LIBERTY LAKE RETAIL BUILDING

East County Vista Drive
Liberty Lake, WA

Prepared for: RGU Architecture

Prepared: September 9th, 2016

By: Danny Patterson, P.E.

For Ty Civil, LLC.

September 9th, 2016

The attached calculations include the engineering design performed by For Ty Civil, LLC for the Liberty Lake Retail Building located on East Country Vista Dr. in Liberty Lake, WA.

Project Description and Background

The project involves a single story wood framed retail building with footprint about 210 ft by 60 ft with flat roof. Wood roof joists are supported by a single beam line at center span and conventional wood shear walls are used for lateral resistance to wind and seismic loads. Conventional spread footings are used for foundation system based on geotechnical report provided.

Design Codes

2012 International Building Code
ASCE/SEI 7-10
AISC Steel Construction Manual, 13th Edition
NDS Wood Design 2015

Design Criteria

Roof Snow Load:	40 psf
Importance Factor:	1.0
Wind Load:	85 mph (Ult. 3 sec gust)
Importance Factor:	1.0
Seismic Design Category:	C
Site Class:	D
Importance Factor:	1.0
Short Period Acceleration:	0.4047
Spectral Response Acceleration:	0.1138
Allowable Soil Bearing:	3000 psf

A. Reserved.

B. Design Requirements:

Ground Snow Load*	Wind Speed (Gust)	Seismic Design Category	Weathering	Frost Line Depth	Termites	Decay	Winter Design Temp	Ice Shield Underlay	Flood Hazards	Air Freeze Index	Mean Annual Temp
40 lbs / ft^2	85 mph	C	Severe	24"	Slight to moderate	None to slight	10°	Yes	2010 2003 1992	1232	47.2°

* Minimum roof snow load to be 40 lbs/ft^2 in the City of Liberty Lake.

C. Professional Preparation Of Plans: The City shall require a Washington licensed design professional, licensed under the provisions of RCW 18-08, WAC 308-12 or RCW 18.43, to prepare or oversee the preparation of plans in accordance with the International Building and Residential Codes, including preparing construction contract documents and administering the contract for construction, erection, enlargement, alteration or repairs of or to a building of any occupancy, unless waived by building official.

D. Construction Plans: All submitted construction documents must be of sufficient detail to show the entire project with emphasis on the following:

1. Structural integrity.
2. Life safety.
3. Architectural barriers (ADA handicap compliance).
4. Compliance with all codes having jurisdiction.
5. Scope of work.
6. Special inspection requirements and protocols.
7. Minimum scale of the plans shall be 1/8 inch per foot.

In general, the amount of detail required will vary depending on the nature and complexity of the project.

E. Permits:

1. Ownership: The ownership of a Liberty Lake development permit inure to the property owner. The permit applicant is, by definition, an agent of the property owner, if not the property owner.

2. Expiration of Permits: All permits shall expire based on the administrative sections of the International Building and Residential Codes.

F. Referenced Ordinance: All referenced codes are available for review at Liberty Lake City Hall.

For Ty Civil, LLC.

Project No. 16-07-01 Date 09/08/16 By: KJH Ck. By

Customer Job Description: Liberty Lake Retail

Gravity Loads

Roof Dead Loads:	Weight (psf)
Roofing	2.5
Sheathing, 5/8" th	1.8
Insulation	1.2
Trusses	3.0
Gypsum ceiling	2.8
Misc.	3.7
Total Roof Dead Load	**15.0**

Roof Live Loads:	Weight (psf)
Roof Live Load	20.0
Snow Load	40.0
Snow Drifts*	See Plan

Wall Dead Loads:	Weight (psf)
2x6's	1.5
Sheathing, 15/32"	1.5
Gypsum board	2.8
Insulation	1.2
Adhered Stone	8
Total Wall Load	**15**

* See snow drift calculation sheet attached

Roof Joist Design

Joist Spacing (ft)	2	ft
Joist DL	30.0	plf
Joist LL	40.0	plf
Joist Snow	80.0	plf
Total	110.0	plf
Span	32.0	ft

Stud Wall Design

Trib Length	15.3	ft
Stud Spacing	2.0	ft
Stud DL	458	
Stud LL	610	
Stud Snow	1220	
Max Stud Load	1678	lbs

Beam 1	(grid 2 west	Reaction	Ftg Area	Ftg size
Span	25.0 ft			
Trib	31.0 ft			
DL	465.00	7		
SL	1240.0	16	7.67	3.0

Beam 2	(grid 2 east beams)			
Span	25.0 ft			
Trib	27.0 ft			
DL	405.00	8.5		
SL	1080.0	19.7	9.40	4.0

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ROOF SNOW DRIFT CALCULATIONS

This roof snow drift analysis is based on the 2002 International Building Code (IBC) and ASCE 7-10

These calculations do not address sloped roofs (7.4), partial loadings (7.5), or unbalanced loadings (7.6).

Ground Snow Load, p_g	=	30	psf	Per Building Official, or see IBC 1608.2.
Exposure Factor, C_e	=	1.0		IBC Table 1608.3.1
Thermal Factor, C_t	=	1.0		IBC Table 1608.3.2
Importance Factor, I_s	=	1.0		IBC Table 1604.5
Roof Slope		0.25	"/ft	
Flat Roof Snow Load, p_f	=	21.0	psf	(Eq. 7-1)
Min. Flat Roof Snow Load, pf	=	20.0	psf	Sec. 7.3
Use, p_f'	=	40	psf	Per Building Official, or above value(s).
Snow Density, D	=	17.90	pcf	(Eq. 7-4)
Basic Snow Depth, $h_b = p_f/D$	=	1.17	ft	
p_f' Snow Depth = $h_b = p_f'/D$	=	2.23	ft	used for drift calculations
Unheated overhangs				
Snow Load	=	42.00	psf, uniform	Sec. 7.4.5

Side Wall Parapets

Parapet/Obstruction?		1	1 = YES	
Length of High Roof, lu	=	0	ft	input 0
Length of Low Roof, l_{ul}	=	55	ft	if parapet, lu = upwind roof length
Roof Height, h_0	=	4	ft	
Leeward Drift Depth, h_d	=	0.00	ft	(Eq. Figure 7-9)
Windward Drift Depth, h_d	=	1.96	ft Governs	(Eq. Figure 7-9)*.75 with l_{ul}
Max. Possible Drift Depth, (h_r-h_b), h_c	=	2.83	ft	Sec. 7.1.1
Drift Snow Load, p_d	=	35.1	psf	
Net Snow Depth, (h_b+h_d), h_n	=	4.19	ft	
Snow load, $p_m = h_n * D$	=	75.1	psf, maximum	
Drift Slope, m	=	0.250		Slope of Drift = 1/4
Width of Drift, w	=	7.8	ft	Length of Drift = (pm-pf)/D/m

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Snow Load	=	42.00	psf, uniform	Sec. 7.4.5

End Wall Parapets

Parapet/Obstruction?		1	1 = YES	
Length of High Roof, lu	=	0	ft	input 0
Length of Low Roof, l_{ul}	=	210	ft	if parapet, lu = upwind roof length
Roof Height, h_0	=	4	ft	
Leeward Drift Depth, h_d	=	0.00	ft	(Eq. Figure 7-9)
Windward Drift Depth, h_d	=	3.70	ft	(Eq. Figure 7-9)*.75 with l_{ul}
Max. Possible Drift Depth, (h_r-h_b), h_c	=	2.83	ft Governs	Sec. 7.1.1
Drift Snow Load, p_d	=	50.6	psf	
Net Snow Depth, (h_b+h_d), h_n	=	5.06	ft	
Snow load, $p_m = h_n * D$	=	90.6	psf, maximum	
Drift Slope, m	=	0.146		Slope of Drift = hc^2/(4hd^2) > 0.125
Width of Drift, w	=	19.3	ft	Length of Drift = (pm-pf)/D/m

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Snow Density, D	=	17.90	pcf	(Eq. 7-4)
Basic Snow Depth, $h_b = p_f/D$	=	1.17	ft	
p_f' Snow Depth = $h_b = p_f'/D$	=	2.23	ft	used for drift calculations
Unheated overhangs				
Snow Load	=	42.00	psf, uniform	Sec. 7.4.5

At Front Entry High Roof

Parapet/Obstruction?		0	1 = YES	
Length of High Roof, lu	=	20	ft	
Length of Low Roof, l_{ul}	=	35	ft	
Roof Height, h_0	=	5	ft	
Leeward Drift Depth, h_d	=	1.44	ft	(Eq. Figure 7-9)
Windward Drift Depth, h_d	=	1.53	ft Governs	(Eq. Figure 7-9)*.75 with l_{ul}
Max. Possible Drift Depth, (h_r-h_b), h_c	=	3.83	ft	Sec. 7.1.1
Drift Snow Load, p_d	=	27.4	psf	
Net Snow Depth, (h_b+h_d), h_n	=	3.76	ft	
Snow load, $p_m = h_n * D$	=	67.4	psf, maximum	
Drift Slope, m	=	0.250		Slope of Drift = 1/4
Width of Drift, w	=	6.1	ft	Length of Drift = (pm-pf)/D/m

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

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ASCE 7-05 Simplified Procedure Wind Loads

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Liberty Lake Retail

Analytical Values

Calculations per ASCE 7-05

V : Basic Wind Speed per Sect 6.5.4 & Figure 1	**85.0**	mph	
Roof Slope Angle	0 to 5	degrees	
Occupancy per Table 1-1	II		All Buildings and other structures except those listed as Category I, III, and IV
Importance Factor per Sect. 6.5.5, & Table 6-1	**1.00**		
Exposure Category per 6.5.6.3, .4 & .5	Exposure B		
MRH : Mean Roof Height	22.0	ft	*"Lambda" is interpolated between height tablular values.*
Lambda : per Figure 6.2, Pg 40	**1.00**		
Effective Wind Area of Component & Cladding	10.0	ft^2	
Roof pitch for cladding pressure	0 to 7 degrees		
User specified minimum design pressure	10.0	psf	
Topographic Factor Kzt per 6.5.7.2	**1.00**		
LHD : Least Horizontal Dimension	**68.0**	ft	
a = max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))	**6.80**	ft	max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))

Design Wind Pressures

Minimum Additional Load Case per 6.4.2.1.1 = 10 PSF on entire vertical plane

Horizontal Pressures . . .

Zone: A =	11.50 psf	Zone: C =	10.00 psf
Zone: B =	-10.00 psf	Zone: D =	-10.00 psf

Vertical Pressures . . .

Zone: E =	-13.80 psf	Zone: G =	-10.00 psf
Zone: F =	-10.00 psf	Zone: H =	-10.00 psf

Overhangs . . .

Zone: Eoh =	-19.30 psf	Zone: Goh =	-15.10 psf

Component & Cladding Design Wind Pressures

Minimum Additional Load Case per 6.4.2.1.1 = 10 PSF on entire vertical plane

*Design Wind Pressure = Lambda * Kzt * Importance * Ps30 per ASCE 7-05 6.4.2.1 Eq 6-1*

Roof Zone 1 :	Positive :	10.000 psf
	Negative :	-13.000 psf
Roof Zone 2 :	Positive :	10.000 psf
	Negative :	-21.800 psf
Roof Zone 3 :	Positive :	10.000 psf
	Negative :	-32.800 psf
Wall Zone 4 :	Positive :	13.000 psf
	Negative :	-14.100 psf
Wall Zone 5 :	Positive :	13.000 psf
	Negative :	-17.400 psf
Roof Overhang Zone 2:		-21.000 psf
Roof Overhang Zone 3:		-34.600 psf

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Project ID: 16-004

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ASCE Seismic Base Shear

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Seismic forces

Occupancy Category

Calculations per ASCE 7-05

Occupancy Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *ASCE 7-05, Page 3, Table 1-1*

Occupancy Importance Factor = 1 — *ASCE 7-05, Page 116, Table 11.5-1*

Gridded Ss & S1values from ASCE 7-05, 2006/09

ASCE 7-05 9.4.1.1

Max. Ground Motions, 5% Damping :

S_S = 0.4047 g, 0.2 sec response
S_1 = 0.1138 g, 1.0 sec response

Latitude = 47.656 deg North
Longitude = 117.086 deg West
Location :

Site Class, Site Coeff. and Design Category

Site Classification "D" : Shear Wave Velocity 600 to 1,200 ft/sec = D — *ASCE 7-05 Table 20.3-1*

Site Coefficients Fa & Fv — *ASCE 7-05 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table values)
Fa = 1.48
Fv = 2.34

Maximum Considered Earthquake Acceleration
S_{MS} = Fa * Ss = 0.597 — *ASCE 7-05 Table 11.4-1*
S_{M1} = Fv * S1 = 0.267 — *ASCE 7-05 Table 11.4-2*

Design Spectral Acceleration
S_{DS} = S_{MS} * 2/3 = 0.398 — *ASCE 7-05 Table 11.4-3*
S_{D1} = S_{M1} * 2/3 = 0.178 — *ASCE 7-05 Table 11.4-4*

Seismic Design Category = C — *ASCE 7-05 Table 11.6-1*

Resisting System

ASCE 7-05 Table 12.2-1

Basic Seismic Force Resisting System . . . Bearing Wall Systems
Light-framed walls sheathed w/wood structural panels rated for shear resistance or steel sheets.

Response Modification Coefficient " R " = 6.50
System Overstrength Factor " Wo " = 3.00
Deflection Amplification Factor " Cd " = 4.00

NOTE! See ASCE 7-05 for all applicable footnotes.

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 65
Category "E" Limit:	Limit = 65
Category "F" Limit:	Limit = 65

Lateral Force Procedure

ASCE 7-05 Section 12.8

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-05 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calculation : All Other Structural Systems

" Ct " value = 0.020
" x " value = 0.75
" hn " : Height from base to highest level = 17.0 ft
" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.167 sec
"TL" : Long-period transition period per ASCE 7-05 Maps 22-15 -> 22-20 16.000 sec

Building Period " Ta " Calculated from Approximate Method selected = 0.167 sec

" Cs " Response Coefficient

ASCE 7-05 Section 12.8.1.1

S_{DS}: Short Period Design Spectral Response	=	0.398	From Eq. 12.8-2, Preliminary Cs	=	0.061
" R " : Response Modification Factor	=	6.50	From Eq. 12.8-3 & 12.8-4 , Cs need not exceed	=	0.163
" I " : Occupancy Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.018

Cs : Seismic Response Coefficient = = 0.0613

Seismic Base Shear

ASCE 7-05 Section 12.8.1

Cs = 0.0613 from 12.8.3

W (see Sum Wi below) = 252.00 k

Seismic Base Shear V = Cs * W = 15.44 k

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ASCE Seismic Base Shear

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Vertical Distribution of Seismic Forces

ASCE 7-05 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi) ^k	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	252.00	17.00	4,284.00	1.0000	15.44	15.44	0.00

Sum Wi = 252.00 k Sum Wi * Hi = 4,284.00 k-ft Total Base Shear = 15.44 k

Base Moment = 262.5 k-ft

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

ASCE 7-05 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	252.00	15.44	15.44	252.00	15.44	20.07	40.15	20.07	20.07

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

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

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

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

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

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

For Ty Civil, LLC.

Date 09/08/16

By: KJH

Project No. 16-07-01

Customer

Job Description: Liberty Lake Retail

Lateral Force Distribution

Floor	Roof El.	Trib el.	parapet ht	Total Trib
1	17.67	8.84	4	12.84

Wind pressure zones	Wind Psf	Roof	lb/ft width
	10.0	12.84	128.35

Transverse Direction Shear Walls (Controlled by Wind Forces)

Grid	Tributary width (ft)	Lenth of SW (ft)	Roof (lbs)	1st floor walls **(lb/ft)**	HD force lbs
A	54.5	28	6995	250	**2633**
E	105	54	13477	250	**975**
J	50.5	25	6482	259	**2991**
Story Totals			26954	k	

Longitudinal Direction Shear Walls (10.8k eq force controls)

Grid	Tributary width (sq ft)	Lenth of SW (ft)	Roof (lbs)	1st floor walls **(lb/ft)**	
1	33.5	68	5400	79	
4/7	33.5	43	5400	126	

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
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Project Descr: Single story wood framed retail
Project ID: 16-004

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Wood Column

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Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Typical bearing wall stud

Code References

Calculations per 2012 NDS, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : IBC 2009

General Information

Analysis Method : Allowable Stress Design
End Fixities Top & Bottom Pinned
Overall Column Height 17.330 ft
(Used for non-slender calculations)

Wood Species Douglas Fir - Larch
Wood Grade No.2

Fb - Tension	900.0 psi	Fv	180.0 psi
Fb - Compr	900.0 psi	Ft	575.0 psi
Fc - Prll	1,350.0 psi	Density	31.20 pcf
Fc - Perp	625.0 psi		

E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
Basic	1,600.0	1,600.0	1,600.0 ksi
Minimum	580.0	580.0	

Wood Section Name **2x6**
Wood Grading/Manuf. Graded Lumber
Wood Member Type Sawn

Exact Width	**1.50**	in
Exact Depth	**5.50**	in
Area	8.250	in^2
Ix	20.797	in^4
Iy	1.547	in^4

Allow Stress Modification Factors

Cf or Cv for Bending	0.0
Cf or Cv for Compression	0.0
Cf or Cv for Tension	0.0
Cm : Wet Use Factor	1.0
Ct : Temperature Factor	1.0
Cfu : Flat Use Factor	1.0
Kf : Built-up columns	1.0 NDS 15.3.2
Use Cr : Repetitive ?	No (non-glb only)

Brace condition for deflection (buckling) along columns :
X-X (width) axis : Fully braced against buckling along X-X Axis
Y-Y (depth) axis : Unbraced Length for X-X Axis buckling = 17.330 ft, K = 0.80

Applied Loads

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

Column self weight included : 30.977 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 17.330 ft, Yecc = -0.250 in, D = 0.460, Lr = 0.610, S = 1.220 k
BENDING LOADS . . .
Lat. Uniform Load creating Mx-x, W = 0.0130 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.0** : 1
Load Combination 0.0
Governing NDS Forumla 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Applied Axial 0.0 k
Applied Mx 0.0 k-ft
Applied My 0.0 k-ft
Fc : Allowable 0.0 psi

PASS Maximum Shear Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
Applied Design Shear 0.0 psi
Allowable Shear 0.0 psi

Maximum SERVICE Lateral Load Reactions . .

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

Maximum SERVICE Load Lateral Deflections . . .
Along Y-Y 0.0 in at 8.723 ft above base
for load combination : +D+W+H
Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Axial Reaction @ Base

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

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Wood Column

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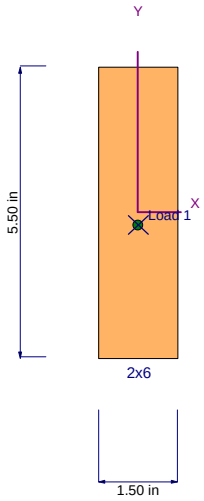
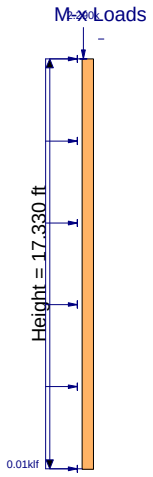
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Typical bearing wall stud

Sketches





Loads are total entered value. Arrows do not reflect absolute direction.

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Beam

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 1

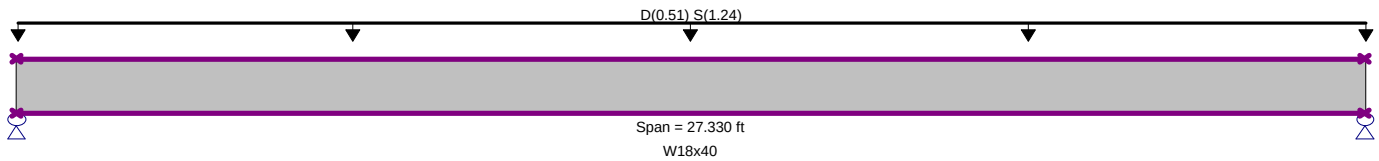
CODE REFERENCES

Calculations per AISC 360-10, IBC 2012, ASCE 7-10
Load Combination Set : IBC 2012

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending
Load Combination IBC 2012

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 calculated and added to loading
Uniform Load : D = 0.510, S = 1.240 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.854 : 1	Maximum Shear Stress Ratio =	0.217 : 1
Section used for this span	W18x40	Section used for this span	W18x40
Ma : Applied	167.125 k-ft	Va : Applied	24.460 k
Mn / Omega : Allowable	195.609 k-ft	Vn/Omega : Allowable	112.770 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	13.665 ft	Location of maximum on span	27.330 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.880 in	Ratio =	372
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.272 in	Ratio =	258
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

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 = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+L+H													
Dsgn. L = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+Lr+H													
Dsgn. L = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+S+H													
Dsgn. L = 27.33 ft	1	0.854	0.217	167.13		167.13	326.67	195.61	1.00	1.00	24.46	169.16	112.77
+D+0.750Lr+0.750L+H													
Dsgn. L = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+0.750L+0.750S+H													
Dsgn. L = 27.33 ft	1	0.706	0.179	138.18		138.18	326.67	195.61	1.00	1.00	20.22	169.16	112.77
+D+0.60W+H													
Dsgn. L = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+0.70E+H													
Dsgn. L = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 27.33 ft	1	0.263	0.067	51.35		51.35	326.67	195.61	1.00	1.00	7.52	169.16	112.77
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 27.33 ft	1	0.706	0.179	138.18		138.18	326.67	195.61	1.00	1.00	20.22	169.16	112.77
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 27.33 ft	1	0.706	0.179	138.18		138.18	326.67	195.61	1.00	1.00	20.22	169.16	112.77
+0.60D+0.60W+0.60H													
Dsgn. L = 27.33 ft	1	0.158	0.040	30.81		30.81	326.67	195.61	1.00	1.00	4.51	169.16	112.77

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Beam

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ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 1

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+0.60H													
Dsgn. L = 27.33 ft	1	0.158	0.040	30.81		30.81	326.67	195.61	1.00	1.00	4.51	169.16	112.77

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	1.2718	13.743		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	24.460	24.460
Overall MINimum	4.509	4.509
+D+H	7.516	7.516
+D+L+H	7.516	7.516
+D+Lr+H	7.516	7.516
+D+S+H	24.460	24.460
+D+0.750Lr+0.750L+H	7.516	7.516
+D+0.750L+0.750S+H	20.224	20.224
+D+0.60W+H	7.516	7.516
+D+0.70E+H	7.516	7.516
+D+0.750Lr+0.750L+0.450W+H	7.516	7.516
+D+0.750L+0.750S+0.450W+H	20.224	20.224
+D+0.750L+0.750S+0.5250E+H	20.224	20.224
+0.60D+0.60W+0.60H	4.509	4.509
+0.60D+0.70E+0.60H	4.509	4.509
D Only	7.516	7.516
Lr Only		
L Only		
S Only	16.945	16.945
W Only		
E Only		
H Only		

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Beam

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 2

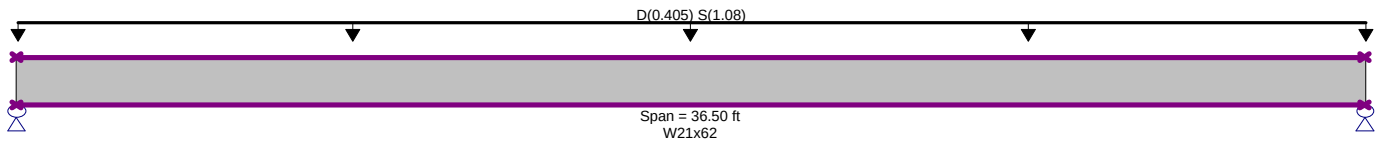
CODE REFERENCES

Calculations per AISC 360-10, IBC 2012, ASCE 7-10
Load Combination Set : IBC 2012

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending
Load Combination : IBC 2012

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 calculated and added to loading
Uniform Load : D = 0.4050, S = 1.080 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.717 : 1	Maximum Shear Stress Ratio =	0.168 : 1
Section used for this span	W21x62	Section used for this span	W21x62
Ma : Applied	257.624 k-ft	Va : Applied	28.233 k
Mn / Omega : Allowable	359.281 k-ft	Vn/Omega : Allowable	168.0 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	18.250 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	1.123 in	Ratio =	389
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.609 in	Ratio =	272
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

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 = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+L+H													
Dsgn. L = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+Lr+H													
Dsgn. L = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+S+H													
Dsgn. L = 36.50 ft	1	0.717	0.168	257.62		257.62	600.00	359.28	1.00	1.00	28.23	252.00	168.00
+D+0.750Lr+0.750L+H													
Dsgn. L = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+0.750L+0.750S+H													
Dsgn. L = 36.50 ft	1	0.592	0.139	212.66		212.66	600.00	359.28	1.00	1.00	23.31	252.00	168.00
+D+0.60W+H													
Dsgn. L = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+0.70E+H													
Dsgn. L = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 36.50 ft	1	0.216	0.051	77.77		77.77	600.00	359.28	1.00	1.00	8.52	252.00	168.00
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 36.50 ft	1	0.592	0.139	212.66		212.66	600.00	359.28	1.00	1.00	23.31	252.00	168.00
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 36.50 ft	1	0.592	0.139	212.66		212.66	600.00	359.28	1.00	1.00	23.31	252.00	168.00
+0.60D+0.60W+0.60H													
Dsgn. L = 36.50 ft	1	0.130	0.030	46.66		46.66	600.00	359.28	1.00	1.00	5.11	252.00	168.00

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Beam

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ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 2

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+0.60H													
Dsgn. L = 36.50 ft	1	0.130	0.030	46.66		46.66	600.00	359.28	1.00	1.00	5.11	252.00	168.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	1.6091	18.354		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	28.233	28.233
Overall MINimum	5.114	5.114
+D+H	8.523	8.523
+D+L+H	8.523	8.523
+D+Lr+H	8.523	8.523
+D+S+H	28.233	28.233
+D+0.750Lr+0.750L+H	8.523	8.523
+D+0.750L+0.750S+H	23.305	23.305
+D+0.60W+H	8.523	8.523
+D+0.70E+H	8.523	8.523
+D+0.750Lr+0.750L+0.450W+H	8.523	8.523
+D+0.750L+0.750S+0.450W+H	23.305	23.305
+D+0.750L+0.750S+0.5250E+H	23.305	23.305
+0.60D+0.60W+0.60H	5.114	5.114
+0.60D+0.70E+0.60H	5.114	5.114
D Only	8.523	8.523
Lr Only		
L Only		
S Only	19.710	19.710
W Only		
E Only		
H Only		

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Column

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ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 2 center post

Code References

Calculations per AISC 360-10, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : IBC 2012

General Information

Steel Section Name : **HSS6x6x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi
Load Combination : IBC 2012

Overall Column Height 16.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for X-X Axis buckling = 16.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for Y-Y Axis buckling = 16.0 ft, K = 1.0

Applied Loads

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

Column self weight included : 304.320 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 16.0 ft, Xecc = 0.500 in, Yecc = 0.500 in, D = 17.0, S = 40.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 0.0 k
Pn / Omega : Allowable 0.0 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 0.0 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 0.0 k-ft

PASS Maximum Shear Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

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

Maximum SERVICE Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
	0.000	PASS	0.00 ft	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Axial Reaction @ Base

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Steel Section Properties : HSS6x6x1/4

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Column

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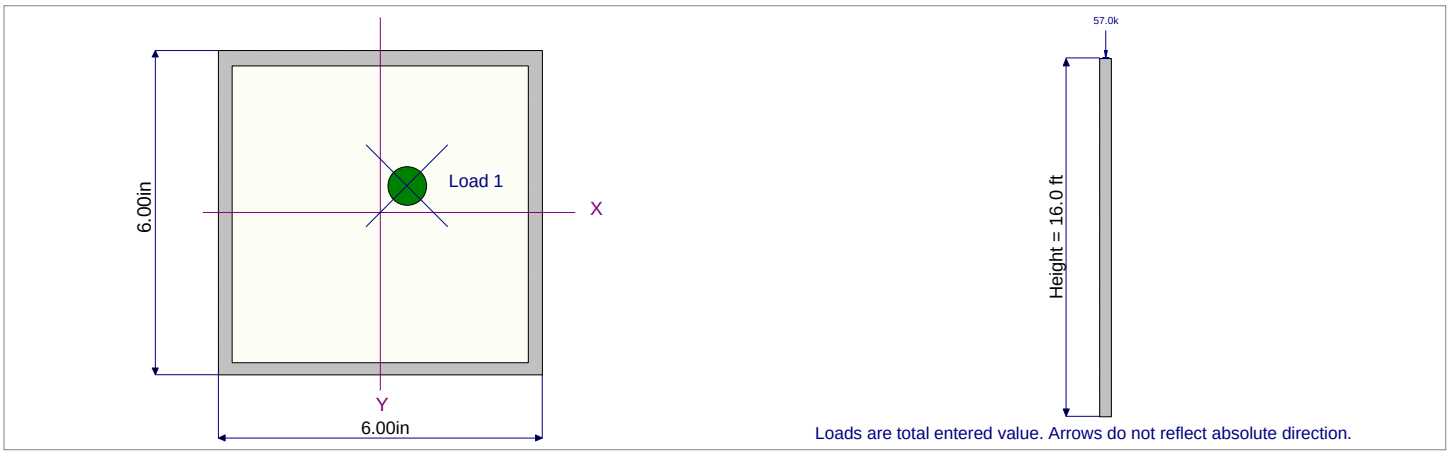
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 2 center post

Steel Section Properties : HSS6x6x1/4

Depth	=	6.000	in	I xx	=	28.60	in^4	J	=	45.600	in^4
				S xx	=	9.54	in^3				
Width	=	6.000	in	R xx	=	2.340	in				
Wall Thick	=	0.250	in	Zx	=	11.200	in^3				
Area	=	5.240	in^2	I yy	=	28.600	in^4	C	=	15.400	in^3
Weight	=	19.020	plf	S yy	=	9.540	in^3				
				R yy	=	2.340	in				
Ycg	=	0.000	in								



For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

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Steel Column

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ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 1 center post

Code References

Calculations per AISC 360-10, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : IBC 2012

General Information

Steel Section Name : **HSS5x5x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi
Load Combination : IBC 2012

Overall Column Height 16.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for X-X Axis buckling = 16.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for Y-Y Axis buckling = 16.0 ft, K = 1.0

Applied Loads

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

Column self weight included : 249.920 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 16.0 ft, Xecc = 0.500 in, Yecc = 0.500 in, D = 14.0, S = 32.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 0.0 k
Pn / Omega : Allowable 0.0 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 0.0 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 0.0 k-ft

PASS Maximum Shear Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

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

Maximum SERVICE Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
	0.000	PASS	0.00 ft	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Axial Reaction @ Base

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Steel Section Properties : HSS5x5x1/4

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Column

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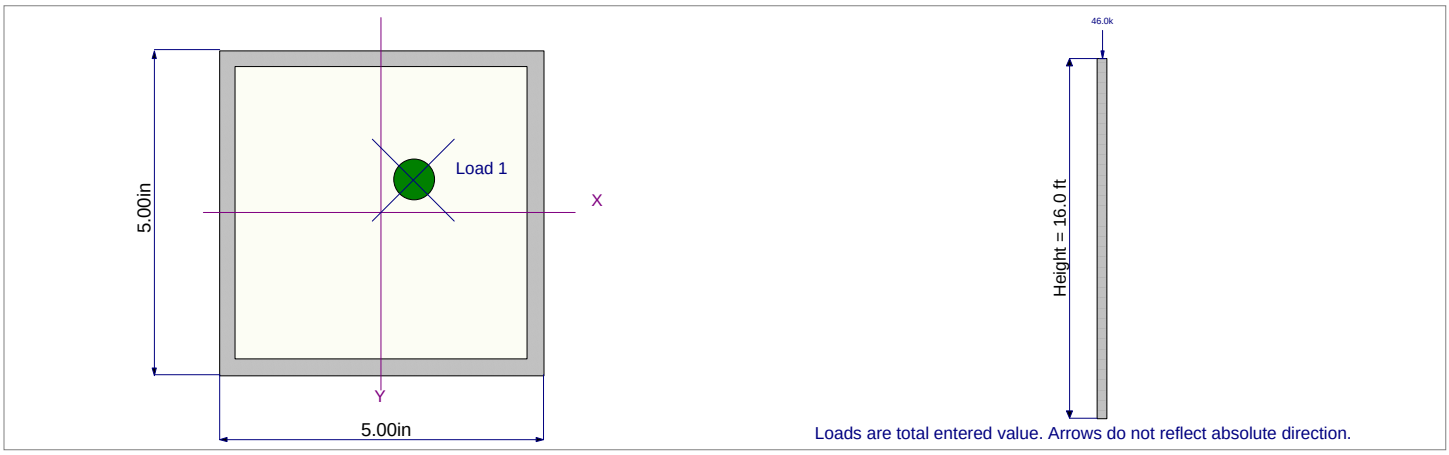
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 1 center post

Steel Section Properties : HSS5x5x1/4

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



For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Column

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 2 end post

Code References

Calculations per AISC 360-10, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : IBC 2012

General Information

Steel Section Name : **HSS5x5x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi
Load Combination : IBC 2012

Overall Column Height 16.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for X-X Axis buckling = 16.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for Y-Y Axis buckling = 16.0 ft, K = 1.0

Applied Loads

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

Column self weight included : 249.920 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 16.0 ft, Xecc = 3.000 in, D = 8.50, S = 20.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 0.0 k
Pn / Omega : Allowable 0.0 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 0.0 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 0.0 k-ft

PASS Maximum Shear Stress Ratio = **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

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

Maximum SERVICE Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio	Status	Location
	0.000	PASS	0.00 ft	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction
	@ Base	@ Top	@ Base	@ Top	@ Base

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Steel Section Properties : HSS5x5x1/4

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Steel Column

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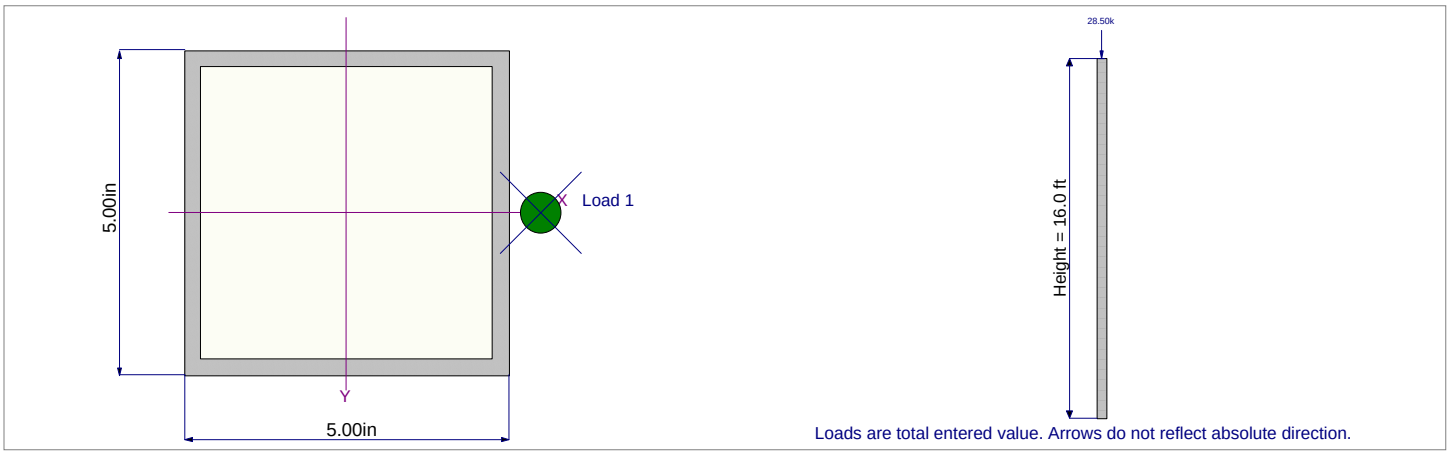
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Beam 2 end post

Steel Section Properties : HSS5x5x1/4

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



For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Wood Beam

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Header 1

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : IBC 2012

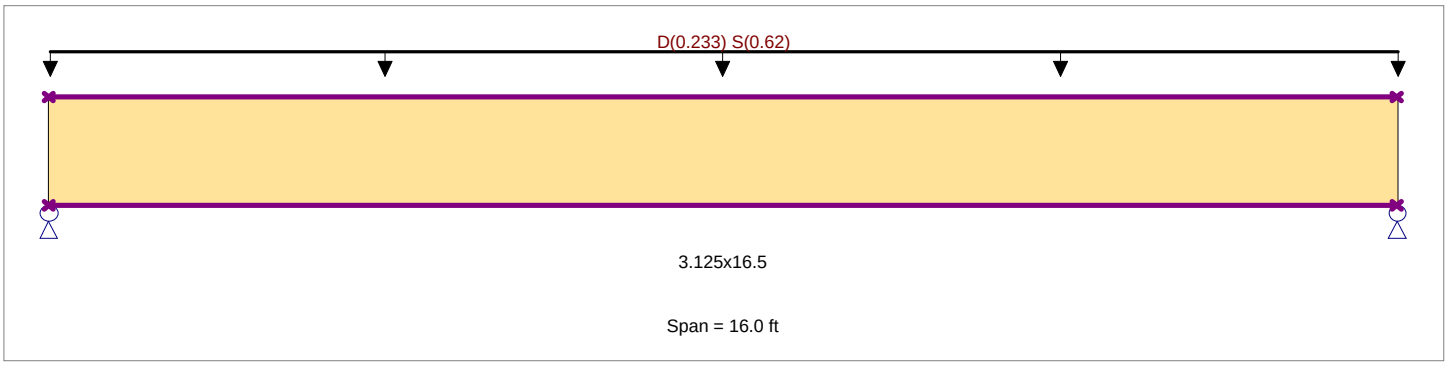
Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2012

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

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

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0 ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	950.0 ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0 ksi
Fv	265.0 psi	Eminbend - yy	850.0 ksi
Ft	1,100.0 psi	Density	31.20 pcf



Applied Loads

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

Uniform Load : D = 0.2330, S = 0.620 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.837 : 1	Maximum Shear Stress Ratio	=	0.542 : 1
Section used for this span		3.125x16.5	Section used for this span		3.125x16.5
fb : Actual	=	2,310.01 psi	fv : Actual	=	165.19 psi
FB : Allowable	=	2,760.00 psi	Fv : Allowable	=	304.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	8.000 ft	Location of maximum on span	=	14.657 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.437 in	Ratio =	439
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.601 in	Ratio =	319
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.292	0.189	0.90	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	2160.00	1.55	45.12	238.50
+D+L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.263	0.170	1.00	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	2400.00	1.55	45.12	265.00
+D+Lr+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.210	0.136	1.25	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	3000.00	1.55	45.12	331.25
+D+S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.837	0.542	1.15	1.000	1.00	1.00	1.00	1.00	1.00	27.30	2,310.01	2760.00	5.68	165.19	304.75
+D+0.750Lr+0.750L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.210	0.136	1.25	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	3000.00	1.55	45.12	331.25
+D+0.750L+0.750S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.685	0.444	1.15	1.000	1.00	1.00	1.00	1.00	1.00	22.34	1,890.25	2760.00	4.65	135.17	304.75

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Wood Beam

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Header 1

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
+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 = 16.0 ft	1	0.164	0.106	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	3840.00	1.55	45.12	424.00
+D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.164	0.106	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	3840.00	1.55	45.12	424.00
+D+0.750Lr+0.750L+0.450W+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.164	0.106	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.46	630.99	3840.00	1.55	45.12	424.00
+D+0.750L+0.750S+0.450W+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.492	0.319	1.60	1.000	1.00	1.00	1.00	1.00	1.00	22.34	1,890.25	3840.00	4.65	135.17	424.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.492	0.319	1.60	1.000	1.00	1.00	1.00	1.00	1.00	22.34	1,890.25	3840.00	4.65	135.17	424.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.099	0.064	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.47	378.59	3840.00	0.93	27.07	424.00
+0.60D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.099	0.064	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.47	378.59	3840.00	0.93	27.07	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.6008	8.058		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	6.824	6.824
Overall MINimum	1.118	1.118
+D+H	1.864	1.864
+D+L+H	1.864	1.864
+D+Lr+H	1.864	1.864
+D+S+H	6.824	6.824
+D+0.750Lr+0.750L+H	1.864	1.864
+D+0.750L+0.750S+H	5.584	5.584
+D+0.60W+H	1.864	1.864
+D+0.70E+H	1.864	1.864
+D+0.750Lr+0.750L+0.450W+H	1.864	1.864
+D+0.750L+0.750S+0.450W+H	5.584	5.584
+D+0.750L+0.750S+0.5250E+H	5.584	5.584
+0.60D+0.60W+0.60H	1.118	1.118
+0.60D+0.70E+0.60H	1.118	1.118
D Only	1.864	1.864
Lr Only		
L Only		
S Only	4.960	4.960
W Only		
E Only		
H Only		

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Wood Beam

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Header 2

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : IBC 2012

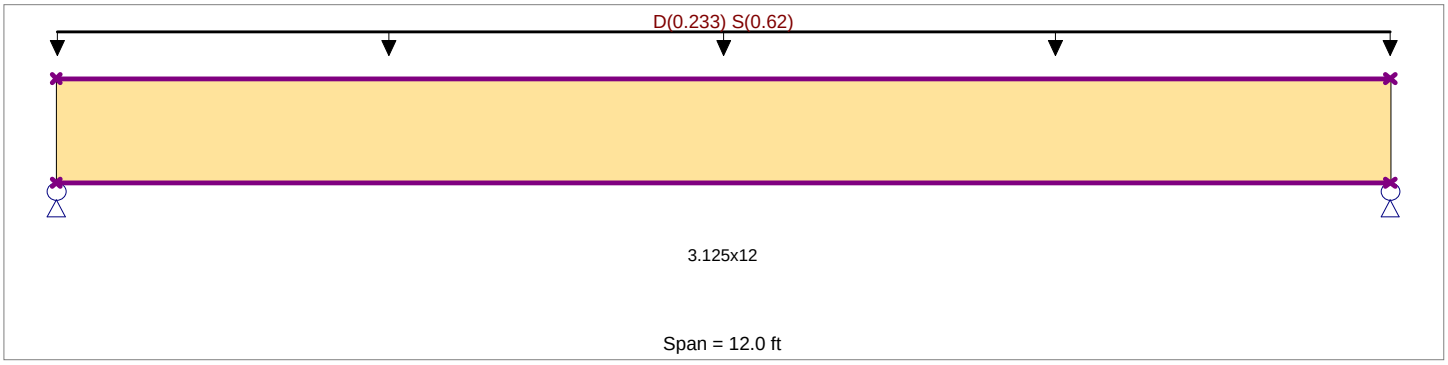
Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2012

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

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

Fb - Tension	2,400.0 psi	*E : Modulus of Elasticity*	
Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0 ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	950.0 ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0 ksi
Fv	265.0 psi	Eminbend - yy	850.0 ksi
Ft	1,100.0 psi	Density	31.20 pcf



Applied Loads

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

Uniform Load : D = 0.2330, S = 0.620 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.890 : 1	Maximum Shear Stress Ratio	=	0.564 : 1
Section used for this span		3.125x12	Section used for this span		3.125x12
fb : Actual	=	2,456.64 psi	fv : Actual	=	171.85 psi
FB : Allowable	=	2,760.00 psi	Fv : Allowable	=	304.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+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	0.359 in	Ratio =	400
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.494 in	Ratio =	291
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.311	0.197	0.90	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	2160.00	1.17	46.94	238.50
+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	0.280	0.177	1.00	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	2400.00	1.17	46.94	265.00
+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	0.224	0.142	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	3000.00	1.17	46.94	331.25
+D+S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.890	0.564	1.15	1.000	1.00	1.00	1.00	1.00	1.00	15.35	2,456.64	2760.00	4.30	171.85	304.75
+D+0.750Lr+0.750L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.224	0.142	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	3000.00	1.17	46.94	331.25
+D+0.750L+0.750S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.728	0.461	1.15	1.000	1.00	1.00	1.00	1.00	1.00	12.56	2,010.24	2760.00	3.52	140.62	304.75

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Wood Beam

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ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Header 2

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
+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	0.175	0.111	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	3840.00	1.17	46.94	424.00
+D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.175	0.111	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	3840.00	1.17	46.94	424.00
+D+0.750Lr+0.750L+0.450W+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	0.175	0.111	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.19	671.04	3840.00	1.17	46.94	424.00
+D+0.750L+0.750S+0.450W+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	0.524	0.332	1.60	1.000	1.00	1.00	1.00	1.00	1.00	12.56	2,010.24	3840.00	3.52	140.62	424.00
+D+0.750L+0.750S+0.5250E+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	0.524	0.332	1.60	1.000	1.00	1.00	1.00	1.00	1.00	12.56	2,010.24	3840.00	3.52	140.62	424.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.105	0.066	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.52	402.62	3840.00	0.70	28.16	424.00
+0.60D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.105	0.066	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.52	402.62	3840.00	0.70	28.16	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.4942	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	5.118	5.118
Overall MINimum	0.839	0.839
+D+H	1.398	1.398
+D+L+H	1.398	1.398
+D+Lr+H	1.398	1.398
+D+S+H	5.118	5.118
+D+0.750Lr+0.750L+H	1.398	1.398
+D+0.750L+0.750S+H	4.188	4.188
+D+0.60W+H	1.398	1.398
+D+0.70E+H	1.398	1.398
+D+0.750Lr+0.750L+0.450W+H	1.398	1.398
+D+0.750L+0.750S+0.450W+H	4.188	4.188
+D+0.750L+0.750S+0.5250E+H	4.188	4.188
+0.60D+0.60W+0.60H	0.839	0.839
+0.60D+0.70E+0.60H	0.839	0.839
D Only	1.398	1.398
Lr Only		
L Only		
S Only	3.720	3.720
W Only		
E Only		
H Only		

For Ty Civil, LLC.

Project Title: Liberty Lake Retail
Engineer: KJH
Project Descr: Single story wood framed retail
Project ID: 16-004

Printed: 8 SEP 2016, 2:40PM

Wood Beam

File = C:\Users\khaiar\DOCUME~1\TEMPJO~1\2016\FUJIYA~1\Calcs\LIBLAK~1.EC6
ENERCALC, INC. 1983-2015, Build:6.15.12.9, Ver:6.15.12.9

Lic. # : KW-06009769 **Licensee : Crux Subsurface**

Description : Header 3

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10
Load Combination Set : IBC 2012

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2012

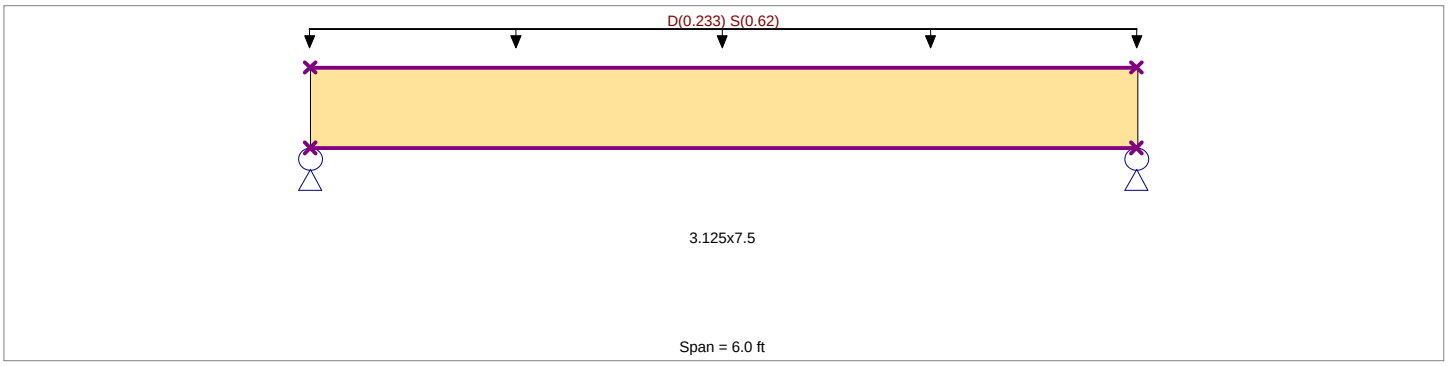
Wood Species : DF/DF
Wood Grade : 24F - V4

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

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

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.20 pcf



Applied Loads

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

Uniform Load : D = 0.2330, S = 0.620 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.570 : 1	Maximum Shear Stress Ratio	=	0.428 : 1
Section used for this span		3.125x7.5	Section used for this span		3.125x7.5
fb : Actual	=	1,572.25 psi	fv : Actual	=	130.30 psi
FB : Allowable	=	2,760.00 psi	Fv : Allowable	=	304.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	3.000 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	0.092 in	Ratio =	782
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.127 in	Ratio =	569
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios									Moment Values			Shear Values		
Segment Length	Span #	M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.199	0.149	0.90	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	2160.00	0.56	35.59	238.50
+D+L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.179	0.134	1.00	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	2400.00	0.56	35.59	265.00
+D+Lr+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.143	0.107	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	3000.00	0.56	35.59	331.25
+D+S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.570	0.428	1.15	1.000	1.00	1.00	1.00	1.00	1.00	3.84	1,572.25	2760.00	2.04	130.30	304.75
+D+0.750Lr+0.750L+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.143	0.107	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	3000.00	0.56	35.59	331.25
+D+0.750L+0.750S+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.466	0.350	1.15	1.000	1.00	1.00	1.00	1.00	1.00	3.14	1,286.55	2760.00	1.67	106.63	304.75

For Ty Civil, LLC.

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Description : Header 3

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
+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 = 6.0 ft	1	0.112	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	3840.00	0.56	35.59	424.00
+D+0.70E+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.112	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	3840.00	0.56	35.59	424.00
+D+0.750Lr+0.750L+0.450W+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.112	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.05	429.47	3840.00	0.56	35.59	424.00
+D+0.750L+0.750S+0.450W+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.335	0.251	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.14	1,286.55	3840.00	1.67	106.63	424.00
+D+0.750L+0.750S+0.5250E+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.335	0.251	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.14	1,286.55	3840.00	1.67	106.63	424.00
+0.60D+0.60W+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.067	0.050	1.60	1.000	1.00	1.00	1.00	1.00	1.00	0.63	257.68	3840.00	0.33	21.36	424.00
+0.60D+0.70E+0.60H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.067	0.050	1.60	1.000	1.00	1.00	1.00	1.00	1.00	0.63	257.68	3840.00	0.33	21.36	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.1265	3.022		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.559	2.559
Overall MINimum	0.419	0.419
+D+H	0.699	0.699
+D+L+H	0.699	0.699
+D+Lr+H	0.699	0.699
+D+S+H	2.559	2.559
+D+0.750Lr+0.750L+H	0.699	0.699
+D+0.750L+0.750S+H	2.094	2.094
+D+0.60W+H	0.699	0.699
+D+0.70E+H	0.699	0.699
+D+0.750Lr+0.750L+0.450W+H	0.699	0.699
+D+0.750L+0.750S+0.450W+H	2.094	2.094
+D+0.750L+0.750S+0.5250E+H	2.094	2.094
+0.60D+0.60W+0.60H	0.419	0.419
+0.60D+0.70E+0.60H	0.419	0.419
D Only	0.699	0.699
Lr Only		
L Only		
S Only	1.860	1.860
W Only		
E Only		
H Only		