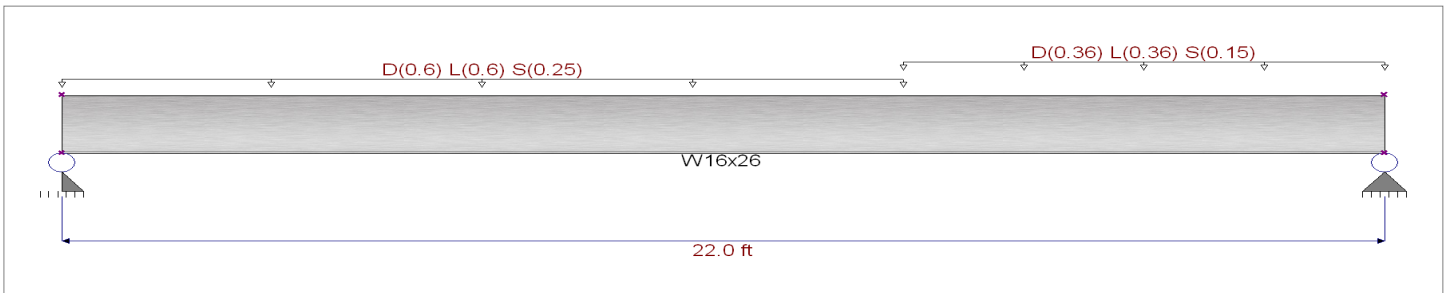
Analysis Method : **Allowable Stress Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**
 Load Combination **ASCE 7-10**
 Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is SHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	11.0 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.60, L = 0.60, S = 0.250 k/ft, Extent = 0.0 --> 14.0 ft, Tributary Width = 1.0 ft
 Uniform Load : D = 0.360, L = 0.360, S = 0.150 k/ft, Extent = 14.0 --> 22.0 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio =	0.418 : 1	MAX Shear Ratio =	0.168 : 1
Steel section	W16x26	Vu : Applied	13.180 k
Composite		Vn/Omega : Allow	78.50 k
% Composite Action	25 %	Location of maximum	0.0 ft
Mu : Applied	68.734 k-ft	Load Combination	+0.60D
Mn / Omega : Allow	164.357 k-ft		
Location of maximum	10.483 ft		
Load Combination	+0.60D		
Pre-Composite			
Mu : Applied	0 k-ft		
Mn * Phi : Allowable	0 k-ft		

Design OK

DEFLECTIONS

FINAL Composite	
Max Downward	0.354 in
Max Upward	0.000 in
Defl Ratio	746
	+D+0.750L+0.750S

Transient Composite	
Max Downward	0.167 in
Max Upward	0.000 in
Defl Ratio	1576
	L Only

NonComposite	
Max Downward	0.067 in
Max Upward	0.000 in
Defl Ratio	6253
	PreCompDL+PreCompLL

Shear Stud Requirements

From Support 1 to 10.48 ft use 9 studs.
 From 10.48 ft to Support 2 use 9 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Max Stress Ratios		Bending Summary		Shear Summary		p.150 / 158
	Span #	M	V	Ma Max	Mn / Omega	Va	
Overall Maximums							



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Composite Steel Beam

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DESCRIPTION: **New Composite Beam 1**

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Span L = 22 ft	1	0.418	0.168	68.73	164.36	13.18	78.50
D Only							
Span L = 22 ft	1	0.208	0.083	34.14	164.36	6.54	78.50
+D+L							
Span L = 22 ft	1	0.406	0.163	66.70	164.36	12.79	78.50
+D+S							
Span L = 22 ft	1	0.290	0.116	47.71	164.36	9.14	78.50
+D+0.750L							
Span L = 22 ft	1	0.356	0.143	58.56	164.36	11.23	78.50
+D+0.750L+0.750S							
Span L = 22 ft	1	0.418	0.168	68.73	164.36	13.18	78.50
+0.60D							
Span L = 22 ft	1	0.125	0.050	20.48	164.36	3.92	78.50

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-I3-1	I per C-I3-2	
D Only	Downward	1	0.1757	10.926	582.442	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.3431	10.926	582.442	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.2454	10.926	582.442	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.3012	10.926	582.442	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.3535	10.926	582.442	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.1054	10.926	582.442	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
L Only	Downward	1	0.1674	10.926	582.442	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0698	10.926	582.442	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	13.180	10.660
D Only	6.538	5.317
+D+L	12.789	10.346
+D+S	9.143	7.412
+D+0.750L	11.227	9.088
+D+0.750L+0.750S	13.180	10.660
+0.60D	3.923	3.190
L Only	6.251	5.029
S Only	2.605	2.095

Steel Section Properties : W16x26

Depth	=	15.700 in	I xx	=	301.00 in^4	I yy	=	9.590 in^4
Web Thick	=	0.250 in	S xx	=	38.40 in^3	S yy	=	3.490 in^3
Flange Width	=	5.500 in	R xx	=	6.260 in	R yy	=	1.120 in
Flange Thick	=	0.345 in	Zx	=	44.200 in^3	Zy	=	5.480 in^3
Area	=	7.680 in^2	J	=	0.262 in^4			
Weight	=	26.143 plf						

Composite Section Properties

Span Number	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
Plastic N. A. Location	Type	Connection	from Bottom	Shear (k)	1/2 Span	k-ft	I-Steel	I-Trans	I-Lwr Bound
PNA in Slab		100.0	15.700	384.000	35	403.04	301.0	1,157.2	910.2
PNA in Flange		95.0	15.665	364.800	34	429.47	301.0	1,157.2	900.5
PNA in Flange		90.0	15.630	345.600	32	420.12	301.0	1,157.2	889.7
PNA in Flange		85.0	15.595	326.400	30	410.73	301.0	1,157.2	877.6
PNA in Flange		80.0	15.560	307.200	28	401.29	301.0	1,157.2	864.3
PNA in Flange		75.0	15.525	288.000	27	391.80	301.0	1,157.2	849.5
PNA in Flange		70.0	15.491	268.800	25	382.26	301.0	1,157.2	833.1
PNA in Flange		65.0	15.456	249.600	23	372.67	301.0	1,157.2	815.0
PNA in Flange		60.0	15.421	230.400	21	363.04	301.0	1,157.2	795.0
PNA in Flange		55.0	15.386	211.200	20	353.36	301.0	1,157.2	772.9



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Composite Steel Beam

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DESCRIPTION: **New Composite Beam 1**

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		50.0	15.351	192.000	18	343.63	301.0	1,157.2	748.6
	PNA in Web		45.0	14.497	172.800	16	327.82	301.0	1,157.2	721.7
	PNA in Web		40.0	13.729	153.600	14	316.33	301.0	1,157.2	692.0
	PNA in Web		35.0	12.961	134.400	13	303.61	301.0	1,157.2	659.1
	PNA in Web		30.0	12.193	115.200	11	289.66	301.0	1,157.2	622.7
	PNA in Web		25.0	11.425	96.000	9	274.48	301.0	1,157.2	582.4

Span 1



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Composite Steel Beam

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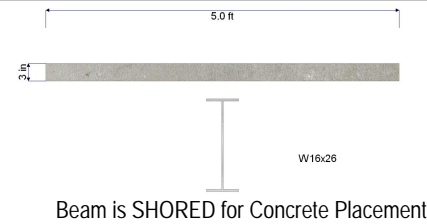
DESCRIPTION: **New Composite Beam 2**

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-10

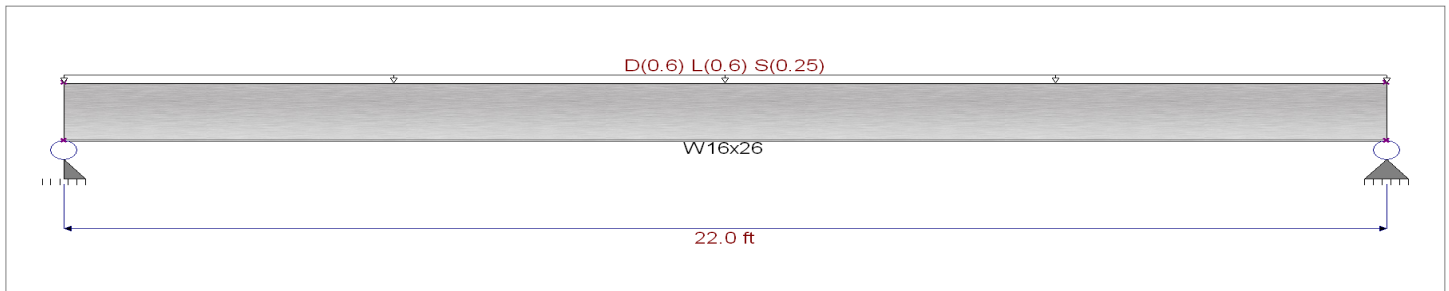
Material Properties

Analysis Method : **Allowable Stress Design**
 Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**
 Load Combination **ASCE 7-10**
 Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	5.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	11.0 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads
 Load for Span Number 1

Uniform Load : D = 0.60, L = 0.60, S = 0.250 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

MAX Bending Ratio =	0.465 : 1	MAX Shear Ratio =	0.177 : 1
Steel section	W16x26	Vu : Applied	13.90 k
Composite		Vn/Omega : Allow	78.50 k
% Composite Action	25 %	Location of maximum	0.0 ft
Mu : Applied	76.447 k-ft	Load Combination	+0.60D
Mn / Omega : Allow	164.357 k-ft		
Location of maximum	10.926 ft		
Load Combination	+0.60D		
Pre-Composite			
Mu : Applied	0 k-ft		
Mn * Phi : Allowable	0 k-ft		

Design OK

DEFLECTIONS	
FINAL Composite	
Max Downward	0.399 in
Max Upward	0.000 in
Defl Ratio	662
	+D+0.750L+0.750S
Transient Composite	
Max Downward	0.189 in
Max Upward	0.000 in
Defl Ratio	1394
	L Only
NonComposite	
Max Downward	0.067 in
Max Upward	0.000 in
Defl Ratio	6253
	PreCompDL+PreCompLL

Shear Stud Requirements

From Support 1 to 10.93 ft use 9 studs.
 From 10.93 ft to Support 2 use 9 studs.

Maximum Forces & Stresses for Load Combinations

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
Overall Maximums							
Span L = 22 ft	1	0.465	0.177	76.45	164.36	13.90	78.50



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Project Title: **Lorenzini Waterfront Home**
 Engineer: **Mark Speidel**
 Project ID:
 Project Descr: **SFR Remodeling**

Composite Steel Beam

File: Lorenzini Residence.ec6
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Lic. # : KW-06002858

DESCRIPTION: **New Composite Beam 2**

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Ma Max	Mn / Omega	Va	Vn / Omega
D Only							
Span L = 22 ft	1	0.230	0.088	37.88	164.36	6.89	78.50
+D+L							
Span L = 22 ft	1	0.451	0.172	74.18	164.36	13.49	78.50
+D+S							
Span L = 22 ft	1	0.322	0.123	53.00	164.36	9.64	78.50
+D+0.750L							
Span L = 22 ft	1	0.396	0.151	65.10	164.36	11.84	78.50
+D+0.750L+0.750S							
Span L = 22 ft	1	0.465	0.177	76.45	164.36	13.90	78.50
+0.60D							
Span L = 22 ft	1	0.138	0.053	22.73	164.36	4.13	78.50

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Span	Deflection	Location in Span	Moment of Inertia					
				Ixx - Used	I-Steel	I-Trans	I per C-13-1	I per C-13-2	
D Only	Downward	1	0.1975	11.074	582.442	0.000	0.000	0.000	0.000
D Only	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+L	Downward	1	0.3867	11.074	582.442	0.000	0.000	0.000	0.000
+D+L	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+S	Downward	1	0.2763	11.074	582.442	0.000	0.000	0.000	0.000
+D+S	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+0.750L	Downward	1	0.3394	11.074	582.442	0.000	0.000	0.000	0.000
+D+0.750L	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Downward	1	0.3986	11.074	582.442	0.000	0.000	0.000	0.000
+D+0.750L+0.750S	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
+0.60D	Downward	1	0.1185	11.074	582.442	0.000	0.000	0.000	0.000
+0.60D	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
L Only	Downward	1	0.1892	11.074	582.442	0.000	0.000	0.000	0.000
L Only	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000
S Only	Downward	1	0.0789	11.074	582.442	0.000	0.000	0.000	0.000
S Only	Upward	1	0.0000	0.000	582.442	0.000	0.000	0.000	0.000

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	13.900	13.900
D Only	6.888	6.888
+D+L	13.488	13.488
+D+S	9.638	9.638
+D+0.750L	11.838	11.838
+D+0.750L+0.750S	13.900	13.900
+0.60D	4.133	4.133
L Only	6.600	6.600
S Only	2.750	2.750

Steel Section Properties : W16x26

Depth	=	15.700 in	Ixx	=	301.00 in^4	Iyy	=	9.590 in^4
Web Thick	=	0.250 in	Sxx	=	38.40 in^3	Syy	=	3.490 in^3
Flange Width	=	5.500 in	Rxx	=	6.260 in	Ryy	=	5.480 in
Flange Thick	=	0.345 in	Zx	=	44.200 in^3	Zy	=	5.480 in^3
Area	=	7.680 in^2	J	=	0.262 in^4			
Weight	=	26.143 plf						

Composite Section Properties

Span Number	Analysis Plastic N. A. Location	Type	% Shear Connection	Plastic N.A. from Bottom	Sum On Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Slab		100.0	15.700	384.000	35	403.04	301.0	1,157.2	910.2
	PNA in Flange		95.0	15.665	364.800	34	429.47	301.0	1,157.2	900.5
	PNA in Flange		90.0	15.630	345.600	32	420.12	301.0	1,157.2	889.7
	PNA in Flange		85.0	15.595	326.400	30	410.73	301.0	1,157.2	877.6
	PNA in Flange		80.0	15.560	307.200	28	401.29	301.0	1,157.2	864.3
	PNA in Flange		75.0	15.525	288.000	27	391.80	301.0	1,157.2	849.5
	PNA in Flange		70.0	15.491	268.800	25	382.26	301.0	1,157.2	833.1
	PNA in Flange		65.0	15.456	249.600	23	372.67	301.0	1,157.2	815.0
	PNA in Flange		60.0	15.421	230.400	21	363.04	301.0	1,157.2	795.0
	PNA in Flange		55.0	15.386	211.200	20	353.36	301.0	1,157.2	772.9
	PNA in Flange		50.0	15.351	192.000	18	343.63	301.0	1,157.2	748.6



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Composite Steel Beam

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DESCRIPTION: **New Composite Beam 2**

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		45.0	14.497	172.800	16	327.82	301.0	1,157.2	721.7
	PNA in Web		40.0	13.729	153.600	14	316.33	301.0	1,157.2	692.0
	PNA in Web		35.0	12.961	134.400	13	303.61	301.0	1,157.2	659.1
	PNA in Web		30.0	12.193	115.200	11	289.66	301.0	1,157.2	622.7
	PNA in Web		25.0	11.425	96.000	9	274.48	301.0	1,157.2	582.4
Span 1										



Composite Steel Beam

Lic. #: KW-06002858

DESCRIPTION: **Cross Support Beam w/ updated loading**

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-10

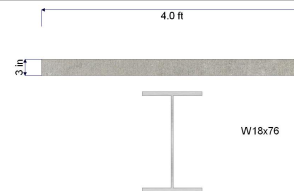
Material Properties

Analysis Method : **Allowable Stress Design**

Beam Bracing : **Beam is Fully Braced against lateral-torsional buckling by attached s**

Load Combination **ASCE 7-10**

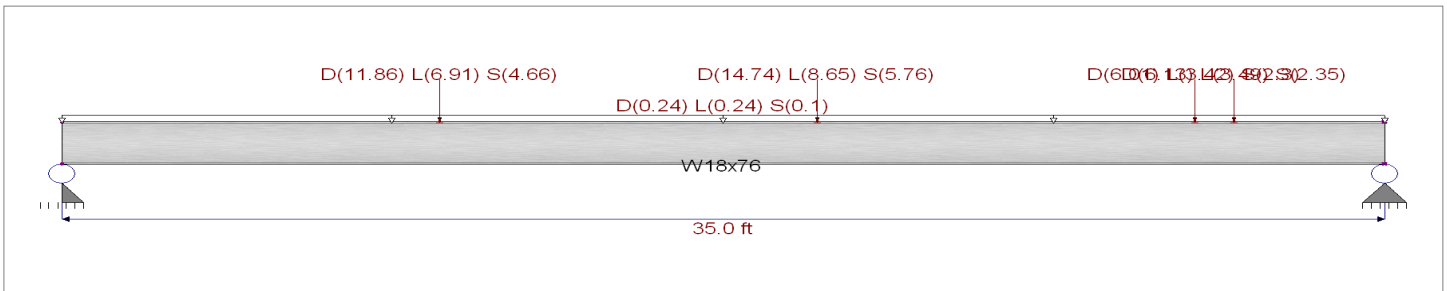
Fy : Steel Yield : **50.0 ksi** E: Modulus : **29,000.0 ksi**



Beam is UNSHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	6.0 in	Concrete f'c	3.0 ksi	Stud Diameter	5/8" in
Effective Width	4.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	10.180 k
Metal Deck ...	ASC, 3W Hi Form	Rib Height	3.0 in	Top Width	7.250 in
Ribs :	Perpendicular	Rib Spacing	12.0 in	Btm Width	4.750 in



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.240, L = 0.240, S = 0.10 k/ft, Tributary Width = 1.0 ft, Post Composite Only

Point Load : D = 11.860, L = 6.910, S = 4.660 k @ 10.0 ft, Post Composite Only

Point Load : D = 14.740, L = 8.650, S = 5.760 k @ 20.0 ft, Post Composite Only

Point Load : D = 6.010, L = 3.420, S = 2.30 k @ 30.0 ft, Post Composite Only

Point Load : D = 6.130, L = 3.490, S = 2.350 k @ 31.0 ft, Post Composite Only

DESIGN SUMMARY

MAX Bending Ratio =	0.955 : 1	MAX Shear Ratio =	0.314 : 1
Steel section	W18x76	Vu : Applied	48.595 k
Composite		Vn/Omega : Allow	154.70 k
% Composite Action	25 %	Location of maximum	35.0 ft
Mu : Applied	445.022 k-ft	Load Combination	+D+0.750L+0.750S
Mn / Omega : Allow	465.784 k-ft		
Location of maximum	19.833 ft		
Load Combination	+D+0.750L+0.750S		
Pre-Composite			
Mu : Applied	11.624 k-ft		
Mn * Phi : Allowable	406.687 k-ft		

Design N.G.

DEFLECTIONS	
FINAL Composite	
Max Downward	1.941 in
Max Upward	0.000 in
Defl Ratio	216 <240
	+D+0.750L+0.750S
Transient Composite	
Max Downward	0.682 in
Max Upward	0.000 in
Defl Ratio	615
	L Only
NonComposite	
Max Downward	0.067 in
Max Upward	0.000 in
Defl Ratio	6253 <240
	PreCompDL+PreCompLL

Shear Stud Requirements

From Support 0 to 19.83 ft use 10 studs.

From 19.83 ft to Support 1 use 10 studs.

Maximum Forces & Stresses for Load Combinations



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Composite Steel Beam

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DESCRIPTION: **Cross Support Beam w/ updated loading**

Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Mu-Applied	MnTr / Omega	Va	Vn / Omega
Pre Composite : D + Const L							
Span L = 35 ft	1	0.029	0.009	11.62	406.69	1.33	154.70
Final Composite : D Only							
Span L = 35 ft	1	0.548	0.141	255.12	465.78	21.88	154.70
Final Composite : +D+L							
Span L = 35 ft	1	0.885	0.230	412.29	465.78	35.61	154.70
Final Composite : +D+S							
Span L = 35 ft	1	0.754	0.194	351.16	465.78	30.02	154.70
Final Composite : +D+0.750L							
Span L = 35 ft	1	0.801	0.208	372.99	465.78	32.17	154.70
Final Composite : +D+0.750L+0.750S							
Span L = 35 ft	1	0.955	0.247	445.02	465.78	38.28	154.70
Final Composite : +0.60D							
Span L = 35 ft	1	0.329	0.085	153.07	465.78	13.13	154.70

Maximum Deflections for Load Combinations - Unfactored Loads

Load Combination	Location in Span (ft)	FINAL	DEFLECTIONS (in)		Added Post Composite	Ixx - Used in^4
			Pre-Composite	NonComposite Removed		
Precomposite	Downward	17.733	0.000	0.0672		1,330.00
Precomposite	Upward	0.000	0.000			1,330.00
NonComposite Removed	Downward	17.733	0.000	0.0672		0.00
NonComposite Removed	Upward	0.000	0.000			0.00
Final Composite : D Only	Downward	17.733	1.051	0.0672	0.067	1,697.81
Final Composite : D Only	Upward	0.000	0.000			1,697.81
Final Composite : +D+L	Downward	17.733	1.733	0.0672	0.067	1,697.81
Final Composite : +D+L	Upward	0.000	0.000			1,697.81
Final Composite : +D+S	Downward	17.733	1.466	0.0672	0.067	1,697.81
Final Composite : +D+S	Upward	0.000	0.000			1,697.81
Final Composite : +D+0.750L	Downward	17.733	1.563	0.0672	0.067	1,697.81
Final Composite : +D+0.750L	Upward	0.000	0.000			1,697.81
Final Composite : +D+0.750L+0.750S	Downward	17.733	1.874	0.0672	0.067	1,697.81
Final Composite : +D+0.750L+0.750S	Upward	0.000	0.000			1,697.81
Final Composite : +0.60D	Downward	17.733	0.631	0.0403	0.040	1,697.81
Final Composite : +0.60D	Upward	0.000	0.000			1,697.81
Final Composite : L Only	Downward	17.733	0.682			1,697.81
Final Composite : L Only	Upward	0.000	0.000			1,697.81
Final Composite : S Only	Downward	17.733	0.415			1,697.81
Final Composite : S Only	Upward	0.000	0.000			1,697.81

Maximum Vertical Reactions - Unfactored

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	38.282	48.595
Precomposite Loads	1.328	1.328
NonComposite Removed	1.328	1.328
Final Composite : D Only	21.876	27.921
Final Composite : +D+L	35.606	45.060
Final Composite : +D+S	30.020	38.346
Final Composite : +D+0.750L	32.174	40.775
Final Composite : +D+0.750L+0.750S	38.282	48.595
Final Composite : +0.60D	13.126	16.752
Final Composite : L Only	13.730	17.140
Final Composite : S Only	8.144	10.426

Steel Section Properties : W18x76

Depth	=	18.200 in	I xx	=	1,330.00 in^4	I yy	=	152.000 in^4
Web Thick	=	0.425 in	S xx	=	146.00 in^3	S yy	=	27.600 in^3
Flange Width	=	11.000 in	R xx	=	7.730 in	R yy	=	2.610 in
Flange Thick	=	0.680 in	Zx	=	163.000 in^3	Zy	=	42.200 in^3
Area	=	22.300 in^2	J	=	2.830 in^4			
Weight	=	75.909 plf						

Composite Section Properties

Span Number	Analysis Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Flange		100.0	17.520	367.200	37	1,007.13	1,330.0	3,044.0	2,351.8
	PNA in Web		95.0	17.093	348.840	35	987.29	1,330.0	3,044.0	2,323.8
	PNA in Web		90.0	16.661	330.480	33	976.63	1,330.0	3,044.0	2,293.9
	PNA in Web		85.0	16.229	312.120	31	965.30	1,330.0	3,044.0	2,262.2



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DESCRIPTION: **Cross Support Beam w/ updated loading**

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Web		80.0	15.797	293.760	29	953.32	1,330.0	3,044.0	2,228.4
	PNA in Web		75.0	15.365	275.400	28	940.67	1,330.0	3,044.0	2,192.6
	PNA in Web		70.0	14.933	257.040	26	927.36	1,330.0	3,044.0	2,154.7
	PNA in Web		65.0	14.501	238.680	24	913.40	1,330.0	3,044.0	2,114.5
	PNA in Web		60.0	14.069	220.320	22	898.77	1,330.0	3,044.0	2,071.9
	PNA in Web		55.0	13.637	201.960	20	883.48	1,330.0	3,044.0	2,026.9
	PNA in Web		50.0	13.205	183.600	19	867.53	1,330.0	3,044.0	1,979.2
	PNA in Web		45.0	12.773	165.240	17	850.92	1,330.0	3,044.0	1,928.9
	PNA in Web		40.0	12.341	146.880	15	833.64	1,330.0	3,044.0	1,875.7
	PNA in Web		35.0	11.909	128.520	13	815.71	1,330.0	3,044.0	1,819.6
	PNA in Web		30.0	11.477	110.160	11	797.11	1,330.0	3,044.0	1,760.3
	PNA in Web		25.0	11.045	91.800	10	777.86	1,330.0	3,044.0	1,697.8

Span 1