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STRUCTURAL CALCULATIONS Partial Lateral & Gravity Design 20-048



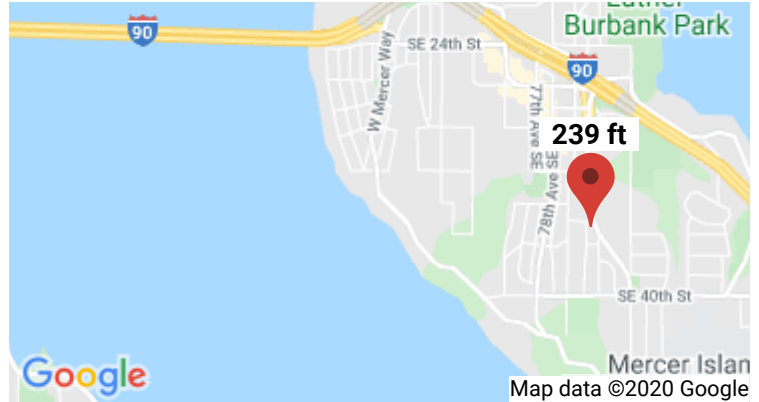
12/14/2020

WEBSTER-BUETHEL RESIDENCE
3624 81st Ave SE
Mercer Island, WA 98040
December 14, 2020

ATC Hazards by Location

Search Information

Address: 3624 81st Ave SE, Mercer Island, WA 98040, USA
Coordinates: 47.5782962, -122.2303926
Elevation: 239 ft
Timestamp: 2020-12-08T17:45:12.339Z
Hazard Type: Wind



ASCE 7-16

MRI 10-Year 67 mph
 MRI 25-Year 73 mph
 MRI 50-Year 78 mph
 MRI 100-Year 83 mph
 Risk Category I 92 mph
 Risk Category II 97 mph
 Risk Category III 104 mph
 Risk Category IV 108 mph

ASCE 7-10

MRI 10-Year 72 mph
 MRI 25-Year 79 mph
 MRI 50-Year 85 mph
 MRI 100-Year 91 mph
 Risk Category I 100 mph
 Risk Category II 110 mph
 Risk Category III-IV 115 mph

ASCE 7-05

ASCE 7-05 Wind Speed 85 mph

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

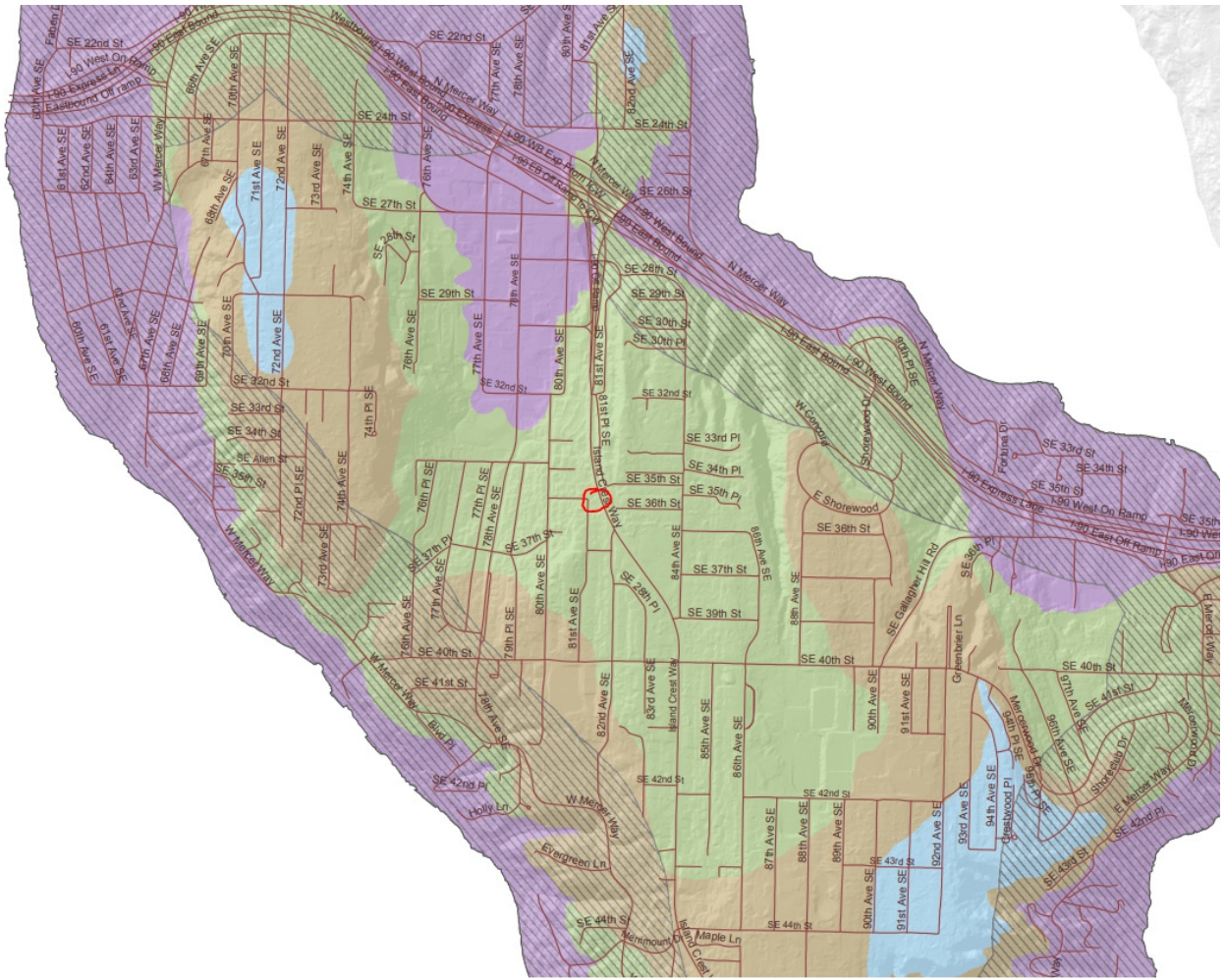
Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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building site described by latitude/longitude location in the report.



Search Information

Address:	3624 81st Ave SE, Mercer Island, WA 98040, USA
Coordinates:	47.5782962, -122.2303926
Elevation:	239 ft
Timestamp:	2020-12-08T17:46:05.270Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	I
Site Class:	D-default



Basic Parameters

Name	Value	Description
S_S	1.408	MCE_R ground motion (period=0.2s)
S_1	0.49	MCE_R ground motion (period=1.0s)
S_{MS}	1.689	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.126	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

▼Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.897	Coefficient of risk (1.0s)
PGA	0.602	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.723	Site modified peak ground acceleration

T_L	6	Long-period transition period (s)
SsRT	1.408	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.56	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.478	Factored deterministic acceleration value (0.2s)
S1RT	0.49	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.546	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.401	Factored deterministic acceleration value (1.0s)
PGAd	1.191	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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Disclaimer

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

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Design Criteria

Scope of Work:	Partial Lateral & Gravity Design		
Site Address:	3624 81st Ave SE Mercer Island, WA 98040		
Number of Stories:	1	Engineer:	PK

Roof Loading

Roofing	Metal	1.8
Sheathing	5/8" Plywood	1.8
Insulation	Roll/Batt	3.0
Ceiling	5/8" GWB	2.8
Framing	Rafters & Beams	3.0
Miscellaneous	fixtures, mechanical, electrical, etc.	2.2
TOTAL DEAD LOAD:		14.6 psf
ROOF SNOW LOAD:		25.0 psf

Main Floor Loading

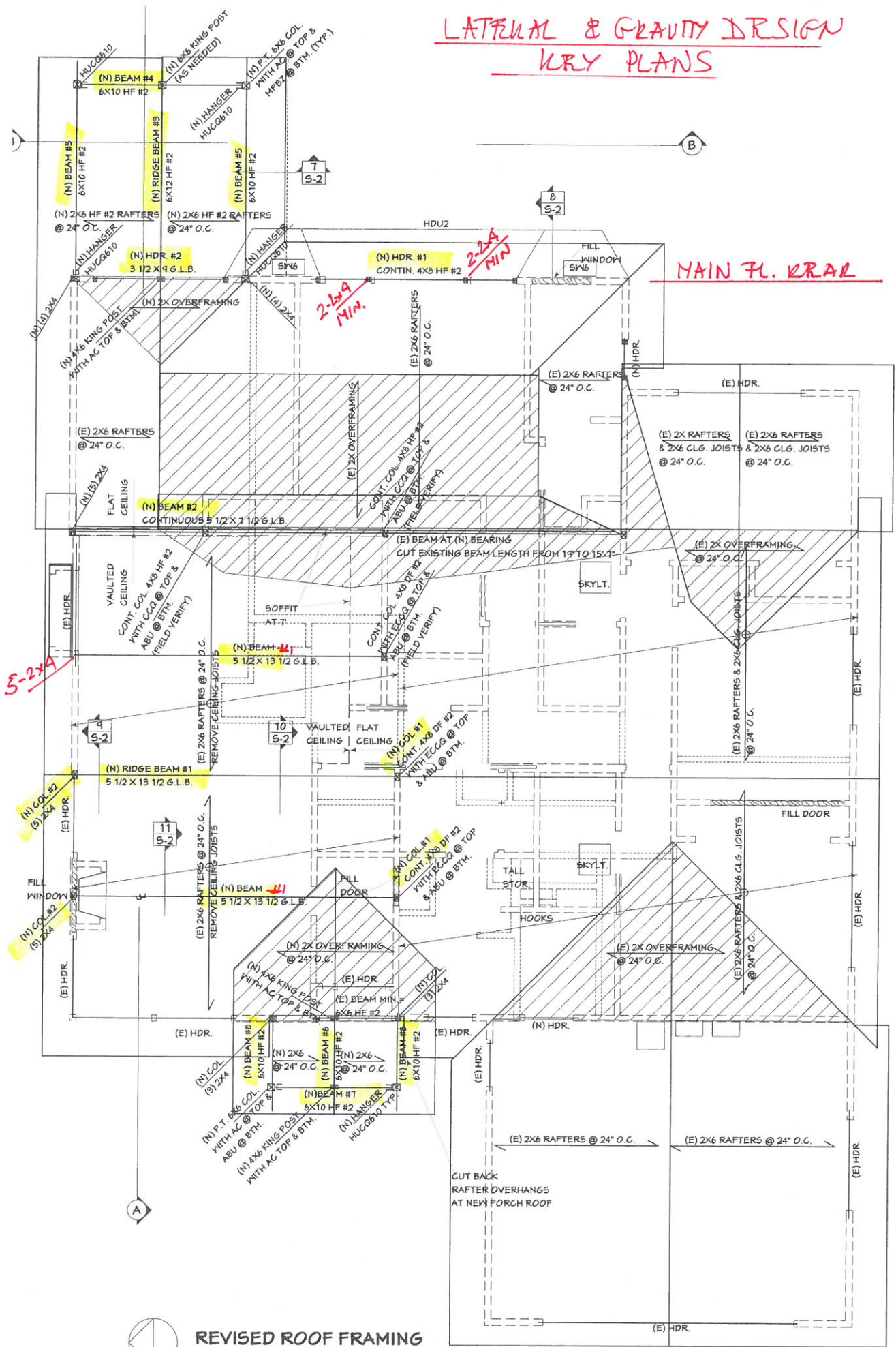
Floor Covering	Carpet/Hardwood/Tile	3.0
Sheathing	3/4" T&G	2.3
Ceiling	1/2" GWB	2.2
Joists	Solid Sawn @ 16" o/c	3.3
Beams		2.8
Miscellaneous	fixtures, mechanical, electrical, etc.	1.4
TOTAL DEAD LOAD:		15.0 psf
FLOOR LIVE LOAD:		40.0 psf

Not Used

Floor Covering	Carpet/Hardwood/Tile	0.0
Sheathing	3/4" T&G	0.0
Ceiling	5/8" GWB	0.0
Joists	I-Joists	0.0
Beams		4.2
Miscellaneous	fixtures, mechanical, electrical, etc.	0.6
TOTAL DEAD LOAD:		4.8 psf
FLOOR LIVE LOAD:		0.0 psf

Soil Bearing Capacity:	1500 psf
Frost Depth:	18 in

LATERAL & GRAVITY DESIGN KEY PLANS

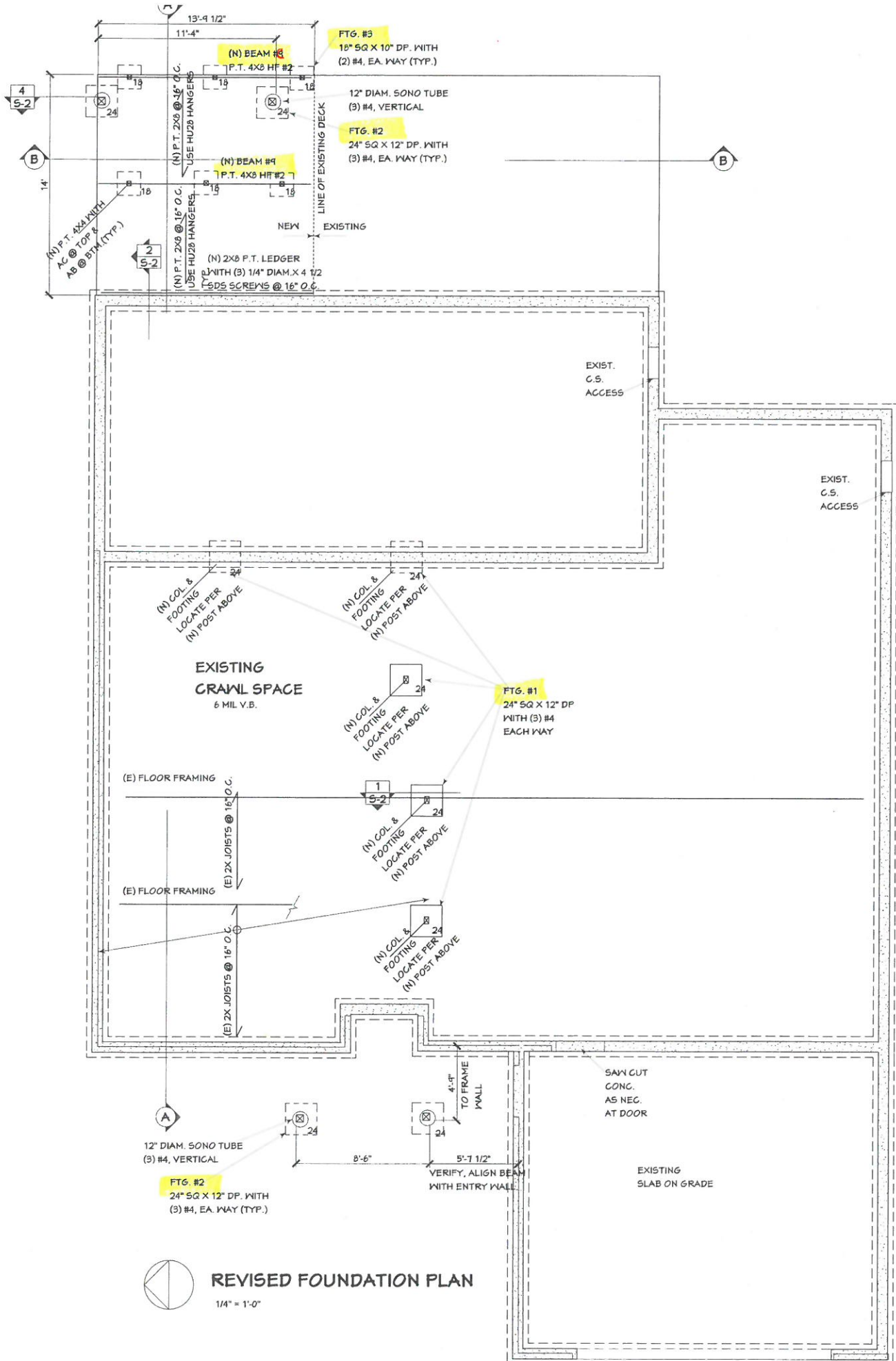


MAIN FL. PLAN



REVISED ROOF FRAMING

1/4" = 1'-0"



REVISED FOUNDATION PLAN

1/4" = 1'-0"

13'-9 1/2"
11'-4"
14'

FTG. #3
18" SQ X 10" DP. WITH
(2) #4, EA. WAY (TYP.)

12" DIAM. SONO TUBE
(3) #4, VERTICAL

FTG. #2
24" SQ X 12" DP. WITH
(3) #4, EA. WAY (TYP.)

(N) BEAM #3
18" SQ X 10" DP. WITH
(2) #4, EA. WAY (TYP.)

P.T. 4X8 HF #2

(N) BEAM #4
24" SQ X 12" DP. WITH
(3) #4, EA. WAY (TYP.)

P.T. 4X8 HF #2

LINE OF EXISTING DECK

NEW EXISTING

(N) P.T. 2X8 @ 16" O.C.
USE HU28 HANGERS

(N) P.T. 2X8 @ 16" O.C.
USE HU28 HANGERS

(N) P.T. 2X8 @ 16" O.C.
USE HU28 HANGERS

(N) 2X8 P.T. LEDGER
WITH (3) 1/4" DIAM. X 4 1/2"
LDS SCREWS @ 16" O.C.

(N) P.T. 4X4 WITH
AC @ TOP &
AB @ BOT (TYP.)

4
S-2

2
S-2

13
24

18

18

18

18

18

18

EXIST.
C.S.
ACCESS

EXIST.
C.S.
ACCESS

(N) COL. &
FOOTING
LOCATE PER
(N) POST ABOVE

(N) COL. &
FOOTING
LOCATE PER
(N) POST ABOVE

**EXISTING
CRAWL SPACE**
6 MIL V.B.

(N) COL. &
FOOTING
LOCATE PER
(N) POST ABOVE

FTG. #1
24" SQ X 12" DP
WITH (3) #4
EACH WAY

(E) FLOOR FRAMING

(E) 2X JOISTS @ 16" O.C.

(N) COL. &
FOOTING
LOCATE PER
(N) POST ABOVE

(E) FLOOR FRAMING

(E) 2X JOISTS @ 16" O.C.

(N) COL. &
FOOTING
LOCATE PER
(N) POST ABOVE

12" DIAM. SONO TUBE
(3) #4, VERTICAL

FTG. #2
24" SQ X 12" DP. WITH
(3) #4, EA. WAY (TYP.)

4'-8"
TO FRAME
WALL

SAY CUT
CONC.
AS NEC.
AT DOOR

VERIFY, ALIGN BEAM
WITH ENTRY WALL

EXISTING
SLAB ON GRADE

8'-6"

5'-7 1/2"

Type of construction: **New**
 Applicable Building Codes: **IBC 2015, ASCE 7/SEI 7-10**

Location: **3624 81st Ave SE
 Mercer Island, WA 98040**

Work performed :

Partial Lateral & Gravity Design

WIND DESIGN:

$$P_s = \lambda I_w P_{s30} K_{zt}$$

Exposure : **B**

Wind Speed = **85 MPH**

P_{s30} =

I_w = **1**

λ = **1.00**

K_{zt} = **1.30**

Wind Exposure Category as set forth in Section 26.7 of ASCE 7-10
 Basic Wind Speed (LRFD) as used in Figure 28.6 of ASCE 7-10 and converted to (ASD)
 Simplified design wind pressure for Exposure B, at h = 30 feet and for I = 1.0, from Figure 28.6-1
 Importance factor as defined in Table 1.5-2 of ASCE 7-10
 Adjustment factor for building height and exposure from Figure 28.6-1 of ASCE 7-10
 Adjustment factor for increased wind speed due to a hill or escarpment from Section 26.8 of ASCE 7-10

Roof slope :

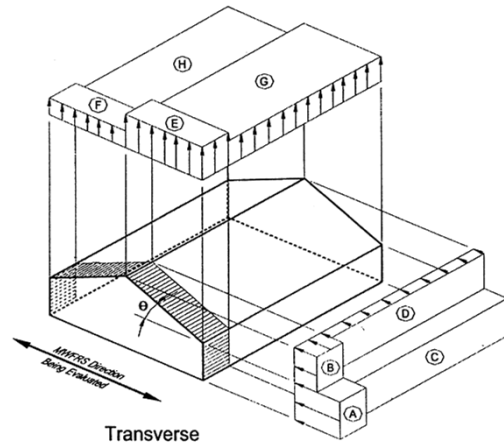
Front/Rear $\tan^{-1} \left(\frac{\text{rise}}{\text{run}} \right) = \tan^{-1} \left(\frac{3}{12} \right) = 14.0 \text{ degrees}$
 Left/Right $\tan^{-1} \left(\frac{3}{12} \right) = 14.0 \text{ degrees}$
 Mean Elevation **28 ft**

Number of floors: **1**

Average uplift (F/R) = **-10.7 psf** Based on wind zones 'G' and 'H'
 Average uplift (R/L) = **-10.7 psf** Based on wind zones 'G' and 'H'

	End zone of wall		End zone of roof	
	Front/Rear	Left/Right	Front/Rear	Left/Right
P_{s30} =	A = 14.1 psf	14.1 psf	B = -4.9 psf	-4.9 psf
P_s =	18.3 psf	18.3 psf	-6.4 psf	-6.4 psf

	Interior zone of wall		Interior zone of roof	
	Front/Rear	Left/Right	Front/Rear	Left/Right
P_{s30} =	C = 9.4 psf	9.4 psf	D = -2.8 psf	-2.8 psf
P_s =	12.2 psf	12.2 psf	-3.6 psf	-3.6 psf



WIND LOAD CALCULATIONS
FRONT → REAR

1st MAIN FLOOR =

WIND ZONE	B	D	A	C								
AVE. HEIGHT	5	5	4	4								
AVE. WIDTH	8	45	8	42								
P_s	0.00	0.00	18.34	12.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	587	2055	0	0	0	0	0	0	0	0
TOTAL	4,650 lbs		Minimum net pressure controls. The calc. pressure is less than the min. net pressure, equal to 16psf(A-C), and 8psf(B-D) applied over the entire area. (ASCE 7-10 28.6.4)									

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
P_s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0 lbs											

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
P_s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0 lbs											

WIND LOAD CALCULATIONS

LEFT → RIGHT

ΣV MAIN FLOOR =

WIND ZONE	B	D	D	A	C							
AVE. HEIGHT	5	5	3	4	4							
AVE. WIDTH	10	60	15	10	57							
Ps	0.00	0.00	0.00	18.34	12.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	734	2788	0	0	0	0	0	0	0

TOTAL 6,630 lbs Minimum net pressure controls. The calc. pressure is less than the min. net pressure, equal to 16psf(A-C), and 8psf(B-D) applied over the entire area. (ASCE 7-10 28.6.4)

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

ρ CALCS:

MAIN FLOOR CALCULATIONS:

Plate Height:	8.00 ft
Total length of Shearwall in Shortest Line:	12.00 ft
Length of Shortest Segment within Shear Line:	6.00 ft
Length of Longest Segment in Shear Line:	6.00 ft

Tributary Area:	1.0
Total Area:	2.0

$\rho = 1.00$
ASCE 7-10 12.3.4.2 b

NOT USED:

Plate Height:	
Total length of Shearwall in Shortest Line:	
Length of Shortest Shearwall within Shear Line:	
Length of Longest Wall in Shear Line:	

Tributary Area:	1.0
Total Area:	2.0

$\rho = NA$

NOT USED:

Plate Height:	
Total length of Shearwall in Shortest Line:	
Length of Shortest Shearwall within Shear Line:	
Length of Longest Wall in Shear Line:	

Tributary Area:	1.0
Total Area:	2.0

$\rho = NA$

All loads in pounds per square foot

SEISMIC DESIGN:

$E = E_h + E_v$

$E = \rho Q_E + .2S_{DS}D$

$Q_E = V = C_s W$

$\rho =$	1.00
Site Class =	D
$I_E =$	1
R =	6.5
$h_n =$	13

When the Site Class is not specified by Geotech, D will be assumed

Importance factor as defined in Table 11.5-1

Total height of structure

$V = 0.7S_{DS}I_E W / R$

$S_{DS} = 2/3 S_{MS}$

$S_s =$

140.8%

$S_{MS} = 169.0\%$

$V = 0.121 W$

$V_{max} = S_{D1}I_E W / T_g R$

$S_{MS} = (F_a)(S_s)$

$F_a =$

1.20

$S_{DS} = 112.6\%$

$E = 0.121 W$

$T_g = 0.02h_n^{0.75}$

$S_{D1} = 2/3 S_{M1}$

$S_1 =$

49.0%

$S_{M1} = 73.5\%$

$T_g = 0.14 s$

$S_{M1} = (F_v)(S_1)$

$F_v =$

1.50

$S_{D1} = 49.0\%$

$C_s = 0.121$

MAIN FLOOR DIAPHRAGM LOADING:

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
50	50	14.6	36500
25	22	14.6	8030
15	15	14.6	3285
		14.6	0
		14.6	0

Area = 3275 Sub-Total = 47815

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0

Area = 0 Sub-Total = 0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
140	4	10.0	5600
100	4	10.0	4000
		10.0	0
		10.0	0
		10.0	0

Area = 960 Sub-Total = 9600

TOTAL = 57415 lb

NOT APPLICABLE

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
		14.6	0
		14.6	0
		14.6	0
		14.6	0
		14.6	0

Area = 0 Sub-Total = 0

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0

Area = 0 Sub-Total = 0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
		10.0	0
		10.0	0
		10.0	0
		10.0	0
		10.0	0

Area = 0 Sub-Total = 0

TOTAL = lb

NOT APPLICABLE

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
		14.6	0
		14.6	0
		14.6	0
		14.6	0
		14.6	0

Area = 0 Sub-Total = 0

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		4.8	0
		4.8	0
		4.8	0
		4.8	0
		4.8	0

Area = 0 Sub-Total = 0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
		10.0	0
		10.0	0
		10.0	0
		10.0	0
		10.0	0

Area = 0 Sub-Total = 0

TOTAL = lb

V (MAIN FLOOR) = .121 x 57415 lb = 6965 lbs
 $V () = .121 \times lb = lbs$
 $V () = .121 \times lb = lbs$

REDISTRIBUTE:

$\Sigma V \times \rho$	height	$\Sigma V \times height$
6965 lb	8	55718
lb		0
lb		0

TOTAL = 6965 lb TOTAL = 55718

E (MAIN) = $\frac{\Sigma V \times height \times \Sigma V \text{ TOTAL}}{\Sigma V \times height \text{ TOTAL}} = 6965 \text{ lbs}$

E () = NOT USED = 0 lbs

E () = NOT USED = 0 lbs

SUMMARY:

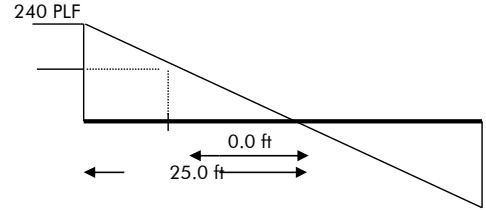
	WIND (front-rear)	WIND (left-right)	SEISMIC
ΣV (MAIN) =	4650 lbs	6630 lbs	6965 lbs
NOT APPLICABLE	0 lbs	0 lbs	0 lbs
NOT APPLICABLE	0 lbs	0 lbs	0 lbs
TOTAL =	4650 lbs	6630 lbs	6965 lbs

DIAPHRAGM SHEAR:

Total diaphragm length =	67.0 ft	Sub-diaphragm length =	50.0 ft
Diaphragm width =	50.0 ft	ΣV (MAIN) =	6,965 lbs

$$v = \frac{\Sigma V(\text{roof})}{(2)(\text{width})} = \frac{5198 \text{ lb}}{100 \text{ ft}} = 52 \text{ PLF}$$

IBC Table 2306.3.1 → 240 PLF



USE 15/32 CDX ROOF SHEATHING OR 3/4 T&G CDX SUBFLOORING w/8d AT 6 in o/c(PANEL EDGE), END 8d AT 12in o/c(PANEL FIELD)

CHORD:

Sub-diaphragm length =	50.0 ft	Total-diaphragm length =	67.0 ft
Sub-diaphragm width =	50.0 ft		
$T = \frac{M}{B} = \frac{\Sigma V \times (\text{diaphragm length})}{8 \times (\text{diaphragm width})} = \frac{5198 \times 50 \text{ ft}}{8 \times 50 \text{ ft}} = 650 \text{ lbs}$			

Top Plate Size:	2x4	Species/Grade:	HF #2
Area =	5.25 in ²	F _t =	525 psi
Load duration (C _D) =	1.33	T _{allowable} = Area x C _D x F _t =	3,666 lbs

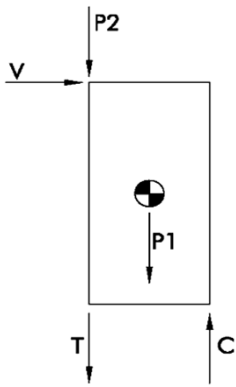
Since T allowable is greater than T applied, OK.

SHEAR CAPACITY OF 10d COMMON NAIL = 102 lbs 102 x C_d x p = 136 lbs 2015 NDS

OF NAILS PER 4 FT SPLICE = $\frac{650 \text{ lbs}}{136 \text{ lbs}} = 5$

USE 2x4 HF #2 TOP PLATE W/ (8) 10d COMMON NAILS PER SPLICE.

Lateral Calculation Key



V = Shear, plf
 H = Height of shearwall
 L = Length of shearwall
 P1 = Weight of shearwall and connected framing
 P2 = Weight of adjacent wall

$T = V \times H - 0.5P1 - P2 =$ Tension reaction to be resisted by holdown
 $C = V \times H + 0.5P1 =$ Compression reaction

ASD Basic Load Combinations

For calculation of tension and compression forces in compliance with ASCE 7-10 2.4.1

Tension Equations (Uplift)

7. $0.6D + W$

8. $(0.6 - 0.14S_{Ds})D + E \longrightarrow 0.44 D + E$

*8. $(0.6 - 0.14S_{Ds})D + 2.5 E \longrightarrow 0.44 D + 2.5 E$

Compression Equations

5. $D + W$

5. $(1 + 0.14S_{Ds})D + E \longrightarrow 1.16 D + E$

6. $D + 0.75W + 0.75L + 0.75S$

6. $(1.0 + 0.105S_{Ds})D + 0.75E + 0.75L + 0.75S \longrightarrow 1.12 D + 0.75 E + 0.75 L + 0.75 S$

*5. $(1 + 0.14S_{Ds})D + 2.5E \longrightarrow 1.16 D + 2.5 E$

*6. $(1.0 + 0.105S_{Ds})D + 1.875E + 0.75L + 0.75S \longrightarrow 1.12 D + 1.875 E + 0.75 L + 0.75 S$

* Equations include overstrength factor.

Note: The 0.7 factor for Earthquake loading has already been incorporated into the calculation of the lateral design force E_h , but not E_v . Therefore this factor has been omitted from equations 5, 6 and 8 where appropriate.

MAIN FLOOR REAR (FAMILY/MASTER BDRM)

SHEARWALL

WIND

SEISMIC

Floor Info

Upper Floor Level, e.g. Upper, Main, Lower
Lt-Rt Load Direction, e.g. Left-Right, Front-Rear
 (For Left Wall, Use Front-Rear Load Direction)

CDX Sheathing type
 Values in accordance with AF&PA SDPWS-2015

Roof Resisting Dead Load
 (e.g. Roof, Upper Floor, Main Floor)

14.00 ft Total Length of Shearwalls

V(from upper)=	6630 lb	6965 lb
V(from main)=	0 lb	0 lb
V(from lower)=	0 lb	0 lb
Σ (Wind) =	6,630 lb	Σ (Smc) = 6,965 lb
v =	191 PLF	v = 200 PLF

Tributary Width (Main Floor)

27.0	tributary width
67.0	total width
Not Used	
1.0	tributary width
2.0	total width
Not Used	
1.0	tributary width
2.0	total width

Height of Shearwall = **8.0 ft**
 Length of Shearwall = **7.0 ft**

Aspect Ratio OK

Use alternate R factor for seismic? **No**

Tributary Area (Main Floor)

27.0	tributary area
67.0	total area
Not Used	
1.0	tributary area
2.0	total area
Not Used	
1.0	tributary area
2.0	total area

Weight of Shearwall = **10.0 lbs**
 Tributary width for dead load = **3.0 ft**
 Length of adjoining wall = **2.0 ft**

SDPWS, Table 4.3A →

0.93 x 260 = 242 PLF

USE **SW6**

Seismic controls shearwall design

C _{TOTAL} =	(floor above) + (this floor) =	1527 lbs	+	1527 lbs	=	1527 lbs	Wind controls
T _{TOTAL} =	(floor above) + (this floor) =	1303 lbs	+	1303 lbs	=	1303 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

USE SIMPSON DESIGNED HOLDDOWN:

OR AT FOUNDATION / INTERIOR WALLS USE:

CS14
LSTHD8/RJ

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: **E = 1604 lbs**



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1. Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General

Design method: CSA A23.3-14
Units: Imperial units

Anchor Information:

Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 8.000
Code report: ICC-ES ESR-2508
Anchor category: -
Anchor ductility: Yes
 h_{min} (inch): 11.13
 c_{ac} (inch): 13.32
 C_{min} (inch): 1.75
 S_{min} (inch): 3.00

Base Material

Concrete: Normal-weight
Concrete thickness, h (inch): 24.00
State: Cracked
Compressive strength, f_c (psi): 2500
 $\Psi_{c,v}$: 1.2
Reinforcement condition: A tension, A shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Recommended Anchor

Anchor Name: SET-XP® - SET-XP w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-2508





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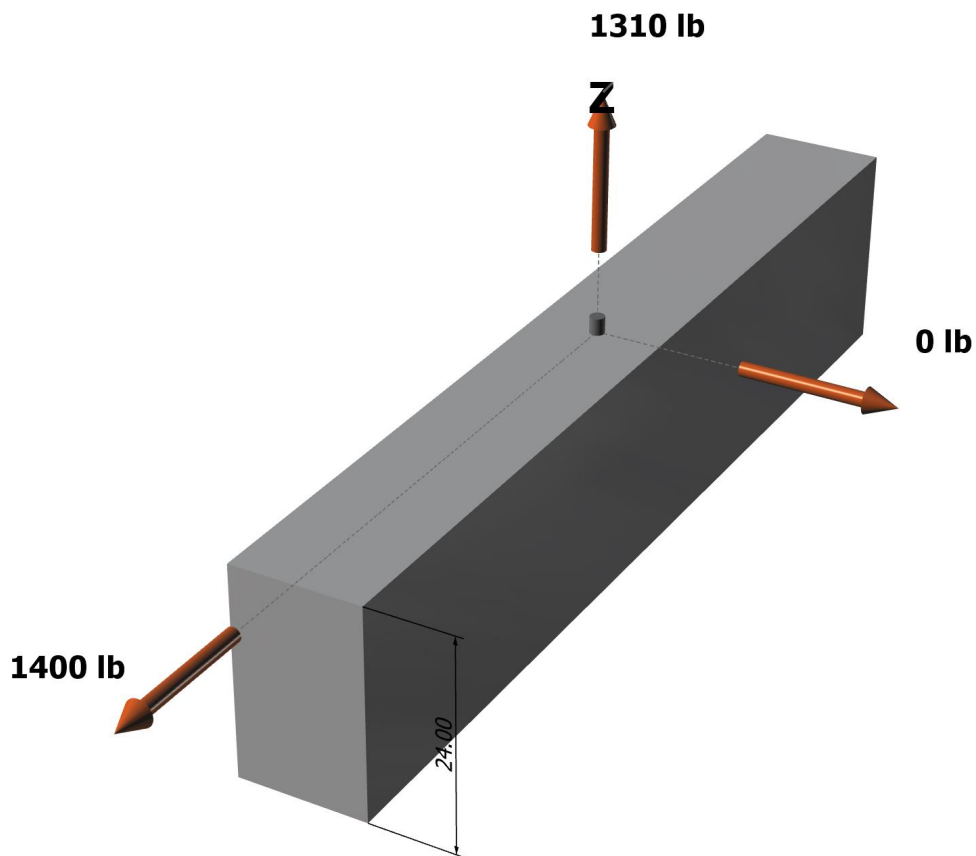
Load and Geometry

Load factor source: CSA A23.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Strength level loads:

N_{ua} [lb]: 1310
 V_{uax} [lb]: 1400
 V_{uay} [lb]: 0

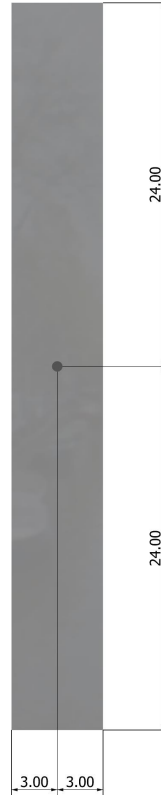
<Figure 1>





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<Figure 2>





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3. Resulting Anchor Forces

Anchor	Tension load, N _{fa} (lb)	Shear load x, V _{fax} (lb)	Shear load y, V _{foy} (lb)	Shear load combined, √(V _{fax}) ² + (V _{foy}) ² (lb)
1	1310.0	1400.0	0.0	1400.0
Sum	1310.0	1400.0	0.0	1400.0

Maximum concrete compression strain (%): 0.00
 Maximum concrete compression stress (psi): 0
 Resultant tension force (lb): 1310
 Resultant compression force (lb): 0
 Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
 Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
 Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
 Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00
 Steel resistance factor, Φ_s: 0.85 (Clause 8.4.3)
 Concrete resistance factor, Φ_c: 0.65 (Clause 8.4.2)

4. Steel Resistance of Anchor in Tension (Clause D.6.1)

$$N_{sar} = N_{sa}\phi_s R \text{ (Eq. D.2)}$$

N _{sa} (lb)	R	N _{sar} (lb)
13110	0.80	8915

5. Concrete Breakout Resistance of Anchor in Tension (Clause D.6.2)

$$N_{br} = k_c \lambda_a \phi_c \sqrt{f'_c} h_{ef}^{1.5} R \text{ (Eq. D.6)}$$

k _c	λ _a	f' _c (psi)	h _{ef} (in)	R	N _{br} (lb)
7.0	1.00	2500	8.000	1.15	14145

$$N_{cbr} = (A_{Nc} / A_{Nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_{br} \text{ (Eq. D.3)}$$

A _{Nc} (mm ²)	A _{Nco} (mm ²)	c _{a,min} (in)	ψ _{ed,N}	ψ _{c,N}	ψ _{cp,N}	N _{cbr} (lb)
144.00	576.00	3.00	0.775	1.00	1.000	2741

6. Adhesive Strength of Anchor in Tension (Clause D.6.5)

$$\tau_{cr} = \tau_{crf} \text{short-term} K_{sat}$$

τ _{cr} (psi)	f _{short-term}	K _{sat}	τ _{cr} (psi)
435	1.72	1.00	748

$$N_{bar} = \lambda_a \phi_c \tau_{cr} \pi d_a h_{ef} R \text{ (Eq. D.24)}$$

λ _a	τ _{cr} (psi)	d _a (in)	h _{ef} (in)	R	N _{bar} (lb)
1.00	748	0.63	8.000	1.00	7639

$$N_{ar} = (A_{Na} / A_{Na0}) \psi_{ed,Na} \psi_{cp,Na} N_{bar} \text{ (Eq. D.20)}$$

A _{Na} (in ²)	A _{Na0} (in ²)	c _{Na} (mm)	c _{a,min} (mm)	ψ _{ed,Na}	ψ _{cp,Na}	N _{bar} (lb)	N _{ar} (lb)
96.46	258.44	8.04	3.00	0.812	1.000	7639	2315



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8. Steel Resistance of Anchor in Shear (Clause D.7.1)

$$V_{sar} = \phi_{grou} V_{sa} \phi_s R \text{ (Clause D.7.1.2)}$$

V_{sa} (lb)	ϕ_{grou}	R	V_{sar} (lb)
7865	1.0	0.75	5014

9. Concrete Breakout Resistance of Anchor in Shear (Clause D.7.2)

Shear perpendicular to edge in x-direction:

$$V_{brx} = \min |7.0(l_e / d_a)^{0.2} \sqrt{d_a \phi_c \lambda_a} \sqrt{f_c c_{a1}}^{1.5} R; 3.75 \lambda_a \phi_c \sqrt{f_c c_{a1}}^{1.5} R| \text{ (Eq. D.35 \& Eq. D.36)}$$

l_e (in)	d_a (in)	λ_a	f_c (psi)	c_{a1} (in)	R	V_{brx} (lb)
5.00	0.625	1.00	2500	16.00	1.15	20020

$$V_{cbrx} = (A_{Vc} / A_{Vco}) \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{brx} \text{ (Eq. D.32)}$$

A_{Vc} (mm ²)	A_{Vco} (mm ²)	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	V_{brx} (lb)	V_{cbrx} (lb)
144.00	1152.00	0.738	1.200	1.000	20020	2215

Shear parallel to edge in x-direction:

$$V_{bry} = \min |7.0(l_e / d_a)^{0.2} \sqrt{d_a \phi_c \lambda_a} \sqrt{f_c c_{a1}}^{1.5} R; 3.75 \lambda_a \phi_c \sqrt{f_c c_{a1}}^{1.5} R| \text{ (Eq. D.35 \& Eq. D.36)}$$

l_e (in)	d_a (in)	λ_a	f_c (psi)	c_{a1} (in)	R	V_{bry} (lb)
5.00	0.625	1.00	2500	3.00	1.15	1625

$$V_{cbry} = (2)(A_{Vc} / A_{Vco}) \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{bry} \text{ (Sec. D.7.2.1(c) \& Eq. D.32)}$$

A_{Vc} (mm ²)	A_{Vco} (mm ²)	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	V_{bry} (lb)	V_{cbry} (lb)
40.50	40.50	1.000	1.200	1.000	1625	3901

10. Concrete Pryout Resistance of Anchor in Shear (Clause D.7.3)

$$V_{cpr} = \min |k_{cp} N_{ar}; k_{cp} N_{cb}| = \min |k_{cp} (A_{Na} / A_{Na0}) \psi_{ed,Na} \psi_{cp,Na} \lambda_a \phi_c \tau_k \pi d_a h_{ef,a} R_a; k_{cp} (A_{Nc} / A_{Nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,Na} k_c \lambda_a \phi_c \sqrt{f_c} h_{ef,cb}^{1.5} R_{cb}| \text{ (Clause D.7.3(a))}$$

k_{cp}	A_{Na} (in ²)	A_{Na0} (mm ²)	$\psi_{ed,Na}$	$\psi_{p,Na}$	τ_k (psi)	d_a (in)	$h_{ef,a}$ (in)	R_a
2.0	96.46	258.44	0.812	1.000	748	0.63	8.000	1.00
A_{Nc} (mm ²)	A_{Nco} (mm ²)	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	k_c	λ_a	f_c (psi)	$h_{ef,cb}$ (in)
144.00	576.00	0.775	1.000	1.000	7.0	1.00	2500	8.000
R_{cb}	V_{cpr} (lb)							
1.00	4630							

11. Results

Interaction of Tensile and Shear Forces (Figure D.18)

Tension	Factored Load, N_{fa} (lb)	Design Resistance, N_r (lb)	Ratio	Status
Steel	1310	8915	0.15	Pass
Concrete breakout	1310	2741	0.48	Pass
Adhesive	1310	2315	0.57	Pass (Governs)
Shear	Factored Load, V_{fa} (lb)	Design Resistance, V_r (lb)	Ratio	Status
Steel	1400	5014	0.28	Pass
T Concrete breakout x+	1400	2215	0.63	Pass (Governs)
 Concrete breakout y-	1400	3901	0.36	Pass (Governs)

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines and must be checked for plausibility.?



Anchor Designer™
Software
Version 2.8.7094.1

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Pryout	1400	4630	0.30	Pass	
Interaction check	$(N_{fa}/N_r)^{5/3}$	$(V_{fa}/V_r)^{5/3}$	Combined Ratio	Permissible	Status
Figure D.18	0.39	0.47	85.3%	1.0	Pass

SET-XP w/ 5/8"Ø F1554 Gr. 36 with hef = 8.000 inch meets the selected design criteria.

12. Warnings

- When cracked concrete is selected, concrete compressive strength used in concrete breakout Resistance in tension, adhesive resistance in tension and concrete pryout resistance in shear for SET-XP adhesive anchor is limited to 17.25 MPa (2,500 psi) per ICC-ES ESR-2508 Section 5.3.
- Minimum spacing and edge distance requirement of 6da per CSA A23.3 Clause D.9.2 and D.9.3 for torqued cast-in-place anchor is waived per designer option.
- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.

Wood Beam

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DESCRIPTION Rafters

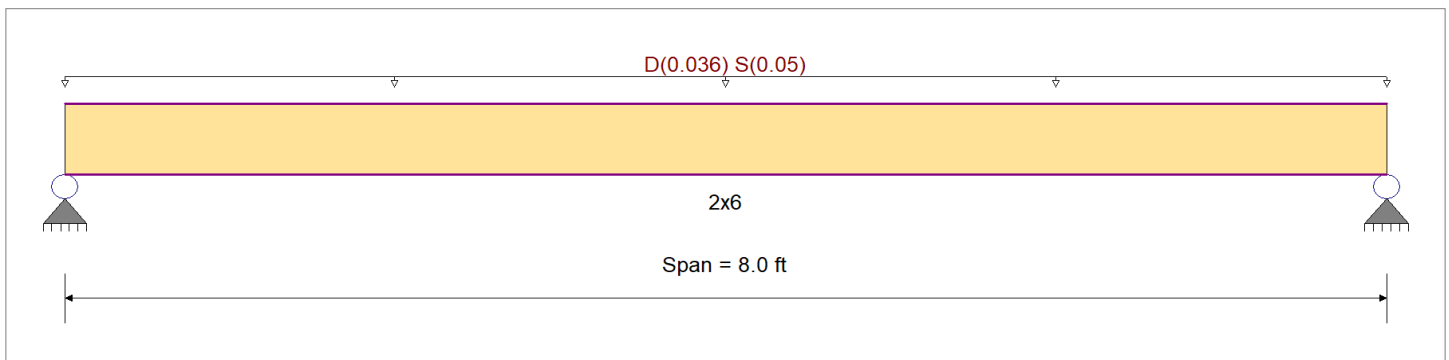
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	850 psi	Ebend- xx	1300ksi
		Fc - Prll	1300 psi	Eminbend - x	470ksi
Wood Species	Hem Fir	Fc - Perp	405 psi		
Wood Grade	No.2	Fv	150 psi		
		Ft	525 psi	Density	26.84pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 2.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.760	1	Maximum Shear Stress Ratio	=	0.329	: 1
Section used for this span		2x6		Section used for this span		2x6	
fb: Actual	=	1,111.22psi		fv: Actual	=	56.69 psi	
Fb: Allowable	=	1,461.36psi		Fv: Allowable	=	172.50 psi	
Load Combination		+D+S+H		Load Combination		+D+S+H	
Location of maximum on span	=	4.000ft		Location of maximum on span	=	7.562 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.171 in	Ratio =	559	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.300 in	Ratio =	319	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values					
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v			
+D+H	Length = 8.0 ft	1	0.417	0.180	0.90	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	1143.68	0.00	0.00	0.00	0.00	0.00	0.00
+D+L+H	Length = 8.0 ft	1	0.375	0.162	1.00	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	1270.75	0.00	0.00	0.00	0.00	0.00	0.00
+D+Lr+H	Length = 8.0 ft	1	0.300	0.130	1.25	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	1588.44	0.00	0.00	0.00	0.00	0.00	0.00
+D+S+H	Length = 8.0 ft	1	0.760	0.329	1.15	1.300	1.00	1.15	1.00	1.00	1.00	0.70	1,111.22	1461.36	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.750Lr+0.750L+H	Length = 8.0 ft	1	0.300	0.130	1.25	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	1588.44	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.750L+0.750S+H	Length = 8.0 ft	1	0.652	0.282	1.15	1.300	1.00	1.15	1.00	1.00	1.00	0.60	952.54	1461.36	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.60W+H						1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00

Wood Beam

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Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 8.0 ft	1	0.234	0.101	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	2033.20	0.13	24.31	240.00	
+D+0.750Lr+0.750L+0.450W-					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.234	0.101	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	2033.20	0.13	24.31	240.00	
+D+0.750L+0.750S+0.450W+					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.468	0.202	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.60	952.54	2033.20	0.27	48.60	240.00	
+0.60D+0.60W+0.60H					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.141	0.061	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.18	285.91	2033.20	0.08	14.59	240.00	
+D+0.70E+0.60H					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.234	0.101	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.30	476.51	2033.20	0.13	24.31	240.00	
+D+0.750L+0.750S+0.5250E-					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.468	0.202	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.60	952.54	2033.20	0.27	48.60	240.00	
+0.60D+0.70E+H					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.141	0.061	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.18	285.91	2033.20	0.08	14.59	240.00	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.3001	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.350	0.350
Overall MINimum	0.200	0.200
+D+H	0.150	0.150
+D+L+H	0.150	0.150
+D+Lr+H	0.150	0.150
+D+S+H	0.350	0.350
+D+0.750Lr+0.750L+H	0.150	0.150
+D+0.750L+0.750S+H	0.300	0.300
+D+0.60W+H	0.150	0.150
+D+0.750Lr+0.750L+0.450W+H	0.150	0.150
+D+0.750L+0.750S+0.450W+H	0.300	0.300
+0.60D+0.60W+0.60H	0.090	0.090
+D+0.70E+0.60H	0.150	0.150
+D+0.750L+0.750S+0.5250E+H	0.300	0.300
+0.60D+0.70E+H	0.090	0.090
D Only	0.150	0.150
S Only	0.200	0.200
H Only		

Wood Beam

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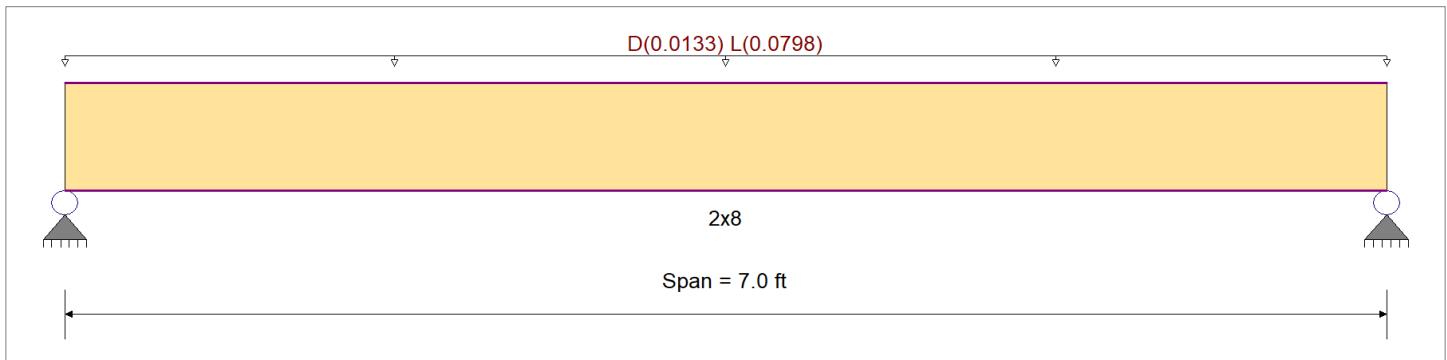
DESCRIPTIO Deck joist

CODE REFERENCES

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

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasti	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
Wood Species	Hem Fir	Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Grade	No.2	Fc - Perp	405.0 psi		
		Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increa	



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.010, L = 0.060 ksf, Tributary Width = 1.330 ft, (DECK)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.454	1	Maximum Shear Stress Ratio	=	0.255	1
Section used for this span		2x8		Section used for this span		2x8	
fb: Actual	=	532.08psi		fv: Actual	=	38.21 psi	
Fb: Allowable	=	1,173.00psi		Fv: Allowable	=	150.00 psi	
Load Combination		+D+L+H		Load Combination		+D+L+H	
Location of maximum on span	=	3.500ft		Location of maximum on span	=	6.412 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.070 in	Ratio =	1199	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.083 in	Ratio =	1006	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
+D+H	Length = 7.0 ft	1	0.081	0.046	0.90	1.200	1.00	1.15	1.00	1.00	1.00	0.09	85.73	1055.70	0.04	6.16	135.00
+D+L+H	Length = 7.0 ft	1	0.454	0.255	1.00	1.200	1.00	1.15	1.00	1.00	1.00	0.58	532.08	1173.00	0.28	38.21	150.00
+D+Lr+H	Length = 7.0 ft	1	0.058	0.033	1.25	1.200	1.00	1.15	1.00	1.00	1.00	0.09	85.73	1466.25	0.04	6.16	187.50
+D+S+H	Length = 7.0 ft	1	0.064	0.036	1.15	1.200	1.00	1.15	1.00	1.00	1.00	0.09	85.73	1348.95	0.04	6.16	172.50
+D+0.750Lr+0.750L+H	Length = 7.0 ft	1	0.287	0.161	1.25	1.200	1.00	1.15	1.00	1.00	1.00	0.46	420.49	1466.25	0.22	30.20	187.50
+D+0.750L+0.750S+H	Length = 7.0 ft	1	0.312	0.175	1.15	1.200	1.00	1.15	1.00	1.00	1.00	0.46	420.49	1348.95	0.22	30.20	172.50
+D+0.60W+H						1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

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CK Engineering LLC

DESCRIPTIO Deck joist

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 7.0 ft	1	0.046	0.026	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.09	85.73	1876.80	0.04	6.16	240.00	
+D+0.750Lr+0.750L+0.450W-					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 7.0 ft	1	0.224	0.126	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.46	420.49	1876.80	0.22	30.20	240.00	
+D+0.750L+0.750S+0.450W+					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 7.0 ft	1	0.224	0.126	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.46	420.49	1876.80	0.22	30.20	240.00	
+0.60D+0.60W+0.60H					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 7.0 ft	1	0.027	0.015	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.06	51.44	1876.80	0.03	3.69	240.00	
+D+0.70E+0.60H					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 7.0 ft	1	0.046	0.026	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.09	85.73	1876.80	0.04	6.16	240.00	
+D+0.750L+0.750S+0.5250E-					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 7.0 ft	1	0.224	0.126	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.46	420.49	1876.80	0.22	30.20	240.00	
+0.60D+0.70E+H					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 7.0 ft	1	0.027	0.015	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.06	51.44	1876.80	0.03	3.69	240.00	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.0835	3.526		0.0000	0.000

Vertical Reactions

Support notation : Far left is #'

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.333	0.333
Overall MINimum	0.279	0.279
+D+H	0.054	0.054
+D+L+H	0.333	0.333
+D+Lr+H	0.054	0.054
+D+S+H	0.054	0.054
+D+0.750Lr+0.750L+H	0.263	0.263
+D+0.750L+0.750S+H	0.263	0.263
+D+0.60W+H	0.054	0.054
+D+0.750Lr+0.750L+0.450W+H	0.263	0.263
+D+0.750L+0.750S+0.450W+H	0.263	0.263
+0.60D+0.60W+0.60H	0.032	0.032
+D+0.70E+0.60H	0.054	0.054
+D+0.750L+0.750S+0.5250E+H	0.263	0.263
+0.60D+0.70E+H	0.032	0.032
D Only	0.054	0.054
L Only	0.279	0.279
H Only		

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#1

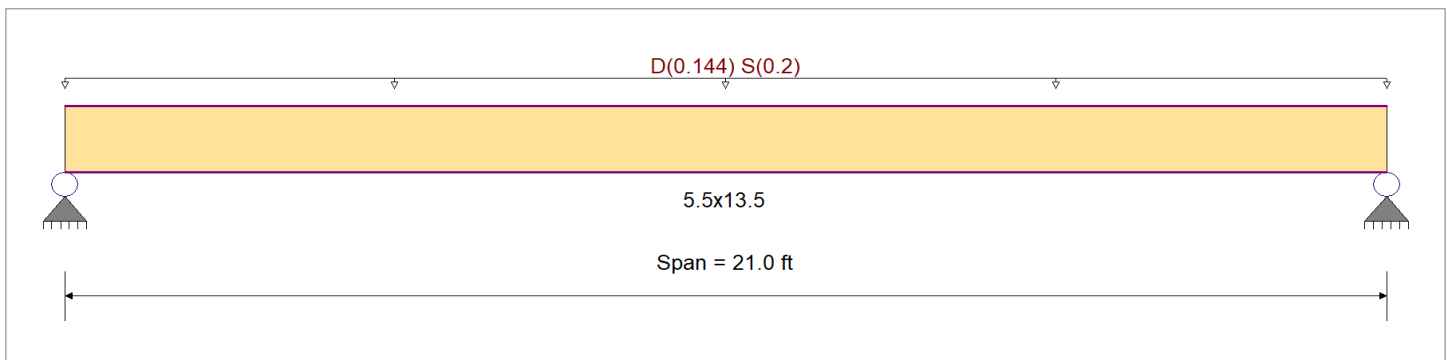
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	2,400.0 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
Wood Species	DF/DF	Fc - Prll	1,650.0 psi	Eminbend - x	950.0ksi
Wood Grade	24F - V4	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
		Fv	265.0 psi	Eminbend - y	850.0ksi
		Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 8.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.526 < 1	Maximum Shear Stress Ratio	=	0.225 < 1
Section used for this span	=	5.5x13.5	Section used for this span	=	5.5x13.5
fb: Actual	=	1,425.82psi	fv: Actual	=	68.58 psi
Fb: Allowable	=	2,708.49psi	Fv: Allowable	=	304.75 psi
Load Combination	=	+D+S+H	Load Combination	=	+D+S+H
Location of maximum on span	=	10.500ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.434 in	Ratio =		581 >=360
Max Upward Transient Deflection		0.000 in	Ratio =		0 <360
Max Downward Total Deflection		0.781 in	Ratio =		322 >=240
Max Upward Total Deflection		0.000 in	Ratio =		0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values								
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v						
+D+H	Length = 21.0 ft	1	0.299	0.128	0.90	0.981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.83	633.90	2119.69	0.00	0.00	0.00	0.00	0.00	238.50	
+D+L+H	Length = 21.0 ft	1	0.269	0.115	1.00	0.981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.83	633.90	2355.21	0.00	0.00	0.00	0.00	0.00	0.00	265.00
+D+Lr+H	Length = 21.0 ft	1	0.215	0.092	1.25	0.981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.83	633.90	2944.01	0.00	0.00	0.00	0.00	0.00	0.00	331.25
+D+S+H	Length = 21.0 ft	1	0.526	0.225	1.15	0.981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	19.85	1,425.82	2708.49	0.00	0.00	0.00	3.39	68.58	0.00	304.75
+D+0.750Lr+0.750L+H	Length = 21.0 ft	1	0.215	0.092	1.25	0.981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.83	633.90	2944.01	0.00	0.00	0.00	0.00	0.00	0.00	331.25
+D+0.750L+0.750S+H	Length = 21.0 ft	1	0.453	0.194	1.15	0.981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	17.09	1,227.84	2708.49	0.00	0.00	0.00	2.92	59.06	0.00	304.75
+D+0.60W+H						0.981	1.00	1.00	1.00	1.00	1.00	1.00				0.00			0.00	0.00	0.00	0.00	

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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Wood Beam

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DESCRIPTIO BM#1

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	f _v	F'v
Length = 21.0 ft	1	0.168	0.072	1.60	0.981	1.00	1.00	1.00	1.00	1.00	1.00	8.83	633.90	3768.33	1.51	30.49	424.00
+D+0.750Lr+0.750L+0.450W-					0.981	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	0.00
Length = 21.0 ft	1	0.168	0.072	1.60	0.981	1.00	1.00	1.00	1.00	1.00	8.83	633.90	3768.33	1.51	30.49	424.00	
+D+0.750L+0.750S+0.450W+					0.981	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	
Length = 21.0 ft	1	0.326	0.139	1.60	0.981	1.00	1.00	1.00	1.00	1.00	17.09	1,227.84	3768.33	2.92	59.06	424.00	
+0.60D+0.60W+0.60H					0.981	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	
Length = 21.0 ft	1	0.101	0.043	1.60	0.981	1.00	1.00	1.00	1.00	1.00	5.30	380.34	3768.33	0.91	18.29	424.00	
+D+0.70E+0.60H					0.981	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	
Length = 21.0 ft	1	0.168	0.072	1.60	0.981	1.00	1.00	1.00	1.00	1.00	8.83	633.90	3768.33	1.51	30.49	424.00	
+D+0.750L+0.750S+0.5250E-					0.981	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	
Length = 21.0 ft	1	0.326	0.139	1.60	0.981	1.00	1.00	1.00	1.00	1.00	17.09	1,227.84	3768.33	2.92	59.06	424.00	
+0.60D+0.70E+H					0.981	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	
Length = 21.0 ft	1	0.101	0.043	1.60	0.981	1.00	1.00	1.00	1.00	1.00	5.30	380.34	3768.33	0.91	18.29	424.00	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.7808	10.577		0.0000	0.000

Vertical Reactions

Support notation : Far left is #'

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.781	3.781
Overall MINimum	2.100	2.100
+D+H	1.681	1.681
+D+L+H	1.681	1.681
+D+Lr+H	1.681	1.681
+D+S+H	3.781	3.781
+D+0.750Lr+0.750L+H	1.681	1.681
+D+0.750L+0.750S+H	3.256	3.256
+D+0.60W+H	1.681	1.681
+D+0.750Lr+0.750L+0.450W+H	1.681	1.681
+D+0.750L+0.750S+0.450W+H	3.256	3.256
+0.60D+0.60W+0.60H	1.009	1.009
+D+0.70E+0.60H	1.681	1.681
+D+0.750L+0.750S+0.5250E+H	3.256	3.256
+0.60D+0.70E+H	1.009	1.009
D Only	1.681	1.681
S Only	2.100	2.100
H Only		

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#2

CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method **Allowable Stress Design**
 Load Combination **ASCE 7-16**

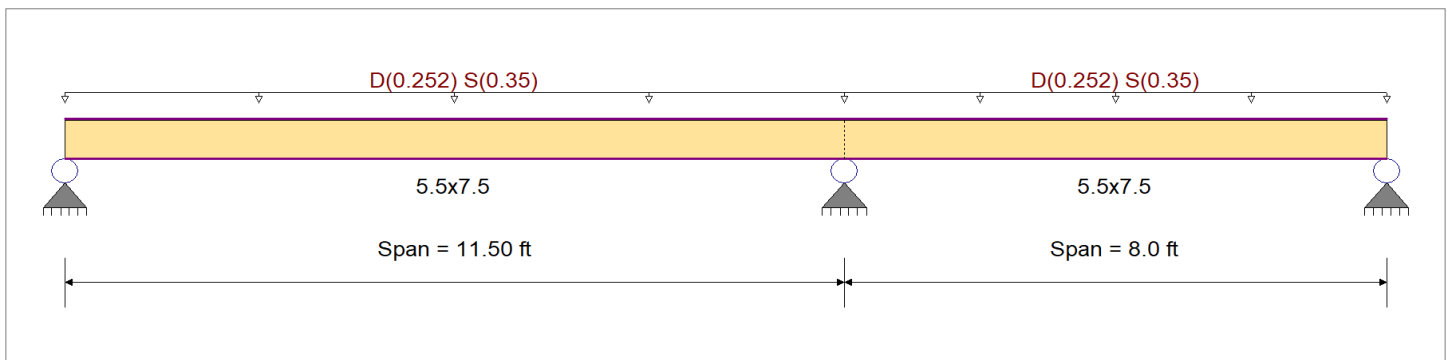
Wood Species **DF/DF**
 Wood Grade **24F - V4**

Fb + **2,400.0 psi**
 Fb - **1,850.0 psi**
 Fc - Prll **1,650.0 psi**
 Fc - Perp **650.0 psi**
 Fv **265.0 psi**
 Ft **1,100.0 psi**

E : Modulus of Elasti

Ebend- xx **1,800.0ksi**
 Eminbend - x **950.0ksi**
 Ebend- yy **1,600.0ksi**
 Eminbend - y **850.0ksi**
 Density **31.210pcf**

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



Applied Loads

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

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 14.0 ft, (ROOF)

Load for Span Number 2

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 14.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.871 : 1	Maximum Shear Stress Ratio	=	0.460 : 1
Section used for this span		5.5x7.5	Section used for this span		5.5x7.5
fb: Actual	=	1,852.82psi	fv: Actual	=	140.07 psi
Fb: Allowable	=	2,127.50psi	Fv: Allowable	=	304.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	11.500ft	Location of maximum on span	=	10.922 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.214 in	Ratio =		644 >=360
Max Upward Transient Deflection		-0.015 in	Ratio =		6326 >=360
Max Downward Total Deflection		0.374 in	Ratio =		369 >=240
Max Upward Total Deflection		-0.026 in	Ratio =		3624 >=240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios								Moment Values			Shear Values				
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v	
+D+H	Length = 11.50 ft	1	0.475	0.251	0.90	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	1665.00	0.00	0.00	0.00	0.00
	Length = 8.0 ft	2	0.475	0.251	0.90	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	1665.00	1.32	59.83	238.50	238.50
+D+L+H	Length = 11.50 ft	1	0.428	0.226	1.00	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	1850.00	1.65	59.83	265.00	265.00
	Length = 8.0 ft	2	0.428	0.226	1.00	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	1850.00	1.32	59.83	265.00	265.00
+D+Lr+H	Length = 11.50 ft	1	0.342	0.181	1.25	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2312.50	1.65	59.83	331.25	331.25
	Length = 8.0 ft	2	0.342	0.181	1.25	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2312.50	1.32	59.83	331.25	331.25
+D+S+H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#2

Load Combination	Segment Length	Span #	Max Stress Ratios								Moment Values			Shear Values			
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
	Length = 11.50 ft	1	0.871	0.460	1.15	1.000	1.00	1.00	1.00	1.00	1.00	7.96	1,852.82	2127.50	3.85	140.07	304.75
	Length = 8.0 ft	2	0.871	0.460	1.15	1.000	1.00	1.00	1.00	1.00	1.00	7.96	1,852.82	2127.50	3.08	140.07	304.75
+D+0.750Lr+0.750L+H						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.342	0.181	1.25	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2312.50	1.65	59.83	331.25
	Length = 8.0 ft	2	0.342	0.181	1.25	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2312.50	1.32	59.83	331.25
+D+0.750L+0.750S+H						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.746	0.394	1.15	1.000	1.00	1.00	1.00	1.00	1.00	6.82	1,587.45	2127.50	3.30	120.01	304.75
	Length = 8.0 ft	2	0.746	0.394	1.15	1.000	1.00	1.00	1.00	1.00	1.00	6.82	1,587.45	2127.50	2.64	120.01	304.75
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.267	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2960.00	1.65	59.83	424.00
	Length = 8.0 ft	2	0.267	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2960.00	1.32	59.83	424.00
+D+0.750Lr+0.750L+0.450W-						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.267	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2960.00	1.65	59.83	424.00
	Length = 8.0 ft	2	0.267	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2960.00	1.32	59.83	424.00
+D+0.750L+0.750S+0.450W+						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.536	0.283	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.82	1,587.45	2960.00	3.30	120.01	424.00
	Length = 8.0 ft	2	0.536	0.283	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.82	1,587.45	2960.00	2.64	120.01	424.00
+0.60D+0.60W+0.60H						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.160	0.085	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.04	474.82	2960.00	0.99	35.90	424.00
	Length = 8.0 ft	2	0.160	0.085	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.04	474.82	2960.00	0.79	35.90	424.00
+D+0.70E+0.60H						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.267	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2960.00	1.65	59.83	424.00
	Length = 8.0 ft	2	0.267	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.40	791.36	2960.00	1.32	59.83	424.00
+D+0.750L+0.750S+0.5250E-						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.536	0.283	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.82	1,587.45	2960.00	3.30	120.01	424.00
	Length = 8.0 ft	2	0.536	0.283	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.82	1,587.45	2960.00	2.64	120.01	424.00
+0.60D+0.70E+H						1.000	1.00	1.00	1.00	1.00	1.00		0.00		0.00	0.00	0.00
	Length = 11.50 ft	1	0.160	0.085	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.04	474.82	2960.00	0.99	35.90	424.00
	Length = 8.0 ft	2	0.160	0.085	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.04	474.82	2960.00	0.79	35.90	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.3736	5.204		0.0000	0.000
+D+S+H	2	0.0157	5.810	+D+S+H	-0.0265	1.475

Vertical Reactions

Load Combination	Support notation : Far left is #'			Values in KIPS
	Support 1	Support 2	Support 3	
Overall MAXimum	2.821	7.644	1.449	
Overall MINimum	1.616	4.379	0.830	
+D+H	1.205	3.265	0.619	
+D+L+H	1.205	3.265	0.619	
+D+Lr+H	1.205	3.265	0.619	
+D+S+H	2.821	7.644	1.449	
+D+0.750Lr+0.750L+H	1.205	3.265	0.619	
+D+0.750L+0.750S+H	2.417	6.549	1.241	
+D+0.60W+H	1.205	3.265	0.619	
+D+0.750Lr+0.750L+0.450W+H	1.205	3.265	0.619	
+D+0.750L+0.750S+0.450W+H	2.417	6.549	1.241	
+0.60D+0.60W+0.60H	0.723	1.959	0.371	
+D+0.70E+0.60H	1.205	3.265	0.619	
+D+0.750L+0.750S+0.5250E+H	2.417	6.549	1.241	
+0.60D+0.70E+H	0.723	1.959	0.371	
D Only	1.205	3.265	0.619	
S Only	1.616	4.379	0.830	
H Only				

Wood Beam

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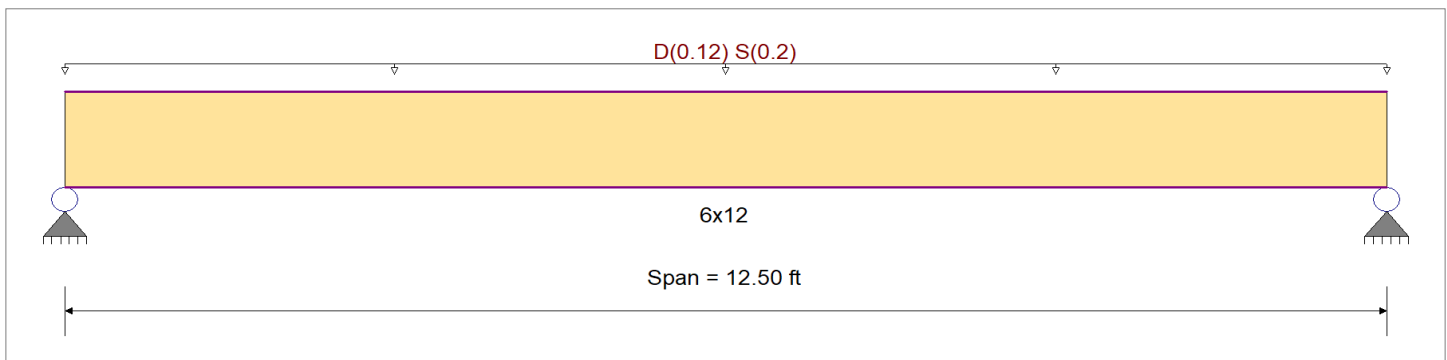
DESCRIPTIO BM#3

CODE REFERENCES

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

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850 psi	E : Modulus of Elasti	
Load Combinati	ASCE 7-16	Fb -	850 psi	Ebend- xx	1300ksi
		Fc - Prll	1300 psi	Eminbend - x	470ksi
Wood Species	Hem Fir	Fc - Perp	405 psi		
Wood Grade	No.2	Fv	150 psi		
		Ft	525 psi	Density	26.84pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 8.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.656	1	Maximum Shear Stress Ratio	=	0.241	: 1
Section used for this span		6x12		Section used for this span		6x12	
fb: Actual	=	641.46psi		fv: Actual	=	41.64 psi	
Fb: Allowable	=	977.50psi		Fv: Allowable	=	172.50 psi	
Load Combination		+D+S+H		Load Combination		+D+S+H	
Location of maximum on span	=	6.250ft		Location of maximum on span	=	11.542 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.122 in	Ratio =	1230	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.202 in	Ratio =	741	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v		
+D+H	Length = 12.50 ft	1	0.333	0.123	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	765.00	0.70	16.54	135.00
+D+L+H	Length = 12.50 ft	1	0.300	0.110	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	850.00	0.70	16.54	150.00
+D+Lr+H	Length = 12.50 ft	1	0.240	0.088	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	1062.50	0.70	16.54	187.50
+D+S+H	Length = 12.50 ft	1	0.656	0.241	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	6.48	641.46	977.50	1.76	41.64	172.50
+D+0.750Lr+0.750L+H	Length = 12.50 ft	1	0.240	0.088	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	1062.50	0.70	16.54	187.50
+D+0.750L+0.750S+H	Length = 12.50 ft	1	0.557	0.205	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5.50	544.79	977.50	1.49	35.36	172.50
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

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DESCRIPTIO BM#3

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v	
Length = 12.50 ft	1	0.187	0.069	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	1360.00	0.70	16.54	240.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.187	0.069	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	1360.00	0.70	16.54	240.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.401	0.147	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5.50	544.79	1360.00	1.49	35.36	240.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.112	0.041	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.54	152.87	1360.00	0.42	9.92	240.00
+D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.187	0.069	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.57	254.79	1360.00	0.70	16.54	240.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.401	0.147	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5.50	544.79	1360.00	1.49	35.36	240.00
+0.60D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.112	0.041	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.54	152.87	1360.00	0.42	9.92	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2023	6.296		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.074	2.074
Overall MINimum	1.250	1.250
+D+H	0.824	0.824
+D+L+H	0.824	0.824
+D+Lr+H	0.824	0.824
+D+S+H	2.074	2.074
+D+0.750Lr+0.750L+H	0.824	0.824
+D+0.750L+0.750S+H	1.761	1.761
+D+0.60W+H	0.824	0.824
+D+0.750Lr+0.750L+0.450W+H	0.824	0.824
+D+0.750L+0.750S+0.450W+H	1.761	1.761
+0.60D+0.60W+0.60H	0.494	0.494
+D+0.70E+0.60H	0.824	0.824
+D+0.750L+0.750S+0.5250E+H	1.761	1.761
+0.60D+0.70E+H	0.494	0.494
D Only	0.824	0.824
S Only	1.250	1.250
H Only		

Wood Beam

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DESCRIPTIO BM#4

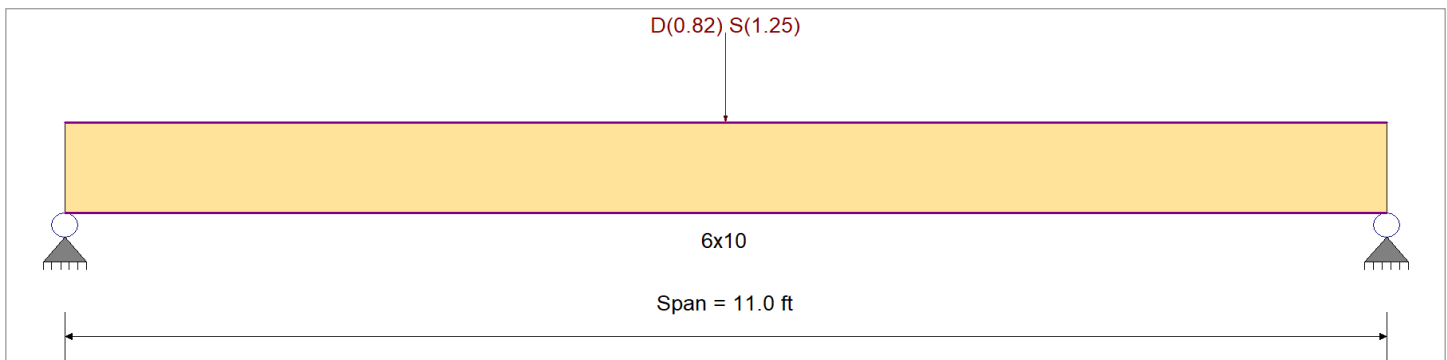
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
Wood Species	Hem Fir	Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Grade	No.2	Fc - Perp	405.0 psi		
		Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Point Load : D = 0.820, S = 1.250 k @ 5.50 ft, (BM#3)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.867 : 1	Maximum Shear Stress Ratio	=	0.180 : 1
Section used for this span		6x10	Section used for this span		6x10
fb: Actual	=	847.07 psi	fv: Actual	=	31.04 psi
Fb: Allowable	=	977.50 psi	Fv: Allowable	=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	5.500ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.118 in	Ratio =		1119 >=360
Max Upward Transient Deflection		0.000 in	Ratio =		0 <360
Max Downward Total Deflection		0.202 in	Ratio =		654 >=240
Max Upward Total Deflection		0.000 in	Ratio =		0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values							
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v					
+D+H	Length = 11.0 ft	1	0.455	0.097	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	765.00	0.00	0.00	0.00	0.00	0.00	0.00
+D+L+H	Length = 11.0 ft	1	0.410	0.087	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	850.00	0.00	0.00	0.00	0.00	0.00	0.00
+D+Lr+H	Length = 11.0 ft	1	0.328	0.070	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	1062.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+S+H	Length = 11.0 ft	1	0.867	0.180	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5.84	847.07	977.50	0.00	1.08	31.04	0.00	0.00	0.00
+D+0.750Lr+0.750L+H	Length = 11.0 ft	1	0.328	0.070	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	1062.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.750L+0.750S+H	Length = 11.0 ft	1	0.739	0.154	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	4.98	722.42	977.50	0.00	0.92	26.55	0.00	0.00	0.00
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00

Wood Beam

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DESCRIPTIO BM#4

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	f _v	F'v
Length = 11.0 ft	1	0.256	0.055	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	1360.00	0.46	13.09	240.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 11.0 ft	1	0.256	0.055	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	1360.00	0.46	13.09	240.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 11.0 ft	1	0.531	0.111	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	4.98	722.42	1360.00	0.92	26.55	240.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 11.0 ft	1	0.154	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.44	209.07	1360.00	0.27	7.86	240.00
+D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 11.0 ft	1	0.256	0.055	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	2.40	348.46	1360.00	0.46	13.09	240.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 11.0 ft	1	0.531	0.111	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	4.98	722.42	1360.00	0.92	26.55	240.00
+0.60D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 11.0 ft	1	0.154	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.44	209.07	1360.00	0.27	7.86	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2015	5.540		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.089	1.089
Overall MINimum	0.625	0.625
+D+H	0.464	0.464
+D+L+H	0.464	0.464
+D+Lr+H	0.464	0.464
+D+S+H	1.089	1.089
+D+0.750Lr+0.750L+H	0.464	0.464
+D+0.750L+0.750S+H	0.932	0.932
+D+0.60W+H	0.464	0.464
+D+0.750Lr+0.750L+0.450W+H	0.464	0.464
+D+0.750L+0.750S+0.450W+H	0.932	0.932
+0.60D+0.60W+0.60H	0.278	0.278
+D+0.70E+0.60H	0.464	0.464
+D+0.750L+0.750S+0.5250E+H	0.932	0.932
+0.60D+0.70E+H	0.278	0.278
D Only	0.464	0.464
S Only	0.625	0.625
H Only		

Wood Beam

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DESCRIPTIO BM#5

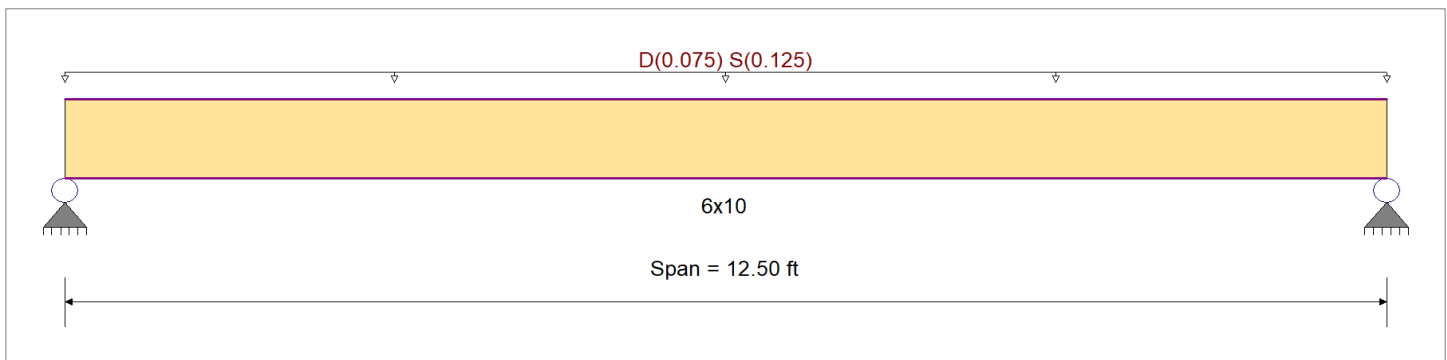
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasti	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
		Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Species	Hem Fir	Fc - Perp	405.0 psi		
Wood Grade	No.2	Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 5.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.608 < 1	Maximum Shear Stress Ratio	=	0.191 < 1
Section used for this span		6x10	Section used for this span		6x10
fb: Actual	=	594.20psi	fv: Actual	=	32.96 psi
Fb: Allowable	=	977.50psi	Fv: Allowable	=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	6.250ft	Location of maximum on span	=	11.724 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.135 in	Ratio =		1109 >= 360
Max Upward Transient Deflection		0.000 in	Ratio =		0 < 360
Max Downward Total Deflection		0.227 in	Ratio =		661 >= 240
Max Upward Total Deflection		0.000 in	Ratio =		0 < 240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values						
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v				
+D+H	Length = 12.50 ft	1	0.314	0.099	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.66	240.07	765.00	0.00	0.00	0.00	0.00	0.00	0.00
+D+L+H	Length = 12.50 ft	1	0.282	0.089	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.66	240.07	850.00	0.00	0.00	0.00	0.00	0.00	0.00
+D+Lr+H	Length = 12.50 ft	1	0.226	0.071	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.66	240.07	1062.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+S+H	Length = 12.50 ft	1	0.608	0.191	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	4.10	594.20	977.50	0.00	1.15	32.96	172.50	0.00	0.00
+D+0.750Lr+0.750L+H	Length = 12.50 ft	1	0.226	0.071	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.66	240.07	1062.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.750L+0.750S+H	Length = 12.50 ft	1	0.517	0.163	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	3.49	505.67	977.50	0.00	0.98	28.05	172.50	0.00	0.00
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#5

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	f _v	F'v
Length = 12.50 ft	1	0.177	0.055	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.66	240.07	1360.00	0.46	13.32	240.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.50 ft	1	0.177	0.055	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.66	240.07	1360.00	0.46	13.32	240.00	
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.50 ft	1	0.372	0.117	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.49	505.67	1360.00	0.98	28.05	240.00	
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.50 ft	1	0.106	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	0.99	144.04	1360.00	0.28	7.99	240.00	
+D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.50 ft	1	0.177	0.055	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.66	240.07	1360.00	0.46	13.32	240.00	
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.50 ft	1	0.372	0.117	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.49	505.67	1360.00	0.98	28.05	240.00	
+0.60D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.50 ft	1	0.106	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	0.99	144.04	1360.00	0.28	7.99	240.00	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2268	6.296		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.311	1.311
Overall MINimum	0.781	0.781
+D+H	0.530	0.530
+D+L+H	0.530	0.530
+D+Lr+H	0.530	0.530
+D+S+H	1.311	1.311
+D+0.750Lr+0.750L+H	0.530	0.530
+D+0.750L+0.750S+H	1.116	1.116
+D+0.60W+H	0.530	0.530
+D+0.750Lr+0.750L+0.450W+H	0.530	0.530
+D+0.750L+0.750S+0.450W+H	1.116	1.116
+0.60D+0.60W+0.60H	0.318	0.318
+D+0.70E+0.60H	0.530	0.530
+D+0.750L+0.750S+0.5250E+H	1.116	1.116
+0.60D+0.70E+H	0.318	0.318
D Only	0.530	0.530
S Only	0.781	0.781
H Only		

Wood Beam

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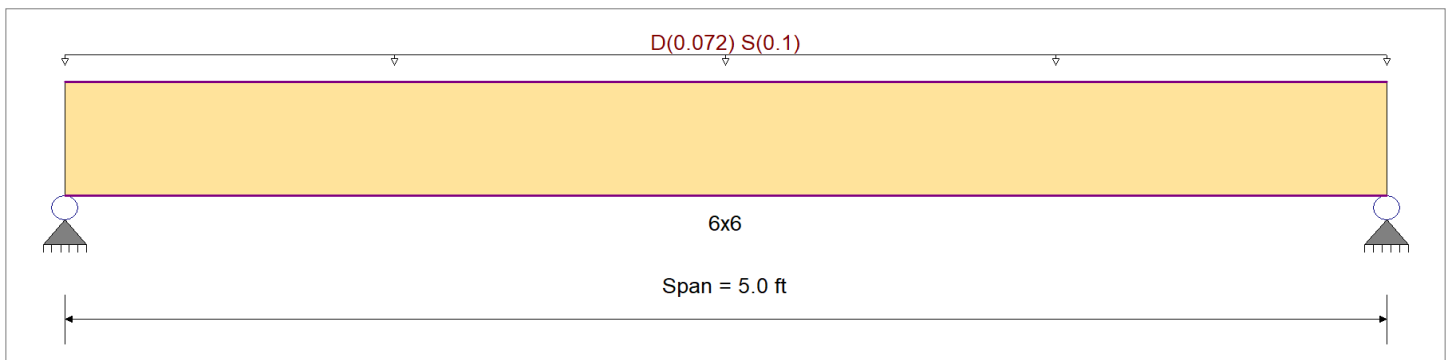
DESCRIPTIO BM#6

CODE REFERENCES

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

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasti	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
		Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Species	Hem Fir	Fc - Perp	405.0 psi		
Wood Grade	No.2	Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

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

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.246 : 1	Maximum Shear Stress Ratio	=	0.104 : 1
Section used for this span		6x6	Section used for this span		6x6
fb: Actual	=	240.23psi	fv: Actual	=	18.00 psi
Fb: Allowable	=	977.50psi	Fv: Allowable	=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	2.500ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.014 in	Ratio =		4205 >=360
Max Upward Transient Deflection		0.000 in	Ratio =		0 <360
Max Downward Total Deflection		0.025 in	Ratio =		2367 >=240
Max Upward Total Deflection		0.000 in	Ratio =		0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values						
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v					
+D+H	Length = 5.0 ft	1	0.137	0.058	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	765.00	0.00	0.00	0.00	0.00	0.00	0.00
+D+L+H	Length = 5.0 ft	1	0.124	0.052	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	850.00	0.00	0.00	0.00	0.00	0.00	0.00
+D+Lr+H	Length = 5.0 ft	1	0.099	0.042	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	1062.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+S+H	Length = 5.0 ft	1	0.246	0.104	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.56	240.23	977.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.750Lr+0.750L+H	Length = 5.0 ft	1	0.099	0.042	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	1062.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.750L+0.750S+H	Length = 5.0 ft	1	0.211	0.090	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.48	206.42	977.50	0.00	0.00	0.00	0.00	0.00	0.00
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#6

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 5.0 ft	1	0.077	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	1360.00	0.16	7.87	240.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.077	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	1360.00	0.16	7.87	240.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.152	0.064	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.48	206.42	1360.00	0.31	15.47	240.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.046	0.020	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.15	63.00	1360.00	0.10	4.72	240.00
+D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.077	0.033	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.24	105.00	1360.00	0.16	7.87	240.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.152	0.064	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.48	206.42	1360.00	0.31	15.47	240.00
+0.60D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.046	0.020	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.15	63.00	1360.00	0.10	4.72	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.0253	2.518		0.0000	0.000

Vertical Reactions

Support notation : Far left is #'

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.444	0.444
Overall MINimum	0.250	0.250
+D+H	0.194	0.194
+D+L+H	0.194	0.194
+D+Lr+H	0.194	0.194
+D+S+H	0.444	0.444
+D+0.750Lr+0.750L+H	0.194	0.194
+D+0.750L+0.750S+H	0.382	0.382
+D+0.60W+H	0.194	0.194
+D+0.750Lr+0.750L+0.450W+H	0.194	0.194
+D+0.750L+0.750S+0.450W+H	0.382	0.382
+0.60D+0.60W+0.60H	0.116	0.116
+D+0.70E+0.60H	0.194	0.194
+D+0.750L+0.750S+0.5250E+H	0.382	0.382
+0.60D+0.70E+H	0.116	0.116
D Only	0.194	0.194
S Only	0.250	0.250
H Only		

Wood Beam

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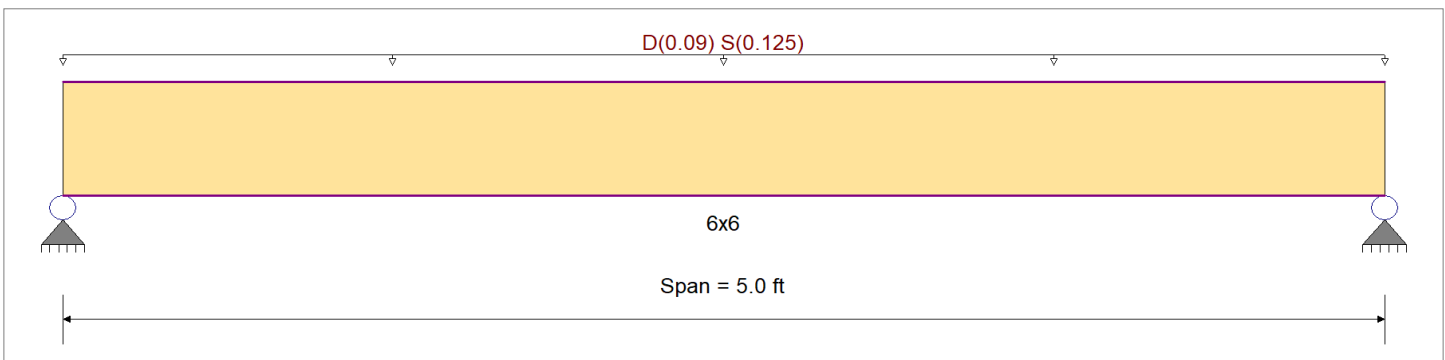
DESCRIPTIO BM#7

CODE REFERENCES

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

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
		Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Species	Hem Fir	Fc - Perp	405.0 psi		
Wood Grade	No.2	Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 5.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.305 : 1	Maximum Shear Stress Ratio	=	0.130 : 1
Section used for this span		6x6	Section used for this span		6x6
fb: Actual	=	298.38psi	fv: Actual	=	22.36 psi
Fb: Allowable	=	977.50psi	Fv: Allowable	=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	2.500ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.018 in	Ratio =		3364 >=360
Max Upward Transient Deflection		0.000 in	Ratio =		0 <360
Max Downward Total Deflection		0.031 in	Ratio =		1905 >=240
Max Upward Total Deflection		0.000 in	Ratio =		0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values								
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v						
+D+H	Length = 5.0 ft	1	0.169	0.072	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	765.00	0.00	0.00	0.00	0.00	0.00	135.00	
+D+L+H	Length = 5.0 ft	1	0.152	0.065	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	850.00	0.00	0.00	0.00	0.00	0.00	0.00	150.00
+D+Lr+H	Length = 5.0 ft	1	0.122	0.052	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	1062.50	0.00	0.00	0.00	0.00	0.00	0.00	187.50
+D+S+H	Length = 5.0 ft	1	0.305	0.130	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.69	298.38	977.50	0.00	0.00	0.00	0.45	22.36	0.00	172.50
+D+0.750Lr+0.750L+H	Length = 5.0 ft	1	0.122	0.052	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	1062.50	0.00	0.00	0.00	0.00	0.00	0.00	187.50
+D+0.750L+0.750S+H	Length = 5.0 ft	1	0.262	0.111	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.59	256.12	977.50	0.00	0.00	0.00	0.39	19.19	0.00	172.50
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Wood Beam

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DESCRIPTIO BM#7

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 5.0 ft	1	0.095	0.040	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	1360.00	0.20	9.69	240.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.095	0.040	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	1360.00	0.20	9.69	240.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.188	0.080	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.59	256.12	1360.00	0.39	19.19	240.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.057	0.024	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.18	77.60	1360.00	0.12	5.82	240.00
+D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.095	0.040	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.30	129.34	1360.00	0.20	9.69	240.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.188	0.080	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.59	256.12	1360.00	0.39	19.19	240.00
+0.60D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 5.0 ft	1	0.057	0.024	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.18	77.60	1360.00	0.12	5.82	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.0315	2.518		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.552	0.552
Overall MINimum	0.313	0.313
+D+H	0.239	0.239
+D+L+H	0.239	0.239
+D+Lr+H	0.239	0.239
+D+S+H	0.552	0.552
+D+0.750Lr+0.750L+H	0.239	0.239
+D+0.750L+0.750S+H	0.473	0.473
+D+0.60W+H	0.239	0.239
+D+0.750Lr+0.750L+0.450W+H	0.239	0.239
+D+0.750L+0.750S+0.450W+H	0.473	0.473
+0.60D+0.60W+0.60H	0.143	0.143
+D+0.70E+0.60H	0.239	0.239
+D+0.750L+0.750S+0.5250E+H	0.473	0.473
+0.60D+0.70E+H	0.143	0.143
D Only	0.239	0.239
S Only	0.313	0.313
H Only		

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#8

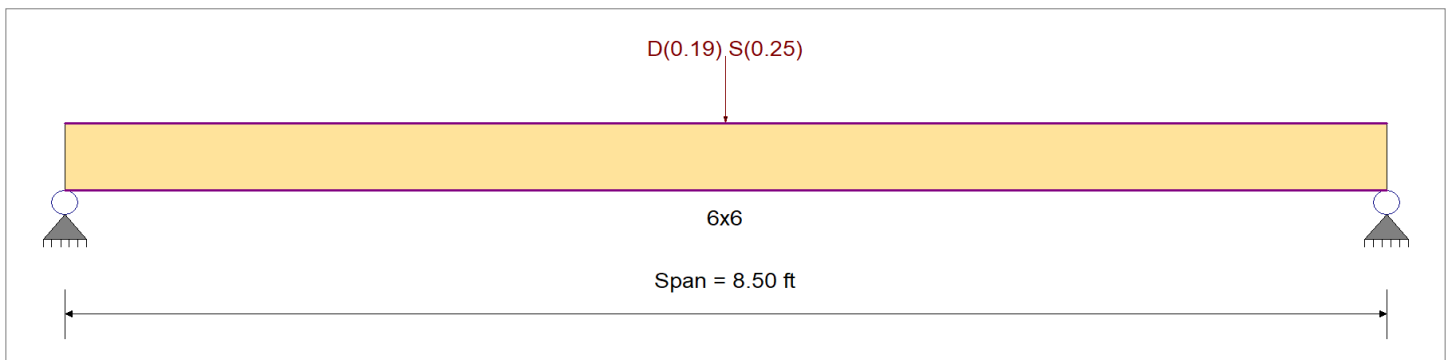
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
		Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Species	Hem Fir	Fc - Perp	405.0 psi		
Wood Grade	No.2	Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Point Load : D = 0.190, S = 0.250 k @ 4.250 ft, (BM#6)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.436	1	Maximum Shear Stress Ratio	=	0.069	: 1
Section used for this span		6x6		Section used for this span		6x6	
fb: Actual	=	426.66psi		fv: Actual	=	11.98 psi	
Fb: Allowable	=	977.50psi		Fv: Allowable	=	172.50 psi	
Load Combination		+D+S+H		Load Combination		+D+S+H	
Location of maximum on span	=	4.250ft		Location of maximum on span	=	0.000ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.056 in	Ratio =	1819	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.105 in	Ratio =	967	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values					
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v			
+D+H	Length = 8.50 ft	1	0.257	0.043	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	765.00	0.12	5.78	135.00
+D+L+H	Length = 8.50 ft	1	0.231	0.039	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	850.00	0.12	5.78	150.00
+D+Lr+H	Length = 8.50 ft	1	0.185	0.031	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	1062.50	0.12	5.78	187.50
+D+S+H	Length = 8.50 ft	1	0.436	0.069	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	426.66	977.50	0.24	11.98	172.50	
+D+0.750Lr+0.750L+H	Length = 8.50 ft	1	0.185	0.031	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	1062.50	0.12	5.78	187.50	
+D+0.750L+0.750S+H	Length = 8.50 ft	1	0.378	0.060	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	369.19	977.50	0.21	10.43	172.50	
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#8

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 8.50 ft	1	0.145	0.024	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	1360.00	0.12	5.78	240.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.50 ft	1	0.145	0.024	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	1360.00	0.12	5.78	240.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.50 ft	1	0.271	0.043	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.85	369.19	1360.00	0.21	10.43	240.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.50 ft	1	0.087	0.014	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.27	118.06	1360.00	0.07	3.47	240.00
+D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.50 ft	1	0.145	0.024	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.45	196.76	1360.00	0.12	5.78	240.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.50 ft	1	0.271	0.043	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.85	369.19	1360.00	0.21	10.43	240.00
+0.60D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.50 ft	1	0.087	0.014	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	0.27	118.06	1360.00	0.07	3.47	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.1054	4.281		0.0000	0.000

Vertical Reactions

Support notation : Far left is #'

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.244	0.244
Overall MINimum	0.125	0.125
+D+H	0.119	0.119
+D+L+H	0.119	0.119
+D+Lr+H	0.119	0.119
+D+S+H	0.244	0.244
+D+0.750Lr+0.750L+H	0.119	0.119
+D+0.750L+0.750S+H	0.213	0.213
+D+0.60W+H	0.119	0.119
+D+0.750Lr+0.750L+0.450W+H	0.119	0.119
+D+0.750L+0.750S+0.450W+H	0.213	0.213
+0.60D+0.60W+0.60H	0.071	0.071
+D+0.70E+0.60H	0.119	0.119
+D+0.750L+0.750S+0.5250E+H	0.213	0.213
+0.60D+0.70E+H	0.071	0.071
D Only	0.119	0.119
S Only	0.125	0.125
H Only		

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#9

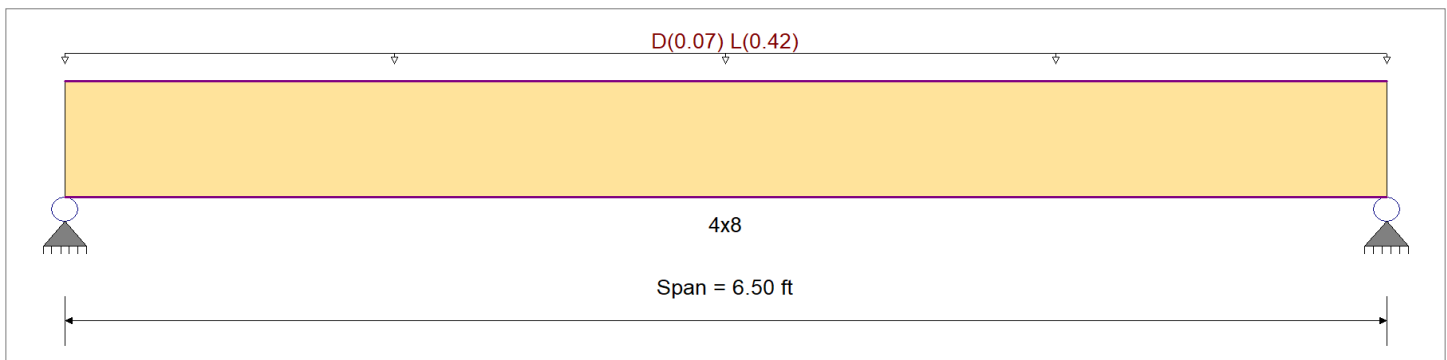
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
		Fc - Prll	1,300.0 psi	Eminbend - x	470.0ksi
Wood Species	Hem Fir	Fc - Perp	405.0 psi		
Wood Grade	No.2	Fv	150.0 psi		
		Ft	525.0 psi	Density	26.840pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.010, L = 0.060 ksf, Tributary Width = 7.0 ft, (DECK)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.925	1	Maximum Shear Stress Ratio	=	0.518	: 1
Section used for this span		4x8		Section used for this span		4x8	
fb: Actual	=	1,022.57 psi		fv: Actual	=	77.70 psi	
Fb: Allowable	=	1,105.00 psi		Fv: Allowable	=	150.00 psi	
Load Combination		+D+L+H		Load Combination		+D+L+H	
Location of maximum on span	=	3.250ft		Location of maximum on span	=	5.907 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.117 in	Ratio =	664	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.138 in	Ratio =	563	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v		
+D+H	Length = 6.50 ft	1	0.155	0.087	0.90	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.39	154.46	994.50	0.20	11.74	135.00
+D+L+H	Length = 6.50 ft	1	0.925	0.518	1.00	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.61	1,022.57	1105.00	0.00	0.00	0.00
+D+Lr+H	Length = 6.50 ft	1	0.112	0.063	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.39	154.46	1381.25	0.00	0.00	0.00
+D+S+H	Length = 6.50 ft	1	0.122	0.068	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.39	154.46	1270.75	0.00	0.00	0.00
+D+0.750Lr+0.750L+H	Length = 6.50 ft	1	0.583	0.326	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.06	805.54	1381.25	1.04	61.21	187.50
+D+0.750L+0.750S+H	Length = 6.50 ft	1	0.634	0.355	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.06	805.54	1270.75	0.00	0.00	0.00
+D+0.60W+H						1.300	1.00	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	0.00

Wood Beam

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CK Engineering LLC

DESCRIPTIO BM#9

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 6.50 ft	1	0.087	0.049	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.39	154.46	1768.00	0.20	11.74	240.00
+D+0.750Lr+0.750L+0.450W-					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.456	0.255	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	2.06	805.54	1768.00	1.04	61.21	240.00
+D+0.750L+0.750S+0.450W+					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.456	0.255	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	2.06	805.54	1768.00	1.04	61.21	240.00
+0.60D+0.60W+0.60H					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.052	0.029	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.24	92.68	1768.00	0.12	7.04	240.00
+D+0.70E+0.60H					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.087	0.049	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.39	154.46	1768.00	0.20	11.74	240.00
+D+0.750L+0.750S+0.5250E-					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.456	0.255	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	2.06	805.54	1768.00	1.04	61.21	240.00
+0.60D+0.70E+H					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.052	0.029	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.24	92.68	1768.00	0.12	7.04	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.1383	3.274		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.608	1.608
Overall MINimum	1.365	1.365
+D+H	0.243	0.243
+D+L+H	1.608	1.608
+D+Lr+H	0.243	0.243
+D+S+H	0.243	0.243
+D+0.750Lr+0.750L+H	1.267	1.267
+D+0.750L+0.750S+H	1.267	1.267
+D+0.60W+H	0.243	0.243
+D+0.750Lr+0.750L+0.450W+H	1.267	1.267
+D+0.750L+0.750S+0.450W+H	1.267	1.267
+0.60D+0.60W+0.60H	0.146	0.146
+D+0.70E+0.60H	0.243	0.243
+D+0.750L+0.750S+0.5250E+H	1.267	1.267
+0.60D+0.70E+H	0.146	0.146
D Only	0.243	0.243
L Only	1.365	1.365
H Only		

Wood Beam

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DESCRIPTIO HDR#1

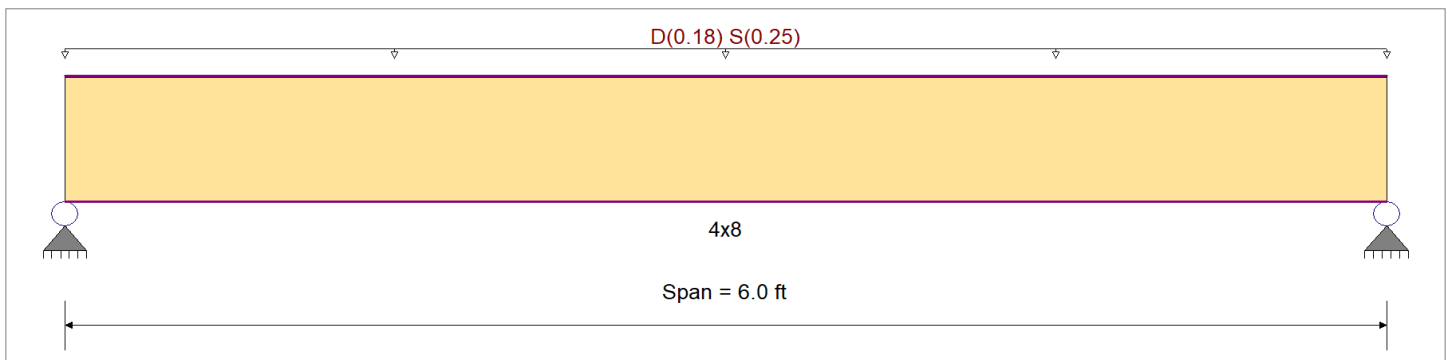
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	850 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	850 psi	Ebend - xx	1300ksi
		Fc - Prll	1300 psi	Eminbend - x	470ksi
Wood Species	Hem Fir	Fc - Perp	405 psi		
Wood Grade	No.2	Fv	150 psi		
		Ft	525 psi	Density	26.84pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 10.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.603 < 1	Maximum Shear Stress Ratio	=	0.359 < 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	765.63psi	fv: Actual	=	61.90 psi
Fb: Allowable	=	1,270.75psi	Fv: Allowable	=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	3.000ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.051 in	Ratio =		1418 >= 360
Max Upward Transient Deflection		0.000 in	Ratio =		0 < 360
Max Downward Total Deflection		0.088 in	Ratio =		815 >= 240
Max Upward Total Deflection		0.000 in	Ratio =		0 < 240

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v		
+D+H	Length = 6.0 ft	1	0.327	0.195	0.90	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	994.50	0.44	26.30	135.00
+D+L+H	Length = 6.0 ft	1	0.294	0.175	1.00	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	1105.00	0.44	26.30	150.00
+D+Lr+H	Length = 6.0 ft	1	0.236	0.140	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	1381.25	0.44	26.30	187.50
+D+S+H	Length = 6.0 ft	1	0.603	0.359	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.96	765.63	1270.75	1.05	61.90	172.50	
+D+0.750Lr+0.750L+H	Length = 6.0 ft	1	0.236	0.140	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	1381.25	0.44	26.30	187.50	
+D+0.750L+0.750S+H	Length = 6.0 ft	1	0.516	0.307	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.68	655.56	1270.75	0.90	53.00	172.50	
+D+0.60W+H						1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00		0.00	0.00	0.00

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 8 DEC 2020, 12:09PM

Wood Beam

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CK Engineering LLC

DESCRIPTIO HDR#1

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	f _v	F'v
Length = 6.0 ft	1	0.184	0.110	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	1768.00	0.44	26.30	240.00
+D+0.750Lr+0.750L+0.450W-					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.184	0.110	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	1768.00	0.44	26.30	240.00
+D+0.750L+0.750S+0.450W+					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.371	0.221	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.68	655.56	1768.00	0.90	53.00	240.00
+0.60D+0.60W+0.60H					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.110	0.066	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.50	195.20	1768.00	0.27	15.78	240.00
+D+0.70E+0.60H					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.184	0.110	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.83	325.34	1768.00	0.44	26.30	240.00
+D+0.750L+0.750S+0.5250E-					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.371	0.221	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	1.68	655.56	1768.00	0.90	53.00	240.00
+0.60D+0.70E+H					1.300	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.110	0.066	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.00	0.50	195.20	1768.00	0.27	15.78	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.0882	3.022		0.0000	0.000

Vertical Reactions

Support notation : Far left is #'

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.304	1.304
Overall MINimum	0.750	0.750
+D+H	0.554	0.554
+D+L+H	0.554	0.554
+D+Lr+H	0.554	0.554
+D+S+H	1.304	1.304
+D+0.750Lr+0.750L+H	0.554	0.554
+D+0.750L+0.750S+H	1.117	1.117
+D+0.60W+H	0.554	0.554
+D+0.750Lr+0.750L+0.450W+H	0.554	0.554
+D+0.750L+0.750S+0.450W+H	1.117	1.117
+0.60D+0.60W+0.60H	0.333	0.333
+D+0.70E+0.60H	0.554	0.554
+D+0.750L+0.750S+0.5250E+H	1.117	1.117
+0.60D+0.70E+H	0.333	0.333
D Only	0.554	0.554
S Only	0.750	0.750
H Only		

Wood Beam

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DESCRIPTIO HDR#2

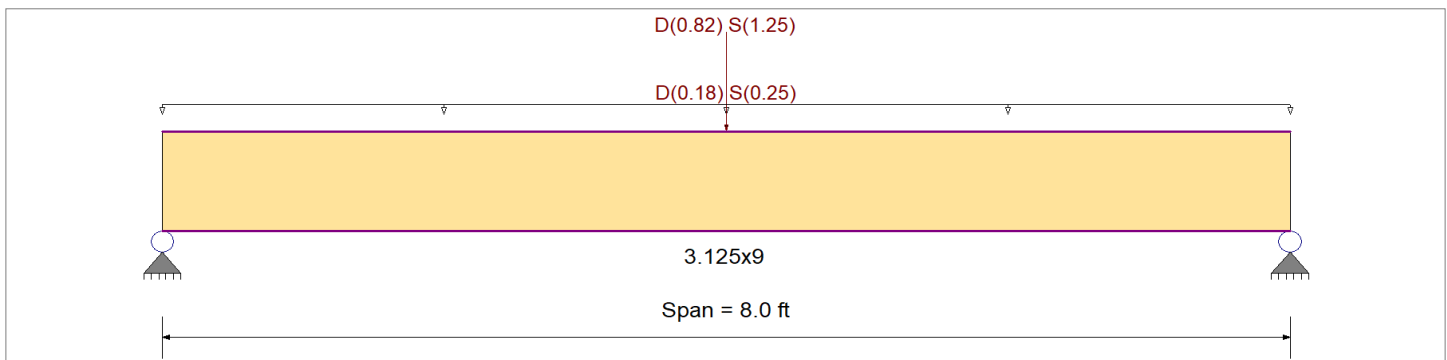
CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method	Allowable Stress Design	Fb +	2400 psi	E : Modulus of Elasticity	
Load Combination	ASCE 7-16	Fb -	1850 psi	Ebend- xx	1800ksi
		Fc - Prll	1650 psi	Eminbend - x	950ksi
Wood Species	DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade	24F - V4	Fv	265 psi	Eminbend - y	850ksi
		Ft	1100 psi	Density	31.21 pcf
Beam Bracing	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loads

Uniform Load : D = 0.0180, S = 0.0250 ksf, Tributary Width = 10.0 ft, (ROOF)

Point Load : D = 0.820, S = 1.250 k @ 4.0 ft, (BM#3)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.786	1	Maximum Shear Stress Ratio	=	0.431	: 1
Section used for this span		3.125x9		Section used for this span		3.125x9	
fb: Actual	=	2,169.96psi		fv: Actual	=	131.26 psi	
Fb: Allowable	=	2,760.00psi		Fv: Allowable	=	304.75 psi	
Load Combination		+D+S+H		Load Combination		+D+S+H	
Location of maximum on span	=	4.000ft		Location of maximum on span	=	7.270 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.136 in	Ratio =	707	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.231 in	Ratio =	416	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values					
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v			
+D+H	Length = 8.0 ft	1	0.412	0.228	0.90	1.000	1.00	1.00	1.00	1.00	1.00	3.13	889.96	2160.00	0.00	0.00	0.00	1.02	54.32	238.50
+D+L+H	Length = 8.0 ft	1	0.371	0.205	1.00	1.000	1.00	1.00	1.00	1.00	1.00	3.13	889.96	2400.00	0.00	0.00	0.00	1.02	54.32	265.00
+D+Lr+H	Length = 8.0 ft	1	0.297	0.164	1.25	1.000	1.00	1.00	1.00	1.00	1.00	3.13	889.96	3000.00	0.00	0.00	0.00	1.02	54.32	331.25
+D+S+H	Length = 8.0 ft	1	0.786	0.431	1.15	1.000	1.00	1.00	1.00	1.00	1.00	7.63	2,169.96	2760.00	0.00	0.00	0.00	2.46	131.26	304.75
+D+0.750Lr+0.750L+H	Length = 8.0 ft	1	0.297	0.164	1.25	1.000	1.00	1.00	1.00	1.00	1.00	3.13	889.96	3000.00	0.00	0.00	0.00	1.02	54.32	331.25
+D+0.750L+0.750S+H	Length = 8.0 ft	1	0.670	0.368	1.15	1.000	1.00	1.00	1.00	1.00	1.00	6.50	1,849.96	2760.00	0.00	0.00	0.00	2.10	112.02	304.75

Wood Beam

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Load Combination Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values								
		M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v						
+D+0.60W+H Length = 8.0 ft	1	0.232	0.128	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.13	889.96	3840.00	0.00	0.00	0.00	1.02	54.32	424.00
+D+0.750Lr+0.750L+0.450W- Length = 8.0 ft	1	0.232	0.128	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.13	889.96	3840.00	0.00	0.00	0.00	1.02	54.32	424.00
+D+0.750L+0.750S+0.450W+ Length = 8.0 ft	1	0.482	0.264	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	6.50	1,849.96	3840.00	0.00	0.00	0.00	2.10	112.02	424.00
+0.60D+0.60W+0.60H Length = 8.0 ft	1	0.139	0.077	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.88	533.98	3840.00	0.00	0.00	0.00	0.61	32.59	424.00
+D+0.70E+0.60H Length = 8.0 ft	1	0.232	0.128	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.13	889.96	3840.00	0.00	0.00	0.00	1.02	54.32	424.00
+D+0.750L+0.750S+0.5250E- Length = 8.0 ft	1	0.482	0.264	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	6.50	1,849.96	3840.00	0.00	0.00	0.00	2.10	112.02	424.00
+0.60D+0.70E+H Length = 8.0 ft	1	0.139	0.077	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.88	533.98	3840.00	0.00	0.00	0.00	0.61	32.59	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2306	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #'

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.779	2.779
Overall MINimum	1.625	1.625
+D+H	1.154	1.154
+D+L+H	1.154	1.154
+D+Lr+H	1.154	1.154
+D+S+H	2.779	2.779
+D+0.750Lr+0.750L+H	1.154	1.154
+D+0.750L+0.750S+H	2.373	2.373
+D+0.60W+H	1.154	1.154
+D+0.750Lr+0.750L+0.450W+H	1.154	1.154
+D+0.750L+0.750S+0.450W+H	2.373	2.373
+0.60D+0.60W+0.60H	0.693	0.693
+D+0.70E+0.60H	1.154	1.154
+D+0.750L+0.750S+0.5250E+H	2.373	2.373
+0.60D+0.70E+H	0.693	0.693
D Only	1.154	1.154
S Only	1.625	1.625
H Only		

Wood Column

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DESCRIPTIO COL#1

Code References

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

General Information

Analysis Metho	Allowable Stress Design			Wood Section Name	4x8
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Heigh	12 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Specie	Hem Fir			Exact Width	3.50 in
Wood Grade	No.2			Exact Depth	7.250 in
Fb +	850 psi	Fv	150 psi	Area	25.375 in ²
Fb -	850 psi	Ft	525 psi	Ix	111.148 in ⁴
Fc - Prll	1300 psi	Density	26.84 pcf	Iy	25.904 in ⁴
Fc - Perp	405 psi				
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Allow Stress Modification Factors	
Basic	1300	1300	1300 ksi	Cf or Cv for Bending	1.30
Minimum	470	470		Cf or Cv for Compression	1.050
				Cf or Cv for Tension	1.20
				Cm : Wet Use Factor	1.0
				Ct : Temperature Fact	1.0
				Cfu : Flat Use Factor	1.0
				Kf : Built-up columns	1.0 NDS 15.3.2
				Use Cr : Repetitive	No
Brace condition for deflection (buckling) along columns :					
X-X (width) axis Unbraced Length for buckling ABOUT Y-Y Axis = 12					
Y-Y (depth) axis Unbraced Length for buckling ABOUT X-X Axis = 12					

Applied Loads

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

Column self weight included : 56.755 lbs * Dead Load Factor

AXIAL LOADS . . .

BM#1: Axial Load at 12.0 ft, D = 1.70, S = 2.10 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6878 : 1**

Load Combination	+D+S+H
Governing NDS Formula	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	3.857 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	220.992 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				

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

Load Combination	+0.60D+0.70E+H
Location of max.above base	12.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	240.0 psi

Other Factors used to calculate allowable stresses . . .
 Bending Compression Tension

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.178	0.3165	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+L+H	1.000	0.161	0.3150	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+Lr+H	1.250	0.130	0.3124	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+S+H	1.150	0.141	0.6878	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+H	1.250	0.130	0.3124	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+H	1.150	0.141	0.5941	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.60W+H	1.600	0.102	0.3102	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.102	0.3102	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.102	0.5884	PASS	0.0 ft	0.0	PASS	12.0 ft
+0.60D+0.60W+0.60H	1.600	0.102	0.1861	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.70E+0.60H	1.600	0.102	0.3102	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.102	0.5884	PASS	0.0 ft	0.0	PASS	12.0 ft

Wood Column

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DESCRIPTIO COL#1

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+0.60D+0.70E+H	1.600	0.102	0.1861	PASS	0.0 ft	0.0	PASS	12.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+H						1.757				
+D+L+H						1.757				
+D+Lr+H						1.757				
+D+S+H						3.857				
+D+0.750Lr+0.750L+H						1.757				
+D+0.750L+0.750S+H						3.332				
+D+0.60W+H						1.757				
+D+0.750Lr+0.750L+0.450W+H						1.757				
+D+0.750L+0.750S+0.450W+H						3.332				
+0.60D+0.60W+0.60H						1.054				
+D+0.70E+0.60H						1.757				
+D+0.750L+0.750S+0.5250E+H						3.332				
+0.60D+0.70E+H						1.054				
D Only						1.757				
Lr Only										
L Only										
S Only										
W Only						2.100				
E Only										
H Only										

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance		Distance	
+D+H	0.000in	0.000ft	0.000in	0.000ft
+D+L+H	0.000in	0.000ft	0.000in	0.000ft
+D+Lr+H	0.000in	0.000ft	0.000in	0.000ft
+D+S+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750Lr+0.750L+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.60W+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750Lr+0.750L+0.450W+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+0.450W+H	0.000in	0.000ft	0.000in	0.000ft
+0.60D+0.60W+0.60H	0.000in	0.000ft	0.000in	0.000ft
+D+0.70E+0.60H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+0.5250E+H	0.000in	0.000ft	0.000in	0.000ft
+0.60D+0.70E+H	0.000in	0.000ft	0.000in	0.000ft
D Only	0.000in	0.000ft	0.000in	0.000ft
Lr Only	0.000in	0.000ft	0.000in	0.000ft
L Only	0.000in	0.000ft	0.000in	0.000ft
S Only	0.000in	0.000ft	0.000in	0.000ft
W Only	0.000in	0.000ft	0.000in	0.000ft
E Only	0.000in	0.000ft	0.000in	0.000ft
H Only	0.000in	0.000ft	0.000in	0.000ft

Wood Column

File: 20-048.ec6

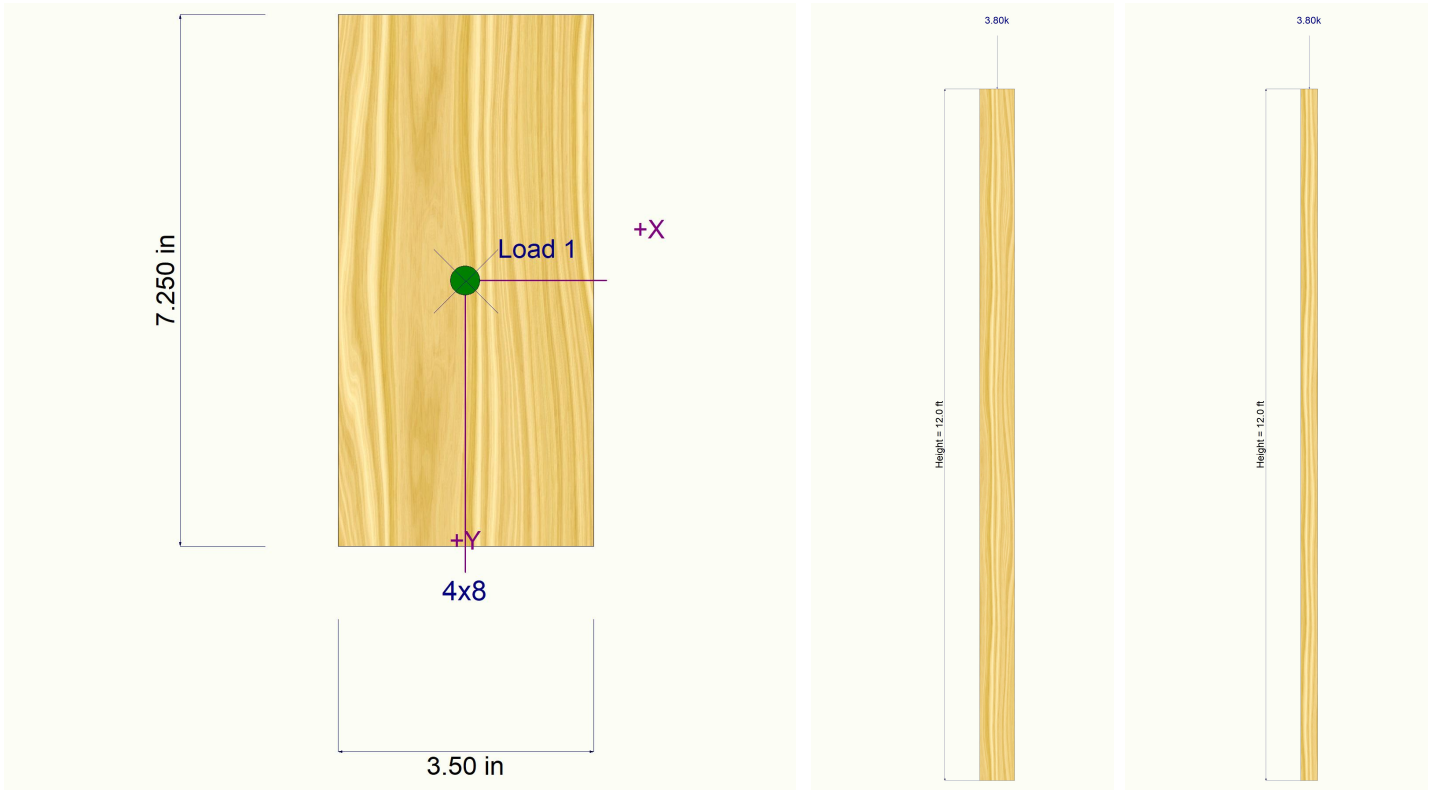
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Sketches



Wood Column

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DESCRIPTIO COL#2

Code References

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

General Information

Analysis Metho	Allowable Stress Design			Wood Section Name	5-2x4	
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber	
Overall Column Heigh	12 ft			Wood Member Type	Sawn	
<i>(Used for non-slender calculations)</i>						
Wood Specie	Hem Fir			Exact Width	7.50 in	
Wood Grade	No.2			Exact Depth	3.50 in	
Fb +	850.0 psi	Fv	150.0 psi	Area	26.250 in^2	
Fb -	850.0 psi	Ft	525.0 psi	Ix	26.797 in^4	
Fc - Prll	1,300.0 psi	Density	26.840 pcf	Iy	123.047 in^4	
Fc - Perp	405.0 psi					
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Allow Stress Modification Factors		
	Basic	1,300.0	1,300.0	1,300.0 ksi	Cf or Cv for Bending	1.50
	Minimum	470.0	470.0		Cf or Cv for Compression	1.150
					Cf or Cv for Tension	1.50
					Cm : Wet Use Factor	1.0
					Ct : Temperature Fact	1.0
					Cfu : Flat Use Factor	1.0
					Kf : Built-up columns	1.0 <i>NDS 15.3.2</i>
					Use Cr : Repetitive	No
Brace condition for deflection (buckling) along columns :						
X-X (width) axis Unbraced Length for buckling ABOUT Y-Y Axis = 12						
Y-Y (depth) axis Unbraced Length for buckling ABOUT X-X Axis = 12						

Applied Loads

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

Column self weight included : 58.713 lbs * Dead Load Factor

AXIAL LOADS . . .

BM#1: Axial Load at 12.0 ft, D = 1.70, S = 2.10 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6631 : 1**

Load Combination	+D+S+H
Governing NDS Formula	Comp Only, f_c/F_c'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	3.859 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	221.672 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				

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

Load Combination	+0.60D+0.70E+H
Location of max.above base	12.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	240.0 psi

Other Factors used to calculate allowable stresses . . .
 Bending Compression Tension

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.163	0.3050	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+L+H	1.000	0.148	0.3037	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+Lr+H	1.250	0.119	0.3015	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+S+H	1.150	0.129	0.6631	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+H	1.250	0.119	0.3015	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+H	1.150	0.129	0.5729	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.60W+H	1.600	0.093	0.2996	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.093	0.2996	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.093	0.5679	PASS	0.0 ft	0.0	PASS	12.0 ft
+0.60D+0.60W+0.60H	1.600	0.093	0.1798	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.70E+0.60H	1.600	0.093	0.2996	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.093	0.5679	PASS	0.0 ft	0.0	PASS	12.0 ft

Wood Column

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DESCRIPTIO COL#2

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+0.60D+0.70E+H	1.600	0.093	0.1798	PASS	0.0 ft	0.0	PASS	12.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+H						1.759				
+D+L+H						1.759				
+D+Lr+H						1.759				
+D+S+H						3.859				
+D+0.750Lr+0.750L+H						1.759				
+D+0.750L+0.750S+H						3.334				
+D+0.60W+H						1.759				
+D+0.750Lr+0.750L+0.450W+H						1.759				
+D+0.750L+0.750S+0.450W+H						3.334				
+0.60D+0.60W+0.60H						1.055				
+D+0.70E+0.60H						1.759				
+D+0.750L+0.750S+0.5250E+H						3.334				
+0.60D+0.70E+H						1.055				
D Only						1.759				
Lr Only										
L Only										
S Only										
W Only						2.100				
E Only										
H Only										

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance		Distance	
+D+H	0.000in	0.000ft	0.000in	0.000ft
+D+L+H	0.000in	0.000ft	0.000in	0.000ft
+D+Lr+H	0.000in	0.000ft	0.000in	0.000ft
+D+S+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750Lr+0.750L+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.60W+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750Lr+0.750L+0.450W+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+0.450W+H	0.000in	0.000ft	0.000in	0.000ft
+0.60D+0.60W+0.60H	0.000in	0.000ft	0.000in	0.000ft
+D+0.70E+0.60H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+0.5250E+H	0.000in	0.000ft	0.000in	0.000ft
+0.60D+0.70E+H	0.000in	0.000ft	0.000in	0.000ft
D Only	0.000in	0.000ft	0.000in	0.000ft
Lr Only	0.000in	0.000ft	0.000in	0.000ft
L Only	0.000in	0.000ft	0.000in	0.000ft
S Only	0.000in	0.000ft	0.000in	0.000ft
W Only	0.000in	0.000ft	0.000in	0.000ft
E Only	0.000in	0.000ft	0.000in	0.000ft
H Only	0.000in	0.000ft	0.000in	0.000ft

Wood Column

File: 20-048.ec6

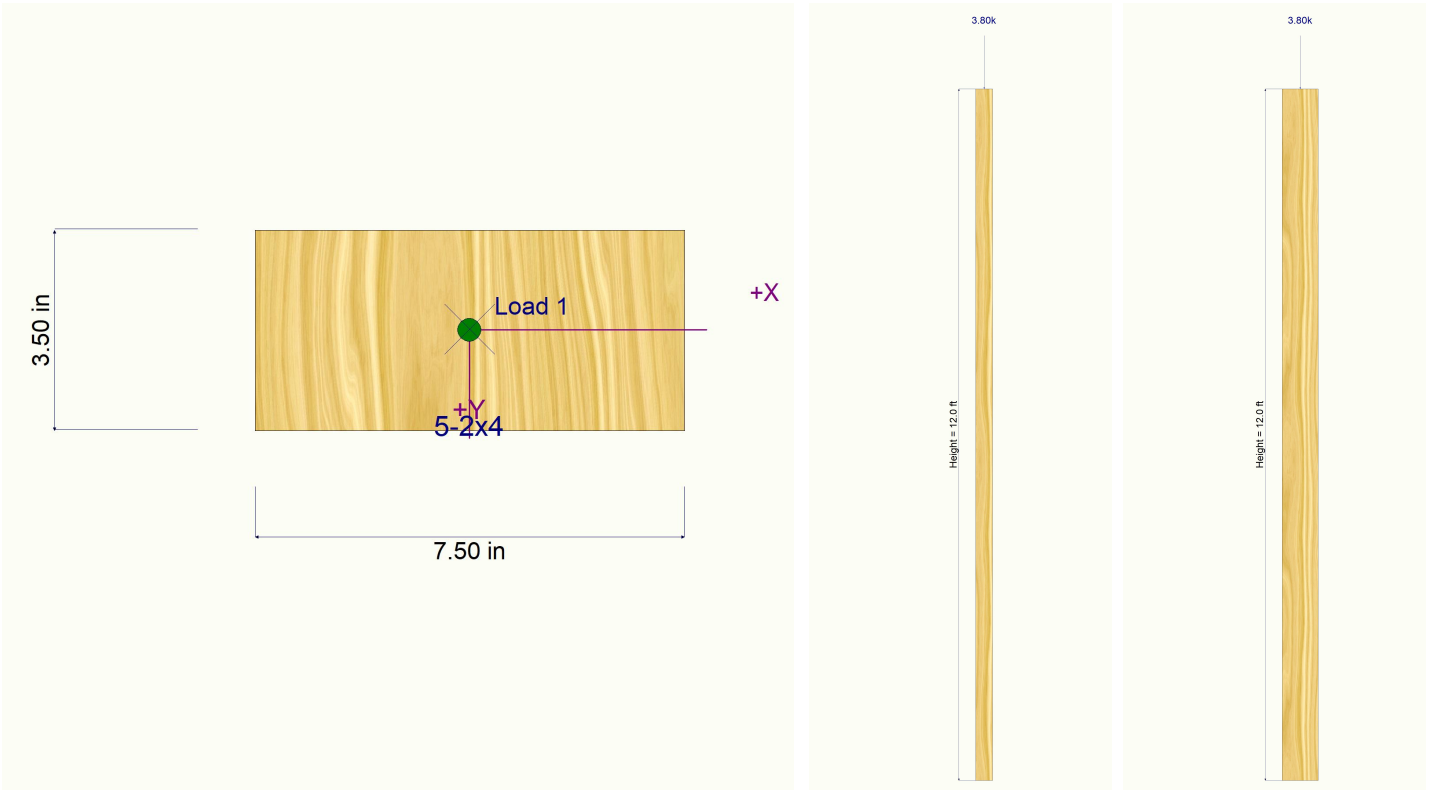
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DESCRIPTIO COL#2

Sketches



Wood Column

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DESCRIPTIO COL#3

Code References

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

General Information

Analysis Metho	Allowable Stress Design			Wood Section Name	4x8
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Heigh	8 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Specie	Hem Fir			Exact Width	3.50 in
Wood Grade	No.2			Exact Depth	7.250 in
Fb +	850.0 psi	Fv	150.0 psi	Area	25.375 in ²
Fb -	850.0 psi	Ft	525.0 psi	Ix	111.148 in ⁴
Fc - Prll	1,300.0 psi	Density	26.840 pcf	Iy	25.904 in ⁴
Fc - Perp	405.0 psi				
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Allow Stress Modification Factors	
Basic	1,300.0	1,300.0	1,300.0 ksi	Cf or Cv for Bending	1.30
Minimum	470.0	470.0		Cf or Cv for Compression	1.050
				Cf or Cv for Tension	1.20
				Cm : Wet Use Factor	1.0
				Ct : Temperature Fact	1.0
				Cfu : Flat Use Factor	1.0
				Kf : Built-up columns	1.0 <small>NDS 15.3.2</small>
				Use Cr : Repetitive	No
Brace condition for deflection (buckling) along columns :					
X-X (width) axis Unbraced Length for buckling ABOUT Y-Y Axis = 8					
Y-Y (depth) axis Unbraced Length for buckling ABOUT X-X Axis = 8					

Applied Loads

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

Column self weight included : 37.837 lbs * Dead Load Factor

AXIAL LOADS . . .

BM#2: Axial Load at 8.0 ft, D = 3.640, S = 4.880 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7134 : 1**

Load Combination	+D+S+H
Governing NDS Formula	Comp Only, f_c/F_c'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	8.558 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	472.776 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

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

Load Combination	+0.60D+0.70E+H
Location of max.above base	8.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	240.0 psi

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.373	0.3159	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+L+H	1.000	0.341	0.3114	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+Lr+H	1.250	0.279	0.3041	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+S+H	1.150	0.301	0.7134	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750Lr+0.750L+H	1.250	0.279	0.3041	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750L+0.750S+H	1.150	0.301	0.6117	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.60W+H	1.600	0.222	0.2984	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.222	0.2984	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.222	0.5953	PASS	0.0 ft	0.0	PASS	8.0 ft
+0.60D+0.60W+0.60H	1.600	0.222	0.1790	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.70E+0.60H	1.600	0.222	0.2984	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.222	0.5953	PASS	0.0 ft	0.0	PASS	8.0 ft

Wood Column

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DESCRIPTIO COL#3

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+0.60D+0.70E+H	1.600	0.222	0.1790	PASS	0.0 ft	0.0	PASS	8.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+H						3.678				
+D+L+H						3.678				
+D+Lr+H						3.678				
+D+S+H						8.558				
+D+0.750Lr+0.750L+H						3.678				
+D+0.750L+0.750S+H						7.338				
+D+0.60W+H						3.678				
+D+0.750Lr+0.750L+0.450W+H						3.678				
+D+0.750L+0.750S+0.450W+H						7.338				
+0.60D+0.60W+0.60H						2.207				
+D+0.70E+0.60H						3.678				
+D+0.750L+0.750S+0.5250E+H						7.338				
+0.60D+0.70E+H						2.207				
D Only						3.678				
Lr Only										
L Only										
S Only										
W Only						4.880				
E Only										
H Only										

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance		Distance	
+D+H	0.000in	0.000ft	0.000in	0.000ft
+D+L+H	0.000in	0.000ft	0.000in	0.000ft
+D+Lr+H	0.000in	0.000ft	0.000in	0.000ft
+D+S+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750Lr+0.750L+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.60W+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750Lr+0.750L+0.450W+H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+0.450W+H	0.000in	0.000ft	0.000in	0.000ft
+0.60D+0.60W+0.60H	0.000in	0.000ft	0.000in	0.000ft
+D+0.70E+0.60H	0.000in	0.000ft	0.000in	0.000ft
+D+0.750L+0.750S+0.5250E+H	0.000in	0.000ft	0.000in	0.000ft
+0.60D+0.70E+H	0.000in	0.000ft	0.000in	0.000ft
D Only	0.000in	0.000ft	0.000in	0.000ft
Lr Only	0.000in	0.000ft	0.000in	0.000ft
L Only	0.000in	0.000ft	0.000in	0.000ft
S Only	0.000in	0.000ft	0.000in	0.000ft
W Only	0.000in	0.000ft	0.000in	0.000ft
E Only	0.000in	0.000ft	0.000in	0.000ft
H Only	0.000in	0.000ft	0.000in	0.000ft

Wood Column

File: 20-048.ec6

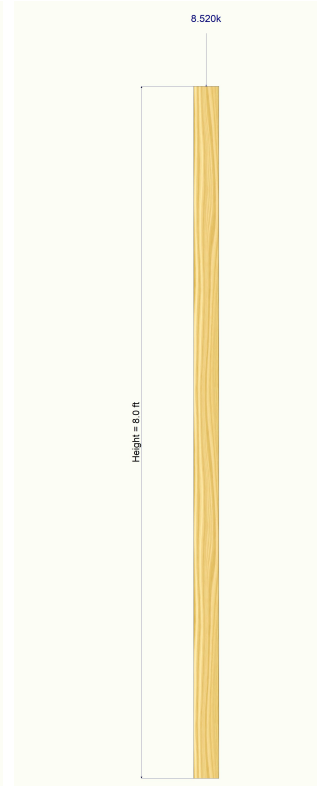
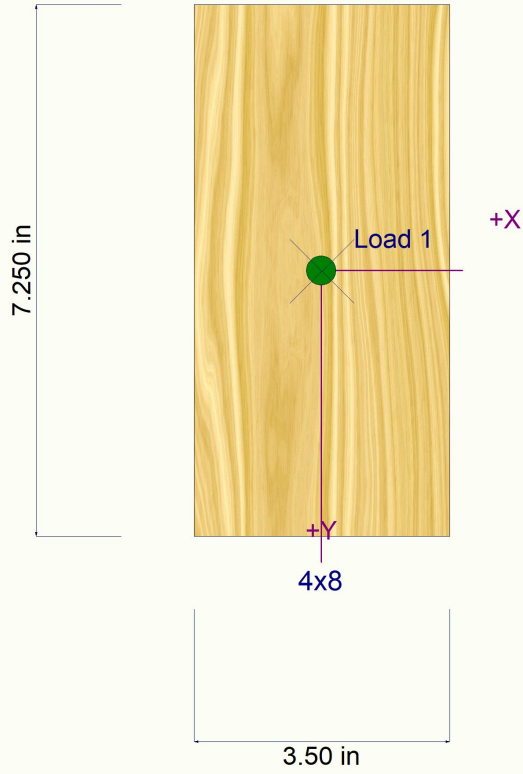
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DESCRIPTIO COL#3

Sketches



General Footing

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DESCRIPTIO FTNG#1

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-16

General Information

Material Properties

f _c : Concrete 28 day strength	=	2.50 ksi
f _y : Rebar Yield	=	40.0 ksi
E _c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Beari	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	150.0 pcf
Soil/Concrete Friction Coeff.	=	0.250

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

Increases based on footing plan dimension

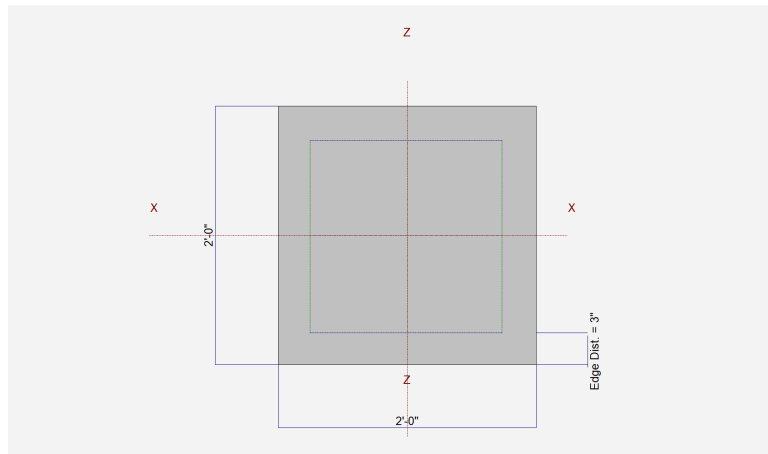
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

Dimensions

Width parallel to X-X Axis	=	2.0 ft
Length parallel to Z-Z Axis	=	2.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



Reinforcing

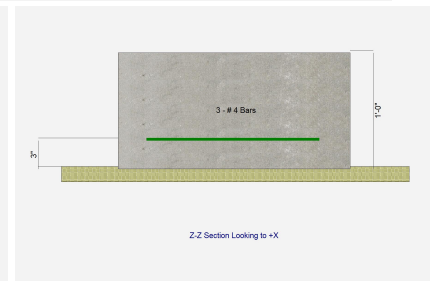
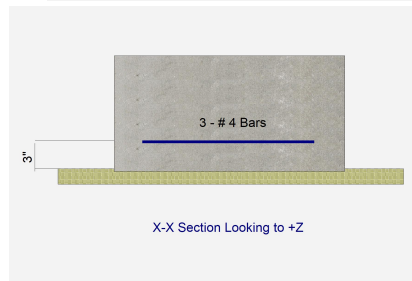
Bars parallel to X-X Axis	=	
Number of Bars	=	3
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	
Number of Bars	=	3.0
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separatio

	=	n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a



Applied Loads

	D	L _r	L	S	W	E	H	
P : Column Load	=	1.7			2.10			k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k

General Footing

DESCRIPTIO FTNG#1

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.730	Soil Bearing	1.095 ksf	1.50 ksf	+D+S+H about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.08557	Z Flexure (+X)	0.6750 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.08557	Z Flexure (-X)	0.6750 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.08557	X Flexure (+Z)	0.6750 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.08557	X Flexure (-Z)	0.6750 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.040	1-way Shear (+X)	3.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.040	1-way Shear (-X)	3.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.040	1-way Shear (+Z)	3.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.040	1-way Shear (-Z)	3.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.09507	2-way Punching	14.260 psi	150.0 psi	+1.20D+L+1.60S+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+L+H	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+Lr+H	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+S+H	1.50	n/a	0.0	1.095	1.095	n/a	n/a	0.730
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	0.9638	0.9638	n/a	n/a	0.643
X-X, +D+0.60W+H	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+0.750Lr+0.750L+0.450W	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+0.750L+0.750S+0.450W	1.50	n/a	0.0	0.9638	0.9638	n/a	n/a	0.643
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.3420	0.3420	n/a	n/a	0.228
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.570	0.570	n/a	n/a	0.380
X-X, +D+0.750L+0.750S+0.5250E	1.50	n/a	0.0	0.9638	0.9638	n/a	n/a	0.643
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.3420	0.3420	n/a	n/a	0.228
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	1.095	1.095	0.730
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	0.9638	0.9638	0.643
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+0.750Lr+0.750L+0.450W	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+0.750L+0.750S+0.450W	1.50	0.0	n/a	n/a	n/a	0.9638	0.9638	0.643
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.3420	0.3420	0.228
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.570	0.570	0.380
Z-Z, +D+0.750L+0.750S+0.5250E	1.50	0.0	n/a	n/a	n/a	0.9638	0.9638	0.643
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.3420	0.3420	0.228

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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General Footing

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DESCRIPTIO FTNG#1

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.85 psi	0.85 psi	0.85 psi	0.85 psi	0.85 psi	75.00 psi	0.01	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	6.29 psi	150.00psi	0.0419	OK
+1.20D+0.50Lr+1.60L+1.60H	5.39 psi	150.00psi	0.03591	OK
+1.20D+1.60L+0.50S+1.60H	8.16 psi	150.00psi	0.0544	OK
+1.20D+1.60Lr+L+1.60H	5.39 psi	150.00psi	0.03591	OK
+1.20D+1.60Lr+0.50W+1.60H	5.39 psi	150.00psi	0.03591	OK
+1.20D+L+1.60S+1.60H	14.26 psi	150.00psi	0.09507	OK
+1.20D+1.60S+0.50W+1.60H	14.26 psi	150.00psi	0.09507	OK
+1.20D+0.50Lr+L+W+1.60H	5.39 psi	150.00psi	0.03591	OK
+1.20D+L+0.50S+W+1.60H	8.16 psi	150.00psi	0.0544	OK
+0.90D+W+1.60H	4.04 psi	150.00psi	0.02694	OK
+1.20D+L+0.20S+E+1.60H	6.50 psi	150.00psi	0.04331	OK
+0.90D+E+0.90H	4.04 psi	150.00psi	0.02694	OK

General Footing

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DESCRIPTIO FTNG#2

Code References

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

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f _c : Concrete 28 day strength	=	2.50 ksi
f _y : Rebar Yield	=	40.0 ksi
E _c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Beari	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	150.0 pcf
Soil/Concrete Friction Coeff.	=	0.250

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

Increases based on footing plan dimension

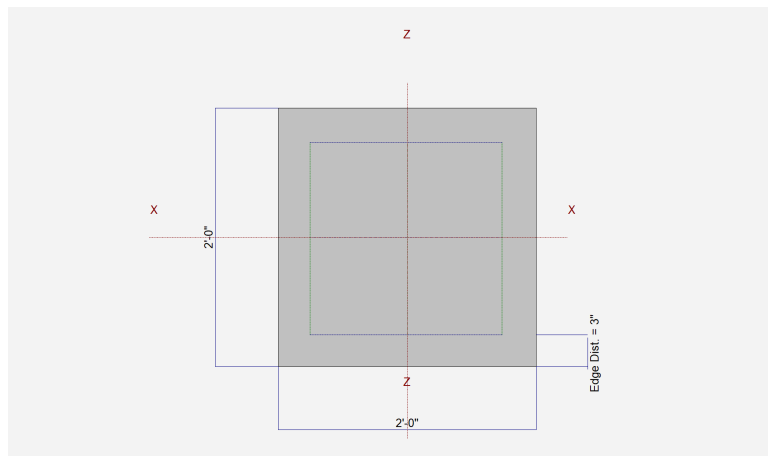
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

Dimensions

Width parallel to X-X Axis	=	2.0 ft
Length parallel to Z-Z Axis	=	2.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



Reinforcing

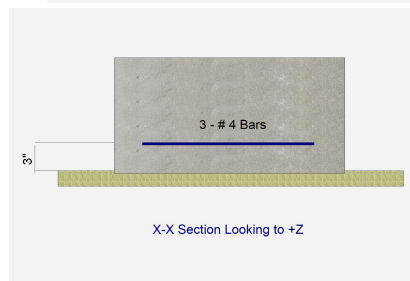
Bars parallel to X-X Axis	=	3.0
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	3.0
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separatio

	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Applied Loads

	D	L _r	L	S	W	E	H	
P : Column Load	=	1.0			1.50			k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k

General Footing

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DESCRIPTIO FTNG#2

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5133	Soil Bearing	0.770 ksf	1.50 ksf	+D+S+H about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.05705	Z Flexure (+X)	0.450 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.05705	Z Flexure (-X)	0.450 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.05705	X Flexure (+Z)	0.450 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.05705	X Flexure (-Z)	0.450 k-ft/ft	7.888 k-ft/ft	+1.20D+L+1.60S+1.60H
PASS	0.02667	1-way Shear (+X)	2.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.02667	1-way Shear (-X)	2.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.02667	1-way Shear (+Z)	2.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.02667	1-way Shear (-Z)	2.0 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.06338	2-way Punching	9.507 psi	150.0 psi	+1.20D+L+1.60S+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+L+H	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+Lr+H	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+S+H	1.50	n/a	0.0	0.770	0.770	n/a	n/a	0.513
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	0.6763	0.6763	n/a	n/a	0.451
X-X, +D+0.60W+H	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+0.750Lr+0.750L+0.450W	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+0.750L+0.750S+0.450W	1.50	n/a	0.0	0.6763	0.6763	n/a	n/a	0.451
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.2370	0.2370	n/a	n/a	0.158
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.3950	0.3950	n/a	n/a	0.263
X-X, +D+0.750L+0.750S+0.5250E	1.50	n/a	0.0	0.6763	0.6763	n/a	n/a	0.451
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.2370	0.2370	n/a	n/a	0.158
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.770	0.770	0.513
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	0.6763	0.6763	0.451
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+0.750Lr+0.750L+0.450W	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+0.750L+0.750S+0.450W	1.50	0.0	n/a	n/a	n/a	0.6763	0.6763	0.451
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.2370	0.2370	0.158
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.3950	0.3950	0.263
Z-Z, +D+0.750L+0.750S+0.5250E	1.50	0.0	n/a	n/a	n/a	0.6763	0.6763	0.451
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.2370	0.2370	0.158

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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General Footing

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DESCRIPTIO FTNG#2

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.50 psi	0.50 psi	0.50 psi	0.50 psi	0.50 psi	75.00 psi	0.01	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	3.70 psi	150.00psi	0.02465	OK
+1.20D+0.50Lr+1.60L+1.60H	3.17 psi	150.00psi	0.02113	OK
+1.20D+1.60L+0.50S+1.60H	5.15 psi	150.00psi	0.03433	OK
+1.20D+1.60Lr+L+1.60H	3.17 psi	150.00psi	0.02113	OK
+1.20D+1.60Lr+0.50W+1.60H	3.17 psi	150.00psi	0.02113	OK
+1.20D+L+1.60S+1.60H	9.51 psi	150.00psi	0.06338	OK
+1.20D+1.60S+0.50W+1.60H	9.51 psi	150.00psi	0.06338	OK
+1.20D+0.50Lr+L+W+1.60H	3.17 psi	150.00psi	0.02113	OK
+1.20D+L+0.50S+W+1.60H	5.15 psi	150.00psi	0.03433	OK
+0.90D+W+1.60H	2.38 psi	150.00psi	0.01584	OK
+1.20D+L+0.20S+E+1.60H	3.96 psi	150.00psi	0.02641	OK
+0.90D+E+0.90H	2.38 psi	150.00psi	0.01584	OK

General Footing

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DESCRIPTIO FTNG#3

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	40.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Beari	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	150.0 pcf
Soil/Concrete Friction Coeff.	=	0.250

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf
	=	ft

Increases based on footing plan dimension

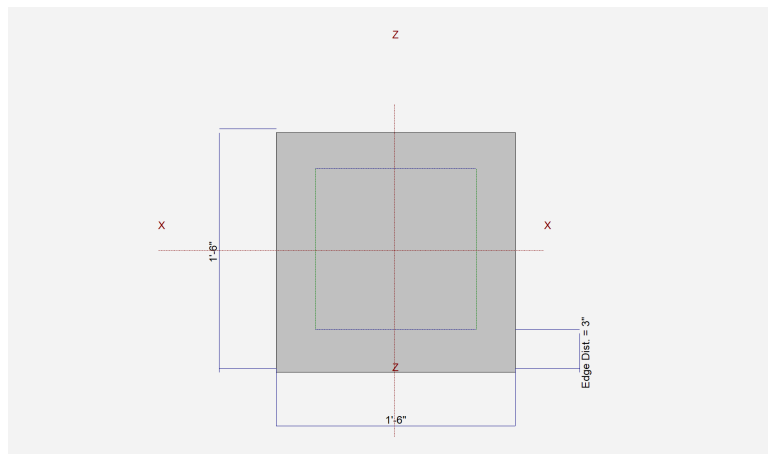
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

Dimensions

Width parallel to X-X Axis	=	1.50 ft
Length parallel to Z-Z Axis	=	1.50 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



Reinforcing

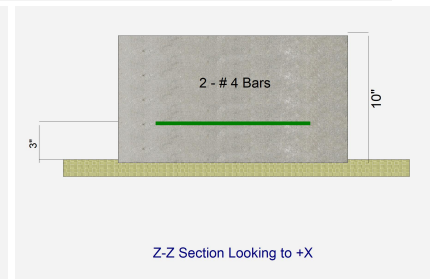
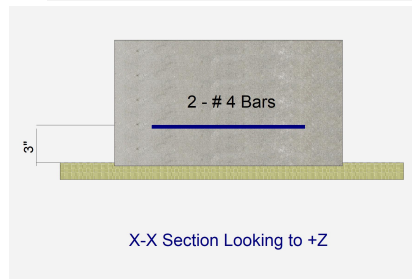
Bars parallel to X-X Axis	=	
Number of Bars	=	2
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	
Number of Bars	=	2
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separatio

# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Applied Loads

	D	Lr	L	S	W	E	H	
P : Column Load	=	0.480			2.50			k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k

General Footing

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DESCRIPTIO FTNG#3

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9633	Soil Bearing	1.445 ksf	1.50 ksf	+D+S+H about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1053	Z Flexure (+X)	0.5720 k-ft/ft	5.433 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.1053	Z Flexure (-X)	0.5720 k-ft/ft	5.433 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.1053	X Flexure (+Z)	0.5720 k-ft/ft	5.433 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.1053	X Flexure (-Z)	0.5720 k-ft/ft	5.433 k-ft/ft	+1.20D+1.60S+0.50W+1.60H
PASS	0.05327	1-way Shear (+X)	3.995 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.05327	1-way Shear (-X)	3.995 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.05327	1-way Shear (+Z)	3.995 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.05327	1-way Shear (-Z)	3.995 psi	75.0 psi	+1.20D+L+1.60S+1.60H
PASS	0.1332	2-way Punching	19.976 psi	150.0 psi	+1.20D+L+1.60S+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+L+H	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+Lr+H	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+S+H	1.50	n/a	0.0	1.445	1.445	n/a	n/a	0.963
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.168	1.168	n/a	n/a	0.779
X-X, +D+0.60W+H	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+0.750Lr+0.750L+0.450W	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+0.750L+0.750S+0.450W	1.50	n/a	0.0	1.168	1.168	n/a	n/a	0.779
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.2005	0.2005	n/a	n/a	0.134
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.3342	0.3342	n/a	n/a	0.223
X-X, +D+0.750L+0.750S+0.5250E	1.50	n/a	0.0	1.168	1.168	n/a	n/a	0.779
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.2005	0.2005	n/a	n/a	0.134
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	1.445	1.445	0.963
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.168	1.168	0.779
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+0.750Lr+0.750L+0.450W	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+0.750L+0.750S+0.450W	1.50	0.0	n/a	n/a	n/a	1.168	1.168	0.779
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.2005	0.2005	0.134
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.3342	0.3342	0.223
Z-Z, +D+0.750L+0.750S+0.5250E	1.50	0.0	n/a	n/a	n/a	1.168	1.168	0.779
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.2005	0.2005	0.134

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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General Footing

File: 20-048.ec6

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DESCRIPTIO FTNG#3

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.0840	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.40D+1.60H	0.0840	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.0720	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.0720	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.2283	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.2283	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.0720	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.0720	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60Lr+0.50W+1.60	0.0720	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60Lr+0.50W+1.60	0.0720	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+L+1.60S+1.60H	0.5720	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+L+1.60S+1.60H	0.5720	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60S+0.50W+1.60L	0.5720	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+1.60S+0.50W+1.60L	0.5720	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.0720	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.0720	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.2283	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.2283	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +0.90D+W+1.60H	0.0540	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +0.90D+W+1.60H	0.0540	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+L+0.20S+E+1.60H	0.1345	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +1.20D+L+0.20S+E+1.60H	0.1345	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +0.90D+E+0.90H	0.0540	+Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
X-X, +0.90D+E+0.90H	0.0540	-Z	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.40D+1.60H	0.0840	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.40D+1.60H	0.0840	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.0720	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.0720	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.2283	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.2283	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.0720	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.0720	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60	0.0720	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60	0.0720	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+L+1.60S+1.60H	0.5720	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+L+1.60S+1.60H	0.5720	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60S+0.50W+1.60L	0.5720	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+1.60S+0.50W+1.60L	0.5720	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.0720	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.0720	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.2283	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.2283	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +0.90D+W+1.60H	0.0540	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +0.90D+W+1.60H	0.0540	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	0.1345	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	0.1345	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +0.90D+E+0.90H	0.0540	-X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK
Z-Z, +0.90D+E+0.90H	0.0540	+X	Bottom	0.2160	Min Temp %	0.2667	5.433	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.59 psi	0.59 psi	0.59 psi	0.59 psi	0.59 psi	75.00 psi	0.01	OK
+1.20D+0.50Lr+1.60L+1.60H	0.50 psi	0.50 psi	0.50 psi	0.50 psi	0.50 psi	75.00 psi	0.01	OK
+1.20D+1.60L+0.50S+1.60H	1.59 psi	1.59 psi	1.59 psi	1.59 psi	1.59 psi	75.00 psi	0.02	OK
+1.20D+1.60Lr+L+1.60H	0.50 psi	0.50 psi	0.50 psi	0.50 psi	0.50 psi	75.00 psi	0.01	OK
+1.20D+1.60Lr+0.50W+1.60H	0.50 psi	0.50 psi	0.50 psi	0.50 psi	0.50 psi	75.00 psi	0.01	OK
+1.20D+L+1.60S+1.60H	4.00 psi	4.00 psi	4.00 psi	4.00 psi	4.00 psi	75.00 psi	0.05	OK
+1.20D+1.60S+0.50W+1.60H	4.00 psi	4.00 psi	4.00 psi	4.00 psi	4.00 psi	75.00 psi	0.05	OK
+1.20D+0.50Lr+L+W+1.60H	0.50 psi	0.50 psi	0.50 psi	0.50 psi	0.50 psi	75.00 psi	0.01	OK
+1.20D+L+0.50S+W+1.60H	1.59 psi	1.59 psi	1.59 psi	1.59 psi	1.59 psi	75.00 psi	0.02	OK
+0.90D+W+1.60H	0.38 psi	0.38 psi	0.38 psi	0.38 psi	0.38 psi	75.00 psi	0.01	OK
+1.20D+L+0.20S+E+1.60H	0.94 psi	0.94 psi	0.94 psi	0.94 psi	0.94 psi	75.00 psi	0.01	OK

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 9 DEC 2020, 9:28AM

General Footing

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DESCRIPTIO FTNG#3

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.38 psi	0.38 psi	0.38 psi	0.38 psi	0.38 psi	75.00 psi	0.01	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	2.93 psi	150.00psi	0.01956	OK
+1.20D+0.50Lr+1.60L+1.60H	2.51 psi	150.00psi	0.01676	OK
+1.20D+1.60L+0.50S+1.60H	7.97 psi	150.00psi	0.05314	OK
+1.20D+1.60Lr+L+1.60H	2.51 psi	150.00psi	0.01676	OK
+1.20D+1.60Lr+0.50W+1.60H	2.51 psi	150.00psi	0.01676	OK
+1.20D+L+1.60S+1.60H	19.98 psi	150.00psi	0.1332	OK
+1.20D+1.60S+0.50W+1.60H	19.98 psi	150.00psi	0.1332	OK
+1.20D+0.50Lr+L+W+1.60H	2.51 psi	150.00psi	0.01676	OK
+1.20D+L+0.50S+W+1.60H	7.97 psi	150.00psi	0.05314	OK
+0.90D+W+1.60H	1.89 psi	150.00psi	0.01257	OK
+1.20D+L+0.20S+E+1.60H	4.70 psi	150.00psi	0.03131	OK
+0.90D+E+0.90H	1.89 psi	150.00psi	0.01257	OK