Structural Calculations

for

NEW SINGLE-FAMILY DWELLING

Asdourian Residence

5300 Butterworth Road

Mercer Island, WA 98040

PERMIT SUBMITTAL

prepared by:

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Job No. 23010

Date: 11/1/23

Date: 11/1/2023
Job # 23010

Vertical Design Loads

Truss Roof		
Metal Roofing	1	psf
5/8" Plywood	2	
Trusses	3	
Insulation	1	
5/8" Gypsum Board	2.8	
Future Solar Panels	4	*
Sum	13.8	psf
Slope:	7	:12
Slope Correction Factor	1.16	
Subtotal	16	psf
M/E/P/misc.	2	psf
DL=	18	psf
LL=	20	psf
SL=	25	psf

Attic w/ Limited Storage

**As required for solar-ready zone per WA State Building Building Code Amendments*

Stick-Framed Roof		
Metal Roofing	1	psf
5/8" Plywood	2	
Rafters	1.9	
Insulation	1	
5/8" Gypsum Board	2.8	
Sum	8.7	psf
Slope:	11	:12
Slope Correction Factor	1.36	
Subtotal	11.8	psf
M/E/P/misc.	1.2	psf
DL=	13	psf
SL=	25	psf

Upper Floor		
Flooring	4	psf
1-1/8" Plywood	3.2	
Joists	2.5	
5/8" Gypsum Board	2.8	
M/E/P/misc.	1.5	
DL=	14	psf
LL=	40	psf

Living Areas

Roof Deck		
Built-up Decking	8	psf
3/4" Plywood	2.4	
Joists	3	
5/8" Gypsum Board	2.8	
M/E/P/misc.	1.8	
DL=	18	psf
LL=	60	psf

Decks

Main Floor		
Flooring	4	psf
8" Concrete Slab	100	
M/E/P/misc.	6	
DL=	110	psf
LL=	40	psf
LL=	60	psf
LL=	3000	lbs

Living Areas
Patio
Garage

Exterior Walls - Stone		
2" Stone Veneer	28	psf
1/2" Plywood	1.6	
2x6 @16"o.c.	1.4	
Batt Insulation	0.2	
1/2" Gypsum Board	2.2	
M/E/P/misc.	1.6	
DL=	35	psf

Exterior Walls - Stucco		
Stucco Siding	10	psf
1/2" Plywood	1.6	
2x6 @16"o.c.	1.4	
Batt Insulation	0.2	
1/2" Gypsum Board	2.2	
M/E/P/misc.	1.6	
DL=	17	psf

Exterior Walls - Cement Board		
Cement Board Siding	3	psf
1/2" Plywood	1.6	
2x6 @16"o.c.	1.4	
Batt Insulation	0.2	
1/2" Gypsum Board	2.2	
M/E/P/misc.	1.6	
DL=	10	psf

Interior Walls		
2 Layers 1/2" Gypsum Board	4.4	psf
2x4 @16"o.c.	0.9	
M/E/P/misc.	1.7	
DL=	7	psf

Date: 11/1/2023
Job # 23010

Seismic Design Loads

Seismic Design Parameters (ASCE 7-16 Section 12.8.1)

Approximate Fundamental Period

$T = T_a = C_t h_n^x$

where:

C_t =	0.02	
h_n =	24	
x =	0.75	
T =	0.22	s

Seismic Response Coefficient

S_s =	1.44	
S_1 =	0.50	
S_{ds} =	1.15	
S_{d1} =	0.50	
R =	6.5	
ρ =	1	
Ω =	2.5	
C_d =	4	
I_e =	1	

$C_s = S_{ds}/(R/I_e)$ = 0.18 W

T_L = 6 s > T

$C_{s,max} = S_{d1}/[T(R/I_e)]$ = 0.35

$C_{s,min} = 0.044 S_{ds} I_e$ = 0.051

$C_{s,min}$ = 0.01

S_1 < 0.6

$C_{s,min} = 0.5 S_1/(R/I_e)$ = 0.038 **Ignore**

$C_{s,min,gov}$ = 0.051

$C_{s,gov}$ = 0.18 (LRFD)

Effective Seismic Weight				
Floor	Area (sf)	w_{floor} (psf)	w_{walls} (psf)[1]	W (lbs)
Roof	4250	18	12	127500
Upper	5100	14	24	193800
			Sum:	**321300 lbs**

[1]Includes weight of interior/exterior walls as uniform area load

Base Shear (includes ρ) - LRFD Level			
$\rho V = \rho C_s W$ =	0.177	W =	**56845 lbs**

Vertical Distribution of Base Shear (ASCE 7-16 Section 12.8.3) - LRFD Level						
Floor	W_x (lbs)	h_x (ft)	$w_x h_x^k$	C_{vx}	F_x (lbs)	F_x (psf)
Roof	127500	24	3060000	0.61	**34803**	**8.2**
Upper	193800	10	1938000	0.39	**22042**	**4.3**
		Sum:	4998000		56845	

Where k = 1

Diaphragm Forces (ASCE 7-16 Section 12.10.1.1, ρ = 1.0) - LRFD Level						
Floor	F_i (lbs)	$\sum F_i$	W_i (lbs)	$\sum W_i$	$\sum F_i / \sum W_i$	F_{px} (lbs)
Roof	34803	34803	127500	127500	0.27	34803
Upper	22042	56845	193800	321300	0.18	34288

Floor	F_{px} Min (lbs)	F_{px} Max (lbs)	F_{px} Gov (lbs)	F_{px} Gov (psf)
Roof	29325	58650	**34803**	**8.2**
Upper	44574	89148	**44574**	**8.7**

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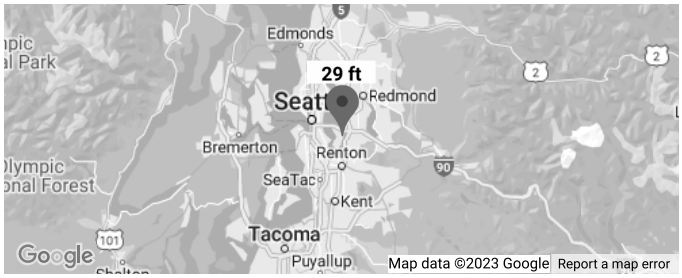
Hazards by Location

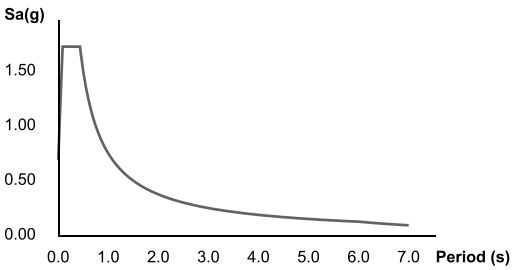
Search Information

Address:	5300 Butterworth Rd, Mercer Island, WA 98040, USA
Coordinates:	47.55587329999999, -122.209765
Elevation:	29 ft
Timestamp:	2023-07-18T18:52:33.111Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	C

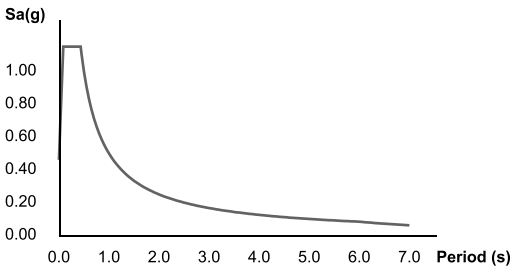
OK TO USE SITE CLASS C VALUES FOR SITE CLASS E PER ASCE 7-16 SECTION 11.4.8 EXCEPTION 1



MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.437	MCE_R ground motion (period=0.2s)
S_1	0.499	MCE_R ground motion (period=1.0s)
S_{MS}	1.724	Site-modified spectral acceleration value
S_{M1}	0.748	Site-modified spectral acceleration value
S_{DS}	1.15	Numeric seismic design value at 0.2s SA
S_{D1}	0.499	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.899	Coefficient of risk (1.0s)
PGA	0.615	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.738	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.437	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.593	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	4.119	Factored deterministic acceleration value (0.2s)
S1RT	0.499	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.555	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)

ASCE 7-16 Wind Forces, Chapter 27, Part 1

Project File: 23010_ASD.ec6

DESCRIPTION: Wind Loads

MWFRS

Basic Values

Risk Category	2	per ASCE 7-16 Table 1.5-1	Horizontal Dim. in North-South Direction (B or L)	=	69.0 ft
V : Basic Wind Speed	98.0	per ASCE 7-16 Fig. 26.5-1 & 26.5-2	Horizontal Dim. in East-West Direction (B or L)		97.0 ft
Kd : Directionality Factor	0.850	per ASCE 7-16 Table 26.6-1	h : Mean Roof height	=	24.0 ft

Exposure Category per ASCE 7-16 Section 26.7

North : Exposure C East : Exposure C
South : Exposure C West : Exposure C

Topographic Factor per ASCE 7-16 Sec 26.8 & Figure 26.8-1

North : K1 = K2 = K3 = Kzt = 1.000
South : K1 = K2 = K3 = Kzt = 1.000
East : K1 = K2 = K3 = Kzt = 1.000
West : K1 = K2 = K3 = Kzt = 1.000

Building Period & Flexibility Category

User has specified the building frequency is >= 1 Hz, therefore considered RIGID for both North-South and East-West directions.

Building Story Data

Level Description	hi ft	Story Ht ft	E_R : X ft	E_R : X ft
Roof	24.00	14.00	0.000	0.000
Upper	10.00	10.00	0.000	0.000

Gust Factor

For wind coming from direction indicated

North = **0.850** South = **0.850**
East = **0.850** West = **0.850**

Enclosure

Check if Building Qualifies as "Open"

	North Wall	South Wall	East Wall	West Wall	Roof	Total
Agross	1.0 ft^2	1.0 ft^2	1.0 ft^2	1.0 ft^2	1.0 ft^2	5.0 ft^2
Aopenings	0.0 ft^2	0.0 ft^2	0.0 ft^2	0.0 ft^2	0.0 ft^2	0.0 ft^2
Aopenings >= 0.8 * Agross ?	No	No	No	No		

All four Agross values must be non-zero **Building does NOT qualify as "Open"**

User has specified the Building is to be considered Enclosed when NORTH elevation receives positi

User has specified the Building is to be considered Enclosed when SOUTH elevation receives positi

User has specified the Building is to be considered Enclosed when EAST elevation receives positive

User has specified the Building is to be considered Enclosed when WEST elevation receives positive

Velocity Pressures

When the following walls experience leeward or sidewall pressures, the value of Kh shall be (per Table 26.10-1) :

North Wall = 0.9372 psf South Wall = 0.9372 psf East Wall = 0.9372 psf West Wall = 0.9372 psf

When the following walls experience leeward or sidewall pressures, the value of qh shall be (per Eq 26.10-1) :

North Wall = 19.585 psf South Wall = 19.585 psf East Wall = 19.585 psf West Wall = 19.585 psf

qz : Windward Wall Velocity Pressures at various heights per Eq. 27.3-1

Height Above Base (ft)	North Elevation Kz	North Elevation qz	South Elevation Kz	South Elevation qz	East Elevation Kz	East Elevation qz	West Elevation Kz	West Elevation qz
0.00	0.849	17.74	0.849	17.74	0.849	17.74	0.849	17.74
5.00	0.849	17.74	0.849	17.74	0.849	17.74	0.849	17.74
10.00	0.849	17.74	0.849	17.74	0.849	17.74	0.849	17.74
15.00	0.849	17.74	0.849	17.74	0.849	17.74	0.849	17.74

ASCE 7-16 Wind Forces, Chapter 27, Part 1

DESCRIPTION: Wind Loads

20.00	0.902	18.85	0.902	18.85	0.902	18.85	0.902	18.85

Pressure Coefficients

GCpi Values when elevation receives positive external pressure

GCpi : Internal pressure coefficient, per sec. 26.13 and Table 26.13-1

North		South		East		West	
+/-	0.180	+/-	0.180	+/-	0.180	+/-	0.180

Specify Cp Values from Figure 27.3-1 for Windward, Leeward & Side Walls

Cp Values when elevation receives positive external pressure

	North	South	East	West
Windward Wall	0.80	0.80	0.80	0.80
Leeward Wall	-0.50	-0.50	-0.50	-0.50
Side Walls	-0.70	-0.70	-0.70	-0.70

Wind Pressures

Wind Pressures when NORTH Elevation receives positive external wind pressure

	Positive Internal	Negative Internal
Leeward Wall Pressures	-11.849 psf	-4.798 psf
Side Wall Pressures	-15.179 psf	-8.128 psf

Windward Wall Pressures . . Height Above Base (ft)	Positive Internal Pressure (psf)	Negative Internal Pressure (psf)
0.00	8.54	15.59
5.00	8.54	15.59
10.00	8.54	15.59
15.00	8.54	15.59
20.00	9.29	16.34

Wind Pressures when SOUTH Elevation receives positive external wind pressure

	Positive Internal	Negative Internal
Leeward Wall Pressures	-11.849 psf	-4.798 psf
Side Wall Pressures	-15.179 psf	-8.128 psf

Windward Wall Pressures . . Height Above Base (ft)	Positive Internal Pressure (psf)	Negative Internal Pressure (psf)
0.00	8.54	15.59
5.00	8.54	15.59
10.00	8.54	15.59
15.00	8.54	15.59
20.00	9.29	16.34

Wind Pressures when EAST Elevation receives positive external wind pressure

	Positive Internal	Negative Internal
Leeward Wall Pressures	-11.849 psf	-4.798 psf
Side Wall Pressures	-15.179 psf	-8.128 psf

Windward Wall Pressures . . Height Above Base (ft)	Positive Internal Pressure (psf)	Negative Internal Pressure (psf)
0.00	8.54	15.59
5.00	8.54	15.59
10.00	8.54	15.59
15.00	8.54	15.59
20.00	9.29	16.34

ASCE 7-16 Wind Forces, Chapter 27, Part 1

DESCRIPTION: Wind Loads

Wind Pressures when WEST Elevation receives positive external wind pressure

	Positive Internal	Negative Internal
Leeward Wall Pressures	-11.849 psf	-4.798 psf
Side Wall Pressures	-15.179 psf	-8.128 psf

Windward Wall Pressures . .

Height Above Base (ft)	Positive Internal Pressure (psf)	Negative Internal Pressure (psf)
0.00	8.54	15.59
5.00	8.54	15.59
10.00	8.54	15.59
15.00	8.54	15.59
20.00	9.29	16.34

Story Forces for Design Wind Load Cases

Values below are calculated based on a building with dimensions B x L x h as defined on the "Basic Values" tab.

Load Case	Windward Wall	Building level	Ht. Range	Trib. Height	Wind Shear Components (k) In "Y" Direction	In "X" Direction	Eccentricity for "Y" Shear	(ft) "X" Shear	Mt, (ft-k)
CASE 1	North	Level 2	17.00' -> 24.0	7.00	-14.39	---	---	---	---
CASE 1	North	Level 1	5.00' -> 17.0	12.00	-23.76	---	---	---	---
CASE 1	South	Level 2	17.00' -> 24.0	7.00	14.39	---	---	---	---
CASE 1	South	Level 1	5.00' -> 17.0	12.00	23.76	---	---	---	---
CASE 1	East	Level 2	17.00' -> 24.0	7.00	---	-10.24	---	---	---
CASE 1	East	Level 1	5.00' -> 17.0	12.00	---	-16.90	---	---	---
CASE 1	West	Level 2	17.00' -> 24.0	7.00	---	10.24	---	---	---
CASE 1	West	Level 1	5.00' -> 17.0	12.00	---	16.90	---	---	---
CASE 2	North	Level 2	17.00' -> 24.0	7.00	-10.79	---	---	14.24	153.7
CASE 2	North	Level 1	5.00' -> 17.0	12.00	-17.82	---	---	14.24	253.7
CASE 2	South	Level 2	17.00' -> 24.0	7.00	10.79	---	---	14.24	153.7
CASE 2	South	Level 1	5.00' -> 17.0	12.00	17.82	---	---	14.24	253.7
CASE 2	East	Level 2	17.00' -> 24.0	7.00	---	-7.68	10.03	---	-77.0
CASE 2	East	Level 1	5.00' -> 17.0	12.00	---	-12.68	10.03	---	127.2
CASE 2	West	Level 2	17.00' -> 24.0	7.00	---	7.68	10.03	---	-77.0
CASE 2	West	Level 1	5.00' -> 17.0	12.00	---	12.68	10.03	---	127.2
CASE 3	North & East	Level 2	17.00' -> 24.0	7.00	-10.79	-7.68	---	---	---
CASE 3	North & East	Level 1	5.00' -> 17.0	12.00	-17.82	-12.68	---	---	---
CASE 3	North & West	Level 2	17.00' -> 24.0	7.00	-10.79	7.68	---	---	---
CASE 3	North & West	Level 1	5.00' -> 17.0	12.00	-17.82	12.68	---	---	---
CASE 3	South & West	Level 2	17.00' -> 24.0	7.00	10.79	7.68	---	---	---
CASE 3	South & West	Level 1	5.00' -> 17.0	12.00	17.82	12.68	---	---	---
CASE 3	South & East	Level 2	17.00' -> 24.0	7.00	10.79	-7.68	---	---	---
CASE 3	South & East	Level 1	5.00' -> 17.0	12.00	17.82	-12.68	---	---	---
CASE 4	North & East	Level 2	17.00' -> 24.0	7.00	-8.10	-5.76	10.03	14.24	173.2
CASE 4	North & East	Level 1	5.00' -> 17.0	12.00	-13.38	-9.52	10.03	14.24	285.9
CASE 4	North & West	Level 2	17.00' -> 24.0	7.00	-8.10	5.76	10.03	14.24	173.2
CASE 4	North & West	Level 1	5.00' -> 17.0	12.00	-13.38	9.52	10.03	14.24	285.9

ASCE 7-16 Wind Forces, Chapter 27, Part 1

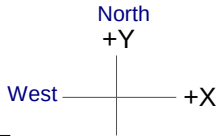
Project File: 23010_ASD.ec6

DESCRIPTION: Wind Loads

CASE 4	South & West	Level 2	17.00' ->	24.0	7.00	8.10	5.76	10.03	14.24	173.2
CASE 4	South & West	Level 1	5.00' ->	17.0(	12.00	13.38	9.52	10.03	14.24	285.9
CASE 4	South & East	Level 2	17.00' ->	24.0	7.00	8.10	-5.76	10.03	14.24	173.2
CASE 4	South & East	Level 1	5.00' ->	17.0(	12.00	13.38	-9.52	10.03	14.24	285.9
Min per ASCE 27.1.	North	Level 2	17.00' ->	24.0	7.00	-10.86	---	---	---	---
Min per ASCE 27.1.	North	Level 1	5.00' ->	17.0(	12.00	-18.62	---	---	---	---
Min per ASCE 27.1.	South	Level 2	17.00' ->	24.0	7.00	10.86	---	---	---	---
Min per ASCE 27.1.	South	Level 1	5.00' ->	17.0(	12.00	18.62	---	---	---	---
Min per ASCE 27.1.	East	Level 2	17.00' ->	24.0	7.00	---	-7.73	---	---	---
Min per ASCE 27.1.	East	Level 1	5.00' ->	17.0(	12.00	---	-13.25	---	---	---
Min per ASCE 27.1.	West	Level 2	17.00' ->	24.0	7.00	---	7.73	---	---	---
Min per ASCE 27.1.	West	Level 1	5.00' ->	17.0(	12.00	---	13.25	---	---	---

Base Shear for Design Wind Load Cas

Values below are calculated based on a building with dimensions B x L x h as defined on the "General" tab.



Load Case	Windward Wall	Leeward Wall	Wind Base Shear Components (k) In "Y" Direction	In "X" Direction		Mt, (ft-k)
Case 1	North	South	-38.15	---		---
Case 1	South	North	38.15	---		---
Case 1	East	West	---	-27.14		---
Case 1	West	East	---	27.14		---
Case 2	North	South	-28.62	---	/-	407.4
Case 2	South	North	28.62	---	/-	407.4
Case 2	East	West	---	-20.36	/-	204.2
Case 2	West	East	---	20.36	/-	204.2
Case 3	North & East	South & West	-28.62	-20.36		---
Case 3	North & West	South & East	-28.62	20.36		---
Case 3	South & West	North & East	28.62	20.36		---
Case 3	South & East	North & West	28.62	-20.36		---
Case 4	North & East	South & West	-21.48	-15.28	/-	459.1
Case 4	North & West	South & East	-21.48	15.28	/-	459.1
Case 4	South & West	North & East	21.48	15.28	/-	459.1
Case 4	South & East	North & West	21.48	-15.28	/-	459.1
Min per ASCE 27.1.5	North	South	-29.49	---		---
Min per ASCE 27.1.5	South	North	29.49	---		---
Min per ASCE 27.1.5	East	West	---	-20.98		---
Min per ASCE 27.1.5	West	East	---	20.98		---

ASCE 7-16 Wind Forces Chpt 28, Pt2 & Chpt 30, Pt2

Project File: 23010_ASD.ec6

LIC# : KW-06018000, Build:20.23.05.25 O.G. ENGINEERING, PLLC (c) ENERCALC INC 1983-2023

DESCRIPTION: C&C

General Design Values

Calculations per ASCE 7-16

V : Basic Wind Speed per Sect 26.5-1 or 2	**98.0**	mph
User specified minimum design pressu	16.0	psf
Occupancy per Table 1.5-1	II	All Buildings and other structures except those listed
Exposure Category per 26.7	Exposure C	
Topographic Factor Kzt per 26.8	1.00	

Component & Cladding Values

Effective Wind Area of Component & Clad	55.0	ft^2
Roof pitch for cladding pressu	Hip Roof > 27 to 45	
LHD : Least Horizontal Dimension	69.0	ft
a = max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))	6.90	ft
Lambda Component & Cladding : per Figur	1.40	

ASCE 7-16 Wind Forces Chpt 28, Pt2 & Chpt 30, Pt2

Project File: 23010_ASD.ec6

LIC# : KW-06018000, Build:20.23.05.25 O.G. ENGINEERING, PLLC (c) ENERCALC INC 1983-2023

DESCRIPTION: C&C

Component & Cladding Design Wind Press

*Design Wind Pressure = Lambda * Kzt * Ps30 pe*

Roof Pressures	Positive	Negative		Overhang Pressures	Negative	
Zone 1	16.000	-25.292	psf	Zone 1	-36.697	psf
Zone 1'	***	***	psf	Zone 1'	***	psf
Zone 2	***	***	psf	Zone 2	***	psf
Zone 2e	16.000	-21.160	psf	Zone 2e	-33.572	psf
Zone 2n	***	***	psf	Zone 2n	***	psf
Zone 2r	16.000	-32.836	psf	Zone 2r	-42.347	psf
Zone 3	16.000	-24.192	psf	Zone 3	-36.904	psf
Zone 3e	***	***	psf	Zone 3e	***	psf
Zone 3r	***	***	psf	Zone 3r	***	psf

Wall Pressures

Wall Zone 4 :	21.538	-23.582	psf
Wall Zone 5 :	21.538	-27.087	psf

'*** : There is no value in Figure 30.4-1 Tabular Values

GOVERNING LATERAL LOAD IN MLFRS

SEISMIC BASE SHEAR

$V_{SEISMIC} = \frac{76845^{\#}}{LEFD}$

WIND BASE SHEAR

$V_{WIND} = \frac{38150^{\#}}{LEFD}$

→ $V_{SEISMIC} > V_{WIND}$

∴ SEISMIC GOVERNS MLFRS DESIGN

ROOF FRAMING (ELEMENTS NOT EXPLICITLY CALC'D BY INSPECTION)

RB2 ROOF BEAM

SPAN = 7'-6" $w = \left(\frac{18}{DL} + \frac{25}{LL}\right)(15\text{psf})\left(\frac{20'}{2}\right) + \left(\frac{20}{LL}\right)\left(\frac{17'}{2}\right) = \frac{1800}{DL} + \frac{1400}{LL} + \frac{200\#/ft}{SL}$

USE 3½ x 9½ LVL

RH3 INTERIOR HEADER

SPAN = 7'-6" $P = \left(\frac{13}{DL} + \frac{25}{LL}\right)\left(\frac{13'}{2}\right)\left(\frac{15'}{2}\right) = \frac{630}{DL} + \frac{1201\#}{SL}$ (CONCENTRATED) @ CRIPPLE SPAN

USE 4-2

RH5 CATHEDRAL CEILING HEADER

SPAN = 10'-0" $P = \left(\frac{13}{DL} + \frac{25}{LL}\right)\left(\frac{17'-6"}{2}\right)\left(\frac{12'-6"}{2}\right) = \frac{1000}{DL} + \frac{1915\#}{SL}$ @ TRUSS

USE HSS 8x4x¼

RH7 EXTERIOR HEADER

SPAN = 8'-0" $W_1 = \frac{18+25}{DL\ LL}$ psf TRIB = $\frac{28'}{2} = 14'$

USE 3½ x 9½ LVL $W_2 = \frac{20}{LL}$ psf TRIB = $\frac{10'}{2} = 5'$

RB8 ROOF BEAM

SPAN = 24'-6" $W_1 = \frac{18+25}{DL\ LL}$ psf TRIB = 14'

USE 5½ x 22 PSL $W_2 = \frac{13+25}{DL\ LL}$ psf TRIB = $\frac{9'-6"}{2} = 4'-9"$ FROM x=0' TO 11'-6"

WIND UPLIFT = $0.6\left(\frac{5900}{WL} - \frac{3920\#}{DL}\right) = 1190\#$

$P_1 = \left(\frac{13+25}{DL\ LL} \text{psf}\right)\left(\frac{6'-6"}{2}\right)\left(\frac{9'-6"}{2}\right) = \frac{2000}{DL} + \frac{3400\#}{LL}$ CK = 11'-6"

USE 'LCE4' OR 'AC6' $P_2 = \left(\frac{13+25}{DL\ LL}\right)\left(\frac{13'}{2}\right)\left(\frac{16'-6"}{2}\right) = \frac{2001}{DL} + \frac{1340\#}{SL}$ CK = 18'

WOOD FOR 1995/200# OF $W_3 = \frac{20}{LL}$ psf TRIB = 5'

WORST CASE WIND UPLIFT @ END BEAM

RB 9 Roof Beam

SPAN = 15 1/4" W = 13+25 psf TRIB = 13 1/4" / 2 = 6 1/4"
USE 5 1/2 x 11 1/4 PSL W2 = 20 plf TRIB = 10'/2 = 5'

RR 11 Steel Roof Rafters

SPAN = 10 1/2" W = 13+25 psf USE 2x10 @ 24" o.c.

RB 13 Hip Beam (NOT USED)

SPAN = 14 1/2" W = (13+25)(1'/2) = 10+10 #/ft ecc = 0'
USE 13/4 x 11 7/8 LVL = (13+25)(13 1/4"/2) = 140+260* ecc = 14)

RB 14 Ridge Beam

SPAN = 21'0" W = 13+25 psf TRIB = 13'/2 = 6'6"
USE 5 1/2 x 11 7/8 PSL

RH 18 Transom Header

SPAN = 10 1/2" W = 27 plf TRIB = 11'/2 = 5'6"
USE 5 1/2 x 5 1/2 PSL HDR

RB 19 Roof Beam

SPAN = 9'6" W = 13+25 psf TRIB = 6'6"/2 = 3'3"
USE TRPL 13/4 x 9 1/2 LVL

UPPER FLOOR POSTS (ELEMENTS NOT EXPLICITLY CALL'D OUT BY INSPECTION)

POST SUPPORTING RB8

H = 9' P = 3920 (DL) + 1231 (LL) + 5900 (SL) # USE 3 1/2" x 5 1/4" PSL

UPPER FLOOR FRAMING

(ELEMENTS NOT EXPLICITLY CALC'D OK BY INSPECTION)

(UFJ1) UPPER FLOOR JOISTS

MAX SPAN = 11'-9" $w = \frac{14}{DL} + \frac{40}{LL}$ psf — USE 14" TJI 210 @ 16" o.c.

$P = [(\frac{18}{DL} + \frac{25}{SL})(\frac{21'}{2}) + (\frac{20}{LL})(\frac{14'}{2}) + (\frac{10}{DL})(10')](16")$
$= 390 + \frac{140}{LL} + \frac{350}{SL}$ # @ x = 8'

(UFJ2) UPPER FLOOR JOISTS

MAX SPAN = 17'-6" $w = \frac{14}{DL} + \frac{40}{LL}$ psf — USE 14" TJI 360 @ 16" o.c.

(UFJ27) DEPRESSED SHOWER FLOOR JOISTS

SPAN = 12'-0" $w = \frac{25}{DL} + \frac{40}{LL}$ psf (of 5 TILE ADDED) — USE 9 1/2" TJI 210 @ 16" o.c.

(RoJ3) ROOF DECK JOISTS

SPAN = 12'-9" $w = \frac{18}{DL} + \frac{60}{LL}$ psf — USE 1 3/4 x 8 1/2 LVL @ 16" o.c. (MIN DEPTH)

(LRR4) LOW ROOF RAFTERS

SPAN = 10'-0" $w = \frac{13}{DL} + \frac{25}{SL}$ psf — USE 1 3/4 x 8 3/4 LVL @ 24" o.c. (MIN DEPTH)

(UFB6) UPPER FLOOR BEAM

SPAN = 15'-3" $w_1 = (\frac{13}{DL} + \frac{25}{SL})(\frac{4'}{2}) = \frac{30}{DL} + \frac{50}{SL}$ #/ft FRAMING = 0' TO 1'-9"

USE 5 1/4 x 14 PSL

$w_2 = (\frac{18}{DL} + \frac{25}{SL})(\frac{18'}{2}) + (\frac{10}{DL})(12') = \frac{280}{DL} + \frac{230}{SL} + \frac{180}{LL}$ #/ft (TR, $+\frac{20}{LL}$)

$P_1 = \frac{1220}{DL} + \frac{1710}{SL}$ # @ x = 8'-6" (RB14)

$P_2 = (\frac{13}{DL} + \frac{25}{SL})(\frac{8'}{2})(\frac{4'}{2}) = \frac{100}{DL} + \frac{200}{SL}$ # @ x = 1'-9" (UFB5)

$P_3 = (\pm) 1.4 \times 2.5 \times \frac{38521 \text{ \#-ft}}{7'} = \frac{19260}{EV REFF}$ # (LOAD, Ω, OTM, WALL, SW UF.4.1)
(+) @ x = 5', (−) @ x = 11'-9"

(UFB7) UPPER FLOOR BEAM

SPAN = 17'-6" $w = (\frac{18}{DL} + \frac{25}{SL}, \frac{+20}{LL})(\frac{15'}{2}) + (\frac{7}{DL})(16') = \frac{290}{DL} + \frac{160}{SL} + \frac{130}{LL}$ #/ft (TR)

USE 5 1/4 x 14 PSL $P = \frac{1000}{DL} + \frac{1910}{SL}$ # @ x = 9'-6" (RB14)

HSD
23010

UFB 8 UPPER FLOOR BEAM

SCAN = 17'-0"

USE 5"x14 PSL

$P_2 = \frac{560}{DL} + \frac{1120}{LL}$ # @ e = 12"

$W = \left(\frac{18+25}{DL}\right)\left(\frac{20'}{2}\right) + \left(\frac{20}{LL}\right)\left(\frac{10'}{2}\right) + \left(\frac{10}{DL}\right)(9') + \left(\frac{18+10}{DL}\right)\left(\frac{10'}{2}\right)$

$= \frac{430}{DL} + \frac{350}{LL} + \frac{490\ \#/ft}{LL}$

$P_1 = 1.4 \times 2.5 \times \frac{10834\ \#/ft}{3'-3"} = \frac{11670\ \#}{EL,UFB}$ (+) @ e = 10" SW UFB 5.2

(-) @ e = 13"

UFB 9 UPPER FLOOR BEAM

BEARING = 2'-6"

CANTILEVER = 1'-6"

USE W14x68

$P_2 = \frac{4400}{DC} + \frac{720}{LL}$ # @ e = 2'-3" UFB 11

$W_1 = \left(\frac{14+40}{DL}\right)\left(\frac{35'}{2}\right) = \frac{250}{DL} + \frac{700\ \#/ft}{LL}$ FROM x=0 TO 2'-6"

$W_2 = \left(\frac{14+40}{DL}\right)\left(\frac{14'}{2}\right) = \frac{120}{DC} + \frac{340\ \#/ft}{LL}$ FROM x = 2'-6" TO 21'

$P_1 = \frac{4370}{DL} + \frac{4120}{LL} + \frac{2980\ \#}{SL}$ UFB 8 @ e = 21'(x2)

UFB 10 UPPER FLOOR BEAM

SCAN = 10'-6"

USE 5"x14 PSL

$P_3 = (+)1.4 \times 2.5 \times \frac{35770\ \#/ft}{6.5'}$ SW UF.4-2

$= 17260\ \#\ (+) @ e = 6'-4"$

$(-) @ e = 6"$

$W = \left(\frac{18+25}{DL}\right)\left(\frac{27'}{2}\right) + \left(\frac{13+20}{DL}\right)\left(\frac{10'}{2}\right) + \left(\frac{?}{DL}\right)(9') = \frac{370 - 460\ \#/ft}{DC} + \frac{+110\ \#/ft}{LL}$

+20 RB 8 (10')

$P_1 = \frac{3860}{DL} + \frac{1230}{LL} + \frac{5740\ \#}{SL}$ @ e = 3"

$P_2 = \left(\frac{14+40}{DC}\right)\left(\frac{10'}{2}\right)\left(\frac{10'}{2}\right) = \frac{350+1100\ \#}{DC\ \ LL}$ @ e = 3" UFB 13

UFB 11 UPPER FLOOR BEAM

SCAN = 17'-0"

USE 3"x14 PSL

$P = \left[\left(\frac{23+40}{DC}\right)\left(\frac{12'}{2}\right) + \left(\frac{14+40}{DC}\right)\left(\frac{2'}{2}\right)\right]\left(\frac{8'}{2}\right) = \frac{560+1020\ \#}{DC\ \ SL}$ @ e = 12" BF UFB 4

UFB 12 UPPER FLOOR BEAM

SCAN = 21'-6"

USE W12x35

$W_1 = \left(\frac{14+40}{DC}\right)\left(\frac{30'}{2}\right) + \left(\frac{?}{DC}\right)(9') = \frac{270}{DC} + \frac{600\ \#/ft}{LL}$

$W_2 = \left(\frac{13+25}{UFB7}\right)\left(\frac{8'}{2}\right) = \frac{70}{DC} + \frac{140\ \#/ft}{SL}$ SL FROM x = 13'-3" TO 21'-6"

$P_1 = \frac{2560}{DC} + \frac{1140}{LL} + \frac{2440\ \#}{SL}$ @ e = 13'-3"

$P_2 = 1.4 \times 2.5 \times \frac{3157\ \#/ft}{11'-6"} = \frac{10510\ \#}{EL,UFB}$ SW UF.6-3 @ e = 13'-3"

LRB14 LOWER ROOF BEAM

SPAN = 11'-0" W = $\frac{13+25}{DL\ \ LL}$ est TRIBS = $\frac{10'}{2}$ = 5' USE 3½ x 11¼ PSL

LRB15 LOWER ROOF BEAM

BACK SPAN = 7'-0" CANTILEVER = 3'-0" (NEW DEPTH) P = $\frac{(13+25)}{DL\ LL}\left(\frac{11'}{2}\right)\left(\frac{14'}{2}\right) = \frac{720+1380\#}{DL\ \ LL}$ e_x = 10'-0"

USE 3½ x 8¾ PSL

UFB5 UPPER FLOOR BEAM

SPAN = 16'-0" $W_1 = \left(\frac{365}{DL} + \frac{447}{LL} + \frac{226}{SL}\right)\left(\frac{12'}{16''}\right) = \frac{270}{DL} + \frac{340}{LL} + \frac{170}{SL}$ #/ft (UFB7)

USE 3½ x 14 LVL $W_2 = \left(\frac{14+40}{DL\ \ LL}\right)\left(\frac{12'}{2}\right) = \frac{80+240}{DL\ \ LL}$ #/ft

UFB17 UPPER FLOOR BEAM

SPAN = 23'-6" $P_1 = \frac{1050+1740+520\#}{DL\ \ LL\ \ SL}$ (UFB5) e_x = 11¼"

USE 5¼ x 14 PSL $P_2 = \left(\frac{18+25}{DL\ \ SL}\right)\left(\frac{19'}{2}+3'\right)\left(\frac{8'}{2}\right) + \left(\frac{20}{LL}\right)\left(\frac{14'}{2}\right)\left(\frac{8'}{2}\right) = \frac{940+560+1250\#}{DL\ \ LL\ \ SL}$ e_x = 19½"

ROB18 ROOF BEAM

SPAN = 14'-0" W = $\frac{18+6}{DL\ \ LL}$ est TRIBS = $\frac{13'}{2}$ = 6'-6" USE (5) 1¾ x 9½ LVL

ROB19 ROOF BEAM SPAN = 12¼"

SPAN P = $\frac{(18+6)}{DL\ \ LL}$ (ROB18) $\left(\frac{10'}{2}\right)\left(\frac{9'}{2}\right) = \frac{410+1350\#}{DL\ \ LL}$ e_x = 6'-0"

USE (5) 1¾ x 9½ LVL

UFH21 UPPER FLOOR HEADER

SPAN = 18'-0" $W_1 = \left(\frac{365}{DL} + \frac{447}{LL} + \frac{226}{SL}\right)\left(\frac{12'}{16''}\right) = \frac{270}{DL} + \frac{340}{LL} + \frac{170}{SL}$ #/ft (UFB5)

FROM x = 0' TO 6'-6", 11'-6" TO 18'

USE 5¼ x 14 PSL

P = $\frac{1270+1330+1290\#}{DL\ \ LL\ \ SL}$ (UFB17)

e_x = 6'-6" + 1'-6"

$W_2 = \left(\frac{14+40}{DL\ \ LL}\right)\left(\frac{23'}{4}\right) = \frac{180+230\#}{DL\ \ LL}$ #/ft FROM x = 6'-6" TO 19'-6"

UFH22 UPPER FLOOR HEADER

SPAN = 9'-0"
USE 5 1/2 x 9 GLB

$w_1 = \frac{270}{DL} + \frac{340}{LL} + \frac{170}{SL}$ #/FT FROM x = 0' TO 3'-6"

$w_2 = \frac{180}{DL} + \frac{220}{LL}$ #/FT FROM x = 3'-6" TO 9'

$P = \frac{1270}{DL} + \frac{1730}{LL} + \frac{1240}{SL}$ # @ x = 3'-6" UFB17

UFB23 UPPER FLOOR BEAM

SPAN = 15'-0"
USE 5 1/4 x 14 PSL

$w = \frac{10}{DL}(13') + \frac{(80+60)}{DL\ LL}\left(\frac{13'}{2}\right) = \frac{250}{DL} + \frac{390}{LL}$ #/FT

$P_1 = \frac{5000}{DL}$ (RH6) $+ \frac{9840}{SL}$ # @ x = 2'-6" + 12'-6"

$P_2 = 1.4 \times 2.5 \times \frac{7825}{13'}$ # (FL) = $\frac{9130}{\text{FL, UFB10}}$ # (+) (SW wt. x 1.1/2) @ x = 2'-6" (+) @ x = 12'-6"

UFB24 UPPER FLOOR BEAM

BACK SPAN = 9'-3"
CANTILEVER = 4'-0"
USE 5 1/4 x 14 PSL

$w = \left(\frac{13}{DL} + \frac{25}{SL}\right)\left(\frac{8'}{2}\right) + \frac{110}{LL}(12') + \left[\frac{140}{DL\ LL}\right]\left(\frac{12'}{2}\right)$

$= \frac{280}{DL} + \frac{300}{LL} + \frac{100}{SL}$ #/FT

$P_3 = \frac{9130}{FL} - \frac{6090}{FL} = \frac{3040}{FL, UFB10}$ # @ x = 13'-3"

$P_1 = \frac{2380}{DL}$ (UFB23) $+ \frac{2430}{LL} + \frac{960}{SL}$ (ROOF) @ x = 13'-3"

$P_2 = \frac{220}{DL} + \frac{710}{LL}$ # @ x = 13'-2"

UFH28 UPPER FLOOR HEADER

SPAN = 2'-6"
USE 3 1/2 x 9 GLB

$P = \frac{2840}{DL} + \frac{1370}{LL} + \frac{2730}{SL} + \frac{8520}{FL}$ (UFB 6) # @ x = 1'-6"

UFB29 UPPER FLOOR BEAM

SPAN = 10'-0"
USE 5 1/4 x 14 PSL

$P = \frac{1220}{DL} + \frac{7530}{LL} + \frac{1520}{SL}$ (UFB 9) #

UFH20 UPPER FLOOR HEADER @ STAIRS OPEN

SPAN = 15'-0" $P = \frac{1000}{DL}$ # (ASSUMED ROOF WEIGHT) @ x = 7'-6"

USE 5 1/2 x 11 7/8 GLB

SS1 STAIR STRINGER — STAIR ASSEMBLY

SPAN = 14'-0" $w = \frac{30+40}{2} = 70$ psf TRIB = 3'-6"

Use HSS 6x6x3/8

LB32 CANTILEVER BEAM

CANTILEVER = 3 1/4" $P = \frac{300\#}{2}$ e $x = 3\frac{1}{4}$" (CONSERVATIVE)

Use L6x4x5/16

$M = 300\# \times 3\frac{1}{4}" = 1125\#\cdot ft = 13.5$ k-in

$M_n/\Omega = \frac{F_y S}{1.67} = \frac{36\,ksi \times 1.10\,in^3}{1.67} = 23.7$ k-in ok

MAIN FLOOR BEAMS

POST SUPPORTING (UFB9)

H=10'0" $P = \frac{15750}{DL} + \frac{20690}{LL} + \frac{2480}{SL}$ #

USE HSS 5"x5"x¼

POST SUPPORTING WEST END OF (UFB12)

H=16'0" $P_1 = \frac{2040}{DL} + \frac{580}{LL} + \frac{2550}{SL} + \frac{11460}{EL,WFO}$ # UFB10

USE 5"x5"x¼ PSL

$P_2 = \frac{9401}{DL} + \frac{780}{LL} + \frac{1311}{SL}$ # RB9

$P_3 = \frac{4420}{DL} + \frac{6840}{LL} + \frac{2010}{SL}$ # UFB12

FOUNDATIONS

S1-S4 STRUCTURAL SLABS

SEE ENERCALC PRINTOUTS TO FOLLOW.

F5 PIN PILE CAP SUPPORTING UFB4

$P = 36434^{\#}$ TOTAL ASD FACTORED

USE (4) 4" PIN PILES

Good for 4 x 10 TONS = 80000# ok

F6 (WORST CASE UNIFORM LOAD @ TYPICAL PERIMETER GRADE BEAM / G.L.E @ GARAGE COVERED)

$$w = \left[\left(\frac{18}{A} + \frac{25}{SC}\right) + \left(\frac{14+40}{A}\right)\right]\left(\frac{24'}{2}\right) + \left(\frac{20}{EC}\right)\left(\frac{14'}{2}\right) + \left(\frac{10}{OC}\right)(20') + \left(\frac{150}{OC}\right)(1.5'\times 2') + \left(\frac{150}{OC}\right)(1.5')\left(8''\right)\left(\frac{18'}{2}\right) = \frac{1530}{GARAGE} + \frac{620}{EC} + \frac{200}{SC}\ ^{\#}/_{LF}$$

$P = \frac{3000^{\#}}{GARAGE}$

→ ASSUME PIN PILES @ 8'-0" O.C. MAP CONSERVATIVE

$P_{PILE} = (1530 + 620)(8') + 3000 = 20200^{\#}$

USE (1) 4" PILE Good for 20000# → CLOSE ENOUGH, ok

USE 18"x24" GRADE BEAM w/ (2) #5 T&B, #3 @ 12" O.C. CLOSED TOPS

F7 TYPICAL INTERIOR GRADE BEAM / WORST CASE POINT LOAD @ GL G/M LOCATIONS

SPANS = 6'-0" $w = \left(\frac{150}{OC}\right)\left[(1.5'\times 2') + \left(8''\right)\left(\frac{2'}{2}\right)\right] = \frac{1800^{\#}}{OC}\ ^{\#}/_{LF}$

$P = \frac{7400}{OC} + \frac{8250}{C} + \frac{5870}{SC} + \frac{11461^{\#}}{EL,\ VERIFY}$ @ GARAGE

USE 18"x24" GRADE BEAM w/ (2) #5 T&B, #3 @ 12" O.C. CLOSED TOPS

$P_{END} = 1.2\times\frac{9.1}{OC} + 0.75\times\frac{4.12}{C} + 0.75\times\frac{2.93}{SC} + \frac{5.73}{EL}^{k} = 78490^{\#}$ (0.525k)

ASD

USE (1) 4" PILE Good for 20000# ok

$V_u = 1.43\times 9.1 + 0.5\times 4.12 + 0.2\times 2.93 + 5.73 = 22850^{\#}$

$\phi V_n = 0.75\left(2\sqrt{3000}\times 18''\times 21'' + \frac{0.22in^2\times 60000\times 21''}{12''}\right)$

$= 48310^{\#}$ ok $A_v = 0.22in^2 > A_{v,min} = 0.18in^2$ ok

COLLECTORS

RT17 Roof DRAG TRUSS @ G.L. C

Vsw Uf. C-2

P = 1.4 x 3565# = 4990#
EL, VERIFY

RT17 Roof DRAG TRUSS @ G.L. G

Vsw Uf. G-3

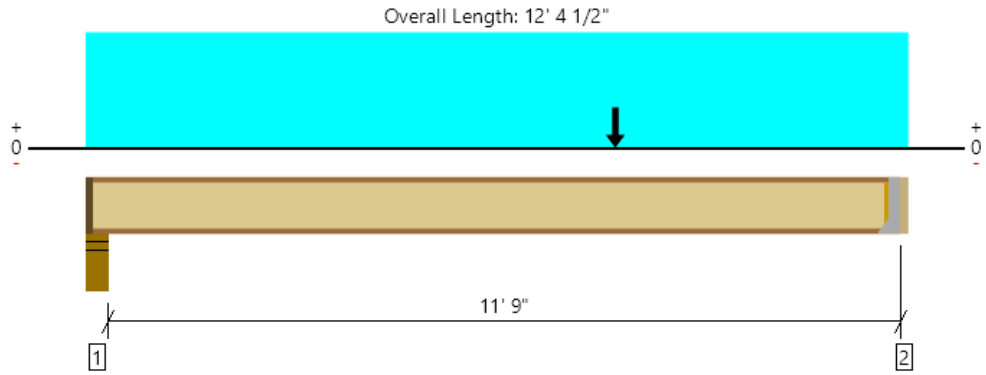
P = 1.4 x 3502# = 4900#
EL, VERIFY

RT17 Roof DRAG TRUSS @ G.L. 3.5

Vsw Uf. 3.5

P = 1.4 x 3302# = 4620#
EL, VERIFY

Upper Floor, UFJ1 - Upper Floor Joist
1 piece(s) 14" 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)	800 @ 12' 2 1/2"	1005 (1.75")	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	800 @ 12' 2 1/2"	1945	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2728 @ 8'	4490	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.094 @ 6' 6 5/8"	0.296	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.164 @ 6' 7"	0.592	Passed (L/868)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
TJ-Pro™ Rating	63	Any	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" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Factored	
1 - Stud wall - HF	5.50"	3.75"	1.75"	256	403	124	659	1 3/4" Rim Board
2 - Hanger on 14" LSL beam	2.00"	Hanger[1]	1.75" / - [2]	365	447	226	869	See note [1]

- Rim Board is assumed to carry all loads applied directly above it, bypassing 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)	4' 7" o/c	
Bottom Edge (Lu)	12' 1" 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
2 - Face Mount Hanger	IUS2.06/9.5	2.00"	N/A	8-10d	2-10dx1.5	Web Stiffeners

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

Vertical Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
1 - Uniform (PSF)	0 to 12' 4 1/2"	16"	14.0	40.0	-	Upper Floor
2 - Point (lb)	8'	N/A	390	190	350	Roof & Wall

Member Notes
UFJ1 - Upper Floor Joist

ForteWEB Software Operator	Job Notes
Owen Gould O.G. Engineering, PLLC (206) 290-4608 owen@ogengineer.com	

Weyerhaeuser

Weyerhaeuser Notes

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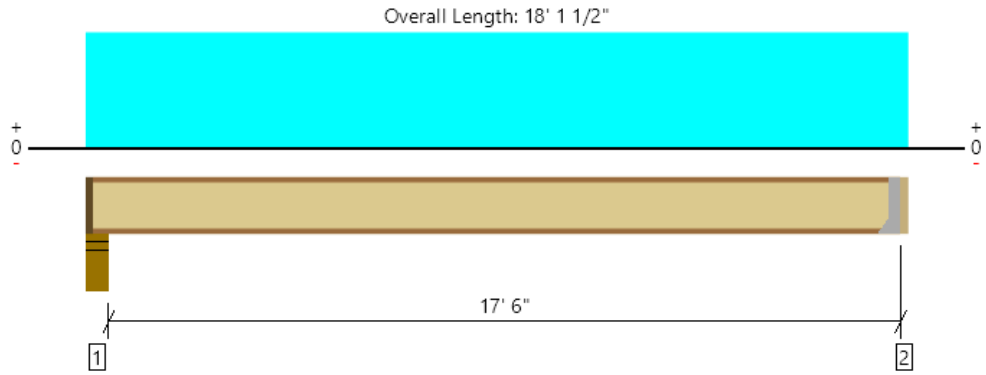
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Upper Floor, UFJ2 - Upper Floor Joist
1 piece(s) 14" TJI® 360 @ 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)	633 @ 17' 11 1/2"	1080 (1.75")	Passed (59%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	633 @ 17' 11 1/2"	1955	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2783 @ 9' 2"	7335	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.191 @ 9' 2"	0.440	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.258 @ 9' 2"	0.879	Passed (L/819)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	53	Any	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" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	3.75"	1.75"	171	489	660	1 3/4" Rim Board
2 - Hanger on 14" LSL beam	2.00"	Hanger[1]	1.75" / - [2]	167	478	645	See note [1]

- Rim Board is assumed to carry all loads applied directly above it, bypassing 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)	17' 10" 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
2 - Face Mount Hanger	IUS2.37/14	2.00"	N/A	12-10dx1.5	2-Strong-Grip	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 18' 1 1/2"	16"	14.0	40.0	Upper Floor

Member Notes
UFJ2 - Upper Floor Joist

ForteWEB Software Operator	Job Notes
Owen Gould O.G. Engineering, PLLC (206) 290-4608 owen@ogengineer.com	

Weyerhaeuser

Weyerhaeuser Notes

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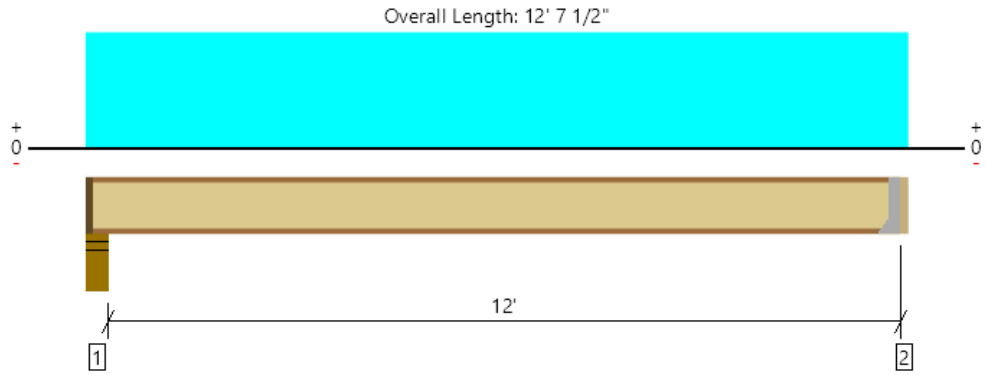
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Upper Floor, UFJ27 - Depressed Shower Floor Joists
1 piece(s) 9 1/2" 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)	524 @ 12' 5 1/2"	1005 (1.75")	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	524 @ 12' 5 1/2"	1330	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1582 @ 6' 5"	3000	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.132 @ 6' 5"	0.302	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.214 @ 6' 5"	0.604	Passed (L/677)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	51	Any	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" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	3.75"	1.75"	214	342	556	1 3/4" Rim Board
2 - Hanger on 9 1/2" LSL beam	2.00"	Hanger[1]	1.75" / - [2]	207	331	538	See note [1]

- Rim Board is assumed to carry all loads applied directly above it, bypassing 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)	5' 2" o/c	
Bottom Edge (Lu)	12' 4" 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
2 - Face Mount Hanger	IUS2.06/9.5	2.00"	N/A	8-10dx1.5	2-Strong-Grip	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 12' 7 1/2"	16"	25.0	40.0	Bathroom

Member Notes
UFJ27 - Depressed Shower Floor Joists

ForteWEB Software Operator	Job Notes
Owen Gould O.G. Engineering, PLLC (206) 290-4608 owen@ogengineer.com	

Weyerhaeuser

Weyerhaeuser Notes

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Multiple Simple Beam

Project File: 23010_ASD.ec6

Description : Roof Framing

Wood Beam Design : RB2 - Roof Beam

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

BEAM Size : **3.5x9.5, TimberStrand LSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss Joist				Wood Grade :	TimberStrand LSL 1.55E			
Fb - Tension	2,325.0 psi	Fc - Prll	2,050.0 psi	Fv	310.0 psi	Ebend- xx	1,550.0 ksi	Density	45.010 pcf
Fb - Compr	2,325.0 psi	Fc - Perp	800.0 psi	Ft	1,070.0 psi	Eminbend - xx	787.82 ksi		

Applied Loads

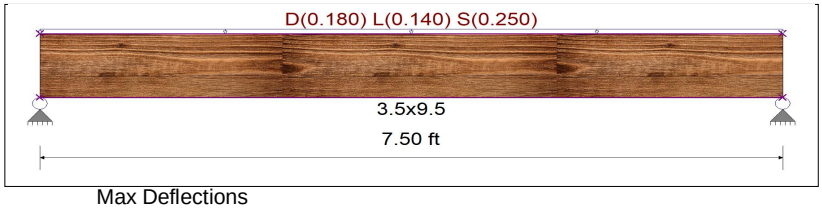
Unif Load: D = 0.180, L = 0.140, S = 0.250 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.283** : 1
fb : Actual : 757.27 psi at 3.750 ft in Span # 1
Fb : Allowable : 2,673.75 psi
Load Comb : +D+0.750L+0.750S

Max fv/FvRatio = **0.224** : 1
fv : Actual : 79.93 psi at 0.000 ft in Span # 1
Fv : Allowable : 356.50 psi
Load Comb : +D+0.750L+0.750S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.68		0.53	0.94			
Right Support	0.68		0.53	0.94			



Max Deflections

Transient Downward	0.046 in	Total Downward	0.079 in
Ratio	1949	Ratio	1133
	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 : RH3 - Interior Header

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

BEAM Size : **4x8, Sawn, Fully Braced**
Using Allowable Stress Design with IBC 2021 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

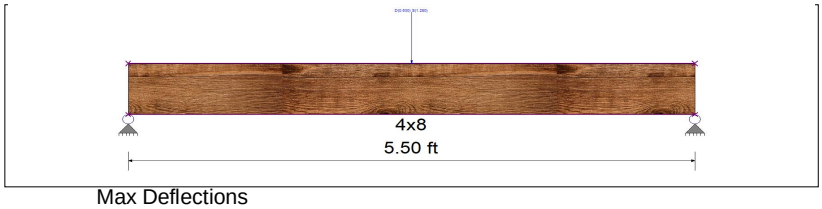
1Point: D = 0.630, S = 1.280 k @ 2.750 ft

Design Summary

Max fb/Fb Ratio = **0.688** : 1
fb : Actual : 1,027.84 psi at 2.750 ft in Span # 1
Fb : Allowable : 1,495.00 psi
Load Comb : +D+S

Max fv/FvRatio = **0.273** : 1
fv : Actual : 56.45 psi at 0.000 ft in Span # 1
Fv : Allowable : 207.00 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.32			0.64			
Right Support	0.32			0.64			



Max Deflections

Transient Downward	0.041 in	Total Downward	0.061 in
Ratio	1618	Ratio	1084
	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

Project File: 23010_ASD.ec6

Steel Beam Design : RH6 - Cathedral Ceiling Header

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

STEEL Section : **HSS8x4x1/4, Fully Braced**
Using Allowable Strength Design with IBC 2021 Load Combinations, Major Axis Bending Fy = 46.0 ksi E = 29,000.0 ksi

Applied Loads

1Point: D = 1.0, S = 1.910 k @ 5.0 ft

Steel Beam Design : RH6 - Cathedral Ceiling Header

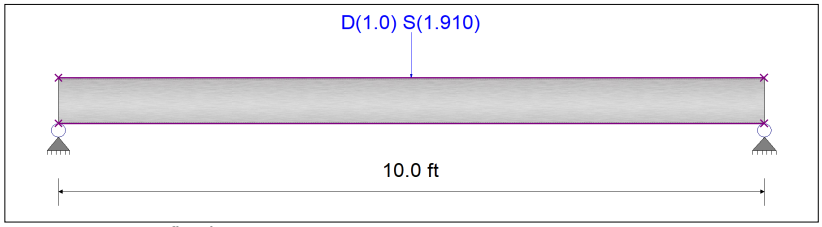
Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **HSS8x4x1/4, Fully Braced**
Using Allowable Strength Design with IBC 2021 Load Combinations, Major Axis Bending Fy = 46.0 ksi E = 29,000.0 ksi

Design Summary

Max fb/Fb Ratio = **0.238** : 1
Mu : Applied 7.275 k-ft at 5.000 ft in Span # 1
Mn / Omega : Allow 30.529 k-ft
Load Comb : +D+S

Max fv/FvRatio = **0.026** : 1
Vu : Applied 1.455 k at 0.000 ft in Span # 1
Vn / Omega : Allow 56.229 k
Load Comb : +D+S



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.50			0.96			
Right Support	0.50			0.96			

Max Deflections

Transient Downward	0.056 in	Total Downward	0.085 in
Ratio	2140		1404
	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

Project File: 23010_ASD.ec6

Wood Beam Design : RH7 - Exterior Header

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

BEAM Size : **3.5x9, GLB, Fully Braced**
Using Allowable Stress Design with IBC 2021 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

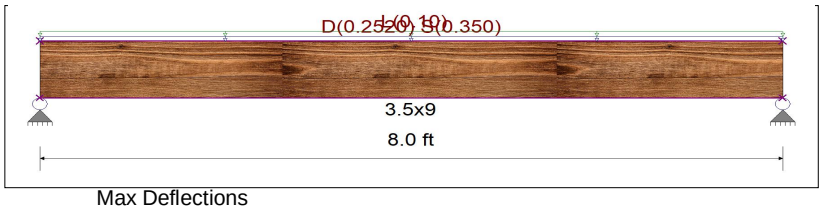
Unif Load: D = 0.0180, S = 0.0250 k/ft, Trib= 14.0 ft
Unif Load: L = 0.020 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.443** : 1
fb : Actual : 1,223.11 psi at 4.000 ft in Span # 1
Fb : Allowable : 2,760.00 psi
Load Comb : +D+S

Max fv/FvRatio = **0.376** : 1
fv : Actual : 114.67 psi at 0.000 ft in Span # 1
Fv : Allowable : 304.75 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.01		0.40	1.40			
Right Support	1.01		0.40	1.40			



Max Deflections

Transient Downward	0.085 in	Total Downward	0.146 in
Ratio	1133	Ratio	658
	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 : RB8 - Roof Beam

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

BEAM Size : **5.25x22, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

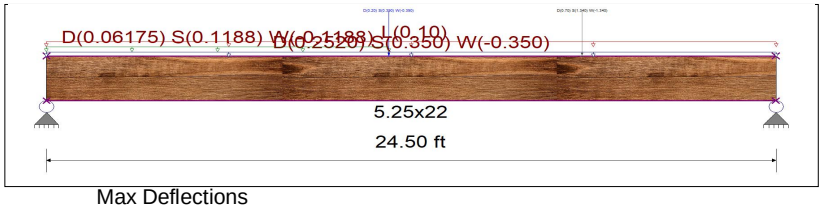
Unif Load: D = 0.0180, S = 0.0250, W = -0.0250 k/ft, Trib= 14.0 ft
Unif Load: D = 0.0130, S = 0.0250, W = -0.0250 k/ft, 0.0 to 11.50 ft, Trib= 4.750 ft
Unif Load: L = 0.020 k/ft, Trib= 5.0 ft
1Point: D = 0.20, S = 0.390, W = -0.390 k @ 11.50 ft
2Point: D = 0.70, S = 1.340, W = -1.340 k @ 18.0 ft

Design Summary

Max fb/Fb Ratio = **0.556** : 1
fb : Actual : 1,734.12 psi at 11.842 ft in Span # 1
Fb : Allowable : 3,118.00 psi
Load Comb : +D+S

Max fv/FvRatio = **0.382** : 1
fv : Actual : 127.50 psi at 0.000 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	3.92		1.23	5.90	-5.90		
Right Support	3.86		1.23	5.78	-5.78		



Max Deflections

Transient Downward	0.391 in	Total Downward	0.650 in
Ratio	751	Ratio	452
	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

Project File: 23010_ASD.ec6

Wood Beam Design : RB9 - Roof Beam

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

BEAM Size : **5.25x11.25, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

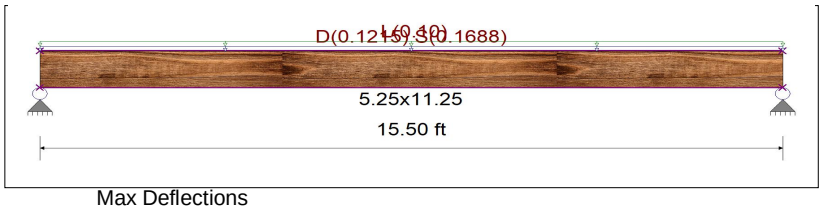
Unif Load: D = 0.0180, S = 0.0250 k/ft, Trib= 6.750 ft
Unif Load: L = 0.020 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.315** : 1
fb : Actual : 1,051.30 psi at 7.750 ft in Span # 1
Fb : Allowable : 3,335.00 psi
Load Comb : +D+0.750L+0.750S

Max fv/FvRatio = **0.191** : 1
fv : Actual : 63.59 psi at 0.000 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+0.750L+0.750S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.94		0.78	1.31			
Right Support	0.94		0.78	1.31			



Max Deflections

Transient Downward	0.161 in	Total Downward	0.277 in
Ratio	1156	Ratio	672
	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 : RR11 - Shed Roof Rafters

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

BEAM Size : **2x10, Sawn, Fully Braced**
Using Allowable Stress Design with IBC 2021 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

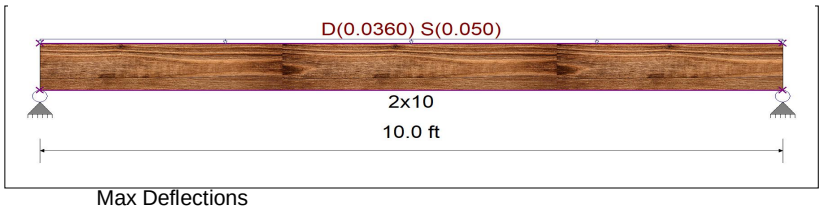
Unif Load: D = 0.0180, S = 0.0250 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.488** : 1
fb : Actual : 603.07 psi at 5.000 ft in Span # 1
Fb : Allowable : 1,236.54 psi
Load Comb : +D+S

Max fv/FvRatio = **0.269** : 1
fv : Actual : 46.49 psi at 10.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.18			0.25			
Right Support	0.18			0.25			



Max Deflections

Transient Downward	0.088 in	Total Downward	0.151 in
Ratio	1364	Ratio	793
	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

Project File: 23010_ASD.ec6

Wood Beam Design : RB14 - Ridge Beam

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

BEAM Size : **5.25x11.875, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss Joist					Wood Grade :	TimberStrand LSL 1.55E		
Fb - Tension	2,325.0 psi	Fc - Prll	2,050.0 psi	Fv	310.0 psi	Ebend- xx	1,550.0 ksi	Density	45.010 pcf
Fb - Compr	2,325.0 psi	Fc - Perp	800.0 psi	Ft	1,070.0 psi	Eminbend - xx	787.82 ksi		

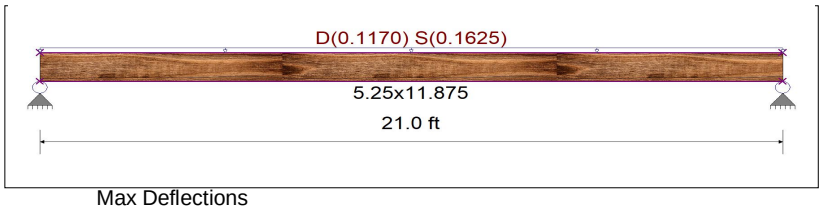
Applied Loads

Unif Load: D = 0.0180, S = 0.0250 k/ft, Trib= 6.50 ft

Design Summary

Max fb/Fb Ratio = **0.560** : 1
fb : Actual : 1,498.43 psi at 10.500 ft in Span # 1
Fb : Allowable : 2,673.75 psi
Load Comb : +D+S

Max fv/FvRatio = **0.198** : 1
fv : Actual : 70.61 psi at 0.000 ft in Span # 1
Fv : Allowable : 356.50 psi
Load Comb : +D+S



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.23			1.71			
Right Support	1.23			1.71			

Max Deflections

Transient Downward	0.630 in	Total Downward	1.083 in
Ratio	400	Ratio	232
	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 : RH18 - Transom Header

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

BEAM Size : **5.25x5.25, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss Joist					Wood Grade :	Parallam PSL 1.8E		
Fb - Tension	2,400.0 psi	Fc - Prll	2,500.0 psi	Fv	190.0 psi	Ebend- xx	1,800.0 ksi	Density	45.070 pcf
Fb - Compr	2,400.0 psi	Fc - Perp	425.0 psi	Ft	1,755.0 psi	Eminbend - xx	914.88 ksi		

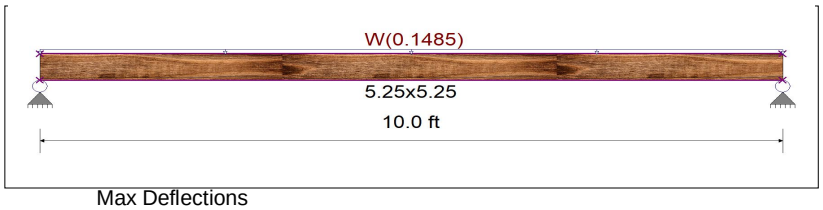
Applied Loads

Beam self weight calculated and added to loads
Unif Load: W = 0.0270 k/ft, Trib= 5.50 ft

Design Summary

Max fb/Fb Ratio = **0.158** : 1
fb : Actual : 607.82 psi at 5.000 ft in Span # 1
Fb : Allowable : 3,840.00 psi
Load Comb : +D+0.60W

Max fv/FvRatio = **0.087** : 1
fv : Actual : 26.59 psi at 0.000 ft in Span # 1
Fv : Allowable : 304.00 psi
Load Comb : +D+0.60W



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.04				0.74		
Right Support	0.04				0.74		

Max Deflections

Transient Downward	0.295 in	Total Downward	0.000 in
Ratio	407	Ratio	9999
	LC: W Only		LC:
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	0 <101
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : RB13 - Roof Beam

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

BEAM Size : **5.250 X 9.50, Parallam PSL, Fully Braced**

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

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

Fb - Tension	2,325.0 psi	Fc - Prll	2,050.0 psi	Fv	310.0 psi	Ebend- xx	1,550.0 ksi	Density	45.010 pcf
Fb - Compr	2,325.0 psi	Fc - Perp	800.0 psi	Ft	1,070.0 psi	Eminbend - xx	787.82 ksi		

Applied Loads

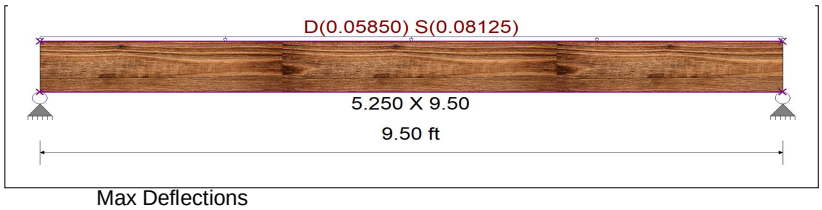
Unif Load: D = 0.0180, S = 0.0250 k/ft, Trib= 3.250 ft

Design Summary

Max fb/Fb Ratio = **0.090** : 1
fb : Actual : 239.57 psi at 4.750 ft in Span # 1
Fb : Allowable : 2,673.75 psi
Load Comb : +D+S

Max fv/FvRatio = **0.056** : 1
fv : Actual : 19.96 psi at 0.000 ft in Span # 1
Fv : Allowable : 356.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.28			0.39			
Right Support	0.28			0.39			



Max Deflections

Transient Downward	0.026 in	Total Downward	0.044 in
Ratio	4427	Ratio	2574
	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

Project File: 23010_ASD.ec6

Description : Upper Floor Framing (1 of 3)

Wood Beam Design : UFB5 - Upper Floor Beam

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

BEAM Size : **3.5x14, TimberStrand LSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss Joist					Wood Grade :	TimberStrand LSL 1.55E		
Fb - Tension	2,325.0 psi	Fc - Prll	2,050.0 psi	Fv	310.0 psi	Ebend- xx	1,550.0 ksi	Density	45.010 pcf
Fb - Compr	2,325.0 psi	Fc - Perp	800.0 psi	Ft	1,070.0 psi	Eminbend - xx	787.82 ksi		

Applied Loads

Unif Load: D = 0.080, L = 0.240 k/ft, Trib= 1.0 ft

Unif Load: D = 0.270, L = 0.340, S = 0.170 k/ft, Trib= 1.0 ft

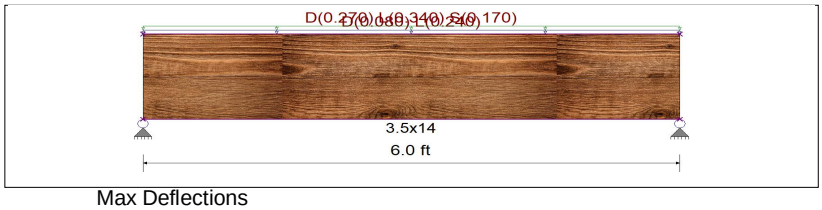
Design Summary

Max fb/Fb Ratio = **0.192** : 1
fb : Actual : 439.24 psi at 3.000 ft in Span # 1
Fb : Allowable : 2,292.26 psi
Load Comb : +D+L

Max fv/FvRatio = **0.169** : 1
fv : Actual : 52.38 psi at 4.840 ft in Span # 1
Fv : Allowable : 310.00 psi
Load Comb : +D+L

Max Reactions (k)

	D	Lr	L	S	W	E	H
Left Support	1.05		1.74	0.51			
Right Support	1.05		1.74	0.51			



Max Deflections

Transient Downward	0.014 in	Total Downward	0.022 in
Ratio	5253	Ratio	3276
	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 : RDJ3 - Roof Deck Joists

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

BEAM Size : **1.750 X 8.50, Microllam LVL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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

Unif Load: D = 0.0180, L = 0.060 k/ft, Trib= 1.330 ft

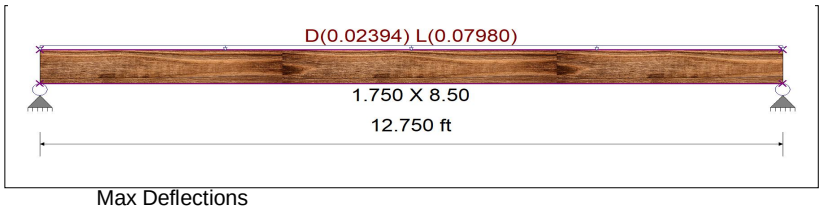
Design Summary

Max fb/Fb Ratio = **0.462** : 1
fb : Actual : 1,200.42 psi at 6.375 ft in Span # 1
Fb : Allowable : 2,600.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.234** : 1
fv : Actual : 66.69 psi at 0.000 ft in Span # 1
Fv : Allowable : 285.00 psi
Load Comb : +D+L

Max Reactions (k)

	D	Lr	L	S	W	E	H
Left Support	0.15		0.51				
Right Support	0.15		0.51				



Max Deflections

Transient Downward	0.266 in	Total Downward	0.346 in
Ratio	574	Ratio	441
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : LRR4 - Low Roof Rafters

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

BEAM Size : **1.750 X 8.750, Microllam LVL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss 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

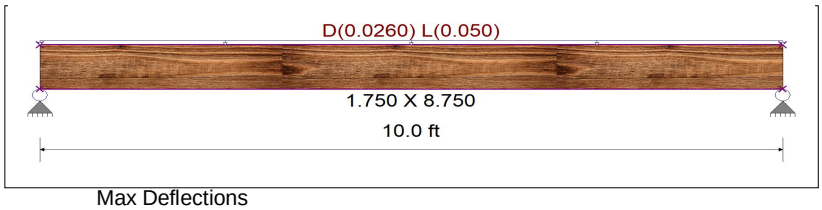
Unif Load: D = 0.0130, L = 0.0250 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.183** : 1
fb : Actual : 510.51 psi at 5.000 ft in Span # 1
Fb : Allowable : 2,784.43 psi
Load Comb : +D+L

Max fv/FvRatio = **0.131** : 1
fv : Actual : 37.22 psi at 0.000 ft in Span # 1
Fv : Allowable : 285.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.13		0.25				
Right Support	0.13		0.25				



Max Deflections

Transient Downward	0.058 in	Total Downward	0.088 in
Ratio	2073	Ratio	1363
	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 : UFB6 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

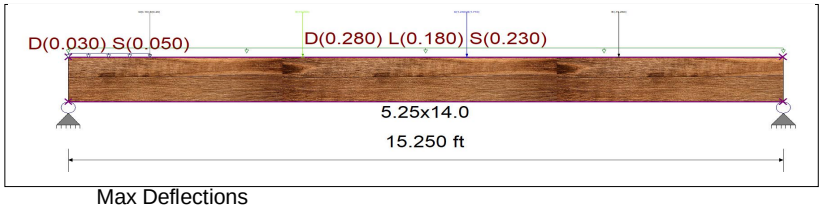
Unif Load: D = 0.030, S = 0.050 k/ft, 0.0 ft to 1.750 ft, Trib= 1.0 ft
Unif Load: D = 0.280, L = 0.180, S = 0.230 k/ft, Trib= 1.0 ft
1Point: D = 1.230, S = 1.710 k @ 8.50 ft
2Point: D = 0.10, S = 0.20 k @ 1.750 ft
3Point: E = 19.260 k @ 5.0 ft
4Point: E = -19.260 k @ 11.750 ft

Design Summary

Max fb/Fb Ratio = **0.682** : 1
fb : Actual : 3,112.03 psi at 5.033 ft in Span # 1
Fb : Allowable : 4,561.28 psi
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max fv/FvRatio = **0.472** : 1
fv : Actual : 219.19 psi at 0.000 ft in Span # 1
Fv : Allowable : 464.00 psi
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	2.82		1.37	2.77		8.52	
Right Support	2.84		1.37	2.73		-8.52	



Max Deflections

Transient Downward	0.083 in	Total Downward	0.383 in
Ratio	2194	Ratio	478
	LC: L Only		LC: +D+S
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : UFB7 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

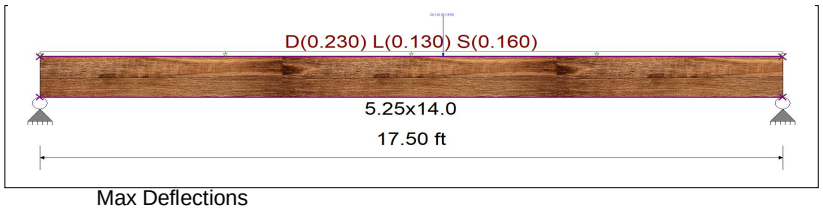
Applied Loads

Unif Load: D = 0.230, L = 0.130, S = 0.160 k/ft, Trib= 1.0 ft
1Point: D = 1.0, S = 1.910 k @ 9.50 ft

Design Summary

Max fb/Fb Ratio = **0.588** : 1
fb : Actual : 1,928.06 psi at 9.508 ft in Span # 1
Fb : Allowable : 3,278.42 psi
Load Comb : +D+0.750L+0.750S

Max fv/FvRatio = **0.320** : 1
fv : Actual : 106.86 psi at 17.500 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+0.750L+0.750S



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	2.47		1.14	2.27			
Right Support	2.56		1.14	2.44			

Max Deflections

Transient Downward	0.267 in	Total Downward	0.525 in
Ratio	785	Ratio	400
	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 : UFB8 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

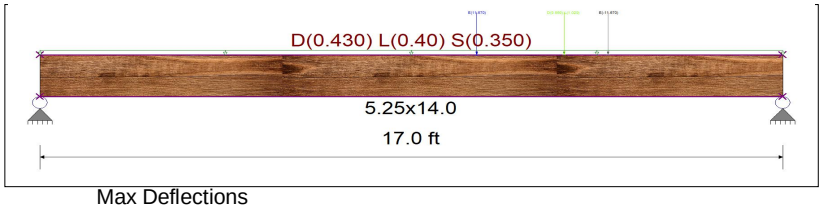
Applied Loads

Unif Load: D = 0.430, L = 0.40, S = 0.350 k/ft, Trib= 1.0 ft
1Point: E = 11.670 k @ 10.0 ft
2Point: E = -11.670 k @ 13.0 ft
3Point: D = 0.560, L = 1.020 k @ 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.838** : 1
fb : Actual : 2,745.87 psi at 8.897 ft in Span # 1
Fb : Allowable : 3,278.42 psi
Load Comb : +D+0.750L+0.750S

Max fv/FvRatio = **0.575** : 1
fv : Actual : 166.74 psi at 17.000 ft in Span # 1
Fv : Allowable : 290.00 psi
Load Comb : +D+L



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	3.82		3.70	2.98		2.06	
Right Support	4.05		4.12	2.98		-2.06	

Max Deflections

Transient Downward	0.340 in	Total Downward	0.677 in
Ratio	600	Ratio	301
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Steel Beam Design : UFB9 - Upper Floor Beam

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

STEEL Section : **W14x68, Fully Braced**
Using Allowable Strength Design with IBC 2021 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 = 0.250, L = 0.70 k/ft, 0.0 ft to 21.50 ft, Trib= 1.0 ft
Unif Load: D = 0.120, L = 0.340 k/ft, 21.50 to 27.0 ft, Trib= 1.0 ft
1Point: D = 4.050, L = 4.120, S = 2.980 k @ 27.0 ft
2Point: D = 4.050, L = 4.120, S = 2.980 k @ 27.0 ft
3Point: D = 0.40, L = 0.720, E = 19.260 k @ 21.250 ft

Steel Beam Design : UFB9 - Upper Floor Beam

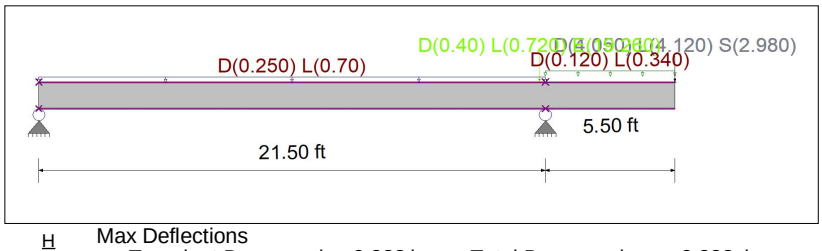
Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **W14x68, Fully Braced**
Using Allowable Strength Design with IBC 2021 Load Combinations, Major Axis Bending Fy = 50.0 ksi E = 29,000.0 ksi

Design Summary

Max fb/Fb Ratio = **0.403** : 1
Mu : Applied 115.546 k-ft at 21.500 ft in Span # 1
Mn / Omega : Allow 286.926 k-ft
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max fv/FvRatio = **0.222** : 1
Vu : Applied 25.820 k at 21.500 ft in Span # 1
Vn / Omega : Allow 116.20 k
Load Comb : +1.121D+0.750L+0.750S+0.5250



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.22		7.53	-1.52		0.22	
Right Support	15.15		20.69	7.48		19.04	

Max Deflections

Transient Downward	0.338 in	Total Downward	0.338 in
Ratio	390		390
L Only, MAX ENVELOPE		D+L+H, LL Comb Run (*L)	
Transient Upward	-0.170 in	Total Upward	-0.170 in
Ratio	998	Ratio	1515
L Only, LL Comb Run (L*)		D+L+H, LL Comb Run (*L)	

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : UFB10 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

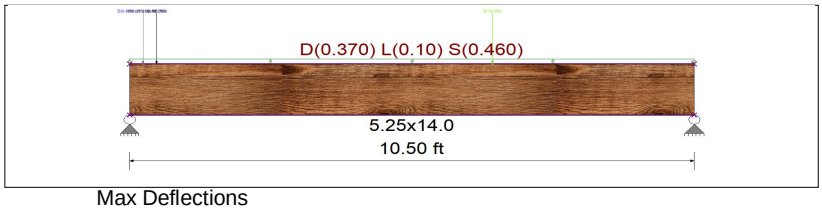
Unif Load: D = 0.370, L = 0.10, S = 0.460 k/ft, Trib= 1.0 ft
1Point: D = 3.860, L = 1.230, S = 5.780 k @ 0.250 ft
2Point: D = 0.350, L = 1.0 k @ 0.250 ft
3Point: E = 19.260 k @ 6.750 ft
4Point: E = -19.260 k @ 0.50 ft

Design Summary

Max fb/Fb Ratio = **0.551** : 1
fb : Actual : 2,513.56 psi at 6.755 ft in Span # 1
Fb : Allowable : 4,561.28 psi
Load Comb : +1.161D+0.70E

Max fv/FvRatio = **0.864** : 1
fv : Actual : 288.20 psi at 0.000 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+0.750L+0.750S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	6.05		2.70	8.06		-11.46	
Right Support	2.04		0.58	2.55		11.46	



Max Deflections

Transient Downward	0.054 in	Total Downward	0.098 in
Ratio	2313	Ratio	1288
	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 : UFB11 - Upper Floor Beam

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

BEAM Size : **3.5x14, TimberStrand LSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss Joist Wood Grade : TimberStrand LSL 1.55E

Fb - Tension	2,325.0 psi	Fc - Prll	2,050.0 psi	Fv	310.0 psi	Ebend- xx	1,550.0 ksi	Density	45.010 pcf
Fb - Compr	2,325.0 psi	Fc - Perp	800.0 psi	Ft	1,070.0 psi	Eminbend - xx	787.82 ksi		

Applied Loads

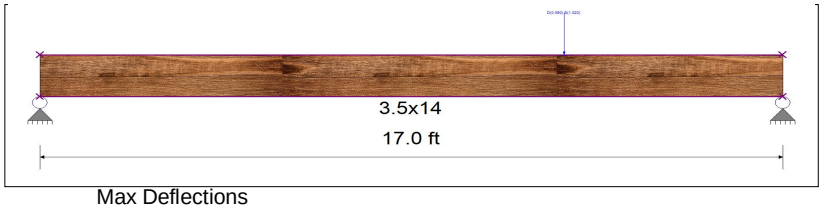
1Point: D = 0.560, S = 1.020 k @ 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.221** : 1
fb : Actual : 583.72 psi at 12.013 ft in Span # 1
Fb : Allowable : 2,636.10 psi
Load Comb : +D+S

Max fv/FvRatio = **0.096** : 1
fv : Actual : 34.14 psi at 12.013 ft in Span # 1
Fv : Allowable : 356.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.16			0.30			
Right Support	0.40			0.72			



Max Deflections

Transient Downward	0.116 in	Total Downward	0.179 in
Ratio	1766	Ratio	1140
	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

Project File: 23010_ASD.ec6

Steel Beam Design : UFB12 - Upper Floor Beam

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

STEEL Section : **W12x35, Fully Braced**
Using Allowable Strength Design with IBC 2021 Load Combinations, Major Axis Bending Fy = 50.0 ksi E = 29,000.0 ksi

Applied Loads

Unif Load: D = 0.270, L = 0.60 k/ft, Trib= 1.0 ft
Unif Load: D = 0.050, S = 0.10 k/ft, Trib= 1.0 ft
1Point: D = 2.560, L = 1.140, S = 2.440 k @ 13.250 ft
2Point: E = 10.510 k @ 13.250 ft

Steel Beam Design : UFB12 - Upper Floor Beam

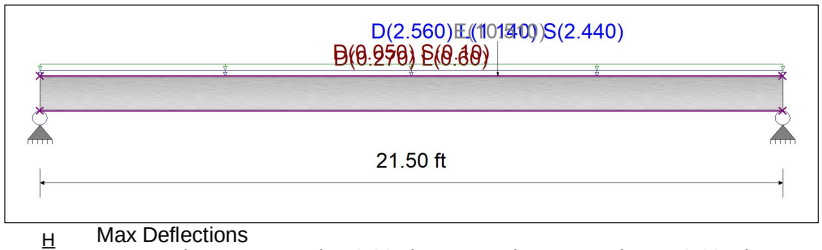
Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : **W12x35, Fully Braced**
Using Allowable Strength Design with IBC 2021 Load Combinations, Major Axis Bending Fy = 50.0 ksi E = 29,000.0 ksi

Design Summary

Max fb/Fb Ratio = **0.818** : 1
Mu : Applied 104.514 k-ft at 13.258 ft in Span # 1
Mn / Omega : Allow 127.745 k-ft
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max fv/FvRatio = **0.218** : 1
Vu : Applied 16.322 k at 21.500 ft in Span # 1
Vn / Omega : Allow 75.0 k
Load Comb : +1.121D+0.750L+0.750S+0.5250



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	4.42		6.89	2.01		4.03	
Right Support	5.02		7.15	2.58		6.48	

Max Deflections

Transient Downward	0.397 in	Total Downward	0.687 in
Ratio	650		375
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : LRB14 - Low Roof Beam

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

BEAM Size : **3.5x11.25, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

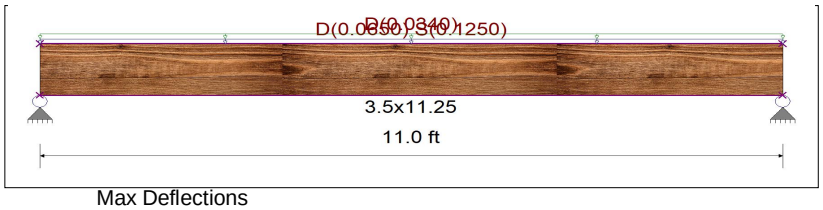
Unif Load: D = 0.0130, S = 0.0250 k/ft, Trib= 5.0 ft
Unif Load: D = 0.0340 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.164** : 1
fb : Actual : 550.68 psi at 5.500 ft in Span # 1
Fb : Allowable : 3,358.98 psi
Load Comb : +D+S

Max fv/FvRatio = **0.117** : 1
fv : Actual : 39.11 psi at 0.000 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.54			0.69			
Right Support	0.54			0.69			



Max Deflections

Transient Downward	0.045 in	Total Downward	0.081 in
Ratio	2913	Ratio	1625
	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 : LRB15 - Low Roof Beam

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

BEAM Size : **3.50 X 8.750, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

1Point: D = 0.720, S = 1.380 k @ 10.0 ft

Design Summary

Max fb/Fb Ratio = **0.504** : 1
fb : Actual : 1,692.69 psi at 7.000 ft in Span # 1
Fb : Allowable : 3,358.98 psi
Load Comb : +D+S

Max fv/FvRatio = **0.308** : 1
fv : Actual : 102.86 psi at 7.000 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+S

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	-0.31			-0.59			
Right Support	1.03			1.97			

Max Deflections

Transient Downward	0.166 in	Total Downward	0.253 in
Ratio	432	Ratio	284
	LC: S Only		LC: +D+S
Transient Upward	-0.053 in	Total Upward	-0.080 in
Ratio	1595	Ratio	1048
	LC: S Only		LC: +D+S

Multiple Simple Beam

Project File: 23010_ASD.ec6

Description : Upper Floor Framing (2 of 3)

Wood Beam Design : UFB5 - Upper Floor Beam

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

BEAM Size : **3.5x14, TimberStrand LSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss Joist Wood Grade : TimberStrand LSL 1.55E

Fb - Tension	2,325.0 psi	Fc - Prll	2,050.0 psi	Fv	310.0 psi	Ebend- xx	1,550.0 ksi	Density	45.010 pcf
Fb - Compr	2,325.0 psi	Fc - Perp	800.0 psi	Ft	1,070.0 psi	Eminbend - xx	787.82 ksi		

Applied Loads

Unif Load: D = 0.270, L = 0.340, S = 0.170 k/ft, Trib= 1.0 ft
Unif Load: D = 0.080, L = 0.240 k/ft, Trib= 1.0 ft

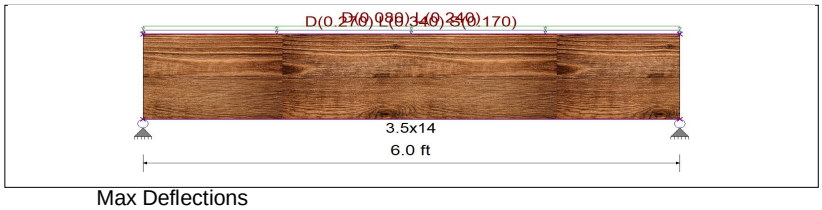
Design Summary

Max fb/Fb Ratio = **0.192** : 1
fb : Actual : 439.24 psi at 3.000 ft in Span # 1
Fb : Allowable : 2,292.26 psi
Load Comb : +D+L

Max fv/FvRatio = **0.276** : 1
fv : Actual : 85.41 psi at 0.000 ft in Span # 1
Fv : Allowable : 310.00 psi
Load Comb : +D+L

Max Reactions (k)

	D	Lr	L	S	W	E	H
Left Support	1.05		1.74	0.51			
Right Support	1.05		1.74	0.51			



Max Deflections

Transient Downward	0.014 in	Total Downward	0.022 in
Ratio	5253	Ratio	3276
	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 : UFB17 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

1Point: D = 1.050, L = 1.740, S = 0.510 k @ 11.750 ft
2Point: D = 0.90, L = 0.560, S = 1.250 k @ 19.50 ft

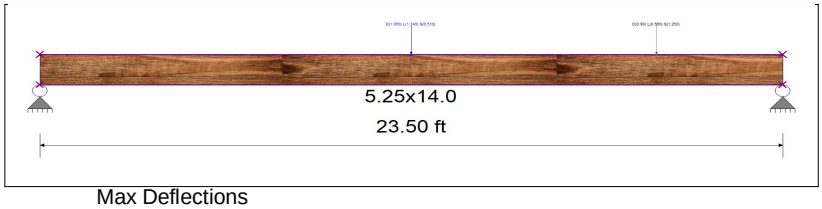
Design Summary

Max fb/Fb Ratio = **0.474** : 1
fb : Actual : 1,351.22 psi at 11.750 ft in Span # 1
Fb : Allowable : 2,850.80 psi
Load Comb : +D+L

Max fv/FvRatio = **0.198** : 1
fv : Actual : 66.16 psi at 19.505 ft in Span # 1
Fv : Allowable : 333.50 psi
Load Comb : +D+0.750L+0.750S

Max Reactions (k)

	D	Lr	L	S	W	E	H
Left Support	0.68		0.97	0.47			
Right Support	1.27		1.33	1.29			



Max Deflections

Transient Downward	0.358 in	Total Downward	0.624 in
Ratio	787	Ratio	452
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : RDB18 - Roof Deck Beam

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

BEAM Size : **5.25x11.25, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss Joist				Wood Grade :	Parallam PSL 2.2E			
Fb - Tension	2900 psi	Fc - Prll	2900 psi	Fv	290 psi	Ebend- xx	2200 ksi	Density	45.07 pcf
Fb - Compr	2900 psi	Fc - Perp	750 psi	Ft	2025 psi	Eminbend - xx	1118.19 ksi		

Applied Loads

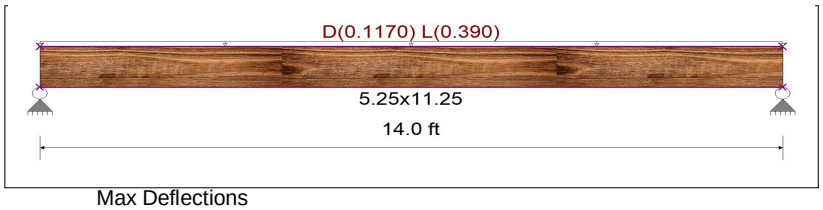
Unif Load: D = 0.0180, L = 0.060 k/ft, Trib= 6.50 ft

Design Summary

Max fb/Fb Ratio = **0.461** : 1
fb : Actual : 1,345.99 psi at 7.000 ft in Span # 1
Fb : Allowable : 2,920.85 psi
Load Comb : +D+L

Max fv/FvRatio = **0.311** : 1
fv : Actual : 90.13 psi at 0.000 ft in Span # 1
Fv : Allowable : 290.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.82		2.73				
Right Support	0.82		2.73				



Max Deflections

Transient Downward	0.247 in	Total Downward	0.321 in
Ratio	679	Ratio	522
	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 : RDB19 - Roof Deck Beam

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

BEAM Size : **3.50 X 8.50, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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

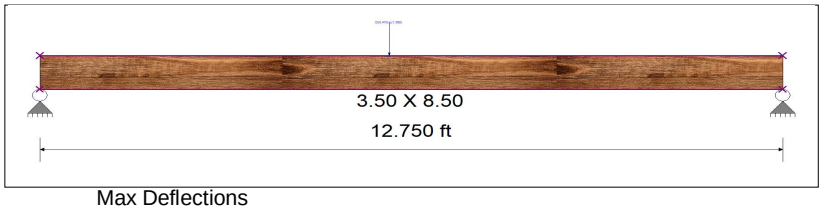
1Point: D = 0.410, L = 1.350 k @ 6.0 ft

Design Summary

Max fb/Fb Ratio = **0.611** : 1
fb : Actual : 1,589.79 psi at 5.993 ft in Span # 1
Fb : Allowable : 2,600.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.165** : 1
fv : Actual : 46.98 psi at 0.000 ft in Span # 1
Fv : Allowable : 285.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.22		0.71				
Right Support	0.19		0.64				



Max Deflections

Transient Downward	0.281 in	Total Downward	0.367 in
Ratio	543	Ratio	417
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : UFH21 - Upper Floor Header

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

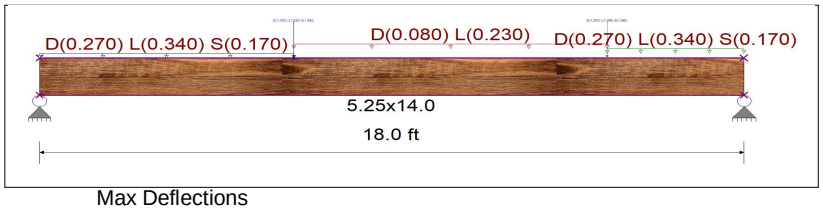
Unif Load: D = 0.270, L = 0.340, S = 0.170 k/ft, 0.0 ft to 6.50 ft, Trib= 1.0 ft
Unif Load: D = 0.270, L = 0.340, S = 0.170 k/ft, 14.50 to 18.0 ft, Trib= 1.0 ft
Unif Load: D = 0.080, L = 0.230 k/ft, 6.50 to 14.50 ft, Trib= 1.0 ft
1Point: D = 1.270, L = 1.330, S = 1.290 k @ 6.50 ft
2Point: D = 1.270, L = 1.330, S = 1.290 k @ 14.50 ft

Design Summary

Max fb/Fb Ratio = **0.746** : 1
fb : Actual : 2,126.81 psi at 6.780 ft in Span # 1
Fb : Allowable : 2,850.80 psi
Load Comb : +D+L

Max fv/FvRatio = **0.501** : 1
fv : Actual : 145.37 psi at 18.000 ft in Span # 1
Fv : Allowable : 290.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	2.86		3.80	2.04			
Right Support	3.03		4.10	2.24			



Max Deflections

Transient Downward	0.398 in	Total Downward	0.681 in
Ratio	542	Ratio	317
	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 : UFH22 - Upper Floor Header

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

BEAM Size : **5.5x9, GLB, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending
Wood Species : DF/DF Wood Grade : 24F-V8

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	2,400.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

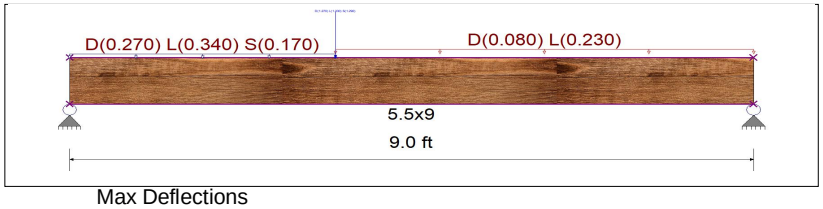
Unif Load: D = 0.270, L = 0.340, S = 0.170 k/ft, 0.0 ft to 3.50 ft, Trib= 1.0 ft
Unif Load: D = 0.080, L = 0.230 k/ft, 3.50 to 9.0 ft, Trib= 1.0 ft
1Point: D = 1.270, L = 1.330, S = 1.290 k @ 3.50 ft

Design Summary

Max fb/Fb Ratio = **0.650** : 1
fb : Actual : 1,561.00 psi at 3.510 ft in Span # 1
Fb : Allowable : 2,400.00 psi
Load Comb : +D+L

Max fv/FvRatio = **0.438** : 1
fv : Actual : 116.05 psi at 0.000 ft in Span # 1
Fv : Allowable : 265.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.67		2.16	1.27			
Right Support	0.98		1.63	0.62			



Max Deflections

Transient Downward	0.120 in	Total Downward	0.207 in
Ratio	898	Ratio	520
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : UFB23 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

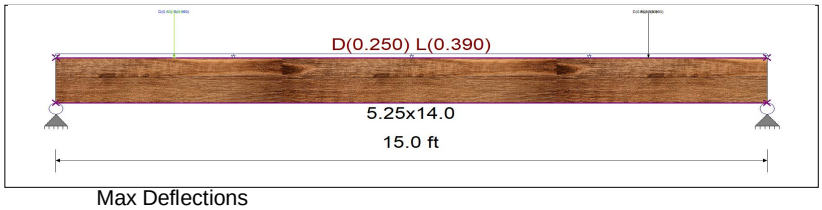
Unif Load: D = 0.250, L = 0.390 k/ft, Trib= 1.0 ft
1Point: D = 0.50, S = 0.960 k @ 2.50 ft
2Point: D = 0.50, S = 0.960 k @ 12.50 ft
3Point: E = 9.130 k @ 2.50 ft
4Point: E = -9.130 k @ 12.50 ft

Design Summary

Max fb/Fb Ratio = **0.472** : 1
fb : Actual : 1,346.94 psi at 7.500 ft in Span # 1
Fb : Allowable : 2,850.80 psi
Load Comb : +D+L

Max fv/FvRatio = **0.386** : 1
fv : Actual : 179.00 psi at 0.000 ft in Span # 1
Fv : Allowable : 464.00 psi
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	2.38		2.93	0.96		6.09	
Right Support	2.38		2.93	0.96		-6.09	



Max Deflections

Transient Downward	0.169 in	Total Downward	0.300 in
Ratio	1064	Ratio	600
	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 : UFB24 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

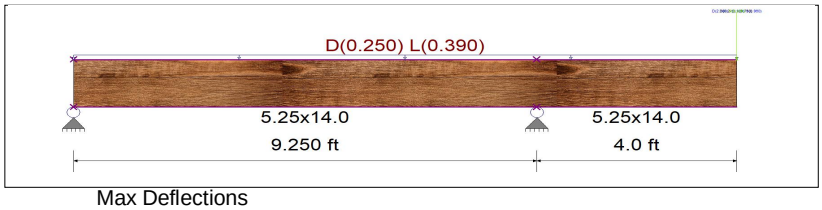
Unif Load: D = 0.250, L = 0.390 k/ft, Trib= 1.0 ft
1Point: D = 2.380, L = 2.930, S = 0.960 k @ 13.250 ft
2Point: D = 0.220, L = 0.710 k @ 13.250 ft
3Point: E = 3.040 k @ 13.250 ft

Design Summary

Max fb/Fb Ratio = **0.738** : 1
fb : Actual : 2,104.69 psi at 9.250 ft in Span # 1
Fb : Allowable : 2,850.80 psi
Load Comb : +D+L

Max fv/FvRatio = **0.619** : 1
fv : Actual : 179.59 psi at 9.250 ft in Span # 1
Fv : Allowable : 290.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	-0.18		-0.11	-0.42		-1.31	
Right Support	6.10		8.92	1.38		4.35	



Max Deflections

Transient Downward	0.168 in	Total Downward	0.288 in
Ratio	572	Ratio	332
	LC: L Only		LC: +D+L
Transient Upward	-0.041 in	Total Upward	-0.070 in
Ratio	2739	Ratio	1578
	LC: L Only		LC: +D+L

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : UFH28 - Upper Floor Header

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

BEAM Size : **3.5x9, GLB, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	DF/DF					Wood Grade :	24F-V8		
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	2,400.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

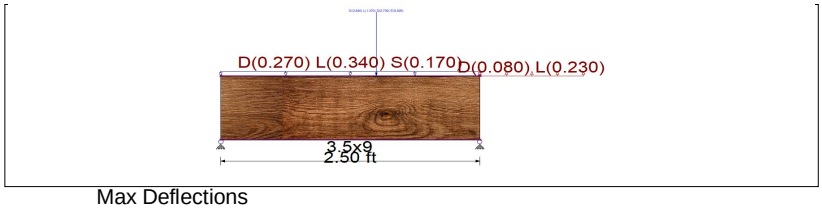
Unif Load: D = 0.270, L = 0.340, S = 0.170 k/ft, 0.0 ft to 2.50 ft, Trib= 1.0 ft
Unif Load: D = 0.080, L = 0.230 k/ft, 3.50 to 2.50 ft, Trib= 1.0 ft
1Point: D = 2.840, L = 1.370, S = 2.730, E = 8.520 k @ 1.50 ft

Design Summary

Max fb/Fb Ratio = **0.460** : 1
fb : Actual : 1,765.69 psi at 1.500 ft in Span # 1
Fb : Allowable : 3,840.00 psi
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max fv/FvRatio = **0.819** : 1
fv : Actual : 347.38 psi at 2.500 ft in Span # 1
Fv : Allowable : 424.00 psi
Load Comb : +1.121D+0.750L+0.750S+0.5250

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.47		0.97	1.30		3.41	
Right Support	2.04		1.25	1.85		5.11	



Max Deflections

Transient Downward	0.004 in	Total Downward	0.009 in
Ratio	7119	Ratio	3404
	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 : UFB29 - Upper Floor Beam

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

BEAM Size : **5.25x14.0, Parallam PSL, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	iLevel Truss 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	750.0 psi	Ft	2,025.0 psi	Eminbend - xx	1,118.19 ksi		

Applied Loads

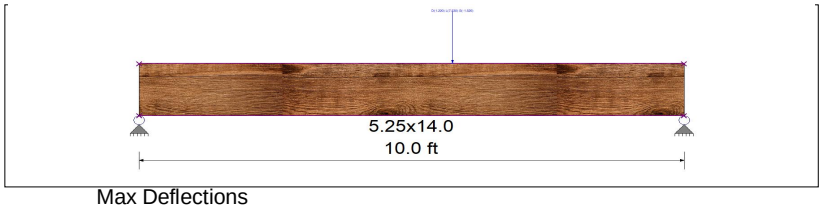
1Point: D = 1.220, L = 7.530, S = -1.520 k @ 5.750 ft

Design Summary

Max fb/Fb Ratio = **0.523** : 1
fb : Actual : 1,491.84 psi at 5.733 ft in Span # 1
Fb : Allowable : 2,850.80 psi
Load Comb : +D+L

Max fv/FvRatio = **0.354** : 1
fv : Actual : 102.68 psi at 5.767 ft in Span # 1
Fv : Allowable : 290.00 psi
Load Comb : +D+L

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.52		3.20	-0.65			
Right Support	0.70		4.33	-0.87			



Max Deflections

Transient Downward	0.100 in	Total Downward	0.116 in
Ratio	1198	Ratio	1031
	LC: L Only		LC: +D+L
Transient Upward	-0.020 in	Total Upward	-0.004 in
Ratio	5938	Ratio	9999
	LC: S Only		LC: +D+S

Multiple Simple Beam

Project File: 23010_ASD.ec6

Wood Beam Design : UFH20 - Upper Floor Header o/ Sliding Door

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

BEAM Size : **5.5x10.5, GLB, Fully Braced**
Using Allowable Stress Design with IBC 2021 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

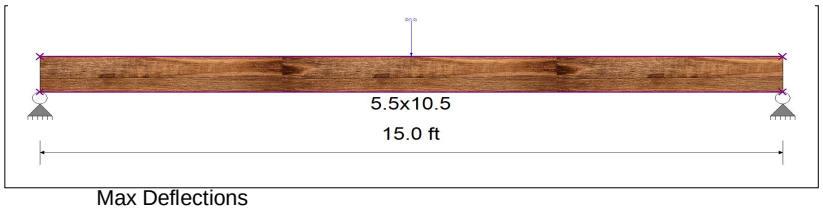
1Point: D = 1.0 k @ 7.50 ft

Design Summary

Max fb/Fb Ratio = **0.206** : 1
fb : Actual : 445.27 psi at 7.500 ft in Span # 1
Fb : Allowable : 2,160.00 psi
Load Comb : D Only

Max fv/FvRatio = **0.054** : 1
fv : Actual : 12.99 psi at 0.000 ft in Span # 1
Fv : Allowable : 238.50 psi
Load Comb : D Only

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



Max Deflections

Transient Downward	0.000 in	Total Downward	0.128 in
Ratio	9999	Ratio	1407
LC:		LC:	D Only
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	0 <0	Ratio	9999
LC:		LC:	

Wood Beam Design : UFH30 - Upper Floor Header o/ Sliding Door

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

BEAM Size : **4x10, Sawn, Fully Braced**
Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species :	Douglas Fir-Larch				Wood Grade :	No.1			
Fb - Tension	1000 psi	Fc - Prll	1500 psi	Fv	180 psi	Ebend- xx	1700 ksi	Density	31.21 pcf
Fb - Compr	1000 psi	Fc - Perp	625 psi	Ft	675 psi	Eminbend - xx	620 ksi		

Applied Loads

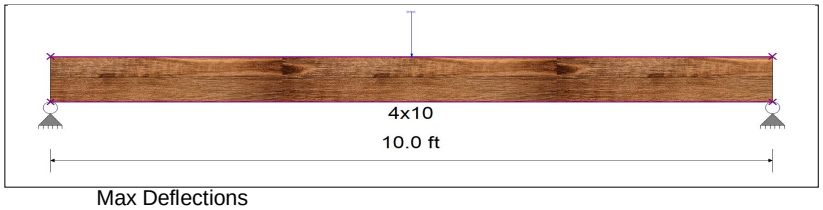
1Point: D = 1.0 k @ 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.557** : 1
fb : Actual : 601.06 psi at 5.000 ft in Span # 1
Fb : Allowable : 1,080.00 psi
Load Comb : D Only

Max fv/FvRatio = **0.143** : 1
fv : Actual : 23.17 psi at 0.000 ft in Span # 1
Fv : Allowable : 162.00 psi
Load Comb : D Only

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



Max Deflections

Transient Downward	0.000 in	Total Downward	0.092 in
Ratio	9999	Ratio	1301
LC:		LC:	D Only
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	0 <0	Ratio	9999
LC:		LC:	

Multiple Simple Beam

Project File: 23010_ASD.ec6

Description : Upper Floor Framing (3 of 3)

Steel Beam Design : SS31 - Stair Stringer

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

STEEL Section : **HSS6x6x3/8, Fully Unbraced**

Using Allowable Strength Design with IBC 2021 Load Combinations, Major Axis Bending

Fy = 46.0 ksi E = 29,000.0 ksi

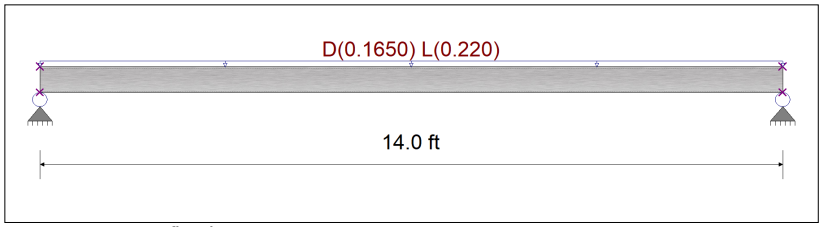
Applied Loads

Unif Load: D = 0.030, L = 0.040 k/ft, Trib= 5.50 ft

Design Summary

Max fb/Fb Ratio = **0.260** : 1
Mu : Applied 9.433 k-ft at 7.000 ft in Span # 1
Mn / Omega : Allow 36.267 k-ft
Load Comb : +D+L

Max fv/FvRatio = **0.047** : 1
Vu : Applied 2.695 k at 0.000 ft in Span # 1
Vn / Omega : Allow 57.137 k
Load Comb : +D+L



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.16		1.54				
Right Support	1.16		1.54				

Max Deflections

Transient Downward	0.167 in	Total Downward	0.292 in
Ratio	1006		575
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Column

Project File: 23010_ASD.ec6

DESCRIPTION: Upper Floor Post Supporting RB8

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Analysis Method	Allowable Stress Design			Wood Section Name	**3.5x5.25**
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Trus Joist
Overall Column Height	9 ft			Wood Member Type	Parallam PSL
(Used for non-slender calculations)					
Wood Species	iLevel Truss Joist			Exact Width	**3.50** in
Wood Grade	Parallam PSL 1.8E			Exact Depth	**5.250** in
Fb +	2400 psi	Fv	190 psi	Area	18.375 in^2
Fb -	2400 psi	Ft	1755 psi	Ix	42.205 in^4
Fc - Prll	2500 psi	Density	45.07 pcf	Iy	18.758 in^4
Fc - Perp	425 psi				

Allow Stress Modification Factors	
Cf or Cv for Bending	1.0
Cf or Cv for Compressio	1.0
Cf or Cv for Tension	1.0
Cm : Wet Use Factor	1.0
Ct : Temperature Fact	1.0
Cfu : Flat Use Factor	1.0
Kf : Built-up columns	1.0
Use Cr : Repetitive ?	No

E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
Basic	1800	1800	1800 ksi
Minimum	914.88	914.88	

Column Buckling Condition:
ABOUT X-X Axis: Lux = 9 ft, Kx = 1.0
ABOUT Y-Y Axis: Luy = 9 ft, Ky = 1.0

Applied Loads

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

Column self weight included : 51.760 lbs * Dead Load Factor
AXIAL LOADS . . .
RB8: Axial Load at 9.0 ft, D = 3.920, L = 1.230, S = 5.90 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7048 : 1**

Load Combination	+D+S
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	9.872 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	762.31 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	9.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	304.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a

Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	0.334	0.2874	PASS	0.0 ft	0.0	PASS	9.0 ft
+D+L	1.000	0.303	0.3740	PASS	0.0 ft	0.0	PASS	9.0 ft
+D+S	1.150	0.265	0.7048	PASS	0.0 ft	0.0	PASS	9.0 ft
+D+0.750L	1.250	0.245	0.3482	PASS	0.0 ft	0.0	PASS	9.0 ft
+D+0.750L+0.750S	1.150	0.265	0.6653	PASS	0.0 ft	0.0	PASS	9.0 ft
+0.60D	1.600	0.193	0.1681	PASS	0.0 ft	0.0	PASS	9.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments k-ft @ Base	@ Top	Mx - End Moments @ Base	@ Top
D Only					3.972				

Wood Column

Project File: 23010_ASD.ec6

DESCRIPTION: Upper Floor Post Supporting RB8

Maximum Reactions

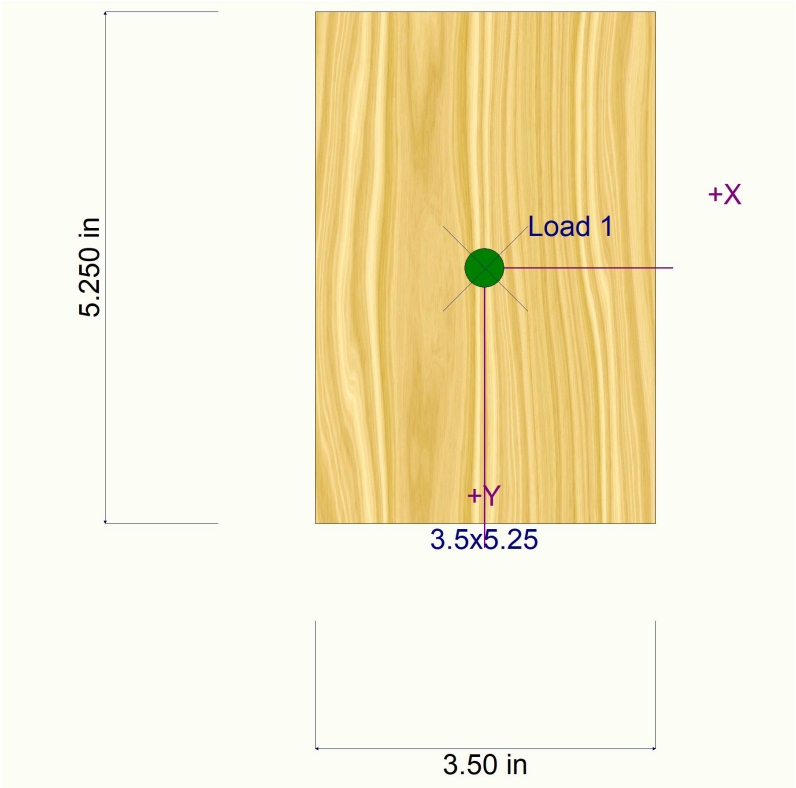
Note: Only non-zero reactions are listed.

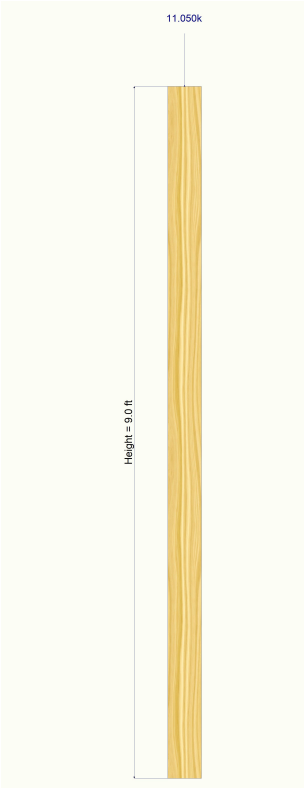
Load Combination	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments @ Base	@ Top	k-ft	Mx - End Moments @ Base	@ Top
+D+L						5.202					
+D+S						9.872					
+D+0.750L						4.894					
+D+0.750L+0.750S						9.319					
+0.60D						2.383					
L Only						1.230					
S Only						5.900					

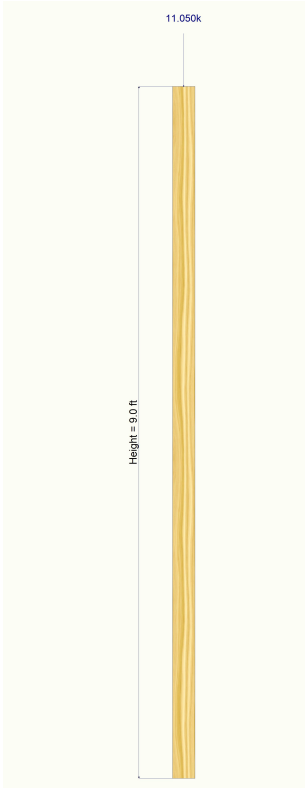
Maximum Deflections for Load Combinations

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

Sketches







Wood Column

Project File: 23010_ASD.ec6

DESCRIPTION: Main Floor Post Supporting UFB12

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Analysis Method	Allowable Stress Design		
End Fixities	Top & Bottom Pinned		
Overall Column Height	10 ft		
(Used for non-slender calculations)			
Wood Species	iLevel Truss Joist		
Wood Grade	Parallam PSL 1.8E		
Fb +	2,400.0 psi	Fv	190.0 psi
Fb -	2,400.0 psi	Ft	1,755.0 psi
Fc - Prll	2,500.0 psi	Density	45.070 pcf
Fc - Perp	425.0 psi		

E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
Basic	1,800.0	1,800.0	1,800.0 ksi
Minimum	914.88	914.88	

Wood Section Name	**5.25x5.25**
Wood Grading/Manuf.	Trus Joist
Wood Member Type	Parallam PSL
Exact Width	**5.250** in
Exact Depth	**5.250** in
Area	27.563 in^2
Ix	63.308 in^4
Iy	63.308 in^4

Allow Stress Modification Factors	
Cf or Cv for Bending	1.0
Cf or Cv for Compressio	1.0
Cf or Cv for Tension	1.0
Cm : Wet Use Factor	1.0
Ct : Temperature Fact	1.0
Cfu : Flat Use Factor	1.0
Kf : Built-up columns	1.0
Use Cr : Repetitive ?	No

Column Buckling Condition:
ABOUT X-X Axis: Lux = 10 ft, Kx = 1.0
ABOUT Y-Y Axis: Luy = 10 ft, Ky = 1.0

Applied Loads

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

Column self weight included : 86.268 lbs * Dead Load Factor
AXIAL LOADS . . .
UFB10: Axial Load at 10.0 ft, D = 2.040, L = 0.580, S = 2.550, E = 11.460 k
RB9: Axial Load at 10.0 ft, D = 0.940, L = 0.780, S = 1.310 k
UFB12: Axial Load at 10.0 ft, D = 4.420, L = 6.890, S = 2.010 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6628 : 1**

Load Combination	+1.121D+0.750L+0.750S+0.5250E
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	24.997 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	1,368.29 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.4390D+0.70E
Location of max.above base	10.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	304.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a

Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	0.566	0.2133	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L	1.000	0.520	0.4395	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S	1.150	0.461	0.3655	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L	1.250	0.428	0.3705	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S	1.150	0.461	0.4946	PASS	0.0 ft	0.0	PASS	10.0 ft
+1.161D+0.70E	1.600	0.342	0.4432	PASS	0.0 ft	0.0	PASS	10.0 ft
+1.121D+0.750L+0.750S+0.525(	1.600	0.342	0.6628	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	0.342	0.1191	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.4390D+0.70E	1.600	0.342	0.2999	PASS	0.0 ft	0.0	PASS	10.0 ft

Wood Column

Project File: 23010_ASD.ec6

DESCRIPTION: Main Floor Post Supporting UFB12

Maximum Reactions

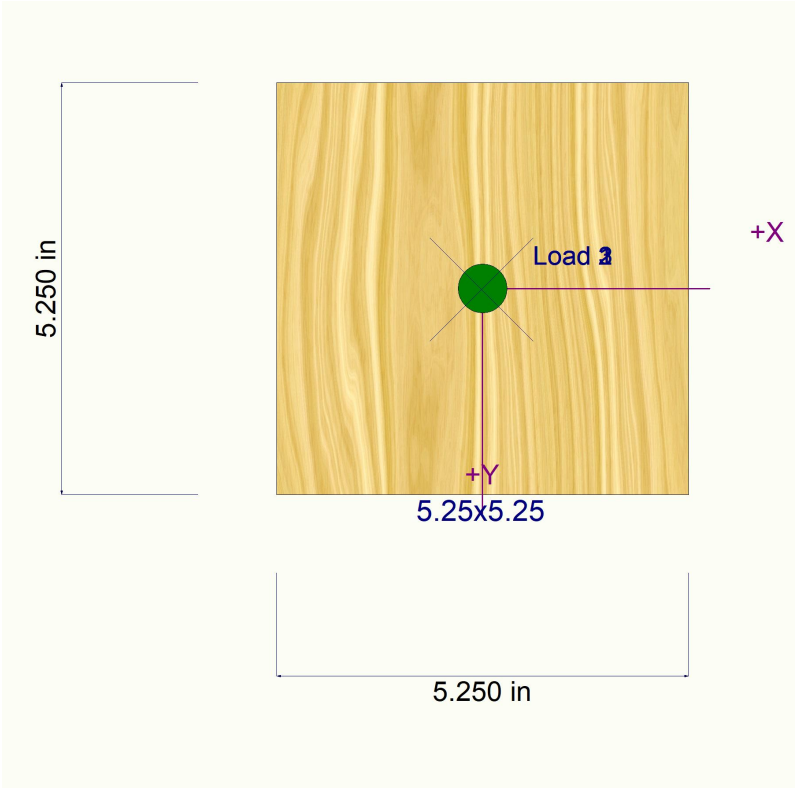
Note: Only non-zero reactions are listed.

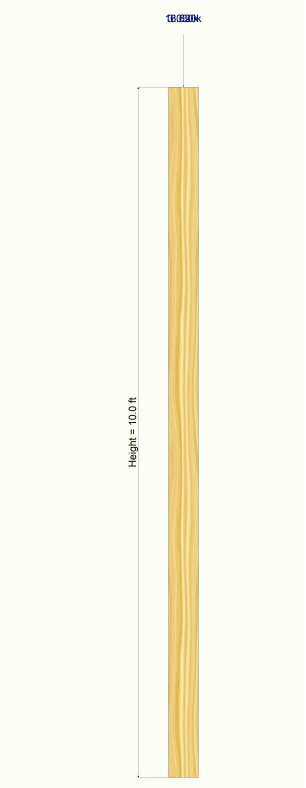
Load Combination	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments @ Base	@ Top	k-ft	Mx - End Moments @ Base	@ Top
D Only						7.486					
+D+L						15.736					
+D+S						13.356					
+D+0.750L						13.674					
+D+0.750L+0.750S						18.076					
+D+0.70E						15.508					
+D+0.750L+0.750S+0.5250E						24.093					
+0.60D						4.492					
+0.60D+0.70E						12.514					
L Only						8.250					
S Only						5.870					
E Only						11.460					

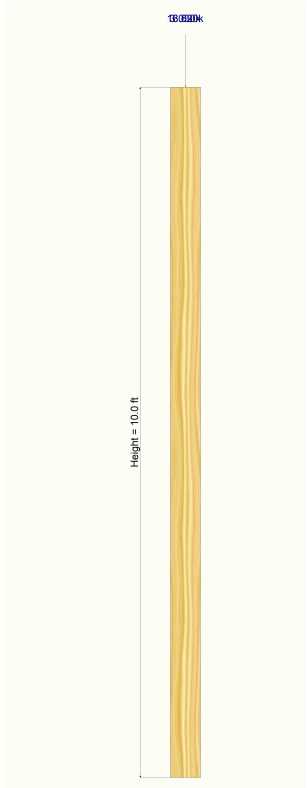
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000ft
+D+S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750L	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750L+0.750S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.70E	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750L+0.750S+0.5250E	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D+0.70E	0.0000 in	0.000ft	0.000 in	0.000ft
L Only	0.0000 in	0.000ft	0.000 in	0.000ft
S Only	0.0000 in	0.000ft	0.000 in	0.000ft
E Only	0.0000 in	0.000ft	0.000 in	0.000ft

Sketches







Steel Column

Project File: 23010_ASD.ec6

DESCRIPTION: Main Floor Post Supporting UFB9

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **HSS5x5x1/4**

Analysis Method :	Allowable Strength
Steel Stress Grade	
Fy : Steel Yield	46.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	10.0 ft
Top & Bottom Fixity	Top & Bottom Pinned
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 10.0 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 10.0 ft, K = 1.0

Applied Loads

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

Column self weight included : 156.20 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 10.0 ft, D = 15.150, L = 20.690, S = 7.480 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.3990 : 1

Load Combination	+D+0.750L+0.750S
Location of max.above base	0.0 ft
At maximum location values are . . .	
Pa : Axial	36.434 k
Pn / Omega : Allowabl	91.321 k
Ma-x : Applied	0.0 k-ft
Mn-x / Omega : Allowable	17.468 k-ft
Ma-y : Applied	0.0 k-ft
Mn-y / Omega : Allowable	17.468 k-ft

PASS Maximum Shear Stress Rati 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

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.0 k

Maximum Load Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination :

Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.168	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft
+D+L	0.394	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft
+D+S	0.250	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft
+D+0.750L	0.338	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft
+D+0.750L+0.750S	0.399	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft
+0.60D	0.101	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only	15.306								
+D+L	35.996								
+D+S	22.786								
+D+0.750L	30.824								
+D+0.750L+0.750S	36.434								
+0.60D	9.184								
L Only	20.690								
S Only	7.480								

Steel Column

Project File: 23010_ASD.ec6

DESCRIPTION: Main Floor Post Supporting UFB9

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments @ Base	@ Top	k-ft	My - End Moments @ Base	@ Top
Axial @ Base	Maximum	36.434										
"	Minimum	7.480										
Reaction, X-X Axis Base	Maximum	15.306										
"	Minimum	15.306										
Reaction, Y-Y Axis Base	Maximum	15.306										
"	Minimum	15.306										
Reaction, X-X Axis Top	Maximum	15.306										
"	Minimum	15.306										
Reaction, Y-Y Axis Top	Maximum	15.306										
"	Minimum	15.306										
Moment, X-X Axis Base	Maximum	15.306										
"	Minimum	15.306										
Moment, Y-Y Axis Base	Maximum	15.306										
"	Minimum	15.306										
Moment, X-X Axis Top	Maximum	15.306										
"	Minimum	15.306										
Moment, Y-Y Axis Top	Maximum	15.306										
"	Minimum	15.306										

Maximum Deflections for Load Combinations

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

Steel Section Properties : HSS5x5x1/4

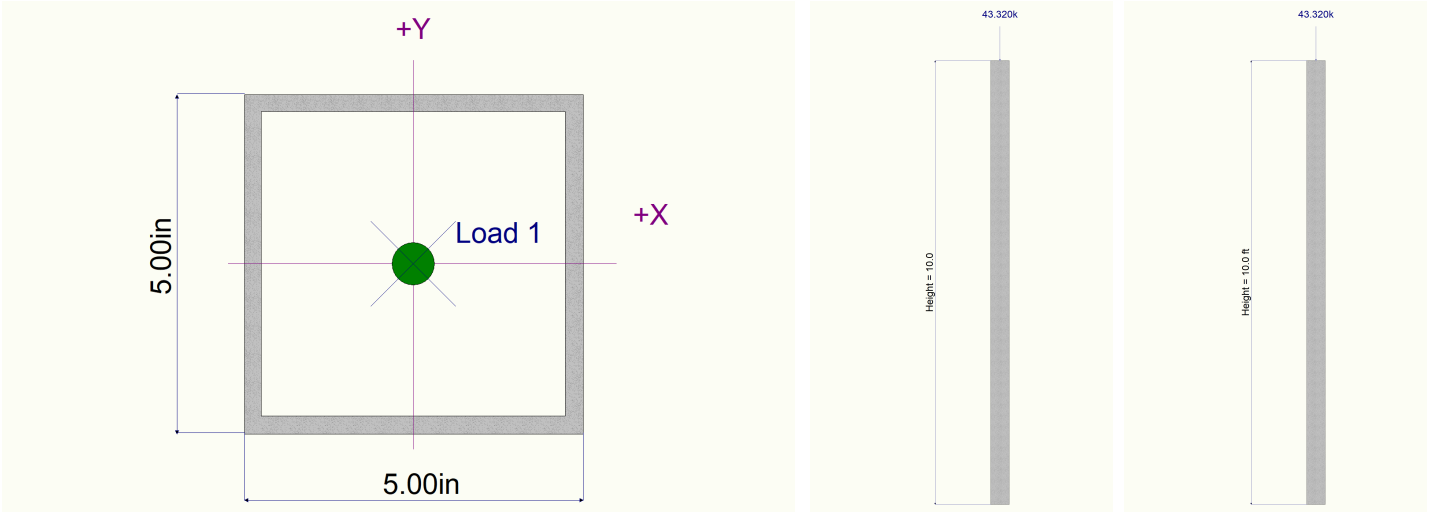
Depth	=	5.000	in	I xx	=	16.00	in^4	J	= 25.800 in^4
Design Thick	=	0.233	in	S xx	=	6.41	in^3		
Width	=	5.000	in	R xx	=	1.930	in		
Wall Thick	=	0.250	in	Zx	=	7.610	in^3		
Area	=	4.300	in^2	I yy	=	16.000	in^4	C	= 10.500 in^3
Weight	=	15.620	plf	S yy	=	6.410	in^3		
				R yy	=	1.930	in		
Ycg	=	0.000	in						

Steel Column

Project File: 23010_ASD.ec6

DESCRIPTION: Main Floor Post Supporting UFB9

Sketches



Multiple Simple Beam

Project File: 23010_ASD.ec6

Description : Main Floor Slabs & Grade Beams

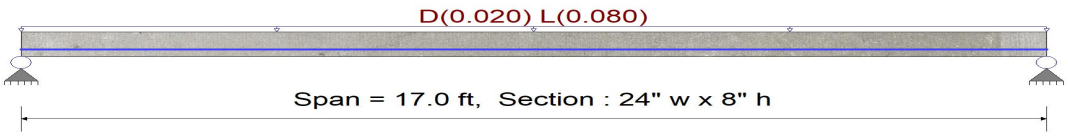
Concrete Beam Design : S1 - Typical Interior Structural Slab - Pinned Supports - 17'-0" max span - 8" slab w/ #5(

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#5 at 2.310 in from Bottom, from 0.0 to 17.0 ft in this span

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

No Stirrups Required from 0.00 to 17.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010, L = 0.040 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio =	**0.923** : 1		
Mu : Applied	13.872 k-ft	at 8.500 ft	in Span # 1
Mn * Phi : Allowable	15.027 k-ft		
Load Comb :	+1.20D+1.60L		

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.81	0.68					
Right Support	1.81	0.68					

Max Deflections

Transient Downward	0.047 in	Total Downward	0.249 in
Ratio	4364	Ratio	820
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

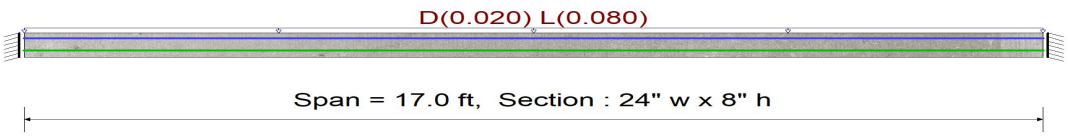
Concrete Beam Design : S1 - Typical Interior Structural Slab - Fixed Supports - 17'-0" max span - 8" slab w/ #4@

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#4 at 1.750 in from Top, from 0.0 to 17.0 ft in this span

2-#5 at 2.310 in from Bottom, from 0.0 to 17.0 ft in this span

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

No Stirrups Required from 0.00 to 17.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010, L = 0.040 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio =	**0.601** : 1		
Mu : Applied	-9.248 k-ft	at 0.000 ft	in Span # 1
Mn * Phi : Allowable	15.40 k-ft		
Load Comb :	+1.20D+1.60L		

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.81	0.68					
Right Support	1.81	0.68					

Max Deflections

Transient Downward	0.009 in	Total Downward	0.034 in
Ratio	9999	Ratio	5974
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

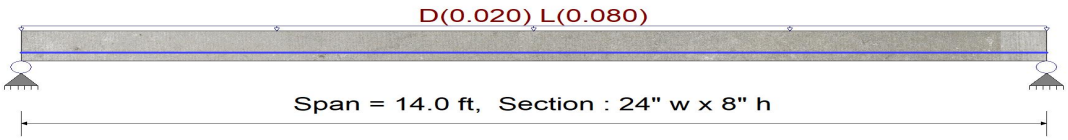
Concrete Beam Design : S2 - Typical Interior Structural Slab - Pinned Supports - 14'-0" max span - 8" slab w/ #4(

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#4 at 2.250 in from Bottom, from 0.0 to 14.0 ft in this span

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

No Stirrups Required from 0.00 to 14.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010, L = 0.040 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio =	**0.941** : 1		
Mu : Applied	9.408 k-ft	at 7.000 ft	in Span # 1
Mn * Phi : Allowable	9.997 k-ft		
Load Comb :	+1.20D+1.60L		

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.49	0.56					
Right Support	1.49	0.56					

Max Deflections

Transient Downward	0.022 in	Total Downward	0.079 in
Ratio	7813	Ratio	2131
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

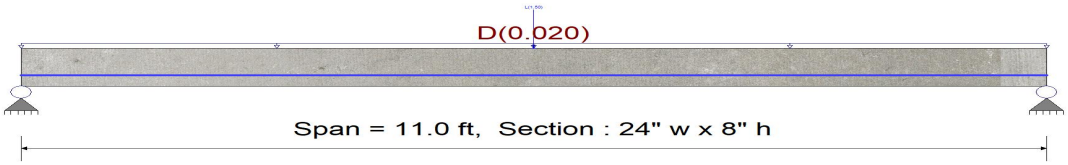
Concrete Beam Design : S3 - Garage Structural Slab - Pinned Supports - 11'-0" max span - 8" slab w/ #5@12"o.(

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#5 at 2.310 in from Bottom, from 0.0 to 11.0 ft in this span

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

No Stirrups Required from 0.00 to 11.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010 k/ft, Trib= 2.0 ft

1Point: L = 1.50 k @ 5.50 ft

Design Summary

Max fb/Fb Ratio =	**0.697** : 1		
Mu : Applied	10.472 k-ft	at 5.500 ft	in Span # 1
Mn * Phi : Allowable	15.027 k-ft		
Load Comb :	+1.20D+1.60L		

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.17	0.75					
Right Support	1.17	0.75					

Max Deflections

Transient Downward	0.022 in	Total Downward	0.044 in
Ratio	5914	Ratio	2988
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

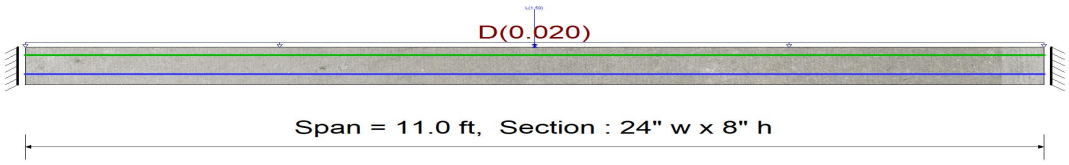
Concrete Beam Design : S3 - Garage Structural Slab - Fixed Supports - 11'-0" max span - 8" slab w/ #4@12"o.c.

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#5 at 2.310 in from Bottom, from 0.0 to 11.0 ft in this span

2-#4 at 1.750 in from Top, from 0.0 to 11.0 ft in this span

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

No Stirrups Required from 0.00 to 11.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010 k/ft, Trib= 2.0 ft

1Point: L = 1.50 k @ 5.50 ft

Design Summary

Max fb/Fb Ratio = **0.382** : 1

Mu : Applied -5.881 k-ft at 11.000 ft in Span # 1

Mn * Phi : Allowable 15.40 k-ft

Load Comb : +1.20D+1.60L

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.17	0.75					
Right Support	1.17	0.75					

Max Deflections

Transient Downward	0.006 in	Total Downward	0.010 in
Ratio	9999	Ratio	9999
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

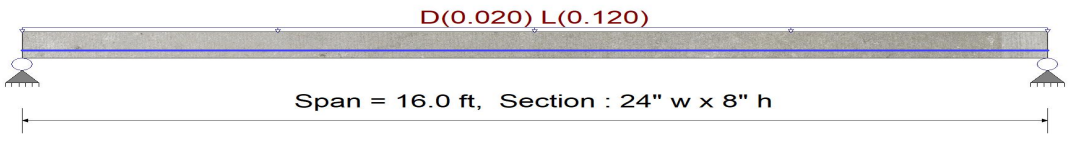
Concrete Beam Design : S4 - Back Patio Structural Slab - Pinned Supports - 16'-0" max span - 8" slab w/ #5@12

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#5 at 2.310 in from Bottom, from 0.0 to 16.0 ft in this span

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

No Stirrups Required from 0.00 to 16.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010, L = 0.060 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.954** : 1

Mu : Applied 14.336 k-ft at 8.000 ft in Span # 1

Mn * Phi : Allowable 15.027 k-ft

Load Comb : +1.20D+1.60L

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.71	0.96					
Right Support	1.71	0.96					

Max Deflections

Transient Downward	0.055 in	Total Downward	0.226 in
Ratio	3489	Ratio	851
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

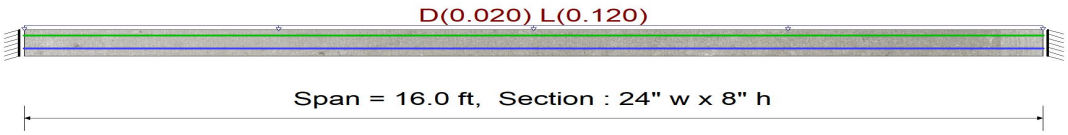
Concrete Beam Design : S4 - Back Patio Structural Slab - Fixed Supports - 16'-0" max span - 8" slab w/ #4@12"

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

Rectangular Beam : 24.0 in wide x 8.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750



Cross Section & Reinforcing Details

2-#5 at 2.310 in from Bottom, from 0.0 to 16.0 ft in this span

2-#4 at 1.750 in from Top, from 0.0 to 16.0 ft in this span

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

No Stirrups Required from 0.00 to 16.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.010, L = 0.060 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.621** : 1

Mu : Applied -9.557 k-ft at 0.000 ft in Span # 1

Mn * Phi : Allowable 15.40 k-ft

Load Comb : +1.20D+1.60L

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.71	0.96					
Right Support	1.71	0.96					

Max Deflections

Transient Downward	0.011 in	Total Downward	0.030 in
Ratio	9999	Ratio	6306
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

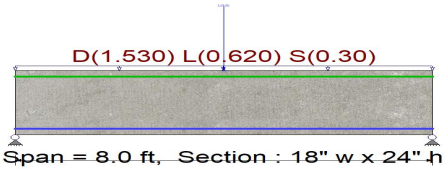
Concrete Beam Design : F6 - Typical Perimeter Grade Beam

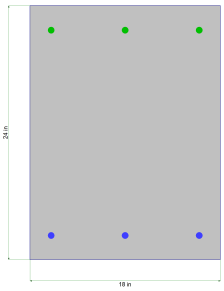
Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Rectangular Beam : 18.0 in wide x 24.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750





Cross Section & Reinforcing Details

3-#5 at 2.310 in from Bottom, from 0.0 to 8.0 ft in this span

3-#5 at 2.310 in from Top, from 0.0 to 8.0 ft in this span

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

No Stirrups Required from 0.00 to 8.00 ft along span, Condition : Vu < PhiVc/2

Applied Loads

Unif Load: D = 1.530, L = 0.620, S = 0.30 k/ft, Trib= 1.0 ft

1Point: L = 3.0 k @ 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.374** : 1

Mu : Applied 33.424 k-ft at 4.000 ft in Span # 1

Mn * Phi : Allowable 89.439 k-ft

Load Comb : +1.20D+1.60L+0.50S

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	6.12	3.98		1.20			
Right Support	6.12	3.98		1.20			

Max Deflections

Transient Downward	0.002 in	Total Downward	0.004 in
Ratio	9999	Ratio	9999
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Multiple Simple Beam

Project File: 23010_ASD.ec6

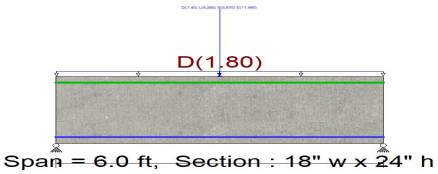
Concrete Beam Design : F7 - Typical Interior Grade Beam

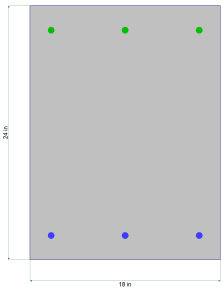
Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Rectangular Beam : 18.0 in wide x 24.0 in high

Using Ultimate Strength Design with IBC 2021 Load Combinations, Major Axis Bending

f'c =	3.0 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 =	60.0 ksi	E Stirrups =	29,000.0 ksi	ϕ Values Bending	0.90
fr =	410.792 ksi	β =	0.850			Shear	0.750





Cross Section & Reinforcing Details

3-#5 at 2.310 in from Bottom, from 0.0 to 6.0 ft in this span

3-#5 at 2.310 in from Top, from 0.0 to 6.0 ft in this span

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

#3 stirrups (2 legs) at 10.75 in o/c from 0.00 to 2.27 ft along span, Condition : PhiVc/2 < Vu <= PhiVc
No Stirrups Required from 2.30 to 3.70 ft along span, Condition : Vu < PhiVc/2
#3 stirrups (2 legs) at 10.75 in o/c from 3.73 to 6.00 ft along span, Condition : PhiVc/2 < Vu <= PhiVc

Applied Loads

Unif Load: D = 1.80 k/ft, Trib= 1.0 ft
1Point: D = 7.40, L = 8.250, S = 5.870, E = 11.460 k @ 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.637** : 1
Mu : Applied 56.997 k-ft at 3.000 ft in Span # 1
Mn * Phi : Allowable 89.439 k-ft
Load Comb : +1.430D+0.50L+0.70S+E

Reactions (k)	D	L	Lr	S	W	E	H
Left Support	9.10	4.12		2.93		5.73	
Right Support	9.10	4.12		2.93		5.73	

Max Deflections

Transient Downward	0.001 in	Total Downward	0.004 in
Ratio	9999	Ratio	9999
	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:

Plywood Shear Wall Design

Refer to Shear Wall Key Plans

Story Forces - ASD Level	
Floor	F_x (psf)
Roof	5.7
Upper	3.0

Plywood Grade
CD-X

Struct 1 or CD-X

15/32" Plywood, w/ 10d nails, min. 1-1/2" penetration into framing members

R_d (Dead Load Resistance Factor) = 0.6-0.14S_{ds} = 0.44

Wall Mark Capacity (Grade Struct 1)		
Wall Mark	Edge Nailing	Capacity (plf)
1	6"o.c.	340
2	4"o.c.	510
3	3"o.c.	665
4	2"o.c.	870
Dbl 2	4"o.c. Both Sides	1020
Dbl 3	3"o.c. Both Sides	1330
Dbl 4	2"o.c. Both Sides	1740

Wall Mark Capacity (Grade CD-X)		
Wall Mark	Edge Nailing	Capacity (plf)
1	6"o.c.	310
2	4"o.c.	460
3	3"o.c.	600
4	2"o.c.	770
Dbl 2	4"o.c. Both Sides	920
Dbl 3	3"o.c. Both Sides	1200
Dbl 4	2"o.c. Both Sides	1540

Holdown Schedule	
Holdown	Capacity (lb)
HDU2	3075
HDU4	4565
HDU5	5645
HDU8	7870
MSTC40	1920
MSTC52	3455
MSTC66	5375

Notes

1) $Wall_{abv}$ = Shear wall on story above that adds shear to subject wall
2) V_{abv} = Shear demand from wall on story above
3) V_{cur} = Shear demand from current story = A_T x F_x
4) V = Total shear demand in wall = V_{abv} + V_{cur}
5) v = unit shear demand = V / L
6) Allowable shear reduction multiplier of 2xL/h for walls w/ h>2L (=1 if h<2L)
7) OTM = Wall overturning moment = V x h
8) w_{DL} = Distributed resisting dead load on top of wall
9) $P_{DL,END}$ = Minimum resisting point dead load on end of wall
10) RM = Resisting Moment from w_{DL} & $P_{DL,END}$, mulitplied by R_d above
11) T_{end} = Tension at end of wall from current story shear = (OTM - RM) / L
12) T_{abv} = Tension from wall holdown on story above
13) T = T_{end} + T_{abv}

Roof Diaphragm

Walls in North-South Direction												
Wall	L (ft)	h (ft)	A_T (sf)	$Wall_{abv}$ [1]	V_{abv} [2] (lbs)	V_{cur} [3] (lbs)	V [4] (lb)	v [5] (plf)	Wall Mark	h>2L?	2xL/h [6]	Capacity (plf)
UF.1	20.25	11	410	none	0	2350	2350	116	1	no	1	310
UF.2.1	6	10	322	none	0	1846	1846	308	2	no	1	460
UF.2.2	4.25	10	228	none	0	1307	1307	308	2	yes	0.85	391
UF.3.1	3	10.5	50	none	0	287	287	96	1	yes	0.57	177
UF.3.2	3	10.5	50	none	0	287	287	96	1	yes	0.57	177
UF.32.1	3	10.5	40	none	0	229	229	76	1	yes	0.57	177
UF.32.2	3	10.5	40	none	0	229	229	76	1	yes	0.57	177
UF.35	11	9	740	none	0	4242	4242	386	2	no	1	460
UF.4.1	7	9	747	none	0	4280	4280	611	4	no	1	770
UF.4.2	6.5	9	693	none	0	3974	3974	611	4	no	1	770
UF.5.1	3.25	9	210	none	0	1204	1204	370	3	yes	0.72	433
UF.5.2	3.25	9	210	none	0	1204	1204	370	3	yes	0.72	433
UF.6.1	3	10.5	130	none	0	745	745	248	3	yes	0.57	343
UF.6.2	3	10.5	130	none	0	745	745	248	3	yes	0.57	343
UF.6.3	3	10.5	140	none	0	803	803	268	3	yes	0.57	343
UF.6.4	3	10.5	140	none	0	803	803	268	3	yes	0.57	343

Holdowns for Walls in North-South Direction										
Wall	OTM [7] (lb-ft)	w_{DL} [8] (plf)	$P_{DL,END}$ [9] (lb)	RM [10] (lb-ft)	T_{end} [11] (lb)	T_{abv} [12] (lb)	T [13] (lb)	Holdown	Capacity	
UF.1	25853	110	1160	20213	279		279	NONE	#N/A	*Close enough*
UF.2.1	18455	100	0	790	2944		2944	HDU2	3075	
UF.2.2	13072	100	0	396	2983		2983	HDU2	3075	
UF.3.1	3009	100	560	935	691		691	MSTC40	1920	
UF.3.2	3009	100	560	935	691		691	MSTC40	1920	
UF.32.1	2408	100	560	935	491		491	MSTC40	1920	
UF.32.2	2408	100	560	935	491		491	MSTC40	1920	
UF.35	38177	70	0	1859	3302		3302	MSTC48B3	3975	
UF.4.1	38521	230	690	4594	4847		4847	MSTC66B3	4490	*Close enough*
UF.4.2	35770	370	740	5543	4650		4650	MSTC66B3	4490	*Close enough*
UF.5.1	10834	330	970	2149	2672		2672	HDU2	3075	
UF.5.2	10834	330	970	2149	2672		2672	HDU2	3075	
UF.6.1	7825	100	560	935	2297		2297	MSTC48B3	3975	
UF.6.2	7825	100	560	935	2297		2297	MSTC48B3	3975	
UF.6.3	8426	100	560	935	2497		2497	MSTC48B3	3975	
UF.6.4	8426	100	560	935	2497		2497	MSTC48B3	3975	

Walls in East-West Direction												
Wall	L (ft)	h (ft)	A_T (sf)	$Wall_{abv}$[1]	V_{abv}[2] (lbs)	V_{cur}[3] (lbs)	V[4] (lb)	v[5] (plf)	Wall Mark	h>2L?	2xL/h[6]	Capacity (plf)
UF.A*	18.25	9	280	none	0	1605	1605	158	1	no	1	310
UF.B	15.25	9	160	none	0	917	917	60	1	no	1	310
UF.C.1	11.25	9	528	none	0	3027	3027	269	1	no	1	310
UF.C.2	13.25	9	622	none	0	3565	3565	269	1	no	1	310
UF.F.1	6.25	10	145	none	0	833	833	133	1	no	1	310
UF.F.2	6	10	139	none	0	799	799	133	1	no	1	310
UF.F.3	6.25	10	145	none	0	833	833	133	1	no	1	310
UF.G.1	5.75	9	335	none	0	1918	1918	334	2	no	1	460
UF.G.2	5.75	9	335	none	0	1918	1918	334	2	no	1	460
UF.G.3	10.5	9	611	none	0	3502	3502	334	2	no	1	460
UF.H	35.5	9	240	none	0	1376	1376	39	1	no	1	310
UF.I.1	16	10	390	none	0	2236	2236	140	1	no	1	310
UF.I.2	14	9	310	none	0	1777	1777	127	1	no	1	310

Holdowns for Walls in East-West Direction										
Wall	OTM[7] (lb-ft)	w_{DL}[8] (plf)	$P_{DL,END}$[9] (lb)	RM[10] (lb-ft)	T_{end}[11] (lb)	T_{abv}[12] (lb)	T[13] (lb)	Holdown	Capacity	
UF.A*	14445	120	480	12619	100		100	None	#N/A	*Close enough*
UF.B	8255	140	280	9021	-50		-50	None	#N/A	
UF.C.1	27243	140	280	5272	1953		1953	MSTC52	3455	
UF.C.2	32086	110	220	5519	2005		2005	HDU2	3075	
UF.F.1	8327	290	1200	5779	408		408	None	#N/A	*Close enough*
UF.F.2	7994	290	1200	5452	424		424	None	#N/A	*Close enough*
UF.F.3	8327	290	1200	5779	408		408	None	#N/A	*Close enough*
UF.G.1	17259	250	500	3076	2467		2467	MSTC52	3455	
UF.G.2	17259	250	500	3076	2467		2467	MSTC52	3455	
UF.G.3	31517	140	0	3388	2679		2679	HDU2	3075	
UF.H	12382	290	580	89260	-2166		-2166	None	#N/A	
UF.I.1	22356	250	500	17560	300		300	None	#N/A	*Close enough*
UF.I.2	15993	120	880	10571	387		387	None	#N/A	*Close enough*

Upper Floor Diaphragm

Walls in North-South Direction												
Wall	L (ft)	h (ft)	A_T (sf)	$Wall_{abv}$ [1]	V_{abv} [2] (lbs)	V_{cur} [3] (lbs)	V [4] (lb)	v [5] (plf)	Wall Mark	h>2L?	2xL/h [6]	Capacity (plf)
MF.1	12.25	9	470	UF.1	2350	1422	3772	308	1	no	1	310
MF.2.1	6	9	188	UF.2	1164	570	1734	289	1	no	1	310
MF.2.2	6	9	188	UF.2	1164	570	1734	289	1	no	1	310
MF.2.3	4.25	9	133	UF.3	825	404	1228	289	1	yes	0.94	293
MF.28	11.25	10	160	none	0	484	484	43	1	no	1	310
MF.3.1	3	10	100	UF.3.1	287	303	589	196	2	yes	0.60	276
MF.3.2	3	10	100	UF.3.2	287	303	589	196	2	yes	0.60	276
MF.32.1	3	10	95	UF.32.1	229	287	517	172	2	yes	0.60	276
MF.32.2	3	10	95	UF.32.2	229	287	517	172	2	yes	0.60	276
MF.35.1*	10.75	10	70	UF.35	1232	211	1442	321	2	no	1	460
MF.35.2	11	10	170	UF.35	3010	515	3526	321	2	no	1	460
MF.4.1	7.5	10	605	UF.4	4502	1832	6334	845	4 STRUCT 1	no	1	870
MF.4.2	6.25	10	505	UF.4	3752	1526	5279	845	4 STRUCT 1	no	1	870
MF.46	7.75	10	900	none	0	2723	2723	351	2	no	1	460
MF.48.1	WSWH24	10	170	UF.5.1	1204	514	1718	N/A	WSWH24	N/A	N/A	4010 LBS
MF.48.2	WSWH24	10	170	UF.5.2	1204	514	1718	N/A	WSWH24	N/A	N/A	4010 LBS
MF.5.1	3	10	110	UF.6.1	745	333	1078	359	3	yes	0.60	360
MF.5.2	3	10	110	UF.6.2	745	333	1078	359	3	yes	0.60	360
MF.6.1	3	10	230	UF.6.3	803	696	1498	499	DBL 2	yes	0.60	552
MF.6.2	3	10	230	UF.6.4	803	696	1498	499	DBL 2	yes	0.60	552
MF.64.1	WSWH12	10	70	none	0	212	212	N/A	WSWH12	N/A	N/A	700 LBS
MF.64.2	WSWH12	10	70	none	0	212	212	N/A	WSWH12	N/A	N/A	700 LBS
MF.7.1	WSWH12	10	150	none	0	454	454	N/A	WSWH12	N/A	N/A	700 LBS
MF.7.2	WSWH12	10	150	none	0	454	454	N/A	WSWH12	N/A	N/A	700 LBS
MF.7.3	WSWH12	10	50	none	0	151	151	N/A	WSWH12	N/A	N/A	700 LBS
MF.7.4	WSWH12	10	50	none	0	151	151	N/A	WSWH12	N/A	N/A	700 LBS

Holdowns for Walls in North-South Direction										
Wall	OTM[7] (lb-ft)	w_{DL}[8] (plf)	$P_{DL,END}$[9] (lb)	RM[10] (lb-ft)	T_{end}[11] (lb)	T_{abv}[12] (lb)	T[13] (lb)	Holdown	Capacity	
MF.1	33950	100	400	5445	2327		2327	HDU2	3075	
MF.2.1	15604	70	280	1291	2386		2386	HDU2	3075	
MF.2.2	15604	70	280	1291	2386	2944	5330	HDU5	5645	
MF.2.3	11053	70	280	800	2412	2983	5395	HDU5	5645	
MF.28	4841	70	280	3327	135		135	NONE	#N/A	*Close enough*
MF.3.1	5892	100	400	724	1722	691	2414	HDU2	3075	
MF.3.2	5892	100	400	724	1722	691	2414	HDU2	3075	
MF.32.1	5167	100	400	724	1481	491	1972	HDU2	3075	
MF.32.2	5167	100	400	724	1481	491	1972	HDU2	3075	
MF.35.1*	14423	100	400	4424	930		930	HDU2	3075	
MF.35.2	35257	70	280	3211	2913		2913	HDU2	3075	
MF.4.1	63342	70	280	1786	8207		8207	HDU11	9535	
MF.4.2	52785	70	280	1368	8227		8227	HDU11	9535	
MF.46	27228	250	250	4146	2978		2978	HDU2	3075	
MF.48.1	17181	N/A	N/A	N/A	N/A		11508	SB1x30	13090	
MF.48.2	17181	N/A	N/A	N/A	N/A		11508	SB1x30	13090	
MF.5.1	10780	100	400	724	3352		3352	HDU4	4565	
MF.5.2	10780	100	400	724	3352		3352	HDU4	4565	
MF.6.1	14984	220	880	1594	4463	2297	6760	HDU8	7870	
MF.6.2	14984	220	880	1594	4463	2297	6760	HDU8	7870	
MF.64.1	2118	N/A	N/A	N/A	N/A		3252	SB1x30	13090	
MF.64.2	2118	N/A	N/A	N/A	N/A		3252	SB1x30	13090	
MF.7.1	4538	N/A	N/A	N/A	N/A		6969	SB1x30	13090	
MF.7.2	4538	N/A	N/A	N/A	N/A		6969	SB1x30	13090	
MF.7.3	1513	N/A	N/A	N/A	N/A		2323	SB1x30	13090	
MF.7.4	1513	N/A	N/A	N/A	N/A		2323	SB1x30	13090	

Walls in East-West Direction												
Wall	L (ft)	h (ft)	A_T (sf)	$Wall_{abv}$[1]	V_{abv}[2] (lbs)	V_{cur}[3] (lbs)	V[4] (lb)	v[5] (plf)	Wall Mark	h>2L?	2xL/h[6]	Capacity (plf)
MF.A	12.75	10	360	UF.A	1605	1089	2694	211	1	no	1	310
MF.B	11.5	10	160	UF.B	917	484	1401	122	1	no	1	310
MF.C.1	11.25	10	566	UF.C	4495	1712	6207	552	3	no	1	600
MF.C.2	5.25	10	264	UF.C	2098	799	2896	552	3	no	1	600
MF.D	7.25	10	680	none	0	2057	2057	284	1	no	1	310
MF.D8	7	10	620	none	0	1876	1876	268	1	no	1	310
MF.E.1	3	9	250	UF.F	1232	756	1989	663	DBL 3	yes	0.67	800
MF.E.2	3	9	250	UF.F	1232	756	1989	663	DBL 3	yes	0.67	800
MF.G.1	5.75	10	230	UF.G	1896	696	2592	451	2	no	1	460
MF.G.2	16.5	10	660	UF.G	5441	1997	7438	451	2	no	1	460
MF.H	10.25	10	230	UF.H	1376	696	2072	202	1	no	1	310
MF.I.1	31.25	9	430	UF.I.1	2236	1301	3537	113	1	no	1	310
MF.I.2	28	10	380	UF.1.2	1777	1150	2927	105	1	no	1	310

Holdowns for Walls in East-West Direction									
Wall	OTM[7] (lb-ft)	w_{DL}[8] (plf)	$P_{DL,END}$[9] (lb)	RM[10] (lb-ft)	T_{end}[11] (lb)	T_{abv}[12] (lb)	T[13] (lb)	Holdown	Capacity
MF.A	26942	210	0	7493	1525		1525	HDU2	3075
MF.B	14012	200	800	9845	362		362	NONE	#N/A
MF.C.1	62067	200	400	7532	4848	1953	6801	HDU8	7870
MF.C.2	28965	290	580	3091	4928	2005	6933	HDU8	7870
MF.D	20573	100	400	2427	2503		2503	HDU2	3075
MF.D8	18757	100	400	2305	2350		2350	HDU2	3075
MF.E.1	17899	260	520	1198	5567		5567	HDU5	5645
MF.E.2	17899	260	520	1198	5567		5567	HDU5	5645
MF.G.1	25920	210	420	2584	4058	2467	6525	HDU8	7870
MF.G.2	74379	210	420	15592	3563	2467	6030	HDU8	7870
MF.H	20716	210	420	6733	1364		1364	HDU2	3075
MF.I.1	31829	260	510	62729	-989		-989	NONE	#N/A
MF.I.2	29267	210	420	41301	-430		-430	NONE	#N/A

Close enough

**Shear wall with force-transfer around openings; see additional spreadsheet to follow*

Standard and Balloon Framing on Concrete Foundations

Strong-Wall High-Strength Wood Shearwall Model No.	Panel Evaluation Height, H_e (lb.)[6]	Allow Vertical Load, P (lb.)[4]	2,500 psi Concrete						3,000 psi Concrete					
			Seismic[3]			Wind			Seismic[3]			Wind		
			Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]	Allowable ASD Shear Load, V (lb.)	Drift at Allowable Shear, Δ (in.)[7]	Anchor Tension at Allowable Shear, T (lb.)[11]
WSWH12x7	78	1,000	1,300	0.32	13,295	1,670	0.43	17,075	1,300	0.32	13,295	1,670	0.43	17,075
		4,000	1,300	0.32	13,295	1,670	0.43	17,075	1,300	0.32	13,295	1,670	0.43	17,075
		7,500	1,300	0.32	13,295	1,670	0.43	17,075	1,300	0.32	13,295	1,670	0.43	17,075
WSWH18x7	78	1,000	3,795	0.32	23,680	4,470	0.39	27,890	3,795	0.32	23,680	4,470	0.39	27,890
		4,000	3,795	0.32	23,680	4,365	0.38	27,245	3,795	0.32	23,680	4,470	0.39	27,890
		7,500	3,795	0.32	23,680	4,050	0.36	25,285	3,795	0.32	23,680	4,470	0.39	27,890
WSWH24x7	78	1,000	7,450	0.30	33,210	7,795	0.34	34,755	7,450	0.30	33,210	7,795	0.34	34,755
		4,000	7,450	0.30	33,210	7,565	0.33	33,715	7,450	0.30	33,210	7,795	0.34	34,755
		7,500	7,115	0.28	31,715	7,115	0.31	31,715	7,450	0.30	33,210	7,795	0.34	34,755
WSWH12x8	93.25	1,000	1,030	0.40	12,580	1,325	0.53	16,195	1,030	0.40	12,580	1,325	0.53	16,195
		4,000	1,030	0.40	12,580	1,325	0.53	16,195	1,030	0.40	12,580	1,325	0.53	16,195
		7,500	1,030	0.40	12,580	1,325	0.53	16,195	1,030	0.40	12,580	1,325	0.53	16,195
WSWH18x8	93.25	1,000	3,060	0.39	22,835	3,880	0.52	28,925	3,060	0.39	22,835	3,955	0.53	29,490
		4,000	3,060	0.39	22,835	3,650	0.49	27,245	3,060	0.39	22,835	3,955	0.53	29,490
		7,500	3,060	0.39	22,835	3,390	0.46	25,285	3,060	0.39	22,835	3,955	0.53	29,490
WSWH24x8	93.25	1,000	6,240	0.37	33,240	6,650	0.43	35,430	6,240	0.37	33,240	6,910	0.45	36,815
		4,000	6,240	0.37	33,240	6,330	0.41	33,715	6,240	0.37	33,240	6,910	0.45	36,815
		7,500	5,950	0.35	31,715	5,950	0.38	31,715	6,240	0.37	33,240	6,910	0.45	36,815
WSWH12x9	105.25	1,000	850	0.45	11,750	1,095	0.60	15,145	850	0.45	11,750	1,095	0.60	15,145
		4,000	850	0.45	11,750	1,095	0.60	15,145	850	0.45	11,750	1,095	0.60	15,145
		7,500	850	0.45	11,750	1,095	0.60	15,145	850	0.45	11,750	1,095	0.60	15,145
WSWH18x9	105.25	1,000	2,575	0.45	21,680	3,325	0.60	27,975	2,575	0.45	21,680	3,325	0.60	27,975
		4,000	2,575	0.45	21,680	3,235	0.58	27,245	2,575	0.45	21,680	3,325	0.60	27,975
		7,500	2,575	0.45	21,680	3,005	0.54	25,285	2,575	0.45	21,680	3,325	0.60	27,975
WSWH24x9	105.25	1,000	5,150	0.43	30,975	5,890	0.52	35,430	5,150	0.43	30,975	6,120	0.54	36,815
		4,000	5,150	0.43	30,975	5,605	0.50	33,715	5,150	0.43	30,975	6,120	0.54	36,815
		7,500	5,150	0.43	30,975	5,275	0.47	31,715	5,150	0.43	30,975	6,120	0.54	36,815
WSWH12x10	117.25	1,000	700	0.50	10,750	900	0.67	13,855	700	0.50	10,750	900	0.67	13,855
		4,000	700	0.50	10,750	900	0.67	13,855	700	0.50	10,750	900	0.67	13,855
		7,500	700	0.50	10,750	900	0.67	13,855	700	0.50	10,750	900	0.67	13,855
WSWH18x10	117.25	1,000	2,140	0.50	20,055	2,755	0.67	25,840	2,140	0.50	20,055	2,755	0.67	25,840
		4,000	2,140	0.50	20,055	2,755	0.67	25,840	2,140	0.50	20,055	2,755	0.67	25,840
		7,500	2,140	0.50	20,055	2,695	0.65	25,285	2,140	0.50	20,055	2,755	0.67	25,840
WSWH24x10	117.25	1,000	4,010	0.48	26,860	5,215	0.67	34,935	4,010	0.48	26,860	5,215	0.67	34,935
		4,000	4,010	0.48	26,860	5,030	0.64	33,715	4,010	0.48	26,860	5,215	0.67	34,935
		7,500	4,010	0.48	26,860	4,735	0.61	31,715	4,010	0.48	26,860	5,215	0.67	34,935
WSWH12x11	129.25	1,000	595	0.56	10,055	765	0.73	12,930	595	0.56	10,055	765	0.73	12,930
		4,000	595	0.56	10,055	765	0.73	12,930	595	0.56	10,055	765	0.73	12,930
		7,500	595	0.56	10,055	765	0.73	12,930	595	0.56	10,055	765	0.73	12,930
WSWH18x11	129.25	1,000	1,960	0.55	20,240	2,520	0.73	26,060	1,960	0.55	20,240	2,520	0.73	26,060
		4,000	1,960	0.55	20,240	2,520	0.73	26,060	1,960	0.55	20,240	2,520	0.73	26,060
		7,500	1,960	0.55	20,240	2,445	0.71	25,285	1,960	0.55	20,240	2,520	0.73	26,060
WSWH24x11	129.25	1,000	4,000	0.54	29,550	4,795	0.68	35,430	4,000	0.54	29,550	4,985	0.70	36,815
		4,000	4,000	0.54	29,550	4,565	0.64	33,715	4,000	0.54	29,550	4,985	0.70	36,815
		7,500	4,000	0.54	29,550	4,295	0.60	31,715	4,000	0.54	29,550	4,985	0.70	36,815

See foonotes on p. 15.

Force Transfer Around Openings Calculator

ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

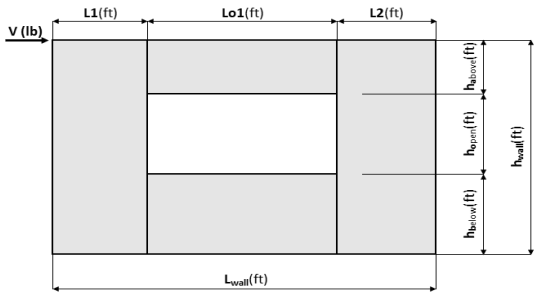
Code: **Date:**

Designer:

Client:

Project:

Wall Line: UF.A



Shear Wall Calculation Variables

V	1605 lbf	Opening 1	
L1	9.00 ft	h_a	1.00 ft
L2	6.75 ft	h_o	4.00 ft
h_{wall}	9.00 ft	h_b	4.00 ft
L_{wall}	18.25 ft	Lo1	2.50 ft

Adj. Factor Method = 1.25-0.125h/bs

Wall Pier Aspect Ratio		Adj. Factor
P1=h_o/L1=	0.44	N/A
P2=h_o/L2=	0.59	N/A

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 792 lbf

2. Unit shear above + below opening

First opening: $va1 = vb1 = H/(h_a+h_b)$ = 158 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 396 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 226 lbf

F2 = O1(L2)/(L1+L2) = 170 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 1.43 ft

T2 = (L2*Lo1)/(L1+L2) = 1.07 ft

6. Unit shear beside opening

v1 = (V/L)(L1+T1)/L1 = 102 plf

v2 = (V/L)(T2+L2)/L2 = 102 plf

Check v1*L1+v2*L2=V? 1605 lbf **OK**

7. Resistance to corner forces

R1 = v1*L1 = 917 lbf

R2 = v2*L2 = 688 lbf

8. Difference corner force + resistance

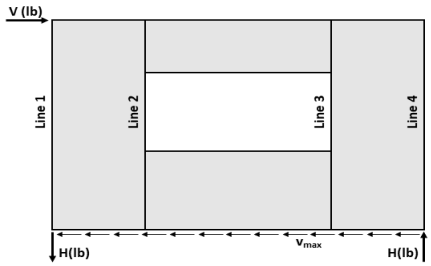
R1-F1 = 691 lbf

R2-F2 = 518 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = 77 plf

vc2 = (R2-F2)/L2 = 77 plf



Check Summary of Shear Values for One Opening

Line 1: $vc1(h_a+h_b)+v1(h_o)=H$?		384	408	792 lbf
Line 2: $va1(h_a+h_b)-vc1(h_a+h_b)-v1(h_o)=0$?	792	384	408	0
Line 3: $va1(h_a+h_b)-vc2(h_a+h_b)-v1(h_o)=0$?	792	384	408	0
Line 4: $vc2(h_a+h_b)+v2(h_o)=H$?		384	408	792 lbf

Design Summary*

Req. Sheathing Capacity	158 plf
Req. Strap Force	226 lbf
Req. HD Force (H)	792 lbf
Req. Shear Wall Anchorage Force (v_{max})	88 plf

***The Design Summary assumes that the shear wall is designed as blocked.**

Force Transfer Around Openings Calculator

ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

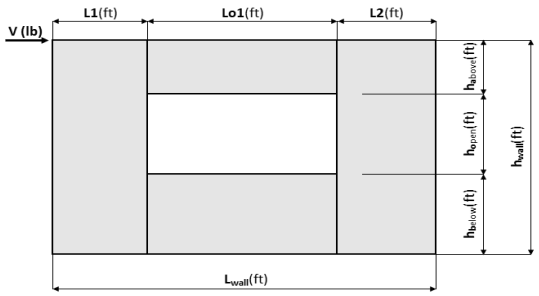
Code: **Date:**

Designer:

Client:

Project:

Wall Line: MF.35.1



Shear Wall Calculation Variables

V	1442 lbf	Opening 1	
L1	2.25 ft	h_a	2.00 ft
L2	2.25 ft	h_o	4.50 ft
h_{wall}	10.00 ft	h_b	3.50 ft
L_{wall}	10.75 ft	Lo1	6.25 ft

Adj. Factor Method =	1.25-0.125h/bs
Wall Pier Aspect Ratio	Adj. Factor
P1=h_o/L1= 2.00	N/A
P2=h_o/L2= 2.00	N/A

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 1342 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(h_a+h_b) = 244 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 1525 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 762 lbf

F2 = O1(L2)/(L1+L2) = 762 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 3.13 ft

T2 = (L2*Lo1)/(L1+L2) = 3.13 ft

6. Unit shear beside opening

v1 = (V/L)(L1+T1)/L1 = 321 plf

v2 = (V/L)(T2+L2)/L2 = 321 plf

Check v1*L1+v2*L2=V? 1442 lbf **OK**

7. Resistance to corner forces

R1 = v1*L1 = 721 lbf

R2 = v2*L2 = 721 lbf

8. Difference corner force + resistance

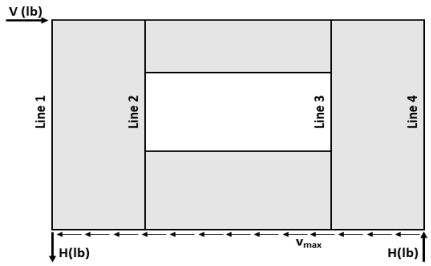
R1-F1 = -41 lbf

R2-F2 = -41 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = -18 plf

vc2 = (R2-F2)/L2 = -18 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(h_a+h_b)+v1(h_o)=H?		-101	1442	1342 lbf
Line 2: va1(h_a+h_b)-vc1(h_a+h_b)-v1(h_o)=0?	1342	-101	1442	0
Line 3: va1(h_a+h_b)-vc2(h_a+h_b)-v1(h_o)=0?	1342	-101	1442	0
Line 4: vc2(h_a+h_b)+v2(h_o)=H?		-101	1442	1342 lbf

Design Summary*

Req. Sheathing Capacity	321 plf
Req. Strap Force	762 lbf
Req. HD Force (H)	1342 lbf
Req. Shear Wall Anchorage Force (v_{max})	134 plf

***The Design Summary assumes that the shear wall is designed as blocked.**

Force Transfer Around Openings Calculator

ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

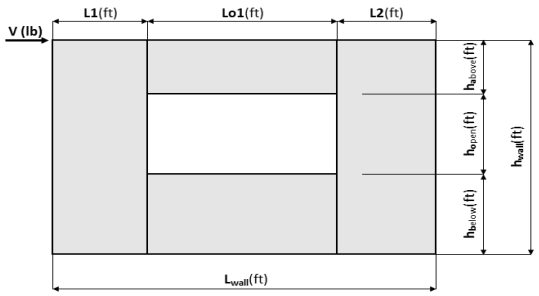
Code: **Date:**

Designer:

Client:

Project:

Wall Line: MF.G.3



Shear Wall Calculation Variables

V	2072 lbf	Opening 1		Adj. Factor Method =	1.25-0.125h/bs
L1	2.00 ft	h_a	2.00 ft	Wall Pier Aspect Ratio	Adj. Factor
L2	2.25 ft	h_o	4.50 ft	P1=h_o/L1= 2.25	0.969
h_{wall}	10.00 ft	h_b	3.50 ft	P2=h_o/L2= 2.00	N/A
L_{wall}	9.50 ft	Lo1	5.25 ft		

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 2181 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(h_a+h_b) = 396 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 2082 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 980 lbf

F2 = O1(L2)/(L1+L2) = 1102 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 2.47 ft

T2 = (L2*Lo1)/(L1+L2) = 2.78 ft

6. Unit shear beside opening

v1 = (V/L)(L1+T1)/L1 = 487 plf

v2 = (V/L)(T2+L2)/L2 = 487 plf

Check v1*L1+v2*L2=V? 2072 lbf **OK**

7. Resistance to corner forces

R1 = v1*L1 = 975 lbf

R2 = v2*L2 = 1097 lbf

8. Difference corner force + resistance

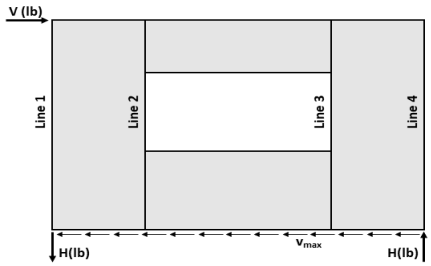
R1-F1 = -5 lbf

R2-F2 = -5 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = -2 plf

vc2 = (R2-F2)/L2 = -2 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(h_a+h_b)+v1(h_o)=H?		-13	2193	2181 lbf
Line 2: va1(h_a+h_b)-vc1(h_a+h_b)-v1(h_o)=0?	2181	-13	2193	0
Line 3: va1(h_a+h_b)-vc2(h_a+h_b)-v1(h_o)=0?	2181	-13	2193	0
Line 4: vc2(h_a+h_b)+v2(h_o)=H?		-13	2193	2181 lbf

Design Summary*

Req. Sheathing Capacity	503 plf	**
Req. Strap Force	1102 lbf	
Req. HD Force (H)	2181 lbf	
Req. Shear Wall Anchorage Force (v_{max})	218 plf	

****Req. Sheathing Capacity has been adjusted per the Aspect Ratio Adjustment Factor**

***The Design Summary assumes that the shear wall is designed as blocked.**