

Structural Calculations

for

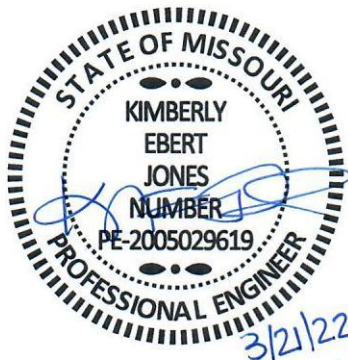
Heartland Dental

Lees Summit, MO

Prepared by:



J&S STRUCTURAL ENGINEERS
6640 W 143rd St, Suite 250
Overland Park, KS 66223



ASCE Seismic Base Shear

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TYPICAL

Risk Category		Calculations per ASCE 7-16
Risk Category of Building or Other Structure :	"II" : All Buildings and other structures except those listed as Category I, III, and IV	ASCE 7-16, Page 4, Table 1.5-1
Seismic Importance Factor	= 1	ASCE 7-16, Page 5, Table 1.5-2 ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping :	Latitude = 38.909 deg North
$S_S = 0.1137$ g, 0.2 sec response	Longitude = 94.403 deg West
$S_1 = 0.06680$ g, 1.0 sec response	Location : Lees Summit, MO 64081

Site Class, Site Coeff. and Design Category

Site Classification "D" : Shear Wave Velocity 600 to 1,200 ft/sec	= D (Based on Testing)	ASCE 7-16 Table 20.3-1
Site Coefficients F_a & F_v (using straight-line interpolation from table values)	$F_a = 1.60$ $F_v = 2.40$	ASCE 7-16 Table 11.4-1 & 11.4-2
Maximum Considered Earthquake Acceleration	$S_{MS} = F_a * S_s = 0.182$ $S_{M1} = F_v * S_1 = 0.160$	ASCE 7-16 Eq. 11.4-1 ASCE 7-16 Eq. 11.4-2
Design Spectral Acceleration	$S_{DS} = S_{MS}^{2/3} = 0.121$ $S_{D1} = S_{M1}^{2/3} = 0.107$	ASCE 7-16 Eq. 11.4-3 ASCE 7-16 Eq. 11.4-4
Seismic Design Category	= B	ASCE 7-16 Table 11.6-1 & -2

Resisting System

Basic Seismic Force Resisting System . . .	Bearing Wall Systems 15. Light-frame (wood) walls sheathed w/wood structural panels rated for shear resistance.
Response Modification Coefficient "R"	= 6.50
System Overstrength Factor "Wo"	= 3.00
Deflection Amplification Factor "Cd"	= 4.00
NOTE! See ASCE 7-16 for all applicable footnotes.	
Building height Limits :	
Category "A & B" Limit:	
Category "C" Limit:	
Category "D" Limit:	
Category "E" Limit:	
Category "F" Limit:	

Lateral Force Procedure

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

Structure Type for Building Period Calculation :	All Other Structural Systems	Use ASCE 12.8-7
"Ct" value = 0.020	"hn" : Height from base to highest level = 15.0 ft	
"x" value = 0.75		
"Ta" Approximate fundamental period using Eq. 12.8-7 :	$T_a = C_t * (h_n^x) = 0.152$ sec	
"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17	8.000 sec	
		= 0.152 sec

"Cs" Response Coefficient

S_{DS} : Short Period Design Spectral Response	= 0.121	From Eq. 12.8-2, Preliminary C_s	= 0.019
"R" : Response Modification Factor	= 6.50	From Eq. 12.8-3 & 12.8-4, C_s need not exceed	= 0.108
"I" : Seismic Importance Factor	= 1	From Eq. 12.8-5 & 12.8-6, C_s not be less than	= 0.010
C_s : Seismic Response Coefficient =			= 0.0187

Seismic Base Shear

$C_s = 0.0187$ from 12.8.1.1	W (see Sum W_i below) = 0.00 k
Seismic Base Shear $V = C_s * W$	= 0.00 k

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
Wpx	Weight at level of diaphragm and other structure elements attached to it.								
Fi	Design Lateral Force applied at the level.								
Sum Fi	Sum of "Lat. Force" of current level plus all levels above								
MIN Req'd Force @ Level	0.20 * S	$\frac{1}{DS}$	* I * Wpx						
MAX Req'd Force @ Level	0.40 * S	$\frac{1}{DS}$	* I * Wpx						
Fpx : Design Force @ Level	Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level								

ASCE 7-16 Snow Loads

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DESCRIPTION: SNOW

Flat Roof Snow Loads

Description :	per ASCE 7-16, Chapter 7		
Ground Snow Load, per Fig 7.2-1	20.00 psf	Roof Slope, Sec .7.3.4	1.20
Terrain Category	B (see ASCE 7-16 Section 26.7)	Roof Configuration	Monoslope
Exposure of Roof	Partially Exposed		
Ce : Exposure Factor, Table 7.3-1	1.00		
Ct : Thermal Factor	1.0 : All not otherwise defined	pm, Minimum required	20.00 psf
Risk Category, per Table 1.5-1	II	pf, Calculated Snow Load per Equation 7-1	14.00 psf
Importance Factor, Is, Table 1.5-2	1.00	pf, Design Snow Load Max(pm min, pf calc)	20.00 psf

Snow Drifts on Roof Projections

Description :	per ASCE 7-16, Chapt		
Balanced Snow Load	20.00 psf	hd : windward	1.66 ft
Ground Snow Load	20.00 psf	hd : Design	1.66 ft
lu-upwind	50.00 ft	pd : Max Drift Only	27.48 psf
Height of Projection	7.00 ft	pd + Balanced	47.48 psf
Snow Density	16.60 pcf	W : Drift Width	6.62 ft
hb : Balanced	1.21 ft		
hc : Ht. of Projection - hb	5.80 ft		
hc / hb	4.81		
Importance Factor	1.00		

Description :	per ASCE 7-16, Chapt		
Balanced Snow Load	20.00 psf	hd : windward	2.17 ft
Ground Snow Load	20.00 psf	hd : Design	2.17 ft
lu-upwind	83.35 ft	pd : Max Drift Only	36.05 psf
Height of Projection	7.00 ft	pd + Balanced	56.05 psf
Snow Density	16.60 pcf	W : Drift Width	8.69 ft
hb : Balanced	1.21 ft		
hc : Ht. of Projection - hb	5.80 ft		
hc / hb	4.81		
Importance Factor	1.00		

Description :	per ASCE 7-16, Chapt		
Balanced Snow Load	20.00 psf	hd : windward	1.85 ft
Ground Snow Load	20.00 psf	hd : Design	1.85 ft
lu-upwind	61.00 ft	pd : Max Drift Only	30.65 psf
Height of Projection	7.00 ft	pd + Balanced	50.65 psf
Snow Density	16.60 pcf	W : Drift Width	7.38 ft
hb : Balanced	1.21 ft		
hc : Ht. of Projection - hb	5.80 ft		
hc / hb	4.81		
Importance Factor	1.00		

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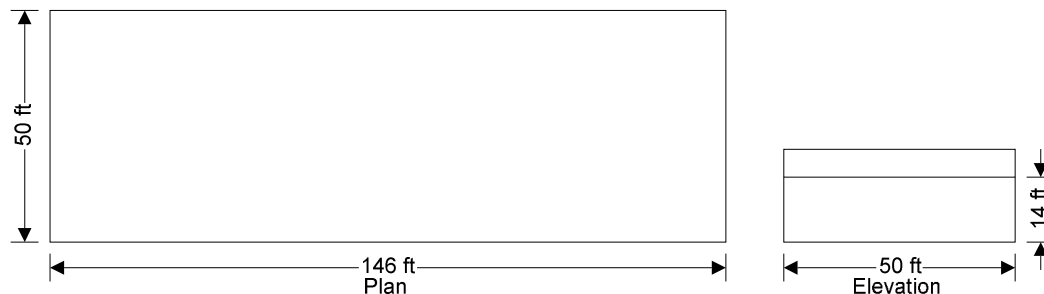
WIND LOADING (ASCE7)

WIND LOADING

In accordance with ASCE7-16

Using the directional design method

Tedds calculation version 2.1.10



Building data

Type of roof	Flat
Length of building	b = 146.00 ft
Width of building	d = 50.00 ft
Height to eaves	H = 14.00 ft
Height of parapet	h _p = 6.00 ft
Mean height	h = 14.00 ft

General wind load requirements

Basic wind speed	V = 115.0 mph
Risk category	II
Velocity pressure exponent coef (Table 26.6-1)	K _d = 0.85
Ground elevation above sea level	Z _{g1} = 0 ft
Ground elevation factor	K _e = exp(-0.0000362 × Z _{g1} /1ft) = 1.00
Exposure category (cl 26.7.3)	B
Enclosure classification (cl.26.12)	Enclosed buildings
Internal pressure coef +ve (Table 26.13-1)	GC _{pi_p} = 0.18
Internal pressure coef -ve (Table 26.13-1)	GC _{pi_n} = -0.18
Gust effect factor	G _f = 0.85
Minimum design wind loading (cl.27.4.7)	p _{min_r} = 8 lb/ft ²

Topography

Topography factor not significant	K _{zt} = 1.0
Velocity pressure equation	q = 0.00256 × K _z × K _{zt} × K _d × V ² × 1psf/mph ²

Velocity pressures table

z (ft)	K _z (Table 26.10-1)	q _z (psf)
14.00	0.57	16.40
20.00	0.62	17.84

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Peak velocity pressure for internal pressure

Peak velocity pressure – internal (as roof press.) $q_i = 16.40$ psf

Parapet pressures and forces

Velocity pressure at top of parapet $q_p = 17.84$ psf

Combined net pressure coefficient, leeward $GC_{pnl} = -1.0$

Combined net parapet pressure, leeward $p_{pl} = q_p \times GC_{pnl} = -17.84$ psf

Combined net pressure coefficient, windward $GC_{pnw} = 1.5$

Combined net parapet pressure, windward $p_{pw} = q_p \times GC_{pnw} = 26.76$ psf

Wind direction 0 deg:

Leeward parapet force $F_{w,wpl_0} = p_{pl} \times h_p \times b = -15.6$ kips

Windward parapet force $F_{w,wpw_0} = p_{pw} \times h_p \times b = 23.4$ kips

Wind direction 90 deg:

Leeward parapet force $F_{w,wpl_90} = p_{pl} \times h_p \times d = -5.4$ kips

Windward parapet force $F_{w,wpw_90} = p_{pw} \times h_p \times d = 8$ kips

Pressures and forces

Net pressure $p = q \times G_f \times C_{pe} - q_i \times GC_{pi}$

Net force $F_w = p \times A_{ref}$

Roof load case 1 - Wind 0, GC_{pi} 0.18, $-C_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient C_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (-ve)	14.00	-0.90	16.40	-15.50	1022.00	-15.84
B (-ve)	14.00	-0.90	16.40	-15.50	1022.00	-15.84
C (-ve)	14.00	-0.50	16.40	-9.92	2044.00	-20.28
D (-ve)	14.00	-0.30	16.40	-7.14	3212.00	-22.92

Total vertical net force $F_{w,v} = -74.89$ kips

Total horizontal net force $F_{w,h} = 0.00$ kips

Walls load case 1 - Wind 0, GC_{pi} 0.18, $-C_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient C_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	14.00	0.80	16.40	8.20	2044.00	16.76
B	14.00	-0.50	16.40	-9.92	2044.00	-20.28
C	14.00	-0.70	16.40	-12.71	700.00	-8.90
D	14.00	-0.70	16.40	-12.71	700.00	-8.90

Overall loading

Projected vertical plan area of wall $A_{vert_w_0} = b \times (H + h_p) = 2920.00$ ft²

Projected vertical area of roof $A_{vert_r_0} = 0.00$ ft²

Minimum overall horizontal loading $F_{w,total_min} = p_{min_w} \times A_{vert_w_0} + p_{min_r} \times A_{vert_r_0} = 46.72$ kips

Leeward net force $F_l = F_{w,wB} + F_{w,wpl_0} = -35.9$ kips

Windward net force $F_w = F_{w,wA} + F_{w,wpw_0} = 40.2$ kips

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Overall horizontal loading $F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 76.1$ kips

Roof load case 2 - Wind 0, $GC_{pi} -0.18$, $-0c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (+ve)	14.00	-0.18	16.40	0.44	1022.00	0.45
B (+ve)	14.00	-0.18	16.40	0.44	1022.00	0.45
C (+ve)	14.00	-0.18	16.40	0.44	2044.00	0.91
D (+ve)	14.00	-0.18	16.40	0.44	3212.00	1.42

Total vertical net force $F_{w,v} = 3.23$ kips

Total horizontal net force $F_{w,h} = 0.00$ kips

Walls load case 2 - Wind 0, $GC_{pi} -0.18$, $-0c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	14.00	0.80	16.40	14.11	2044.00	28.83
B	14.00	-0.50	16.40	-4.02	2044.00	-8.21
C	14.00	-0.70	16.40	-6.81	700.00	-4.77
D	14.00	-0.70	16.40	-6.81	700.00	-4.77

Overall loading

Projected vertical plan area of wall

$$A_{vert_w_0} = b \times (H + h_p) = 2920.00 \text{ ft}^2$$

Projected vertical area of roof

$$A_{vert_r_0} = 0.00 \text{ ft}^2$$

Minimum overall horizontal loading

$$F_{w,total_min} = p_{min_w} \times A_{vert_w_0} + p_{min_r} \times A_{vert_r_0} = 46.72 \text{ kips}$$

Leeward net force

$$F_l = F_{w,wB} + F_{w,wpl_0} = -23.8 \text{ kips}$$

Windward net force

$$F_w = F_{w,wA} + F_{w,wpw_0} = 52.3 \text{ kips}$$

Overall horizontal loading

$$F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 76.1 \text{ kips}$$

Roof load case 3 - Wind 90, $GC_{pi} 0.18$, $-c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (-ve)	14.00	-0.90	16.40	-15.50	350.00	-5.43
B (-ve)	14.00	-0.90	16.40	-15.50	350.00	-5.43
C (-ve)	14.00	-0.50	16.40	-9.92	700.00	-6.95
D (-ve)	14.00	-0.30	16.40	-7.14	5900.00	-42.10

Total vertical net force $F_{w,v} = -59.90$ kips

Total horizontal net force $F_{w,h} = 0.00$ kips

Walls load case 3 - Wind 90, $GC_{pi} 0.18$, $-c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	14.00	0.80	16.40	8.20	700.00	5.74

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	Wind Loading				4	
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Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
B	14.00	-0.25	16.40	-6.49	700.00	-4.55
C	14.00	-0.70	16.40	-12.71	2044.00	-25.98
D	14.00	-0.70	16.40	-12.71	2044.00	-25.98

Overall loading

Projected vertical plan area of wall

$$A_{vert_w_90} = d \times (H + h_p) = 1000.00 \text{ ft}^2$$

Projected vertical area of roof

$$A_{vert_r_90} = 0.00 \text{ ft}^2$$

Minimum overall horizontal loading

$$F_{w,total_min} = p_{min_w} \times A_{vert_w_90} + p_{min_r} \times A_{vert_r_90} = 16.00 \text{ kips}$$

Leeward net force

$$F_l = F_{w,wB} + F_{w,wpl_90} = -9.9 \text{ kips}$$

Windward net force

$$F_w = F_{w,wA} + F_{w,wpw_90} = 13.8 \text{ kips}$$

Overall horizontal loading

$$F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 23.7 \text{ kips}$$

Roof load case 4 - Wind 90, $GC_{pi} -0.18$, $+c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A (+ve)	14.00	-0.18	16.40	0.44	350.00	0.16
B (+ve)	14.00	-0.18	16.40	0.44	350.00	0.16
C (+ve)	14.00	-0.18	16.40	0.44	700.00	0.31
D (+ve)	14.00	-0.18	16.40	0.44	5900.00	2.61

Total vertical net force

$$F_{w,v} = 3.23 \text{ kips}$$

Total horizontal net force

$$F_{w,h} = 0.00 \text{ kips}$$

Walls load case 4 - Wind 90, $GC_{pi} -0.18$, $+c_{pe}$

Zone	Ref. height (ft)	Ext pressure coefficient c_{pe}	Peak velocity pressure q_p (psf)	Net pressure p (psf)	Area A_{ref} (ft ²)	Net force F_w (kips)
A	14.00	0.80	16.40	14.11	700.00	9.87
B	14.00	-0.25	16.40	-0.59	700.00	-0.41
C	14.00	-0.70	16.40	-6.81	2044.00	-13.91
D	14.00	-0.70	16.40	-6.81	2044.00	-13.91

Overall loading

Projected vertical plan area of wall

$$A_{vert_w_90} = d \times (H + h_p) = 1000.00 \text{ ft}^2$$

Projected vertical area of roof

$$A_{vert_r_90} = 0.00 \text{ ft}^2$$

Minimum overall horizontal loading

$$F_{w,total_min} = p_{min_w} \times A_{vert_w_90} + p_{min_r} \times A_{vert_r_90} = 16.00 \text{ kips}$$

Leeward net force

$$F_l = F_{w,wB} + F_{w,wpl_90} = -5.8 \text{ kips}$$

Windward net force

$$F_w = F_{w,wA} + F_{w,wpw_90} = 17.9 \text{ kips}$$

Overall horizontal loading

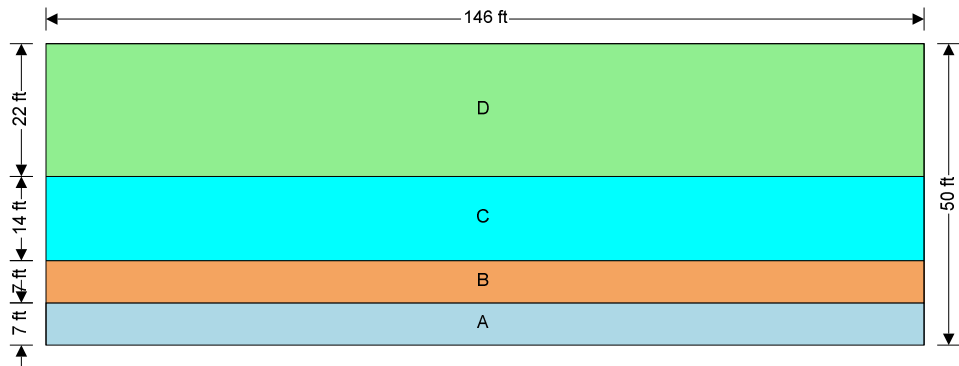
$$F_{w,total} = \max(F_w - F_l + F_{w,h}, F_{w,total_min}) = 23.7 \text{ kips}$$



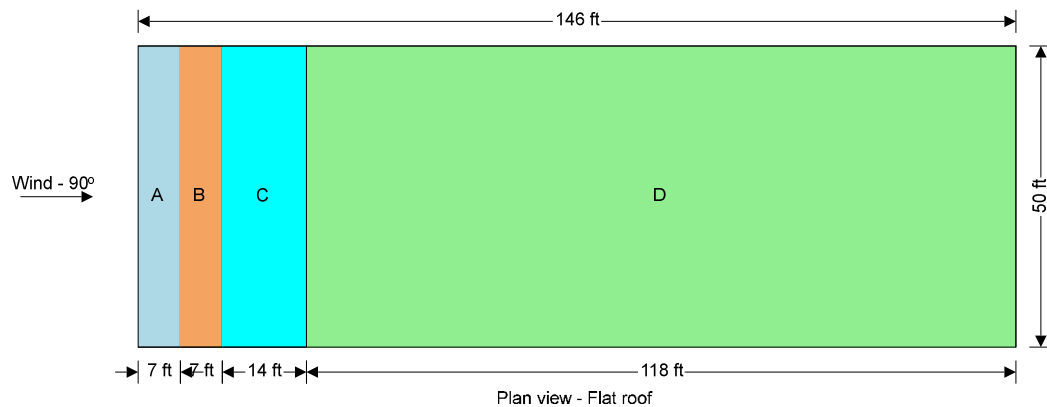
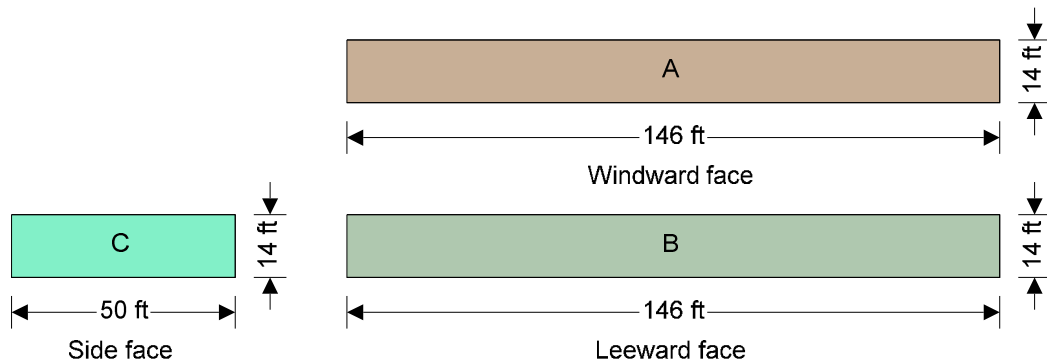
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Wind - 0°
Plan view - Flat roof

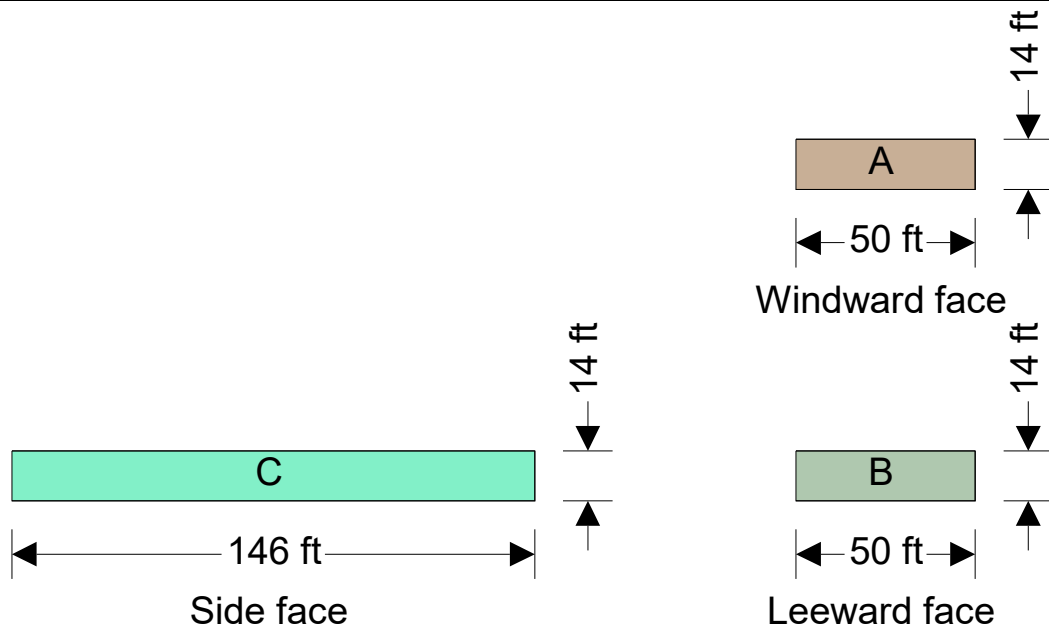




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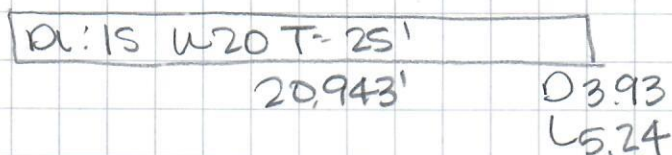


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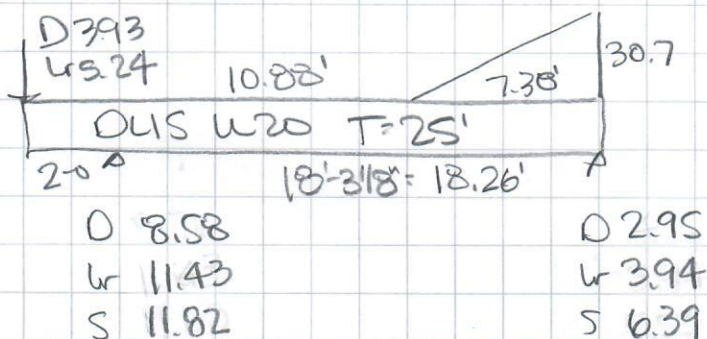
Project Market Street Center		Job Ref.	
Section Roof Framing		Sheet no./rev.	
Calc. by KIM	Date 3/6/22	Chk'd by	Date
		App'd by	Date

B1



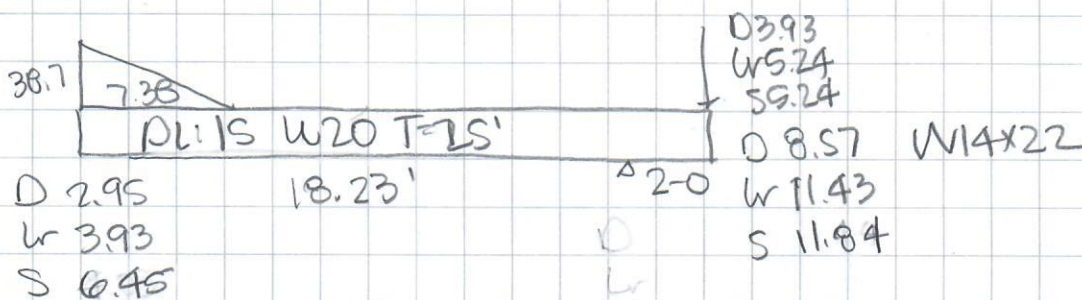
W14x22

B2



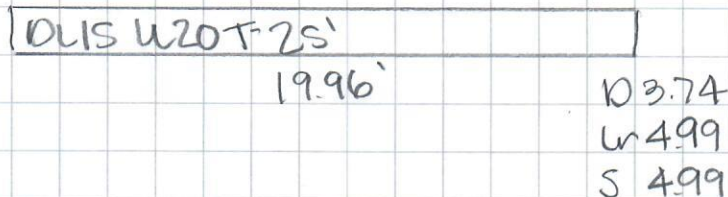
W14x22

B3



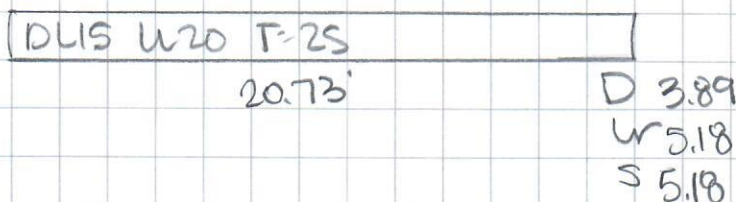
W14x22

B4



W14x22

B5



W14x22

Steel Beam

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DESCRIPTION: B1

CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

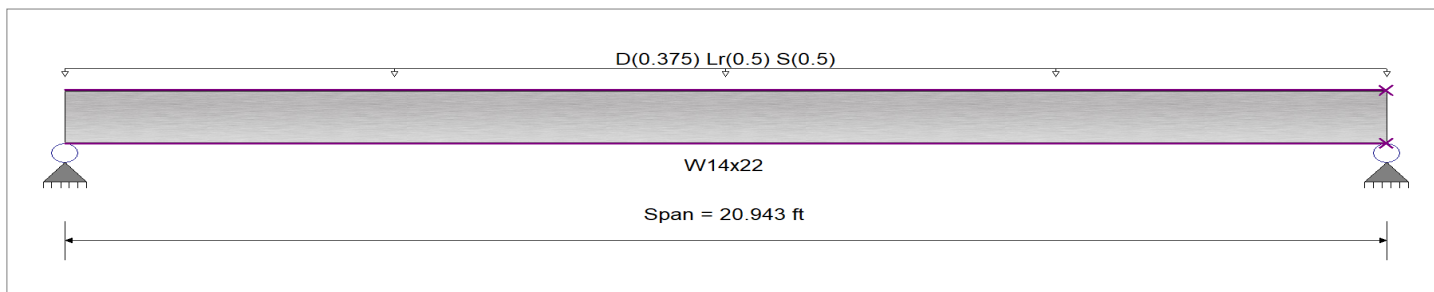
Analysis Method : Allowable Strength Design

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

Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi

E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.020 ksf, Tributary Width = 25.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.579 : 1	Maximum Shear Stress Ratio =	0.145 : 1
Section used for this span	W14x22	Section used for this span	W14x22
Ma : Applied	47.973 k-ft	Va : Applied	9.163 k
Mn / Omega : Allowable	82.834 k-ft	Vn / Omega : Allowable	63.020 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	10.472 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.376 in	Ratio =	667 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.659 in	Ratio =	381 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment Length			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H														
Dsgn. L = 20.94 ft		1	0.248	0.062	20.56		20.56	138.33	82.83	1.00	1.00	3.93	94.53	63.02
+D+L+H														
Dsgn. L = 20.94 ft		1	0.248	0.062	20.56		20.56	138.33	82.83	1.00	1.00	3.93	94.53	63.02
+D+Lr+H														
Dsgn. L = 20.94 ft		1	0.579	0.145	47.97		47.97	138.33	82.83	1.00	1.00	9.16	94.53	63.02
+D+S+H														
Dsgn. L = 20.94 ft		1	0.579	0.145	47.97		47.97	138.33	82.83	1.00	1.00	9.16	94.53	63.02
+D+0.750Lr+0.750L+H														
Dsgn. L = 20.94 ft		1	0.496	0.125	41.12		41.12	138.33	82.83	1.00	1.00	7.85	94.53	63.02
+D+0.750L+0.750S+H														
Dsgn. L = 20.94 ft		1	0.496	0.125	41.12		41.12	138.33	82.83	1.00	1.00	7.85	94.53	63.02
+D+0.60W+H														
Dsgn. L = 20.94 ft		1	0.248	0.062	20.56		20.56	138.33	82.83	1.00	1.00	3.93	94.53	63.02
+D+0.750Lr+0.750L+0.450W+H														
Dsgn. L = 20.94 ft		1	0.496	0.125	41.12		41.12	138.33	82.83	1.00	1.00	7.85	94.53	63.02
+D+0.750L+0.750S+0.450W+H														
Dsgn. L = 20.94 ft		1	0.496	0.125	41.12		41.12	138.33	82.83	1.00	1.00	7.85	94.53	63.02
+0.60D+0.60W+0.60H														
Dsgn. L = 20.94 ft		1	0.149	0.037	12.34		12.34	138.33	82.83	1.00	1.00	2.36	94.53	63.02
+D+0.70E+0.60H														
Dsgn. L = 20.94 ft		1	0.248	0.062	20.56		20.56	138.33	82.83	1.00	1.00	3.93	94.53	63.02
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 20.94 ft		1	0.496	0.125	41.12		41.12	138.33	82.83	1.00	1.00	7.85	94.53	63.02

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Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 6 MAR 2022, 10:34PM

Steel Beam

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DESCRIPTION: B1

Load Combination Segment Length	Span #	Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+H													
Dsgn. L = 20.94 ft	1	0.149	0.037	12.34		12.34	138.33	82.83	1.00	1.00	2.36	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.6593	10.531		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Overall MAXimum	9.163	9.163
Overall MINimum	2.356	2.356
+D+H	3.927	3.927
+D+L+H	3.927	3.927
+D+Lr+H	9.163	9.163
+D+S+H	9.163	9.163
+D+0.750Lr+0.750L+H	7.854	7.854
+D+0.750L+0.750S+H	7.854	7.854
+D+0.60W+H	3.927	3.927
+D+0.750Lr+0.750L+0.450W+H	7.854	7.854
+D+0.750L+0.750S+0.450W+H	7.854	7.854
+0.60D+0.60W+0.60H	2.356	2.356
+D+0.70E+0.60H	3.927	3.927
+D+0.750L+0.750S+0.5250E+H	7.854	7.854
+0.60D+0.70E+H	2.356	2.356
D Only	3.927	3.927
Lr Only	5.236	5.236
S Only	5.236	5.236
H Only		

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CODE REFERENCES

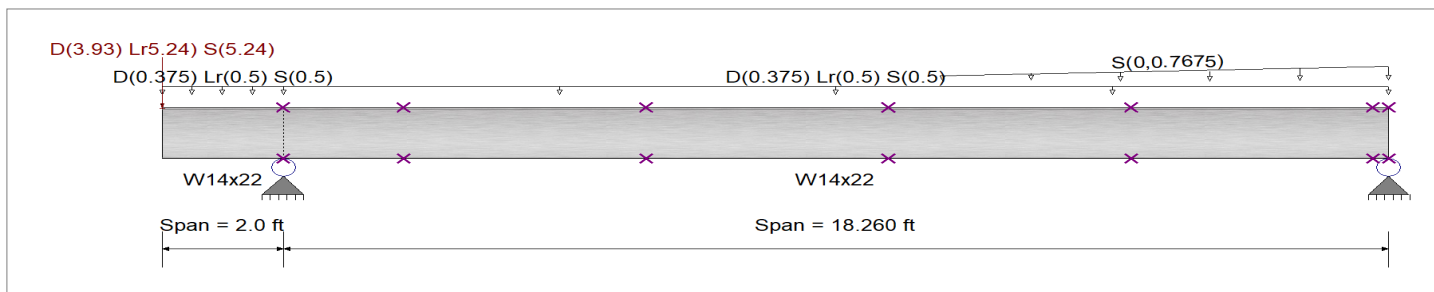
Load Combination Set : ASCE 7-16

Analysis Method : Allowable Strength Design
Beam Bracing : Beam bracing is defined as a set spacing over all spans
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi

Note : User has selected to consider

Regular spacing of lateral supports on length of beam = 4.0 ft



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

Load for Span Number 1

Uniform Load : $D = 0.0150$, $L_r = 0.020$, $S = 0.020$ ksf, Tributary Width = 25.0 ft

Point Load : $D = 3.930$, $L_r = 5.240$, $S = 5.240$ k @ 0.0 ft

Uniform Load : $D = 0.0150$, $L_r = 0.020$, $S = 0.020$ ksf, Tributary Width = 25.0 ft

Varying Uniform Load : S= 0.0->0.03070 ksf, Extent = 10.880 --> 18.260 ft, Trib Width = 25.0 ft

Design OK

Maximum Bending Stress Ratio =	0.376 : 1	Maximum Shear Stress Ratio =	0.173 : 1
Section used for this span	W14x22	Section used for this span	W14x22
M _a : Applied	31.162 k-ft	V _a : Applied	10.920 k
M _n / Omega : Allowable	82.834 k-ft	V _n /Omega : Allowable	63.020 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	10.810ft	Location of maximum on span	2.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.188 in	Ratio =	1,166 >=360
Max Upward Transient Deflection	-0.042 in	Ratio =	1,151 >=360
Max Downward Total Deflection	0.298 in	Ratio =	736 >=180
Max Upward Total Deflection	-0.064 in	Ratio =	751 >=180

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 2.00 ft	1	0.104	0.074		-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 1.97 ft	2	0.104	0.062	-0.00	-8.61	8.61	138.33	82.83	1.48	1.00	3.90	94.53	63.02
Dsgn. L = 0.58 ft	2	0.020	0.050	0.12	-1.66	1.66	138.33	82.83	1.77	1.00	3.16	94.53	63.02
Dsgn. L = 3.43 ft	2	0.097	0.047	7.99	0.12	7.99	138.33	82.83	1.55	1.00	2.94	94.53	63.02
Dsgn. L = 3.94 ft	2	0.140	0.026	11.58	7.99	11.58	138.33	82.83	1.09	1.00	1.65	94.53	63.02
Dsgn. L = 4.02 ft	2	0.140	0.021	11.62	9.24	11.62	138.33	82.83	1.04	1.00	1.34	94.53	63.02
Dsgn. L = 4.02 ft	2	0.112	0.045	9.24	0.85	9.24	138.33	82.83	1.43	1.00	2.84	94.53	63.02
Dsgn. L = 0.29 ft	2	0.010	0.047	0.85		0.85	138.33	82.83	1.66	1.00	2.95	94.53	63.02
+D+L+H													

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DESCRIPTION: B2

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 2.00 ft	1	0.104	0.074		-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 1.97 ft	2	0.104	0.062	-0.00	-8.61	8.61	138.33	82.83	1.48	1.00	3.90	94.53	63.02
Dsgn. L = 0.58 ft	2	0.020	0.050	0.12	-1.66	1.66	138.33	82.83	1.77	1.00	3.16	94.53	63.02
Dsgn. L = 3.43 ft	2	0.097	0.047	7.99	0.12	7.99	138.33	82.83	1.55	1.00	2.94	94.53	63.02
Dsgn. L = 3.94 ft	2	0.140	0.026	11.58	7.99	11.58	138.33	82.83	1.09	1.00	1.65	94.53	63.02
Dsgn. L = 4.02 ft	2	0.140	0.021	11.62	9.24	11.62	138.33	82.83	1.04	1.00	1.34	94.53	63.02
Dsgn. L = 4.02 ft	2	0.112	0.045	9.24	0.85	9.24	138.33	82.83	1.43	1.00	2.84	94.53	63.02
Dsgn. L = 0.29 ft	2	0.010	0.047	0.85		0.85	138.33	82.83	1.66	1.00	2.95	94.53	63.02
+D+Lr+H													
Dsgn. L = 2.00 ft	1	0.243	0.173		-20.09	20.09	138.33	82.83	1.00	1.00	10.92	94.53	63.02
Dsgn. L = 1.97 ft	2	0.243	0.144	-0.00	-20.09	20.09	138.33	82.83	1.48	1.00	9.09	94.53	63.02
Dsgn. L = 0.58 ft	2	0.047	0.117	0.29	-3.87	3.87	138.33	82.83	1.77	1.00	7.36	94.53	63.02
Dsgn. L = 3.43 ft	2	0.225	0.109	18.65	0.29	18.65	138.33	82.83	1.55	1.00	6.85	94.53	63.02
Dsgn. L = 3.94 ft	2	0.326	0.061	27.03	18.65	27.03	138.33	82.83	1.09	1.00	3.85	94.53	63.02
Dsgn. L = 4.02 ft	2	0.327	0.049	27.12	21.56	27.12	138.33	82.83	1.04	1.00	3.12	94.53	63.02
Dsgn. L = 4.02 ft	2	0.260	0.105	21.56	1.98	21.56	138.33	82.83	1.43	1.00	6.63	94.53	63.02
Dsgn. L = 0.29 ft	2	0.024	0.109	1.98		1.98	138.33	82.83	1.66	1.00	6.89	94.53	63.02
+D+S+H													
Dsgn. L = 2.00 ft	1	0.243	0.173		-20.09	20.09	138.33	82.83	1.00	1.00	10.92	94.53	63.02
Dsgn. L = 1.97 ft	2	0.243	0.150	-0.00	-20.09	20.09	138.33	82.83	1.51	1.00	9.47	94.53	63.02
Dsgn. L = 0.44 ft	2	0.038	0.123	0.20	-3.11	3.11	138.33	82.83	1.63	1.00	7.74	94.53	63.02
Dsgn. L = 3.58 ft	2	0.253	0.117	20.94	0.20	20.94	138.33	82.83	1.56	1.00	7.36	94.53	63.02
Dsgn. L = 3.94 ft	2	0.372	0.067	30.82	20.94	30.82	138.33	82.83	1.10	1.00	4.23	94.53	63.02
Dsgn. L = 4.02 ft	2	0.376	0.051	31.16	26.38	31.16	138.33	82.83	1.02	1.00	3.23	94.53	63.02
Dsgn. L = 4.02 ft	2	0.318	0.141	26.38	2.66	26.38	138.33	82.83	1.39	1.00	8.86	94.53	63.02
Dsgn. L = 0.29 ft	2	0.032	0.148	2.66		2.66	138.33	82.83	1.65	1.00	9.34	94.53	63.02
+D+0.750Lr+0.750L+H													
Dsgn. L = 2.00 ft	1	0.208	0.149		-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 1.97 ft	2	0.208	0.124	-0.00	-17.22	17.22	138.33	82.83	1.48	1.00	7.79	94.53	63.02
Dsgn. L = 0.58 ft	2	0.040	0.100	0.25	-3.31	3.31	138.33	82.83	1.77	1.00	6.31	94.53	63.02
Dsgn. L = 3.43 ft	2	0.193	0.093	15.99	0.25	15.99	138.33	82.83	1.55	1.00	5.87	94.53	63.02
Dsgn. L = 3.94 ft	2	0.280	0.052	23.16	15.99	23.16	138.33	82.83	1.09	1.00	3.30	94.53	63.02
Dsgn. L = 4.02 ft	2	0.281	0.042	23.24	18.48	23.24	138.33	82.83	1.04	1.00	2.67	94.53	63.02
Dsgn. L = 4.02 ft	2	0.223	0.090	18.48	1.69	18.48	138.33	82.83	1.43	1.00	5.69	94.53	63.02
Dsgn. L = 0.29 ft	2	0.020	0.094	1.69		1.69	138.33	82.83	1.66	1.00	5.90	94.53	63.02
+D+0.750L+0.750S+H													
Dsgn. L = 2.00 ft	1	0.208	0.149		-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 1.97 ft	2	0.208	0.128	-0.00	-17.22	17.22	138.33	82.83	1.51	1.00	8.08	94.53	63.02
Dsgn. L = 0.44 ft	2	0.033	0.105	0.07	-2.75	2.75	138.33	82.83	1.60	1.00	6.60	94.53	63.02
Dsgn. L = 3.58 ft	2	0.214	0.099	17.70	0.07	17.70	138.33	82.83	1.56	1.00	6.27	94.53	63.02
Dsgn. L = 3.94 ft	2	0.314	0.057	26.01	17.70	26.01	138.33	82.83	1.10	1.00	3.58	94.53	63.02
Dsgn. L = 4.02 ft	2	0.317	0.044	26.27	22.10	26.27	138.33	82.83	1.02	1.00	2.75	94.53	63.02
Dsgn. L = 4.02 ft	2	0.267	0.117	22.10	2.21	22.10	138.33	82.83	1.40	1.00	7.36	94.53	63.02
Dsgn. L = 0.29 ft	2	0.027	0.123	2.21		2.21	138.33	82.83	1.66	1.00	7.74	94.53	63.02
+D+0.60W+H													
Dsgn. L = 2.00 ft	1	0.104	0.074		-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 1.97 ft	2	0.104	0.062	-0.00	-8.61	8.61	138.33	82.83	1.48	1.00	3.90	94.53	63.02
Dsgn. L = 0.58 ft	2	0.020	0.050	0.12	-1.66	1.66	138.33	82.83	1.77	1.00	3.16	94.53	63.02
Dsgn. L = 3.43 ft	2	0.097	0.047	7.99	0.12	7.99	138.33	82.83	1.55	1.00	2.94	94.53	63.02
Dsgn. L = 3.94 ft	2	0.140	0.026	11.58	7.99	11.58	138.33	82.83	1.09	1.00	1.65	94.53	63.02
Dsgn. L = 4.02 ft	2	0.140	0.021	11.62	9.24	11.62	138.33	82.83	1.04	1.00	1.34	94.53	63.02
Dsgn. L = 4.02 ft	2	0.112	0.045	9.24	0.85	9.24	138.33	82.83	1.43	1.00	2.84	94.53	63.02
Dsgn. L = 0.29 ft	2	0.010	0.047	0.85		0.85	138.33	82.83	1.66	1.00	2.95	94.53	63.02
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 2.00 ft	1	0.208	0.149		-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 1.97 ft	2	0.208	0.124	-0.00	-17.22	17.22	138.33	82.83	1.48	1.00	7.79	94.53	63.02
Dsgn. L = 0.58 ft	2	0.040	0.100	0.25	-3.31	3.31	138.33	82.83	1.77	1.00	6.31	94.53	63.02
Dsgn. L = 3.43 ft	2	0.193	0.093	15.99	0.25	15.99	138.33	82.83	1.55	1.00	5.87	94.53	63.02
Dsgn. L = 3.94 ft	2	0.280	0.052	23.16	15.99	23.16	138.33	82.83	1.09	1.00	3.30	94.53	63.02
Dsgn. L = 4.02 ft	2	0.281	0.042	23.24	18.48	23.24	138.33	82.83	1.04	1.00	2.67	94.53	63.02
Dsgn. L = 4.02 ft	2	0.223	0.090	18.48	1.69	18.48	138.33	82.83	1.43	1.00	5.69	94.53	63.02
Dsgn. L = 0.29 ft	2	0.020	0.094	1.69		1.69	138.33	82.83	1.66	1.00	5.90	94.53	63.02
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 2.00 ft	1	0.208	0.149		-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 1.97 ft	2	0.208	0.128	-0.00	-17.22	17.22	138.33	82.83	1.51	1.00	8.08	94.53	63.02
Dsgn. L = 0.44 ft	2	0.033	0.105	0.07	-2.75	2.75	138.33	82.83	1.60	1.00	6.60	94.53	63.02
Dsgn. L = 3.58 ft	2	0.214	0.099	17.70	0.07	17.70	138.33	82.83	1.56	1.00	6.27	94.53	63.02
Dsgn. L = 3.94 ft	2	0.314	0.057	26.01	17.70	26.01	138.33	82.83	1.10	1.00	3.58	94.53	63.02
Dsgn. L = 4.02 ft	2	0.317	0.044	26.27	22.10	26.27	138.33	82.83	1.02	1.00	2.75	94.53	63.02

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DESCRIPTION: B2

Load Combination			Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment Length	Span #		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 4.02 ft	2		0.267	0.117	22.10	2.21	22.10	138.33	82.83	1.40	1.00	7.36	94.53	63.02
Dsgn. L = 0.29 ft	2		0.027	0.123	2.21		2.21	138.33	82.83	1.66	1.00	7.74	94.53	63.02
+0.60D+0.60W+0.60H														
Dsgn. L = 2.00 ft	1		0.062	0.045		-5.17	5.17	138.33	82.83	1.00	1.00	2.81	94.53	63.02
Dsgn. L = 1.97 ft	2		0.062	0.037	-0.00	-5.17	5.17	138.33	82.83	1.48	1.00	2.34	94.53	63.02
Dsgn. L = 0.58 ft	2		0.012	0.030	0.07	-0.99	0.99	138.33	82.83	1.77	1.00	1.89	94.53	63.02
Dsgn. L = 3.43 ft	2		0.058	0.028	4.80	0.07	4.80	138.33	82.83	1.55	1.00	1.76	94.53	63.02
Dsgn. L = 3.94 ft	2		0.084	0.016	6.95	4.80	6.95	138.33	82.83	1.09	1.00	0.99	94.53	63.02
Dsgn. L = 4.02 ft	2		0.084	0.013	6.97	5.54	6.97	138.33	82.83	1.04	1.00	0.80	94.53	63.02
Dsgn. L = 4.02 ft	2		0.067	0.027	5.54	0.51	5.54	138.33	82.83	1.43	1.00	1.71	94.53	63.02
Dsgn. L = 0.29 ft	2		0.006	0.028	0.51		0.51	138.33	82.83	1.66	1.00	1.77	94.53	63.02
+D+0.70E+0.60H														
Dsgn. L = 2.00 ft	1		0.104	0.074		-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 1.97 ft	2		0.104	0.062	-0.00	-8.61	8.61	138.33	82.83	1.48	1.00	3.90	94.53	63.02
Dsgn. L = 0.58 ft	2		0.020	0.050	0.12	-1.66	1.66	138.33	82.83	1.77	1.00	3.16	94.53	63.02
Dsgn. L = 3.43 ft	2		0.097	0.047	7.99	0.12	7.99	138.33	82.83	1.55	1.00	2.94	94.53	63.02
Dsgn. L = 3.94 ft	2		0.140	0.026	11.58	7.99	11.58	138.33	82.83	1.09	1.00	1.65	94.53	63.02
Dsgn. L = 4.02 ft	2		0.140	0.021	11.62	9.24	11.62	138.33	82.83	1.04	1.00	1.34	94.53	63.02
Dsgn. L = 4.02 ft	2		0.112	0.045	9.24	0.85	9.24	138.33	82.83	1.43	1.00	2.84	94.53	63.02
Dsgn. L = 0.29 ft	2		0.010	0.047	0.85		0.85	138.33	82.83	1.66	1.00	2.95	94.53	63.02
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 2.00 ft	1		0.208	0.149		-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 1.97 ft	2		0.208	0.128	-0.00	-17.22	17.22	138.33	82.83	1.51	1.00	8.08	94.53	63.02
Dsgn. L = 0.44 ft	2		0.033	0.105	0.07	-2.75	2.75	138.33	82.83	1.60	1.00	6.60	94.53	63.02
Dsgn. L = 3.58 ft	2		0.214	0.099	17.70	0.07	17.70	138.33	82.83	1.56	1.00	6.27	94.53	63.02
Dsgn. L = 3.94 ft	2		0.314	0.057	26.01	17.70	26.01	138.33	82.83	1.10	1.00	3.58	94.53	63.02
Dsgn. L = 4.02 ft	2		0.317	0.044	26.27	22.10	26.27	138.33	82.83	1.02	1.00	2.75	94.53	63.02
Dsgn. L = 4.02 ft	2		0.267	0.117	22.10	2.21	22.10	138.33	82.83	1.40	1.00	7.36	94.53	63.02
Dsgn. L = 0.29 ft	2		0.027	0.123	2.21		2.21	138.33	82.83	1.66	1.00	7.74	94.53	63.02
+0.60D+0.70E+H														
Dsgn. L = 2.00 ft	1		0.062	0.045		-5.17	5.17	138.33	82.83	1.00	1.00	2.81	94.53	63.02
Dsgn. L = 1.97 ft	2		0.062	0.037	-0.00	-5.17	5.17	138.33	82.83	1.48	1.00	2.34	94.53	63.02
Dsgn. L = 0.58 ft	2		0.012	0.030	0.07	-0.99	0.99	138.33	82.83	1.77	1.00	1.89	94.53	63.02
Dsgn. L = 3.43 ft	2		0.058	0.028	4.80	0.07	4.80	138.33	82.83	1.55	1.00	1.76	94.53	63.02
Dsgn. L = 3.94 ft	2		0.084	0.016	6.95	4.80	6.95	138.33	82.83	1.09	1.00	0.99	94.53	63.02
Dsgn. L = 4.02 ft	2		0.084	0.013	6.97	5.54	6.97	138.33	82.83	1.04	1.00	0.80	94.53	63.02
Dsgn. L = 4.02 ft	2		0.067	0.027	5.54	0.51	5.54	138.33	82.83	1.43	1.00	1.71	94.53	63.02
Dsgn. L = 0.29 ft	2		0.006	0.028	0.51		0.51	138.33	82.83	1.66	1.00	1.77	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000		-0.0639	0.000
+D+S+H	2	0.2977	9.787	+D+S+H	0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum		20.391	9.339
Overall MINimum		5.145	1.771
+D+H		8.575	2.952
+D+L+H		8.575	2.952
+D+Lr+H		20.009	6.889
+D+S+H		20.391	9.339
+D+0.750Lr+0.750L+H		17.151	5.904
+D+0.750L+0.750S+H		17.437	7.742
+D+0.60W+H		8.575	2.952
+D+0.750Lr+0.750L+0.450W+H		17.151	5.904
+D+0.750L+0.750S+0.450W+H		17.437	7.742
+0.60D+0.60W+0.60H		5.145	1.771
+D+0.70E+0.60H		8.575	2.952
+D+0.750L+0.750S+0.5250E+H		17.437	7.742
+0.60D+0.70E+H		5.145	1.771
D Only		8.575	2.952
Lr Only		11.434	3.936
S Only		11.815	6.387
H Only			

DESCRIPTION: B3

Load Combination Set : ASCE 7-16

E: Modulus : 29,000.0 ksi

Note : User has selected to consider

Regular spacing of lateral supports on length of beam = 4.0 ft



Point Load : $D = 3.930$, $L_r = 5.240$, $S = 5.240$ k @ 2.0 ft

Design OK

Maximum Bending Stress Ratio =	0.378 : 1	Maximum Shear Stress Ratio =	0.173 : 1
Section used for this span	W14x22	Section used for this span	W14x22
Ma : Applied	31.331 k-ft	Va : Applied	10.920 k
Mn / Omega : Allowable	82.834 k-ft	Vn/Omega : Allowable	63.020 k
Load Combination	+D+S+H	Load Combination	+D+Lr+H
Location of maximum on span	7.365 ft	Location of maximum on span	18.230 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.190 in	Ratio =	1,153 >=360
Max Upward Transient Deflection	-0.042 in	Ratio =	1,138 >=360
Max Downward Total Deflection	0.299 in	Ratio =	732 >=180
Max Upward Total Deflection	-0.064 in	Ratio =	748 >=180

Load Combination			Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H														
Dsgn. L = 3.94 ft	1		0.105	0.047	8.69		8.69	138.33	82.83	1.53	1.00	2.95	94.53	63.02
Dsgn. L = 4.01 ft	1		0.140	0.023	11.57	8.69	11.57	138.33	82.83	1.06	1.00	1.47	94.53	63.02
Dsgn. L = 4.01 ft	1		0.140	0.024	11.57	8.41	11.57	138.33	82.83	1.07	1.00	1.54	94.53	63.02
Dsgn. L = 3.72 ft	1		0.102	0.047	8.41	0.10	8.41	138.33	82.83	1.51	1.00	2.93	94.53	63.02
Dsgn. L = 0.29 ft	1		0.009	0.048	0.10	-0.77	0.77	138.33	82.83	1.83	1.00	3.04	94.53	63.02
Dsgn. L = 2.26 ft	1		0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.59	1.00	4.68	94.53	63.02
Dsgn. L = 1.77 ft	2		0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 0.23 ft	2		0.011	0.064		-0.92	0.92	138.33	82.83	1.00	1.00	4.02	94.53	63.02
+D+L+H														

Steel Beam

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DESCRIPTION: B3

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 3.94 ft	1	0.105	0.047	8.69		8.69	138.33	82.83	1.53	1.00	2.95	94.53	63.02
Dsgn. L = 4.01 ft	1	0.140	0.023	11.57	8.69	11.57	138.33	82.83	1.06	1.00	1.47	94.53	63.02
Dsgn. L = 4.01 ft	1	0.140	0.024	11.57	8.41	11.57	138.33	82.83	1.07	1.00	1.54	94.53	63.02
Dsgn. L = 3.72 ft	1	0.102	0.047	8.41	0.10	8.41	138.33	82.83	1.51	1.00	2.93	94.53	63.02
Dsgn. L = 0.29 ft	1	0.009	0.048	0.10	-0.77	0.77	138.33	82.83	1.83	1.00	3.04	94.53	63.02
Dsgn. L = 2.26 ft	1	0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.59	1.00	4.68	94.53	63.02
Dsgn. L = 1.77 ft	2	0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 0.23 ft	2	0.011	0.064	-0.92	0.92	138.33	82.83	1.00	1.00	4.02	94.53	63.02	
+D+Lr+H													
Dsgn. L = 3.94 ft	1	0.245	0.109	20.28		20.28	138.33	82.83	1.53	1.00	6.87	94.53	63.02
Dsgn. L = 4.01 ft	1	0.326	0.054	27.00	20.28	27.00	138.33	82.83	1.06	1.00	3.43	94.53	63.02
Dsgn. L = 4.01 ft	1	0.326	0.057	26.99	19.63	26.99	138.33	82.83	1.07	1.00	3.59	94.53	63.02
Dsgn. L = 3.72 ft	1	0.237	0.109	19.63	0.23	19.63	138.33	82.83	1.51	1.00	6.84	94.53	63.02
Dsgn. L = 0.29 ft	1	0.022	0.113	0.23	-1.81	1.81	138.33	82.83	1.83	1.00	7.10	94.53	63.02
Dsgn. L = 2.26 ft	1	0.243	0.173	-0.00	-20.09	20.09	138.33	82.83	1.59	1.00	10.92	94.53	63.02
Dsgn. L = 1.77 ft	2	0.243	0.173	-0.00	-20.09	20.09	138.33	82.83	1.00	1.00	10.92	94.53	63.02
Dsgn. L = 0.23 ft	2	0.026	0.149	-2.15	2.15	138.33	82.83	1.00	1.00	9.37	94.53	63.02	
+D+S+H													
Dsgn. L = 3.94 ft	1	0.305	0.149	25.28		25.28	138.33	82.83	1.49	1.00	9.39	94.53	63.02
Dsgn. L = 4.01 ft	1	0.378	0.059	31.33	25.28	31.33	138.33	82.83	1.04	1.00	3.71	94.53	63.02
Dsgn. L = 4.01 ft	1	0.377	0.063	31.19	22.19	31.19	138.33	82.83	1.08	1.00	4.00	94.53	63.02
Dsgn. L = 3.94 ft	1	0.268	0.118	22.19	-0.34	22.19	138.33	82.83	1.54	1.00	7.44	94.53	63.02
Dsgn. L = 0.07 ft	1	0.011	0.119	-0.00	-0.88	0.88	138.33	82.83	1.98	1.00	7.51	94.53	63.02
Dsgn. L = 2.26 ft	1	0.243	0.173	-0.00	-20.09	20.09	138.33	82.83	1.64	1.00	10.92	94.53	63.02
Dsgn. L = 1.77 ft	2	0.243	0.173	-0.00	-20.09	20.09	138.33	82.83	1.00	1.00	10.92	94.53	63.02
Dsgn. L = 0.23 ft	2	0.026	0.149	-2.15	2.15	138.33	82.83	1.00	1.00	9.37	94.53	63.02	
+D+0.750Lr+0.750L+H													
Dsgn. L = 3.94 ft	1	0.210	0.093	17.38		17.38	138.33	82.83	1.53	1.00	5.89	94.53	63.02
Dsgn. L = 4.01 ft	1	0.279	0.047	23.14	17.38	23.14	138.33	82.83	1.06	1.00	2.94	94.53	63.02
Dsgn. L = 4.01 ft	1	0.279	0.049	23.14	16.83	23.14	138.33	82.83	1.07	1.00	3.08	94.53	63.02
Dsgn. L = 3.72 ft	1	0.203	0.093	16.83	0.20	16.83	138.33	82.83	1.51	1.00	5.87	94.53	63.02
Dsgn. L = 0.29 ft	1	0.019	0.097	0.20	-1.55	1.55	138.33	82.83	1.83	1.00	6.09	94.53	63.02
Dsgn. L = 2.26 ft	1	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.59	1.00	9.36	94.53	63.02
Dsgn. L = 1.77 ft	2	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 0.23 ft	2	0.022	0.127	-1.84	1.84	138.33	82.83	1.00	1.00	8.03	94.53	63.02	
+D+0.750L+0.750S+H													
Dsgn. L = 3.94 ft	1	0.255	0.123	21.13		21.13	138.33	82.83	1.50	1.00	7.78	94.53	63.02
Dsgn. L = 4.01 ft	1	0.318	0.050	26.38	21.13	26.38	138.33	82.83	1.04	1.00	3.15	94.53	63.02
Dsgn. L = 4.01 ft	1	0.317	0.054	26.29	18.75	26.29	138.33	82.83	1.08	1.00	3.38	94.53	63.02
Dsgn. L = 3.94 ft	1	0.226	0.101	18.75	-0.39	18.75	138.33	82.83	1.54	1.00	6.34	94.53	63.02
Dsgn. L = 0.07 ft	1	0.010	0.101	-0.00	-0.85	0.85	138.33	82.83	1.77	1.00	6.39	94.53	63.02
Dsgn. L = 2.26 ft	1	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.63	1.00	9.36	94.53	63.02
Dsgn. L = 1.77 ft	2	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 0.23 ft	2	0.022	0.127	-1.84	1.84	138.33	82.83	1.00	1.00	8.03	94.53	63.02	
+D+0.60W+H													
Dsgn. L = 3.94 ft	1	0.105	0.047	8.69		8.69	138.33	82.83	1.53	1.00	2.95	94.53	63.02
Dsgn. L = 4.01 ft	1	0.140	0.023	11.57	8.69	11.57	138.33	82.83	1.06	1.00	1.47	94.53	63.02
Dsgn. L = 4.01 ft	1	0.140	0.024	11.57	8.41	11.57	138.33	82.83	1.07	1.00	1.54	94.53	63.02
Dsgn. L = 3.72 ft	1	0.102	0.047	8.41	0.10	8.41	138.33	82.83	1.51	1.00	2.93	94.53	63.02
Dsgn. L = 0.29 ft	1	0.009	0.048	0.10	-0.77	0.77	138.33	82.83	1.83	1.00	3.04	94.53	63.02
Dsgn. L = 2.26 ft	1	0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.59	1.00	4.68	94.53	63.02
Dsgn. L = 1.77 ft	2	0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 0.23 ft	2	0.011	0.064	-0.92	0.92	138.33	82.83	1.00	1.00	4.02	94.53	63.02	
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 3.94 ft	1	0.210	0.093	17.38		17.38	138.33	82.83	1.53	1.00	5.89	94.53	63.02
Dsgn. L = 4.01 ft	1	0.279	0.047	23.14	17.38	23.14	138.33	82.83	1.06	1.00	2.94	94.53	63.02
Dsgn. L = 4.01 ft	1	0.279	0.049	23.14	16.83	23.14	138.33	82.83	1.07	1.00	3.08	94.53	63.02
Dsgn. L = 3.72 ft	1	0.203	0.093	16.83	0.20	16.83	138.33	82.83	1.51	1.00	5.87	94.53	63.02
Dsgn. L = 0.29 ft	1	0.019	0.097	0.20	-1.55	1.55	138.33	82.83	1.83	1.00	6.09	94.53	63.02
Dsgn. L = 2.26 ft	1	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.59	1.00	9.36	94.53	63.02
Dsgn. L = 1.77 ft	2	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 0.23 ft	2	0.022	0.127	-1.84	1.84	138.33	82.83	1.00	1.00	8.03	94.53	63.02	
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 3.94 ft	1	0.255	0.123	21.13		21.13	138.33	82.83	1.50	1.00	7.78	94.53	63.02
Dsgn. L = 4.01 ft	1	0.318	0.050	26.38	21.13	26.38	138.33	82.83	1.04	1.00	3.15	94.53	63.02
Dsgn. L = 4.01 ft	1	0.317	0.054	26.29	18.75	26.29	138.33	82.83	1.08	1.00	3.38	94.53	63.02
Dsgn. L = 3.94 ft	1	0.226	0.101	18.75	-0.39	18.75	138.33	82.83	1.54	1.00	6.34	94.53	63.02
Dsgn. L = 0.07 ft	1	0.010	0.101	-0.00	-0.85	0.85	138.33	82.83	1.77	1.00	6.39	94.53	63.02
Dsgn. L = 2.26 ft	1	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.63	1.00	9.36	94.53	63.02

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DESCRIPTION: B3

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 1.77 ft	2	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 0.23 ft	2	0.022	0.127		-1.84	1.84	138.33	82.83	1.00	1.00	8.03	94.53	63.02
+0.60D+0.60W+0.60H													
Dsgn. L = 3.94 ft	1	0.063	0.028	5.22		5.22	138.33	82.83	1.53	1.00	1.77	94.53	63.02
Dsgn. L = 4.01 ft	1	0.084	0.014	6.94	5.22	6.94	138.33	82.83	1.06	1.00	0.88	94.53	63.02
Dsgn. L = 4.01 ft	1	0.084	0.015	6.94	5.05	6.94	138.33	82.83	1.07	1.00	0.92	94.53	63.02
Dsgn. L = 3.72 ft	1	0.061	0.028	5.05	0.06	5.05	138.33	82.83	1.51	1.00	1.76	94.53	63.02
Dsgn. L = 0.29 ft	1	0.006	0.029	0.06	-0.46	0.46	138.33	82.83	1.83	1.00	1.83	94.53	63.02
Dsgn. L = 2.26 ft	1	0.062	0.045	-0.00	-5.17	5.17	138.33	82.83	1.59	1.00	2.81	94.53	63.02
Dsgn. L = 1.77 ft	2	0.062	0.045	-0.00	-5.17	5.17	138.33	82.83	1.00	1.00	2.81	94.53	63.02
Dsgn. L = 0.23 ft	2	0.007	0.038		-0.55	0.55	138.33	82.83	1.00	1.00	2.41	94.53	63.02
+D+0.70E+0.60H													
Dsgn. L = 3.94 ft	1	0.105	0.047	8.69		8.69	138.33	82.83	1.53	1.00	2.95	94.53	63.02
Dsgn. L = 4.01 ft	1	0.140	0.023	11.57	8.69	11.57	138.33	82.83	1.06	1.00	1.47	94.53	63.02
Dsgn. L = 4.01 ft	1	0.140	0.024	11.57	8.41	11.57	138.33	82.83	1.07	1.00	1.54	94.53	63.02
Dsgn. L = 3.72 ft	1	0.102	0.047	8.41	0.10	8.41	138.33	82.83	1.51	1.00	2.93	94.53	63.02
Dsgn. L = 0.29 ft	1	0.009	0.048	0.10	-0.77	0.77	138.33	82.83	1.83	1.00	3.04	94.53	63.02
Dsgn. L = 2.26 ft	1	0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.59	1.00	4.68	94.53	63.02
Dsgn. L = 1.77 ft	2	0.104	0.074	-0.00	-8.61	8.61	138.33	82.83	1.00	1.00	4.68	94.53	63.02
Dsgn. L = 0.23 ft	2	0.011	0.064		-0.92	0.92	138.33	82.83	1.00	1.00	4.02	94.53	63.02
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 3.94 ft	1	0.255	0.123	21.13		21.13	138.33	82.83	1.50	1.00	7.78	94.53	63.02
Dsgn. L = 4.01 ft	1	0.318	0.050	26.38	21.13	26.38	138.33	82.83	1.04	1.00	3.15	94.53	63.02
Dsgn. L = 4.01 ft	1	0.317	0.054	26.29	18.75	26.29	138.33	82.83	1.08	1.00	3.38	94.53	63.02
Dsgn. L = 3.94 ft	1	0.226	0.101	18.75	-0.39	18.75	138.33	82.83	1.54	1.00	6.34	94.53	63.02
Dsgn. L = 0.07 ft	1	0.010	0.101	-0.00	-0.85	0.85	138.33	82.83	1.77	1.00	6.39	94.53	63.02
Dsgn. L = 2.26 ft	1	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.63	1.00	9.36	94.53	63.02
Dsgn. L = 1.77 ft	2	0.208	0.149	-0.00	-17.22	17.22	138.33	82.83	1.00	1.00	9.36	94.53	63.02
Dsgn. L = 0.23 ft	2	0.022	0.127		-1.84	1.84	138.33	82.83	1.00	1.00	8.03	94.53	63.02
+0.60D+0.70E+H													
Dsgn. L = 3.94 ft	1	0.063	0.028	5.22		5.22	138.33	82.83	1.53	1.00	1.77	94.53	63.02
Dsgn. L = 4.01 ft	1	0.084	0.014	6.94	5.22	6.94	138.33	82.83	1.06	1.00	0.88	94.53	63.02
Dsgn. L = 4.01 ft	1	0.084	0.015	6.94	5.05	6.94	138.33	82.83	1.07	1.00	0.92	94.53	63.02
Dsgn. L = 3.72 ft	1	0.061	0.028	5.05	0.06	5.05	138.33	82.83	1.51	1.00	1.76	94.53	63.02
Dsgn. L = 0.29 ft	1	0.006	0.029	0.06	-0.46	0.46	138.33	82.83	1.83	1.00	1.83	94.53	63.02
Dsgn. L = 2.26 ft	1	0.062	0.045	-0.00	-5.17	5.17	138.33	82.83	1.59	1.00	2.81	94.53	63.02
Dsgn. L = 1.77 ft	2	0.062	0.045	-0.00	-5.17	5.17	138.33	82.83	1.00	1.00	2.81	94.53	63.02
Dsgn. L = 0.23 ft	2	0.007	0.038		-0.55	0.55	138.33	82.83	1.00	1.00	2.41	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2989	8.532		0.0000	0.000
	2	0.0000	8.532	+D+S+H	-0.0642	2.000

Vertical Reactions

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	9.393	20.406	
Overall MINimum	1.767	5.142	
+D+H	2.946	8.570	
+D+L+H	2.946	8.570	
+D+Lr+H	6.874	19.998	
+D+S+H	9.393	20.406	
+D+0.750Lr+0.750L+H	5.892	17.141	
+D+0.750L+0.750S+H	7.781	17.447	
+D+0.60W+H	2.946	8.570	
+D+0.750Lr+0.750L+0.450W+H	5.892	17.141	
+D+0.750L+0.750S+0.450W+H	7.781	17.447	
+0.60D+0.60W+0.60H	1.767	5.142	
+D+0.70E+0.60H	2.946	8.570	
+D+0.750L+0.750S+0.5250E+H	7.781	17.447	
+0.60D+0.70E+H	1.767	5.142	
D Only	2.946	8.570	
Lr Only	3.928	11.427	
S Only	6.447	11.836	
H Only			

Steel Beam

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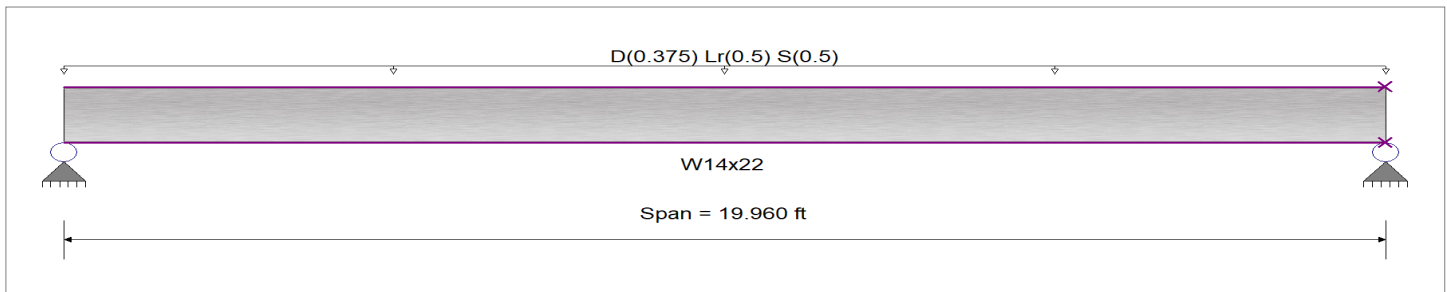
DESCRIPTION: B4

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending
Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0150, Lr = 0.020, S = 0.020 ksf, Tributary Width = 25.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.526 : 1	Maximum Shear Stress Ratio =	0.139 : 1
Section used for this span	W14x22	Section used for this span	W14x22
Ma : Applied	43.575 k-ft	Va : Applied	8.733 k
Mn / Omega : Allowable	82.834 k-ft	Vn / Omega : Allowable	63.020 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	9.980 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.311 in	Ratio =	770 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.544 in	Ratio =	440 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination			Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment Length	Span #		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H														
Dsgn. L = 19.96 ft	1		0.225	0.059	18.68		18.68	138.33	82.83	1.00	1.00	3.74	94.53	63.02
+D+L+H														
Dsgn. L = 19.96 ft	1		0.225	0.059	18.68		18.68	138.33	82.83	1.00	1.00	3.74	94.53	63.02
+D+Lr+H														
Dsgn. L = 19.96 ft	1		0.526	0.139	43.58		43.58	138.33	82.83	1.00	1.00	8.73	94.53	63.02
+D+S+H														
Dsgn. L = 19.96 ft	1		0.526	0.139	43.58		43.58	138.33	82.83	1.00	1.00	8.73	94.53	63.02
+D+0.750Lr+0.750L+H														
Dsgn. L = 19.96 ft	1		0.451	0.119	37.35		37.35	138.33	82.83	1.00	1.00	7.49	94.53	63.02
+D+0.750L+0.750S+H														
Dsgn. L = 19.96 ft	1		0.451	0.119	37.35		37.35	138.33	82.83	1.00	1.00	7.49	94.53	63.02
+D+0.60W+H														
Dsgn. L = 19.96 ft	1		0.225	0.059	18.68		18.68	138.33	82.83	1.00	1.00	3.74	94.53	63.02
+D+0.750Lr+0.750L+0.450W+H														
Dsgn. L = 19.96 ft	1		0.451	0.119	37.35		37.35	138.33	82.83	1.00	1.00	7.49	94.53	63.02
+D+0.750L+0.750S+0.450W+H														
Dsgn. L = 19.96 ft	1		0.451	0.119	37.35		37.35	138.33	82.83	1.00	1.00	7.49	94.53	63.02
+0.60D+0.60W+0.60H														
Dsgn. L = 19.96 ft	1		0.135	0.036	11.21		11.21	138.33	82.83	1.00	1.00	2.25	94.53	63.02
+D+0.70E+0.60H														
Dsgn. L = 19.96 ft	1		0.225	0.059	18.68		18.68	138.33	82.83	1.00	1.00	3.74	94.53	63.02
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 19.96 ft	1		0.451	0.119	37.35		37.35	138.33	82.83	1.00	1.00	7.49	94.53	63.02

J&S Structural Engineers
6640 W, 143rd Street
Suite 250
Overland Park, KS 66223

Project Title:
Engineer:
Project ID:
Project Descr:

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Steel Beam

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DESCRIPTION: B4

Load Combination Segment Length	Span #	Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+H													
Dsgn. L = 19.96 ft	1	0.135	0.036	11.21		11.21	138.33	82.83	1.00	1.00	2.25	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.5440	10.037		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Overall MAXimum	8.733	8.733
Overall MINimum	2.246	2.246
+D+H	3.743	3.743
+D+L+H	3.743	3.743
+D+Lr+H	8.733	8.733
+D+S+H	8.733	8.733
+D+0.750Lr+0.750L+H	7.485	7.485
+D+0.750L+0.750S+H	7.485	7.485
+D+0.60W+H	3.743	3.743
+D+0.750Lr+0.750L+0.450W+H	7.485	7.485
+D+0.750L+0.750S+0.450W+H	7.485	7.485
+0.60D+0.60W+0.60H	2.246	2.246
+D+0.70E+0.60H	3.743	3.743
+D+0.750L+0.750S+0.5250E+H	7.485	7.485
+0.60D+0.70E+H	2.246	2.246
D Only	3.743	3.743
Lr Only	4.990	4.990
S Only	4.990	4.990
H Only		

Steel Beam

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DESCRIPTION: B5

CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

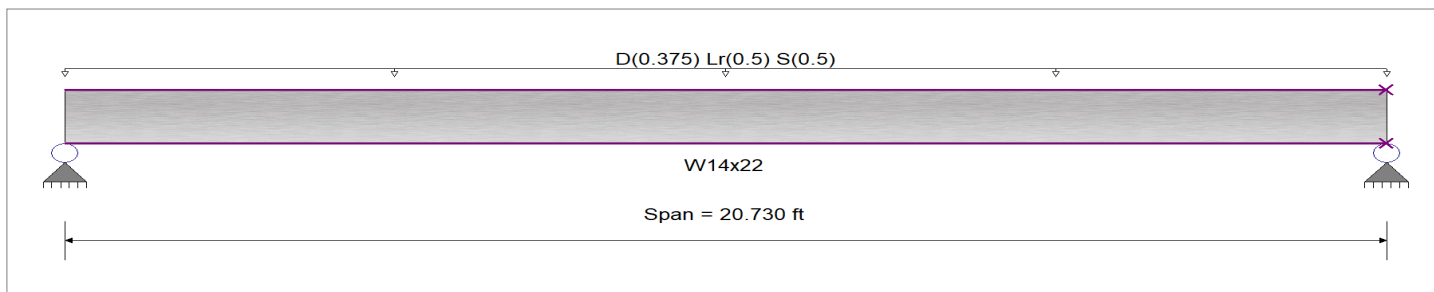
Analysis Method : Allowable Strength Design

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

Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi

E: Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.020 ksf, Tributary Width = 25.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.567 : 1	Maximum Shear Stress Ratio =	0.144 : 1
Section used for this span	W14x22	Section used for this span	W14x22
Ma : Applied	47.002 k-ft	Va : Applied	9.069 k
Mn / Omega : Allowable	82.834 k-ft	Vn / Omega : Allowable	63.020 k
Load Combination	+D+Lr+H	Load Combination	+D+Lr+H
Location of maximum on span	10.365 ft	Location of maximum on span	20.730 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.362 in	Ratio =	687 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.633 in	Ratio =	393 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination		Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment Length			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H														
Dsgn. L =	20.73 ft	1	0.243	0.062	20.14		20.14	138.33	82.83	1.00	1.00	3.89	94.53	63.02
+D+L+H														
Dsgn. L =	20.73 ft	1	0.243	0.062	20.14		20.14	138.33	82.83	1.00	1.00	3.89	94.53	63.02
+D+Lr+H														
Dsgn. L =	20.73 ft	1	0.567	0.144	47.00		47.00	138.33	82.83	1.00	1.00	9.07	94.53	63.02
+D+S+H														
Dsgn. L =	20.73 ft	1	0.567	0.144	47.00		47.00	138.33	82.83	1.00	1.00	9.07	94.53	63.02
+D+0.750Lr+0.750L+H														
Dsgn. L =	20.73 ft	1	0.486	0.123	40.29		40.29	138.33	82.83	1.00	1.00	7.77	94.53	63.02
+D+0.750L+0.750S+H														
Dsgn. L =	20.73 ft	1	0.486	0.123	40.29		40.29	138.33	82.83	1.00	1.00	7.77	94.53	63.02
+D+0.60W+H														
Dsgn. L =	20.73 ft	1	0.243	0.062	20.14		20.14	138.33	82.83	1.00	1.00	3.89	94.53	63.02
+D+0.750Lr+0.750L+0.450W+H														
Dsgn. L =	20.73 ft	1	0.486	0.123	40.29		40.29	138.33	82.83	1.00	1.00	7.77	94.53	63.02
+D+0.750L+0.750S+0.450W+H														
Dsgn. L =	20.73 ft	1	0.486	0.123	40.29		40.29	138.33	82.83	1.00	1.00	7.77	94.53	63.02
+0.60D+0.60W+0.60H														
Dsgn. L =	20.73 ft	1	0.146	0.037	12.09		12.09	138.33	82.83	1.00	1.00	2.33	94.53	63.02
+D+0.70E+0.60H														
Dsgn. L =	20.73 ft	1	0.243	0.062	20.14		20.14	138.33	82.83	1.00	1.00	3.89	94.53	63.02
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L =	20.73 ft	1	0.486	0.123	40.29		40.29	138.33	82.83	1.00	1.00	7.77	94.53	63.02

J&S Structural Engineers
6640 W, 143rd Street
Suite 250
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Project Title:
Engineer:
Project ID:
Project Descr:

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Steel Beam

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DESCRIPTION: B5

Load Combination Segment Length	Span #	Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+H													
Dsgn. L = 20.73 ft	1	0.146	0.037	12.09		12.09	138.33	82.83	1.00	1.00	2.33	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.6329	10.424		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Overall MAXimum	9.069	9.069
Overall MINimum	2.332	2.332
+D+H	3.887	3.887
+D+L+H	3.887	3.887
+D+Lr+H	9.069	9.069
+D+S+H	9.069	9.069
+D+0.750Lr+0.750L+H	7.774	7.774
+D+0.750L+0.750S+H	7.774	7.774
+D+0.60W+H	3.887	3.887
+D+0.750Lr+0.750L+0.450W+H	7.774	7.774
+D+0.750L+0.750S+0.450W+H	7.774	7.774
+0.60D+0.60W+0.60H	2.332	2.332
+D+0.70E+0.60H	3.887	3.887
+D+0.750L+0.750S+0.5250E+H	7.774	7.774
+0.60D+0.70E+H	2.332	2.332
D Only	3.887	3.887
Lr Only	5.183	5.183
S Only	5.183	5.183
H Only		

Steel Beam

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DESCRIPTION: B7

CODE REFERENCES

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

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Strength Design

Beam Bracing : Beam bracing is defined as a set spacing over all spans

Bending Axis : Major Axis Bending

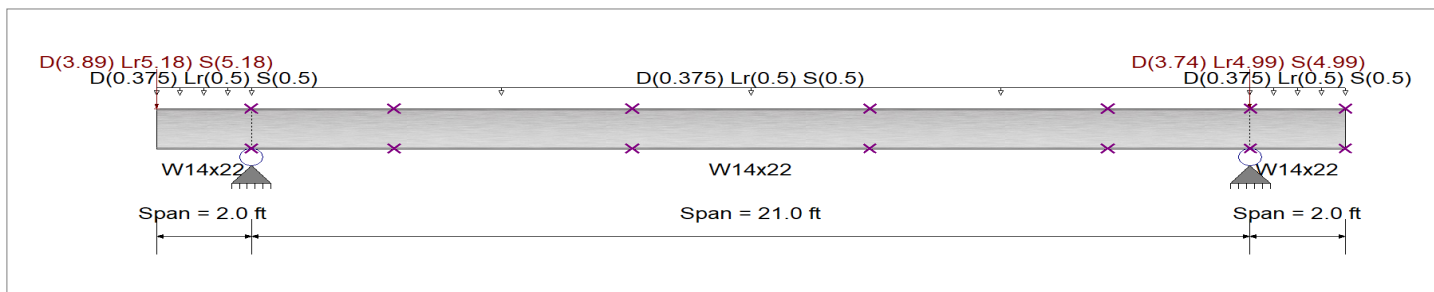
Fy : Steel Yield : 50.0 ksi

E: Modulus : 29,000.0 ksi

Unbraced Lengths

First Brace starts at 5.0 ft from Left-Most support

Regular spacing of lateral supports on length of beam = 5.0 ft



Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.020 ksf, Tributary Width = 25.0 ft

Point Load : D = 3.890, Lr = 5.180, S = 5.180 k @ 0.0 ft

Load for Span Number 2

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.020 ksf, Tributary Width = 25.0 ft

Load for Span Number 3

Uniform Load : D = 0.0150, Lr = 0.020, S = 0.020 ksf, Tributary Width = 25.0 ft

Point Load : D = 3.740, Lr = 4.990, S = 4.990 k @ 0.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =		0.481 : 1	Maximum Shear Stress Ratio =		0.172 : 1
Section used for this span		W14x22	Section used for this span		W14x22
Ma : Applied		37.841 k-ft	Va : Applied		10.820 k
Mn / Omega : Allowable		78.619 k-ft	Vn/Omega : Allowable		63.020 k
Load Combination		+D+Lr+H	Load Combination		+D+Lr+H
Location of maximum on span		11.480ft	Location of maximum on span		2.000 ft
Span # where maximum occurs		Span # 2	Span # where maximum occurs		Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.280 in	Ratio =		900 >=360
Max Upward Transient Deflection		-0.087 in	Ratio =		550 >=360
Max Downward Total Deflection		0.490 in	Ratio =		514 >=180
Max Upward Total Deflection		-0.153 in	Ratio =		314 >=180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 2.00 ft	1	0.103	0.074		-8.53	8.53	138.33	82.83	1.00	1.00	4.64	94.53	63.02
Dsgn. L = 2.94 ft	2	0.103	0.068	2.51	-8.53	8.53	138.33	82.83	2.11	1.00	4.31	94.53	63.02
Dsgn. L = 5.04 ft	2	0.168	0.051	13.91	2.51	13.91	138.33	82.83	1.37	1.00	3.21	94.53	63.02
Dsgn. L = 4.90 ft	2	0.206	0.021	16.21	13.91	16.21	131.29	78.62	1.02	1.00	1.32	94.53	63.02
Dsgn. L = 5.04 ft	2	0.191	0.038	15.85	8.46	15.85	138.33	82.83	1.16	1.00	2.41	94.53	63.02

Steel Beam

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DESCRIPTION: B7

Load Combination			Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 3.08 ft	2		0.102	0.057	8.46	-0.75	8.46	138.33	82.83	1.67	1.00	3.57	94.53	63.02
Dsgn. L = 2.00 ft	3		0.009	0.012		-0.75	0.75	138.33	82.83	1.00	1.00	0.75	94.53	63.02
+D+L+H														
Dsgn. L = 2.00 ft	1		0.103	0.074		-8.53	8.53	138.33	82.83	1.00	1.00	4.64	94.53	63.02
Dsgn. L = 2.94 ft	2		0.103	0.068	2.51	-8.53	8.53	138.33	82.83	2.11	1.00	4.31	94.53	63.02
Dsgn. L = 5.04 ft	2		0.168	0.051	13.91	2.51	13.91	138.33	82.83	1.37	1.00	3.21	94.53	63.02
Dsgn. L = 4.90 ft	2		0.206	0.021	16.21	13.91	16.21	131.29	78.62	1.02	1.00	1.32	94.53	63.02
Dsgn. L = 5.04 ft	2		0.191	0.038	15.85	8.46	15.85	138.33	82.83	1.16	1.00	2.41	94.53	63.02
Dsgn. L = 3.08 ft	2		0.102	0.057	8.46	-0.75	8.46	138.33	82.83	1.67	1.00	3.57	94.53	63.02
Dsgn. L = 2.00 ft	3		0.009	0.012		-0.75	0.75	138.33	82.83	1.00	1.00	0.75	94.53	63.02
+D+Lr+H														
Dsgn. L = 2.00 ft	1		0.240	0.172		-19.89	19.89	138.33	82.83	1.00	1.00	10.82	94.53	63.02
Dsgn. L = 2.94 ft	2		0.240	0.159	5.88	-19.89	19.89	138.33	82.83	2.11	1.00	10.05	94.53	63.02
Dsgn. L = 5.04 ft	2		0.392	0.119	32.46	5.88	32.46	138.33	82.83	1.37	1.00	7.48	94.53	63.02
Dsgn. L = 4.90 ft	2		0.481	0.049	37.84	32.46	37.84	131.29	78.62	1.02	1.00	3.07	94.53	63.02
Dsgn. L = 5.04 ft	2		0.447	0.089	36.99	19.74	36.99	138.33	82.83	1.16	1.00	5.63	94.53	63.02
Dsgn. L = 3.08 ft	2		0.238	0.132	19.74	-1.75	19.74	138.33	82.83	1.67	1.00	8.32	94.53	63.02
Dsgn. L = 2.00 ft	3		0.021	0.028		-1.75	1.75	138.33	82.83	1.00	1.00	1.75	94.53	63.02
+D+S+H														
Dsgn. L = 2.00 ft	1		0.240	0.172		-19.89	19.89	138.33	82.83	1.00	1.00	10.82	94.53	63.02
Dsgn. L = 2.94 ft	2		0.240	0.159	5.88	-19.89	19.89	138.33	82.83	2.11	1.00	10.05	94.53	63.02
Dsgn. L = 5.04 ft	2		0.392	0.119	32.46	5.88	32.46	138.33	82.83	1.37	1.00	7.48	94.53	63.02
Dsgn. L = 4.90 ft	2		0.481	0.049	37.84	32.46	37.84	131.29	78.62	1.02	1.00	3.07	94.53	63.02
Dsgn. L = 5.04 ft	2		0.447	0.089	36.99	19.74	36.99	138.33	82.83	1.16	1.00	5.63	94.53	63.02
Dsgn. L = 3.08 ft	2		0.238	0.132	19.74	-1.75	19.74	138.33	82.83	1.67	1.00	8.32	94.53	63.02
Dsgn. L = 2.00 ft	3		0.021	0.028		-1.75	1.75	138.33	82.83	1.00	1.00	1.75	94.53	63.02
+D+0.750Lr+0.750L+H														
Dsgn. L = 2.00 ft	1		0.206	0.147		-17.05	17.05	138.33	82.83	1.00	1.00	9.28	94.53	63.02
Dsgn. L = 2.94 ft	2		0.206	0.137	5.04	-17.05	17.05	138.33	82.83	2.11	1.00	8.62	94.53	63.02
Dsgn. L = 5.04 ft	2		0.336	0.102	27.82	5.04	27.82	138.33	82.83	1.37	1.00	6.41	94.53	63.02
Dsgn. L = 4.90 ft	2		0.413	0.042	32.43	27.82	32.43	131.29	78.62	1.02	1.00	2.63	94.53	63.02
Dsgn. L = 5.04 ft	2		0.383	0.077	31.71	16.92	31.71	138.33	82.83	1.16	1.00	4.82	94.53	63.02
Dsgn. L = 3.08 ft	2		0.204	0.113	16.92	-1.50	16.92	138.33	82.83	1.67	1.00	7.13	94.53	63.02
Dsgn. L = 2.00 ft	3		0.018	0.024		-1.50	1.50	138.33	82.83	1.00	1.00	1.50	94.53	63.02
+D+0.750L+0.750S+H														
Dsgn. L = 2.00 ft	1		0.206	0.147		-17.05	17.05	138.33	82.83	1.00	1.00	9.28	94.53	63.02
Dsgn. L = 2.94 ft	2		0.206	0.137	5.04	-17.05	17.05	138.33	82.83	2.11	1.00	8.62	94.53	63.02
Dsgn. L = 5.04 ft	2		0.336	0.102	27.82	5.04	27.82	138.33	82.83	1.37	1.00	6.41	94.53	63.02
Dsgn. L = 4.90 ft	2		0.413	0.042	32.43	27.82	32.43	131.29	78.62	1.02	1.00	2.63	94.53	63.02
Dsgn. L = 5.04 ft	2		0.383	0.077	31.71	16.92	31.71	138.33	82.83	1.16	1.00	4.82	94.53	63.02
Dsgn. L = 3.08 ft	2		0.204	0.113	16.92	-1.50	16.92	138.33	82.83	1.67	1.00	7.13	94.53	63.02
Dsgn. L = 2.00 ft	3		0.018	0.024		-1.50	1.50	138.33	82.83	1.00	1.00	1.50	94.53	63.02
+D+0.60W+H														
Dsgn. L = 2.00 ft	1		0.103	0.074		-8.53	8.53	138.33	82.83	1.00	1.00	4.64	94.53	63.02
Dsgn. L = 2.94 ft	2		0.103	0.068	2.51	-8.53	8.53	138.33	82.83	2.11	1.00	4.31	94.53	63.02
Dsgn. L = 5.04 ft	2		0.168	0.051	13.91	2.51	13.91	138.33	82.83	1.37	1.00	3.21	94.53	63.02
Dsgn. L = 4.90 ft	2		0.206	0.021	16.21	13.91	16.21	131.29	78.62	1.02	1.00	1.32	94.53	63.02
Dsgn. L = 5.04 ft	2		0.191	0.038	15.85	8.46	15.85	138.33	82.83	1.16	1.00	2.41	94.53	63.02
Dsgn. L = 3.08 ft	2		0.102	0.057	8.46	-0.75	8.46	138.33	82.83	1.67	1.00	3.57	94.53	63.02
Dsgn. L = 2.00 ft	3		0.009	0.012		-0.75	0.75	138.33	82.83	1.00	1.00	0.75	94.53	63.02
+D+0.750Lr+0.750L+0.450W+H														
Dsgn. L = 2.00 ft	1		0.206	0.147		-17.05	17.05	138.33	82.83	1.00	1.00	9.28	94.53	63.02
Dsgn. L = 2.94 ft	2		0.206	0.137	5.04	-17.05	17.05	138.33	82.83	2.11	1.00	8.62	94.53	63.02
Dsgn. L = 5.04 ft	2		0.336	0.102	27.82	5.04	27.82	138.33	82.83	1.37	1.00	6.41	94.53	63.02
Dsgn. L = 4.90 ft	2		0.413	0.042	32.43	27.82	32.43	131.29	78.62	1.02	1.00	2.63	94.53	63.02
Dsgn. L = 5.04 ft	2		0.383	0.077	31.71	16.92	31.71	138.33	82.83	1.16	1.00	4.82	94.53	63.02
Dsgn. L = 3.08 ft	2		0.204	0.113	16.92	-1.50	16.92	138.33	82.83	1.67	1.00	7.13	94.53	63.02
Dsgn. L = 2.00 ft	3		0.018	0.024		-1.50	1.50	138.33	82.83	1.00	1.00	1.50	94.53	63.02
+D+0.750L+0.750S+0.450W+H														
Dsgn. L = 2.00 ft	1		0.206	0.147		-17.05	17.05	138.33	82.83	1.00	1.00	9.28	94.53	63.02
Dsgn. L = 2.94 ft	2		0.206	0.137	5.04	-17.05	17.05	138.33	82.83	2.11	1.00	8.62	94.53	63.02
Dsgn. L = 5.04 ft	2		0.336	0.102	27.82	5.04	27.82	138.33	82.83	1.37	1.00	6.41	94.53	63.02
Dsgn. L = 4.90 ft	2		0.413	0.042	32.43	27.82	32.43	131.29	78.62	1.02	1.00	2.63	94.53	63.02
Dsgn. L = 5.04 ft	2		0.383	0.077	31.71	16.92	31.71	138.33	82.83	1.16	1.00	4.82	94.53	63.02
Dsgn. L = 3.08 ft	2		0.204	0.113	16.92	-1.50	16.92	138.33	82.83	1.67	1.00	7.13	94.53	63.02
Dsgn. L = 2.00 ft	3		0.018	0.024		-1.50	1.50	138.33	82.83	1.00	1.00	1.50	94.53	63.02
+0.60D+0.60W+0.60H														
Dsgn. L = 2.00 ft	1		0.062	0.044		-5.12	5.12	138.33	82.83	1.00	1.00	2.78	94.53	63.02
Dsgn. L = 2.94 ft	2		0.062	0.041	1.51	-5.12	5.12	138.33	82.83	2.11	1.00	2.58	94.53	63.02

Steel Beam

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DESCRIPTION: B7

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 5.04 ft	2	0.101	0.031	8.34	1.51	8.34	138.33	82.83	1.37	1.00	1.92	94.53	63.02
Dsgn. L = 4.90 ft	2	0.124	0.013	9.73	8.34	9.73	131.29	78.62	1.02	1.00	0.79	94.53	63.02
Dsgn. L = 5.04 ft	2	0.115	0.023	9.51	5.07	9.51	138.33	82.83	1.16	1.00	1.45	94.53	63.02
Dsgn. L = 3.08 ft	2	0.061	0.034	5.07	-0.45	5.07	138.33	82.83	1.67	1.00	2.14	94.53	63.02
Dsgn. L = 2.00 ft	3	0.005	0.007		-0.45	0.45	138.33	82.83	1.00	1.00	0.45	94.53	63.02
+D+0.70E+0.60H													
Dsgn. L = 2.00 ft	1	0.103	0.074		-8.53	8.53	138.33	82.83	1.00	1.00	4.64	94.53	63.02
Dsgn. L = 2.94 ft	2	0.103	0.068	2.51	-8.53	8.53	138.33	82.83	2.11	1.00	4.31	94.53	63.02
Dsgn. L = 5.04 ft	2	0.168	0.051	13.91	2.51	13.91	138.33	82.83	1.37	1.00	3.21	94.53	63.02
Dsgn. L = 4.90 ft	2	0.206	0.021	16.21	13.91	16.21	131.29	78.62	1.02	1.00	1.32	94.53	63.02
Dsgn. L = 5.04 ft	2	0.191	0.038	15.85	8.46	15.85	138.33	82.83	1.16	1.00	2.41	94.53	63.02
Dsgn. L = 3.08 ft	2	0.102	0.057	8.46	-0.75	8.46	138.33	82.83	1.67	1.00	3.57	94.53	63.02
Dsgn. L = 2.00 ft	3	0.009	0.012		-0.75	0.75	138.33	82.83	1.00	1.00	0.75	94.53	63.02
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 2.00 ft	1	0.206	0.147		-17.05	17.05	138.33	82.83	1.00	1.00	9.28	94.53	63.02
Dsgn. L = 2.94 ft	2	0.206	0.137	5.04	-17.05	17.05	138.33	82.83	2.11	1.00	8.62	94.53	63.02
Dsgn. L = 5.04 ft	2	0.336	0.102	27.82	5.04	27.82	138.33	82.83	1.37	1.00	6.41	94.53	63.02
Dsgn. L = 4.90 ft	2	0.413	0.042	32.43	27.82	32.43	131.29	78.62	1.02	1.00	2.63	94.53	63.02
Dsgn. L = 5.04 ft	2	0.383	0.077	31.71	16.92	31.71	138.33	82.83	1.16	1.00	4.82	94.53	63.02
Dsgn. L = 3.08 ft	2	0.204	0.113	16.92	-1.50	16.92	138.33	82.83	1.67	1.00	7.13	94.53	63.02
Dsgn. L = 2.00 ft	3	0.018	0.024		-1.50	1.50	138.33	82.83	1.00	1.00	1.50	94.53	63.02
+0.60D+0.70E+H													
Dsgn. L = 2.00 ft	1	0.062	0.044		-5.12	5.12	138.33	82.83	1.00	1.00	2.78	94.53	63.02
Dsgn. L = 2.94 ft	2	0.062	0.041	1.51	-5.12	5.12	138.33	82.83	2.11	1.00	2.58	94.53	63.02
Dsgn. L = 5.04 ft	2	0.101	0.031	8.34	1.51	8.34	138.33	82.83	1.37	1.00	1.92	94.53	63.02
Dsgn. L = 4.90 ft	2	0.124	0.013	9.73	8.34	9.73	131.29	78.62	1.02	1.00	0.79	94.53	63.02
Dsgn. L = 5.04 ft	2	0.115	0.023	9.51	5.07	9.51	138.33	82.83	1.16	1.00	1.45	94.53	63.02
Dsgn. L = 3.08 ft	2	0.061	0.034	5.07	-0.45	5.07	138.33	82.83	1.67	1.00	2.14	94.53	63.02
Dsgn. L = 2.00 ft	3	0.005	0.007		-0.45	0.45	138.33	82.83	1.00	1.00	0.45	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.0000	0.000	+D+S+H	-0.1073	0.000
	2	0.4899	11.060		0.0000	0.000
	3	0.0000	11.060		-0.1527	2.000

Vertical Reactions

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		20.871	18.804	
Overall MINimum		5.369	4.834	
+D+H		8.948	8.057	
+D+L+H		8.948	8.057	
+D+Lr+H		20.871	18.804	
+D+S+H		20.871	18.804	
+D+0.750Lr+0.750L+H		17.890	16.117	
+D+0.750L+0.750S+H		17.890	16.117	
+D+0.60W+H		8.948	8.057	
+D+0.750Lr+0.750L+0.450W+H		17.890	16.117	
+D+0.750L+0.750S+0.450W+H		17.890	16.117	
+0.60D+0.60W+0.60H		5.369	4.834	
+D+0.70E+0.60H		8.948	8.057	
+D+0.750L+0.750S+0.5250E+H		17.890	16.117	
+0.60D+0.70E+H		5.369	4.834	
D Only		8.948	8.057	
Lr Only		11.923	10.747	
S Only		11.923	10.747	
H Only				

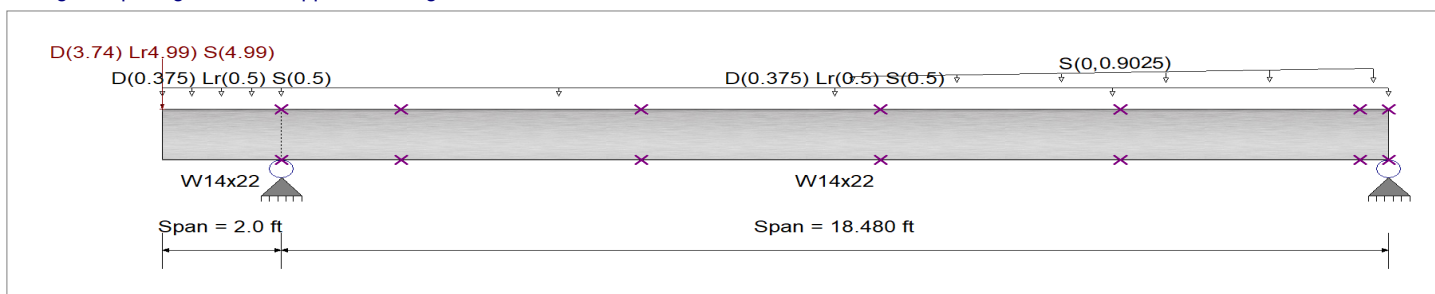
DESCRIPTION: B6

Load Combination Set : ASCE 7-16

E: Modulus : 29,000.0 ksi

Note : User has selected to consider

Regular spacing of lateral supports on length of beam = 4.0 ft



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

Load for Span Number 1

Uniform Load : $D = 0.0150$, $L_r = 0.020$, $S = 0.020$ ksf, Tributary Width = 25.0 ft

Point Load : D = 3.740, Lr = 4.990, S = 4.990 k @ 0.0 ft

Uniform Load : $D = 0.0150$, $L_r = 0.020$, $S = 0.020$ ksf, Tributary Width = 25.0 ft

Varying Uniform Load : S= 0.0->0.03610 ksf, Extent = 9.530 -->> 18.230 ft, Trib Width = 25.0 ft

Design OK

Maximum Bending Stress Ratio =		0.429 : 1	Maximum Shear Stress Ratio =		0.166 : 1
Section used for this span		W14x22	Section used for this span		W14x22
Ma : Applied		35.529 k-ft	Va : Applied		10.480 k
Mn / Omega : Allowable		82.785 k-ft	Vn/Omega : Allowable		63.020 k
Load Combination		+D+S+H	Load Combination		+D+Lr+H
Location of maximum on span		11.088ft	Location of maximum on span		2.000 ft
Span # where maximum occurs		Span # 2	Span # where maximum occurs		Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.231 in	Ratio =	958	>=360
Max Upward Transient Deflection		-0.055 in	Ratio =	870	>=360
Max Downward Total Deflection		0.350 in	Ratio =	633	>=180
Max Upward Total Deflection		-0.081 in	Ratio =	595	>=180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 2.00 ft	1	0.099	0.071		-8.23	8.23	138.33	82.83	1.00	1.00	4.49	94.53	63.02
Dsgn. L = 2.00 ft	2	0.099	0.062	-0.00	-8.23	8.23	138.33	82.83	1.53	1.00	3.91	94.53	63.02
Dsgn. L = 0.44 ft	2	0.014	0.050	0.19	-1.17	1.17	138.33	82.83	1.74	1.00	3.16	94.53	63.02
Dsgn. L = 3.55 ft	2	0.102	0.048	8.46	0.19	8.46	138.33	82.83	1.52	1.00	3.00	94.53	63.02
Dsgn. L = 3.99 ft	2	0.146	0.026	12.12	8.46	12.12	138.33	82.83	1.09	1.00	1.67	94.53	63.02
Dsgn. L = 3.99 ft	2	0.147	0.021	12.16	9.80	12.16	138.33	82.83	1.04	1.00	1.33	94.53	63.02
Dsgn. L = 3.99 ft	2	0.118	0.045	9.80	1.51	9.80	138.33	82.83	1.39	1.00	2.83	94.53	63.02
Dsgn. L = 0.52 ft	2	0.018	0.048	1.51		1.51	138.33	82.83	1.51	1.00	3.02	94.53	63.02
+D+L+H													

Steel Beam

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DESCRIPTION: B6

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 2.00 ft	1	0.099	0.071		-8.23	8.23	138.33	82.83	1.00	1.00	4.49	94.53	63.02
Dsgn. L = 2.00 ft	2	0.099	0.062	-0.00	-8.23	8.23	138.33	82.83	1.53	1.00	3.91	94.53	63.02
Dsgn. L = 0.44 ft	2	0.014	0.050	0.19	-1.17	1.17	138.33	82.83	1.74	1.00	3.16	94.53	63.02
Dsgn. L = 3.55 ft	2	0.102	0.048	8.46	0.19	8.46	138.33	82.83	1.52	1.00	3.00	94.53	63.02
Dsgn. L = 3.99 ft	2	0.146	0.026	12.12	8.46	12.12	138.33	82.83	1.09	1.00	1.67	94.53	63.02
Dsgn. L = 3.99 ft	2	0.147	0.021	12.16	9.80	12.16	138.33	82.83	1.04	1.00	1.33	94.53	63.02
Dsgn. L = 3.99 ft	2	0.118	0.045	9.80	1.51	9.80	138.33	82.83	1.39	1.00	2.83	94.53	63.02
Dsgn. L = 0.52 ft	2	0.018	0.048	1.51		1.51	138.33	82.83	1.51	1.00	3.02	94.53	63.02
+D+Lr+H													
Dsgn. L = 2.00 ft	1	0.232	0.166		-19.21	19.21	138.33	82.83	1.00	1.00	10.48	94.53	63.02
Dsgn. L = 2.00 ft	2	0.232	0.145	-0.00	-19.21	19.21	138.33	82.83	1.53	1.00	9.12	94.53	63.02
Dsgn. L = 0.44 ft	2	0.033	0.117	0.44	-2.74	2.74	138.33	82.83	1.74	1.00	7.38	94.53	63.02
Dsgn. L = 3.55 ft	2	0.238	0.111	19.74	0.44	19.74	138.33	82.83	1.52	1.00	6.99	94.53	63.02
Dsgn. L = 3.99 ft	2	0.341	0.062	28.28	19.74	28.28	138.33	82.83	1.09	1.00	3.89	94.53	63.02
Dsgn. L = 3.99 ft	2	0.342	0.049	28.37	22.87	28.37	138.33	82.83	1.04	1.00	3.10	94.53	63.02
Dsgn. L = 3.99 ft	2	0.276	0.105	22.87	3.53	22.87	138.33	82.83	1.39	1.00	6.59	94.53	63.02
Dsgn. L = 0.52 ft	2	0.043	0.112	3.53		3.53	138.33	82.83	1.51	1.00	7.05	94.53	63.02
+D+S+H													
Dsgn. L = 2.00 ft	1	0.232	0.166		-19.21	19.21	138.33	82.83	1.00	1.00	10.48	94.53	63.02
Dsgn. L = 2.00 ft	2	0.232	0.155	-0.00	-19.21	19.21	138.33	82.83	1.59	1.00	9.79	94.53	63.02
Dsgn. L = 0.22 ft	2	0.017	0.128	0.36	-1.41	1.41	138.33	82.83	1.51	1.00	8.05	94.53	63.02
Dsgn. L = 3.77 ft	2	0.287	0.125	23.75	0.36	23.75	138.33	82.83	1.56	1.00	7.85	94.53	63.02
Dsgn. L = 3.99 ft	2	0.422	0.072	34.95	23.75	34.95	138.33	82.83	1.11	1.00	4.55	94.53	63.02
Dsgn. L = 3.99 ft	2	0.429	0.055	35.53	30.71	35.53	138.25	82.78	1.02	1.00	3.45	94.53	63.02
Dsgn. L = 3.99 ft	2	0.371	0.153	30.71	5.18	30.71	138.33	82.83	1.35	1.00	9.61	94.53	63.02
Dsgn. L = 0.52 ft	2	0.063	0.163	5.18		5.18	138.33	82.83	1.51	1.00	10.30	94.53	63.02
+D+0.750Lr+0.750L+H													
Dsgn. L = 2.00 ft	1	0.199	0.143		-16.47	16.47	138.33	82.83	1.00	1.00	8.98	94.53	63.02
Dsgn. L = 2.00 ft	2	0.199	0.124	-0.00	-16.47	16.47	138.33	82.83	1.53	1.00	7.82	94.53	63.02
Dsgn. L = 0.44 ft	2	0.028	0.100	0.38	-2.35	2.35	138.33	82.83	1.74	1.00	6.32	94.53	63.02
Dsgn. L = 3.55 ft	2	0.204	0.095	16.92	0.38	16.92	138.33	82.83	1.52	1.00	5.99	94.53	63.02
Dsgn. L = 3.99 ft	2	0.293	0.053	24.24	16.92	24.24	138.33	82.83	1.09	1.00	3.33	94.53	63.02
Dsgn. L = 3.99 ft	2	0.294	0.042	24.31	19.61	24.31	138.33	82.83	1.04	1.00	2.66	94.53	63.02
Dsgn. L = 3.99 ft	2	0.237	0.090	19.61	3.02	19.61	138.33	82.83	1.39	1.00	5.65	94.53	63.02
Dsgn. L = 0.52 ft	2	0.037	0.096	3.02		3.02	138.33	82.83	1.51	1.00	6.04	94.53	63.02
+D+0.750L+0.750S+H													
Dsgn. L = 2.00 ft	1	0.199	0.143		-16.47	16.47	138.33	82.83	1.00	1.00	8.98	94.53	63.02
Dsgn. L = 2.00 ft	2	0.199	0.132	-0.00	-16.47	16.47	138.33	82.83	1.58	1.00	8.32	94.53	63.02
Dsgn. L = 0.22 ft	2	0.016	0.108	0.15	-1.35	1.35	138.33	82.83	1.42	1.00	6.83	94.53	63.02
Dsgn. L = 3.77 ft	2	0.241	0.106	19.92	0.15	19.92	138.33	82.83	1.56	1.00	6.66	94.53	63.02
Dsgn. L = 3.99 ft	2	0.353	0.061	29.25	19.92	29.25	138.33	82.83	1.10	1.00	3.83	94.53	63.02
Dsgn. L = 3.99 ft	2	0.358	0.046	29.67	25.48	29.67	138.33	82.83	1.02	1.00	2.92	94.53	63.02
Dsgn. L = 3.99 ft	2	0.308	0.126	25.48	4.26	25.48	138.33	82.83	1.36	1.00	7.92	94.53	63.02
Dsgn. L = 0.52 ft	2	0.051	0.135	4.26		4.26	138.33	82.83	1.51	1.00	8.48	94.53	63.02
+D+0.60W+H													
Dsgn. L = 2.00 ft	1	0.099	0.071		-8.23	8.23	138.33	82.83	1.00	1.00	4.49	94.53	63.02
Dsgn. L = 2.00 ft	2	0.099	0.062	-0.00	-8.23	8.23	138.33	82.83	1.53	1.00	3.91	94.53	63.02
Dsgn. L = 0.44 ft	2	0.014	0.050	0.19	-1.17	1.17	138.33	82.83	1.74	1.00	3.16	94.53	63.02
Dsgn. L = 3.55 ft	2	0.102	0.048	8.46	0.19	8.46	138.33	82.83	1.52	1.00	3.00	94.53	63.02
Dsgn. L = 3.99 ft	2	0.146	0.026	12.12	8.46	12.12	138.33	82.83	1.09	1.00	1.67	94.53	63.02
Dsgn. L = 3.99 ft	2	0.147	0.021	12.16	9.80	12.16	138.33	82.83	1.04	1.00	1.33	94.53	63.02
Dsgn. L = 3.99 ft	2	0.118	0.045	9.80	1.51	9.80	138.33	82.83	1.39	1.00	2.83	94.53	63.02
Dsgn. L = 0.52 ft	2	0.018	0.048	1.51		1.51	138.33	82.83	1.51	1.00	3.02	94.53	63.02
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 2.00 ft	1	0.199	0.143		-16.47	16.47	138.33	82.83	1.00	1.00	8.98	94.53	63.02
Dsgn. L = 2.00 ft	2	0.199	0.124	-0.00	-16.47	16.47	138.33	82.83	1.53	1.00	7.82	94.53	63.02
Dsgn. L = 0.44 ft	2	0.028	0.100	0.38	-2.35	2.35	138.33	82.83	1.74	1.00	6.32	94.53	63.02
Dsgn. L = 3.55 ft	2	0.204	0.095	16.92	0.38	16.92	138.33	82.83	1.52	1.00	5.99	94.53	63.02
Dsgn. L = 3.99 ft	2	0.293	0.053	24.24	16.92	24.24	138.33	82.83	1.09	1.00	3.33	94.53	63.02
Dsgn. L = 3.99 ft	2	0.294	0.042	24.31	19.61	24.31	138.33	82.83	1.04	1.00	2.66	94.53	63.02
Dsgn. L = 3.99 ft	2	0.237	0.090	19.61	3.02	19.61	138.33	82.83	1.39	1.00	5.65	94.53	63.02
Dsgn. L = 0.52 ft	2	0.037	0.096	3.02		3.02	138.33	82.83	1.51	1.00	6.04	94.53	63.02
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 2.00 ft	1	0.199	0.143		-16.47	16.47	138.33	82.83	1.00	1.00	8.98	94.53	63.02
Dsgn. L = 2.00 ft	2	0.199	0.132	-0.00	-16.47	16.47	138.33	82.83	1.58	1.00	8.32	94.53	63.02
Dsgn. L = 0.22 ft	2	0.016	0.108	0.15	-1.35	1.35	138.33	82.83	1.42	1.00	6.83	94.53	63.02
Dsgn. L = 3.77 ft	2	0.241	0.106	19.92	0.15	19.92	138.33	82.83	1.56	1.00	6.66	94.53	63.02
Dsgn. L = 3.99 ft	2	0.353	0.061	29.25	19.92	29.25	138.33	82.83	1.10	1.00	3.83	94.53	63.02
Dsgn. L = 3.99 ft	2	0.358	0.046	29.67	25.48	29.67	138.33	82.83	1.02	1.00	2.92	94.53	63.02

Steel Beam

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DESCRIPTION: B6

Load Combination		Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment	Length		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.60W+0.60H	Dsgn. L = 3.99 ft	2	0.308	0.126	25.48	4.26	25.48	138.33	82.83	1.36	1.00	7.92	94.53	63.02
	Dsgn. L = 0.52 ft	2	0.051	0.135	4.26		4.26	138.33	82.83	1.51	1.00	8.48	94.53	63.02
	Dsgn. L = 2.00 ft	1	0.060	0.043		-4.94	4.94	138.33	82.83	1.00	1.00	2.69	94.53	63.02
	Dsgn. L = 2.00 ft	2	0.060	0.037	-0.00	-4.94	4.94	138.33	82.83	1.53	1.00	2.35	94.53	63.02
	Dsgn. L = 0.44 ft	2	0.008	0.030	0.12	-0.70	0.70	138.33	82.83	1.74	1.00	1.90	94.53	63.02
	Dsgn. L = 3.55 ft	2	0.061	0.029	5.08	0.12	5.08	138.33	82.83	1.52	1.00	1.80	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.088	0.016	7.27	5.08	7.27	138.33	82.83	1.09	1.00	1.00	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.088	0.013	7.29	5.88	7.29	138.33	82.83	1.04	1.00	0.80	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.071	0.027	5.88	0.91	5.88	138.33	82.83	1.39	1.00	1.70	94.53	63.02
Dsgn. L = 0.52 ft	2	0.011	0.029	0.91		0.91	138.33	82.83	1.51	1.00	1.81	94.53	63.02	
+D+0.70E+0.60H	Dsgn. L = 2.00 ft	1	0.099	0.071		-8.23	8.23	138.33	82.83	1.00	1.00	4.49	94.53	63.02
	Dsgn. L = 2.00 ft	2	0.099	0.062	-0.00	-8.23	8.23	138.33	82.83	1.53	1.00	3.91	94.53	63.02
	Dsgn. L = 0.44 ft	2	0.014	0.050	0.19	-1.17	1.17	138.33	82.83	1.74	1.00	3.16	94.53	63.02
	Dsgn. L = 3.55 ft	2	0.102	0.048	8.46	0.19	8.46	138.33	82.83	1.52	1.00	3.00	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.146	0.026	12.12	8.46	12.12	138.33	82.83	1.09	1.00	1.67	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.147	0.021	12.16	9.80	12.16	138.33	82.83	1.04	1.00	1.33	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.118	0.045	9.80	1.51	9.80	138.33	82.83	1.39	1.00	2.83	94.53	63.02
	Dsgn. L = 0.52 ft	2	0.018	0.048	1.51		1.51	138.33	82.83	1.51	1.00	3.02	94.53	63.02
	Dsgn. L = 2.00 ft	1	0.199	0.143		-16.47	16.47	138.33	82.83	1.00	1.00	8.98	94.53	63.02
Dsgn. L = 2.00 ft	2	0.199	0.132	-0.00	-16.47	16.47	138.33	82.83	1.58	1.00	8.32	94.53	63.02	
+D+0.750L+0.750S+0.5250E+H	Dsgn. L = 0.22 ft	2	0.016	0.108	0.15	-1.35	1.35	138.33	82.83	1.42	1.00	6.83	94.53	63.02
	Dsgn. L = 3.77 ft	2	0.241	0.106	19.92	0.15	19.92	138.33	82.83	1.56	1.00	6.66	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.353	0.061	29.25	19.92	29.25	138.33	82.83	1.10	1.00	3.83	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.358	0.046	29.67	25.48	29.67	138.33	82.83	1.02	1.00	2.92	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.308	0.126	25.48	4.26	25.48	138.33	82.83	1.36	1.00	7.92	94.53	63.02
	Dsgn. L = 0.52 ft	2	0.051	0.135	4.26		4.26	138.33	82.83	1.51	1.00	8.48	94.53	63.02
	Dsgn. L = 2.00 ft	1	0.060	0.043		-4.94	4.94	138.33	82.83	1.00	1.00	2.69	94.53	63.02
	Dsgn. L = 2.00 ft	2	0.060	0.037	-0.00	-4.94	4.94	138.33	82.83	1.53	1.00	2.35	94.53	63.02
	Dsgn. L = 0.44 ft	2	0.008	0.030	0.12	-0.70	0.70	138.33	82.83	1.74	1.00	1.90	94.53	63.02
+0.60D+0.70E+H	Dsgn. L = 3.55 ft	2	0.061	0.029	5.08	0.12	5.08	138.33	82.83	1.52	1.00	1.80	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.088	0.016	7.27	5.08	7.27	138.33	82.83	1.09	1.00	1.00	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.088	0.013	7.29	5.88	7.29	138.33	82.83	1.04	1.00	0.80	94.53	63.02
	Dsgn. L = 3.99 ft	2	0.071	0.027	5.88	0.91	5.88	138.33	82.83	1.39	1.00	1.70	94.53	63.02
	Dsgn. L = 0.52 ft	2	0.011	0.029	0.91		0.91	138.33	82.83	1.51	1.00	1.81	94.53	63.02

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.0000	0.000	+D+S+H	-0.0806	0.000
	2	0.3504	9.905		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum		20.274	10.302
Overall MINimum		5.040	1.812
+D+H		8.400	3.020
+D+L+H		8.400	3.020
+D+Lr+H		19.605	7.045
+D+S+H		20.274	10.302
+D+0.750Lr+0.750L+H		16.803	6.039
+D+0.750L+0.750S+H		17.305	8.482
+D+0.60W+H		8.400	3.020
+D+0.750Lr+0.750L+0.450W+H		16.803	6.039
+D+0.750L+0.750S+0.450W+H		17.305	8.482
+0.60D+0.60W+0.60H		5.040	1.812
+D+0.70E+0.60H		8.400	3.020
+D+0.750L+0.750S+0.5250E+H		17.305	8.482
+0.60D+0.70E+H		5.040	1.812
D Only		8.400	3.020
Lr Only		11.204	4.026
S Only		11.873	7.283
H Only			

Wood Beam

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DESCRIPTION: H1

CODE REFERENCES

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

Load Combination Set : ASCE 7-16

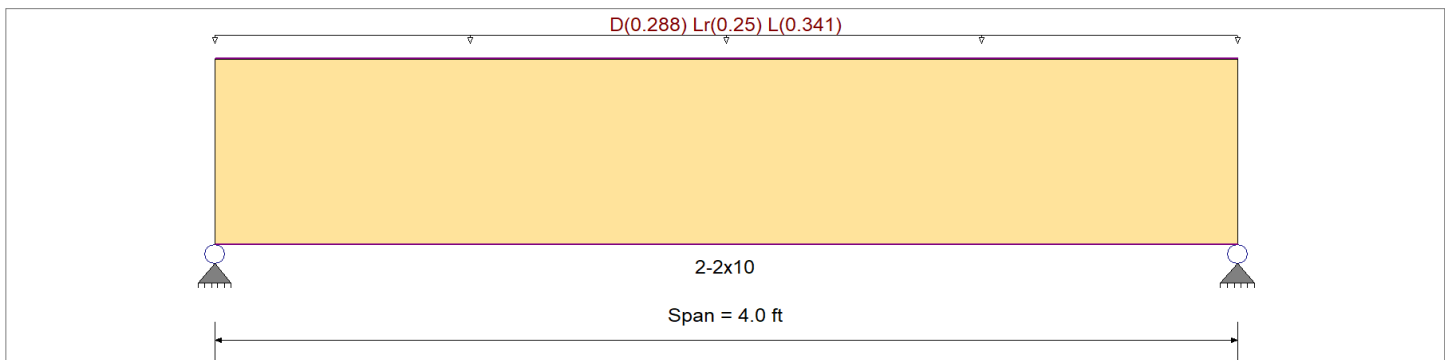
Material Properties

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

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

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

F_b + 900 psi
F_b - 900 psi
F_c - Prll 1350 psi
F_c - Perp 625 psi
F_v 180 psi
F_t 575 psi
E : Modulus of Elasticity
E_{bend} - xx 1600 ksi
E_{minbend} - xx 580 ksi
Density 31.21 pcf



Applied Loads

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

Uniform Load : D = 0.2880, L_r = 0.250, L = 0.3410, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.356	1	Maximum Shear Stress Ratio	=	0.234	1
Section used for this span		2-2x10		Section used for this span		2-2x10	
fb: Actual	=	352.86	psi	fv: Actual	=	42.19	psi
Fb: Allowable	=	990.00	psi	Fv: Allowable	=	180.00	psi
Load Combination		+D+L+H		Load Combination		+D+L+H	
Location of maximum on span	=	2.000	ft	Location of maximum on span	=	3.241	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.006	in	Ratio =		7691	>=360
Max Upward Transient Deflection		0.000	in	Ratio =		0	<360
Max Downward Total Deflection		0.013	in	Ratio =		3586	>=180
Max Upward Total Deflection		0.000	in	Ratio =		0	<180

Maximum Forces & Stresses for Load Combinations

Load Combination Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
		M	V	C _d	C _{FV}	C _i	C _r	C _m	C _t	C _L		M	fb	F'b	V	fv	Fv
+D+H Length = 4.0 ft	1	0.181	0.119	0.90	1.100	1.00	1.00	1.00	1.00	1.00		0.58	161.57	891.00	0.36	19.32	162.00
+D+L+H Length = 4.0 ft	1	0.356	0.234	1.00	1.100	1.00	1.00	1.00	1.00	1.00		1.26	352.86	990.00	0.78	42.19	180.00
+D+Lr+H Length = 4.0 ft	1	0.244	0.160	1.25	1.100	1.00	1.00	1.00	1.00	1.00		1.08	301.81	1237.50	0.67	36.09	225.00
+D+S+H Length = 4.0 ft	1	0.142	0.093	1.15	1.100	1.00	1.00	1.00	1.00	1.00		0.58	161.57	1138.50	0.36	19.32	207.00
+D+0.750Lr+0.750L+H Length = 4.0 ft	1	0.331	0.218	1.25	1.100	1.00	1.00	1.00	1.00	1.00		1.46	410.23	1237.50	0.91	49.05	225.00
+D+0.750L+0.750S+H Length = 4.0 ft	1	0.268	0.176	1.15	1.100	1.00	1.00	1.00	1.00	1.00		1.09	305.04	1138.50	0.67	36.47	207.00
+D+0.60W+H Length = 4.0 ft	1	0.102	0.067	1.60	1.100	1.00	1.00	1.00	1.00	1.00		0.58	161.57	1584.00	0.36	19.32	288.00

Wood Beam

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DESCRIPTION: H1

Load Combination	Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
			M	V								M	f _b	F _b	V	f _v	F _v
+D+0.750Lr+0.750L+0.450W+H	Length = 4.0 ft	1	0.259	0.170	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.46	410.23	1584.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.450W+H	Length = 4.0 ft	1	0.193	0.127	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.09	305.04	1584.00	0.00	0.00	0.00
+0.60D+0.60W+0.60H	Length = 4.0 ft	1	0.061	0.040	1.60	1.100	1.00	1.00	1.00	1.00	1.00	0.35	96.94	1584.00	0.00	0.00	0.00
+D+0.70E+0.60H	Length = 4.0 ft	1	0.102	0.067	1.60	1.100	1.00	1.00	1.00	1.00	1.00	0.58	161.57	1584.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.5250E+H	Length = 4.0 ft	1	0.193	0.127	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.09	305.04	1584.00	0.00	0.00	0.00
+0.60D+0.70E+H	Length = 4.0 ft	1	0.061	0.040	1.60	1.100	1.00	1.00	1.00	1.00	1.00	0.35	96.94	1584.00	0.00	0.00	0.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750Lr+0.750L+0.450W+H	1	0.0134	2.015		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.463	1.463
Overall MINimum	0.682	0.682
+D+H	0.576	0.576
+D+L+H	1.258	1.258
+D+Lr+H	1.076	1.076
+D+S+H	0.576	0.576
+D+0.750Lr+0.750L+H	1.463	1.463
+D+0.750L+0.750S+H	1.088	1.088
+D+0.60W+H	0.576	0.576
+D+0.750Lr+0.750L+0.450W+H	1.463	1.463
+D+0.750L+0.750S+0.450W+H	1.088	1.088
+0.60D+0.60W+0.60H	0.346	0.346
+D+0.70E+0.60H	0.576	0.576
+D+0.750L+0.750S+0.5250E+H	1.088	1.088
+0.60D+0.70E+H	0.346	0.346
D Only	0.576	0.576
Lr Only	0.500	0.500
L Only	0.682	0.682
H Only		

Wood Beam

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DESCRIPTION: H2

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 : iLevel Truss Joist

Wood Grade : MicroLam LVL 1.9 E

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

Fb + 2600 psi

Fb - 2600 psi

Fc - Prll 2510 psi

Fc - Perp 750 psi

Fv 285 psi

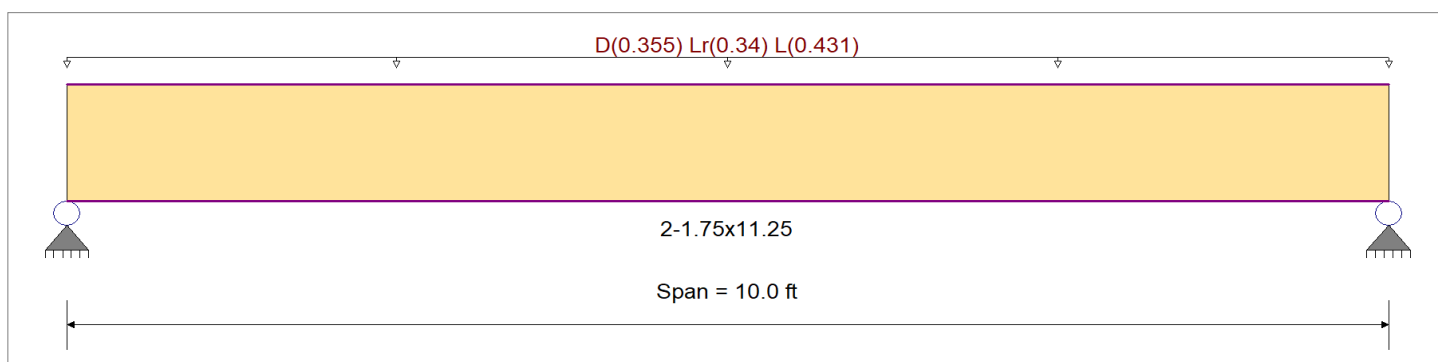
Ft 1555 psi

E : Modulus of Elasticity

Ebend- xx 1900 ksi

Eminbend - xx 965.71 ksi

Density 42.01 pcf



Applied Loads

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

Uniform Load : D = 0.3550, Lr = 0.340, L = 0.4310, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.614	1	Maximum Shear Stress Ratio	=	0.429	1
Section used for this span		2-1.75x11.25		Section used for this span		2-1.75x11.25	
fb: Actual	=	1,596.95 psi		fv: Actual	=	122.39 psi	
Fb: Allowable	=	2,600.00 psi		Fv: Allowable	=	285.00 psi	
Load Combination		+D+L+H		Load Combination		+D+L+H	
Location of maximum on span	=	5.000 ft		Location of maximum on span	=	0.000 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.124 in	Ratio = 970	>=360			
Max Upward Transient Deflection		0.000 in	Ratio = 0	<360			
Max Downward Total Deflection		0.268 in	Ratio = 448	>=180			
Max Upward Total Deflection		0.000 in	Ratio = 0	<180			

Maximum Forces & Stresses for Load Combinations

Load Combination Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
		M	V	C _d	C _{FV}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v	
+D+H													0.00	0.00	0.00	0.00	
Length = 10.0 ft	1	0.308	0.216	0.90	1.000	1.00	1.00	1.00	1.00	1.00	4.44	721.27	2340.00	1.45	55.28	256.50	
+D+L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 10.0 ft	1	0.614	0.429	1.00	1.000	1.00	1.00	1.00	1.00	1.00	9.83	1,596.95	2600.00	3.21	122.39	285.00	
+D+Lr+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 10.0 ft	1	0.434	0.304	1.25	1.000	1.00	1.00	1.00	1.00	1.00	8.69	1,412.06	3250.00	2.84	108.22	356.25	
+D+S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 10.0 ft	1	0.241	0.169	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.44	721.27	2990.00	1.45	55.28	327.75	
+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 = 10.0 ft	1	0.583	0.408	1.25	1.000	1.00	1.00	1.00	1.00	1.00	11.67	1,896.13	3250.00	3.81	145.32	356.25	
+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 = 10.0 ft	1	0.461	0.322	1.15	1.000	1.00	1.00	1.00	1.00	1.00	8.48	1,378.03	2990.00	2.77	105.62	327.75	
+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 = 10.0 ft	1	0.173	0.121	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.44	721.27	4160.00	1.45	55.28	456.00	

Wood Beam

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DESCRIPTION: H2

Load Combination	Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
			M	V								M	f _b	F _b	V	f _v	F _v
+D+0.750Lr+0.750L+0.450W+H	Length = 10.0 ft	1	0.456	0.319	1.60	1.000	1.00	1.00	1.00	1.00	1.00	11.67	1,896.13	4160.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.450W+H	Length = 10.0 ft	1	0.331	0.232	1.60	1.000	1.00	1.00	1.00	1.00	1.00	8.48	1,378.03	4160.00	0.00	0.00	0.00
+0.60D+0.60W+0.60H	Length = 10.0 ft	1	0.104	0.073	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.66	432.76	4160.00	0.00	0.00	0.00
+D+0.70E+0.60H	Length = 10.0 ft	1	0.173	0.121	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.44	721.27	4160.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.5250E+H	Length = 10.0 ft	1	0.331	0.232	1.60	1.000	1.00	1.00	1.00	1.00	1.00	8.48	1,378.03	4160.00	0.00	0.00	0.00
+0.60D+0.70E+H	Length = 10.0 ft	1	0.104	0.073	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.66	432.76	4160.00	0.00	0.00	0.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750Lr+0.750L+0.450W+H	1	0.2677	5.036		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.666	4.666
Overall MINimum	2.155	2.155
+D+H	1.775	1.775
+D+L+H	3.930	3.930
+D+Lr+H	3.475	3.475
+D+S+H	1.775	1.775
+D+0.750Lr+0.750L+H	4.666	4.666
+D+0.750L+0.750S+H	3.391	3.391
+D+0.60W+H	1.775	1.775
+D+0.750Lr+0.750L+0.450W+H	4.666	4.666
+D+0.750L+0.750S+0.450W+H	3.391	3.391
+0.60D+0.60W+0.60H	1.065	1.065
+D+0.70E+0.60H	1.775	1.775
+D+0.750L+0.750S+0.5250E+H	3.391	3.391
+0.60D+0.70E+H	1.065	1.065
D Only	1.775	1.775
Lr Only	1.700	1.700
L Only	2.155	2.155
H Only		

Wood Beam

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DESCRIPTION: H4

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 : Douglas Fir-Larch

Wood Grade : No.2

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

Fb + 900.0 psi

Fb - 900.0 psi

Fc - Prll 1,350.0 psi

Fc - Perp 625.0 psi

Fv 180.0 psi

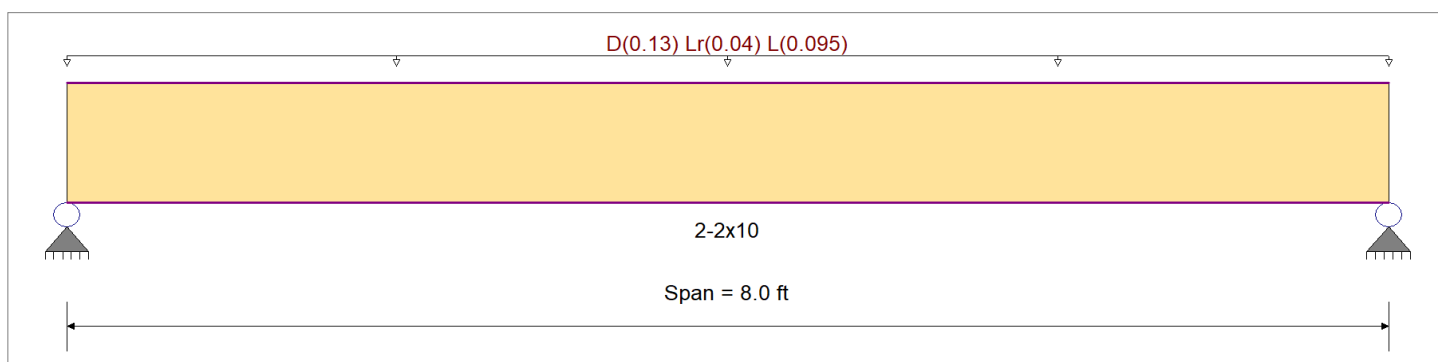
Ft 575.0 psi

E : Modulus of Elasticity

Ebend- xx 1,600.0 ksi

Eminbend - xx 580.0 ksi

Density 31.210 pcf



Applied Loads

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

Uniform Load : D = 0.130, Lr = 0.040, L = 0.0950, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.510	1	Maximum Shear Stress Ratio	=	0.219	1
Section used for this span		2-2x10		Section used for this span		2-2x10	
fb: Actual	=	504.89	psi	fv: Actual	=	39.42	psi
Fb: Allowable	=	990.00	psi	Fv: Allowable	=	180.00	psi
Load Combination		+D+L+H		Load Combination		+D+L+H	
Location of maximum on span	=	4.000	ft	Location of maximum on span	=	7.241	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.028	in	Ratio =		3451	>=360
Max Upward Transient Deflection		0.000	in	Ratio =		0	<360
Max Downward Total Deflection		0.068	in	Ratio =		1417	>=180
Max Upward Total Deflection		0.000	in	Ratio =		0	<180

Maximum Forces & Stresses for Load Combinations

Load Combination Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
		M	V	C _d	C _{FV}	C _i	C _r	C _m	C _t	C _L		M	fb	F'b	V	fv	Fv
+D+H														0.00			
Length = 8.0 ft	1	0.327	0.141	0.90	1.100	1.00	1.00	1.00	1.00	1.00	1.04	291.72	891.00	0.42	22.77	162.00	
+D+L+H					1.100	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.510	0.219	1.00	1.100	1.00	1.00	1.00	1.00	1.00	1.80	504.89	990.00	0.73	39.42	180.00	
+D+Lr+H					1.100	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.308	0.132	1.25	1.100	1.00	1.00	1.00	1.00	1.00	1.36	381.48	1237.50	0.55	29.78	225.00	
+D+S+H					1.100	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.256	0.110	1.15	1.100	1.00	1.00	1.00	1.00	1.00	1.04	291.72	1138.50	0.42	22.77	207.00	
+D+0.750Lr+0.750L+H					1.100	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.419	0.180	1.25	1.100	1.00	1.00	1.00	1.00	1.00	1.85	518.92	1237.50	0.75	40.51	225.00	
+D+0.750L+0.750S+H					1.100	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.397	0.170	1.15	1.100	1.00	1.00	1.00	1.00	1.00	1.61	451.60	1138.50	0.65	35.26	207.00	
+D+0.60W+H					1.100	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 8.0 ft	1	0.184	0.079	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.04	291.72	1584.00	0.42	22.77	288.00	

Wood Beam

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DESCRIPTION: H4

Load Combination	Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
			M	V								M	f _b	F _b	V	f _v	F _v
+D+0.750Lr+0.750L+0.450W+H	Length = 8.0 ft	1	0.328	0.141	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.85	518.92	1584.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.450W+H	Length = 8.0 ft	1	0.285	0.122	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.61	451.60	1584.00	0.00	0.00	0.00
+0.60D+0.60W+0.60H	Length = 8.0 ft	1	0.110	0.047	1.60	1.100	1.00	1.00	1.00	1.00	1.00	0.62	175.03	1584.00	0.00	0.00	0.00
+D+0.70E+0.60H	Length = 8.0 ft	1	0.184	0.079	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.04	291.72	1584.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.5250E+H	Length = 8.0 ft	1	0.285	0.122	1.60	1.100	1.00	1.00	1.00	1.00	1.00	1.61	451.60	1584.00	0.00	0.00	0.00
+0.60D+0.70E+H	Length = 8.0 ft	1	0.110	0.047	1.60	1.100	1.00	1.00	1.00	1.00	1.00	0.62	175.03	1584.00	0.00	0.00	0.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750Lr+0.750L+0.450W+H	1	0.0677	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.925	0.925
Overall MINimum	0.380	0.380
+D+H	0.520	0.520
+D+L+H	0.900	0.900
+D+Lr+H	0.680	0.680
+D+S+H	0.520	0.520
+D+0.750Lr+0.750L+H	0.925	0.925
+D+0.750L+0.750S+H	0.805	0.805
+D+0.60W+H	0.520	0.520
+D+0.750Lr+0.750L+0.450W+H	0.925	0.925
+D+0.750L+0.750S+0.450W+H	0.805	0.805
+0.60D+0.60W+0.60H	0.312	0.312
+D+0.70E+0.60H	0.520	0.520
+D+0.750L+0.750S+0.5250E+H	0.805	0.805
+0.60D+0.70E+H	0.312	0.312
D Only	0.520	0.520
Lr Only	0.160	0.160
L Only	0.380	0.380
H Only		

Wood Beam

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DESCRIPTION: H3

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 : iLevel Truss Joist

Wood Grade : MicroLam LVL 1.9 E

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

Fb + 2,600.0 psi

Fb - 2,600.0 psi

Fc - Prll 2,510.0 psi

Fc - Perp 750.0 psi

Fv 285.0 psi

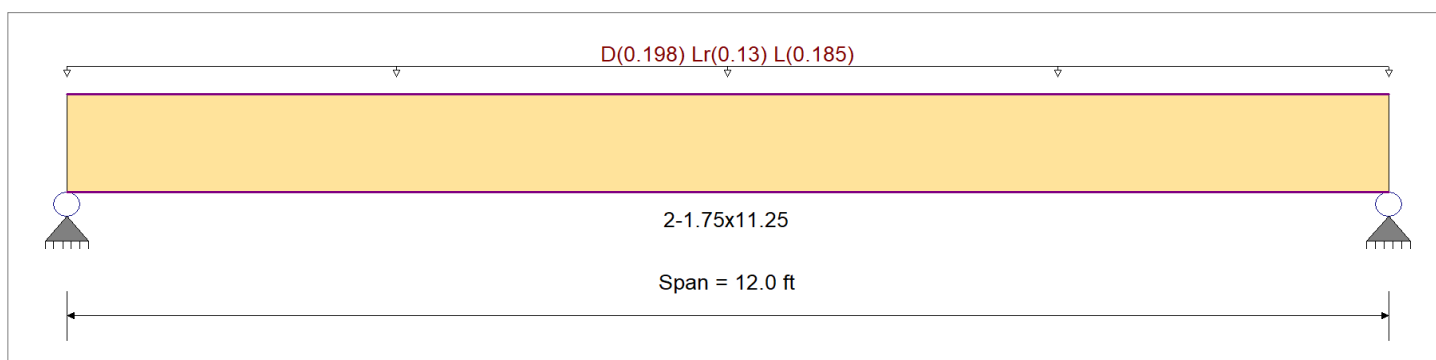
Ft 1,555.0 psi

E : Modulus of Elasticity

Ebend- xx 1,900.0 ksi

Eminbend - xx 965.71 ksi

Density 42.010 pcf



Applied Loads

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

Uniform Load : D = 0.1980, Lr = 0.130, L = 0.1850, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.431 : 1	Maximum Shear Stress Ratio	=	0.260 : 1
Section used for this span	=	2-1.75x11.25	Section used for this span	=	2-1.75x11.25
fb: Actual	=	1,120.55 psi	fv: Actual	=	74.12 psi
Fb: Allowable	=	2,600.00 psi	Fv: Allowable	=	285.00 psi
Load Combination	=	+D+L+H	Load Combination	=	+D+L+H
Location of maximum on span	=	6.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.110 in	Ratio =		1308 >=360
Max Upward Transient Deflection		0.000 in	Ratio =		0 <360
Max Downward Total Deflection		0.258 in	Ratio =		557 >=180
Max Upward Total Deflection		0.000 in	Ratio =		0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
		M	V	C _d	C _{FV}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v	
+D+H													0.00	0.00	0.00	0.00	
Length = 12.0 ft	1	0.248	0.149	0.90	1.000	1.00	1.00	1.00	1.00	1.00	3.56	579.29	2340.00	1.01	38.32	256.50	
+D+L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.0 ft	1	0.431	0.260	1.00	1.000	1.00	1.00	1.00	1.00	1.00	6.89	1,120.55	2600.00	1.95	74.12	285.00	
+D+Lr+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.0 ft	1	0.295	0.178	1.25	1.000	1.00	1.00	1.00	1.00	1.00	5.90	959.63	3250.00	1.67	63.48	356.25	
+D+S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 12.0 ft	1	0.194	0.117	1.15	1.000	1.00	1.00	1.00	1.00	1.00	3.56	579.29	2990.00	1.01	38.32	327.75	
+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 = 12.0 ft	1	0.391	0.236	1.25	1.000	1.00	1.00	1.00	1.00	1.00	7.82	1,270.49	3250.00	2.21	84.04	356.25	
+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 = 12.0 ft	1	0.330	0.199	1.15	1.000	1.00	1.00	1.00	1.00	1.00	6.06	985.23	2990.00	1.71	65.17	327.75	
+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 = 12.0 ft	1	0.139	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.56	579.29	4160.00	1.01	38.32	456.00	

Wood Beam

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DESCRIPTION: H3

Load Combination	Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
			M	V								M	f _b	F _b	V	f _v	F _v
+D+0.750Lr+0.750L+0.450W+H	Length = 12.0 ft	1	0.305	0.184	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.82	1,270.49	4160.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.450W+H	Length = 12.0 ft	1	0.237	0.143	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.06	985.23	4160.00	0.00	0.00	0.00
+0.60D+0.60W+0.60H	Length = 12.0 ft	1	0.084	0.050	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.14	347.57	4160.00	0.60	22.99	456.00
+D+0.70E+0.60H	Length = 12.0 ft	1	0.139	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.56	579.29	4160.00	0.00	0.00	0.00
+D+0.750L+0.750S+0.5250E+H	Length = 12.0 ft	1	0.237	0.143	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.06	985.23	4160.00	1.71	65.17	456.00
+0.60D+0.70E+H	Length = 12.0 ft	1	0.084	0.050	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.14	347.57	4160.00	0.60	22.99	456.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750Lr+0.750L+0.450W+H	1	0.2583	6.044		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.606	2.606
Overall MINimum	1.110	1.110
+D+H	1.188	1.188
+D+L+H	2.298	2.298
+D+Lr+H	1.968	1.968
+D+S+H	1.188	1.188
+D+0.750Lr+0.750L+H	2.606	2.606
+D+0.750L+0.750S+H	2.021	2.021
+D+0.60W+H	1.188	1.188
+D+0.750Lr+0.750L+0.450W+H	2.606	2.606
+D+0.750L+0.750S+0.450W+H	2.021	2.021
+0.60D+0.60W+0.60H	0.713	0.713
+D+0.70E+0.60H	1.188	1.188
+D+0.750L+0.750S+0.5250E+H	2.021	2.021
+0.60D+0.70E+H	0.713	0.713
D Only	1.188	1.188
Lr Only	0.780	0.780
L Only	1.110	1.110
H Only		

Wood Column

Lic. # : KW-06007346

File: JSA HEARTLAND DENTAL LS.ec6
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J&S STRUCTURAL ENGINEERS, P.A.

DESCRIPTION: typical stud wall

Code References

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

General Information

Analysis Method : Allowable Stress Design				Wood Section Name 2x6	
End Fixities Top & Bottom Pinned				Wood Grading/Manuf. Graded Lumber	
Overall Column Height		12 ft		Wood Member Type Sawn	
(Used for non-slender calculations)					
Wood Species Douglas Fir-Larch		Exact Width 1.50 in Allow Stress Modification Factors			
Wood Grade No.2		Exact Depth 5.50 in Cf or Cv for Bending 1.30			
Fb +	900 psi	Fv	180 psi	Area	8.250 in^2 Cf or Cv for Compression 1.10
Fb -	900 psi	Ft	575 psi	Ix	20.797 in^4 Cf or Cv for Tension 1.30
Fc - Prll	1350 psi	Density	31.21 pcf	Iy	1.547 in^4 Cm : Wet Use Factor 1.0
Fc - Perp	625 psi				Ct : Temperature Factor 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial		Cfu : Flat Use Factor 1.0
Basic	1600	1600	1600 ksi		Kf : Built-up columns 1.0 NDS 15.3.2
Minimum	580	580			Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :					
				X-X (width) axis :	Fully braced against buckling ABOUT Y-Y Axis
				Y-Y (depth) axis :	Unbraced Length for buckling ABOUT X-X Axis = 12 ft, K = 1.0

Applied Loads

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

Column self weight included : 21.457 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 12.0 ft, D = 0.6650, Lr = 0.6650, L = 0.7860 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, W = 0.03330 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.4415 : 1**
 Load Combination **+D+0.750Lr+0.750L+0.450W+H**
 Governing NDS Formula **1Comp + Mxx, NDS Eq. 3.9-3**
 Location of max.above base **5.960 ft**
 At maximum location values are . . .
 Applied Axial **1.775 k**
 Applied Mx **0.2697 k-ft**
 Applied My **0.0 k-ft**
 Fc : Allowable **647.07 psi**

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.1998 k	Bottom along Y-Y	0.1998 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y	0.4719 in	at	6.040 ft	above base
for load combination : W Only				
Along X-X	0.0 in	at	0.0 ft	above base
for load combination : n/a				

Other Factors used to calculate allowable stresses . . .

<u>Bending</u>	<u>Compression</u>	<u>Tension</u>
----------------	--------------------	----------------

PASS Maximum Shear Stress Ratio = **0.07568 : 1**
 Load Combination **+D+0.60W+H**
 Location of max.above base **0.0 ft**
 Applied Design Shear **21.796 psi**
 Allowable Shear **288.0 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	0.448	0.1390	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+L+H	1.000	0.411	0.2924	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+Lr+H	1.250	0.340	0.2598	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+S+H	1.150	0.365	0.1334	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+H	1.250	0.340	0.3411	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+H	1.150	0.365	0.2480	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.60W+H	1.600	0.272	0.3628	PASS	5.960 ft	0.07568	PASS	0.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.272	0.4415	PASS	5.960 ft	0.05676	PASS	12.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.272	0.3511	PASS	5.960 ft	0.05676	PASS	12.0 ft

Wood Column

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J&S STRUCTURAL ENGINEERS, P.A.

DESCRIPTION: typical stud wall

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+0.60W+0.60H	1.600	0.272	0.3344	PASS	5.960 ft	0.07568	PASS	0.0 ft
+D+0.70E+0.60H	1.600	0.272	0.1286	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.272	0.2390	PASS	0.0 ft	0.0	PASS	12.0 ft
+0.60D+0.70E+H	1.600	0.272	0.07715	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		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						0.686					
+D+L+H						1.472					
+D+Lr+H						1.351					
+D+S+H						0.686					
+D+0.750Lr+0.750L+H						1.775					
+D+0.750L+0.750S+H						1.276					
+D+0.60W+H				0.120	0.120	0.686					
+D+0.750Lr+0.750L+0.450W+H				0.090	0.090	1.775					
+D+0.750L+0.750S+0.450W+H				0.090	0.090	1.276					
+0.60D+0.60W+0.60H				0.120	0.120	0.412					
+D+0.70E+0.60H						0.686					
+D+0.750L+0.750S+0.5250E+H						1.276					
+0.60D+0.70E+H						0.412					
D Only						0.686					
Lr Only						0.665					
L Only						0.786					
S Only											
W Only				0.200	0.200						
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
+D+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+Lr+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750Lr+0.750L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.60W+H	0.0000	in	0.000 ft	0.2832	in	6.040 ft
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000 ft	0.2124	in	6.040 ft
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000 ft	0.2124	in	6.040 ft
+0.60D+0.60W+0.60H	0.0000	in	0.000 ft	0.2832	in	6.040 ft
+D+0.70E+0.60H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+0.60D+0.70E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
D Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
Lr Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
L Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
S Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
W Only	0.0000	in	0.000 ft	0.4719	in	6.040 ft
E Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
H Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft

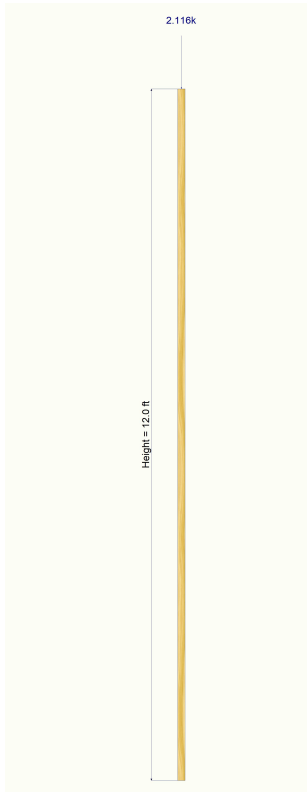
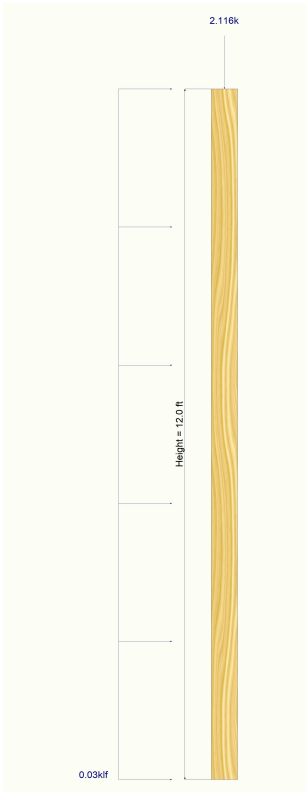
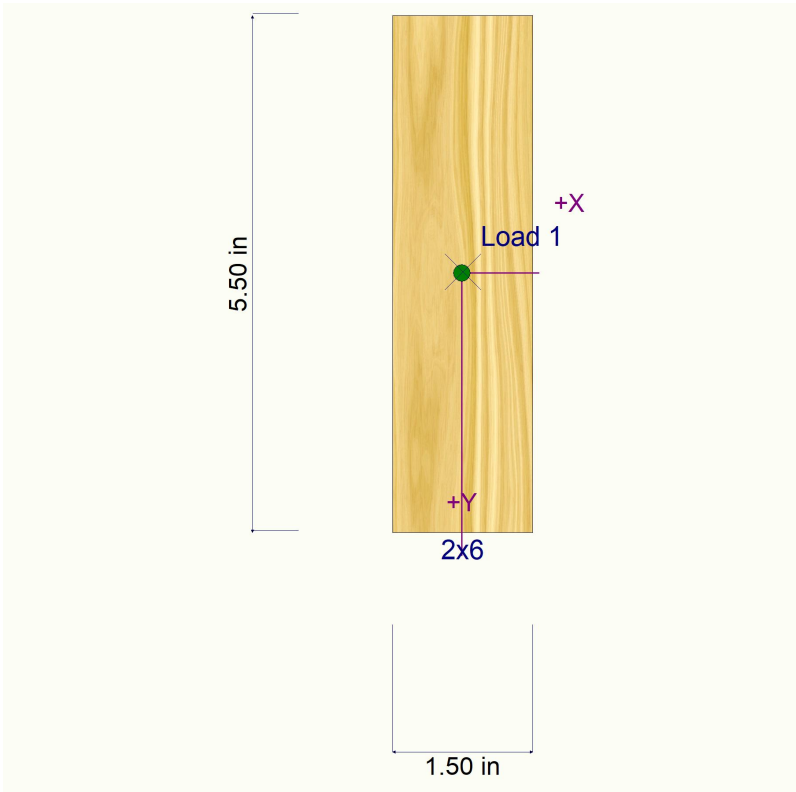
Wood Column

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J&S STRUCTURAL ENGINEERS, P.A.

DESCRIPTION: typical stud wall

Sketches



Wood Column

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Lic. # : KW-06007346

DESCRIPTION: 4'-0" jamb

Code References

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

General Information

Analysis Method : Allowable Stress Design				Wood Section Name 2-2x6	
End Fixities Top & Bottom Pinned				Wood Grading/Manuf. Graded Lumber	
Overall Column Height		12 ft		Wood Member Type Sawn	
(Used for non-slender calculations)					
Wood Species Douglas Fir-Larch		Exact Width 3.0 in Allow Stress Modification Factors			
Wood Grade No.2		Exact Depth 5.50 in Cf or Cv for Bending 1.30			
Fb +	900.0 psi	Fv	180.0 psi	Area	16.50 in^2 Cf or Cv for Compression 1.10
Fb -	900.0 psi	Ft	575.0 psi	Ix	41.594 in^4 Cf or Cv for Tension 1.30
Fc - Prll	1,350.0 psi	Density	31.210 pcf	Iy	12.375 in^4 Cm : Wet Use Factor 1.0
Fc - Perp	625.0 psi				Ct : Temperature Factor 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial		Cfu : Flat Use Factor 1.0
Basic	1,600.0	1,600.0	1,600.0 ksi		Kf : Built-up columns 1.0 NDS 15.3.2
Minimum	580.0	580.0			Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :					
				X-X (width) axis :	Fully braced against buckling ABOUT Y-Y Axis
				Y-Y (depth) axis :	Unbraced Length for buckling ABOUT X-X Axis = 12 ft, K = 1.0

Applied Loads

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

Column self weight included : 42.914 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 12.0 ft, D = 0.6650, Lr = 0.6650, L = 0.7860 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, W = 0.050 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.2483 : 1	Maximum SERVICE Lateral Load Reactions . .		
	Load Combination	+D+0.60W+H	Top along Y-Y	0.30 k	Bottom along Y-Y 0.30 k
	Governing NDS Formula	1Comp + Mxx, NDS Eq. 3.9-3	Top along X-X	0.0 k	Bottom along X-X 0.0 k
	Location of max.above base	5.960 ft	Maximum SERVICE Load Lateral Deflections . . .		
	At maximum location values are . . .		Along Y-Y	0.3543 in at 6.040 ft above base	
	Applied Axial	0.7079 k	for load combination : W Only		
	Applied Mx	0.540 k-ft	Along X-X	0.0 in at 0.0 ft above base	
	Applied My	0.0 k-ft	for load combination : n/a		
	Fc : Allowable	647.07 psi	Other Factors used to calculate allowable stresses . .		
PASS	Maximum Shear Stress Ratio =	0.05682 : 1	Bending	Compression	Tension
	Load Combination	+D+0.60W+H			
	Location of max.above base	12.0 ft			
	Applied Design Shear	16.364 psi			
	Allowable Shear	288.0 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	0.448	0.07169	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+L+H	1.000	0.411	0.1483	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+Lr+H	1.250	0.340	0.1319	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+S+H	1.150	0.365	0.06879	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+H	1.250	0.340	0.1726	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+H	1.150	0.365	0.1261	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.60W+H	1.600	0.272	0.2483	PASS	5.960 ft	0.05682	PASS	12.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.272	0.2318	PASS	5.960 ft	0.04261	PASS	12.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.272	0.2083	PASS	5.960 ft	0.04261	PASS	12.0 ft

Wood Column

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Lic. # : KW-06007346

DESCRIPTION: 4'-0" jamb

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+0.60W+0.60H	1.600	0.272	0.2392	PASS	5.960 ft	0.05682	PASS	12.0 ft
+D+0.70E+0.60H	1.600	0.272	0.06631	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.272	0.1215	PASS	0.0 ft	0.0	PASS	12.0 ft
+0.60D+0.70E+H	1.600	0.272	0.03978	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		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						0.708					
+D+L+H						1.494					
+D+Lr+H						1.373					
+D+S+H						0.708					
+D+0.750Lr+0.750L+H						1.796					
+D+0.750L+0.750S+H						1.297					
+D+0.60W+H				0.180	0.180	0.708					
+D+0.750Lr+0.750L+0.450W+H				0.135	0.135	1.796					
+D+0.750L+0.750S+0.450W+H				0.135	0.135	1.297					
+0.60D+0.60W+0.60H				0.180	0.180	0.425					
+D+0.70E+0.60H						0.708					
+D+0.750L+0.750S+0.5250E+H						1.297					
+0.60D+0.70E+H						0.425					
D Only						0.708					
Lr Only						0.665					
L Only						0.786					
S Only											
W Only				0.300	0.300						
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
+D+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+Lr+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750Lr+0.750L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.60W+H	0.0000	in	0.000 ft	0.2126	in	6.040 ft
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000 ft	0.1594	in	6.040 ft
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000 ft	0.1594	in	6.040 ft
+0.60D+0.60W+0.60H	0.0000	in	0.000 ft	0.2126	in	6.040 ft
+D+0.70E+0.60H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+0.60D+0.70E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
D Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
Lr Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
L Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
S Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
W Only	0.0000	in	0.000 ft	0.3543	in	6.040 ft
E Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
H Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft

Wood Column

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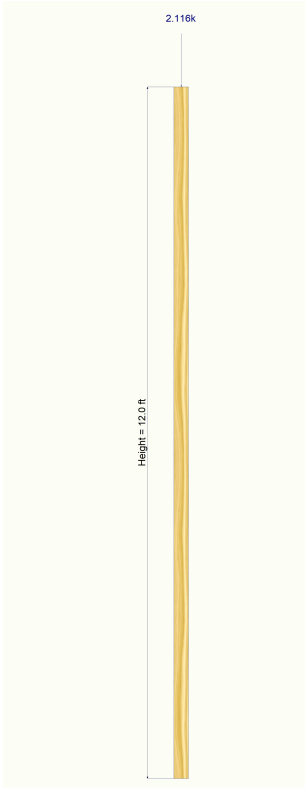
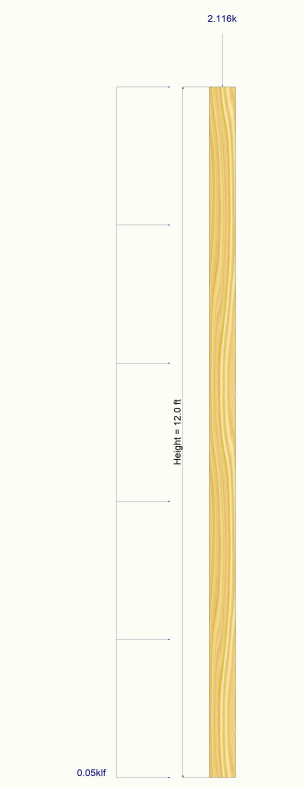
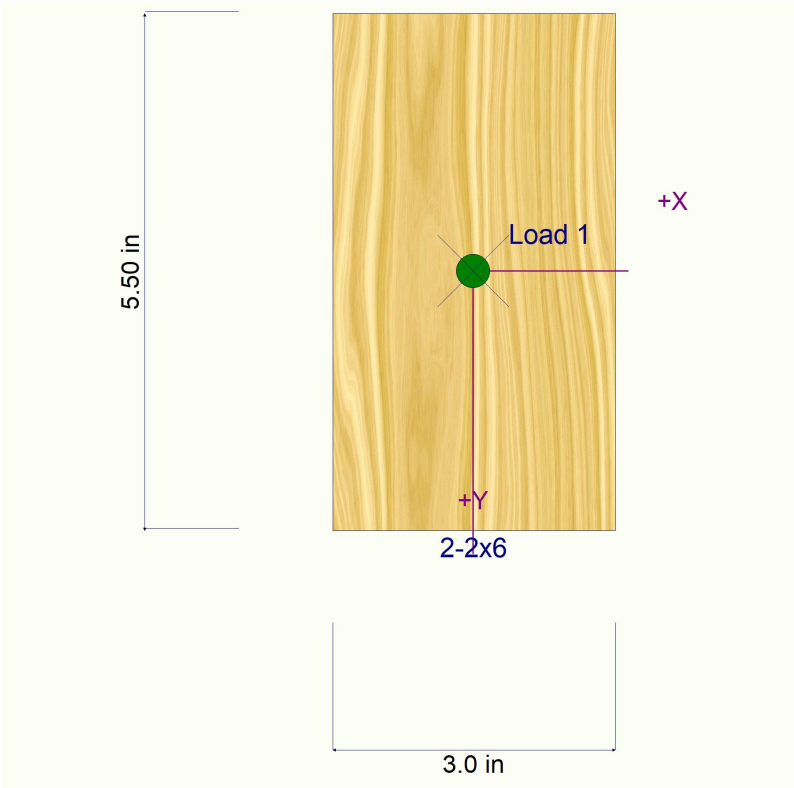
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J&S STRUCTURAL ENGINEERS, P.A.

DESCRIPTION: 4'-0" jamb

Sketches



Wood Column

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DESCRIPTION: 10'-0" jamb

Code References

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

General Information

Analysis Method : Allowable Stress Design				Wood Section Name 4-2x6	
End Fixities Top & Bottom Pinned				Wood Grading/Manuf. Graded Lumber	
Overall Column Height		12 ft		Wood Member Type Sawn	
(Used for non-slender calculations)					
Wood Species Douglas Fir-Larch		Exact Width 6.0 in Allow Stress Modification Factors			
Wood Grade No.2		Exact Depth 5.50 in Cf or Cv for Bending 1.30			
Fb +	900.0 psi	Fv	180.0 psi	Area	33.0 in^2 Cf or Cv for Compression 1.10
Fb -	900.0 psi	Ft	575.0 psi	Ix	83.188 in^4 Cf or Cv for Tension 1.30
Fc - Prll	1,350.0 psi	Density	31.210 pcf	Iy	99.0 in^4 Cm : Wet Use Factor 1.0
Fc - Perp	625.0 psi				Ct : Temperature Factor 1.0
E : Modulus of Elasticity . . .		x-x Bending	y-y Bending	Axial	Cfu : Flat Use Factor 1.0
	Basic	1,600.0	1,600.0	1,600.0 ksi	Kf : Built-up columns 1.0 NDS 15.3.2
	Minimum	580.0	580.0		Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :					
				X-X (width) axis :	Fully braced against buckling ABOUT Y-Y Axis
				Y-Y (depth) axis :	Unbraced Length for buckling ABOUT X-X Axis = 12 ft, K = 1.0

Applied Loads

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

Column self weight included : 85.828 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 12.0 ft, D = 0.6650, Lr = 0.6650, L = 0.7860 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, W = 0.1250 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2970 : 1**
 Load Combination +D+0.60W+H
 Governing NDS Formula **1Comp + Mxx, NDS Eq. 3.9-3**
 Location of max.above base 5.960 ft
 At maximum location values are . . .
 Applied Axial 0.7508 k
 Applied Mx 1.350 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 647.07 psi

Maximum SERVICE Lateral Load Reactions . .
 Top along Y-Y 0.750 k Bottom along Y-Y 0.750 k
 Top along X-X 0.0 k Bottom along X-X 0.0 k

Maximum SERVICE Load Lateral Deflections . . .
 Along Y-Y 0.4429 in at 6.040 ft above base
 for load combination : **W Only**
 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 = **0.07102 : 1**
 Load Combination +D+0.60W+H
 Location of max.above base 12.0 ft
 Applied Design Shear 20.455 psi
 Allowable Shear 288.0 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	0.448	0.03802	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+L+H	1.000	0.411	0.07630	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+Lr+H	1.250	0.340	0.06804	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+S+H	1.150	0.365	0.03648	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+H	1.250	0.340	0.08837	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+H	1.150	0.365	0.06512	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.60W+H	1.600	0.272	0.2970	PASS	5.960 ft	0.07102	PASS	12.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.272	0.2407	PASS	5.960 ft	0.05327	PASS	12.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.272	0.2318	PASS	5.960 ft	0.05327	PASS	12.0 ft

Wood Column

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J&S STRUCTURAL ENGINEERS, P.A.

DESCRIPTION: 10'-0" jamb

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+0.60W+0.60H	1.600	0.272	0.2922	PASS	5.960 ft	0.07102	PASS	12.0 ft
+D+0.70E+0.60H	1.600	0.272	0.03516	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.272	0.06277	PASS	0.0 ft	0.0	PASS	12.0 ft
+0.60D+0.70E+H	1.600	0.272	0.02110	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		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						0.751					
+D+L+H						1.537					
+D+Lr+H						1.416					
+D+S+H						0.751					
+D+0.750Lr+0.750L+H						1.839					
+D+0.750L+0.750S+H						1.340					
+D+0.60W+H				0.450	0.450	0.751					
+D+0.750Lr+0.750L+0.450W+H				0.338	0.338	1.839					
+D+0.750L+0.750S+0.450W+H				0.338	0.338	1.340					
+0.60D+0.60W+0.60H				0.450	0.450	0.450					
+D+0.70E+0.60H						0.751					
+D+0.750L+0.750S+0.5250E+H						1.340					
+0.60D+0.70E+H						0.450					
D Only						0.751					
Lr Only						0.665					
L Only						0.786					
S Only											
W Only				0.750	0.750						
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
+D+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+Lr+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750Lr+0.750L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.60W+H	0.0000	in	0.000 ft	0.2657	in	6.040 ft
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000 ft	0.1993	in	6.040 ft
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000 ft	0.1993	in	6.040 ft
+0.60D+0.60W+0.60H	0.0000	in	0.000 ft	0.2657	in	6.040 ft
+D+0.70E+0.60H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+0.60D+0.70E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
D Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
Lr Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
L Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
S Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
W Only	0.0000	in	0.000 ft	0.4429	in	6.040 ft
E Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
H Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft

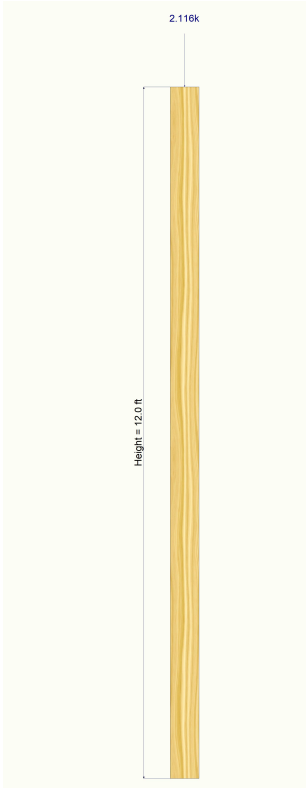
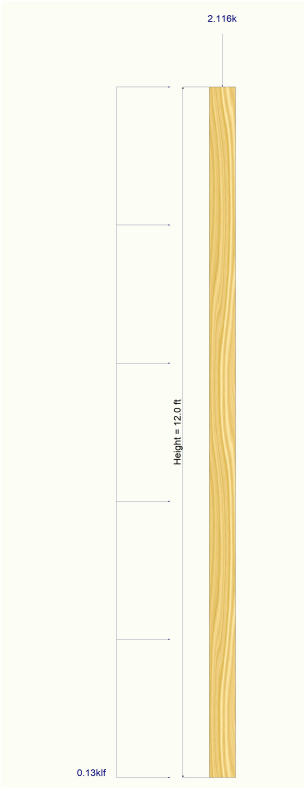
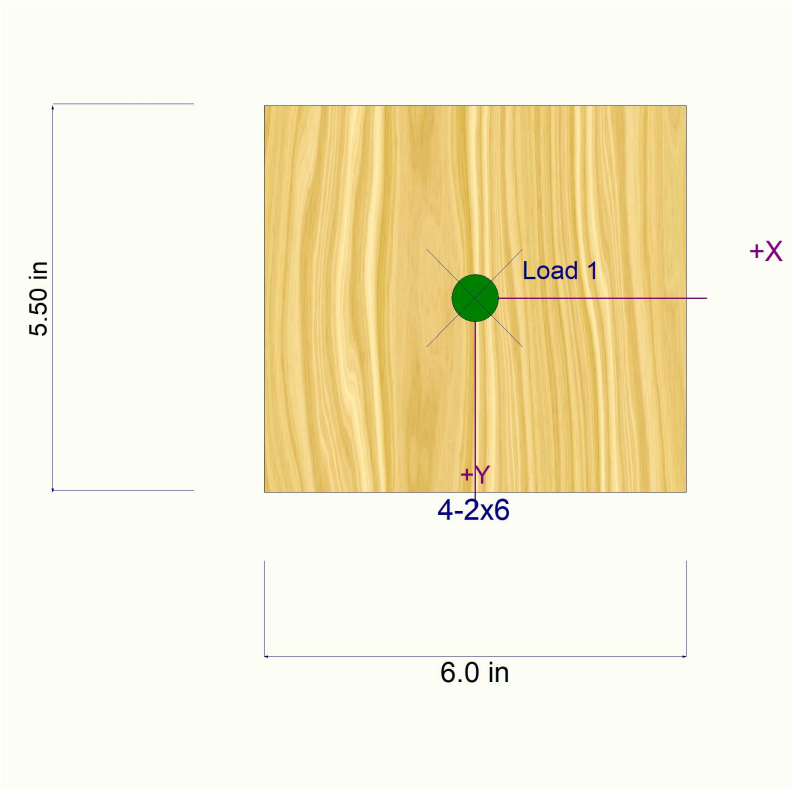
Wood Column

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J&S STRUCTURAL ENGINEERS, P.A.

DESCRIPTION: 10'-0" jamb

Sketches



 J&S STRUCTURAL ENGINEERS 6640 W 143 rd St Suite 250 Overland Park, KS 66223 913.549.4701	Project Heartland Dental				Job Ref.	
	Section				Sheet no./rev. 1	
	Calc. by K	Date 3/21/2022	Chk'd by	Date	App'd by	Date

Lateral Analysis:

Max X Direction:; $X_{\max} = 146$ ft;

Max Y Direction:; $Y_{\max} = 50$ ft;

Height:; $H = 15.33$ ft;

Parapet Height:; $H_p = 7.17$ ft;

Seismic:

; $C_s = .0187$;

; $w_{t\text{roof}} = 15$ psf;

; $w_{t\text{wall}} = 10$ psf;

; $V_{sx} = C_s \times ((w_{t\text{roof}} \times X_{\max} \times Y_{\max}) + (w_{t\text{wall}} \times 2 \times Y_{\max} \times (H/2 + H_p))) = 2.33$ kips;

; $V_{sy} = C_s \times ((w_{t\text{roof}} \times X_{\max} \times Y_{\max}) + (w_{t\text{wall}} \times 2 \times X_{\max} \times (H/2 + H_p))) = 2.86$ kips;

Wind:

; wind = 18.3 psf;

; $V_{wx} = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times Y_{\max} = 16.85$ kips;

; $V_{wy} = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times X_{\max} = 49.21$ kips;;

Max Lateral load:

; $V_{x\text{max}} = \max(V_{sx} \times .7, V_{wx} \times .6) = 10.11$ kips;

; $V_{y\text{max}} = \max(V_{sy} \times .7, V_{wy} \times .6) = 29.53$ kips

Distribute Load:

; $X1 = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times 25 \text{ ft} \times 0.6 = 5.06$ kips;;;

; $X2 = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times 25 \text{ ft} \times 0.6 = 5.06$ kips;;;

; $Y1 = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times 42.33 \text{ ft} \times 0.6 = 8.56$ kips;;;

; $Y2 = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times 73 \text{ ft} \times 0.6 = 14.76$ kips;

; $Y3 = ((\text{wind} \times H/2) + (\text{wind} \times 1.5 \times H_p)) \times 30.67 \text{ ft} \times 0.6 = 6.20$ kips;



J&S STRUCTURAL ENGINEERS

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Overland Park, KS 66223
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Date: 1/9/22 Page:
Project Name: Heartland Dental
Project No.: 22-
Subject: Lateral Analysis

Computed by: KIM Checked by:

<u>X1</u>			w(dead)= 0.475 (klf)				
V(kips)= 5.06	L(feet)		V(wall)	M(OT)	M(R)	Uplift	
	10.50	2	0.65	10.1	26.2	-1.54	
	7.00	6	0.43	6.7	11.6	-0.71	
	18.92	1	1.17	18.1	85.0	-3.54	
Total Length (ft)= 81.92			v(wall)= 0.062 (klf)				
<u>Y1</u>			w(dead)= 0.165 (klf)				
V(kips)= 8.56	L(feet)		V(wall)	M(OT)	M(R)	Uplift	
	11.00	1	3.42	53.1	10.0	3.92	
	16.50	1	5.14	79.6	22.5	3.46	
	0.00	1	0.00	0.0	0.0	#DIV/0!	
Total Length (ft)= 27.5			v(wall)= 0.311 (klf)				
<u>Y2</u>			w(dead)= 0.165 (klf)				
V(kips)= 14.76	L(feet)		V(wall)	M(OT)	M(R)	Uplift	
	49.00	1	14.76	228.8	198.1	0.63	
	8.00	0	2.41	32.5	5.3	3.41	
	14.00	0	4.22	56.9	16.2	2.91	
Total Length (ft)= 49			v(wall)= 0.301 (klf)				
<u>Y3</u>			w(dead)= 0.165 (klf)			h2=	15.5
V(kips)= 6.20	L(feet)		V(wall)	M(OT)	M(R)	Uplift	
	11.00	1	2.92	45.3	10.0	3.21	
	7.50	1	1.99	30.9	4.6	3.50	
	4.83	1	1.28	19.9	1.9	3.72	
Total Length (ft)= 23.33			v(wall)= 0.266 (klf)				
Footing: Depth =			3.00 M(OT)ftg=			115	
Width =			4.00 M(R)ftg =			25	0.0
Length =			5 SF =			-1	

FND CHECK			w(dead)= 0.165 (klf)			h2= 15.5
V(kips)= 14.76	L(feet)		V(wall)	M(OT)	M(R)	Uplift
	49.00	1	14.76	228.8	198.1	0.63
	3.25	0	0.86	13.4	0.9	3.85
	2.67	0	0.71	11.0	0.6	3.90
Total Length (ft)= 49			v(wall)= 0.301 (klf)			
Footing: Depth =			1.00 M(OT)ftg= 244			
Width =			2.00 M(R)ftg = 558			0.0
Length =			49 SF = 1.29			

Table 4.3A Nominal Unit Shear Capacities for Wood-Frame Shear Walls^{1,3}**Wood-based Panels (Excluding Plywood for G_s)⁴**

Sheathing Material	Minimum Nominal Panel Thickness (in.)	Minimum Fastener Penetration in Framing (in.)	Fastener Type & Size	A SEISMIC								B WIND			
				Panel Edge Fastener Spacing (in.)								Panel Edge Fastener Spacing (in.)			
				6		4		3		2		6	4	3	2
				v_s (plf)	G_s (kips/in.)	v_s (plf)	G_s (kips/in.)	v_s (plf)	G_s (kips/in.)	v_s (plf)	G_s (kips/in.)	v_w (plf)	v_w (plf)	v_w (plf)	v_w (plf)
Wood Structural Panels - Structural ^{4,5}	5/16	1-1/4	Nail (common or galvanized box) 6d	400	13.0	600	18.0	780	23.0	1020	35.0	560	840	1090	1430
	3/8 ²	1-3/8	8d	460	19.0	720	24.0	920	30.0	1220	43.0	645	1010	1290	1710
	7/16 ²			510	16.0	790	21.0	1010	27.0	1340	40.0	715	1105	1415	1875
	15/32			560	14.0	860	18.0	1100	24.0	1460	37.0	785	1205	1540	2045
	15/32	1-1/2	10d	680	22.0	1020	29.0	1330	36.0	1740	51.0	715/2=357 1105/2=552			
Wood Structural Panels - Sheathing ^{4,5}	5/16	1-1/4	6d	360	13.0	540	18.0	700	24.0	900	37.0	505	755	980	1260
	3/8			400	11.0	600	15.0	780	20.0	1020	32.0	560	840	1090	1430
	3/8 ²	1-3/8	8d	440	17.0	640	25.0	820	31.0	1060	45.0	615	895	1150	1485
	7/16 ²			480	15.0	700	22.0	900	28.0	1170	42.0	670	980	1260	1640
	15/32			520	13.0	760	19.0	980	25.0	1280	39.0	730	1065	1370	1790
	19/32	1-1/2	10d	620	22.0	920	30.0	1200	37.0	1540	52.0	870	1290	1680	2155
Plywood Siding	5/16	1-1/4	Nail (galvanized casing) 6d	280	13.0	420	16.0	550	17.0	720	21.0	390	590	770	1010
	3/8	1-3/8	8d	320	16.0	480	18.0	620	20.0	820	22.0	450	670	870	1150
Particleboard Sheathing - (M-S "Exterior Glue" and M-2 "Exterior Glue")	3/8		Nail (common or galvanized box) 6d	240	15.0	360	17.0	460	19.0	600	22.0	335	505	645	840
	3/8		8d	260	18.0	380	20.0	480	21.0	630	23.0	365	530	670	880
	1/2			280	18.0	420	20.0	540	22.0	700	24.0	390	590	755	980
	1/2		10d	370	21.0	550	23.0	720	24.0	920	25.0	520	770	1010	1290
	5/8			400	21.0	610	23.0	790	24.0	1040	26.0	560	855	1105	1455
Fiberboard Sheathing - Structural	1/2		Nail (common or galvanized roofing) 8d common or 11 ga. galv. roofing nail (0.120" x 1-1/2" long x 7/16" head)			340	4.0	460	5.0	520	5.5		475	645	730
	25/32		8d common or 11 ga. galv. roofing nail (0.120" x 1-3/4" long x 7/16" head)			360	4.0	480	5.0	540	5.5		505	670	755

- Nominal unit shear capacities shall be adjusted in accordance with 4.3.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.3.6. For specific requirements, see 4.3.7.1 for wood structural panel shear walls, 4.3.7.2 for particleboard shear walls, and 4.3.7.3 for fiberboard shear walls.
- Shears are permitted to be increased to values shown for 15/32 inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.
- For framing grades other than Douglas Fir-Larch or Southern Pine, reduced nominal unit shear capacities shall be determined by multiplying the tabulated nominal unit shear capacity by the Specific Gravity Adjustment Factor = $[1 - (0.5 - G)]$, where G = Specific Gravity of the framing lumber from the *NDS*. The Specific Gravity Adjustment Factor shall not be greater than 1.
- Apparent shear stiffness values, G_s , are based on nail slip in framing with moisture content less than or equal to 19% at time of fabrication and panel stiffness values for shear walls constructed with OSB panels. When plywood panels are used, G_s values shall be determined in accordance with Appendix A.
- Where moisture content of the framing is greater than 19% at time of fabrication, G_s values shall be multiplied by 0.5.

per ANSI/AF&PA SDPWS-2005 - Section 4.3.3 Unit Shear Capacity, Allowable Stress Design Safety Factor of 2 should be utilized.

HDU/DTT Holdowns



This product is preferable to similar connectors because of
a) easier installation, b) higher loads, c) lower installed cost,
or a combination of these features.

HDU holdowns are pre-deflected during the manufacturing process, virtually eliminating deflection under load due to material stretch. They use Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screws which install easily, reduce fastener slip and provide a greater net section when compared to bolts.

The HDU series of holdowns are designed to replace previous versions of the product such as PHDs as well as bolted holdowns. The HDU2, 4 and 5 are direct replacements for the PHD2, 5 and 6, respectively.

The DTT tension ties are designed for lighter-duty holdown applications on single or 2x posts. The new DTT1Z is installed with nails or Simpson Strong-Tie Strong-Drive SD Connector screws and the DTT2Z installs easily with the Strong-Drive SDS Heavy-Duty Connector screws (included). The DTT1Z holdowns have been tested for use in designed shearwalls and prescriptive braced wall panels as well as prescriptive wood-deck applications (see page 209 for deck applications).

For more information on holdown options, contact Simpson Strong-Tie.

HDU SPECIAL FEATURES:

- **Holdown designs** virtually eliminate deflection due to material stretch.
- Uses Strong-Drive SDS Heavy-Duty Connector screws which install easily, reduce fastener slip, and provide a greater net section area of the post compared to bolts.
- Strong-Drive SDS Heavy-Duty Connector screws are supplied with the holdowns to ensure proper fasteners are used.
- No stud bolts to countersink at openings.

MATERIAL: See table

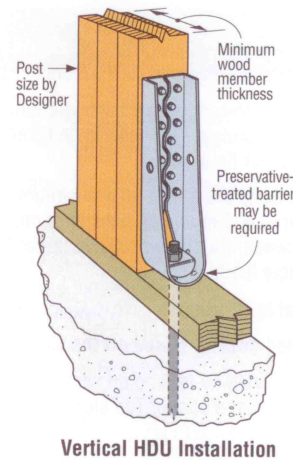
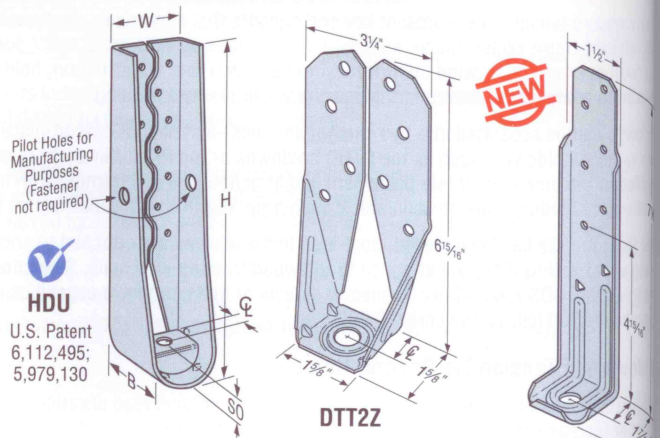
FINISH: HDU – Galvanized; DTT1Z and DTT2Z – ZMAX® coating; DTT2SS – stainless steel

INSTALLATION: • See General Notes on page 45.

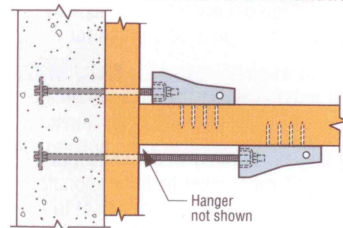
- The HDU requires no additional washer, the DTT requires a standard cut washer (included with DTT2Z) be installed between the nut and the seat.
- Strong-Drive SDS Heavy-Duty Connector screws install best with a low speed high torque drill with a 3/8" hex head driver.

CODES: See page 12 for Code Reference Key Chart.

These products are available with additional corrosion protection. Additional products on this page may also be available with this option, check with Simpson Strong-Tie for details.

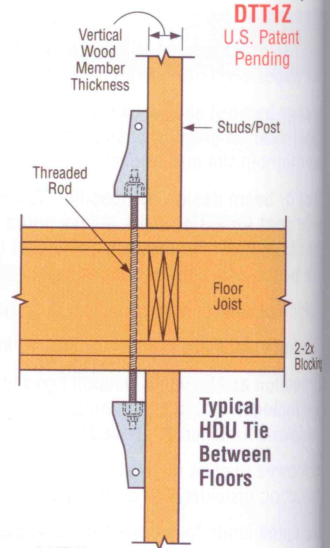


Vertical HDU Installation



Horizontal HDU Offset Installation (Plan View)

See Holdown and Tension Tie General Notes on page 45.



Typical HDU Tie Between Floors

Model No.	Ga	Dimensions (in.)					Fasteners		Minimum Wood Member Thickness ⁴ (in.)	Allowable Tension Loads (160) ¹			Code Ref.
		W	H	B	℄	SO	Anchor Bolt Dia. (in.)	Post Fasteners		DF/SP	SPF/HF	Deflection at Allowable Load (in.)	
DTT1Z	14	1½	7⅞	1⅞	¾	¾	¾	6-SD #9x1½	1½	840	840	0.170	160
								6-10dx1½		910	640	0.167	
								8-10dx1½		910	850	0.167	
DTT2Z	14	3¼	6⅝	1⅝	⅞	¾	½	8-SDS ¼"x1½"	1½	1825	1800	0.105	16, L8, F5
DTT2Z-SDS2.5								8-SDS ¼"x1½"	3	2145	1835	0.128	
	8-SDS ¼"x2½"	3	2145	2105	0.128								
HDU2-SDS2.5	14	3	8⅞	3¼	⅞	⅞	⅝	6-SDS ¼"x2½"	3	3075	2215	0.088	
HDU4-SDS2.5	14	3	10⅝	3¼	⅞	⅞	⅝	10-SDS ¼"x2½"	3	4565	3285	0.114	
HDU5-SDS2.5	14	3	13⅞	3¼	⅞	⅞	⅝	14-SDS ¼"x2½"	3	5645	4065	0.115	
HDU8-SDS2.5	10	3	16⅞	3½	⅞	1½	⅞	20-SDS ¼"x2½"	3	6765	4870	0.084	
									3½	6970	5020	0.116	
									4½	7870	5665	0.113	
HDU11-SDS2.5	10	3	22¼	3½	⅞	1½	1	30-SDS ¼"x2½"	5½	9535	6865	0.137	
									7¼	11175	8045	0.137	
HDU14-SDS2.5	7	3	25⅞	3½	⅞	⅞	1	36-SDS ¼"x2½"	4x6 ^{3,4}	10770	7755	0.122	170
									7¼ ³	14390	10435	0.177	16, L8, F5
									5½ ^{2,3}	14445	10350	0.177	

1. See page 45 for Holdown and Tension Tie General Notes.

2. Noted HDU14 allowable loads are based on a 5 1/2" wide post (6x6 min.).

3. HDU14 requires heavy hex anchor nut to achieve tabulated loads (supplied with holdown).

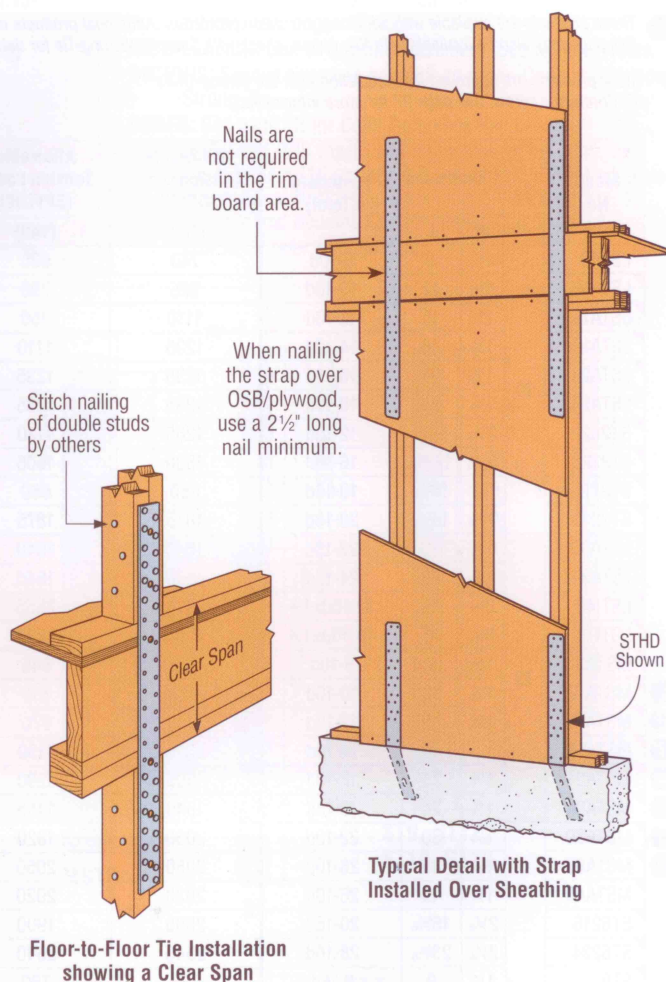
4. Loads are applicable to installation on either narrow or wide face of post.

CODES: See page 12 for Code Reference Key Chart.

These products are approved for installation with the Strong-Drive® SD Connector screw. See page 27 for more information.

Floor-to-Floor Clear Span Table

Model No.	Clear Span	Fasteners (Total)	Allowable Tension Loads (DF/SP)	Allowable Tension Loads (SPF/HF)
			(160)	(160)
MSTA49	18	26-10d	2020	2020
	16	26-10d	2020	2020
MSTC28	18	12-16d sinkers	1155	995
	16	16-16d sinkers	1540	1325
MSTC40	24	20-16d sinkers	2310	1985
	18	28-16d sinkers	2695	2320
	16	32-16d sinkers	3080	2650
MSTC52	24	36-16d sinkers	3465	2980
	18	44-16d sinkers	4235	3645
	16	48-16d sinkers	4620	3975
MSTC66	30	48-16d sinkers	4780	4120
	24	54-16d sinkers	5380	4640
	18	64-16d sinkers	5860	5495
	16	68-16d sinkers	5860	5840
MSTC78	30	64-16d sinkers	5860	5495
	24	72-16d sinkers	5860	5860
	18	76-16d sinkers	5860	5860
MST37	24	14-16d	1725	1495
	18	20-16d	2465	2135
	16	22-16d	2710	2345
MST48	24	26-16d	3215	2780
	18	32-16d	3960	3425
	16	34-16d	4205	3640
MST60	30	34-16d	4605	3995
	24	40-16d	5240	4700
	18	46-16d	6235	5405
MST72	30	48-16d	6505	5640
	24	54-16d	6730	6345
	18	62-16d	6730	6475



These products are available with additional corrosion protection. Additional products on this page may also be available with this option, check with Simpson Strong-Tie for details.

	Model No.	Ga	Dimensions		Fasteners (Total)			Allowable Tension Loads (DF/SP)		Allowable Tension Loads (SPF/HF)		Code Ref.
			W	L	Nails	Bolts		Nails	Bolts	Nails	Bolts	
						Qty	Dia					
	MST27	12	2⅞	27	30-16d	4	½	3700	2165	3200	2000	I4, L3, F2
	MST37		2⅞	37½	42-16d	6	½	5080	3025	4480	2805	
	MST48		2⅞	48	50-16d	8	½	5310	3675	5190	3410	
	MST60	10	2⅞	60	68-16d	10	½	6730	4485	6475	4175	
	MST72		2⅞	72	68-16d	10	½	6730	4485	6475	4175	
	HST2	7	2½	21¼	—	6	¾	—	5220	—	4835	
	HST5		5	21¼	—	12	¾	—	10650	—	9870	
	HST3	3	3	25½	—	6	¾	—	7680	—	6660	
	HST6		6	25½	—	12	¾	—	15470	—	13320	

1. Loads include a 60% load duration increase on the fasteners for wind or earthquake loading.
2. Install bolts or nails as specified by Designer. Bolt and nail values may not be combined.
3. Allowable bolt loads are based on parallel-to-grain loading and these minimum member thicknesses: MST-2 1/2"; HST2 and HST5-4"; HST3 and HST6-4 1/2".
4. Use half of the required nails in each member being connected to achieve the listed loads.
5. When installing strap over wood structural panel sheathing, use 2 1/2" long nail minimum.
6. Tension loads apply for uplift as well when installed vertically.
7. **NAILS:** 16d = 0.162" dia. x 3 3/8" long, 16d Sinker = 0.148" dia. x 3 3/4" long, 10dx1 1/2" = 0.148" dia. x 1 1/2" long. See page 22-23 for other nail sizes and information.



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Engineer:	kj	Page:	1/5
Project:	HD2-SDS2.5 ANCHOR		
Address:			
Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

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: ACI 318-14
Units: Imperial units

Anchor Information:

Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 5.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
 h_{min} (inch): 6.25
 c_{ac} (inch): 8.60
 c_{min} (inch): 1.75
 s_{min} (inch): 2.50

Base Material

Concrete: Normal-weight
Concrete thickness, h (inch): 36.00
State: Uncracked
Compressive strength, f'_c (psi): 3000
 $\Psi_{c,v}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: No
Reinforcement provided at corners: No
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-3G - SET-3G w/ 1/2"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057





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Address:			
Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

Load and Geometry

Load factor source: ACI 318 Section 5.3

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: No

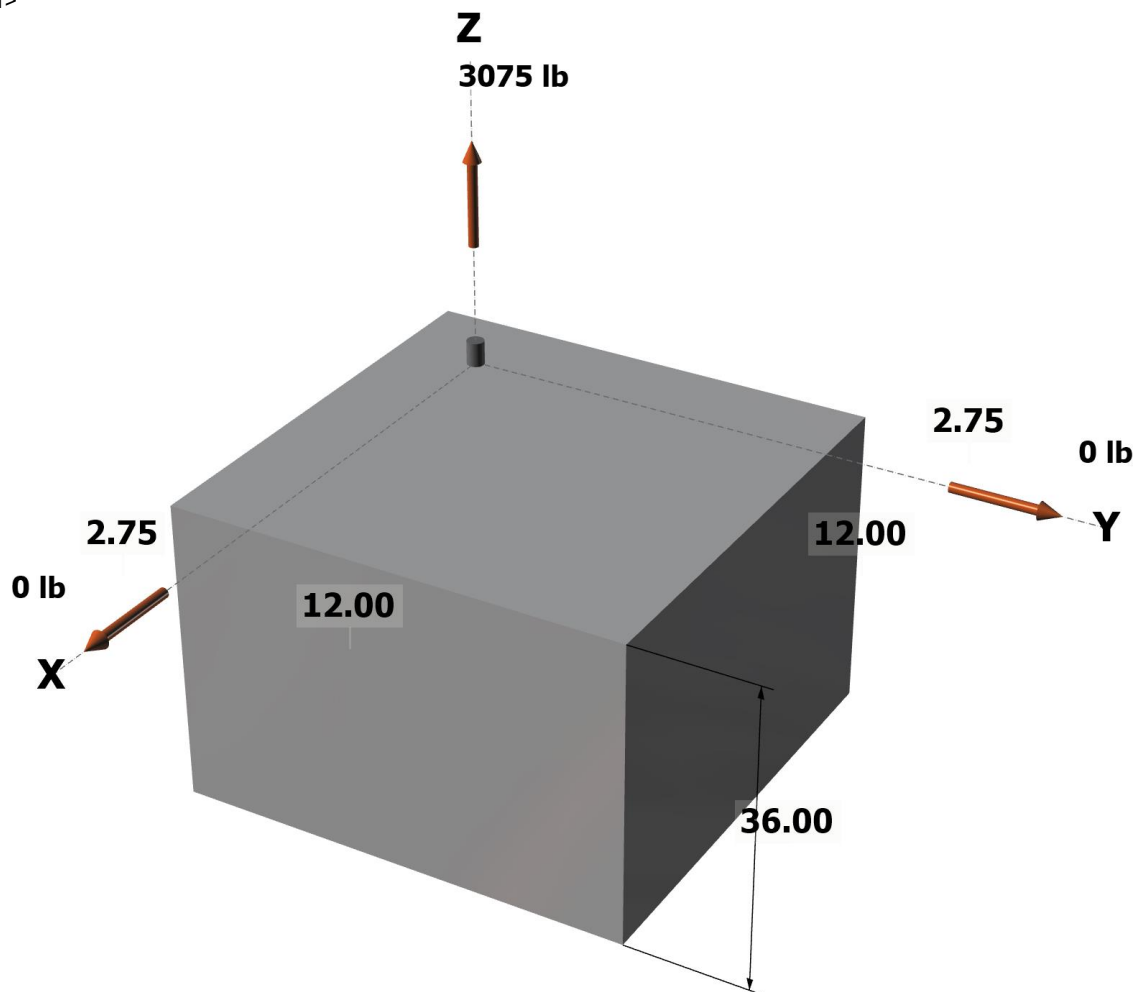
Strength level loads:

N_{ua} [lb]: 3075

V_{uax} [lb]: 0

V_{uay} [lb]: 0

<Figure 1>



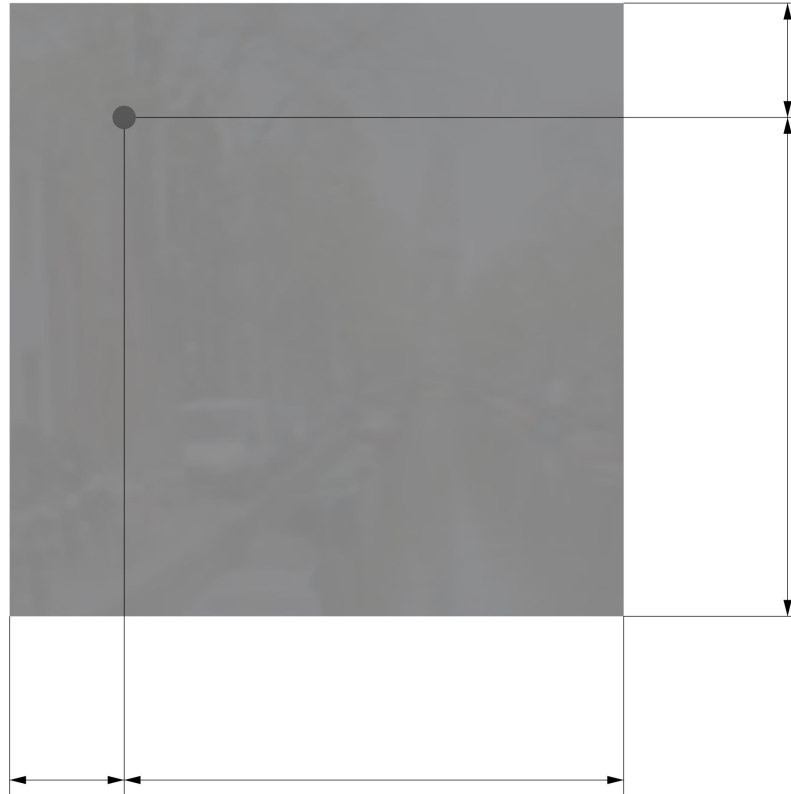
Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

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Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

<Figure 2>





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E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	3075.0	0.0	0.0	0.0
Sum	3075.0	0.0	0.0	0.0

Maximum concrete compression strain (%): 0.00

Maximum concrete compression stress (psi): 0

Resultant tension force (lb): 3075

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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
8235	0.75	6176

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	3000	5.000	14697

$\phi N_{cb} = \phi (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{cp,N} \Psi_{c,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in ²)	A_{Nco} (in ²)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
105.06	225.00	2.75	0.810	1.00	0.872	14697	0.65	3152

6. Adhesive Strength of Anchor in Tension (Sec. 17.4.5)

$\tau_{k,uncr} = \tau_{k,uncr} f_{short-term} K_{sat} (f'_c / 2,500)^n$

$\tau_{k,uncr}$ (psi)	$f_{short-term}$	K_{sat}	f'_c (psi)	n	$\tau_{k,uncr}$ (psi)
2260	1.00	1.00	3000	0.35	2409

$N_{ba} = \lambda_a \tau_{uncr} \pi d_a h_{ef}$ (Eq. 17.4.5.2)

λ_a	τ_{uncr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	2409	0.50	5.000	18920

$\phi N_a = \phi (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{cp,Na} \Psi_{c,Na} N_{ba}$ (Sec. 17.3.1 & Eq. 17.4.5.1a)

A_{Na} (in ²)	A_{Na0} (in ²)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	$\Psi_{c,Na}$	N_{ba} (lb)	ϕ	ϕN_a (lb)
98.34	205.45	7.17	2.75	0.815	0.834	1.00	18920	0.65	4000

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

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Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	3075	6176	0.50	Pass
Concrete breakout	3075	3152	0.98	Pass (Governs)
Adhesive	3075	4000	0.77	Pass

SET-3G w/ 1/2"Ø F1554 Gr. 36 with hef = 5.000 inch meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.



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Project:	H DU4-SDS2.5 ANCHOR		
Address:			
Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

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: ACI 318-14
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-4057
Anchor category: -
Anchor ductility: Yes
 h_{min} (inch): 9.38
 c_{ac} (inch): 13.82
 C_{min} (inch): 1.75
 S_{min} (inch): 3.00

Base Material

Concrete: Normal-weight
Concrete thickness, h (inch): 36.00
State: Uncracked
Compressive strength, f'_c (psi): 3000
 $\Psi_{c,v}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: No
Reinforcement provided at corners: No
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-3G - SET-3G w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057





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Address:			
Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

Load and Geometry

Load factor source: ACI 318 Section 5.3

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: No

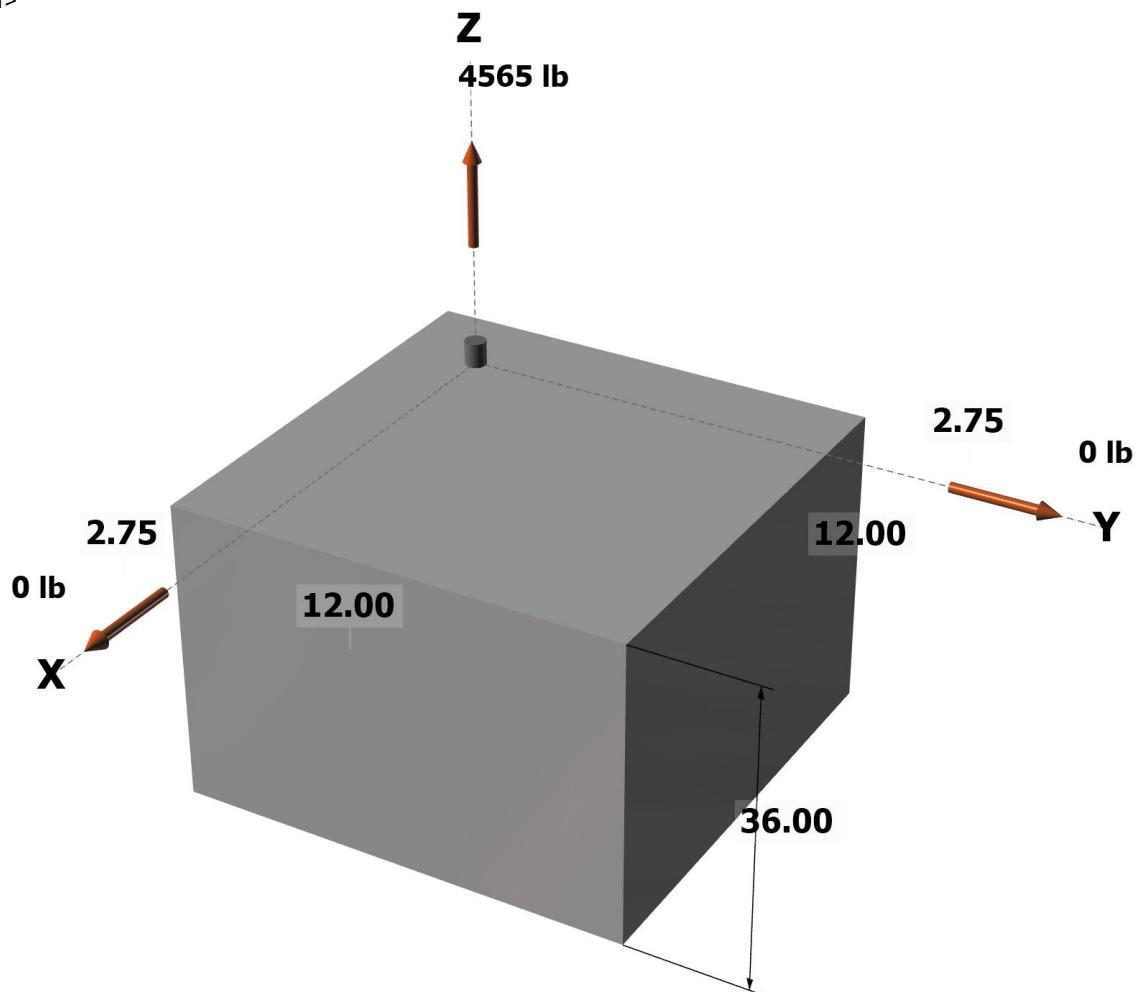
Strength level loads:

N_{ua} [lb]: 4565

V_{uax} [lb]: 0

V_{uay} [lb]: 0

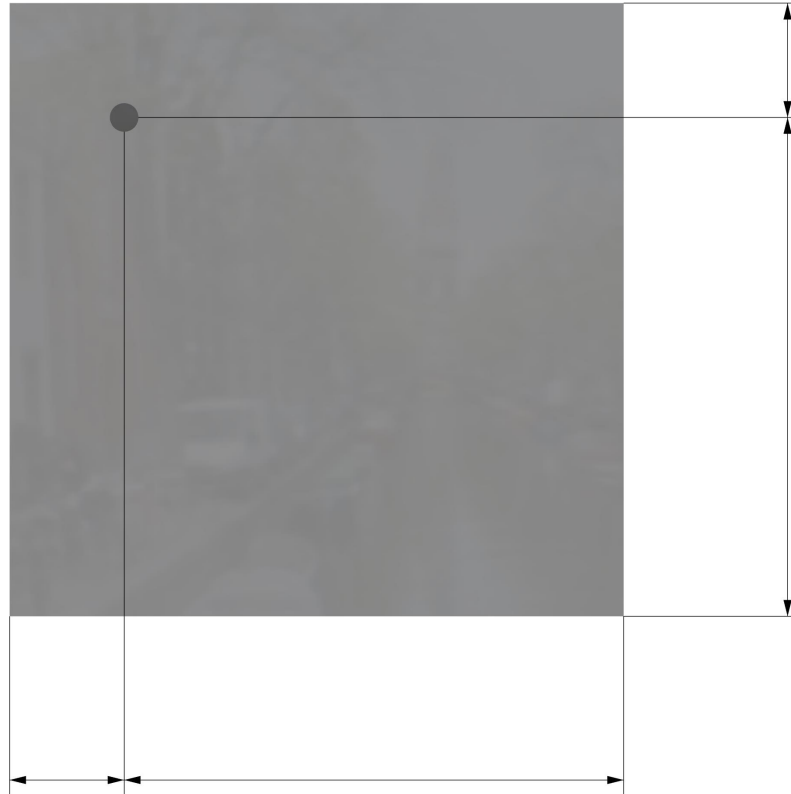
<Figure 1>





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<Figure 2>





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3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	4565.0	0.0	0.0	0.0
Sum	4565.0	0.0	0.0	0.0

Maximum concrete compression strain (%): 0.00

Maximum concrete compression stress (psi): 0

Resultant tension force (lb): 4565

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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13110	0.75	9833

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	3000	8.000	29745

$\phi N_{cb} = \phi (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{cp,N} \Psi_{c,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in ²)	A_{Nco} (in ²)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
217.56	576.00	2.75	0.769	1.00	0.868	29745	0.65	4875

6. Adhesive Strength of Anchor in Tension (Sec. 17.4.5)

$\tau_{k,uncr} = \tau_{k,uncr} f_{short-term} K_{sat} (f'_c / 2,500)^n$

$\tau_{k,uncr}$ (psi)	$f_{short-term}$	K_{sat}	f'_c (psi)	n	$\tau_{k,uncr}$ (psi)
2162	1.00	1.00	3000	0.35	2304

$N_{ba} = \lambda_a \tau_{uncr} \pi d_a h_{ef}$ (Eq. 17.4.5.2)

λ_a	τ_{uncr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	2304	0.63	8.000	36198

$\phi N_a = \phi (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{cp,Na} \Psi_{c,Na} N_{ba}$ (Sec. 17.3.1 & Eq. 17.4.5.1a)

A_{Na} (in ²)	A_{Na0} (in ²)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	ϕ	ϕN_a (lb)
132.53	307.10	8.76	2.75	0.794	0.634	36198	0.65	5113

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

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Project:	H DU4-SDS2.5 ANCHOR		
Address:			
Phone:			
E-mail:	KIM@JSSTRUCTURALENGINEERS.COM		

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	4565	9833	0.46	Pass
Concrete breakout	4565	4875	0.94	Pass (Governs)
Adhesive	4565	5113	0.89	Pass

SET-3G w/ 5/8"Ø F1554 Gr. 36 with hef = 8.000 inch meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.