STRUCTURAL CALCULATIONS

Bott's Marsh Development
Community Building

Project No. 218368
November 28, 2018

Design Criteria

Location

Building Department ..... City of Wheeler
City ..... Wheeler, Oregon
Longitude ..... 45.69374° West
Latitude ..... 123.88106° North

Applicable Codes

2014 Oregon Structural Specialty Code (OSSC)
American Society of Civil Engineers (ASCE) 7-10, *Minimum Design Loads for Buildings and Other Structures*
American Concrete Institute (ACI) 318-11, *Building Code Requirements for Structural Concrete and Commentary*
American Institute of Steel Construction (AISC), *Steel Construction Manual, 14th Edition*
National Design Specification (NDS) 2012, *Nation Design Specification for Wood Construction*

Design Loads

Gravity Loads

Dead Load

Self Weight per material takeoff

Live Load

Office ..... 65 psf
Assembly Space ..... 100 psf

Snow Loads (per ASCE 7-10)

p_g= 2 psf — Reference location
p_{fmin} = 20 psf — Per OSSC

Wind Loads (per ASCE 7-10)

V= 135 mph	Reference location
Exposure D	Section 26.7
K_{zt}= 1.0	Table 26.8-1

Seismic Loads (per ASCE 7-10)

S_S = 1.317	Per USGS Design Report
S_1 = 0.671	Per USGS Design Report
S_{DS} = 0.790	Per USGS Design Report
S_{D1} = 1.073	Per USGS Design Report
Site Class = F	Per Geotechnical Report

Lateral System: Input Lateral Catergory

R = 6.5	Table 12.2-1
Ω = 3.0	Table 12.2-1
C_d = 4.0	Table 12.2-1

Foundation Design

Based on Geotechnical Report by Chinook GeoServices, Inc. from September 18, 2006.

Mat Foundation

Subgrade Modulus (Kv1)..... 43 kcf
Passive Resistance..... 233 pcf

Project: Wheeler Mill Building
Wheeler, Oregon

Client: Tom Johnson Architect

Date: 8/9/10
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By: CJW
Job #: 218368

MATERIAL TAKE-OFF

- ROOF WEIGHT

40' = ~400 lb @ 4'-0" O.C.

$= \frac{(400)}{(4)(40)} = 2.5 \rightarrow$ USE 3.0 PSF

METAL ROOFING	=	2 PSF
PLYWOOD	=	3 PSF
INSULATION	=	1 PSF
DECKING	=	2 PSF
MISC.	=	1 PSF
		14 PSF

STUD WALL = 12 PSF

FLOOR WEIGHT

FLOORING	=	2 PSF
PLYWOOD	=	3 PSF
FRAMING	=	4 PSF
GYP.	=	3 PSF
MISC.	=	2 PSF
		14 PSF

- LIVE LOAD

OFFICE LIVE LOAD = 50 PSF + 15 PSF (PARTITION) = 65 PSF
ASSEMBLY AREAS = 100 PSF

- SNOW LOAD = 20 PSF (MIN ROOF SNOW)

GIRDER TRUSS REACTIONS

COPAN = 40'

TRIB = 24'/2 + 4'/2 = 14'

W_{DL} = (14 PSF)(14') = 196 PLF

W_{SL} = (20 PSF)(14') = 280 PLF

$R_1 = R_2$ = (196)(40)/2 = 3,920 lb (D)
(280)(40)/2 = 5600 lb (S)

Project: Wheeler Mill Building
Wheeler, Oregon

Client: **Tom Johnson Architect**

Date: 8/9/18
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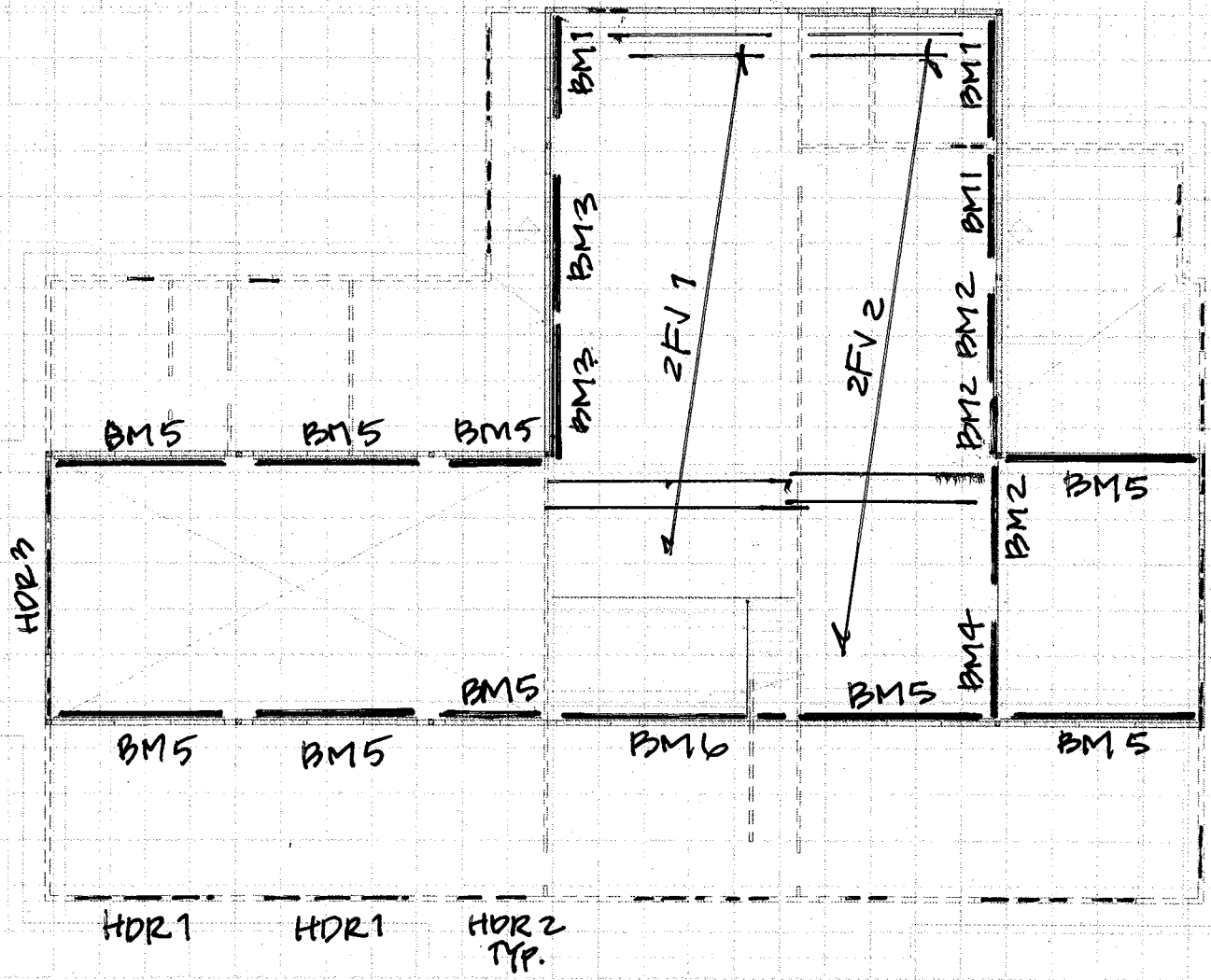
By: GWM
Job #: 218368

LOW ROOF / UPPER FLOOR FRAMING



Wood Beam

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ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31

Lic. # : KW-06011470 — Licensee : Grummel Engineering LLC

Description : BM 1

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

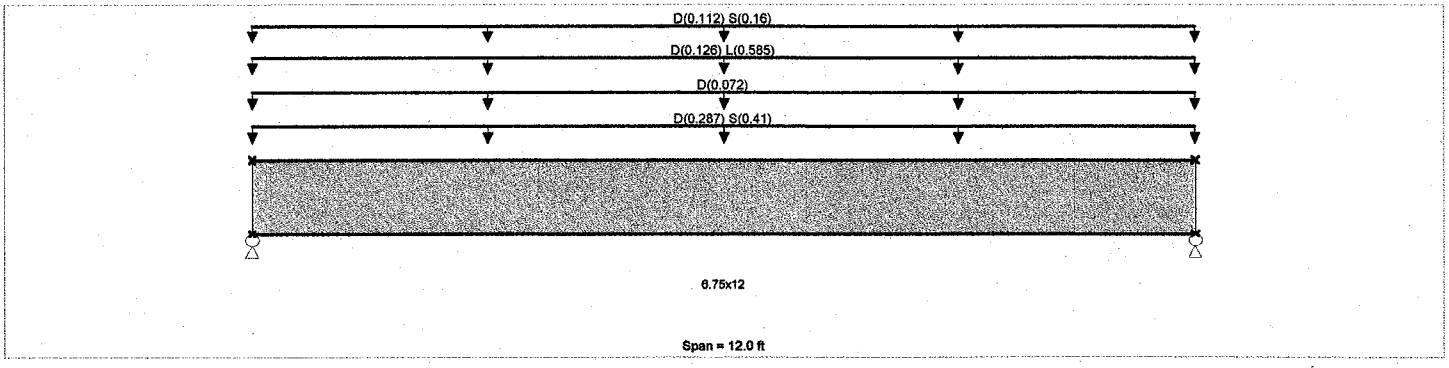
Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

Wood Species DF/DF
Wood Grade 24F - V4

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

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 20.50 ft
Uniform Load : D = 0.0120 ksf, Tributary Width = 6.0 ft
Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 9.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 8.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.715 : 1**	Maximum Shear Stress Ratio	=	**0.453 : 1**
Section used for this span		**6.75x12**	Section used for this span		**6.75x12**
fb : Actual	=	1,974.40 psi	fv : Actual	=	138.11 psi
FB : Allowable	=	2,760.00 psi	Fv : Allowable	=	304.75 psi
Load Combination		+D+0.750L+0.750S+H	Load Combination		+D+0.750L+0.750S+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	0.157 in	Ratio =	917 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.397 in	Ratio =	362 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.379	0.240	0.90	1.000	1.00	1.00	1.00	1.00	1.00	11.06	819.40	2160.00	3.10	57.32	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	0.666	0.422	1.00	1.000	1.00	1.00	1.00	1.00	1.00	21.59	1,599.40	2400.00	6.04	111.88	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	0.273	0.173	1.25	1.000	1.00	1.00	1.00	1.00	1.00	11.06	819.40	3000.00	3.10	57.32	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	0.572	0.363	1.15	1.000	1.00	1.00	1.00	1.00	1.00	21.32	1,579.40	2760.00	5.97	110.48	304.75

Wood Beam

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ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31

Lic. # : KW-06011470 — Licensee : Grummel Engineering LLC

Description : BM 1

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+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	0.468	0.297	1.25	1.000	1.00	1.00	1.00	1.00	1.00	18.96	1,404.40	3000.00	5.30	98.24	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	0.715	0.453	1.15	1.000	1.00	1.00	1.00	1.00	1.00	26.65	1,974.40	2760.00	7.46	138.11	304.75
+D+0.60W+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.213	0.135	1.60	1.000	1.00	1.00	1.00	1.00	1.00	11.06	819.40	3840.00	3.10	57.32	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	0.213	0.135	1.60	1.000	1.00	1.00	1.00	1.00	1.00	11.06	819.40	3840.00	3.10	57.32	424.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.366	0.232	1.60	1.000	1.00	1.00	1.00	1.00	1.00	18.96	1,404.40	3840.00	5.30	98.24	424.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.514	0.326	1.60	1.000	1.00	1.00	1.00	1.00	1.00	26.65	1,974.40	3840.00	7.46	138.11	424.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.514	0.326	1.60	1.000	1.00	1.00	1.00	1.00	1.00	26.65	1,974.40	3840.00	7.46	138.11	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	0.128	0.081	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.64	491.64	3840.00	1.86	34.39	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	0.128	0.081	1.60	1.000	1.00	1.00	1.00	1.00	1.00	6.64	491.64	3840.00	1.86	34.39	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.3972	6.044		0.0000	0.000

Vertical Reactions

Support notation : Far left is #' — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	8.885	8.885
Overall MINimum	2.212	2.212
+D+H	3.687	3.687
+D+L+H	7.197	7.197
+D+Lr+H	3.687	3.687
+D+S+H	7.107	7.107
+D+0.750Lr+0.750L+H	6.320	6.320
+D+0.750L+0.750S+H	8.885	8.885
+D+0.60W+H	3.687	3.687
+D+0.70E+H	3.687	3.687
+D+0.750Lr+0.750L+0.450W+H	6.320	6.320
+D+0.750L+0.750S+0.450W+H	8.885	8.885
+D+0.750L+0.750S+0.5250E+H	8.885	8.885
+0.60D+0.60W+0.60H	2.212	2.212
+0.60D+0.70E+0.60H	2.212	2.212
D Only	3.687	3.687
Lr Only		
L Only	3.510	3.510
S Only	3.420	3.420
W Only		
E Only		
H Only		

Wood Beam

Description : BM 2

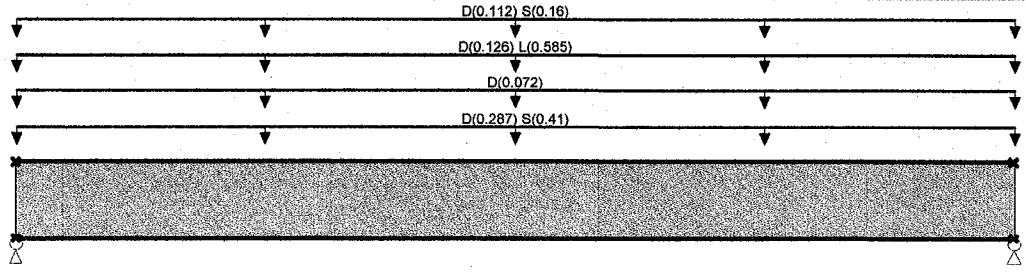
CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Metho	Allowable Stress Design	Fb - Tension	2,400.0 psi	*E : Modulus of Elasti*	
Load Combinati	IBC 2015	Fb - Compr	1,850.0 psi	Ebend- xx	1,800.0 ksi
		Fc - Prll	1,650.0 psi	Eminbend - x	950.0 ksi
Wood Species	DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade	24F - V4	Fv	265.0 psi	Eminbend - y	850.0 ksi
		Ft	1,100.0 psi	Density	31.20 pcf

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 20.50 ft
Uniform Load : D = 0.0120 ksf, Tributary Width = 6.0 ft
Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 9.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 8.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.770 : 1		Maximum Shear Stress Ratio	=	0.471 : 1	
Section used for this span		6.75x13.5		Section used for this span		6.75x13.5	
fb : Actual	=	2,126.51	psi	fv : Actual	=	143.44	psi
FB : Allowable	=	2,760.00	psi	Fv : Allowable	=	304.75	psi
Load Combination		+D+0.750L+0.750		Load Combination		+D+0.750L+0.750	
Location of maximum on span	=	7.00	ft	Location of maximum on span	=	12.87	ft
Span # where maximum occurs	=	Span #		Span # where maximum occurs	=	Span #	

Maximum Deflection

Max Downward Transient Deflection	0.204 in	Ratio =	822 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.518 in	Ratio =	324 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

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													0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.409	0.25	0.9	1.00	1.0	1.0	1.0	1.0	1.0	15.1	884.3	2160.0	3.6	59.65	238.50
+D+L+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.718	0.43	1.0	1.00	1.0	1.0	1.0	1.0	1.0	29.4	1,723.2	2400.0	7.0	116.24	265.00
+D+Lr+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.295	0.18	1.2	1.00	1.0	1.0	1.0	1.0	1.0	15.1	884.3	3000.0	3.6	59.65	331.25
+D+S+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.617	0.37	1.1	1.00	1.0	1.0	1.0	1.0	1.0	29.0	1,701.7	2760.0	6.9	114.79	304.75

Wood Beam

Lic. # : KW-06011470

Description : BM 2

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.750Lr+0.750L+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.505	0.30	1.2	1.00	1.0	1.0	1.0	1.0	1.0	25.8	1,513.5	3000.0	6.2	102.09	331.25
+D+0.750L+0.750S+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.770	0.47	1.1	1.00	1.0	1.0	1.0	1.0	1.0	36.3	2,126.5	2760.0	8.7	143.44	304.75
+D+0.60W+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.230	0.14	1.6	1.00	1.0	1.0	1.0	1.0	1.0	15.1	884.3	3840.0	3.6	59.65	424.00
+D+0.70E+H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.230	0.14	1.6	1.00	1.0	1.0	1.0	1.0	1.0	15.1	884.3	3840.0	3.6	59.65	424.00
+D+0.750Lr+0.750L+0.450W					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.394	0.24	1.6	1.00	1.0	1.0	1.0	1.0	1.0	25.8	1,513.5	3840.0	6.2	102.09	424.00
+D+0.750L+0.750S+0.450W+					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.554	0.33	1.6	1.00	1.0	1.0	1.0	1.0	1.0	36.3	2,126.5	3840.0	8.7	143.44	424.00
+D+0.750L+0.750S+0.5250E-					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.554	0.33	1.6	1.00	1.0	1.0	1.0	1.0	1.0	36.3	2,126.5	3840.0	8.7	143.44	424.00
+0.60D+0.60W+0.60H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.138	0.08	1.6	1.00	1.0	1.0	1.0	1.0	1.0	9.0	530.6	3840.0	2.1	35.79	424.00
+0.60D+0.70E+0.60H					1.00	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 14.0 ft	1	0.138	0.08	1.6	1.00	1.0	1.0	1.0	1.0	1.0	9.0	530.6	3840.0	2.1	35.79	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Def	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.5176	7.051		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	10.381	10.381
Overall MINimum	2.590	2.590
+D+H	4.317	4.317
+D+L+H	8.412	8.412
+D+Lr+H	4.317	4.317
+D+S+H	8.307	8.307
+D+0.750Lr+0.750L+H	7.388	7.388
+D+0.750L+0.750S+H	10.381	10.381
+D+0.60W+H	4.317	4.317
+D+0.70E+H	4.317	4.317
+D+0.750Lr+0.750L+0.450W+H	7.388	7.388
+D+0.750L+0.750S+0.450W+H	10.381	10.381
+D+0.750L+0.750S+0.5250E+H	10.381	10.381
+0.60D+0.60W+0.60H	2.590	2.590
+0.60D+0.70E+0.60H	2.590	2.590
D Only	4.317	4.317
Lr Only		
L Only	4.095	4.095
S Only	3.990	3.990
W Only		
E Only		
H Only		

Wood Beam

Description : BM 3

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

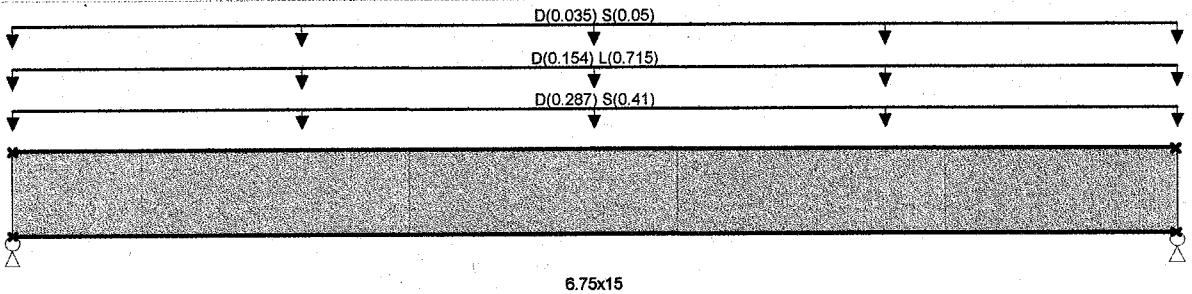
Wood Species DF/DF
Wood Grade 24F - V4

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 Elasti

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

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 20.50 ft
Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 11.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 2.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.784 : 1	Maximum Shear Stress Ratio	=	0.459 : 1
Section used for this span		6.75x15	Section used for this span		6.75x15
fb : Actual	=	1,840.07 psi	fv : Actual	=	121.72 psi
FB : Allowable	=	2,346.22 psi	Fv : Allowable	=	265.00 psi
Load Combination		+D+L+	Load Combination		+D+L+
Location of maximum on span	=	8.00 ft	Location of maximum on span	=	14.77 ft
Span # where maximum occurs	=	Span #	Span # where maximum occurs	=	Span #

Maximum Deflection

Max Downward Transient Deflection	0.310 in	Ratio =	618 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.599 in	Ratio =	320 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.358	0.21	0.9	0.97	1.0	1.0	1.0	1.0	1.0	15.9	755.3	2111.6	3.3	49.97	238.50
+D+L+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.784	0.45	1.0	0.97	1.0	1.0	1.0	1.0	1.0	38.8	1,840.0	2346.2	8.2	121.72	265.00
+D+Lr+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.258	0.15	1.2	0.97	1.0	1.0	1.0	1.0	1.0	15.9	755.3	2932.7	3.3	49.97	331.25
+D+S+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.539	0.31	1.1	0.97	1.0	1.0	1.0	1.0	1.0	30.6	1,453.2	2698.1	6.4	96.13	304.75
+D+0.750Lr+0.750L+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00

Wood Beam

Lic. # : KW-06011470

Description : BM 3

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 16.0 ft	1	0.535	0.31:	1.2	0.97	1.0	1.0	1.0	1.0	1.0	33.0	1,568.9	2932.7	7.0	103.78	331.25
+D+0.750L+0.750S+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.775	0.45	1.1	0.97	1.0	1.0	1.0	1.0	1.0	44.1	2,092.2	2698.1	9.3	138.40	304.75
+D+0.60W+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.201	0.11	1.6	0.97	1.0	1.0	1.0	1.0	1.0	15.9	755.3	3753.9	3.3	49.97	424.00
+D+0.70E+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.201	0.11	1.6	0.97	1.0	1.0	1.0	1.0	1.0	15.9	755.3	3753.9	3.3	49.97	424.00
+D+0.750Lr+0.750L+0.450W-					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.418	0.24	1.6	0.97	1.0	1.0	1.0	1.0	1.0	33.0	1,568.9	3753.9	7.0	103.78	424.00
+D+0.750L+0.750S+0.450W+					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.557	0.32	1.6	0.97	1.0	1.0	1.0	1.0	1.0	44.1	2,092.2	3753.9	9.3	138.40	424.00
+D+0.750L+0.750S+0.5250E-					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.557	0.32	1.6	0.97	1.0	1.0	1.0	1.0	1.0	44.1	2,092.2	3753.9	9.3	138.40	424.00
+0.60D+0.60W+0.60H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.121	0.07	1.6	0.97	1.0	1.0	1.0	1.0	1.0	9.5	453.2	3753.9	2.0	29.98	424.00
+0.60D+0.70E+0.60H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.121	0.07	1.6	0.97	1.0	1.0	1.0	1.0	1.0	9.5	453.2	3753.9	2.0	29.98	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Def	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.5986	8.058		0.0000	0.000

Vertical Reactions

Support notation : Far left is # Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.034	11.034
Overall MINimum	2.390	2.390
+D+H	3.984	3.984
+D+L+H	9.704	9.704
+D+Lr+H	3.984	3.984
+D+S+H	7.664	7.664
+D+0.750Lr+0.750L+H	8.274	8.274
+D+0.750L+0.750S+H	11.034	11.034
+D+0.60W+H	3.984	3.984
+D+0.70E+H	3.984	3.984
+D+0.750Lr+0.750L+0.450W+H	8.274	8.274
+D+0.750L+0.750S+0.450W+H	11.034	11.034
+D+0.750L+0.750S+0.5250E+H	11.034	11.034
+0.60D+0.60W+0.60H	2.390	2.390
+0.60D+0.70E+0.60H	2.390	2.390
D Only	3.984	3.984
Lr Only		
L Only	5.720	5.720
S Only	3.680	3.680
W Only		
E Only		
H Only		

Wood Beam

Description : BM 4

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

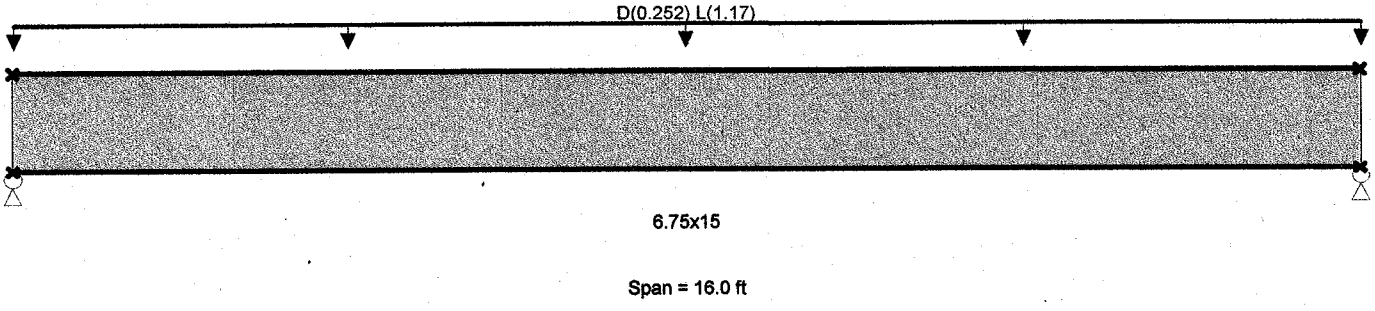
Wood Species DF/DF
Wood Grade 24F - V4

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 Elasti

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

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 18.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.919 : 1	Maximum Shear Stress Ratio	=	0.538 : 1
Section used for this span		6.75x15	Section used for this span		6.75x15
fb : Actual	=	2,157.23 psi	fv : Actual	=	142.70 psi
FB : Allowable	=	2,346.22 psi	Fv : Allowable	=	265.00 psi
Load Combination		+D+L+	Load Combination		+D+L+
Location of maximum on span	=	8.00 ft	Location of maximum on span	=	14.77 ft
Span # where maximum occurs	=	Span #	Span # where maximum occurs	=	Span #

Maximum Deflection

Max Downward Transient Deflection	0.508 in	Ratio =	378 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.617 in	Ratio =	311 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.181	0.10	0.9	0.97	1.0	1.0	1.0	1.0	1.0	8.0	382.2	2111.6	1.7	25.29	238.50
+D+L+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.919	0.53	1.0	0.97	1.0	1.0	1.0	1.0	1.0	45.5	2,157.2	2346.2	9.6	142.70	265.00
+D+Lr+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.130	0.07	1.2	0.97	1.0	1.0	1.0	1.0	1.0	8.0	382.2	2932.7	1.7	25.29	331.25
+D+S+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.142	0.08	1.1	0.97	1.0	1.0	1.0	1.0	1.0	8.0	382.2	2698.1	1.7	25.29	304.75
+D+0.750Lr+0.750L+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.584	0.34	1.2	0.97	1.0	1.0	1.0	1.0	1.0	36.1	1,713.4	2932.7	7.6	113.35	331.25
+D+0.750L+0.750S+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.635	0.37	1.1	0.97	1.0	1.0	1.0	1.0	1.0	36.1	1,713.4	2698.1	7.6	113.35	304.75

Wood Beam

Description : BM 4

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.60W+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.102	0.06	1.6	0.97	1.0	1.0	1.0	1.0	1.0	8.0	382.2	3753.9	1.7	25.29	424.00
+D+0.70E+H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.102	0.06	1.6	0.97	1.0	1.0	1.0	1.0	1.0	8.0	382.2	3753.9	1.7	25.29	424.00
+D+0.750Lr+0.750L+0.450W					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.456	0.26	1.6	0.97	1.0	1.0	1.0	1.0	1.0	36.1	1,713.4	3753.9	7.6	113.35	424.00
+D+0.750L+0.750S+0.450W+					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.456	0.26	1.6	0.97	1.0	1.0	1.0	1.0	1.0	36.1	1,713.4	3753.9	7.6	113.35	424.00
+D+0.750L+0.750S+0.5250E					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.456	0.26	1.6	0.97	1.0	1.0	1.0	1.0	1.0	36.1	1,713.4	3753.9	7.6	113.35	424.00
+0.60D+0.60W+0.60H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.061	0.03	1.6	0.97	1.0	1.0	1.0	1.0	1.0	4.8	229.3	3753.9	1.0	15.17	424.00
+0.60D+0.70E+0.60H					0.97	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 16.0 ft	1	0.061	0.03	1.6	0.97	1.0	1.0	1.0	1.0	1.0	4.8	229.3	3753.9	1.0	15.17	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Def	Location in Span
+D+L+H	1	0.6172	8.058		0.0000	0.000

Vertical Reactions

Support notation : Far left is # Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	11.376	11.376
Overall MINimum	1.210	1.210
+D+H	2.016	2.016
+D+L+H	11.376	11.376
+D+Lr+H	2.016	2.016
+D+S+H	2.016	2.016
+D+0.750Lr+0.750L+H	9.036	9.036
+D+0.750L+0.750S+H	9.036	9.036
+D+0.60W+H	2.016	2.016
+D+0.70E+H	2.016	2.016
+D+0.750Lr+0.750L+0.450W+H	9.036	9.036
+D+0.750L+0.750S+0.450W+H	9.036	9.036
+D+0.750L+0.750S+0.5250E+H	9.036	9.036
+0.60D+0.60W+0.60H	1.210	1.210
+0.60D+0.70E+0.60H	1.210	1.210
D Only	2.016	2.016
Lr Only		
L Only	9.360	9.360
S Only		
W Only		
E Only		
H Only		

Wood Beam

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ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470 — Licensee : Grummel Engineering LLC

Description : BM 5

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

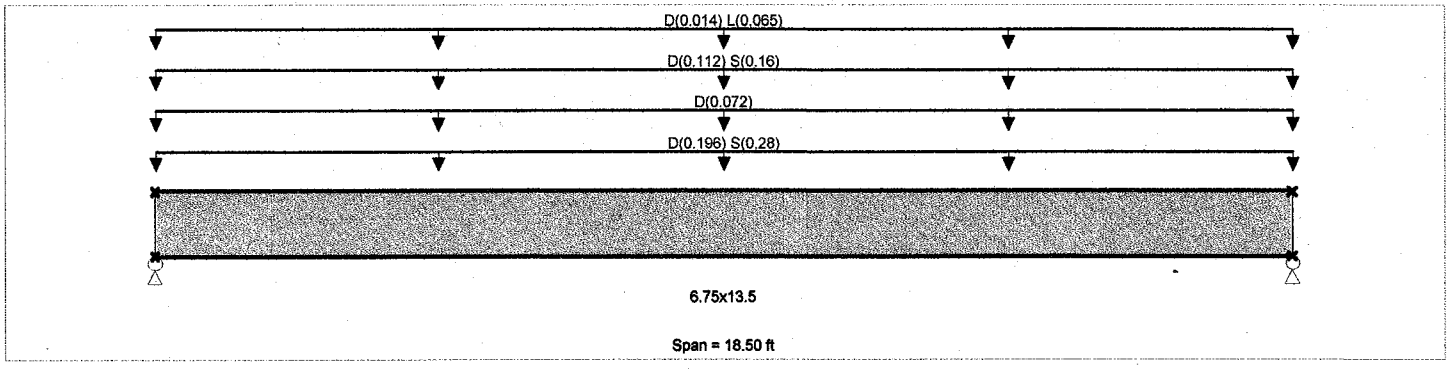
Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

Wood Species DF/DF
Wood Grade 24F - V4

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

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 14.0 ft
Uniform Load : D = 0.0120 ksf, Tributary Width = 6.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 8.0 ft
Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.795 : 1**	Maximum Shear Stress Ratio	=	**0.377 : 1**
Section used for this span		**6.75x13.5**	Section used for this span		**6.75x13.5**
fb : Actual	=	2,137.68 psi	fv : Actual	=	114.81 psi
FB : Allowable	=	2,687.43 psi	Fv : Allowable	=	304.75 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	9.250 ft	Location of maximum on span	=	17.420 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.468 in	Ratio =	474 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.909 in	Ratio =	244 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

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 = 18.50 ft	1	0.493	0.233	0.90	0.974	1.00	1.00	1.00	1.00	1.00	17.70	1,035.97	2103.21	3.38	55.64	238.50
+D+L+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.513	0.243	1.00	0.974	1.00	1.00	1.00	1.00	1.00	20.48	1,198.72	2336.90	3.91	64.38	265.00
+D+Lr+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.355	0.168	1.25	0.974	1.00	1.00	1.00	1.00	1.00	17.70	1,035.97	2921.12	3.38	55.64	331.25
+D+S+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.795	0.377	1.15	0.974	1.00	1.00	1.00	1.00	1.00	36.52	2,137.68	2687.43	6.97	114.81	304.75

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31

Lic. # : KW-06011470 — Licensee : Grummel Engineering LLC

Description : BM 5

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.750Lr+0.750L+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.396	0.188	1.25	0.974	1.00	1.00	1.00	1.00	1.00	19.79	1,158.03	2921.12	3.78	62.20	331.25
+D+0.750L+0.750S+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.738	0.350	1.15	0.974	1.00	1.00	1.00	1.00	1.00	33.90	1,984.31	2687.43	6.47	106.58	304.75
+D+0.60W+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.277	0.131	1.60	0.974	1.00	1.00	1.00	1.00	1.00	17.70	1,035.97	3739.04	3.38	55.64	424.00
+D+0.70E+H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.277	0.131	1.60	0.974	1.00	1.00	1.00	1.00	1.00	17.70	1,035.97	3739.04	3.38	55.64	424.00
+D+0.750Lr+0.750L+0.450W-					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.310	0.147	1.60	0.974	1.00	1.00	1.00	1.00	1.00	19.79	1,158.03	3739.04	3.78	62.20	424.00
+D+0.750L+0.750S+0.450W+					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.531	0.251	1.60	0.974	1.00	1.00	1.00	1.00	1.00	33.90	1,984.31	3739.04	6.47	106.58	424.00
+D+0.750L+0.750S+0.5250E-					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.531	0.251	1.60	0.974	1.00	1.00	1.00	1.00	1.00	33.90	1,984.31	3739.04	6.47	106.58	424.00
+0.60D+0.60W+0.60H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.166	0.079	1.60	0.974	1.00	1.00	1.00	1.00	1.00	10.62	621.58	3739.04	2.03	33.38	424.00
+0.60D+0.70E+0.60H					0.974	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 18.50 ft	1	0.166	0.079	1.60	0.974	1.00	1.00	1.00	1.00	1.00	10.62	621.58	3739.04	2.03	33.38	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.9085	9.318		0.0000	0.000

Vertical Reactions

Support notation : Far left is #' — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	7.897	7.897
Overall MINimum	0.601	0.601
+D+H	3.827	3.827
+D+L+H	4.428	4.428
+D+Lr+H	3.827	3.827
+D+S+H	7.897	7.897
+D+0.750Lr+0.750L+H	4.278	4.278
+D+0.750L+0.750S+H	7.331	7.331
+D+0.60W+H	3.827	3.827
+D+0.70E+H	3.827	3.827
+D+0.750Lr+0.750L+0.450W+H	4.278	4.278
+D+0.750L+0.750S+0.450W+H	7.331	7.331
+D+0.750L+0.750S+0.5250E+H	7.331	7.331
+0.60D+0.60W+0.60H	2.296	2.296
+0.60D+0.70E+0.60H	2.296	2.296
D Only	3.827	3.827
Lr Only		
L Only	0.601	0.601
S Only	4.070	4.070
W Only		
E Only		
H Only		

Wood Beam

Lic. # : KW-06011470

Description : BM 6

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

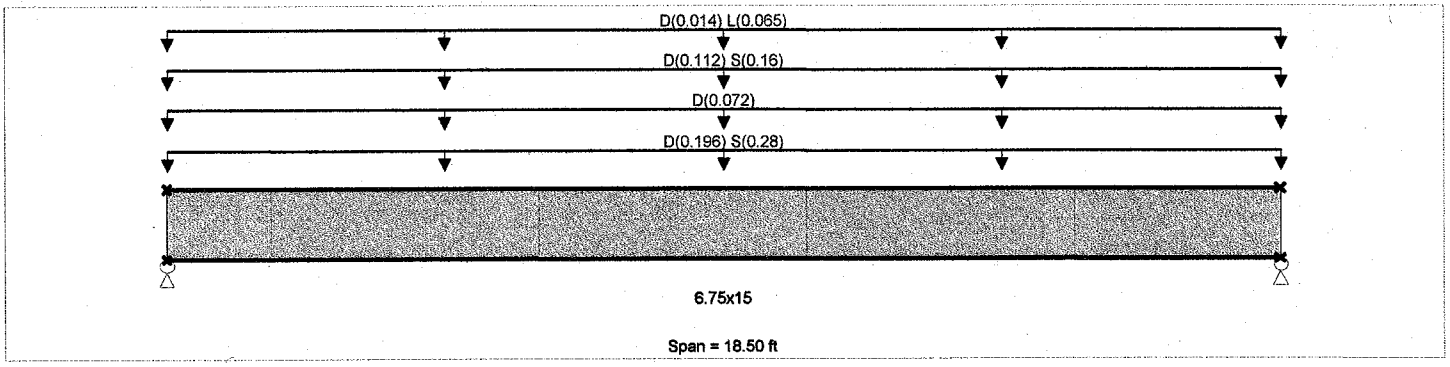
Wood Species DF/DF
Wood Grade 24F - V4

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 Elasti

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

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 14.0 ft
Uniform Load : D = 0.0120 ksf, Tributary Width = 6.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 8.0 ft
Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.653 : 1	Maximum Shear Stress Ratio	=	0.334 : 1
Section used for this span		6.75x15	Section used for this span		6.75x15
fb : Actual	=	1,735.97 psi	fv : Actual	=	101.88 psi
FB : Allowable	=	2,659.27 psi	Fv : Allowable	=	304.75 psi
Load Combination		+D+S+	Load Combination		+D+S+
Location of maximum on span	=	9.25 ft	Location of maximum on span	=	17.28 ft
Span # where maximum occurs	=	Span #	Span # where maximum occurs	=	Span #

Maximum Deflection

Max Downward Transient Deflection	0.341 in	Ratio =	650 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.664 in	Ratio =	334 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.405	0.20	0.9	0.96	1.0	1.0	1.0	1.0	1.0	17.7	843.5	2081.1	3.3	49.51	238.50
+D+L+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.422	0.21	1.0	0.96	1.0	1.0	1.0	1.0	1.0	20.5	975.4	2312.4	3.8	57.25	265.00
+D+Lr+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.292	0.14	1.2	0.96	1.0	1.0	1.0	1.0	1.0	17.7	843.5	2890.5	3.3	49.51	331.25
+D+S+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.653	0.33	1.1	0.96	1.0	1.0	1.0	1.0	1.0	36.6	1,735.5	2659.2	6.8	101.88	304.75

Wood Beam

Lic. # : KW-06011470

Description : BM 6

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.750Lr+0.750L+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.326	0.16	1.2	0.96	1.0	1.0	1.0	1.0	1.0	19.8	942.4	2890.5	3.7	55.31	331.25
+D+0.750L+0.750S+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.606	0.31	1.1	0.96	1.0	1.0	1.0	1.0	1.0	34.0	1,611.7	2659.2	6.3	94.59	304.75
+D+0.60W+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.228	0.11	1.6	0.96	1.0	1.0	1.0	1.0	1.0	17.7	843.5	3699.8	3.3	49.51	424.00
+D+0.70E+H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.228	0.11	1.6	0.96	1.0	1.0	1.0	1.0	1.0	17.7	843.5	3699.8	3.3	49.51	424.00
+D+0.750Lr+0.750L+0.450W					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.255	0.13	1.6	0.96	1.0	1.0	1.0	1.0	1.0	19.8	942.4	3699.8	3.7	55.31	424.00
+D+0.750L+0.750S+0.450W+					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.436	0.22	1.6	0.96	1.0	1.0	1.0	1.0	1.0	34.0	1,611.7	3699.8	6.3	94.59	424.00
+D+0.750L+0.750S+0.5250E					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.436	0.22	1.6	0.96	1.0	1.0	1.0	1.0	1.0	34.0	1,611.7	3699.8	6.3	94.59	424.00
+0.60D+0.60W+0.60H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.137	0.07	1.6	0.96	1.0	1.0	1.0	1.0	1.0	10.6	506.1	3699.8	2.0	29.71	424.00
+0.60D+0.70E+0.60H					0.96	1.0	1.0	1.0	1.0	1.0			0.0	0.0	0.00	0.00
Length = 18.50 ft	1	0.137	0.07	1.6	0.96	1.0	1.0	1.0	1.0	1.0	10.6	506.1	3699.8	2.0	29.71	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Def	Location in Span
+D+S+H	1	0.6640	9.318		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	7.917	7.917
Overall MINimum	0.601	0.601
+D+H	3.847	3.847
+D+L+H	4.449	4.449
+D+Lr+H	3.847	3.847
+D+S+H	7.917	7.917
+D+0.750Lr+0.750L+H	4.298	4.298
+D+0.750L+0.750S+H	7.351	7.351
+D+0.60W+H	3.847	3.847
+D+0.70E+H	3.847	3.847
+D+0.750Lr+0.750L+0.450W+H	4.298	4.298
+D+0.750L+0.750S+0.450W+H	7.351	7.351
+D+0.750L+0.750S+0.5250E+H	7.351	7.351
+0.60D+0.60W+0.60H	2.308	2.308
+0.60D+0.70E+0.60H	2.308	2.308
D Only	3.847	3.847
Lr Only		
L Only	0.601	0.601
S Only	4.070	4.070
W Only		
E Only		
H Only		

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470 — Licensee : Grummel Engineering LLC

Description : BM 7

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

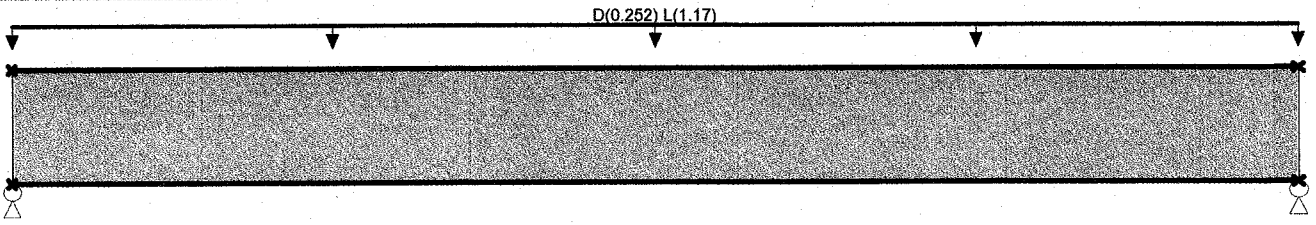
Wood Species DF/DF
Wood Grade 24F - V4

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 Elasti

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

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, L = 0.0650 ksf, Tributary Width = 18.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.633 : 1	Maximum Shear Stress Ratio	=	0.439 : 1
Section used for this span		6.75x13.5	Section used for this span		6.75x13.5
fb : Actual	=	1,518.87 psi	fv : Actual	=	116.41 psi
FB : Allowable	=	2,400.00 psi	Fv : Allowable	=	265.00 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	0.220 in	Ratio =	653 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.272 in	Ratio =	530 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.133	0.092	0.90	1.000	1.00	1.00	1.00	1.00	1.00	4.89	286.28	2160.00	1.33	21.94	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	0.633	0.439	1.00	1.000	1.00	1.00	1.00	1.00	1.00	25.95	1,518.87	2400.00	7.07	116.41	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	0.095	0.066	1.25	1.000	1.00	1.00	1.00	1.00	1.00	4.89	286.28	3000.00	1.33	21.94	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	0.104	0.072	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.89	286.28	2760.00	1.33	21.94	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	0.404	0.280	1.25	1.000	1.00	1.00	1.00	1.00	1.00	20.69	1,210.73	3000.00	5.64	92.79	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

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : BM 7

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 12.0 ft	1	0.439	0.304	1.15	1.000	1.00	1.00	1.00	1.00	1.00	20.69	1,210.73	2760.00	5.64	92.79	304.75
+D+0.60W+H					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.075	0.052	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.89	286.28	3840.00	1.33	21.94	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	0.075	0.052	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.89	286.28	3840.00	1.33	21.94	424.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.315	0.219	1.60	1.000	1.00	1.00	1.00	1.00	1.00	20.69	1,210.73	3840.00	5.64	92.79	424.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.315	0.219	1.60	1.000	1.00	1.00	1.00	1.00	1.00	20.69	1,210.73	3840.00	5.64	92.79	424.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.315	0.219	1.60	1.000	1.00	1.00	1.00	1.00	1.00	20.69	1,210.73	3840.00	5.64	92.79	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	0.045	0.031	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.93	171.77	3840.00	0.80	13.16	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	0.045	0.031	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.93	171.77	3840.00	0.80	13.16	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.2716	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	8.650	8.650
Overall MINimum	0.978	0.978
+D+H	1.630	1.630
+D+L+H	8.650	8.650
+D+Lr+H	1.630	1.630
+D+S+H	1.630	1.630
+D+0.750Lr+0.750L+H	6.895	6.895
+D+0.750L+0.750S+H	6.895	6.895
+D+0.60W+H	1.630	1.630
+D+0.70E+H	1.630	1.630
+D+0.750Lr+0.750L+0.450W+H	6.895	6.895
+D+0.750L+0.750S+0.450W+H	6.895	6.895
+D+0.750L+0.750S+0.5250E+H	6.895	6.895
+0.60D+0.60W+0.60H	0.978	0.978
+0.60D+0.70E+0.60H	0.978	0.978
D Only	1.630	1.630
Lr Only		
L Only	7.020	7.020
S Only		
W Only		
E Only		
H Only		

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : HDR 1

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

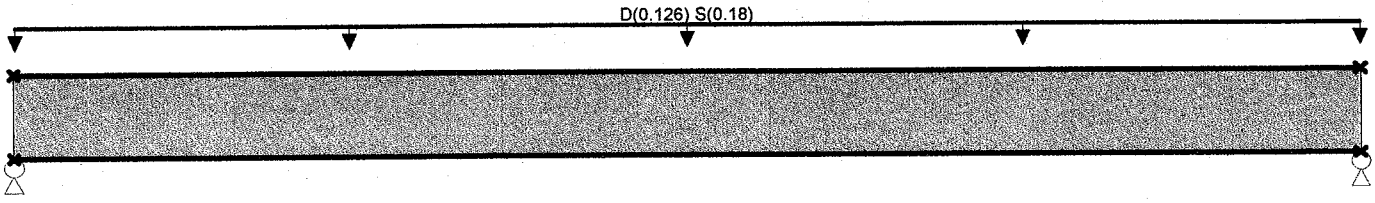
Material Properties

Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

Wood Species Douglas Fir - Larch (North)
Wood Grade No.2

Fb - Tension	875 psi	*E : Modulus of Elasti*	
Fb - Compr	875 psi	Ebend- xx	1300 ksi
Fc - Prll	600 psi	Eminbend - x	470 ksi
Fc - Perp	625 psi		
Fv	170 psi		
Ft	425 psi	Density	30.58 pcf

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 9.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.823 : 1	Maximum Shear Stress Ratio	=	0.243 : 1
Section used for this span		6x10	Section used for this span		6x10
fb : Actual	=	827.91 psi	fv : Actual	=	47.44 psi
FB : Allowable	=	1,006.25 psi	Fv : Allowable	=	195.50 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	0.165 in	Ratio =	870 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.291 in	Ratio =	494 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+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	0.455	0.134	0.90	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	787.50	0.71	20.51	153.00
+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	0.409	0.121	1.00	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	875.00	0.71	20.51	170.00
+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	0.327	0.097	1.25	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	1093.75	0.71	20.51	212.50
+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	0.823	0.243	1.15	1.000	1.00	1.00	1.00	1.00	1.00	5.71	827.91	1006.25	1.65	47.44	195.50
+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	0.327	0.097	1.25	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	1093.75	0.71	20.51	212.50
+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

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : HDR 1

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 12.0 ft	1	0.706	0.208	1.15	1.000	1.00	1.00	1.00	1.00	1.00	4.90	710.42	1006.25	1.42	40.71	195.50
+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	0.256	0.075	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	1400.00	0.71	20.51	272.00
+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	0.256	0.075	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	1400.00	0.71	20.51	272.00
+D+0.750Lr+0.750L+0.450W-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.256	0.075	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.47	357.95	1400.00	0.71	20.51	272.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.507	0.150	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.90	710.42	1400.00	1.42	40.71	272.00
+D+0.750L+0.750S+0.5250E-					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.507	0.150	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.90	710.42	1400.00	1.42	40.71	272.00
+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	0.153	0.045	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.48	214.77	1400.00	0.43	12.31	272.00
+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	0.153	0.045	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.48	214.77	1400.00	0.43	12.31	272.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2913	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	1.903	1.903
Overall MINimum	0.494	0.494
+D+H	0.823	0.823
+D+L+H	0.823	0.823
+D+Lr+H	0.823	0.823
+D+S+H	1.903	1.903
+D+0.750Lr+0.750L+H	0.823	0.823
+D+0.750L+0.750S+H	1.633	1.633
+D+0.60W+H	0.823	0.823
+D+0.70E+H	0.823	0.823
+D+0.750Lr+0.750L+0.450W+H	0.823	0.823
+D+0.750L+0.750S+0.450W+H	1.633	1.633
+D+0.750L+0.750S+0.5250E+H	1.633	1.633
+0.60D+0.60W+0.60H	0.494	0.494
+0.60D+0.70E+0.60H	0.494	0.494
D Only	0.823	0.823
Lr Only		
L Only		
S Only	1.080	1.080
W Only		
E Only		
H Only		

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470 — Licensee : Grummel Engineering LLC

Description : HDR 2

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

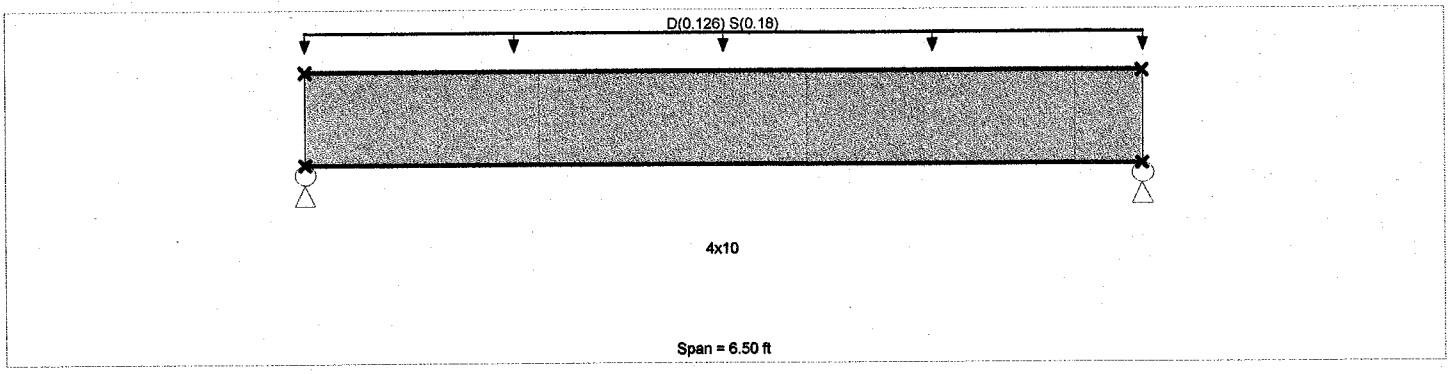
Analysis Metho Allowable Stress Design
Load Combinati IBC 2015

Wood Species Douglas Fir - Larch (North)
Wood Grade No. 1/No. 2

Fb - Tension	850.0 psi
Fb - Compr	850.0 psi
Fc - Prll	1,400.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	500.0 psi

E : Modulus of Elasti	
Ebend- xx	1,600.0 ksi
Eminbend - x	580.0 ksi
Density	30.580 pcf

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 9.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.339 : 1	Maximum Shear Stress Ratio	=	0.174 : 1
Section used for this span		4x10	Section used for this span		4x10
fb : Actual	=	397.27 psi	fv : Actual	=	36.11 psi
FB : Allowable	=	1,173.00 psi	Fv : Allowable	=	207.00 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	3.250 ft	Location of maximum on span	=	5.741 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.020 in	Ratio =	3961 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.034 in	Ratio =	2279 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.184	0.095	0.90	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	918.00	0.33	15.33	162.00
+D+L+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.165	0.085	1.00	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	1020.00	0.33	15.33	180.00
+D+Lr+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.132	0.068	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	1275.00	0.33	15.33	225.00
+D+S+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.339	0.174	1.15	1.200	1.00	1.00	1.00	1.00	1.00	1.65	397.27	1173.00	0.78	36.11	207.00
+D+0.750Lr+0.750L+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.132	0.068	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	1275.00	0.33	15.33	225.00
+D+0.750L+0.750S+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : HDR 2

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 6.50 ft	1	0.290	0.149	1.15	1.200	1.00	1.00	1.00	1.00	1.00	1.41	340.13	1173.00	0.67	30.91	207.00
+D+0.60W+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.103	0.053	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	1632.00	0.33	15.33	288.00
+D+0.70E+H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.103	0.053	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	1632.00	0.33	15.33	288.00
+D+0.750Lr+0.750L+0.450W+					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.103	0.053	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.70	168.72	1632.00	0.33	15.33	288.00
+D+0.750L+0.750S+0.450W+					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.208	0.107	1.60	1.200	1.00	1.00	1.00	1.00	1.00	1.41	340.13	1632.00	0.67	30.91	288.00
+D+0.750L+0.750S+0.5250E+					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.208	0.107	1.60	1.200	1.00	1.00	1.00	1.00	1.00	1.41	340.13	1632.00	0.67	30.91	288.00
+0.60D+0.60W+0.60H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.062	0.032	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.42	101.23	1632.00	0.20	9.20	288.00
+0.60D+0.70E+0.60H					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.062	0.032	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.42	101.23	1632.00	0.20	9.20	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.0342	3.274		0.0000	0.000

Vertical Reactions

Support notation : Far left is #' Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.017	1.017
Overall MINimum	0.259	0.259
+D+H	0.432	0.432
+D+L+H	0.432	0.432
+D+Lr+H	0.432	0.432
+D+S+H	1.017	1.017
+D+0.750Lr+0.750L+H	0.432	0.432
+D+0.750L+0.750S+H	0.871	0.871
+D+0.60W+H	0.432	0.432
+D+0.70E+H	0.432	0.432
+D+0.750Lr+0.750L+0.450W+H	0.432	0.432
+D+0.750L+0.750S+0.450W+H	0.871	0.871
+D+0.750L+0.750S+0.5250E+H	0.871	0.871
+0.60D+0.60W+0.60H	0.259	0.259
+0.60D+0.70E+0.60H	0.259	0.259
D Only	0.432	0.432
Lr Only		
L Only		
S Only	0.585	0.585
W Only		
E Only		
H Only		

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : HDR 3

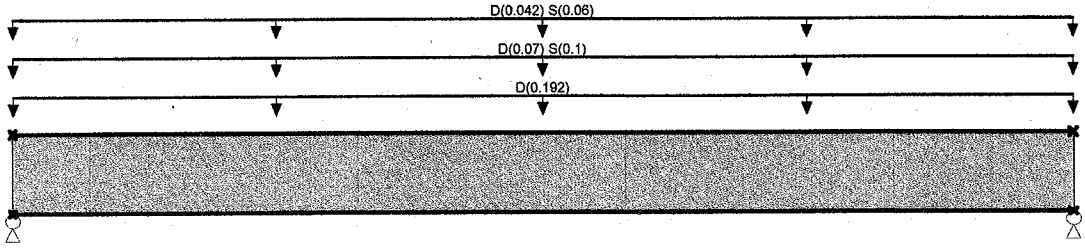
CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Metho	Allowable Stress Design	Fb - Tension	875.0 psi	*E : Modulus of Elasti*	
Load Combinati	IBC 2015	Fb - Compr	875.0 psi	Ebend- xx	1,300.0 ksi
		Fc - Prll	600.0 psi	Eminbend - x	470.0 ksi
Wood Species	Douglas Fir - Larch (North)	Fc - Perp	625.0 psi		
Wood Grade	No.2	Fv	170.0 psi		
		Ft	425.0 psi	Density	30.580 pcf

Beam Bracing Beam is Fully Braced against lateral-torsional buckling



Applied Loads

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

Beam self weight calculated and added to loads
Uniform Load : D = 0.0120 ksf, Tributary Width = 16.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 5.0 ft
Uniform Load : D = 0.0140, S = 0.020 ksf, Tributary Width = 3.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.845 : 1**	Maximum Shear Stress Ratio	=	**0.294 : 1**
Section used for this span		**6x12**	Section used for this span		**6x12**
fb : Actual	=	850.66 psi	fv : Actual	=	57.52 psi
FB : Allowable	=	1,006.25 psi	Fv : Allowable	=	195.50 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	0.083 in	Ratio =	1737 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.247 in	Ratio =	582 >=240.
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0

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	0.718	0.250	0.90	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	787.50	1.61	38.24	153.00
+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	0.646	0.225	1.00	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	875.00	1.61	38.24	170.00
+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	0.517	0.180	1.25	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	1093.75	1.61	38.24	212.50
+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	0.845	0.294	1.15	1.000	1.00	1.00	1.00	1.00	1.00	8.59	850.66	1006.25	2.43	57.52	195.50
+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

Wood Beam

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : HDR 3

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 12.0 ft	1	0.517	0.180	1.25	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	1093.75	1.61	38.24	212.50
+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	0.775	0.270	1.15	1.000	1.00	1.00	1.00	1.00	1.00	7.87	779.39	1006.25	2.22	52.70	195.50
+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	0.404	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	1400.00	1.61	38.24	272.00
+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	0.404	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	1400.00	1.61	38.24	272.00
+D+0.750Lr+0.750L+0.450W					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.404	0.141	1.60	1.000	1.00	1.00	1.00	1.00	1.00	5.71	565.58	1400.00	1.61	38.24	272.00
+D+0.750L+0.750S+0.450W+					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.557	0.194	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.87	779.39	1400.00	2.22	52.70	272.00
+D+0.750L+0.750S+0.5250E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.557	0.194	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.87	779.39	1400.00	2.22	52.70	272.00
+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	0.242	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.43	339.35	1400.00	0.97	22.95	272.00
+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	0.242	0.084	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.43	339.35	1400.00	0.97	22.95	272.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2472	6.044		0.0000	0.000

Vertical Reactions

Support notation : Far left is # Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.865	2.865
Overall MINimum	0.960	0.960
+D+H	1.905	1.905
+D+L+H	1.905	1.905
+D+Lr+H	1.905	1.905
+D+S+H	2.865	2.865
+D+0.750Lr+0.750L+H	1.905	1.905
+D+0.750L+0.750S+H	2.625	2.625
+D+0.60W+H	1.905	1.905
+D+0.70E+H	1.905	1.905
+D+0.750Lr+0.750L+0.450W+H	1.905	1.905
+D+0.750L+0.750S+0.450W+H	2.625	2.625
+D+0.750L+0.750S+0.5250E+H	2.625	2.625
+0.60D+0.60W+0.60H	1.143	1.143
+0.60D+0.70E+0.60H	1.143	1.143
D Only	1.905	1.905
Lr Only		
L Only		
S Only	0.960	0.960
W Only		
E Only		
H Only		

Steel Column

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Licensee : Grummel Engineering LLC

Lic. # : KW-06011470

Description : C 1

Code References

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10
Load Combinations Used : IBC 2015

General Information

Steel Section Name : **HSS5x5x3/16**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 9.0 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 = 9.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for Y-Y Axis buckling = 9.0 ft, K = 1.0

Applied Loads

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

Column self weight included : 107.730 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 9.0 ft, D = 9.30, L = 5.980, S = 11.440 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.3051** : 1
Load Combination +D+0.750L+0.750S+H
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 22.473 k
Pn / Omega : Allowabl 73.657 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 13.520 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 13.520 k-ft

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

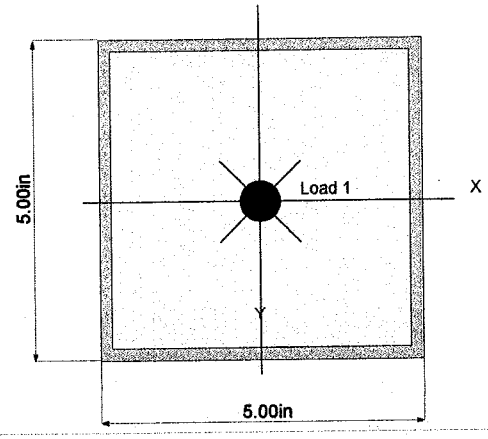
Maximum SERVICE Load Reactions . .

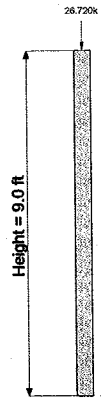
Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.0 k

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 :





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

Wood Column

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
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Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : C 2

Code References

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combinations Used : IBC 2015

General Information

Analysis Methc	Allowable Stress Design		
End Fixities	Top & Bottom Pinned		
Overall Column Heigh	9.0 ft		
(Used for non-slender calculations)			
Wood Specie	Douglas Fir - Larch (North)		
Wood Grade	No.1		
Fb +	1,200.0 psi	Fv	170.0 psi
Fb -	1,200.0 psi	Ft	825.0 psi
Fc - Prll	1,000.0 psi	Density	30.580 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	6x6		
Wood Grading/Manuf.	Graded Lumber		
Wood Member Type	Sawn		
Exact Width	5.50 in	Allow Stress Modification Factors	
Exact Depth	5.50 in	Cf or Cv for Bending	1.0
Area	30.250 in^2	Cf or Cv for Compressio	1.0
Ix	76.255 in^4	Cf or Cv for Tension	1.0
Iy	76.255 in^4	Cm : Wet Use Factor	1.0
		Ct : Temperature Fact	1.0
		Cfu : Flat Use Factor	1.0
		Kf : Built-up columns	1.0 *NDS 15.3.2*
		Use Cr : Repetitive	No

Brace condition for deflection (buckling) along columns :
X-X (width) axis Unbraced Length for X-X Axis buckling = 9.0 ft, K =
Y-Y (depth) axis Unbraced Length for X-X Axis buckling = 9.0 ft, K =

Applied Loads

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

Column self weight included : 57.815 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 9.0 ft, D = 6.960, L = 10.470, S = 6.720 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.80 : 1

Load Combination	+D+0.750L+0.750S+H
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	19.910 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	822.75 psi

PASS Maximum Shear Stress Ratio = 0.0 : 1

Load Combination	+0.60D+0.70E+0.60H
Location of max.above base	9.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	272.0 psi

Maximum SERVICE Lateral Load Reactions . .

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

Maximum SERVICE Load Lateral Deflections . . .

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

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Wood Column

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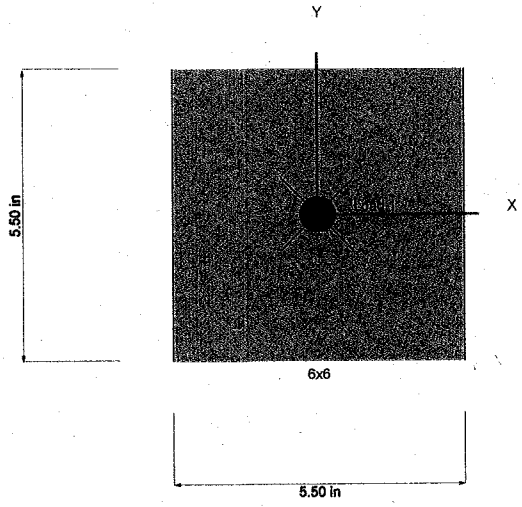
Licensee : Grummel Engineering LLC

Description : C 2

Sketches



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

Steel Column

File = \\SE2012\Company\JOBFIL~1\218368~1\CALCUL~1\218368.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Lic. # : KW-06011470
Licensee : Grummel Engineering LLC

Description : C 3

Code References

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10
Load Combinations Used : IBC 2015

General Information

Steel Section Name : **HSS5-1/2x5-1/2x5/16**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 21.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Fully braced against buckling along X-X Axis
Y-Y (depth) axis :
Fully braced against buckling along Y-Y Axis

Applied Loads

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

Column self weight included : 445.410 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 9.0 ft, Xecc = 2.250 in, D = 1.905, S = 0.960 k
BENDING LOADS . . .
Lat. Uniform Load creating Mx-x, W = 0.080 k/ft
Lat. Point Load at 9.0 ft creating Mx-x, W = 5.40 k

DESIGN SUMMARY

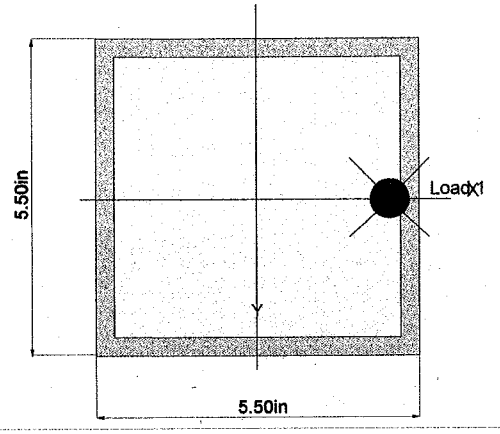
Bending & Shear Check Results

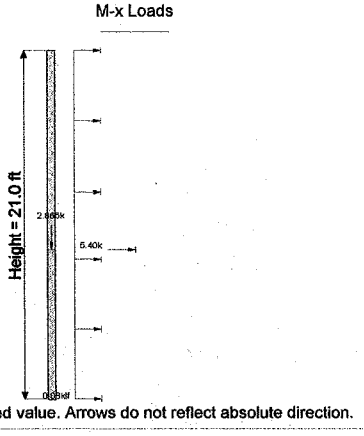
PASS Max. Axial+Bending Stress Ratio = **0.7506** : 1
Load Combination +D+0.60W+H
Location of max.above base 9.020 ft
At maximum location values are . . .
Pa : Axial 0.4454 k
Pn / Omega : Allowabl 161.138 k
Ma-x : Applied 19.228 k-ft
Mn-x / Omega : Allowable 25.938 k-ft
Ma-y : Applied 0.2038 k-ft
Mn-y / Omega : Allowable 25.938 k-ft

PASS Maximum Shear Stress Rati **0.05292** : 1
Load Combination +D+0.60W+H
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 2.355 k
Vn / Omega : Allowable 44.506 k

Maximum SERVICE Load Reactions . .
Top along X-X 0.02558 k
Bottom along X-X 0.02558 k
Top along Y-Y 3.154 k
Bottom along Y-Y 3.926 k

Maximum SERVICE Load Deflections . . .
Along Y-Y 1.697 in at 10.148 ft above base
for load combination : +D+0.60W+H
Along X-X 0.01027 in at 12.826 ft above base
for load combination : +D+S+H





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

RedSpec™ by RedBuilt™
v7.1.9

Project: Project
Location: Wheeler, Oregon
Folder: Folder
Date: 11/28/18 2:41 PM
Designer: SMO
Comment:

Type: Type

14" Red-L™ @ 16" o.c. with Glued Sheathing

This product meets or exceeds the set design controls for the application and loads listed

This truss design is feasible. The finished design shall be produced by RedBuilt Engineering. All open-web trusses are custom designed to carry the specific design loads for each project. Actual truss capacity when fabricated is limited to that required to resist the specific loads. Do not use this analysis to verify the capacity of existing trusses.

DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Pass/Fail
Span Live	61%	0.459	0.750	L / 588	L / 360	PASS
Span Total	65%	0.735	1.125	L / 367	L / 240	PASS

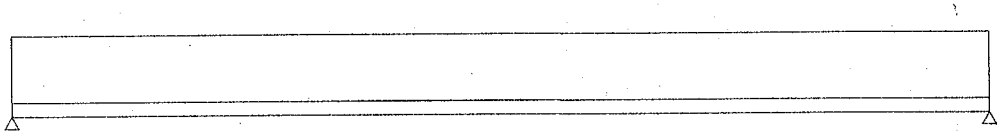
FloorChoice™ Rating: 2.6

Performance rating is based on: 23/32", 3/4" Panels, glued and nailed, 5/8" Gypsum, no topping, simple span, flexible support. RedSpec has not performed a structural analysis of the sheathing.

SUPPORTS	Support 1	Support 2
Live Reaction (lb) (DOL%)	769 (100)	769 (100)
Dead Reaction (lb)	462	462
Total Reaction (lb) (DOL%)	1231 (100)	1231 (100)
Bearing	Top Chord	Top Chord
Support	Beam	Wall
Bearing Clip	6" No-Notch Clip	6" No-Notch Clip
Approx. Clip Height	1.5"	1.5"
Approx. Clip Width	7.1875"	7.1875"
Assumed Bearing Width	3.5"	3.5"

SPANS AND LOADS

Dimensions represent horizontal clear span.



22'- 6.0"

APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Floor(100%)	50	15	15	16"	Glued Floor Joist

NOTES

- Building code and design methodology: 2012 IBC ASD (US).
- No repetitive member increase applied in design.
- Truss design includes consideration for a 2000.0 lbs load distributed over a 30" square area and all live loads removed.
- Deflection analysis is based on composite action with single layer of 24 oc (23/32", 3/4") span-rated sheathing, glued and nailed.
- Continuous lateral support required at top edge. Lateral support at bottom edge shall be per RedBuilt recommendations.
- Pricing Load (plf) = 107
- Pricing Index (plf) = 107

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CHECK WIND UPLIFT @ TRUSSES

$P_{net} = \lambda K_{zt} P_{net30}$

$\lambda = \frac{1.61 + 1.55}{2} = 1.58$

$K_{zt} = 1.0$

ZONE '2' $P_{net30} = \frac{-44.4 - 51.7}{2} = -50.9$ PSF

→ USE −51 PSF

@ OVERHANG ZONE '2' $P_{NET30} = \frac{-56.7 - 65.7}{2} = -61.2$ PSF

→ USE −62 PSF

$\therefore P_{NET} = (1.58)(1.0)(-51) = -80$ PSF

$P_{NET,OVERHANG} = (1.58)(1.0)(62) = -98$ PSF

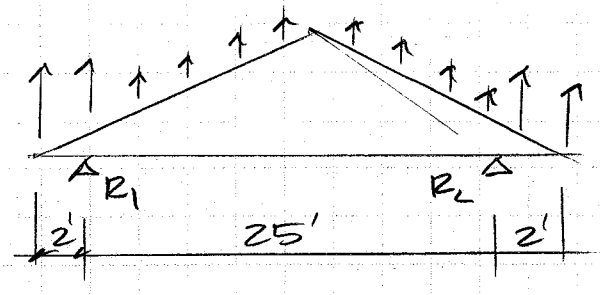
$0.6(D) + 0.6(W)$

$\therefore 0.6(15\ PSF) + 0.6(-80) = -39$ PSF (ADD)

$0.6(15) + 0.6(-98) = -50$ PSF (ADD)

$R_1 = R_2 = (-39\ PSF)(4')(25+4) + (2)(2)(-50+39)(4')$

$= \frac{-4700}{2} = -2350$ lb



USE (1) SIMPSON H10A &
(2) SIMPSON DTT2Z @ EA.
FULL SPAN TRUSS

OUTRIGGER DESIGN

$P = \lambda K_{zt} P_{net30}$

$\lambda = \frac{1.55 + 1.61}{2} = 1.58$

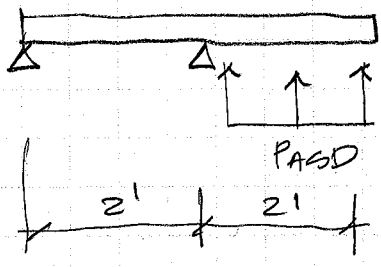
$K_{zt} = 1.0$

$P_{NET} = \frac{-86 - 99.8}{2} = -92.9 \rightarrow$ USE -93 PSF

$P_{(ASD)} = 0.6(-93) = -55$ PSF

$M_a = (-55 \text{ PSF})(2')(2)^2/2$

$= -220$ ft-lb



$S_{REQ} = \frac{-220 \times 12}{(1.15)(1.5)(1.6)(850)} = 1.13 \text{ IN}^3$

$1.13 < 3.1 \text{ IN}^3$ ✓ ok

USE 2x4 @ 24" o.c. OUTRIGGERS

TIMBER BRACE DESIGN

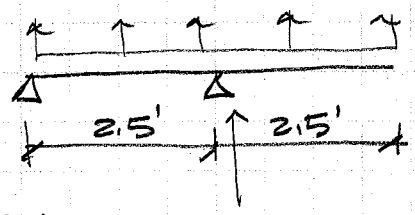
FROM PREVIOUS CALCULATION -

$P_{OVERHANG} = -98$ PSF

$0.6(15\ PSF) + 0.6(-98) = -50$ PSF

$M_u = |(-50)|(2')(2.5)^2/2$

$= 312\ ft\text{-}lb = 3750\ IN\text{-}lb$



$S_{REQ} = \dfrac{3750}{(1.15)(1.6)(1.5)(850)} = 1.6 < 3.1$

USE 2X4 @ 24" O.C.

$R_1 = \dfrac{(-50\ PSF)(2.5+2.5)^2}{2(2.5)} = -250\ lb/ft$

$(-500\ lb/JOIST)$

SIZE BEAM

$1.0(15\ PSF) + 1.0(20\ PSF) = 35$ PSF

$L = 8'$

$TRIB = \dfrac{(2.5+2.5)^2}{2(2.5)} = 5'$

$w_a = (35\ PSF)(5') = 175$ PLF

$M_a = (175)(8)^2/8 = 1400\ ft\text{-}lb$

$S_{REQ} = \dfrac{(1400)(12)}{850} = 19.8\ IN^3 < 30.7$

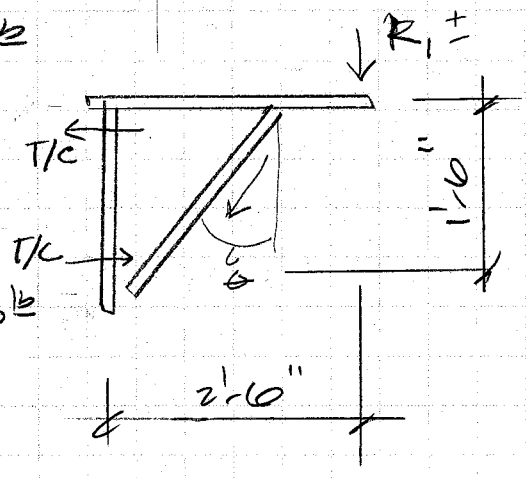
USE 4X8 BM

TIMBER BRACE DESIGN (CONT.)

$R_1^+ = (2)(175\ PLF)(8')/2 = 1400^{lb}$

$R_1^- = (2)(-250)(8')/2 = -2000^{lb}$

$T/C\ (MAX) = \frac{(-2000^{lb})(2.5')}{1.5} = \pm 3{,}333^{lb}$



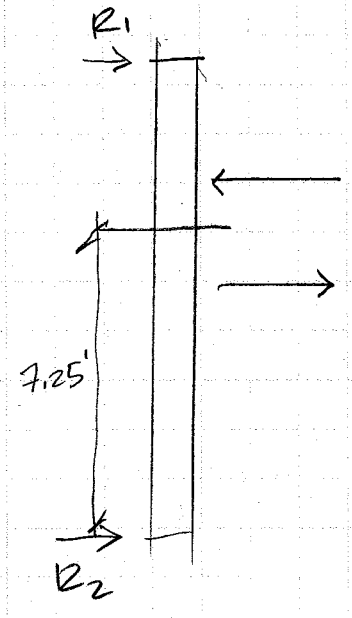
DESIGN POST

$R_1 = R_2 = \frac{(1400^{lb})(2.5')}{10'} = 350^{lb}$

$M_a = (350^{lb})(7.25') = 2538^{ft\text{-}lb}$

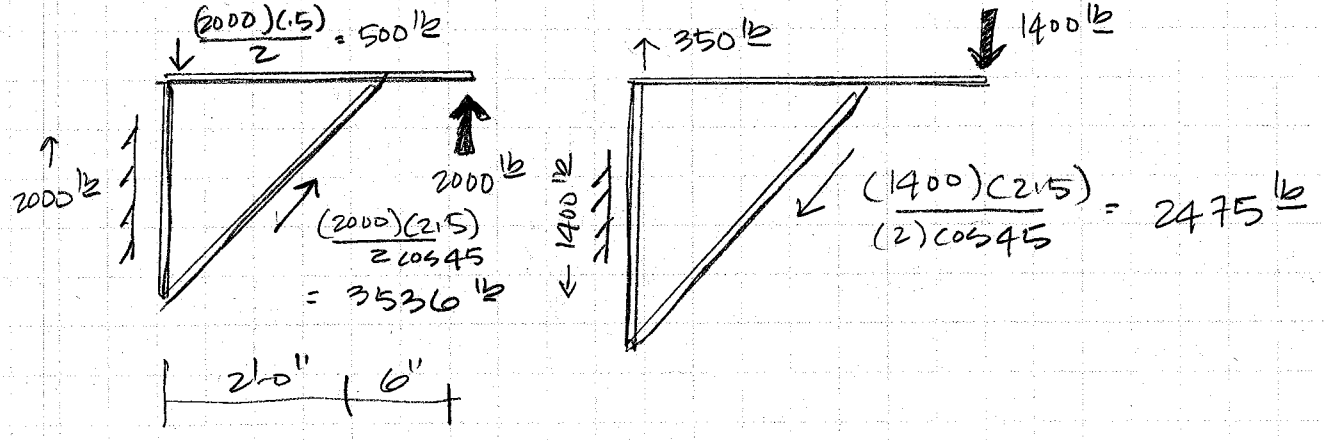
$S_{REQ} = \frac{2538 \times 12}{1200} = 25.4^{in^3}$

$< 27.7^{in^3}$



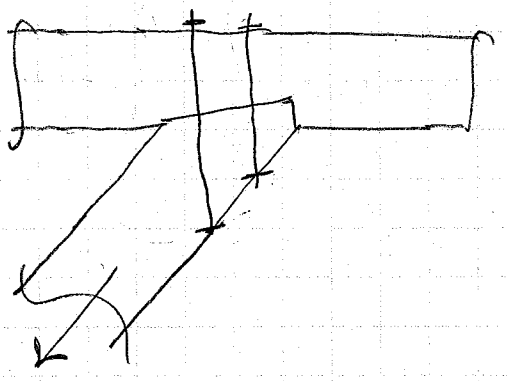
USE 6x6 DF #1

TIMBER BRACE DESIGN (CONT.)



$Z_{11} = (930\ lb)(1.6) = 1488\ lb$

$W = (625\ lb/in^2)\left(\frac{\pi(2)^2}{4}\right)(1.6)$
$= 3,142\ lb$



$$\sqrt{\left(\frac{2500}{(2)(1488)}\right)^2 + \left(\frac{2500}{(2)(3142)}\right)^2} = 0.9321$$

∴ USE (2) 5/8" ϕ A325
THRU BOLTS W/ 2" ϕ WASHERS

MAT FOUNDATION DESIGN

(SEE LOADING DIAGRAM FOR MORE INFORMATION.)

UNLOAD SITE

TOTAL DEAD LOAD OF STRUCTURE —

SLAB	(.150 KSF)(7,200 ft²)	=	1080 kip
G.B.	(2')(2')(430')(.150)	=	258 kip
2ND FLR	(4165 ft²)(.014 KSF)	=	58 kip
ROOF	(8200 ft²)(.015 KSF)	=	123 kip
WALLS	(4)(2150 ft²)(.012)	=	103 kip
		Σ =	1622 kip

GEOFOAM FILL = 3 PCF
SOIL = 120 PCF

$$\text{SOIL EQUIV} = \frac{1622 \text{ kip}}{.12} = 13{,}517 \text{ ft}^3$$

$$\frac{13517}{7200} = 1.88' \text{ OF SOIL}$$

REMOVING 2'-6" SOIL & REPLACING W/ GEOFOAM —

$$(.12)(7200)(2.5) - \left(\frac{3}{1000}\right)(2.5)(7200) = 2106 \text{ k} \quad \text{LESS THAN } 1622 \text{ kip}$$

∴ UNLOAD 2'-6" OF SOIL & REPLACE W/ 3 PCF GEOFOAM BLOCKS ✓ ok

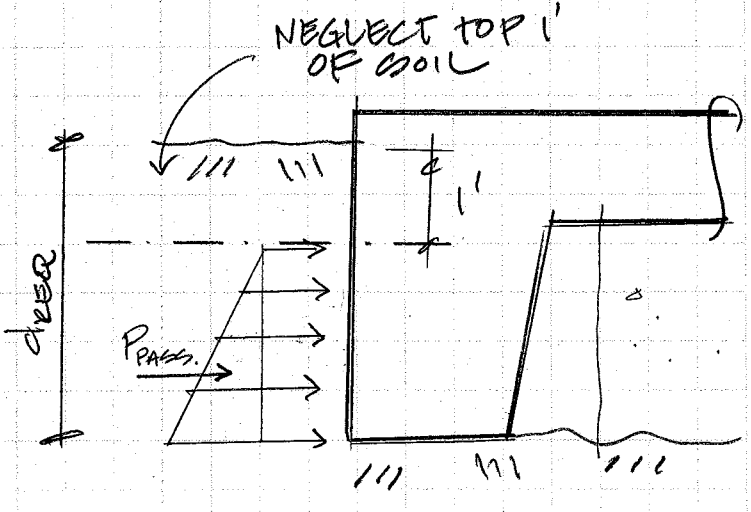
PASSIVE PRESSURE DESIGN

FROM LATERAL DESIGN CALCS:

$V_{ASD} = 36{,}005\ lb$

FROM GEOTECH:

$P_{PASSIVE} = \frac{350\ PCF}{1.5\ F.S.} = 233\ PCF$



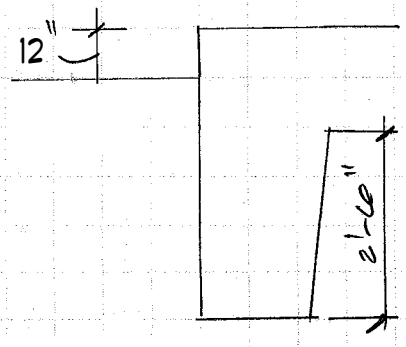
$\frac{36{,}005\ lb}{80'} = 450\ lb/ft$

FIND d_{REQ}

$(1')(233\ PCF)(d) + (\frac{1}{2})(233)(d)^2 = 450\ lb/ft$

$d_{REQ} = 1.21' + 1.0' = 2.21'$

$d_{AVAIL} = 3'\text{-}6" - 1'\text{-}0" = 2'\text{-}6" > 2.21'$



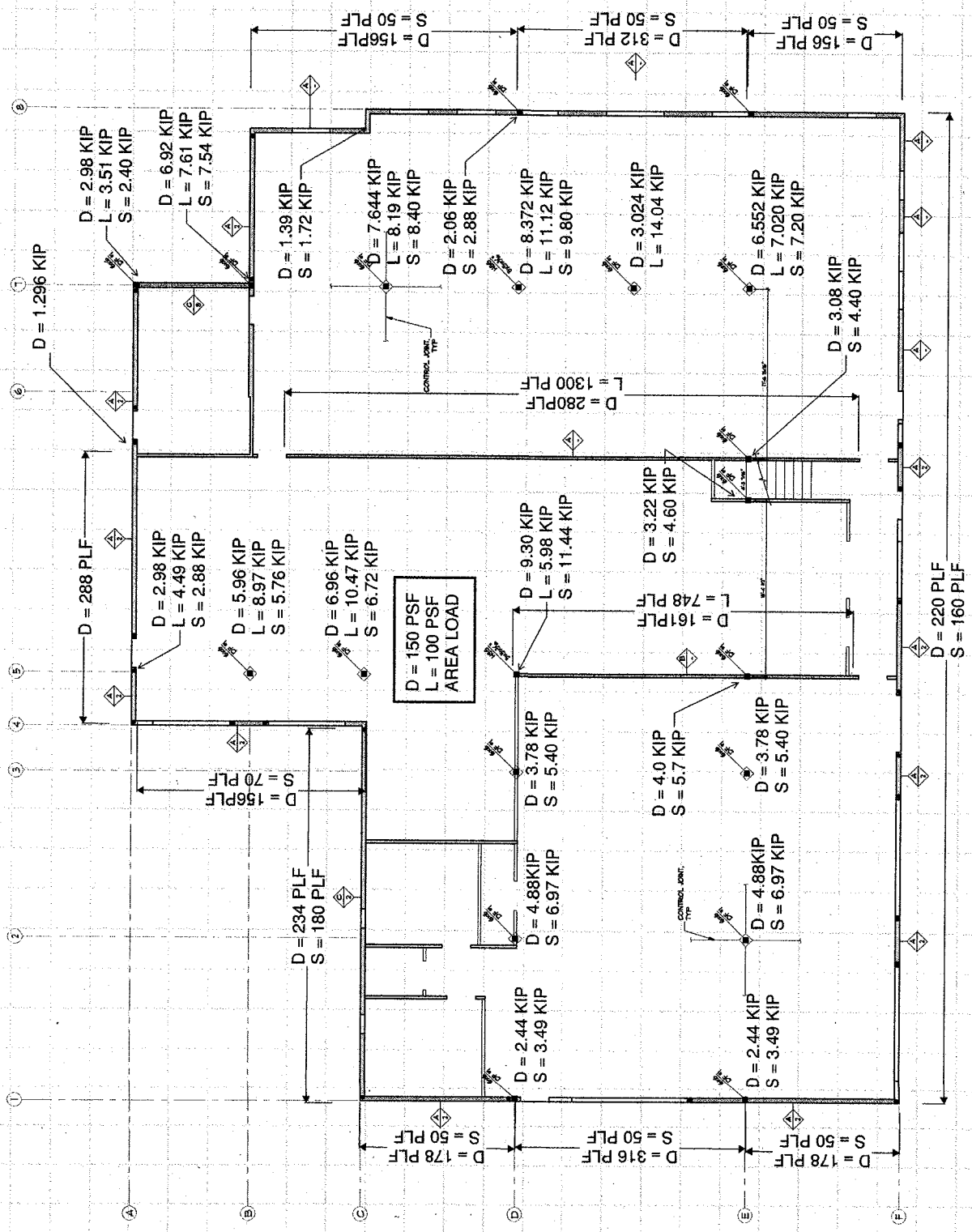
∴ USE 3'-6" DEEP EXTERIOR GRADE BMS

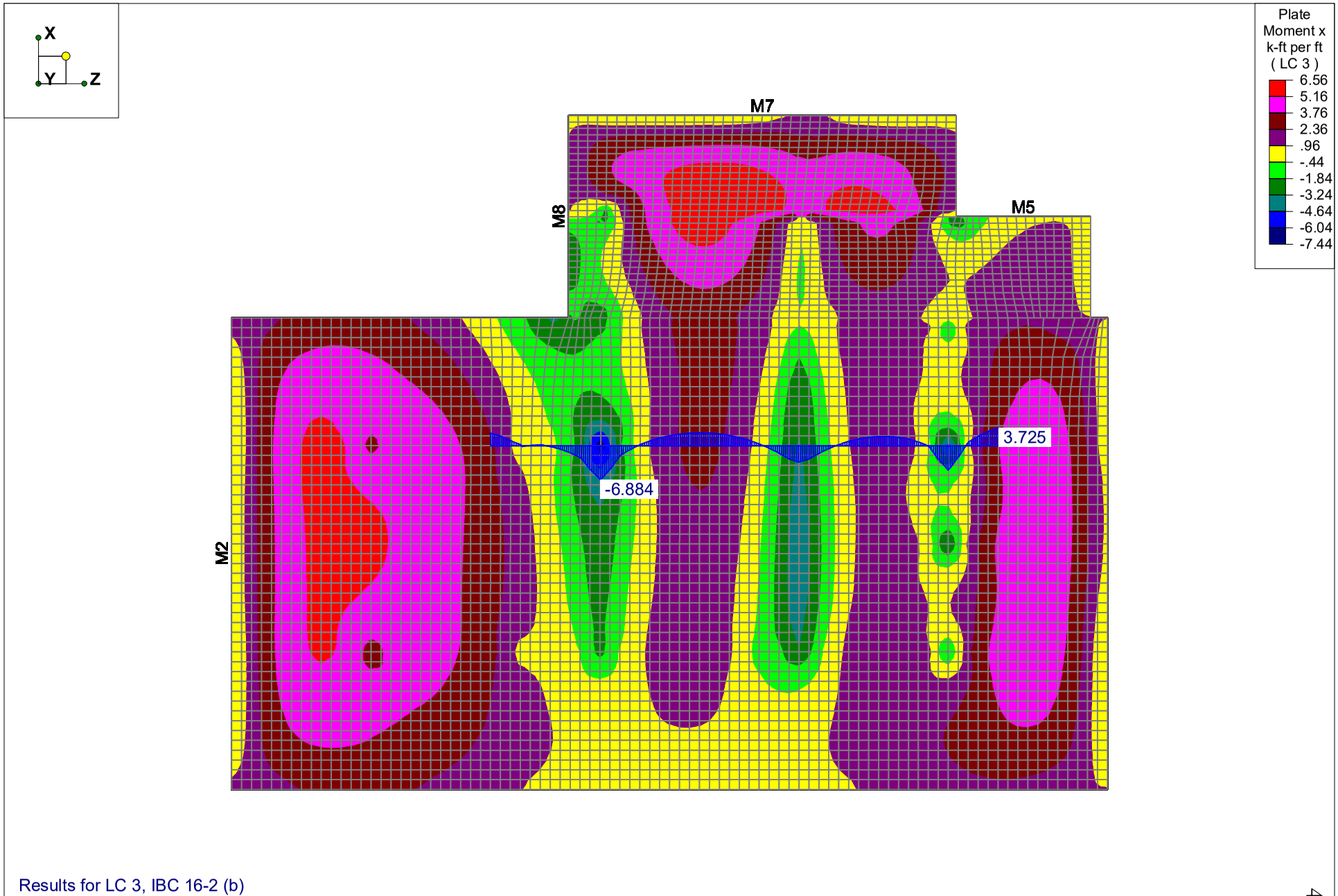
Project: Wheeler Mill Building
Wheeler, Oregon

Client: Tom Johnson Architect

Date: 11/15/18
Page: 39/107
By: SMJ
Job #: 218368

MAT FOUNDATION LOADING



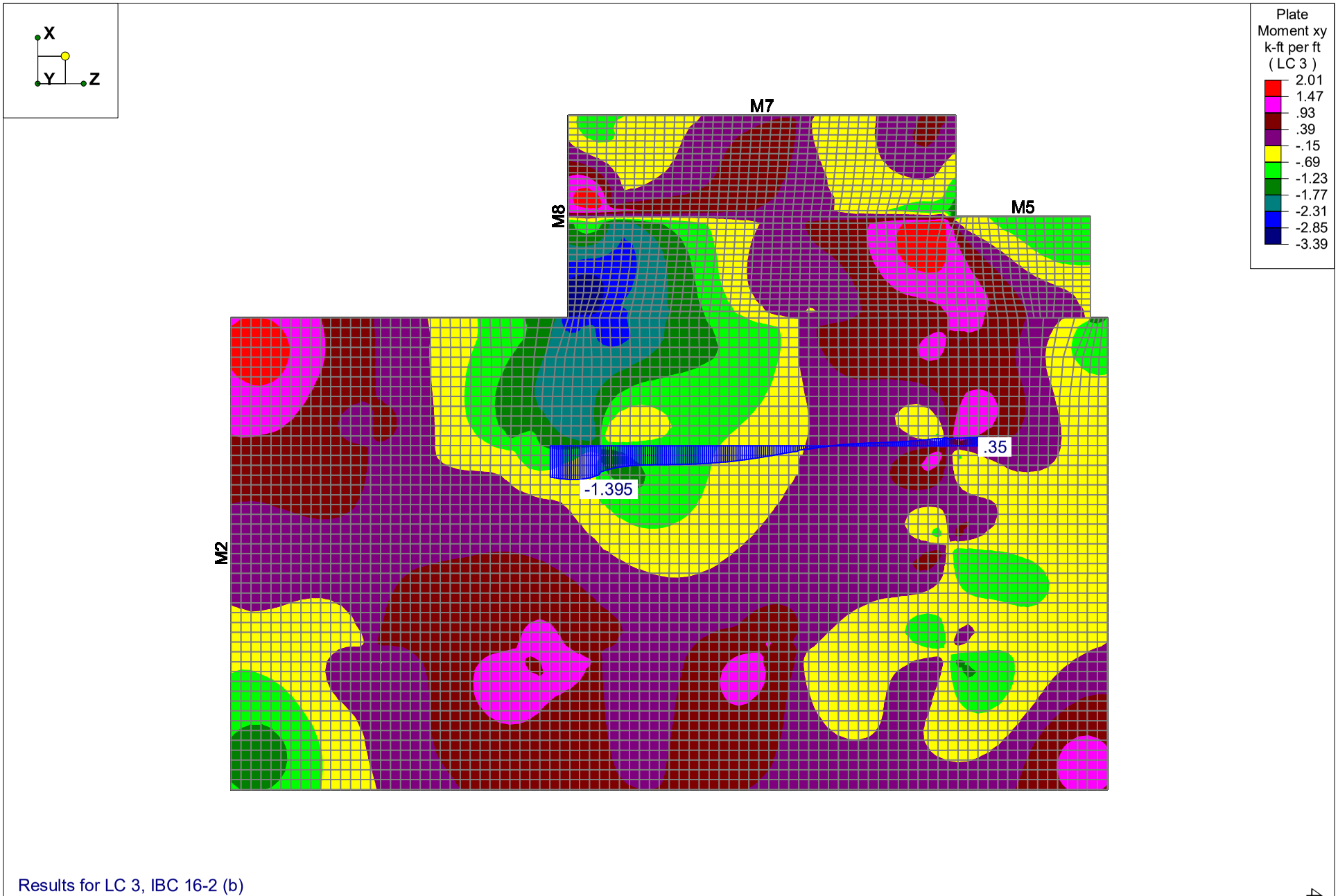


Results for LC 3, IBC 16-2 (b)

		SK - 1
		Nov 29, 2018 at 11:13 AM
		Foundation - Surface Plate Loads.r3d

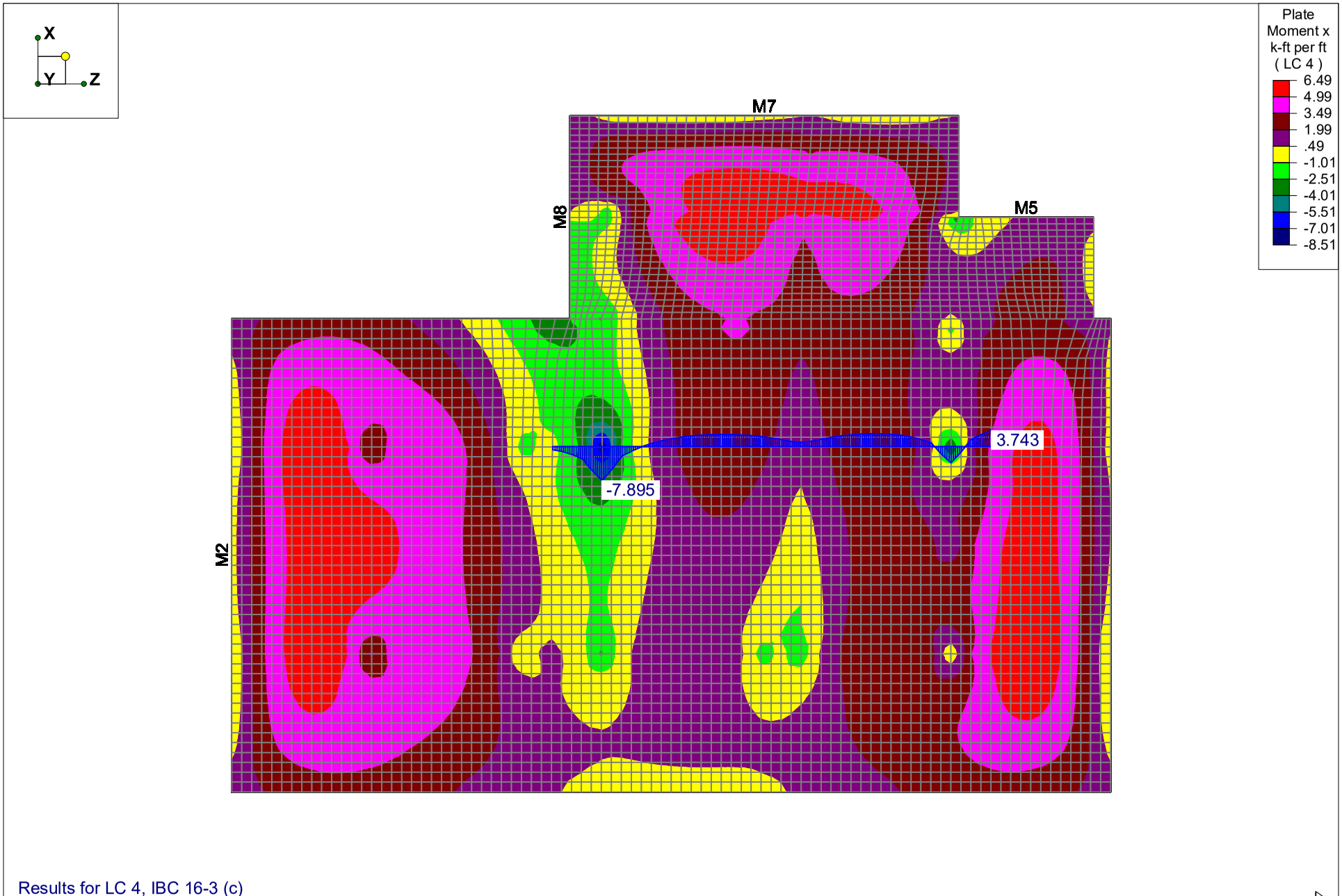
Results for LC 3, IBC 16-2 (b)

		SK - 2
		Nov 29, 2018 at 11:15 AM
		Foundation - Surface Plate Loads.r3d



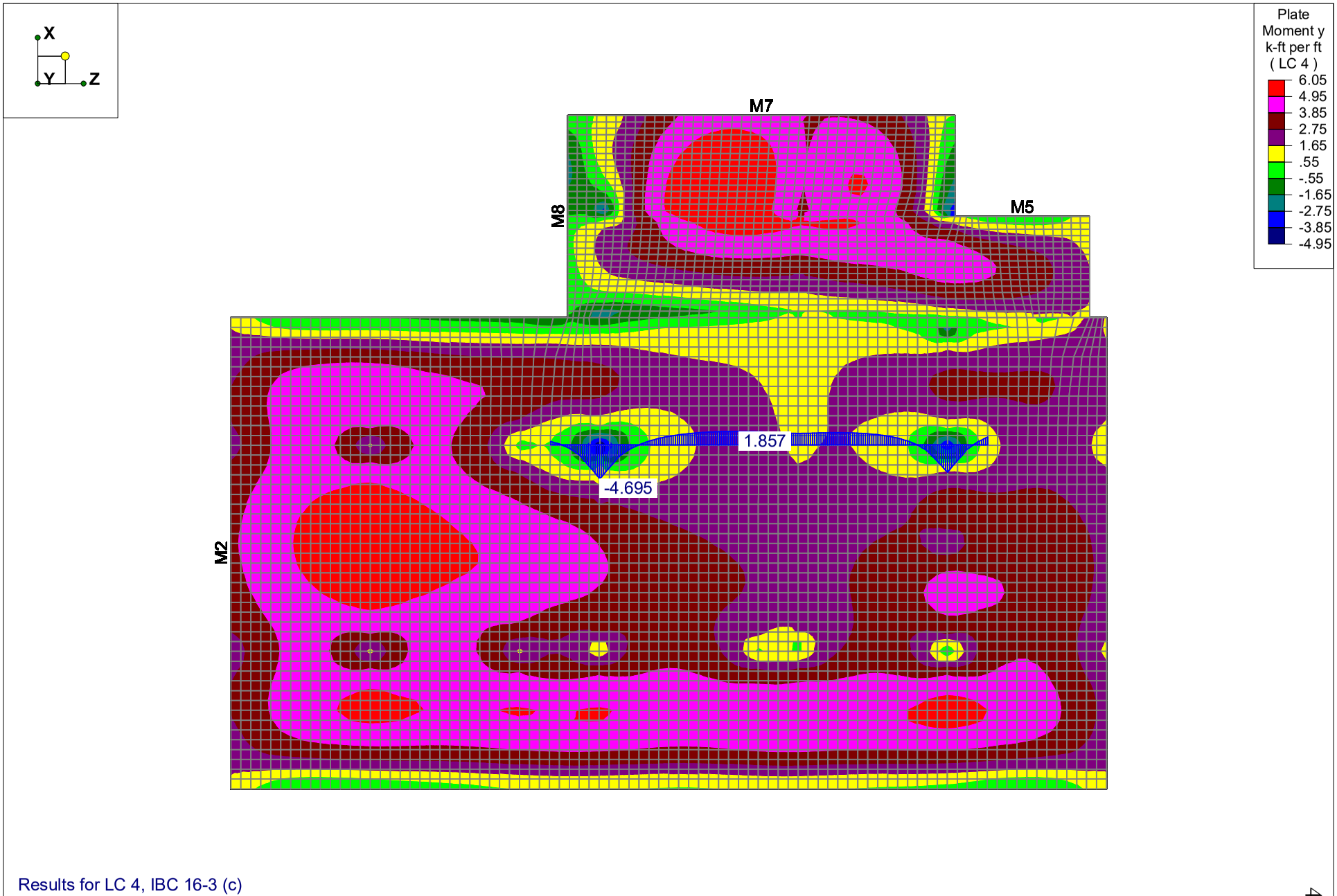
Results for LC 3, IBC 16-2 (b)

		SK - 3
		Nov 29, 2018 at 11:16 AM
		Foundation - Surface Plate Loads.r3d



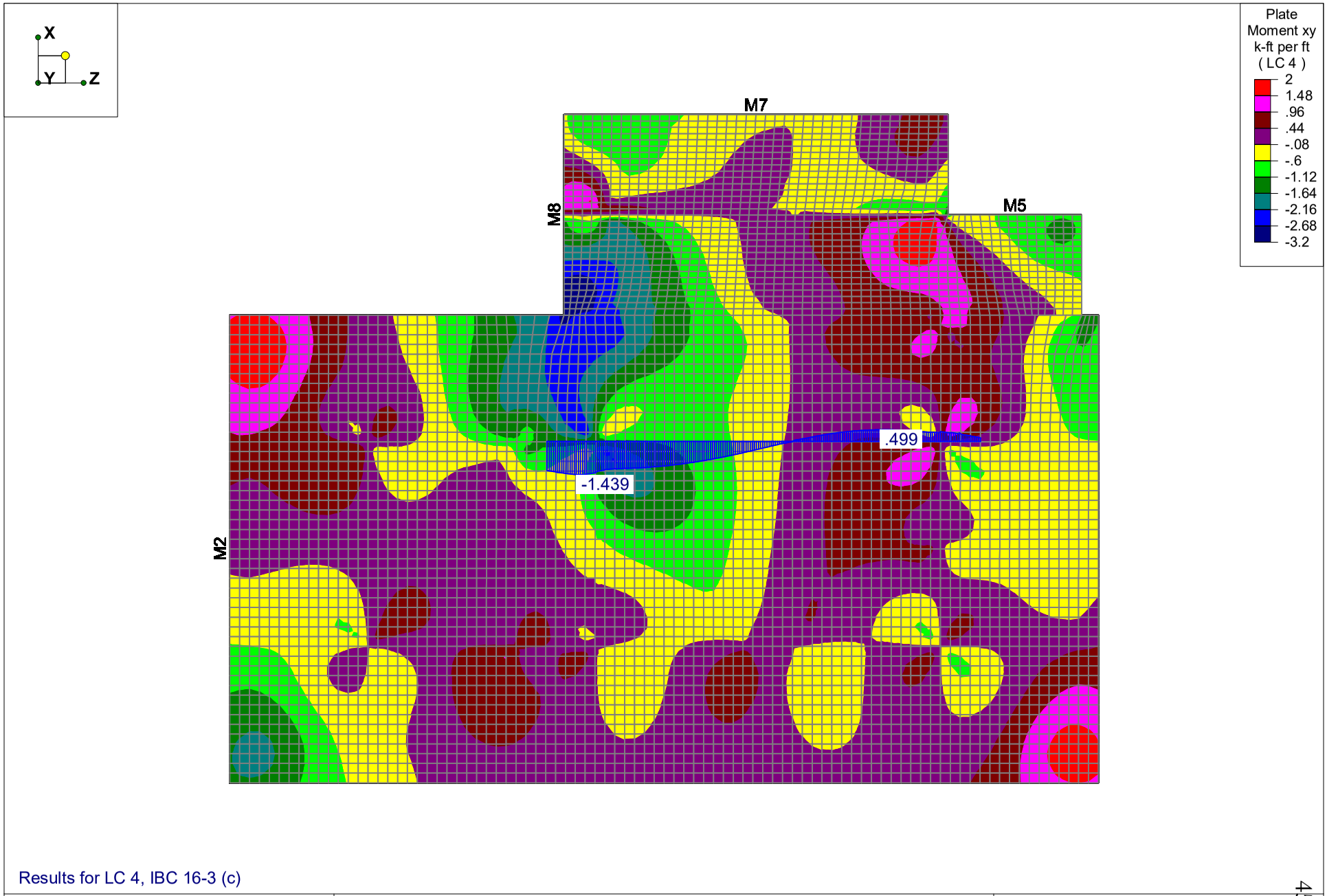
Results for LC 4, IBC 16-3 (c)

		SK - 4
		Nov 29, 2018 at 11:16 AM
		Foundation - Surface Plate Loads.r3d



Results for LC 4, IBC 16-3 (c)

		SK - 5
		Nov 29, 2018 at 11:17 AM
		Foundation - Surface Plate Loads.r3d



Results for LC 4, IBC 16-3 (c)

		SK - 6
		Nov 29, 2018 at 11:17 AM
		Foundation - Surface Plate Loads.r3d

MAT FOUNDATION DESIGN

MIN STEEL = $(0.0018)(12")(12") = 0.26^{IN^2/FT}$

∴ USE #5 @ 12" O.C. EA. FACE
($A = 0.31\ IN^2$)

FIND CAPACITY OF TYP. SLABS —

$$\phi M_N = (0.9)(.31)(60)\left(8.69 - \frac{.46}{2}\right) = 141.6^{K\text{-}IN}$$

$$d = 12 - 3 - 5/16 = 8.69^{IN}$$

$$a = \frac{(0.31)(60)}{(0.85)(4)(12)} = 0.46$$

$$\phi M_N = \frac{141.6}{12} = 11.8^{K\text{-}FT}$$

FIND MAX M_u FROM MODEL —

$$M_{u,MAX} = M_{x\ OR\ Y} + M_{xy} = -8.0 - 1.4 = 9.4^{K\text{-}FT}$$

$M_u < \phi M_N$ ✓OK

INCREASE BOTTOM REINF. TO 8" O.C. @ CONTROLLING POINT LOADS FOR GOOD MEASURE

CHECK PUNCHING SHEAR

$P_u = 1.2(8.4) + 1.6(11.12) + 0.5(9.8) = 37.9$ kip

FROM MODEL, JOINT REACTION = .64 kip (CN4787)

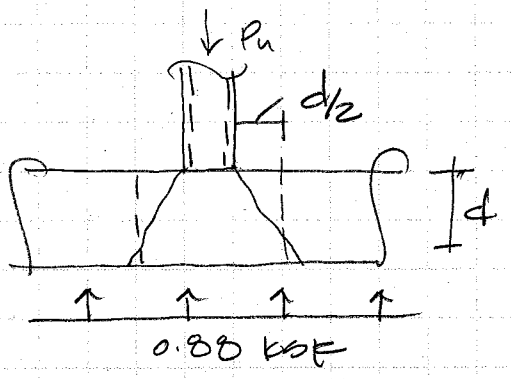
$\therefore q_u = (.64\text{ kip})\underbrace{(1.16)(1.18)}_{\text{PLATE AREA}} = 0.88$ KSF

FOR HSS5x5 COLUMN (IGNORING BASE PLATE)

$d = 12 - 3 - 5/16 = 8.69"$

$d/2 = 8.69/2 = 4.35"$

$b_o = 4(5" + 4.35(2))$
$= 54.8$ IN



$$\phi V_c = \frac{(0.75)(4)(1.0)\sqrt{4000}\,(54.8)(8.69)}{1000\text{ lb/k}}$$

$= 90.4$ kip

$V_u = 37.8\text{ kip} - (.88\text{ KSF})\left(\frac{13.7}{2}\right)^2 = 36.7$ kip

$\phi V_c > V_u$ ✓ ok

CHECK GRADE BEAM TORSION

$T_{u,MAX} = 45.0\ \text{K-ft} = 547\ \text{K-IN}$

$$\phi T_N = 0.75\left[\frac{(2)(A_o)(A_t)f_{yt}}{s}\cot\theta\right]$$

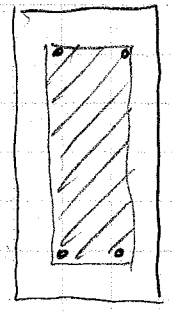
$A_o = 0.85(14")(30") = 357\ \text{IN}^2$

$A_t = 0.20\ \text{IN}^2$

$f_{yt} = 60\ \text{ksi}$

$s = 8"$

$\theta = 45°$



$\phi T_N = 803\ \text{K-IN} > 547\ \text{K-IN}$

USE #4 TIES @ 8" O.C.
@ AREAS OF HIGH TORSION

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	f'c[ksi]	Lambda	Flex Steel[...	Shear Stee...
1	Conc3000NW	3156	1372	.15	.6	.145	3	1	60	60
2	Conc3500NW	3409	1482	.15	.6	.145	3.5	1	60	60
3	Conc4000NW	3644	1584	.15	.6	.145	4	1	60	60
4	Conc3000LW	2085	907	.15	.6	.11	3	.75	60	60
5	Conc3500LW	2252	979	.15	.6	.11	3.5	.75	60	60
6	Conc4000LW	2408	1047	.15	.6	.11	4	.75	60	60

Concrete Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	CONC1A	CRECT36X18	Beam	None	Conc4000NW	Typical	648	17496	69984	47939.04

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(de...	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N8	N9			CONC1A	Beam	None	Conc4000NW	Typical
2	M2	N9	N10			CONC1A	Beam	None	Conc4000NW	Typical
3	M3	N10	N7			CONC1A	Beam	None	Conc4000NW	Typical
4	M4	N6	N5			CONC1A	Beam	None	Conc4000NW	Typical
5	M5	N5	N2			CONC1A	Beam	None	Conc4000NW	Typical
6	M6	N2	N1			CONC1A	Beam	None	Conc4000NW	Typical
7	M7	N1	N4			CONC1A	Beam	None	Conc4000NW	Typical
8	M8	N4	N3			CONC1A	Beam	None	Conc4000NW	Typical
9	M9	N7	N8			CONC1A	Beam	None	Conc4000NW	Typical

Joint Loads and Enforced Displacements (BLC 1 : D)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1420	L	Y	-2.44
2	N1468	L	Y	-4.88
3	N1527	L	Y	-3.78
4	N2481	L	Y	-4
5	N3501	L	Y	-3.22
6	N3996	L	Y	-3.08
7	N4716	L	Y	-6.552
8	N5751	L	Y	-2.835
9	N599	L	Y	-2.44
10	N502	L	Y	-4.88
11	N1094	L	Y	-3.78
12	N2402	L	Y	-9.3
13	N4787	L	Y	-8.372
14	N5447	L	Y	-2.016
15	N4765	L	Y	-3.024
16	N2354	L	Y	-6.958
17	N2177	L	Y	-5.964
18	N377	L	Y	-2.982
19	N372	L	Y	-1.296
20	N1	L	Y	-2.982
21	N2	L	Y	-6.92

Joint Loads and Enforced Displacements (BLC 1 : D) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
22	N6	L	Y	-1.388
23	N4832	L	Y	-7.644
24	N2406	L	Y	-.188
25	N2410	L	Y	-.188
26	N2414	L	Y	-.188
27	N2417	L	Y	-.188
28	N2421	L	Y	-.188
29	N2425	L	Y	-.188
30	N2429	L	Y	-.188
31	N2432	L	Y	-.188
32	N2436	L	Y	-.188
33	N2440	L	Y	-.188
34	N2444	L	Y	-.188
35	N2447	L	Y	-.188
36	N2451	L	Y	-.188
37	N2455	L	Y	-.188
38	N2459	L	Y	-.188
39	N2462	L	Y	-.188
40	N2466	L	Y	-.188
41	N2470	L	Y	-.188
42	N2474	L	Y	-.188
43	N2477	L	Y	-.188
44	N3992	L	Y	-.327
45	N3989	L	Y	-.327
46	N3985	L	Y	-.327
47	N3981	L	Y	-.327
48	N3977	L	Y	-.327
49	N3974	L	Y	-.327
50	N3970	L	Y	-.327
51	N3966	L	Y	-.327
52	N3962	L	Y	-.327
53	N3959	L	Y	-.327
54	N3955	L	Y	-.327
55	N3951	L	Y	-.327
56	N3947	L	Y	-.327
57	N3944	L	Y	-.327
58	N3940	L	Y	-.327
59	N3936	L	Y	-.327
60	N3932	L	Y	-.327
61	N3929	L	Y	-.327
62	N3925	L	Y	-.327
63	N3921	L	Y	-.327
64	N3917	L	Y	-.327
65	N3914	L	Y	-.327
66	N3910	L	Y	-.327
67	N3906	L	Y	-.327
68	N3902	L	Y	-.327
69	N3899	L	Y	-.327
70	N3895	L	Y	-.327
71	N3891	L	Y	-.327
72	N3887	L	Y	-.327
73	N3884	L	Y	-.327

Joint Loads and Enforced Displacements (BLC 1 : D) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
74	N3880	L	Y	-.327
75	N3876	L	Y	-.327
76	N3872	L	Y	-.327
77	N3869	L	Y	-.327
78	N3865	L	Y	-.21
79	N3861	L	Y	-.21
80	N3857	L	Y	-.21
81	N3854	L	Y	-.21
82	N3850	L	Y	-.21
83	N3846	L	Y	-.21
84	N3842	L	Y	-.21
85	N3839	L	Y	-.21
86	N3835	L	Y	-.21
87	N3831	L	Y	-.21
88	N3827	L	Y	-.21
89	N3824	L	Y	-.21
90	N3820	L	Y	-.21
91	N3816	L	Y	-.21
92	N3812	L	Y	-.21
93	N3797	L	Y	-.21
94	N3798	L	Y	-.21
95	N3799	L	Y	-.21
96	N3800	L	Y	-.21
97	N3782	L	Y	-.21
98	N3783	L	Y	-.21
99	N3784	L	Y	-.21
100	N3785	L	Y	-.21
101	N3767	L	Y	-.21
102	N3768	L	Y	-.21
103	N3769	L	Y	-.21
104	N3770	L	Y	-.21
105	N3749	L	Y	-.21
106	N3750	L	Y	-.21
107	N3751	L	Y	-.21
108	N3752	L	Y	-.21

Joint Loads and Enforced Displacements (BLC 2 : L)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1420	L	Y	0
2	N1468	L	Y	0
3	N1527	L	Y	0
4	N2481	L	Y	0
5	N3501	L	Y	0
6	N3996	L	Y	0
7	N4716	L	Y	-7.02
8	N5751	L	Y	0
9	N599	L	Y	0
10	N502	L	Y	0
11	N1094	L	Y	0
12	N2402	L	Y	-5.98
13	N4787	L	Y	-11.12

Joint Loads and Enforced Displacements (BLC 2 : L) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
14	N5447	L	Y	0
15	N4765	L	Y	-14.04
16	N2354	L	Y	-10.465
17	N2177	L	Y	-8.97
18	N377	L	Y	-4.485
19	N372	L	Y	0
20	N1	L	Y	-3.51
21	N2	L	Y	-7.605
22	N6	L	Y	0
23	N4832	L	Y	-8.19
24	N2481	L	Y	-.873
25	N2477	L	Y	-.873
26	N2474	L	Y	-.873
27	N2470	L	Y	-.873
28	N2466	L	Y	-.873
29	N2462	L	Y	-.873
30	N2459	L	Y	-.873
31	N2455	L	Y	-.873
32	N2451	L	Y	-.873
33	N2447	L	Y	-.873
34	N2444	L	Y	-.873
35	N2440	L	Y	-.873
36	N2436	L	Y	-.873
37	N2432	L	Y	-.873
38	N2429	L	Y	-.873
39	N2425	L	Y	-.873
40	N2421	L	Y	-.873
41	N2417	L	Y	-.873
42	N2414	L	Y	-.873
43	N2410	L	Y	-.873
44	N2406	L	Y	-.873
45	N3996	L	Y	-1.52
46	N3992	L	Y	-1.52
47	N3989	L	Y	-1.52
48	N3985	L	Y	-1.52
49	N3981	L	Y	-1.52
50	N3977	L	Y	-1.52
51	N3974	L	Y	-1.52
52	N3970	L	Y	-1.52
53	N3966	L	Y	-1.52
54	N3962	L	Y	-1.52
55	N3959	L	Y	-1.52
56	N3955	L	Y	-1.52
57	N3951	L	Y	-1.52
58	N3947	L	Y	-1.52
59	N3944	L	Y	-1.52
60	N3940	L	Y	-1.52
61	N3936	L	Y	-1.52
62	N3932	L	Y	-1.52
63	N3929	L	Y	-1.52
64	N3925	L	Y	-1.52
65	N3921	L	Y	-1.52

Joint Loads and Enforced Displacements (BLC 2 : L) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
66	N3917	L	Y	-1.52
67	N3914	L	Y	-1.52
68	N3910	L	Y	-1.52
69	N3906	L	Y	-1.52
70	N3902	L	Y	-1.52
71	N3899	L	Y	-1.52
72	N3895	L	Y	-1.52
73	N3891	L	Y	-1.52
74	N3887	L	Y	-1.52
75	N3884	L	Y	-1.52
76	N3880	L	Y	-1.52
77	N3876	L	Y	-1.52
78	N3872	L	Y	-1.52
79	N3869	L	Y	-1.52
80	N3865	L	Y	-.975
81	N3861	L	Y	-.975
82	N3857	L	Y	-.975
83	N3854	L	Y	-.975
84	N3850	L	Y	-.975
85	N3846	L	Y	-.975
86	N3842	L	Y	-.975
87	N3839	L	Y	-.975
88	N3835	L	Y	-.975
89	N3831	L	Y	-.975
90	N3827	L	Y	-.975
91	N3824	L	Y	-.975
92	N3820	L	Y	-.975
93	N3816	L	Y	-.975
94	N3812	L	Y	-.975
95	N3797	L	Y	-.975
96	N3798	L	Y	-.975
97	N3799	L	Y	-.975
98	N3800	L	Y	-.975
99	N3782	L	Y	-.975
100	N3783	L	Y	-.975
101	N3784	L	Y	-.975
102	N3785	L	Y	-.975
103	N3767	L	Y	-.975
104	N3768	L	Y	-.975
105	N3769	L	Y	-.975
106	N3770	L	Y	-.975
107	N3749	L	Y	-.975
108	N3750	L	Y	-.975
109	N3751	L	Y	-.975
110	N3752	L	Y	-.975
111	N3753	L	Y	-.975

Joint Loads and Enforced Displacements (BLC 3 : S)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1420	L	Y	-3.49
2	N1468	L	Y	-6.97

Joint Loads and Enforced Displacements (BLC 3 : S) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
3	N1527	L	Y	-5.4
4	N2481	L	Y	-5.7
5	N3501	L	Y	-4.6
6	N3996	L	Y	-4.4
7	N4716	L	Y	-7.2
8	N5751	L	Y	-4.5
9	N599	L	Y	-3.49
10	N502	L	Y	-6.97
11	N1094	L	Y	-5.4
12	N2402	L	Y	-11.44
13	N4787	L	Y	-9.8
14	N5447	L	Y	-2.88
15	N4765	L	Y	0
16	N2354	L	Y	-6.72
17	N2177	L	Y	-5.76
18	N377	L	Y	0
19	N372	L	Y	0
20	N1	L	Y	-2.4
21	N2	L	Y	-7.54
22	N6	L	Y	-1.72
23	N4832	L	Y	-8.4

Member Distributed Loads (BLC 1 : D)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.22	-.22	0	0
2	M2	Y	-.178	-.178	0	16
3	M2	Y	-.316	-.316	16	40
4	M2	Y	-.178	-.178	40	56
5	M3	Y	-.234	-.234	0	40
6	M8	Y	-.157	-.157	0	0
7	M7	Y	-.288	-.288	12	0
8	M9	Y	-.156	-.156	0	15
9	M9	Y	-.312	-.312	15	40
10	M9	Y	-.156	-.156	40	56

Member Distributed Loads (BLC 3 : S)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.16	-.16	0	0
2	M2	Y	-.05	-.05	0	16
3	M2	Y	-.05	-.05	16	40
4	M2	Y	-.05	-.05	40	56
5	M3	Y	-.18	-.18	0	40
6	M8	Y	-.07	-.07	0	0
7	M7	Y	0	0	12	0
8	M9	Y	-.05	-.05	0	15
9	M9	Y	-.05	-.05	15	40
10	M9	Y	-.05	-.05	40	56

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	D	DL		-1		108		10		
2	L	LL				111				5760
3	S	SL				23		10		

Load Combinations

	Description	So...	PDelta	S...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...
1	IBC 16-1	Yes	Y		DL	1.4																
2	IBC 16-2 ...	Yes	Y		DL	1.2	LL	1.6	LLS	1.6												
3	IBC 16-2 ...	Yes	Y		DL	1.2	LL	1.6	LLS	1.6	SL	.5	SLN	.5								
4	IBC 16-3 ...	Yes	Y		DL	1.2	SL	1.6	SLN	1.6	LL	.5	LLS	1								
5	IBC 16-8		Y		DL	1																
6	IBC 16-9		Y		DL	1	LL	1	LLS	1												
7	IBC 16-1...		Y		DL	1																
8	IBC 16-1...		Y		DL	1	SL	1	SLN	1												
9	IBC 16-1...		Y		DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75								

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
1	1	M1	1	0	.184	0	18.195	0	18.762
2			2	0	2.672	0	3.211	0	28.476
3			3	0	.745	0	.844	0	-.929
4			4	0	-2.616	0	-1.95	0	29.962
5			5	0	-.231	0	-18.319	0	18.809
6	1	M2	1	0	.091	0	18.698	0	18.438
7			2	0	2.114	0	12.705	0	45.866
8			3	0	-.855	0	-.476	0	49.673
9			4	0	-2.312	0	-12.426	0	44.124
10			5	0	-.131	0	-18.186	0	17.304
11	1	M3	1	0	.196	0	17.162	0	18.283
12			2	0	3.274	0	-9.311	0	14.201
13			3	0	-2.958	0	-21.514	0	27.361
14			4	0	1.092	0	8.233	0	41.847
15			5	0	.344	0	-20.204	0	12.282
16	1	M4	1	0	-.497	0	7.606	0	20.749
17			2	0	-1.096	0	7.583	0	22.542
18			3	0	.741	0	9.423	0	21.861
19			4	0	1.489	0	11.011	0	17.282
20			5	0	.182	0	10.55	0	11.587
21	1	M5	1	0	.37	0	-11.682	0	10.762
22			2	0	-.819	0	-12.397	0	16.232
23			3	0	1.043	0	-10.735	0	20.23
24			4	0	1.777	0	-10.263	0	16.375
25			5	0	3.6	0	-14.435	0	4.95
26	1	M6	1	0	-3.944	0	4.937	0	17.081
27			2	0	-2.241	0	7.386	0	26.622
28			3	0	1.005	0	10.406	0	26.66
29			4	0	2.15	0	12.026	0	20.372
30			5	0	1.25	0	11.484	0	11.825

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-..	z-z Moment[k-...
31	1	M7	1	0	-2.439	0	-11.904	0	11.802
32			2	0	.858	0	-8.382	0	50.076
33			3	0	-1.173	0	-3.142	0	52.724
34			4	0	3.5	0	4.682	0	40.562
35			5	0	-1.443	0	9.927	0	5.382
36	1	M8	1	0	-1.2	0	-5.138	0	9.837
37			2	0	-1.89	0	3.031	0	24.719
38			3	0	-.64	0	15.558	0	24.276
39			4	0	.52	0	28.344	0	16.744
40			5	0	-3.064	0	35.044	0	8.01
41	1	M9	1	0	.638	0	12.458	0	20.482
42			2	0	2.315	0	7.813	0	25.769
43			3	0	-1.39	0	.393	0	34.298
44			4	0	-2.83	0	-12.342	0	40.646
45			5	0	-.137	0	-18.651	0	18.314
46	2	M1	1	0	.268	0	10.86	0	10.997
47			2	0	1.856	0	.512	0	16.427
48			3	0	.935	0	5.904	0	.872
49			4	0	-1.817	0	4.409	0	27.279
50			5	0	-.092	0	-14.122	0	14.884
51	2	M2	1	0	.18	0	14.793	0	14.232
52			2	0	1.635	0	9.45	0	36.884
53			3	0	-.98	0	-2.032	0	42.157
54			4	0	-2.189	0	-12.631	0	39.193
55			5	0	-.204	0	-17.176	0	16.663
56	2	M3	1	0	.072	0	16.561	0	17.269
57			2	0	3.635	0	-4.091	0	20.769
58			3	0	-3.705	0	-24.665	0	31.697
59			4	0	-.933	0	7.834	0	21.758
60			5	0	-.5	0	-21.77	0	10.13
61	2	M4	1	0	-.534	0	5.828	0	26.573
62			2	0	-.856	0	6.246	0	28.35
63			3	0	1.152	0	8.571	0	26.856
64			4	0	2.098	0	10.537	0	20.711
65			5	0	1.028	0	10.191	0	12.698
66	2	M5	1	0	1.213	0	-12.819	0	10.4
67			2	0	.474	0	-14.095	0	11.577
68			3	0	2.975	0	-13.144	0	9.478
69			4	0	4.609	0	-12.817	0	-3.758
70			5	0	7.904	0	-15.843	0	-29.064
71	2	M6	1	0	-5.38	0	-24.416	0	18.28
72			2	0	-1.465	0	-14.492	0	31.139
73			3	0	2.594	0	-6.307	0	30.191
74			4	0	4.575	0	-.913	0	20.452
75			5	0	4.564	0	1.491	0	5.036
76	2	M7	1	0	-3.745	0	-4.971	0	1.795
77			2	0	2.465	0	-.345	0	33.377
78			3	0	-4.16	0	-5.98	0	41.047
79			4	0	4.62	0	2.062	0	44.484
80			5	0	-2.402	0	8.771	0	2.295
81	2	M8	1	0	-2.147	0	-2.073	0	8.7
82			2	0	-1.581	0	8.772	0	24.617

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-..	z-z Moment[k-...
83			3	0	-1.253	0	19.878	0	20.19
84			4	0	-1.448	0	33.862	0	20.071
85			5	0	-4.431	0	42.512	0	14.454
86	2	M9	1	0	-.208	0	10.237	0	21.998
87			2	0	2.615	0	5.844	0	23.254
88			3	0	.732	0	5.081	0	22.487
89			4	0	-2.009	0	-2.504	0	27.237
90			5	0	.005	0	-10.891	0	10.967
91	3	M1	1	0	.312	0	11.92	0	12.195
92			2	0	1.99	0	.626	0	17.633
93			3	0	.993	0	5.725	0	.952
94			4	0	-1.947	0	4.434	0	28.252
95			5	0	-.167	0	-14.994	0	15.847
96	3	M2	1	0	.121	0	15.755	0	15.114
97			2	0	2.172	0	10.209	0	37.004
98			3	0	-1.085	0	-2.174	0	45.546
99			4	0	-2.882	0	-13.585	0	39.141
100			5	0	-.146	0	-18.318	0	17.656
101	3	M3	1	0	.148	0	17.54	0	18.41
102			2	0	3.919	0	-5.273	0	20.301
103			3	0	-4.353	0	-25.117	0	34.536
104			4	0	1.599	0	8.176	0	23.392
105			5	0	-.439	0	-22.235	0	11.038
106	3	M4	1	0	-.905	0	6.581	0	26.377
107			2	0	-1.117	0	7.017	0	29.04
108			3	0	1.08	0	9.382	0	27.919
109			4	0	2.14	0	11.329	0	21.673
110			5	0	1.09	0	10.889	0	13.305
111	3	M5	1	0	1.282	0	-13.428	0	11.103
112			2	0	.681	0	-14.691	0	11.925
113			3	0	3.46	0	-13.417	0	8.55
114			4	0	5.32	0	-12.617	0	-7.179
115			5	0	9.113	0	-14.111	0	-36.327
116	3	M6	1	0	-6.126	0	-30.468	0	15.944
117			2	0	-1.65	0	-18.439	0	30.608
118			3	0	2.668	0	-9.021	0	30.357
119			4	0	4.861	0	-2.905	0	20.458
120			5	0	5.052	0	.024	0	4.153
121	3	M7	1	0	-4.367	0	-4.071	0	.345
122			2	0	2.075	0	1.194	0	38.054
123			3	0	-4.221	0	-4.813	0	47.514
124			4	0	4.884	0	3.318	0	48.632
125			5	0	-2.207	0	9.283	0	2.307
126	3	M8	1	0	-1.955	0	-2.064	0	9.19
127			2	0	-1.221	0	9.386	0	23.299
128			3	0	-1.225	0	20.53	0	16.694
129			4	0	-1.628	0	35.543	0	17.403
130			5	0	-4.796	0	45.567	0	11.969
131	3	M9	1	0	-.144	0	11.17	0	22.487
132			2	0	3.168	0	6.95	0	22.566
133			3	0	.86	0	5.725	0	25.234
134			4	0	-2.73	0	-3.376	0	26.635

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
135			5	0	.032	0	-12.088	0	12.038
136	4	M1	1	0	.333	0	17.508	0	18.327
137			2	0	2.585	0	2.477	0	25.753
138			3	0	.916	0	1.769	0	-.099
139			4	0	-2.526	0	.612	0	29.293
140			5	0	-.406	0	-17.998	0	18.816
141	4	M2	1	0	-.079	0	18.719	0	18.138
142			2	0	3.474	0	12.868	0	38.939
143			3	0	-1.145	0	-1.371	0	53.289
144			4	0	-4.263	0	-14.323	0	38.082
145			5	0	.045	0	-19.738	0	18.581
146	4	M3	1	0	.383	0	18.422	0	19.824
147			2	0	3.975	0	-10.549	0	13.362
148			3	0	-4.974	0	-21.834	0	35.112
149			4	0	3.225	0	8.394	0	36.754
150			5	0	.243	0	-20.198	0	13.309
151	4	M4	1	0	-1.646	0	8.712	0	19.902
152			2	0	-1.75	0	8.886	0	24.349
153			3	0	.564	0	10.826	0	24.675
154			4	0	1.669	0	12.315	0	19.737
155			5	0	.626	0	11.634	0	12.74
156	4	M5	1	0	.819	0	-12.841	0	11.842
157			2	0	.327	0	-13.618	0	14.297
158			3	0	3.097	0	-11.306	0	11.913
159			4	0	4.764	0	-9.413	0	-2.471
160			5	0	8.459	0	-7.915	0	-29.41
161	4	M6	1	0	-6.395	0	-24.086	0	8.304
162			2	0	-2.369	0	-13.273	0	23.59
163			3	0	1.639	0	-4.924	0	25.331
164			4	0	3.613	0	1.169	0	18.415
165			5	0	3.726	0	2.539	0	5.717
166	4	M7	1	0	-4.596	0	-5.691	0	2.874
167			2	0	-1.635	0	-2.131	0	54.714
168			3	0	-2.188	0	.402	0	64.591
169			4	0	4.351	0	7.42	0	51.077
170			5	0	-.978	0	10.23	0	3.927
171	4	M8	1	0	-.765	0	-3.645	0	10.083
172			2	0	.753	0	6.494	0	18.042
173			3	0	-.681	0	17.467	0	9.427
174			4	0	-1.231	0	32.662	0	7.603
175			5	0	-4.358	0	43.712	0	1.286
176	4	M9	1	0	.515	0	13.527	0	20.507
177			2	0	3.95	0	9.972	0	20.252
178			3	0	-.879	0	3.921	0	36.029
179			4	0	-4.604	0	-10.845	0	30.536
180			5	0	.008	0	-18.224	0	17.645

Member Torsion Stresses

	LC	Member Label	Sec	Torque[k-ft]	Shear[ksi]	y Warp Shear...	z Warp Shear...	z-Bot Warp B...	z-Top Warp B...
1	1	M1	1	18.195	0	NC	NC	NC	NC
2			2	3.211	0	NC	NC	NC	NC
3			3	.844	0	NC	NC	NC	NC
4			4	-1.95	0	NC	NC	NC	NC
5			5	-18.319	0	NC	NC	NC	NC
6	1	M2	1	18.698	0	NC	NC	NC	NC
7			2	12.705	0	NC	NC	NC	NC
8			3	-.476	0	NC	NC	NC	NC
9			4	-12.426	0	NC	NC	NC	NC
10			5	-18.186	0	NC	NC	NC	NC
11	1	M3	1	17.162	0	NC	NC	NC	NC
12			2	-9.311	0	NC	NC	NC	NC
13			3	-21.514	0	NC	NC	NC	NC
14			4	8.233	0	NC	NC	NC	NC
15			5	-20.204	0	NC	NC	NC	NC
16	1	M4	1	7.606	0	NC	NC	NC	NC
17			2	7.583	0	NC	NC	NC	NC
18			3	9.423	0	NC	NC	NC	NC
19			4	11.011	0	NC	NC	NC	NC
20			5	10.55	0	NC	NC	NC	NC
21	1	M5	1	-11.682	0	NC	NC	NC	NC
22			2	-12.397	0	NC	NC	NC	NC
23			3	-10.735	0	NC	NC	NC	NC
24			4	-10.263	0	NC	NC	NC	NC
25			5	-14.435	0	NC	NC	NC	NC
26	1	M6	1	4.937	0	NC	NC	NC	NC
27			2	7.386	0	NC	NC	NC	NC
28			3	10.406	0	NC	NC	NC	NC
29			4	12.026	0	NC	NC	NC	NC
30			5	11.484	0	NC	NC	NC	NC
31	1	M7	1	-11.904	0	NC	NC	NC	NC
32			2	-8.382	0	NC	NC	NC	NC
33			3	-3.142	0	NC	NC	NC	NC
34			4	4.682	0	NC	NC	NC	NC
35			5	9.927	0	NC	NC	NC	NC
36	1	M8	1	-5.138	0	NC	NC	NC	NC
37			2	3.031	0	NC	NC	NC	NC
38			3	15.558	0	NC	NC	NC	NC
39			4	28.344	0	NC	NC	NC	NC
40			5	35.044	0	NC	NC	NC	NC
41	1	M9	1	12.458	0	NC	NC	NC	NC
42			2	7.813	0	NC	NC	NC	NC
43			3	.393	0	NC	NC	NC	NC
44			4	-12.342	0	NC	NC	NC	NC
45			5	-18.651	0	NC	NC	NC	NC
46	2	M1	1	10.86	0	NC	NC	NC	NC
47			2	.512	0	NC	NC	NC	NC
48			3	5.904	0	NC	NC	NC	NC
49			4	4.409	0	NC	NC	NC	NC
50			5	-14.122	0	NC	NC	NC	NC
51	2	M2	1	14.793	0	NC	NC	NC	NC
52			2	9.45	0	NC	NC	NC	NC

Member Torsion Stresses (Continued)

	LC	Member Label	Sec	Torque[k-ft]	Shear[ksi]	y Warp Shear...	z Warp Shear...	z-Bot Warp B...	z-Top Warp B...
53			3	-2.032	0	NC	NC	NC	NC
54			4	-12.631	0	NC	NC	NC	NC
55			5	-17.176	0	NC	NC	NC	NC
56	2	M3	1	16.561	0	NC	NC	NC	NC
57			2	-4.091	0	NC	NC	NC	NC
58			3	-24.665	0	NC	NC	NC	NC
59			4	7.834	0	NC	NC	NC	NC
60			5	-21.77	0	NC	NC	NC	NC
61	2	M4	1	5.828	0	NC	NC	NC	NC
62			2	6.246	0	NC	NC	NC	NC
63			3	8.571	0	NC	NC	NC	NC
64			4	10.537	0	NC	NC	NC	NC
65			5	10.191	0	NC	NC	NC	NC
66	2	M5	1	-12.819	0	NC	NC	NC	NC
67			2	-14.095	0	NC	NC	NC	NC
68			3	-13.144	0	NC	NC	NC	NC
69			4	-12.817	0	NC	NC	NC	NC
70			5	-15.843	0	NC	NC	NC	NC
71	2	M6	1	-24.416	0	NC	NC	NC	NC
72			2	-14.492	0	NC	NC	NC	NC
73			3	-6.307	0	NC	NC	NC	NC
74			4	-.913	0	NC	NC	NC	NC
75			5	1.491	0	NC	NC	NC	NC
76	2	M7	1	-4.971	0	NC	NC	NC	NC
77			2	-.345	0	NC	NC	NC	NC
78			3	-5.98	0	NC	NC	NC	NC
79			4	2.062	0	NC	NC	NC	NC
80			5	8.771	0	NC	NC	NC	NC
81	2	M8	1	-2.073	0	NC	NC	NC	NC
82			2	8.772	0	NC	NC	NC	NC
83			3	19.878	0	NC	NC	NC	NC
84			4	33.862	0	NC	NC	NC	NC
85			5	42.512	0	NC	NC	NC	NC
86	2	M9	1	10.237	0	NC	NC	NC	NC
87			2	5.844	0	NC	NC	NC	NC
88			3	5.081	0	NC	NC	NC	NC
89			4	-2.504	0	NC	NC	NC	NC
90			5	-10.891	0	NC	NC	NC	NC
91	3	M1	1	11.92	0	NC	NC	NC	NC
92			2	.626	0	NC	NC	NC	NC
93			3	5.725	0	NC	NC	NC	NC
94			4	4.434	0	NC	NC	NC	NC
95			5	-14.994	0	NC	NC	NC	NC
96	3	M2	1	15.755	0	NC	NC	NC	NC
97			2	10.209	0	NC	NC	NC	NC
98			3	-2.174	0	NC	NC	NC	NC
99			4	-13.585	0	NC	NC	NC	NC
100			5	-18.318	0	NC	NC	NC	NC
101	3	M3	1	17.54	0	NC	NC	NC	NC
102			2	-5.273	0	NC	NC	NC	NC
103			3	-25.117	0	NC	NC	NC	NC
104			4	8.176	0	NC	NC	NC	NC

Member Torsion Stresses (Continued)

	LC	Member Label	Sec	Torque[k-ft]	Shear[ksi]	y Warp Shear...	z Warp Shear...	z-Bot Warp B...	z-Top Warp B...
105			5	-22.235	0	NC	NC	NC	NC
106	3	M4	1	6.581	0	NC	NC	NC	NC
107			2	7.017	0	NC	NC	NC	NC
108			3	9.382	0	NC	NC	NC	NC
109			4	11.329	0	NC	NC	NC	NC
110			5	10.889	0	NC	NC	NC	NC
111	3	M5	1	-13.428	0	NC	NC	NC	NC
112			2	-14.691	0	NC	NC	NC	NC
113			3	-13.417	0	NC	NC	NC	NC
114			4	-12.617	0	NC	NC	NC	NC
115			5	-14.111	0	NC	NC	NC	NC
116	3	M6	1	-30.468	0	NC	NC	NC	NC
117			2	-18.439	0	NC	NC	NC	NC
118			3	-9.021	0	NC	NC	NC	NC
119			4	-2.905	0	NC	NC	NC	NC
120			5	.024	0	NC	NC	NC	NC
121	3	M7	1	-4.071	0	NC	NC	NC	NC
122			2	1.194	0	NC	NC	NC	NC
123			3	-4.813	0	NC	NC	NC	NC
124			4	3.318	0	NC	NC	NC	NC
125			5	9.283	0	NC	NC	NC	NC
126	3	M8	1	-2.064	0	NC	NC	NC	NC
127			2	9.386	0	NC	NC	NC	NC
128			3	20.53	0	NC	NC	NC	NC
129			4	35.543	0	NC	NC	NC	NC
130			5	45.567	0	NC	NC	NC	NC
131	3	M9	1	11.17	0	NC	NC	NC	NC
132			2	6.95	0	NC	NC	NC	NC
133			3	5.725	0	NC	NC	NC	NC
134			4	-3.376	0	NC	NC	NC	NC
135			5	-12.088	0	NC	NC	NC	NC
136	4	M1	1	17.508	0	NC	NC	NC	NC
137			2	2.477	0	NC	NC	NC	NC
138			3	1.769	0	NC	NC	NC	NC
139			4	.612	0	NC	NC	NC	NC
140			5	-17.998	0	NC	NC	NC	NC
141	4	M2	1	18.719	0	NC	NC	NC	NC
142			2	12.868	0	NC	NC	NC	NC
143			3	-1.371	0	NC	NC	NC	NC
144			4	-14.323	0	NC	NC	NC	NC
145			5	-19.738	0	NC	NC	NC	NC
146	4	M3	1	18.422	0	NC	NC	NC	NC
147			2	-10.549	0	NC	NC	NC	NC
148			3	-21.834	0	NC	NC	NC	NC
149			4	8.394	0	NC	NC	NC	NC
150			5	-20.198	0	NC	NC	NC	NC
151	4	M4	1	8.712	0	NC	NC	NC	NC
152			2	8.886	0	NC	NC	NC	NC
153			3	10.826	0	NC	NC	NC	NC
154			4	12.315	0	NC	NC	NC	NC
155			5	11.634	0	NC	NC	NC	NC
156	4	M5	1	-12.841	0	NC	NC	NC	NC

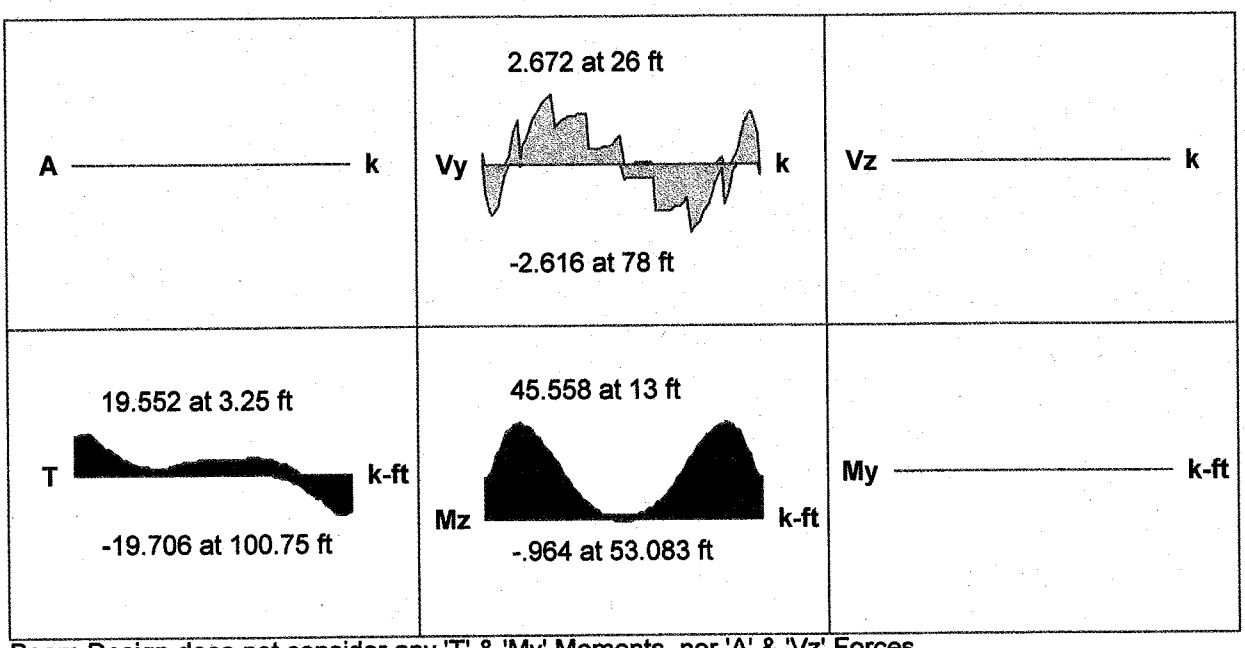
Member Torsion Stresses (Continued)

	LC	Member Label	Sec	Torque[k-ft]	Shear[ksi]	y Warp Shear...	z Warp Shear...	z-Bot Warp B...	z-Top Warp B...
157			2	-13.618	0	NC	NC	NC	NC
158			3	-11.306	0	NC	NC	NC	NC
159			4	-9.413	0	NC	NC	NC	NC
160			5	-7.915	0	NC	NC	NC	NC
161	4	M6	1	-24.086	0	NC	NC	NC	NC
162			2	-13.273	0	NC	NC	NC	NC
163			3	-4.924	0	NC	NC	NC	NC
164			4	1.169	0	NC	NC	NC	NC
165			5	2.539	0	NC	NC	NC	NC
166	4	M7	1	-5.691	0	NC	NC	NC	NC
167			2	-2.131	0	NC	NC	NC	NC
168			3	.402	0	NC	NC	NC	NC
169			4	7.42	0	NC	NC	NC	NC
170			5	10.23	0	NC	NC	NC	NC
171	4	M8	1	-3.645	0	NC	NC	NC	NC
172			2	6.494	0	NC	NC	NC	NC
173			3	17.467	0	NC	NC	NC	NC
174			4	32.662	0	NC	NC	NC	NC
175			5	43.712	0	NC	NC	NC	NC
176	4	M9	1	13.527	0	NC	NC	NC	NC
177			2	9.972	0	NC	NC	NC	NC
178			3	3.921	0	NC	NC	NC	NC
179			4	-10.845	0	NC	NC	NC	NC
180			5	-18.224	0	NC	NC	NC	NC

Beam: ***M1***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**104 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N8**	Effective 'I':	**24494.4 in^4**
J Joint:	**N9**		

Code Check: **0.521 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.521 (LC 1)**	Bot Bending Check	**0.009 (LC 1)**	Shear Check	**0.047 (LC 1)**
Location	**13 ft**	Location	**53.083 ft**	Location	**26 ft**
Gov Muz Top	**45.558 k-ft**	Gov Muz Bot	**-.964 k-ft**	Gov Vuy	**2.672 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**112.62 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 104**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**4 #4**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	.6	T	97.079	.0033	.02	.001	.589	.126
	.6	B	0	0	0	0	0	0
	29.2	T	97.079	.0033	.02	.001	.589	.364
	-	B	0	0	0	0	0	0
	55.4	T	97.079	.0033	.02	.001	.589	.127
	55.4	B	0	0	0	0	0	0

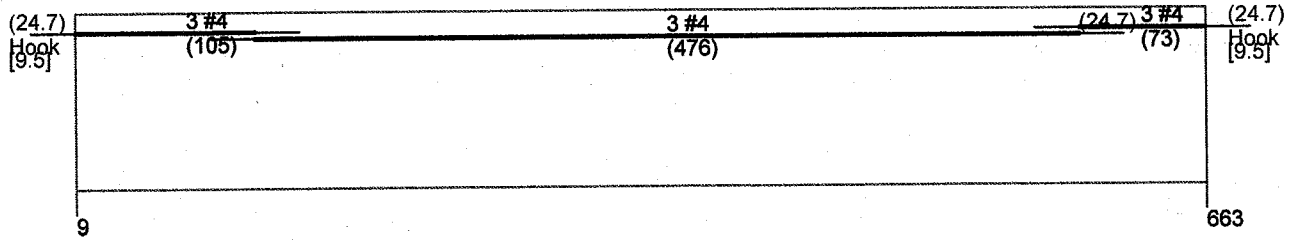
Shear Steel

Span	Region (ft)	Bars Provided
1	3.5 - 15.8	
	15.8 - 28	
	28 - 40.3	
	40.3 - 52.5	

Shear Span Results

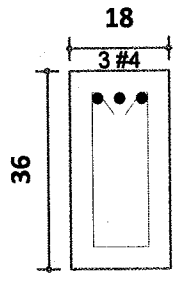
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.5 - 15.8	75.705	75.705	0	0	0
	15.8 - 28	75.705	75.705	0	0	0
	28 - 40.3	75.705	75.705	0	0	0
	40.3 - 52.5	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)

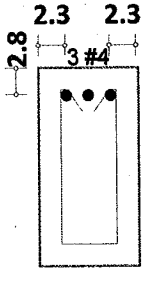


Span 1

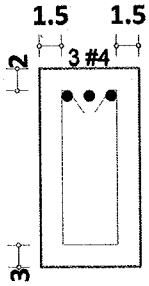
Cross Section Detailing(All Bars Equally Spaced, Units: in)



Start



Middle



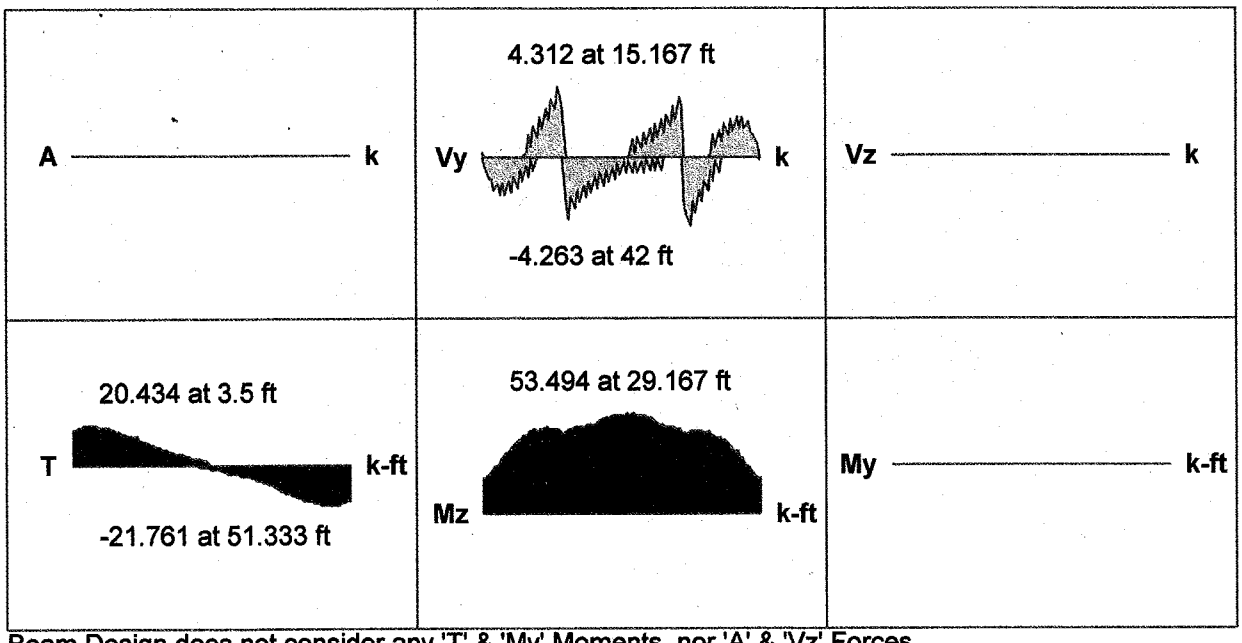
End

Span 1

Beam: ***M2***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**56 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N9**	Effective 'I':	**24494.4 in^4**
J Joint:	**N10**		

Code Check: **0.612 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.612 (LC 4)**	Bot Bending Check	**0.000 (LC N/A)**	Shear Check	**0.076 (LC 4)**
Location	**29.167 ft**	Location	**0 ft**	Location	**15.167 ft**
Gov Muz Top	**53.494 k-ft**	Gov Muz Bot	**0 k-ft**	Gov Vuy	**4.312 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**0 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 56**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**-**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	1.1	T	97.079	.0033	.02	.001	.589	.137
	1.1	B	0	0	0	0	0	0
	59.6	T	97.079	.0033	.02	.001	.589	.346
	39	B	125.134	.0033	.02	.0014	.785	.416
	102.9	T	97.079	.0033	.02	.001	.589	.104
	102.9	B	0	0	0	0	0	0

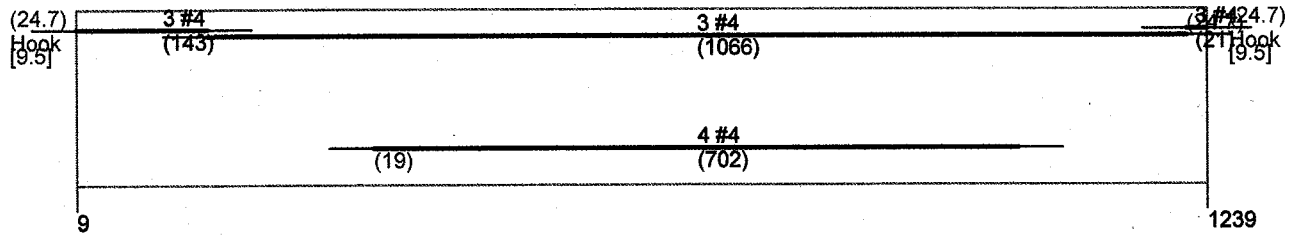
Shear Steel

Span	Region (ft)	Bars Provided
1	3.3 - 27.1	
	27.1 - 52	
	52 - 75.8	
	75.8 - 100.8	

Shear Span Results

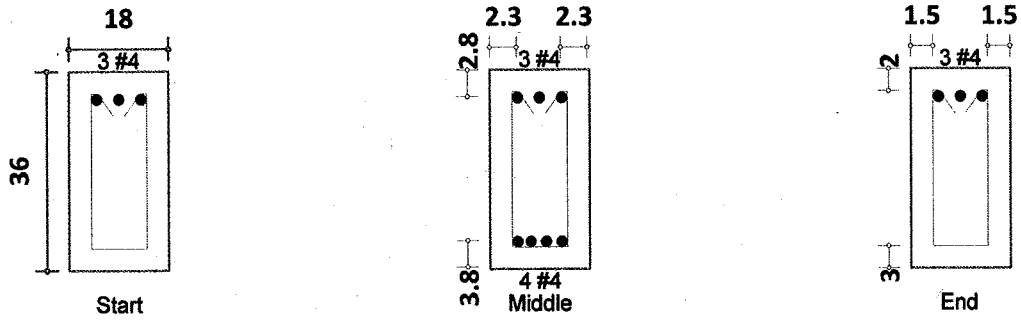
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.3 - 27.1	75.705	75.705	0	0	0
	27.1 - 52	75.705	75.705	0	0	0
	52 - 75.8	75.705	75.705	0	0	0
	75.8 - 100.8	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)

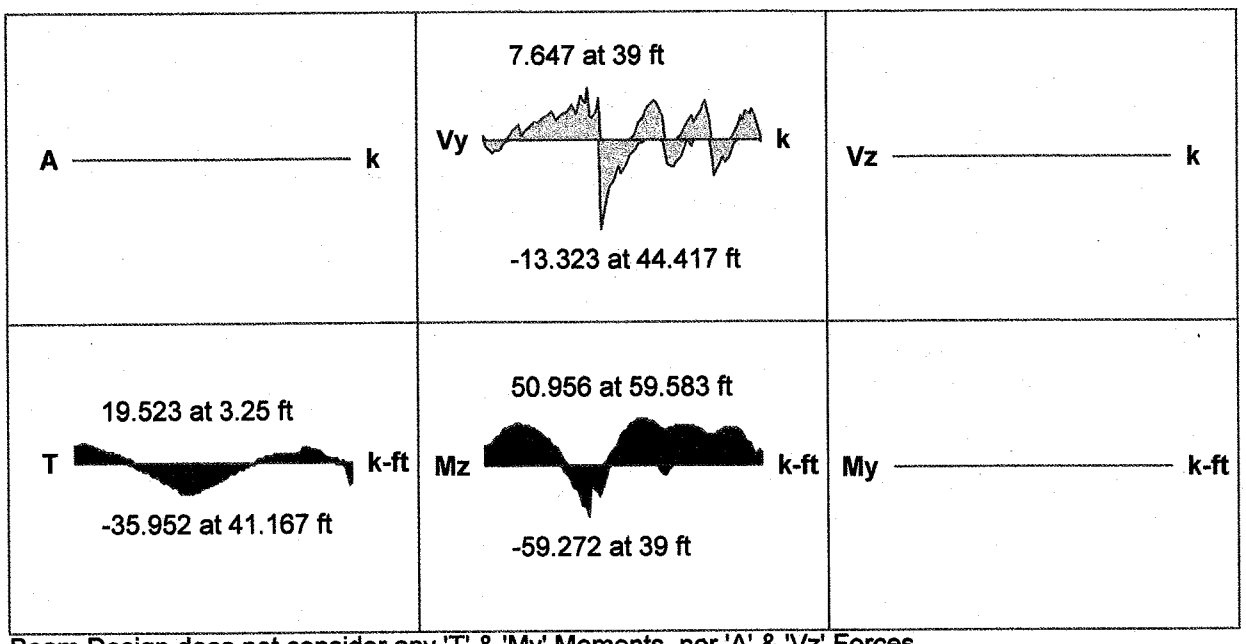


Span 1

Beam: ***M3***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**104 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N10**	Effective 'I':	**24494.4 in^4**
J Joint:	**N7**		

Code Check: **0.583 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.583 (LC 4)**	Bot Bending Check	**0.526 (LC 4)**	Shear Check	**0.235 (LC 3)**
Location	**59.583 ft**	Location	**39 ft**	Location	**44.417 ft**
Gov Muz Top	**50.956 k-ft**	Gov Muz Bot	**-59.272 k-ft**	Gov Vuy	**13.323 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**112.62 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 104**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**4 #4**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	1.1	T	97.079	.0033	.02	.001	.589	.131
	1.1	B	0	0	0	0	0	0
	13	T	97.079	.0033	.02	.001	.589	.309
	53.1	B	125.134	.0033	.02	.0014	.785	.007
	102.9	T	97.079	.0033	.02	.001	.589	.131
	102.9	B	0	0	0	0	0	0

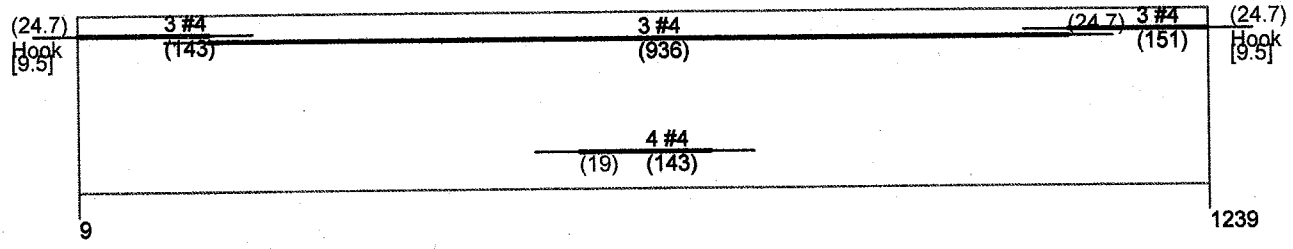
Shear Steel

Span	Region (ft)	Bars Provided
1	3.3 - 27.1	
	27.1 - 52	
	52 - 75.8	
	75.8 - 100.8	

Shear Span Results

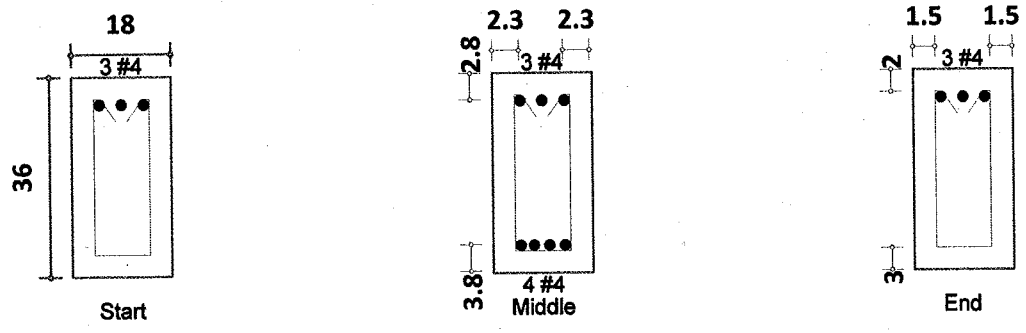
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.3 - 27.1	75.705	75.705	0	0	0
	27.1 - 52	75.705	75.705	0	0	0
	52 - 75.8	75.705	75.705	0	0	0
	75.8 - 100.8	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)

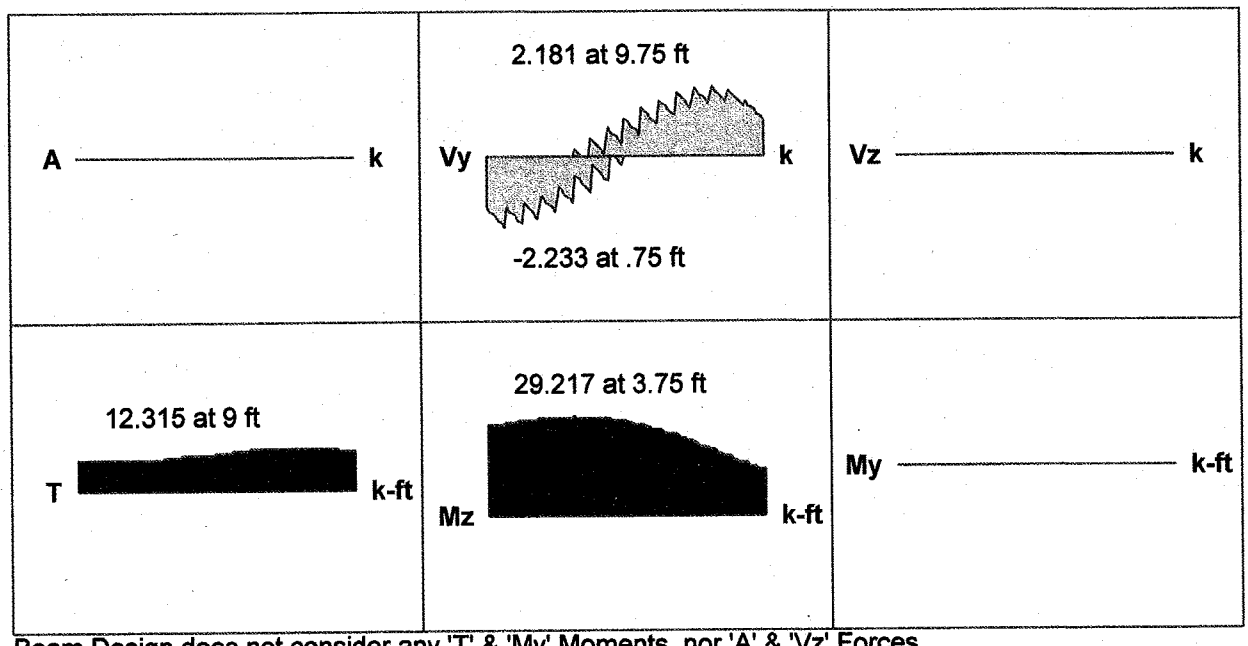


Span 1

Beam: ***M4***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**12 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N6**	Effective 'I':	**24494.4 in^4**
J Joint:	**N5**		

Code Check: **0.334 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.334 (LC 3)**	Bot Bending Check	**0.000 (LC N/A)**	Shear Check	**0.035 (LC 3)**
Location	**3.75 ft**	Location	**0 ft**	Location	**8.25 ft**
Gov Muz Top	**29.217 k-ft**	Gov Muz Bot	**0 k-ft**	Gov Vuy	**1.976 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**0 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 12**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**-**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	.8	T	97.079	.0033	.02	.001	.589	.185
	.8	B	0	0	0	0	0	0
	3.8	T	97.079	.0033	.02	.001	.589	.198
	-	B	0	0	0	0	0	0
	11.3	T	97.079	.0033	.02	.001	.589	.103
	11.3	B	0	0	0	0	0	0

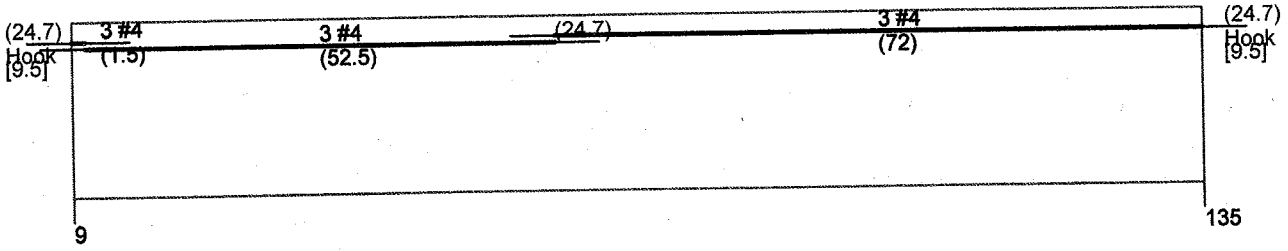
Shear Steel

Span	Region (ft)	Bars Provided
1	3.5 - 4.8	
	4.8 - 6	
	6 - 7.3	
	7.3 - 8.5	

Shear Span Results

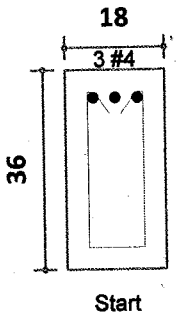
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.5 - 4.8	75.705	75.705	0	0	0
	4.8 - 6	75.705	75.705	0	0	0
	6 - 7.3	75.705	75.705	0	0	0
	7.3 - 8.5	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)

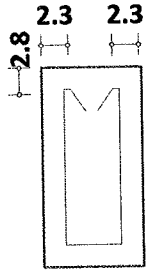


Span 1

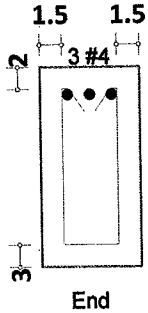
Cross Section Detailing(All Bars Equally Spaced, Units: in)



Start



Middle



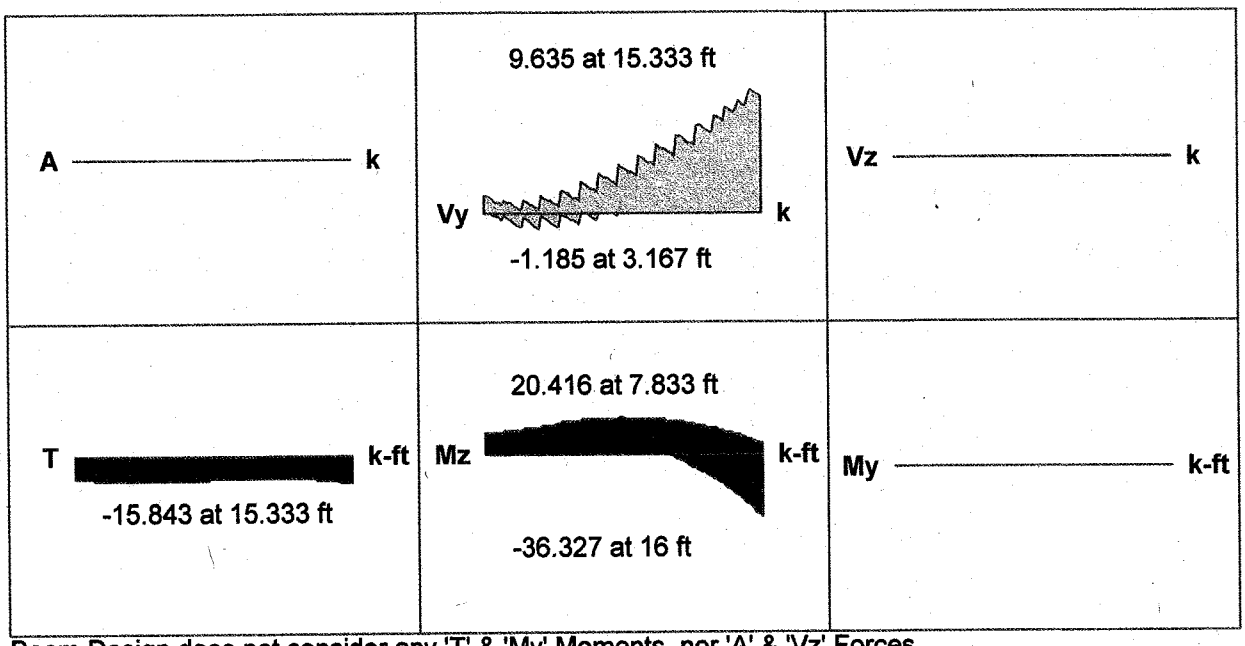
End

Span 1

Beam: ***M5***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**16 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N5**	Effective 'I':	**24494.4 in^4**
J Joint:	**N2**		

Code Check: **0.257 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.234 (LC 1)**	Bot Bending Check	**0.257 (LC 3)**	Shear Check	**0.120 (LC 3)**
Location	**7.833 ft**	Location	**15.167 ft**	Location	**12.333 ft**
Gov Muz Top	**20.416 k-ft**	Gov Muz Bot	**-28.938 k-ft**	Gov Vuy	**6.828 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**112.62 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 16**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**-**
	Right	**T**	**3 #4**
	Right	**B**	**4 #4**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	.7	T	97.079	.0033	.02	.001	.589	.078
	.7	B	0	0	0	0	0	0
	7.8	T	97.079	.0033	.02	.001	.589	.138
	-	B	0	0	0	0	0	0
	15.2	T	97.079	.0033	.02	.001	.589	.055
	15.2	B	125.134	.0033	.02	.0014	.785	.202

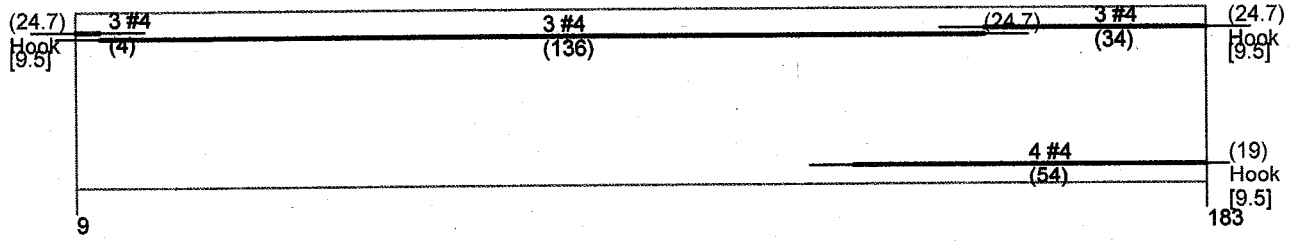
Shear Steel

Span	Region (ft)	Bars Provided
1	3.5 - 5.7	
	5.7 - 8	
	8 - 10.2	
	10.2 - 12.5	

Shear Span Results

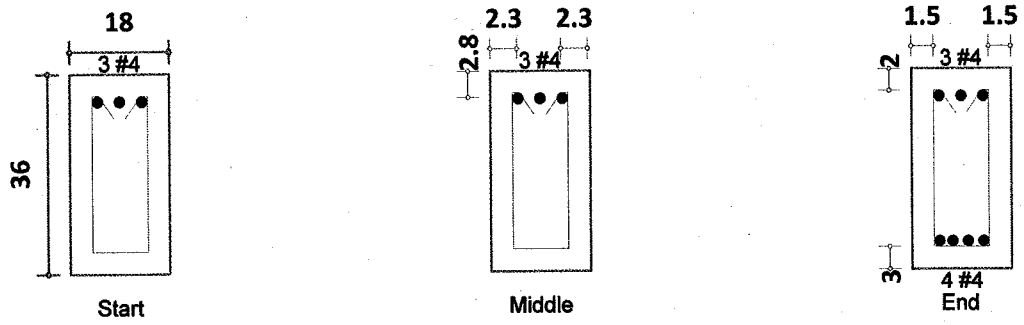
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.5 - 5.7	75.705	75.705	0	0	0
	5.7 - 8	75.705	75.705	0	0	0
	8 - 10.2	75.705	75.705	0	0	0
	10.2 - 12.5	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)

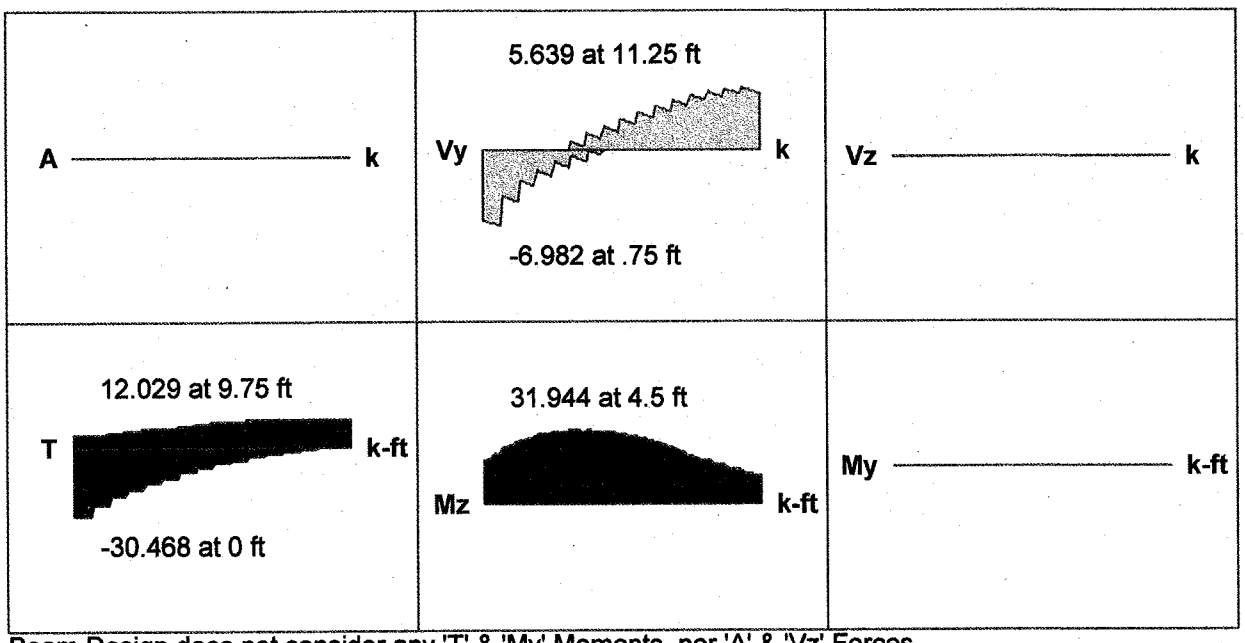


Span 1

Beam: ***M6***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**12 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N2**	Effective 'I':	**24494.4 in^4**
J Joint:	**N1**		

Code Check: **0.366 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.366 (LC 2)**	Bot Bending Check	**0.000 (LC N/A)**	Shear Check	**0.078 (LC 3)**
Location	**4.5 ft**	Location	**0 ft**	Location	**8.25 ft**
Gov Muz Top	**31.944 k-ft**	Gov Muz Bot	**0 k-ft**	Gov Vuy	**4.408 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**0 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 12**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**-**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	.8	T	97.079	.0033	.02	.001	.589	.161
	.8	B	0	0	0	0	0	0
	4.5	T	97.079	.0033	.02	.001	.589	.217
	-	B	0	0	0	0	0	0
	11.3	T	97.079	.0033	.02	.001	.589	.094
	11.3	B	0	0	0	0	0	0

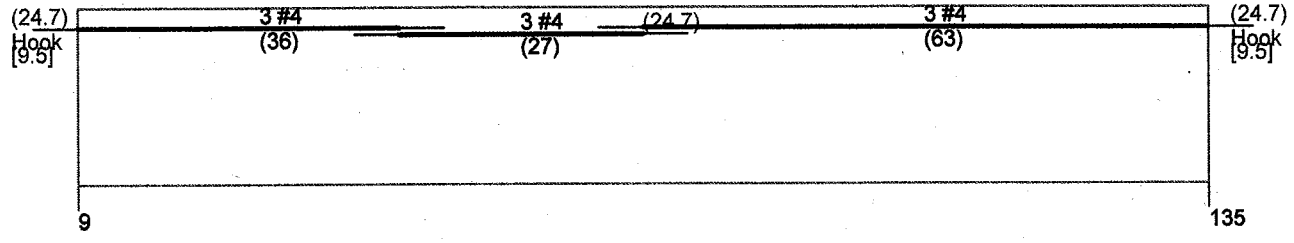
Shear Steel

Span	Region (ft)	Bars Provided
1	3.5 - 4.8	
	4.8 - 6	
	6 - 7.3	
	7.3 - 8.5	

Shear Span Results

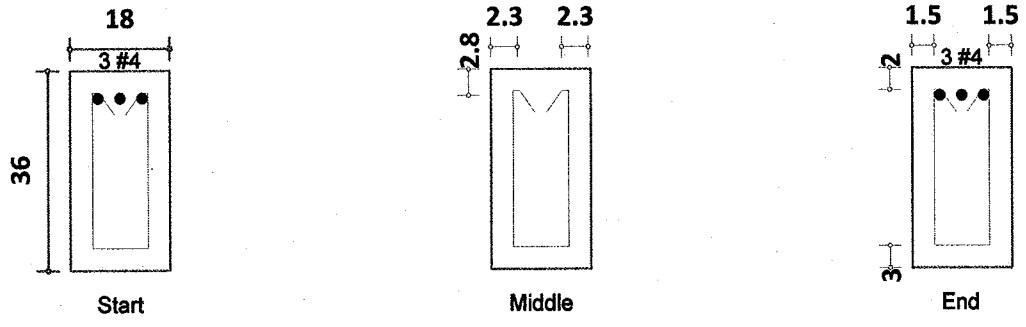
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.5 - 4.8	75.705	75.705	0	0	0
	4.8 - 6	75.705	75.705	0	0	0
	6 - 7.3	75.705	75.705	0	0	0
	7.3 - 8.5	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)

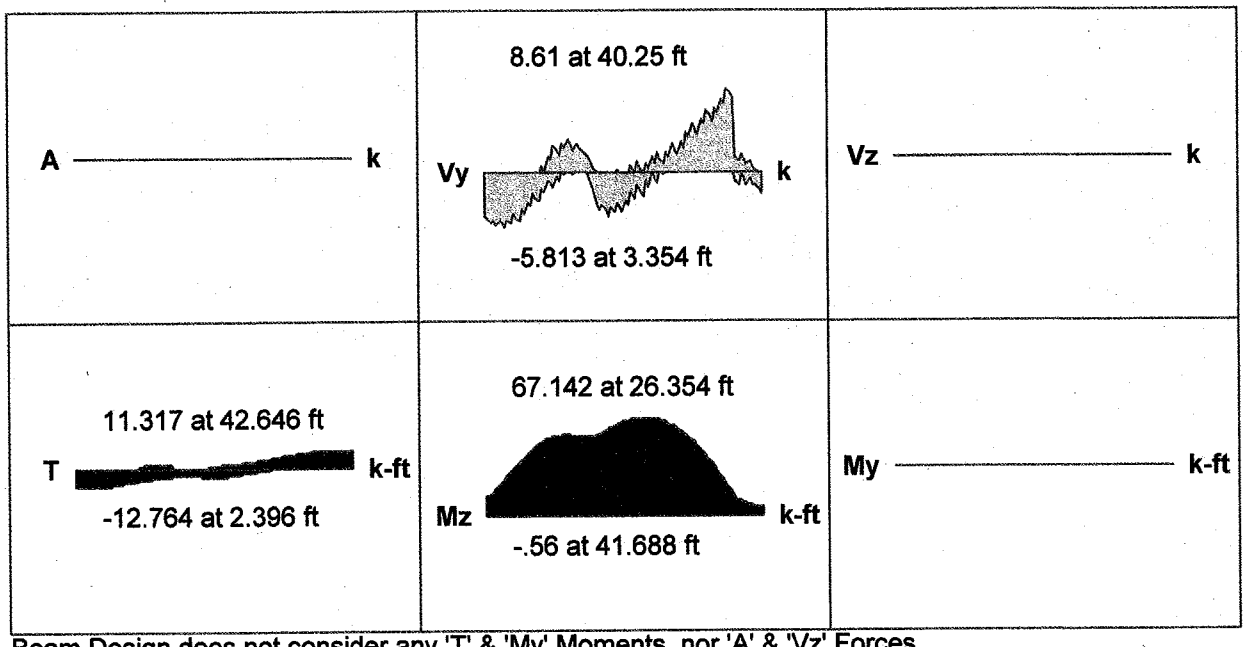


Span 1

Beam: ***M7***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**46 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N1**	Effective 'I':	**24494.4 in^4**
J Joint:	**N4**		

Code Check: **0.576 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.576 (LC 4)**	Bot Bending Check	**0.005 (LC 2)**	Shear Check	**0.152 (LC 3)**
Location	**25.875 ft**	Location	**41.688 ft**	Location	**40.25 ft**
Gov Muz Top	**66.852 k-ft**	Gov Muz Bot	**-.56 k-ft**	Gov Vuy	**8.61 k**
phi*Mnz Top	**116.155 k-ft**	phi*Mnz Bot	**112.62 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 46**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**4 #4**
	Mid	**B**	**4 #4**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	1	T	97.079	.0033	.02	.001	.589	.099
	1	B	0	0	0	0	0	0
	25.9	T	129.061	.0033	.02	.0013	.785	.455
	41.7	B	125.134	.0033	.02	.0014	.785	.004
	45	T	97.079	.0033	.02	.001	.589	.031
	45	B	0	0	0	0	0	0

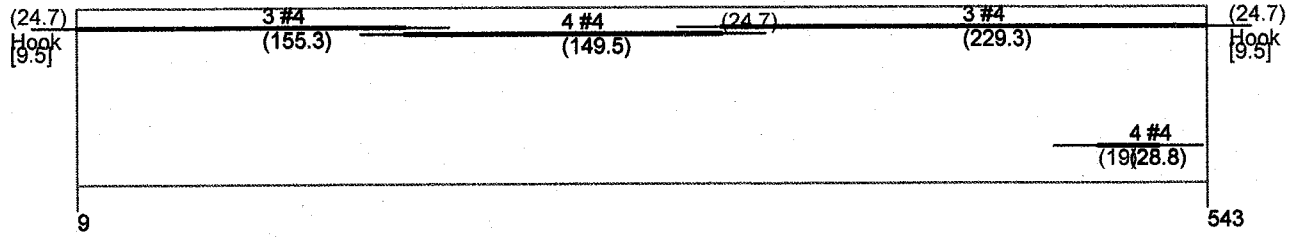
Shear Steel

Span	Region (ft)	Bars Provided
1	3.4 - 12.9	
	12.9 - 23	
	23 - 32.6	
	32.6 - 42.6	

Shear Span Results

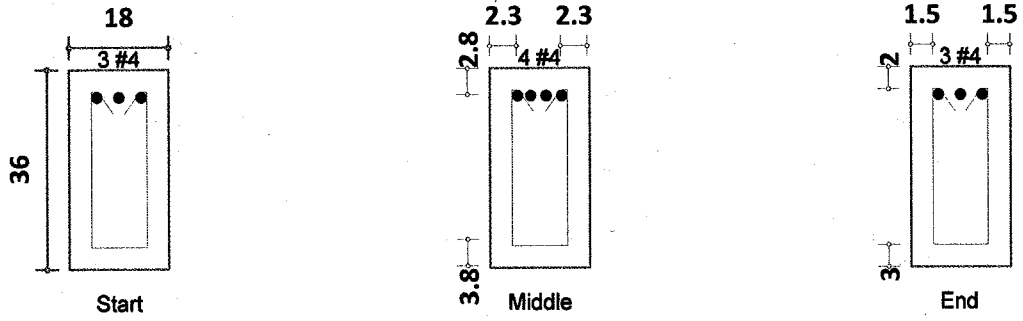
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.4 - 12.9	75.705	75.705	0	0	0
	12.9 - 23	75.705	75.705	0	0	0
	23 - 32.6	75.705	75.705	0	0	0
	32.6 - 42.6	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)

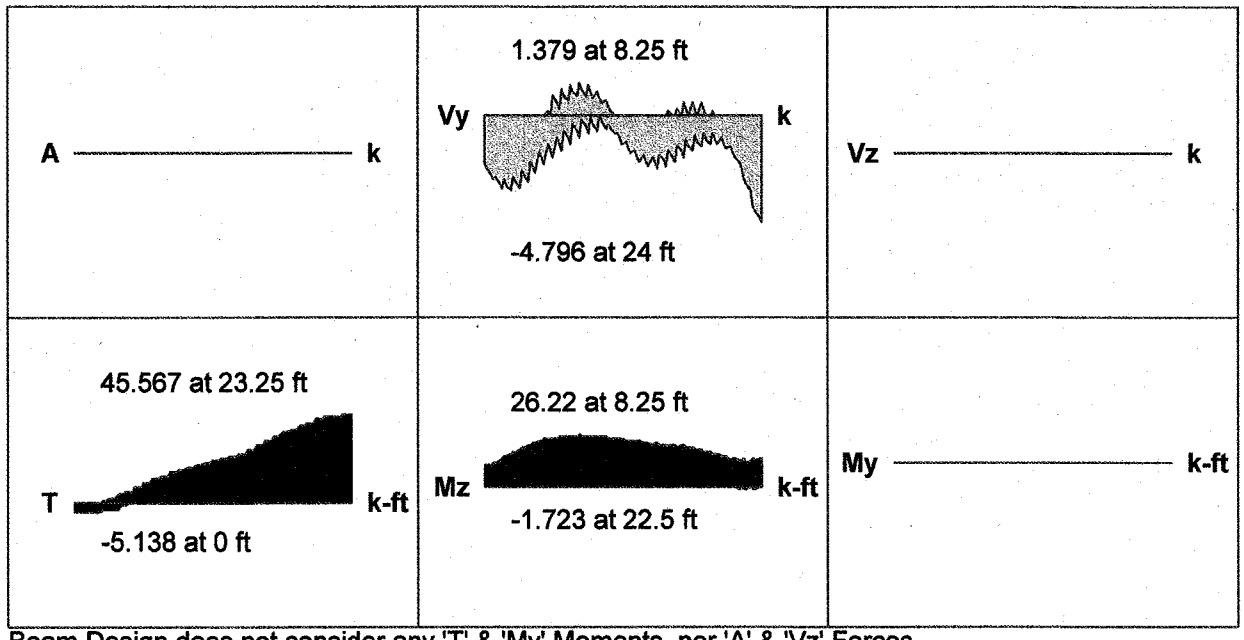


Span 1

Beam: ***M8***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**24 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N4**	Effective 'I':	**24494.4 in^4**
J Joint:	**N3**		

Code Check: **0.300 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.300 (LC 1)**	Bot Bending Check	**0.015 (LC 4)**	Shear Check	**0.052 (LC 2)**
Location	**8.25 ft**	Location	**22.5 ft**	Location	**3.75 ft**
Gov Muz Top	**26.22 k-ft**	Gov Muz Bot	**-1.723 k-ft**	Gov Vuy	**2.959 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**112.62 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 24**	**9**	**9**

Bending Steel

Span	Loc	Top/Bot	Bars Provided
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**4 #4**
	Right	**T**	**3 #4**
	Right	**B**	**4 #4**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	.8	T	97.079	.0033	.02	.001	.589	.079
	.8	B	0	0	0	0	0	0
	8.3	T	97.079	.0033	.02	.001	.589	.178
	22.5	B	125.134	.0033	.02	.0014	.785	.012
	23.3	T	97.079	.0033	.02	.001	.589	.091
	23.3	B	125.134	.0033	.02	.0014	.785	.012

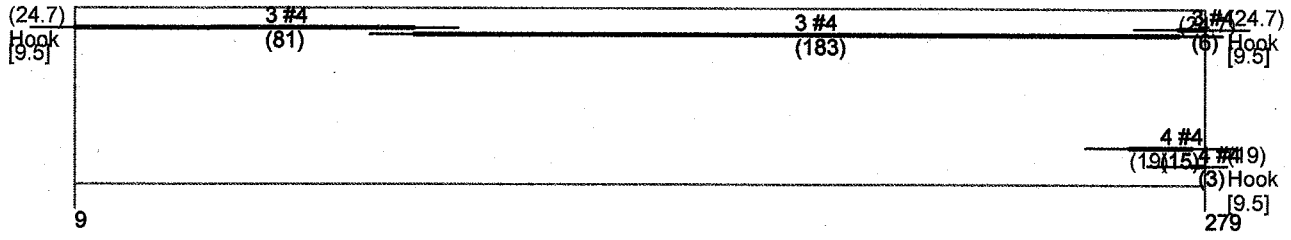
Shear Steel

Span	Region (ft)	Bars Provided
1	3.5 - 7.8	
	7.8 - 12	
	12 - 16.3	
	16.3 - 20.5	

Shear Span Results

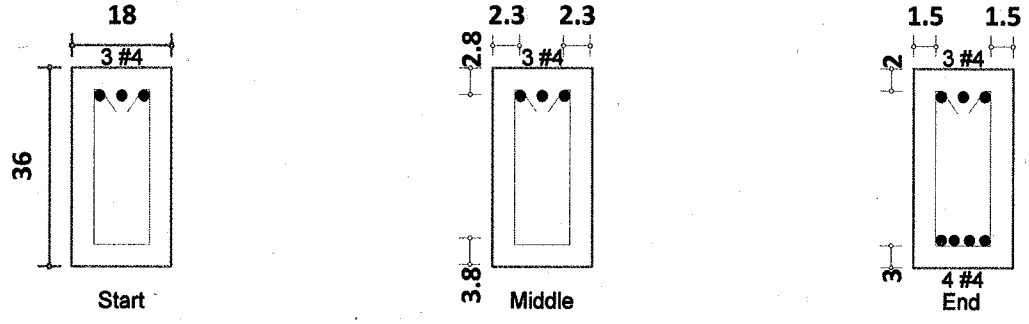
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.5 - 7.8	75.705	75.705	0	0	0
	7.8 - 12	75.705	75.705	0	0	0
	12 - 16.3	75.705	75.705	0	0	0
	16.3 - 20.5	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)

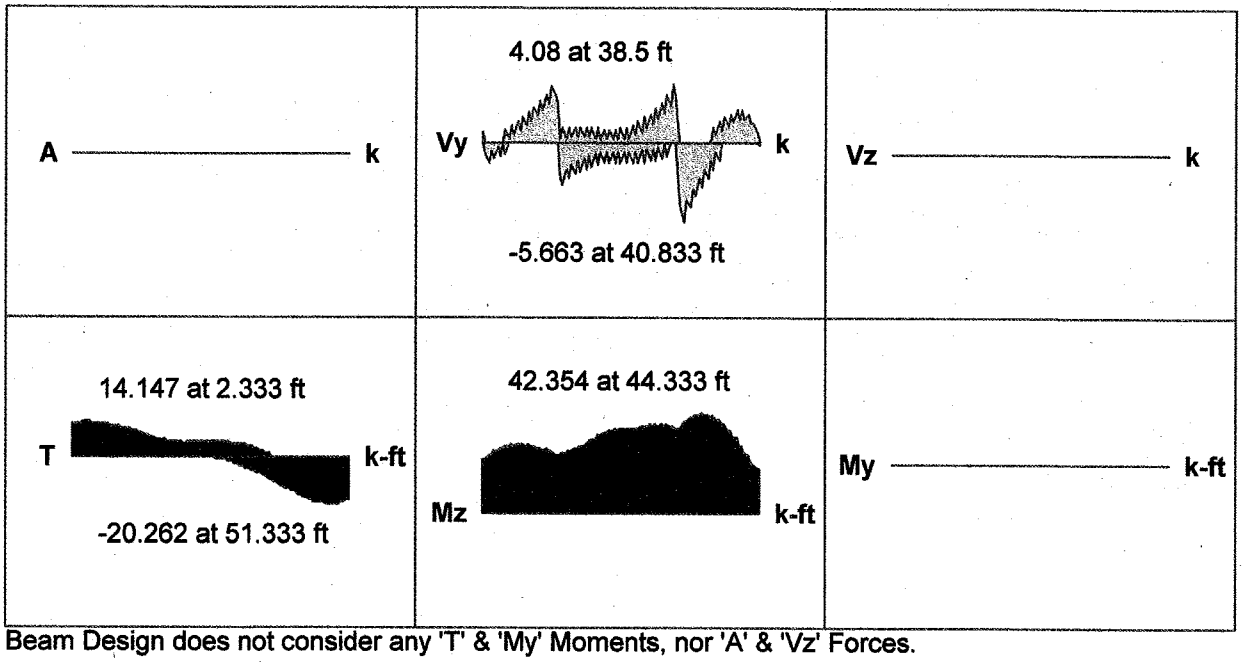


Span 1

Beam: ***M9***

Shape:	**CRECT36X18**	Concrete Stress Block:	**Rectangular**
Material:	**Conc4000NW**	Cracked Sections Used:	**Yes**
Length:	**56 ft**	Cracked 'I' Factor:	**.35**
I Joint:	**N7**	Effective 'I':	**24494.4 in^4**
J Joint:	**N8**		

Code Check: **0.485 (bending)**
Report Based On 97 Sections



Beam Design does not consider any 'T' & 'My' Moments, nor 'A' & 'Vz' Forces.

ACI 318-14 Code Check

Top Bending Check	**0.485 (LC 1)**	Bot Bending Check	**0.000 (LC N/A)**	Shear Check	**0.100 (LC 4)**
Location	**44.333 ft**	Location	**0 ft**	Location	**40.833 ft**
Gov Muz Top	**42.354 k-ft**	Gov Muz Bot	**0 k-ft**	Gov Vuy	**5.663 k**
phi*Mnz Top	**87.371 k-ft**	phi*Mnz Bot	**0 k-ft**	phi*Vny	**56.779 k**
Tension Bar Fy	**60 ksi**	Concrete Weight	**.145 k/ft^3**	Top Cover	**2 in**
Shear Bar Fy	**60 ksi**	λ	**1**	Bottom Cover	**3 in**
F'c	**4 ksi**	E_Concrete	**3644 ksi**	Side Cover	**1.5 in**
Flex. Rebar Set	**ASTM A615**	Min 1 Bar Dia Spac.	**No**	Legs/Stirrup	**2**
Shear Rebar Set	**ASTM A615**	Threshold Torsion	**15.369 k-ft**		

Factored torsional moment Tu exceeds the threshold torsion per ACI 318-14 22.7.4.1

Span Information

Span	Span Length (ft)	I-Face Dist. (in)	J-Face Dist. (in)
1	**0 - 56**	**9**	**9**

Bending Steel

Span	*Loc*	*Top/Bot*	*Bars Provided*
1	**Left**	**T**	**3 #4**
	Left	**B**	**-**
	Mid	**T**	**3 #4**
	Mid	**B**	**-**
	Right	**T**	**3 #4**
	Right	**B**	**-**

Bending Span Results

Span	Loc (ft)	Top/Bot	Mnz (k-ft)	Rho Min	Rho Max	Rho	As Prvd (in^2)	As Reqd (in^2)
1	.6	T	97.079	.0033	.02	.001	.589	.154
	.6	B	0	0	0	0	0	0
	44.3	T	97.079	.0033	.02	.001	.589	.288
	-	B	0	0	0	0	0	0
	55.4	T	97.079	.0033	.02	.001	.589	.125
	55.4	B	0	0	0	0	0	0

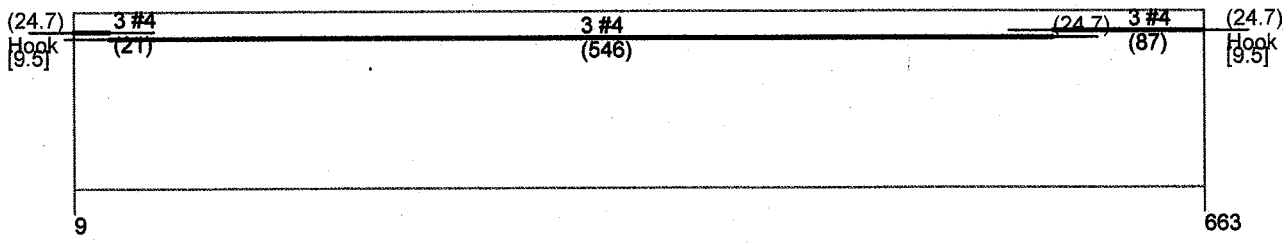
Shear Steel

Span	Region (ft)	Bars Provided
1	3.5 - 15.8	
	15.8 - 28	
	28 - 40.3	
	40.3 - 52.5	

Shear Span Results

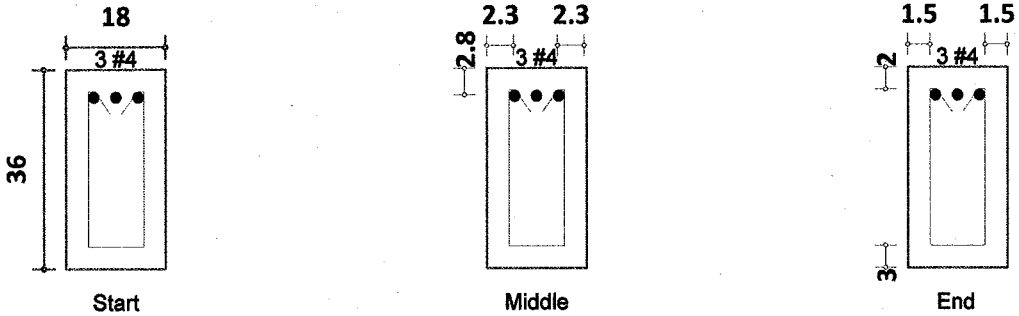
Span	Region (ft)	Vn (k)	Vc (k)	Vs (k)	As Reqd (in^2/ft)	As Prvd (in^2/ft)
1	3.5 - 15.8	75.705	75.705	0	0	0
	15.8 - 28	75.705	75.705	0	0	0
	28 - 40.3	75.705	75.705	0	0	0
	40.3 - 52.5	75.705	75.705	0	0	0

Rebar Detailing, face of support to face of support of each span(Units: in)



Span 1

Cross Section Detailing(All Bars Equally Spaced, Units: in)



Span 1

LATERAL ANALYSIS

WIND FORCES

V = 135 MPH
EXP 'D'
K_{zt} = 1.0

FROM TABLE 27.6-1:

$$P_{30'} = \frac{48.7 + 56.7}{2} = 52.7 \text{ PSF}$$

$$P_{30'}(ASD) = 52.7 \times 0.6 = 31.6 \text{ PSF}$$

USE 32 PSF

FROM TABLE 27.6-2:

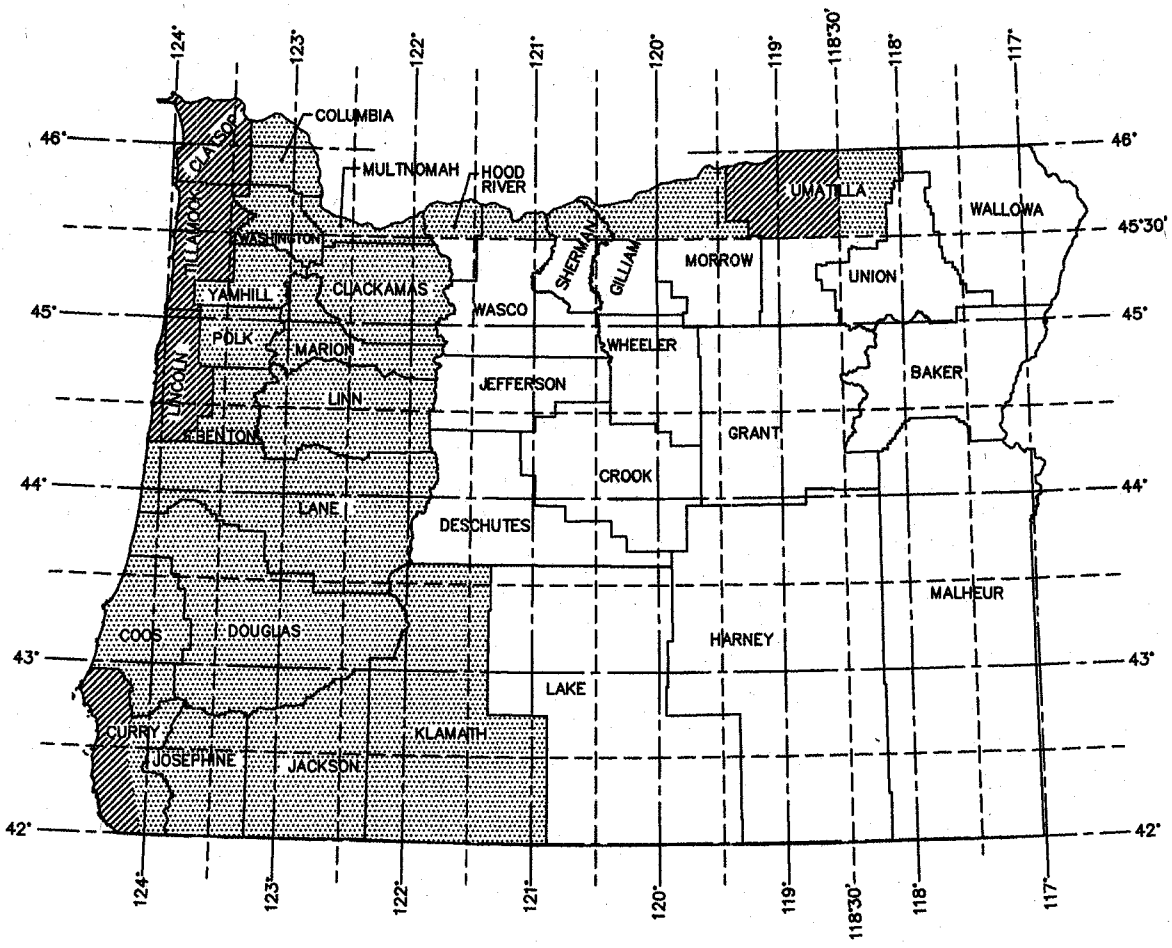
$$P_{30'_L} = (1.183)\frac{[(5.4+7.6)+(6.3+8.8)]}{2}\sin(14°)$$

$$= 4.0 \text{ PSF}$$

$$P_{30'_L}(ASD) = 0.6 \times 4.0 = 2.4 \text{ PSF} \rightarrow \text{USE 5 PSF}$$

State of Oregon
Building Codes Division
Better Buildings for Oregon

Combined Oregon Wind Speed Map



1. All areas with full exposure to ocean winds shall be designed to the highest wind speed for that Risk Catagory.
2. Areas in Hood River and Multnomah Counties with full exposure to Columbia River Gorge winds shall be designed to the highest wind speed for that Risk Catagory.

RISK CATAGORY I	RISK CATAGORY II	RISK CATAGORY III & IV
125 mph	135 mph	145 mph
115 mph	120 mph	130 mph
100 mph	110 mph	115 mph

For SI: 1 mile per hour = 0.44 m/s

ULTIMATE DESIGN WIND SPEED, Vult BASED ON RISK CATAGORY

This map is a compilation of all 3 wind speed maps based on Risk Catagory in the 2014 OSSC. Refer to the actual maps in the code for exact code language.

WIND FORCES (CONT.)

EAST-WEST

$A_{WALL} = 1{,}100\,ft^2 - 90\,ft^2 = 1010\,ft^2$

$A_{ROOF} = 170\,ft^2 + 90\,ft^2 = 260\,ft^2$

NORTH-SOUTH

$A_{WALLS} = 480\,ft^2 + 460\,ft^2 = 940\,ft^2$

$A_{ROOF} = 515\,ft^2 + 670\,ft^2 = 1185\,ft^2$

WIND FORCES

$F_{E/W} = (1010\,ft^2)(32\,PSF) + (260\,ft^2)(5\,PSF)$

$= 33{,}620\,lb$

$F_{N/S} = (940\,ft^2)(32\,PSF) + (1105\,ft^2)(5\,PSF)$

$= 36{,}005\,lb$

SEISMIC FORCES

SEISMIC MASS –

$$\text{AREA, ROOF} = \frac{8150\ ft^2}{\cos 14} = 8400\ ft^2$$

$$\text{AREA, 2ND} = 4170\ ft^2$$

$$A_{WALLS} = 1010\ ft^2 \quad (W/E)$$
$$940\ ft^2 \quad (N/S)$$

$$= (2)[1010 + 940] = 3900\ ft^2$$

DEAD LOADS
- ROOF = 14 PSF
- WALLS = 12 PSF
- FLOOR = 14 PSF + 10 PSF (PARTITION)
  = 24 PSF

$$EW = (8400\ ft^2)(14\ PSF) + (4170\ ft^2)(24\ PSF) + (3900\ ft^2)(12\ PSF) = 264{,}480\ lb$$

$$SDS = \frac{2}{3} SMS = \frac{2}{3}(1.192\ g) = 0.795\ g$$

$$C_S = 0.795/6.5 = 0.1223$$

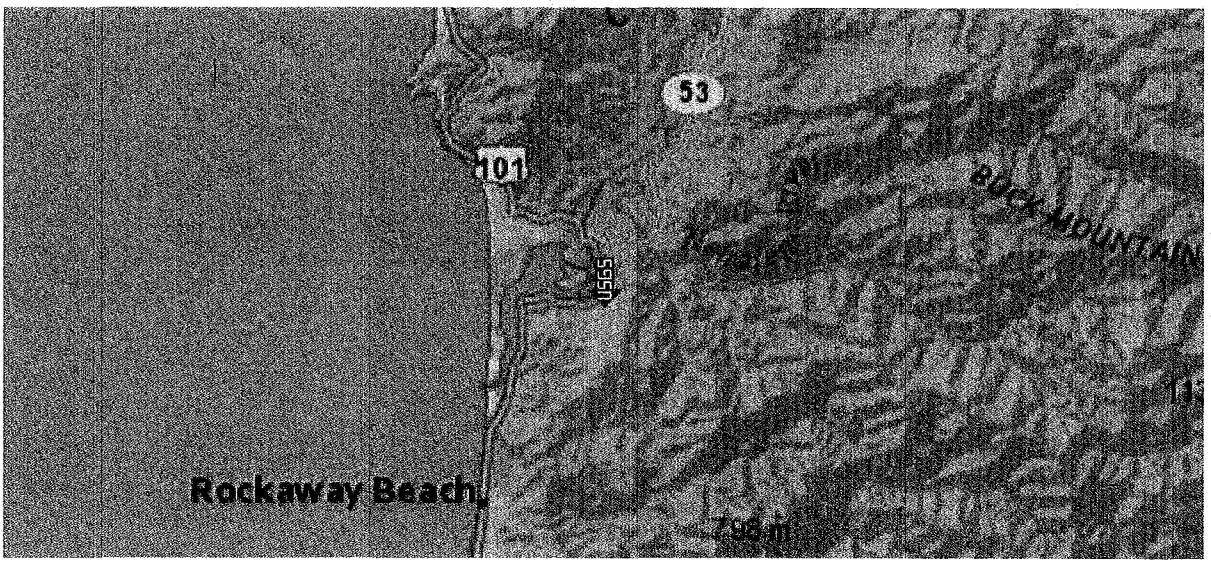
$$V_{SEISMIC\ (ASD)} = (0.1223)(264{,}480)(.7) = 22{,}642\ lb$$

WIND CONTROLS BOTH DIR.

USGS Design Maps Summary Report

User-Specified Input

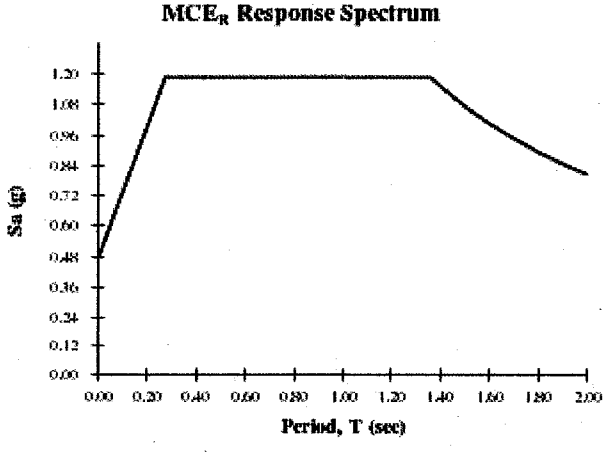
Report Title	Wheeler Mill Sat October 27, 2018 00:50:58 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	45.69374°N, 123.88106°W
Site Soil Classification	Site Class E – "Soft Clay Soil"
Risk Category	I/II/III

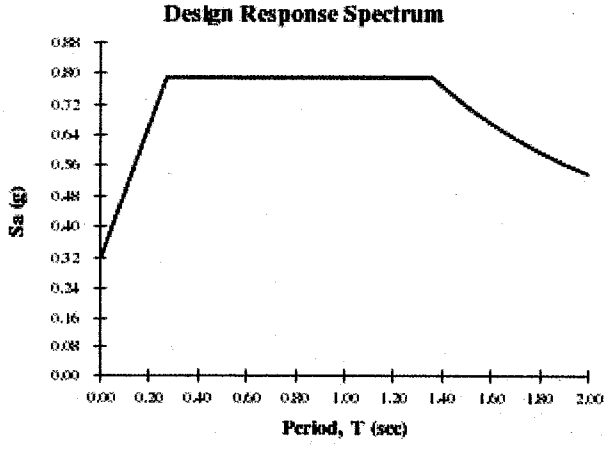


USGS-Provided Output

S_S =	1.317 g	S_{MS} =	1.185 g	S_{DS} =	0.790 g
S_1 =	0.671 g	S_{M1} =	1.610 g	S_{D1} =	1.073 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

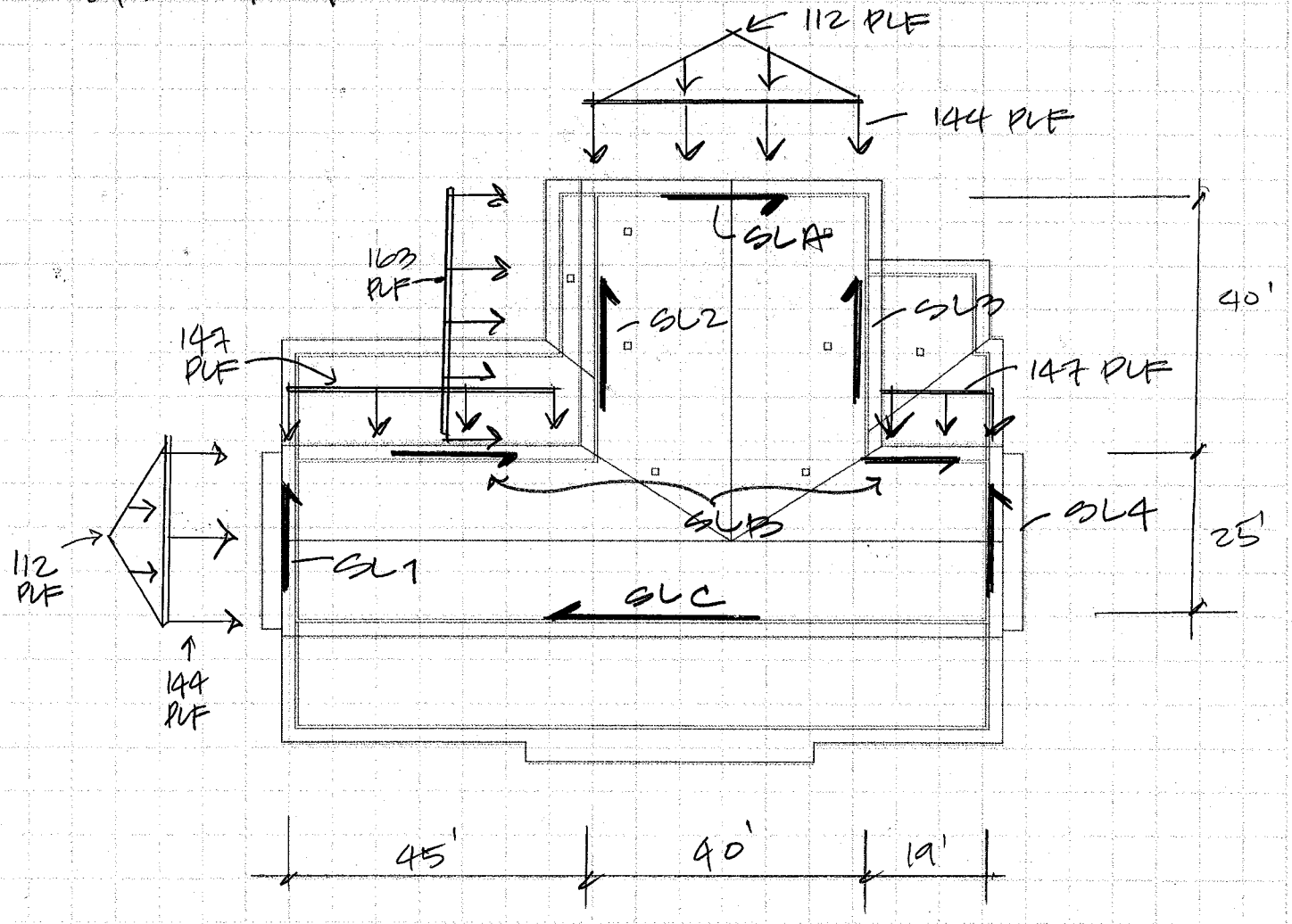
Project: Wheeler Mill Building
Wheeler, Oregon

Client: **Tom Johnson Architect**

Date: 10/29/18
Page: 86/107
By: GMG
Job #: 218368

WIND FORCE DISTRIBUTION

UPPER ROOF -



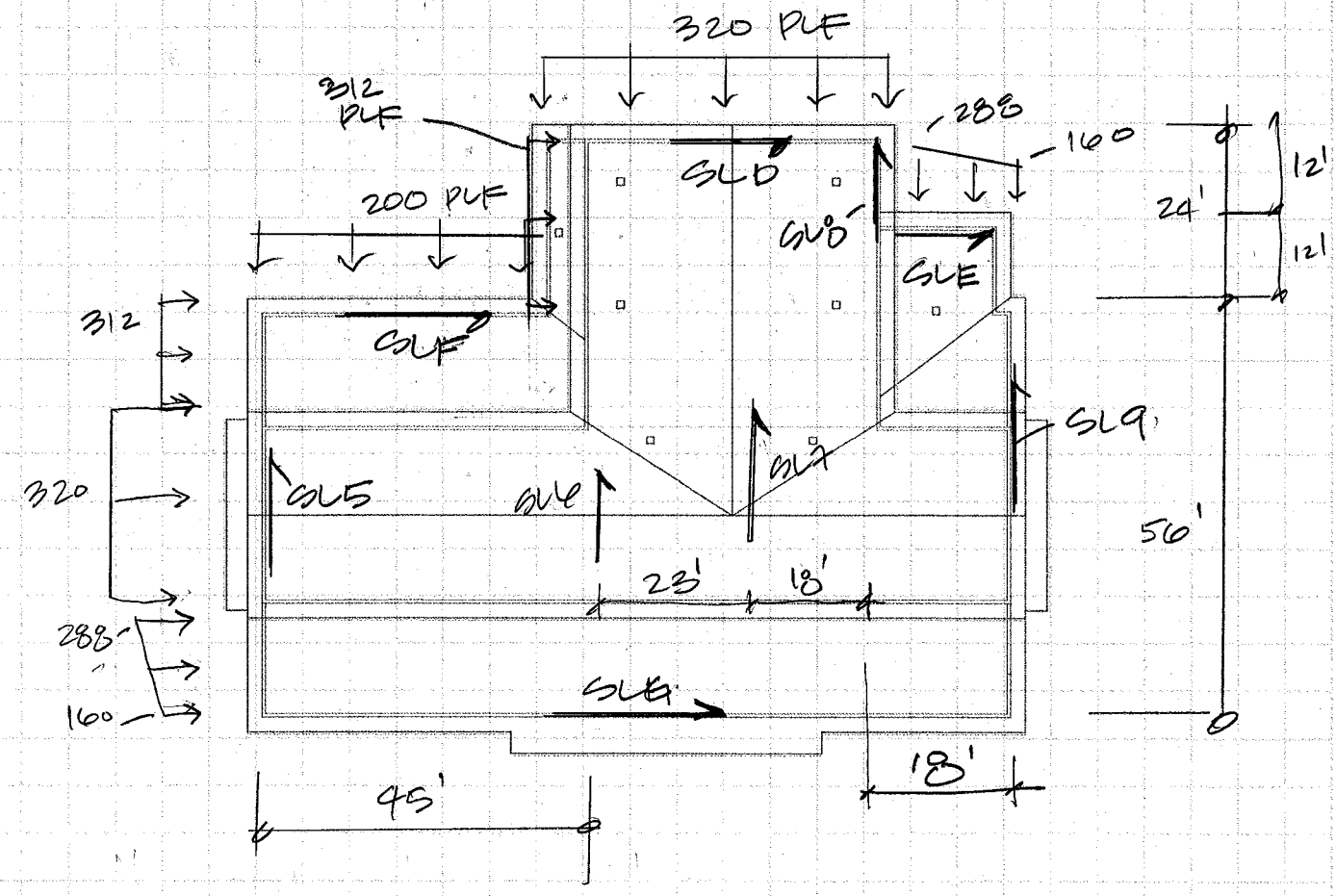
Project: Wheeler Mill Building
Wheeler, Oregon

Client: **Tom Johnson Architect**

Date: 10/29/18
Page: 87/107
By: GWD
Job #: 218368

WIND FORCE DISTRIBUTION

LOWER ROOF / 2ND FLOOR -



SHEARWALL LOAD DISTRIBUTION

NORTH / SOUTH

- GL1 = (147)(45/2) = 3308 lb
- GL2 = (1/2)(1/2)(40)(112) + (144)(40/2) + (147)(45/2) = 7308 lb
- GL3 = 4000 + 147(19/2) = 5397 lb
- GL4 = (147)(19/2) = 1397 lb

- GL5 = (200)(45/2) = 4,500 lb
  Σ = 4500 + 3308 = 7,808 lb
- GL6 = 4500 + 320(23/2) = 8180 lb
  Σ = 8180 + 7308 = 15,488 lb
- GL7 = 320(23/2 + 18) = 6,560 lb
- GL8 = (320)(18/2) + (160)(18/2) + (1/2)(2/3)(18)(288-160) = 5088 lb
  Σ = 5088 + 5397 = 10485 lb
- GL9 = (160)(18/2) + (2/3)(1/2)(18)(288-160) = 2208 lb
  Σ = 2208 + 1397 = 3605 lb

EAST / WEST

- GLA = 163(40/2) = 3260 lb
- GLB = 3260 + (144)(25/2) + 1/2(1/2)(25)(112) = 5760 lb
- GLC = 2500 lb

- GLD = (312)(12/2) = 1872
  Σ = 1872 + 3260 = 5132 lb
- GLE = 1872 lb
- GLF = 1872 lb + 13,505 = 15,377 lb
- GLG = 11,002 lb

Printed: 29 OCT 2018, 11:33AM
File = C:\PROGRA~2\ENERCA~1
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.31
Licensee : Grummel Engineering LLC

General Beam Analysis

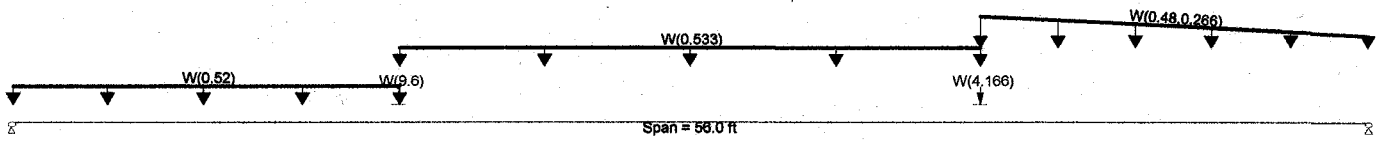
Lic. # : KW-06011470

Description : Diaphragm

General Beam Properties

Elastic Modulus 1,600,000 ksi

Span #1 Span Length = 56.0 ft Area = 780.0 in^2 Moment of Inertia = 31,237,760 in^4



Applied Loads

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

Load for Span Number 1
- Uniform Load : W = 0.520 k/ft, Extent = 0.0 -->> 16.0 ft, Tributary Width = 1.0 ft
- Uniform Load : W = 0.5330 k/ft, Extent = 16.0 -->> 40.0 ft, Tributary Width = 1.0 ft
- Varying Uniform Load : W(S,E) = 0.480->0.2660 k/ft, Extent = 40.0 -->> 56.0 ft, Trib Width = 1.0 ft
- Point Load : W = 9.60 k @ 16.0 ft
- Point Load : W = 4.166 k @ 40.0 ft

DESIGN SUMMARY

Maximum Bending =	188.003 k-ft	Maximum Shear =	13.505 k
Load Combination	+D+0.60W+H	Load Combination	+D+0.60W+H
Location of maximum on span	24.640 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	0.000 in	0	
Max Upward Transient Deflection	0.000 in	0	
Max Downward Total Deflection	0.000 in	0	
Max Upward Total Deflection	0.000 in	0	

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	22.509	18.337
Overall MINimum	10.129	8.252
+D+H		
+D+L+H		
+D+Lr+H		
+D+S+H		
+D+0.750Lr+0.750L+H		
+D+0.750L+0.750S+H		
+D+0.60W+H	13.505	11.002
+D+0.70E+H		
+D+0.750Lr+0.750L+0.450W+H	10.129	8.252
+D+0.750L+0.750S+0.450W+H	10.129	8.252
+D+0.750L+0.750S+0.5250E+H		
+0.60D+0.60W+0.60H	13.505	11.002
+0.60D+0.70E+0.60H		
D Only		
Lr Only		
L Only		
S Only		
W Only	22.509	18.337
E Only		
H Only		

(ASSD REACTIONS)

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
By: SMO

Shear Line '1' & '5'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	56
ASD Lateral Load (lbs.) =	3308
Total Wall Length (ft.) =	24.0
Unit Shear (PLF) =	138

SEE ETHO SPREADSHEET

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	24.0	11.0	36388	32486	3772	163
ΣL =	24.0					

NO HD REQ'D

1st Floor

Additional Resisting Load (PLF) =	0
Total Additional Res. Load (PLF) =	56
Lateral Load (lbs.) =	4500
Σ Lateral Load (lbs.) =	7808
Total Wall Length (ft.) =	32.0
Unit Shear (PLF) =	244

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs.)	T (lbs)
1	16.0	12.0	46848	15360	4528	1968
2	16.0	12.0	46848	15360	4528	1968
ΣL =	32.0					

2

Notes:

$M_{ot} = vLH$

$M_{res} = \frac{1}{2}[wH]L^2 * 0.6$ (ASD)

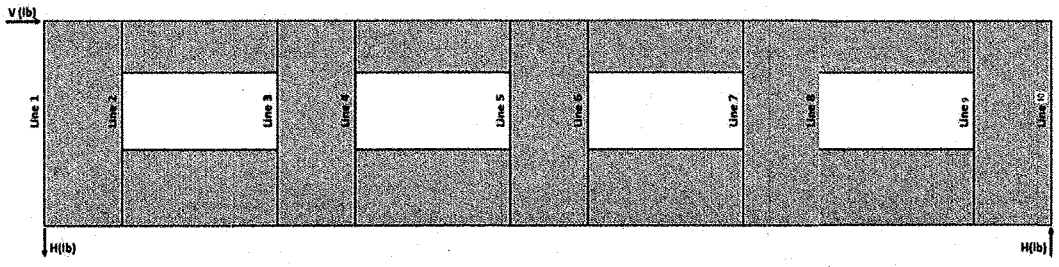
$T = \frac{M_{ot} - M_{res}}{L}$

$C = \frac{M_{ot} + M_{res}}{L}$

GRUMMEL ENGINEERING, LLC

Project Information

Code:	Date: 10/29/2018
Designer:	SMO
Client:	Tom Johnson Architect
Project:	Wheeler Mill Building
Wall Line:	SL 1



Input Variables

V	3308 lbf	Opening 1		Opening 2		Opening 3		Opening 4		Wall Pier Aspect Ratio			Adj. Factor		
h_{wall}	10.00 ft	ha1	2.00 ft	ha2	2.00 ft	ha3	2.00 ft	ha4	2.00 ft	P1=ho1/L1=	1.60		N/A		
L1	2.50 ft	ho1	4.00 ft	ho2	4.00 ft	ho3	4.00 ft	ho4	4.00 ft	P2=ho2/L2=	1.60		N/A		
L2	2.50 ft	hb1	4.00 ft	hb2	4.00 ft	hb3	4.00 ft	hb4	4.00 ft	P3=ho3/L3=	1.60		N/A		
L3	2.50 ft	Lo1	3.00 ft	Lo2	3.00 ft	Lo3	3.00 ft	Lo4	3.00 ft	P4=ho4/L4=	1.60		N/A		
L4	2.50 ft									P5=ho4/L5=	1.60		N/A		
L5	2.50 ft														
L_{wall}	24.50 ft														

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 1350 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	225 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	225 plf
Third opening: va3 = vb3 = H/(ha3+hb3) =	225 plf
Fourth opening: va4 = vb4 = H/(ha4+hb4) =	225 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	675 lbf
Second opening: O2 = va2 x (Lo2) =	675 lbf
Third opening: O3 = va3 x (Lo3) =	675 lbf
Fourth opening: O4 = va4 x (Lo4) =	675 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	338 lbf
F2 = O1(L2)/(L1+L2) =	338 lbf
F3 = O2(L2)/(L2+L3) =	338 lbf
F4 = O2(L3)/(L2+L3) =	338 lbf
F5 = O3(L3)/(L3+L4) =	338 lbf
F6 = O3(L4)/(L3+L4) =	338 lbf
F7 = O4(L4)/(L4+L5) =	338 lbf
F8 = O4(L5)/(L4+L5) =	338 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	1.50 ft
T2 = (L2*Lo1)/(L1+L2) =	1.50 ft
T3 = (L2*Lo2)/(L2+L3) =	1.50 ft
T4 = (L3*Lo2)/(L2+L3) =	1.50 ft
T5 = (L3*Lo3)/(L3+L4) =	1.50 ft
T6 = (L4*Lo3)/(L3+L4) =	1.50 ft
T7 = (L4*Lo4)/(L4+L5) =	1.50 ft
T8 = (L5*Lo4)/(L4+L5) =	1.50 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	216 plf
V2 = (V/L)(T2+L2+T3)/L2 =	297 plf
V3 = (V/L)(T4+L3+T5)/L3 =	297 plf
V4 = (V/L)(T6+L4+T7)/L4 =	297 plf
V5 = (V/L)(T8+L5) =	216 plf
Check V1*L1+V2*L2+V3*L3+V4*L4=V?	3308 lbf OK

7. Resistance to corner forces

R1 = V1*L1 =	540 lbf
R2 = V2*L2 =	743 lbf
R3 = V3*L3 =	743 lbf
R4 = V4*L4 =	743 lbf
R5 = V4*L4 =	540 lbf

8. Difference corner force + resistance

R1-F1 =	203 lbf
R2-F2-F3 =	68 lbf
R3-F4-F5 =	68 lbf
R4-F6 =	405 lbf
R5-F7 =	203 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =	81 plf
vc2 = (R2-F2-F3)/L2 =	27 plf
vc3 = (R3-F4-F5)/L3 =	27 plf
vc4 = (R4-F6-F7)/L4 =	162 plf
vc4 = (R5-F7)/L5 =	81 plf

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
By: SMO

Shear Line '2' & '6'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	280
ASD Lateral Load (lbs.) =	7308
Total Wall Length (ft.) =	40.0
Unit Shear (PLF) =	183

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	40.0	5.0	36540	163200	7714	0
Σ L =	40.0					

1st Floor

Additional Resisting Load (PLF) =	0
Total Additional Res. Load (PLF) =	280
Lateral Load (lbs.) =	8180
Σ Lateral Load (lbs.) =	15488
Total Wall Length (ft.) =	35.0
Unit Shear (PLF) =	443

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs.)	T (lbs)
1	35.0	10.0	154880	147000	11425	225
Σ L =	35.0					

NO HD REQ'D

Notes:

$$M_{ot} = vLH$$

$$M_{res} = \frac{1}{2}[wH]L^2 * 0.6 \text{ (ASD)}$$

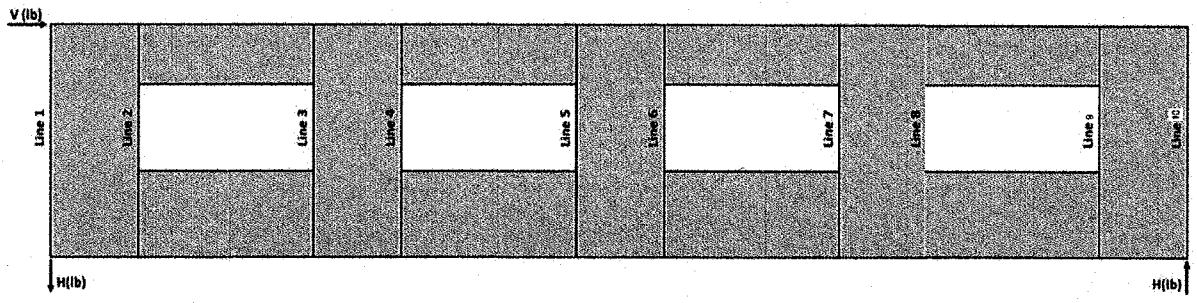
$$T = \frac{M_{ot} - M_{res}}{L}$$

$$C = \frac{M_{ot} + M_{res}}{L}$$

GRUMMEL ENGINEERING, LLC

Project Information

Code:	**Date:** 10/29/2018
Designer:	SMO
Client:	Tom Johnson Architect
Project:	Wheeler Mill Building
Wall Line:	SL 2



Input Variables

		Opening 1		Opening 2		Opening 3		Opening 4		Wall Pier Aspect Ratio		Adj. Factor
V	7308 lbf											
h_{wall}	9.00 ft	ha1	1.00 ft	ha2	1.00 ft	ha3	1.00 ft	ha4	1.00 ft	P1=ho1/L1=	0.55	N/A
L1	7.25 ft	ho1	4.00 ft	ho2	4.00 ft	ho3	4.00 ft	ho4	4.00 ft	P2=ho2/L2=	0.89	N/A
L2	4.50 ft	hb1	4.00 ft	hb2	4.00 ft	hb3	4.00 ft	hb4	4.00 ft	P3=ho3/L3=	0.89	N/A
L3	4.50 ft	Lo1	4.00 ft	Lo2	3.00 ft	Lo3	3.00 ft	Lo4	3.00 ft	P4=ho4/L4=	0.89	N/A
L4	4.50 ft									P5=ho4/L5=	0.55	N/A
L5	7.25 ft											
L_{wall}	41.00 ft											

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 1604 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	321 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	321 plf
Third opening: va3 = vb3 = H/(ha3+hb3) =	321 plf
Fourth opening: va4 = vb4 = H/(ha4+hb4) =	321 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	1283 lbf
Second opening: O2 = va2 x (Lo2) =	963 lbf
Third opening: O3 = va3 x (Lo3) =	963 lbf
Fourth opening: O4 = va4 x (Lo4) =	963 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	792 lbf
F2 = O1(L2)/(L1+L2) =	491 lbf
F3 = O2(L2)/(L2+L3) =	481 lbf
F4 = O2(L3)/(L2+L3) =	481 lbf
F5 = O3(L3)/(L3+L4) =	481 lbf
F6 = O3(L4)/(L3+L4) =	481 lbf
F7 = O4(L4)/(L4+L5) =	369 lbf
F8 = O4(L5)/(L4+L5) =	594 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	2.47 ft
T2 = (L2*Lo1)/(L1+L2) =	1.53 ft
T3 = (L2*Lo2)/(L2+L3) =	1.50 ft
T4 = (L3*Lo2)/(L2+L3) =	1.50 ft
T5 = (L3*Lo3)/(L3+L4) =	1.50 ft
T6 = (L4*Lo3)/(L3+L4) =	1.50 ft
T7 = (L4*Lo4)/(L4+L5) =	1.15 ft
T8 = (L5*Lo4)/(L4+L5) =	1.85 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	239 plf
V2 = (V/L)(T2+L2+T3)/L2 =	298 plf
V3 = (V/L)(T4+L3+T5)/L3 =	297 plf
V4 = (V/L)(T6+L4+T7)/L4 =	283 plf
V5 = (V/L)(T8+L5) =	224 plf
Check V1*L1+V2*L2+V3*L3+V4*L4=V?	7308 lbf **OK**

7. Resistance to corner forces

R1 = V1*L1 =	1732 lbf
R2 = V2*L2 =	1343 lbf
R3 = V3*L3 =	1337 lbf
R4 = V4*L4 =	1274 lbf
R5 = V4*L4 =	1622 lbf

8. Difference corner force + resistance

R1-F1 =	940 lbf
R2-F2-F3 =	370 lbf
R3-F4-F5 =	374 lbf
R4-F6 =	793 lbf
R5-F7 =	1254 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =	130 plf
vc2 = (R2-F2-F3)/L2 =	82 plf
vc3 = (R3-F4-F5)/L3 =	83 plf
vc4 = (R4-F6-F7)/L4 =	176 plf
vc4 = (R5-F7)/L5 =	173 plf

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
By: SMO

Shear Line '3' + '8'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	180
ASD Lateral Load (lbs.) =	5397
Total Wall Length (ft.) =	40.0
Unit Shear (PLF) =	135

min to S.L. 2

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	40.0	5.0	26985	115200	5475	0
Σ L =	40.0					

1st Floor

Additional Resisting Load (PLF) =	0
Total Additional Res. Load (PLF) =	180
Lateral Load (lbs.) =	5088
Σ Lateral Load (lbs.) =	10485
Total Wall Length (ft.) =	12.0
Unit Shear (PLF) =	874

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs.)	T (lbs)
1	12.0	10.0	104850	12960	10538	7658
Σ L =	12.0					

1

8

Notes:

$M_{ot} = vLH$

$M_{res} = \frac{1}{2}[wH]L^2 * 0.6$ (ASD)

$T \doteq \frac{M_{ot} - M_{res}}{L}$

$C = \frac{M_{ot} + M_{res}}{L}$

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
By: SMO

Shear Line '4' & '9'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	56
ASD Lateral Load (lbs.) =	1397
Total Wall Length (ft.) =	24.0
Unit Shear (PLF) =	58

SEE FTAO SPREADSHEET

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	24.0	11.0	15367	32486	2896	0

Σ L = 24.0

1st Floor

Additional Resisting Load (PLF) =	0
Total Additional Res. Load (PLF) =	56
Lateral Load (lbs.) =	2208
Σ Lateral Load (lbs.) =	3605
Total Wall Length (ft.) =	48.0
Unit Shear (PLF) =	75

SEE FTAO SPREADSHEET

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs.)	T (lbs)
1	24.0	12.0	21630	34560	3301	0
2	24.0	12.0	21630	34560	3301	0

Σ L = 48.0

Notes:

$M_{ot} = vLH$

$M_{res} = \frac{1}{2}[wH]L^2 * 0.6$ (ASD)

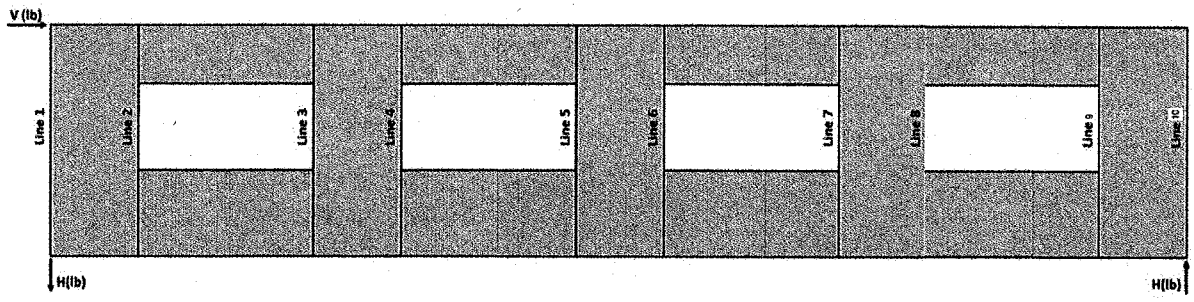
$T = \frac{M_{ot} - M_{res}}{L}$

$C = \frac{M_{ot} + M_{res}}{L}$

GRUMMEL ENGINEERING, LLC

Project Information

Code:	**Date:** 10/29/2018
Designer:	SMO
Client:	Tom Johnson Architect
Project:	Wheeler Mill Building
Wall Line:	SL 4



Input Variables

		Opening 1		Opening 2		Opening 3		Opening 4		Wall Pier Aspect Ratio		Adj. Factor
V	1397 lbf											
h_{wall}	10.00 ft	ha1	2.00 ft	ha2	2.00 ft	ha3	2.00 ft	ha4	2.00 ft	P1=ho1/L1=	1.60	N/A
L1	2.50 ft	ho1	4.00 ft	ho2	4.00 ft	ho3	4.00 ft	ho4	4.00 ft	P2=ho2/L2=	1.60	N/A
L2	2.50 ft	hb1	4.00 ft	hb2	4.00 ft	hb3	4.00 ft	hb4	4.00 ft	P3=ho3/L3=	1.60	N/A
L3	2.50 ft	Lo1	3.00 ft	Lo2	3.00 ft	Lo3	3.00 ft	Lo4	3.00 ft	P4=ho4/L4=	1.60	N/A
L4	2.50 ft									P5=ho4/L5=	1.60	N/A
L5	2.50 ft											
L_{wall}	24.50 ft											

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 570 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	95 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	95 plf
Third opening: va3 = vb3 = H/(ha3+hb3) =	95 plf
Fourth opening: va4 = vb4 = H/(ha4+hb4) =	95 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	285 lbf
Second opening: O2 = va2 x (Lo2) =	285 lbf
Third opening: O3 = va3 x (Lo3) =	285 lbf
Fourth opening: O4 = va4 x (Lo4) =	285 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	143 lbf
F2 = O1(L2)/(L1+L2) =	143 lbf
F3 = O2(L2)/(L2+L3) =	143 lbf
F4 = O2(L3)/(L2+L3) =	143 lbf
F5 = O3(L3)/(L3+L4) =	143 lbf
F6 = O3(L4)/(L3+L4) =	143 lbf
F7 = O4(L4)/(L4+L5) =	143 lbf
F8 = O4(L5)/(L4+L5) =	143 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	1.50 ft
T2 = (L2*Lo1)/(L1+L2) =	1.50 ft
T3 = (L2*Lo2)/(L2+L3) =	1.50 ft
T4 = (L3*Lo2)/(L2+L3) =	1.50 ft
T5 = (L3*Lo3)/(L3+L4) =	1.50 ft
T6 = (L4*Lo3)/(L3+L4) =	1.50 ft
T7 = (L4*Lo4)/(L4+L5) =	1.50 ft
T8 = (L5*Lo4)/(L4+L5) =	1.50 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	91 plf
V2 = (V/L)(T2+L2+T3)/L2 =	125 plf
V3 = (V/L)(T4+L3+T5)/L3 =	125 plf
V4 = (V/L)(T6+L4+T7)/L4 =	125 plf
V5 = (V/L)(T8+L5) =	91 plf
Check V1*L1+V2*L2+V3*L3+V4*L4=V?	1397 lbf **OK**

7. Resistance to corner forces

R1 = V1*L1 =	228 lbf
R2 = V2*L2 =	314 lbf
R3 = V3*L3 =	314 lbf
R4 = V4*L4 =	314 lbf
R5 = V4*L4 =	228 lbf

8. Difference corner force + resistance

R1-F1 =	86 lbf
R2-F2-F3 =	29 lbf
R3-F4-F5 =	29 lbf
R4-F6 =	171 lbf
R5-F7 =	86 lbf

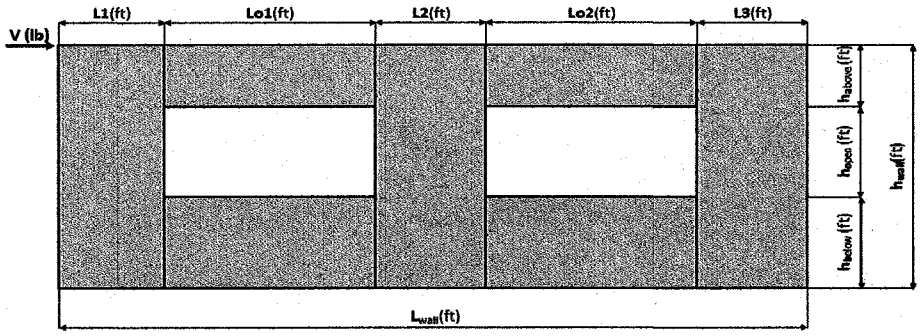
9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =	34 plf
vc2 = (R2-F2-F3)/L2 =	11 plf
vc3 = (R3-F4-F5)/L3 =	11 plf
vc4 = (R4-F6-F7)/L4 =	68 plf
vc4 = (R5-F7)/L5 =	34 plf

GRUMMEL ENGINEERING, LLC

Project Information

Code:	**Date:** 10/29/2018
Designer:	SMO
Client:	Tom Johnson Architect
Project:	Wheeler Mill Building
Wall Line:	SL 9.1



Input Variables

V	1800 lbf		Opening 1		Opening 2	Wall Pier Aspect Ratio		Adj. Factor
h_{wall}	10.75 ft	ha1	3.50 ft	ha2	3.50 ft	P1=ho1/L1=	1.42	N/A
L1	3.00 ft	ho1	4.25 ft	ho2	4.25 ft	P2=ho2/L2=	0.45	N/A
L2	9.50 ft	hb1	3.00 ft	hb2	3.00 ft	P3=ho2/L3=	0.94	N/A
L3	4.50 ft	Lo1	9.50 ft	Lo2	3.50 ft			
L_{wall}	24.00 ft							

1. Hold-down forces: H = Vh_{wall}/L_{wall} 806 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	124 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	124 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	434 lbf
Second opening: O2 = va2 x (Lo2) =	434 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	104 lbf
F2 = O1(L2)/(L1+L2) =	330 lbf
F3 = O2(L2)/(L2+L3) =	295 lbf
F4 = O2(L3)/(L2+L3) =	140 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	0.84 ft
T2 = (L2*Lo1)/(L1+L2) =	2.66 ft
T3 = (L2*Lo2)/(L2+L3) =	2.38 ft
T4 = (L3*Lo2)/(L2+L3) =	1.13 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	96 plf
V2 = (V/L)(T2+L2+T3)/L2 =	115 plf
V3 = (V/L)(T4+L3)/L3 =	94 plf
Check V1*L1+V2*L2+V3*L3=V?	1800 lbf **OK**

7. Resistance to corner forces

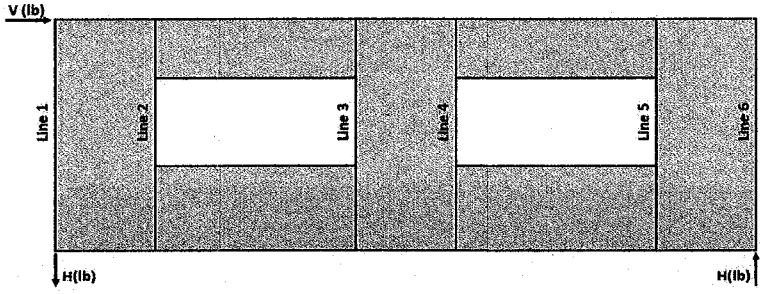
R1 = V1*L1 =	288 lbf
R2 = V2*L2 =	1090 lbf
R3 = V3*L3 =	422 lbf

8. Difference corner force + resistance

R1-F1 =	184 lbf
R2-F2-F3 =	466 lbf
R3-F4 =	282 lbf

9. Unit shear in corner zones

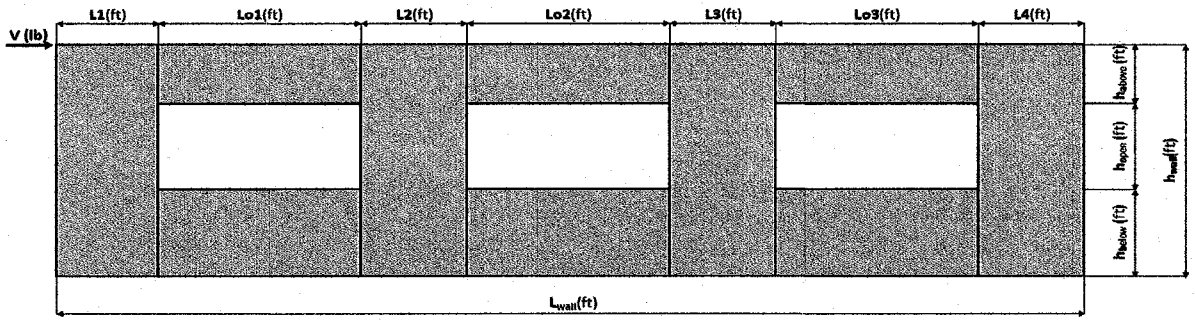
vc1 = (R1-F1)/L1 =	61 plf
vc2 = (R2-F2-F3)/L2 =	49 plf
vc3 = (R3-F4)/L3 =	63 plf



GRUMMEL ENGINEERING, LLC

Project Information

Code:	**Date:** 10/29/2018
Designer:	SMO
Client:	Tom Johnson Architect
Project:	Wheeler Mill Building
Wall Line:	SL 9.2



Input Variables

V	1800 lbf		Opening 1		Opening 2		Opening 3	Wall Pier Aspect Ratio		Adj. Factor
h_{wall}	12.50 ft	ha1	5.25 ft	ha2	5.25 ft	ha3	5.25 ft	P1=ho1/L1=	1.00	N/A
L1	4.50 ft	ho1	4.50 ft	ho2	4.50 ft	ho3	4.50 ft	P2=ho2/L2=	2.25	0.9688
L2	2.00 ft	hb1	2.75 ft	hb2	2.75 ft	hb3	2.75 ft	P3=ho3/L3=	1.80	N/A
L3	2.50 ft	Lo1	4.17 ft	Lo2	4.17 ft	Lo3	4.17 ft	P4=ho3/L4=	1.80	N/A
L4	2.50 ft									
L_{wall}	24.00 ft									

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 938 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	117 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	117 plf
Third opening: va3 = vb3 = H/(ha3+hb3) =	117 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	488 lbf
Second opening: O2 = va2 x (Lo2) =	488 lbf
Third opening: O3 = va3 x (Lo3) =	488 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	338 lbf
F2 = O1(L2)/(L1+L2) =	150 lbf
F3 = O2(L2)/(L2+L3) =	217 lbf
F4 = O2(L3)/(L2+L3) =	271 lbf
F5 = O3(L3)/(L3+L4) =	244 lbf
F6 = O3(L4)/(L3+L4) =	244 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	2.88 ft
T2 = (L2*Lo1)/(L1+L2) =	1.28 ft
T3 = (L2*Lo2)/(L2+L3) =	1.85 ft
T4 = (L3*Lo2)/(L2+L3) =	2.31 ft
T5 = (L3*Lo3)/(L3+L4) =	2.08 ft
T6 = (L4*Lo3)/(L3+L4) =	2.08 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	123 plf
V2 = (V/L)(T2+L2+T3)/L2 =	193 plf
V3 = (V/L)(T4+L3+T5)/L3 =	207 plf
V4 = (V/L)(T6+L4)/L4 =	138 plf
Check V1*L1+V2*L2+V3*L3+V4*L4=V?	1800 lbf **OK**

7. Resistance to corner forces

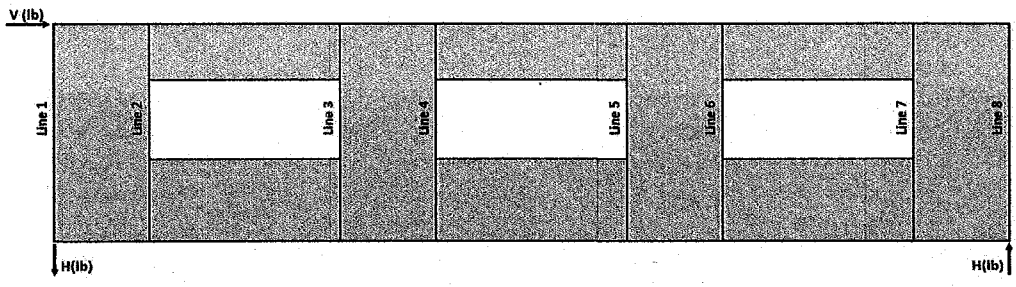
R1 = V1*L1 =	554 lbf
R2 = V2*L2 =	385 lbf
R3 = V3*L3 =	517 lbf
R4 = V4*L4 =	344 lbf

8. Difference corner force + resistance

R1-F1 =	216 lbf
R2-F2-F3 =	18 lbf
R3-F4-F5 =	2 lbf
R4-F6 =	100 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =	48 plf
vc2 = (R2-F2-F3)/L2 =	9 plf
vc3 = (R3-F4-F5)/L3 =	1 plf
vc4 = (R4-F6)/L4 =	40 plf



GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
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Shear Line '7'

1st Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	720
ASD Lateral Load (lbs.) =	6560
Total Wall Length (ft.) =	60.0
Unit Shear (PLF) =	109

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	60.0	10.0	65600	907200	26293	0
Σ L =	60.0					

Notes:

$$M_{ot} = vLH$$

$$M_{res} = \frac{1}{2}[wH]L^2 * 0.6 \text{ (ASD)}$$

$$T = \frac{M_{ot} - M_{res}}{L}$$

$$C = \frac{M_{ot} + M_{res}}{L}$$

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
By: SMO

Shear Line 'A' & 'D'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	56
ASD Lateral Load (lbs.) =	3260
Total Wall Length (ft.) =	41.0
Unit Shear (PLF) =	80

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	41.0	11.0	35860	94808	4729	0
ΣL =	41.0					

1st Floor

Additional Resisting Load (PLF) =	0
Total Additional Res. Load (PLF) =	56
Lateral Load (lbs.) =	1872
Σ Lateral Load (lbs.) =	5132
Total Wall Length (ft.) =	38.0
Unit Shear (PLF) =	135

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs.)	T (lbs)
1	12.0	10.0	16206	7603	2407	717
2	20.0	10.0	27011	21120	3111	295
3	6.0	10.0	8103	1901	1879	1034
ΣL =	38.0					

2

Notes:

$M_{ot} = vLH$

$M_{res} = \frac{1}{2}[wH]L^2 * 0.6$ (ASD)

$T = \frac{M_{ot} - M_{res}}{L}$

$C = \frac{M_{ot} + M_{res}}{L}$

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

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Shear Line 'B'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	168
ASD Lateral Load (lbs.) =	5760
Total Wall Length (ft.) =	62.0
Unit Shear (PLF) =	93

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	18.0	5.0	8361	22162	2517	0
2	44.0	5.0	20439	132422	5481	0
Σ L =	62.0					

Notes:

$$M_{ot} = vLH$$

$$M_{res} = \frac{1}{2}[wH]L^2 * 0.6 \text{ (ASD)}$$

$$T = \frac{M_{ot} - M_{res}}{L}$$

$$C = \frac{M_{ot} + M_{res}}{L}$$

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
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Shear Line 'C'

2nd Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	168
ASD Lateral Load (lbs.) =	1440
Total Wall Length (ft.) =	103.0
Unit Shear (PLF) =	14

- OK FOR FTAO BY INSPECT.

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	103.0	5.0	7200	725656	11812	0
Σ L =	103.0					

Notes:

$$M_{ot} = vLH$$

$$M_{res} = \frac{1}{2}[wH]L^2 * 0.6 \text{ (ASD)}$$

$$T = \frac{M_{ot} - M_{res}}{L}$$

$$C = \frac{M_{ot} + M_{res}}{L}$$

GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
Page:
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Shear Line 'E'

1st Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	56
ASD Lateral Load (lbs.) =	1872
Total Wall Length (ft.) =	12.0
Unit Shear (PLF) =	156

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	12.0	10.0	18720	7603	2616	926
ΣL =	12.0					

2

Notes:

$M_{ot} = vLH$

$M_{res} = \frac{1}{2}[wH]L^2 * 0.6$ (ASD)

$T = \frac{M_{ot} - M_{res}}{L}$

$C = \frac{M_{ot} + M_{res}}{L}$

GRUMMEL ENGINEERING, LLC

Project:	Wheeler Mill Wheeler, Oregon	**Date:** 10/29/2018 **Page:** **By:** SMO	

Shear Line 'F'

1st Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	56
ASD Lateral Load (lbs.) =	15377
Total Wall Length (ft.) =	38.0
Unit Shear (PLF) =	405

— SEE F1AD SPREAD SHEET

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	38.0	10.0	153770	76243	7391	2040
ΣL =	38.0					

Notes:

$M_{ot} = vLH$

$M_{res} = \frac{1}{2}[wH]L^2 * 0.6$ (ASD)

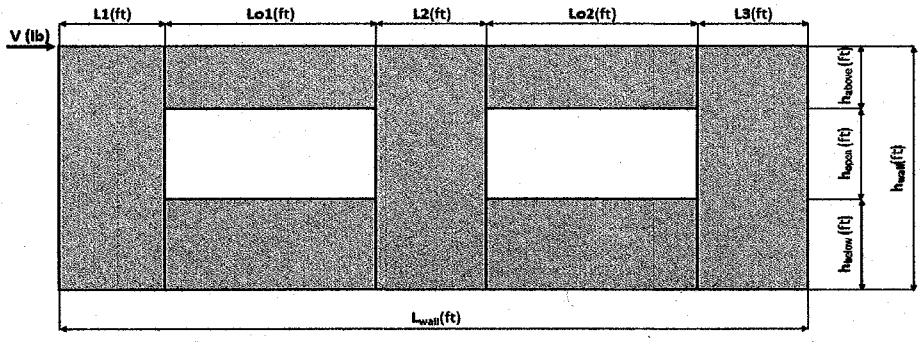
$T = \frac{M_{ot} - M_{res}}{L}$

$C = \frac{M_{ot} + M_{res}}{L}$

GRUMMEL ENGINEERING, LLC

Project Information

Code:	**Date:** 10/29/2018
Designer:	SMO
Client:	Tom Johnson Architect
Project:	Wheeler Mill Building
Wall Line:	SL[redacted]



Input Variables

V	15377 lbf	Opening 1		Opening 2		Wall Pier Aspect Ratio		Adj. Factor
h_{wall}	10.00 ft	ha1	2.50 ft	ha2	2.50 ft	P1=ho1/L1=	0.21	N/A
L1	13.00 ft	ho1	2.75 ft	ho2	2.75 ft	P2=ho2/L2=	0.21	N/A
L2	13.00 ft	hb1	4.75 ft	hb2	4.75 ft	P3=ho2/L3=	0.42	N/A
L3	6.50 ft	Lo1	2.75 ft	Lo2	2.75 ft			
L_{wall}	38.00 ft							

1. Hold-down forces: H = Vh_{wall}/L_{wall} 4047 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	558 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	558 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	1535 lbf
Second opening: O2 = va2 x (Lo2) =	1535 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	767 lbf
F2 = O1(L2)/(L1+L2) =	767 lbf
F3 = O2(L2)/(L2+L3) =	1023 lbf
F4 = O2(L3)/(L2+L3) =	512 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	1.38 ft
T2 = (L2*Lo1)/(L1+L2) =	1.38 ft
T3 = (L2*Lo2)/(L2+L3) =	1.83 ft
T4 = (L3*Lo2)/(L2+L3) =	0.92 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	447 plf
V2 = (V/L)(T2+L2+T3)/L2 =	505 plf
V3 = (V/L)(T4+L3)/L3 =	462 plf
Check V1*L1+V2*L2+V3*L3=V?	15377 lbf **OK**

7. Resistance to corner forces

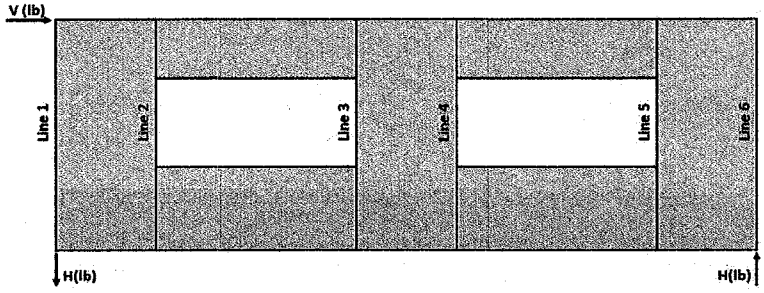
R1 = V1*L1 =	5817 lbf
R2 = V2*L2 =	6559 lbf
R3 = V3*L3 =	3001 lbf

8. Difference corner force + resistance

R1-F1 =	5050 lbf
R2-F2-F3 =	4768 lbf
R3-F4 =	2490 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =	388 plf
vc2 = (R2-F2-F3)/L2 =	367 plf
vc3 = (R3-F4)/L3 =	383 plf



GRUMMEL ENGINEERING, LLC

Project: Wheeler Mill
Wheeler, Oregon

Date: 10/29/2018
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Shear Line 'G'

1st Floor

Wt. of Wall (PSF) =	12
Additional Resisting Load (PLF) =	165
ASD Lateral Load (lbs.) =	11002
Total Wall Length (ft.) =	46.5
Unit Shear (PLF) =	237

SEE FTAO SHEET FOR SECTION '4'

Section	L (ft.)	H (ft.)	M_{ot}	M_{res}	C (lbs)	T (lbs)
1	4.5	10.0	10647	1731	3007	1981
2	4.5	10.0	10647	1731	3007	1981
3	9.5	10.0	22477	7716	3720	1554
4	28.0	10.0	66249	67032	6356	0
ΣL =	46.5					

2

Notes:

$$M_{ot} = vLH$$

$$M_{res} = \frac{1}{2}[wH]L^2 * 0.6 \text{ (ASD)}$$

$$T = \frac{M_{ot} - M_{res}}{L}$$

$$C = \frac{M_{ot} + M_{res}}{L}$$

DIAPHRAGM CHECKS

@ ROOF —

$$v_{MAX} = \frac{7{,}308 \text{ PLF}}{40'} = 183 \text{ PLF}$$

USE 5/8" PLY. W/ 10d @ 6" O.C. @ PANEL EDGES

@ FLOOR —

$$v_{MAX} = \frac{15480}{36} = 430 \text{ PLF} < \frac{895}{2.0} = 448$$

USE 7/4" PLY. W/ 10d @ 6" O.C. @ PANEL EDGES