AUGUSTINE RESIDENCE

3860 W. MERCER WAY
MERCER ISLAND, WA 98040

STRUCTURAL CALCULATIONS
FOR
EXISTING RESIDENCE ADDITION

Date Signed: 03-30-2025

2021 International Residential Code
2021 International Building Code

PROJECT NAME	
ADDRESS	3860 W. MERCER WAY MERCER ISLAND, WA 98040
PROJECT #	
DATE	3/30/2025

BUILDING CODE

2021 International Residential Code
2021 International Building Code

WIND DESIGN

Vult =	110	MPH
Vasd =	85	MPH
Exposure =	B	
K_{ZT} =	1.00	
Importance Factor =	1.0	

SEISMIC DESIGN

Ss(g) =	1.417	S_{MS}(g) =	1.7	S_{DS}(g) =	1.134
S_1(g) =	0.493				
Seismic Design Category =	D				
Site Class =	D				
Importance Factor =	1.0				

DESIGN LOADING

Roof Snow Load =	25	PSF	
Floor Live Load =	40	PSF	
Bedroom Live Load =	30	PSF	
Deck & Balcony Live Load =	60	PSF	
Roof Dead Load =	15	PSF	
Floor Dead Load =	15	PSF	(For framing gravity design)
Exterior Wall Dead Load =	10	PSF	
Partition Wall Seismic Weight =	10	PSF	
Floor Seismic Weight =	10	PSF	
Allowable Soil Pressure =	1500	PSF	
Lateral Earth (Restrained) Pressure =	50	PCF	
Passive Pressure =	300	PCF	
Coefficient of Friction =	0.4		

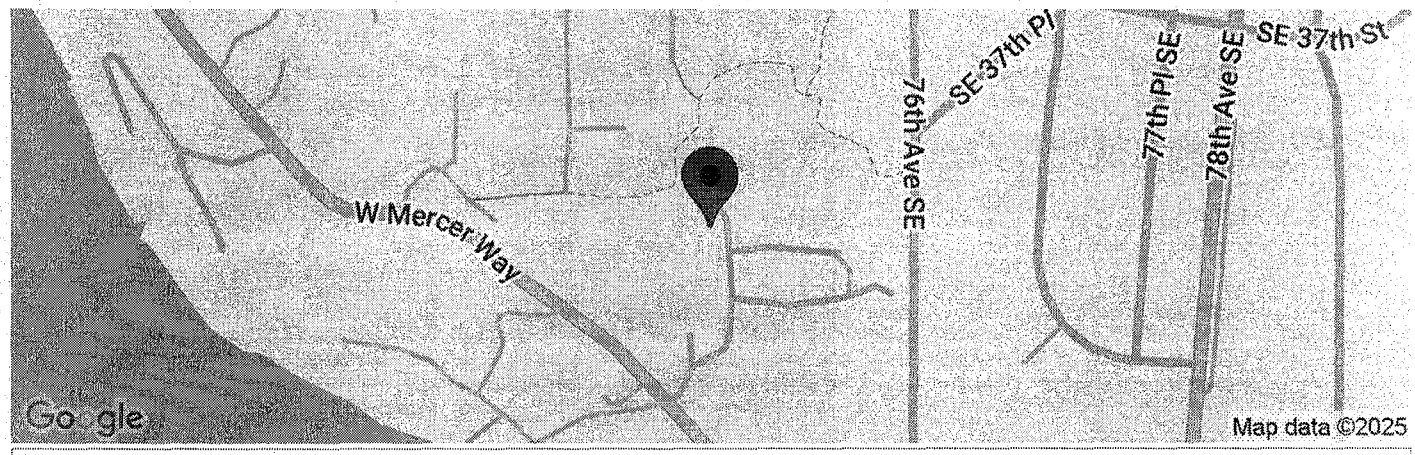
SCOPE OF WORK Existing residence building addition design

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

OSHPD

3860 W Mercer Way, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.576189, -122.2397325



Date	3/29/2025, 9:17:42 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.417	MCE_R ground motion. (for 0.2 second period)
S_1	0.493	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.7	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.134	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.606	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.728	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	1.417	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.571	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	3.515	Factored deterministic acceleration value. (0.2 second)
S1RT	0.493	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.55	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.411	Factored deterministic acceleration value. (1.0 second)

Type	Value	Description
PGAd	1.202	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.606	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.902	Mapped value of the risk coefficient at short periods
C_{R1}	0.897	Mapped value of the risk coefficient at a period of 1 s
C_V	1.383	Vertical coefficient

BUILDING LATERAL DESIGN

ROOF WT: 2621 FT^2 . (15 PSF + 10PSF/2) = 52.4 kips.

ROOF HT: 10' MAX.

ASCE 7-16 Seismic Base Shear

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: MAIN RESIDENCE

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.417 g, 0.2 sec response

S_1 = 0.4930 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Conforms to ASCE 7 Section 12.8.1.3: Regular structure with period of 0.5 s or less, SDS limited to max of 0.7*SDS or 1.0 for calculatior

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec		=	**D** (By Default per 11.4.3)	*ASCE 7-16 Table 20.3-1*
Site Coefficients Fa & Fv	Fa	=	1.20	*ASCE 7-16 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table va	Fv	=	1.81	
Maximum Considered Earthquake Acceleral	S_{MS} = Fa * Ss	=	1.700	*ASCE 7-16 Eq. 11.4-1*
	S_{M1} = Fv * S1	=	0.891	*ASCE 7-16 Eq. 11.4-2*
Design Spectral Acceleration	S_{DS} = S_{MS} * 2/3	=	1.134	*ASCE 7-16 Eq. 11.4-3*
	S_{D1} = S_{M1} * 2/3	=	0.594	*ASCE 7-16 Eq. 11.4-4*
Seismic Design Category		=	**D**	*SCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Bearing Wall Systems**

15.Light-frame (wood) walls sheathed w/wood structural panels rated for shear resistance.

Response Modification Coefficient " I = 6.50

System Overstrength Factor " Wo " = 2.50

Deflection Amplification Factor " Cd " = 4.00

NOTE! See ASCE 7-16 for all applicable footnc

Building height Limits :

Category "A & B" Limit: No Limit

Category "C" Limit: No Limit

Category "D" Limit: Limit = 65

Category "E" Limit: Limit = 65

Category "F" Limit: Limit = 65

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcula All Other Structural Systems

" Ct " value = 0.020 " hn " : Height from base to highest leve 10.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.112 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 6.000 sec

Building Period " Ta " Calculated from Approximate Method sel= 0.112

ASCE 7-16 Seismic Base Shear

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: Seismic Base Shear Analysis

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.134	From Eq. 12.8-2, Preliminary Cs	=	0.154
" R " : Response Modification Factor	=	6.50	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	0.812
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.044

User has selected ASCE 12.8.1.3 : Regular structure, Less than 5 Stories and with T <<= 0.5 sec, SO Ss <= 1.5 for Cs calcul

Cs : Seismic Response Coefficient = = 0.1538

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.1538 from 12.8.1.1

W (see Sum Wi below) = 52.40 k

Seismic Base Shear V = Cs * W = 8.06 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	52.40	10.00	524.00	1.0000	8.06	8.06	0.00

Sum Wi = 52.40 k Sum Wi * Hi = 524.00 k-ft Total Base Shear = 8.06 k

Base Moment = 80.6 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	52.40	8.06	8.06	52.40	8.06	11.88	23.76	11.88	11.88

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

ASCE 7

Wind Loads per ASCE 7 Chapter 28 MWFRS (Envelope Procedure)- Low-Rise Buildings

Input Cells =
Project Number:
Project Name: AUGUSTINE RESIDENCE ADDITION
Location:
Design By:

Program Limitations:
1. Mean roof height *h* less than or equal to 60 ft.
2. Mean roof height *h* does not exceed least horizontal dimension.

BUILDING AND SITE INFORMATION

INPUT

Building width, B =	62	ft (perpendicular to ridge)
Building length, L =	66	ft (parallel to ridge)
Building eave height, h_e =	10	ft
Building ridge height, h_r =	14	ft
Height of parapet, h_p =	10	ft
Roof slope, s =	5.00 in./ft.	= 22.62 degrees
Is roof a gable or hip =	Gable	
Risk Category =	II	
Wind velocity, V =	110	mi/hr = 85 mi/hr (ASD)
Exposure =	B	
Topographic factor, K_{zt} =	1	
Wind directionality factor, K_d =	0.85	
Bldg internal pressure condition =	Enclosed	

OUTPUT

Mean roof height, h =	12	ft
2a =	9.6	ft
h/L =	0.18	
h/B =	0.19	
Internal Pressure Coeff's, GC_{pi} =	0.18	
	-0.18	
Pressure exposure coeff, K_h =	0.7	
Velocity pressure, q_h =	18.43	psf

Design Wind Pressure (LRFD)
17.6 PSF

Bldg. Info.	Height(ft)	Roof		
		10		
	E-W Width	66	ft	
	N-S Width	62	ft	
E-W Vw (kip)	Roof	5.9	Sum (kip)	5.9
N-S Vw (kip)	Roof	5.5	Sum (kip)	5.5

MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)

Wind Pressures for Low-Rise Buildings

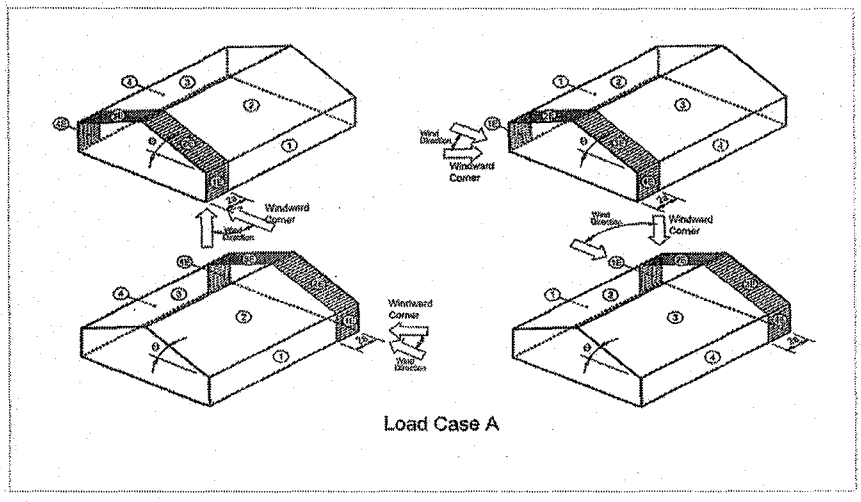
$p = q_h[(GC_{pf}) - (GC_{pi})]$ (lb/ft^2)

Load Case A: Winds Perpendicular to Ridge

Internal pressure = +/- 3.3 psf (LRFD)
+/- 2 psf (ASD)

Bldg Surface	GC_{pf}	Wind Pressure (lb/ft^2)	
		LRFD	ASD
1	0.54	10	6
2	-0.45	-8.3	-5
3	-0.47	-8.7	-5.2
4	-0.41	-7.6	-4.6
1E	0.77	14.2	8.5
2E	-0.72	-13.3	-8
3E	-0.65	-12	-7.2
4E	-0.6	-11.1	-6.7

Note: 1. Sign Convention
positive numbers denote forces toward the surface
negative numbers denote forces away from the surface
2. Minimum wind design loads shall not be less than 16 psf (LRFD) multiplied by wall area of building and 8 psf (LRFD) multiplied by the roof area of the building projected onto a vertical plane normal to the assumed wind direction (see Sect. C27.4.7 & Figure C27.4-1)
3. Internal pressure cancels when Zones 1 & 4 and 1E & 4E are combined, but adds or subtracts at Zones 2 & 3 and 2E & 3E that do not have directly opposing loads.



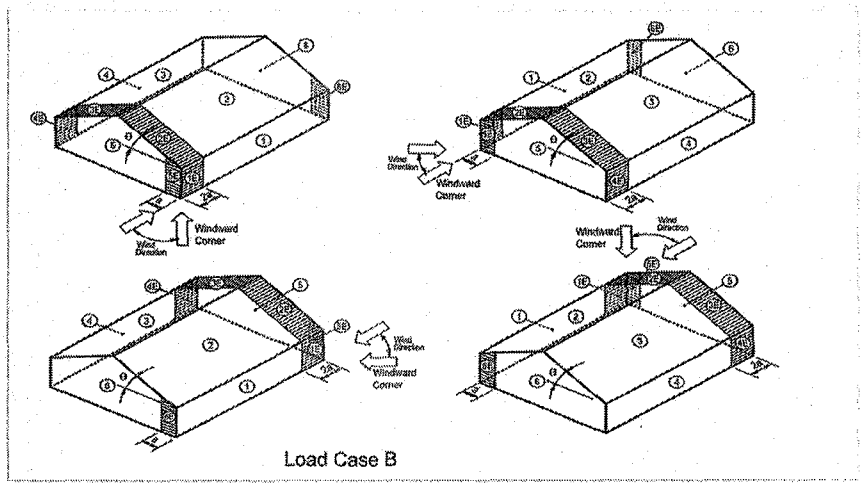
Load Case A

Load Case B: Winds Parallel to Ridge

Bldg Surface	GC_{pf}	Wind Pressure (lb/ft^2)	
		LRFD	ASD
1	-0.45	-8.3	-5
2	-0.69	-12.8	-7.7
3	-0.37	-6.9	-4.1
4	-0.45	-8.3	-5
5	0.4	7.4	4.4
6	-0.29	-5.4	-3.2
1E	-0.48	-8.9	-5.3
2E	-1.07	-19.8	-11.9
3E	-0.53	-9.8	-5.9
4E	-0.48	-8.9	-5.3
5E	0.61	11.3	6.8
6E	-0.43	-8	-4.8

Internal pressure = +/- 3.3 psf (LRFD)
+/- 2 psf (ASD)

Note: 1. *Sign Convention*
positive numbers denote forces toward the surface
negative numbers denote forces away from the surface
2. *Minimum wind design loads shall not be less than 16 psf (LRFD) multiplied by wall area of building (see Sect. C27.4.7 & Figure C27.4-1).*
3. *Internal pressure cancels when Zones 1 & 4 and 1E & 4E are combined, but adds or subtracts at Zones 2 & 3 and 2E & 3E that do not have directly opposing loads.*



Load Case B

MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)

Wind Pressures for Parapets

Pressure exposure coeff, K_z = 0.7
Velocity pressure, q_p = 18.43 psf (LRFD)

$p_p = q_p(GC_{pn})$ (lb/ft^2)

Windward parapets, p_{p_wind} = 27.6 psf (LRFD)
Leeward parapets, p_{p_lee} = -18.4 psf (LRFD)

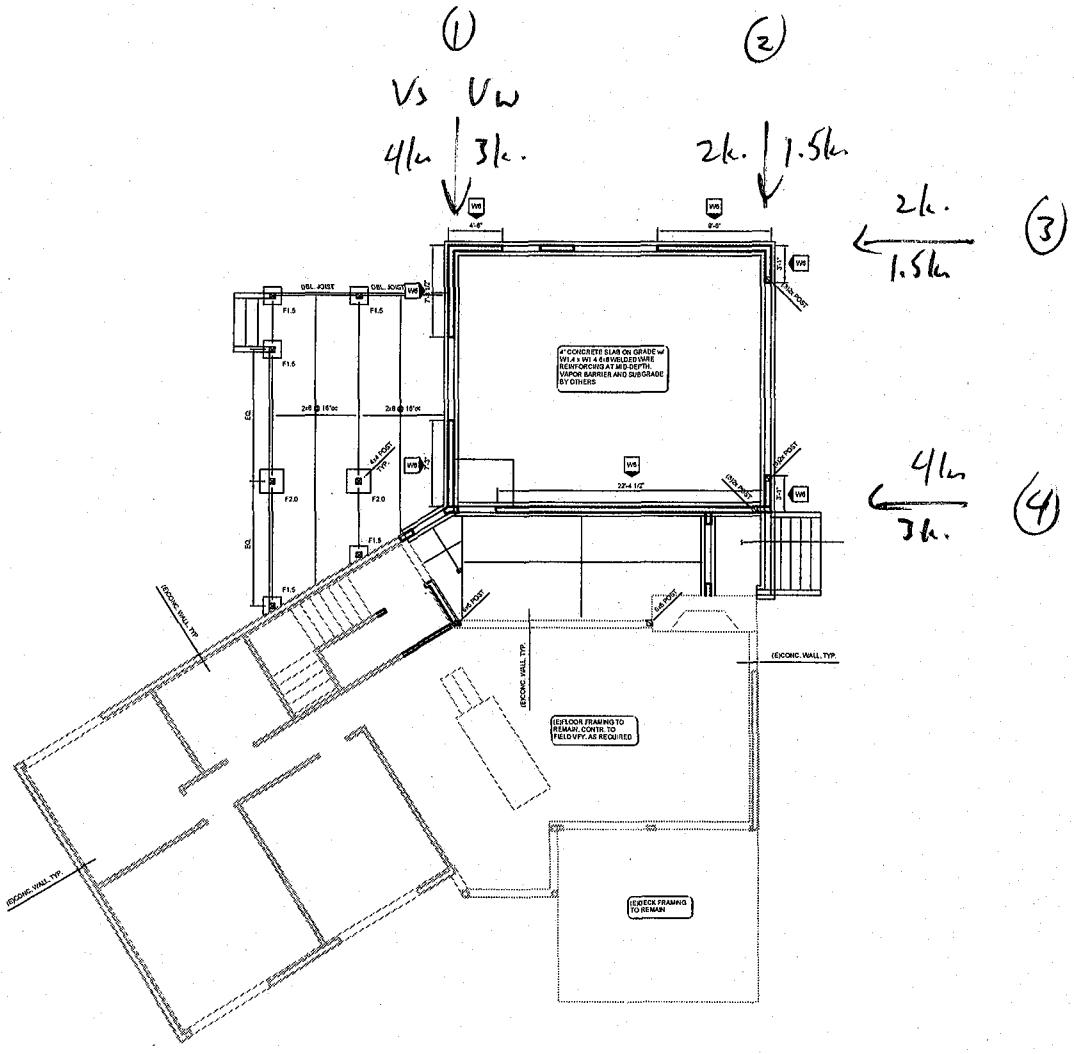
positive numbers signify net pressure acting toward the exterior side of the parapet
negative numbers signify net pressure acting away from the exterior side of the parapet

Wind Pressures for Roof Uplift

Roof uplift load up to 9.6 feet from exterior walls, p = -18.4 psf (LRFD)

Roof uplift load more than 9.6 feet from exterior walls, p = -12 psf (LRFD)

SHEAR WALL DESIGN PLAN.



Wood Shear Wall Design 2021 IBC

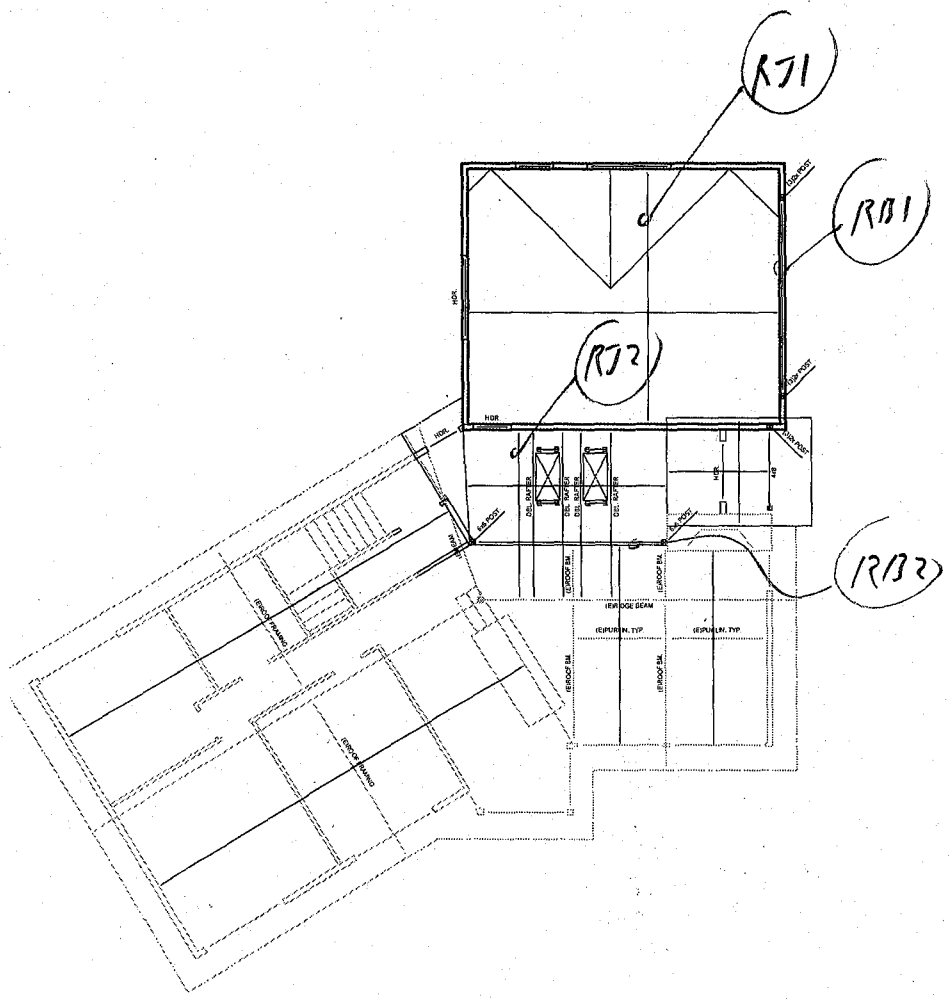
	SW#	Length b(ft)	Height h(ft)	Vseismic (LRFD)(kips)	Vwind (LRFD)(kips)	Aspect Ratio h/b	h/b>2?	Total Design V (ASD)		SW Design	SW Uplift (ASD)	Wall Holdown	Foundation Holdown
Seisc.	SW1	14.92'	10.0'	4.0 k	3.0 k	0.67	N	2.80 k	0.19 klf	W6	1.43 k		STHD10
Seisc.	SW2	6.17'	10.0'	2.0 k	1.50 k	1.62	N	1.40 k	0.23 klf	W6	2.09 k		STHD10
Seisc.	SW3	14.0'	10.0'	2.0 k	1.50 k	0.71	N	1.40 k	0.10 klf	W6	.58 k		Not Reqd*
Seisc.	SW4	22.33'	10.0'	4.0 k	3.0 k	0.45	N	2.80 k	0.13 klf	W6	.58 k		Not Reqd*

SW #	Vs,all (ASD) (kip/ft)	Vw,all (ASD) (kip/ft)
W6	0.26	0.37
W4	0.38	0.53
W3	0.49	0.69
2W6	0.52	0.73
2W4	0.76	1.07
2W3	0.98	1.37
2W2	1.28	1.79

Wall HD	Tall (ASD)(kips)
MSTC28	1.54
MSTC40	3.08
MSTC52	4.62
MSTC66	5.86
MST72	6.73
CMST12x84"	9.215
2xMSTC66	11.72
2xMST72	13.46
2xCMST12x84"	18.43
HD19(SPC.)	19.07

FTG HD	Tall (ASD) (kips)
STHD10	3.40
STHD14	3.82
HDU4	4.57
HDU5	5.65
HDU8	6.97
HDU11	9.34
HDU14	10.77
HD12	12.67
HDU14(SPC.)	14.44
HD12(SPC.)	15.51
HD19	16.77
HD19(SPC.)	19.07

*Holdown not required for uplift less than 1 Kips(ASD)



RJ1, L= 21'6. 1 3/4 x 11 7/8 LSL @ 24" o.c.

RJ2, 2x10 @ 24" o.c.

RB1, L= 16'3, TL= 2' Roof. 3 1/2 x 9 1/2 GLB.

RB2, L= 13'7, TL= 4' Roof. 3 1/2 x 11 1/2 GLB

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: RJ1

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2021

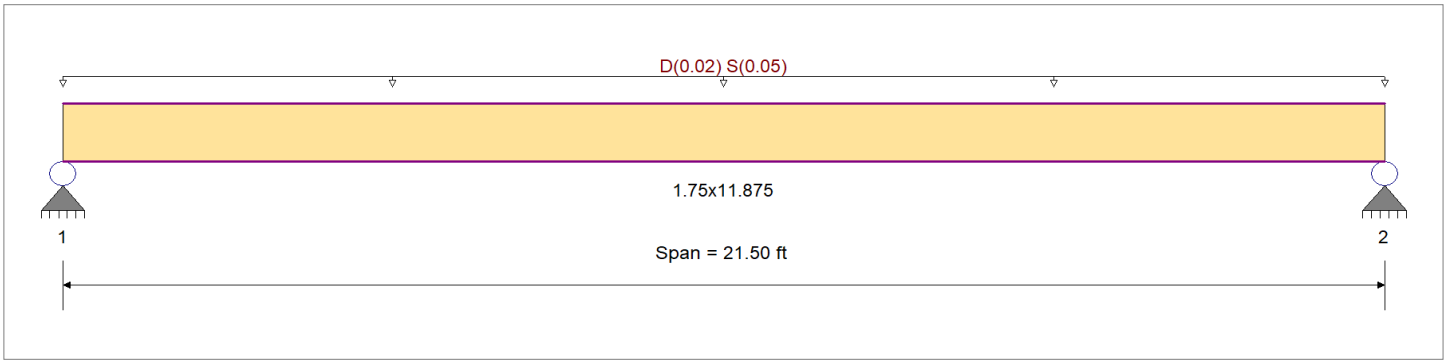
Wood Species : iLevel Truss Joist
Wood Grade : TimberStrand LSL 1.55E

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

Fb +	2325 psi
Fb -	2325 psi
Fc - Prll	2050 psi
Fc - Perp	800 psi
Fv	310 psi
Ft	1070 psi

E : Modulus of Elasticity

Ebend- xx	1550 ksi
Eminbend - xx	787.815 ksi
Density	45.01 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.010, S = 0.0250 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.482 : 1	Maximum Shear Stress Ratio	=	0.152 : 1
Section used for this span		1.75x11.875	Section used for this span		1.75x11.875
fb: Actual	=	1,289.59 psi	fv: Actual	=	54.16 psi
F'b	=	2,676.33 psi	F'v	=	356.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	10.750 ft	Location of maximum on span	=	20.558 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.639 in	Ratio =	0 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	403 <360	n/a
Max Downward Total Deflection	0.977 in	Ratio =	264 >=180	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 21.50 ft	1	0.213	0.067	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	1.53	446.7	2,094.5	0.26	18.8	279.0
+D+S					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 21.50 ft	1	0.482	0.152	1.15	1.00	1.00	1.00	1.001	1.00	1.00	1.00	4.42	1,289.6	2,676.3	0.75	54.2	356.5
+D+0.750S					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 21.50 ft	1	0.403	0.127	1.15	1.00	1.00	1.00	1.001	1.00	1.00	1.00	3.70	1,078.9	2,676.3	0.63	45.3	356.5
+0.60D					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 21.50 ft	1	0.072	0.023	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.92	268.0	3,723.6	0.16	11.3	496.0

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: RJ1

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.9773	10.828		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.822	0.822
Max Upward from Load Combinations	0.822	0.822
Max Upward from Load Cases	0.538	0.538
D Only	0.285	0.285
+D+S	0.822	0.822
+D+0.750S	0.688	0.688
+0.60D	0.171	0.171
S Only	0.538	0.538

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: RB1

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2021

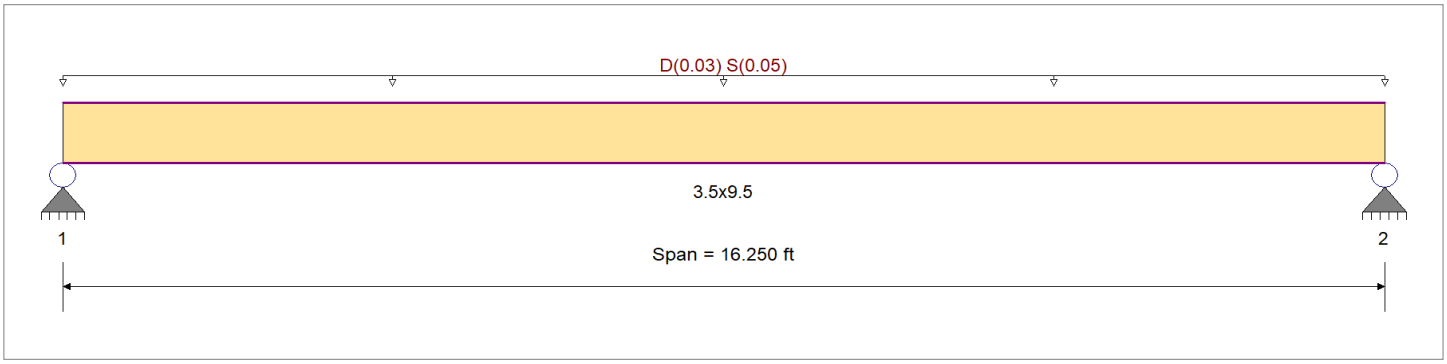
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.238 : 1	Maximum Shear Stress Ratio	=	0.095 : 1
Section used for this span		3.5x9.5	Section used for this span		3.5x9.5
fb: Actual	=	656.12 psi	fv: Actual	=	28.93 psi
F'b	=	2,760.00 psi	F'v	=	304.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	8.125 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.175 in	Ratio =	0	>=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	1112	<360	n/a
Max Downward Total Deflection	0.306 in	Ratio =	637	>=180	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.250 ft	1	0.130	0.052	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.23	279.9	2,160.0	0.27	12.3	238.5
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.250 ft	1	0.238	0.095	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.88	656.1	2,760.0	0.64	28.9	304.8
+D+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.250 ft	1	0.204	0.081	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.47	562.1	2,760.0	0.55	24.8	304.8
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.250 ft	1	0.044	0.017	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.74	168.0	3,840.0	0.16	7.4	424.0

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: RB1

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.3057	8.184		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.709	0.709
Max Upward from Load Combinations	0.709	0.709
Max Upward from Load Cases	0.406	0.406
D Only	0.302	0.302
+D+S	0.709	0.709
+D+0.750S	0.607	0.607
+0.60D	0.181	0.181
S Only	0.406	0.406

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: RB2

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

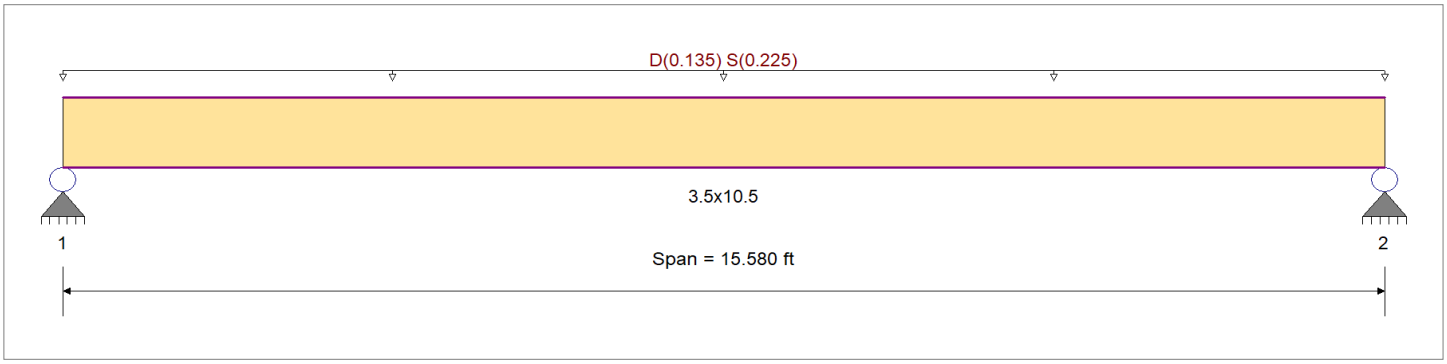
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 9.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.755 : 1	Maximum Shear Stress Ratio	=	0.342 : 1
Section used for this span		3.5x10.5	Section used for this span		3.5x10.5
fb: Actual	=	2,083.23 psi	fv: Actual	=	104.19 psi
F'b	=	2,760.00 psi	F'v	=	304.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	7.790 ft	Location of maximum on span	=	14.727 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.494 in	Ratio =	0 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	378 <360	n/a
Max Downward Total Deflection	0.807 in	Ratio =	231 >=180	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 15.580 ft	1	0.375	0.170	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.34	809.4	2,160.0	0.99	40.5	238.5
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.580 ft	1	0.755	0.342	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	11.16	2,083.2	2,760.0	2.55	104.2	304.8
+D+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.580 ft	1	0.639	0.290	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.46	1,764.8	2,760.0	2.16	88.3	304.8
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.580 ft	1	0.126	0.057	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.60	485.6	3,840.0	0.60	24.3	424.0

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: RB2

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.8073	7.847		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.866	2.866
Max Upward from Load Combinations	2.866	2.866
Max Upward from Load Cases	1.753	1.753
D Only	1.114	1.114
+D+S	2.866	2.866
+D+0.750S	2.428	2.428
+0.60D	0.668	0.668
S Only	1.753	1.753

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: DECK BEAM

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2021

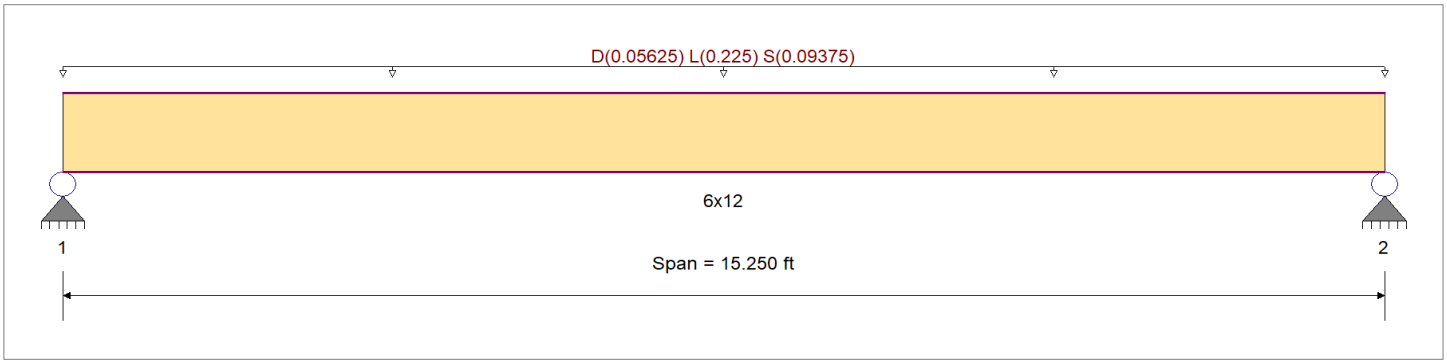
Wood Species : Douglas Fir-Larch
Wood Grade : No.2

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

Fb +	875.0 psi
Fb -	875.0 psi
Fc - Prll	600.0 psi
Fc - Perp	625.0 psi
Fv	170.0 psi
Ft	425.0 psi

E : Modulus of Elasticity

Ebend- xx	1,300.0 ksi
Eminbend - xx	470.0 ksi
Density	31.210 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, L = 0.060, S = 0.0250 ksf, Tributary Width = 3.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.970 : 1	Maximum Shear Stress Ratio	=	0.275 : 1
Section used for this span		6x12	Section used for this span		6x12
fb: Actual	=	848.76 psi	fv: Actual	=	46.72 psi
F'b	=	875.00 psi	F'v	=	170.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.625 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.304 in	Ratio =	0	>=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	602	<360	n/a
Max Downward Total Deflection	0.417 in	Ratio =	438	>=180	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 15.250 ft	1	0.256	0.072	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.03	201.3	787.5	0.47	11.1	153.0
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.250 ft	1	0.970	0.275	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	8.57	848.8	875.0	1.97	46.7	170.0
+D+S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.250 ft	1	0.468	0.133	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.76	471.1	1,006.3	1.09	25.9	195.5
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.250 ft	1	0.628	0.178	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	6.94	686.9	1,093.8	1.59	37.8	212.5
+D+0.750L+0.750S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.250 ft	1	0.884	0.250	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	8.98	889.2	1,006.3	2.06	48.9	195.5

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: DECK BEAM

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.250 ft	**1**	0.086	0.024	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.22	120.8	1,400.0	0.28	6.6	272.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.4174	7.681		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.356	2.356
Max Upward from Load Combinations	2.356	2.356
Max Upward from Load Cases	1.716	1.716
D Only	0.533	0.533
+D+L	2.249	2.249
+D+S	1.248	1.248
+D+0.750L	1.820	1.820
+D+0.750L+0.750S	2.356	2.356
+0.60D	0.320	0.320
L Only	1.716	1.716
S Only	0.715	0.715

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

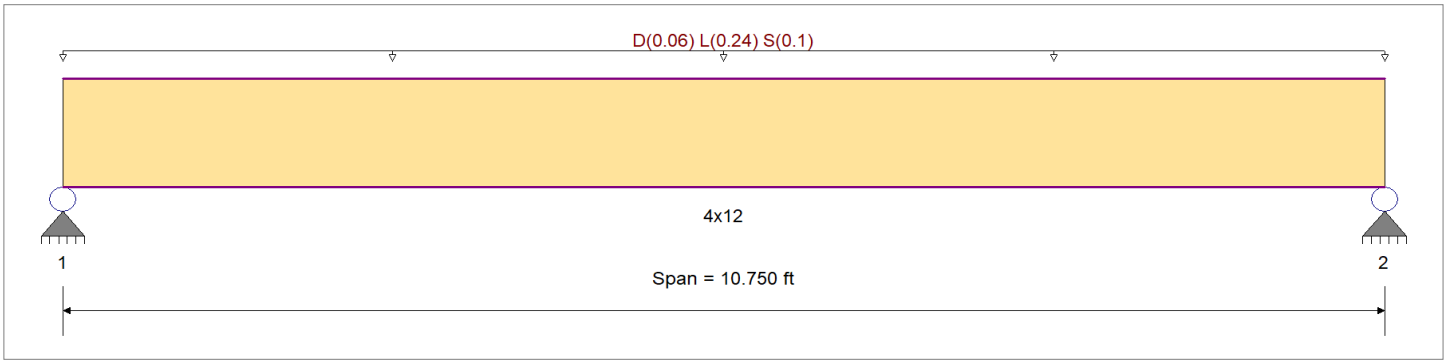
DESCRIPTION: OUTTER DECK BEAM

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	875.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	875.0 psi	Ebend- xx	1,300.0 ksi
		Fc - Prll	600.0 psi	Eminbend - xx	470.0 ksi
Wood Species :	Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade :	No.2	Fv	170.0 psi		
		Ft	425.0 psi	Density	31.210 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, L = 0.060, S = 0.0250 ksf, Tributary Width = 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.753 : 1	Maximum Shear Stress Ratio	=	0.309 : 1
Section used for this span		4x12	Section used for this span		4x12
fb: Actual	=	724.42 psi	fv: Actual	=	52.57 psi
F'b	=	962.50 psi	F'v	=	170.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	5.375 ft	Location of maximum on span	=	9.848 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.134 in	Ratio =	0 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	960 <360	n/a
Max Downward Total Deflection	0.181 in	Ratio =	712 >=180	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 10.750 ft	1	0.186	0.076	0.90	1.00	1.00	1.00	1.100	1.00	1.00	1.00	0.99	160.9	866.3	0.31	11.7	153.0
+D+L					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.750 ft	1	0.753	0.309	1.00	1.00	1.00	1.00	1.100	1.00	1.00	1.00	4.46	724.4	962.5	1.38	52.6	170.0
+D+S					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.750 ft	1	0.357	0.147	1.15	1.00	1.00	1.00	1.100	1.00	1.00	1.00	2.43	395.7	1,106.9	0.75	28.7	195.5
+D+0.750L					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.750 ft	1	0.485	0.199	1.25	1.00	1.00	1.00	1.100	1.00	1.00	1.00	3.59	583.5	1,203.1	1.11	42.3	212.5
+D+0.750L+0.750S					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.750 ft	1	0.686	0.282	1.15	1.00	1.00	1.00	1.100	1.00	1.00	1.00	4.67	759.6	1,106.9	1.45	55.1	195.5

Wood Beam

Project File: AUGUSTINE RESIDENCE ADDITION.ec6

DESCRIPTION: OUTTER DECK BEAM

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
+0.60D					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.750 ft	**1**	0.063	0.026	1.60	1.00	1.00	1.00	1.100	1.00	1.00	1.00	0.59	96.5	1,540.0	0.18	7.0	272.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.1811	5.414		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.739	1.739
Max Upward from Load Combinations	1.739	1.739
Max Upward from Load Cases	1.290	1.290
D Only	0.368	0.368
+D+L	1.658	1.658
+D+S	0.906	0.906
+D+0.750L	1.336	1.336
+D+0.750L+0.750S	1.739	1.739
+0.60D	0.221	0.221
L Only	1.290	1.290
S Only	0.538	0.538