TRUNORTH

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STRUCTURAL CALCULATIONS PACKAGE

FOR:

LANDS OF WINGS CAPITAL LLC

ARVIN BABU
2199 DIAMOND MOUNTAIN RD.
CALISTOGA, CALIFORNIA 94515
APN: 120-240-015

DESIGN PROFESSIONAL
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Limitations:

The calculations and recommendations provided within this package are limited to structural elements directly affected as a result of the proposed improvements. Any deviations from the approved plans or changes to the proposed scope of work or design, including but not limited to modifications to the size, location, or nature of the improvements, shall be immediately communicated in writing to the design professional prior to construction with the understanding that additional structural analysis and design may be required. Any unexpected conditions encountered during construction should be immediately communicated to the Design Professional.

LATERAL ANALYSIS

ASCE 7-16 Seismic Base Shear

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: Seismic Base Shear for New Deck

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.906 g, 0.2 sec response
S_1 = 0.7120 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North
Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "C" : Shear Wave Velocity 1,200 to 2,500 ft/sec		= **C**	*ASCE 7-16 Table 20.3-1*
Site Coefficients Fa & Fv	Fa	= 1.20	*ASCE 7-16 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table va	Fv	= 1.40	
Maximum Considered Earthquake Accelera	S_{MS} = Fa * Ss	= 2.287	*ASCE 7-16 Eq. 11.4-1*
	S_{M1} = Fv * S1	= 0.997	*ASCE 7-16 Eq. 11.4-2*
Design Spectral Acceleration	S_{DS} = S_{MS} * 2/3	= 1.525	*ASCE 7-16 Eq. 11.4-3*
	S_{D1} = S_{M1} * 2/3	= 0.665	*ASCE 7-16 Eq. 11.4-4*
Seismic Design Category		= **D**	*SCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Building Frame Systems**
3.Steel ordinary concentrically braced frames

Response Modification Coefficient " I = 3.25
System Overstrength Factor " Wo " = 2.00
Deflection Amplification Factor " Cd ' = 3.25

NOTE! See ASCE 7-16 for all applicable footn

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 35j
Category "E" Limit:	Limit = 35j
Category "F" Limit:	Limit = 35j

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

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

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcul: STEEL 100% Moment Resisting Frame

" Ct " value = 0.028 " hn " : Height from base to highest leve 20.0 ft
" x " value = 0.80
" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.308 sec
"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel = 0.308

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	= 1.525	From Eq. 12.8-2, Preliminary Cs	=	0.469
" R " : Response Modification Factor	= 3.25	From Eq. 12.8-3 & 12.8-4 , Cs need not excee	=	0.665
" I " : Seismic Importance Factor	= 1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.110

Cs : Seismic Response Coefficient = = **0.4692**

ASCE 7-16 Seismic Base Shear

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.4692 from 12.8.1.1

W (see Sum Wi below) = 9.32 k

Seismic Base Shear V = Cs * W = 4.37 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	9.32	8.00	74.58	1.0000	4.37	4.37	0.00

Sum Wi = 9.32 k Sum Wi * Hi = 74.58 k-ft Total Base Shear = 4.37 k

Base Moment = 35.0 k-ft

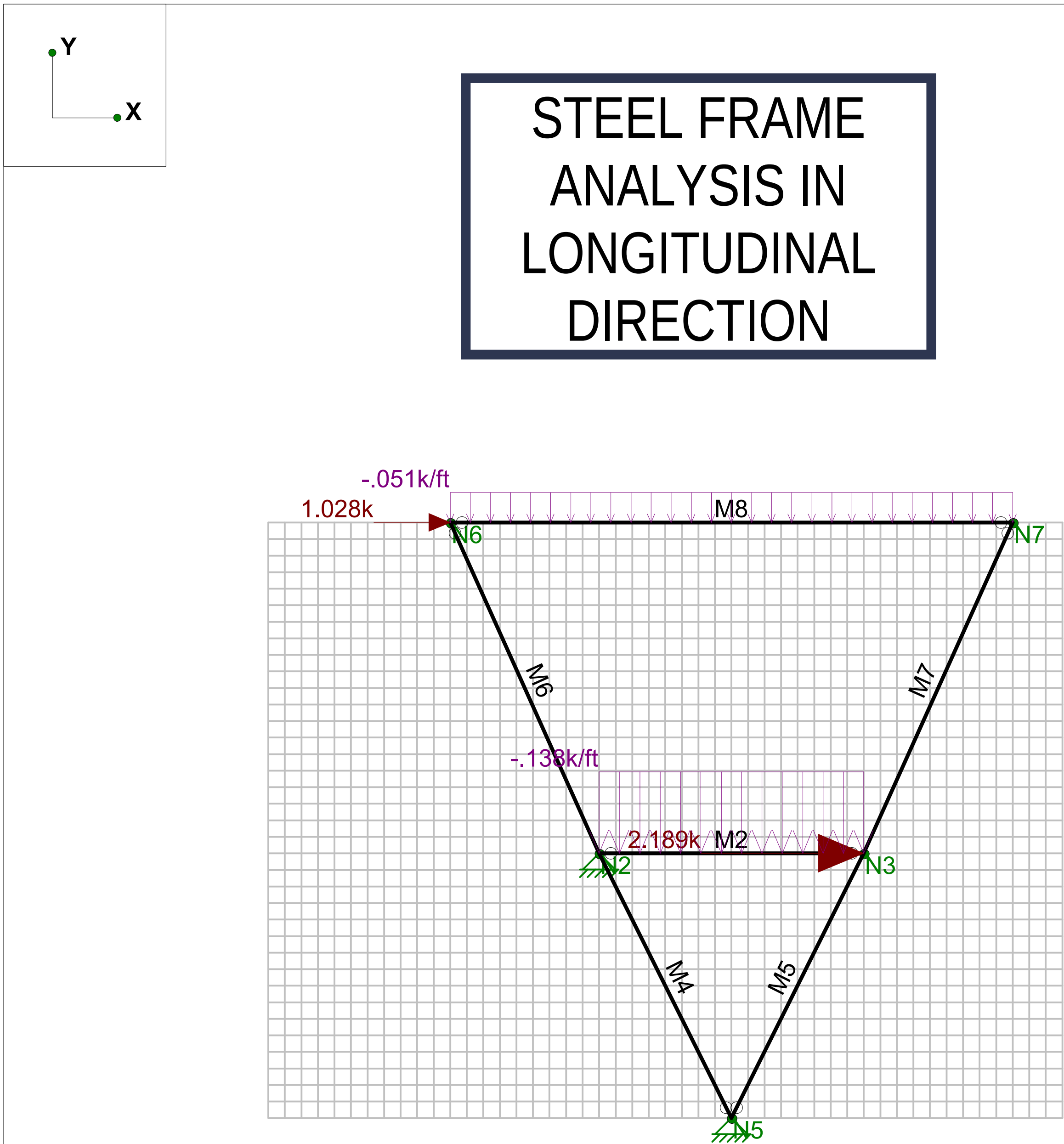
Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	9.32	4.37	4.37	9.32	4.37	2.84	5.69	4.37	4.37

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

STEEL FRAME ANALYSIS IN LONGITUDINAL DIRECTION



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		Deck RISA Model.r2e

Global

Display Sections for Member Calcs	5

Joint Coordinates

Joint Label	X Coordinate (ft)	Y Coordinate (ft)
N2	10	8
N3	18	8
N5	14	0
N6	5.5	18
N7	22.5	18

Boundary Conditions

Joint Label	X Translation (k/in)	Y Translation (k/in)	Rotation (k-ft/rad)
N5	Reaction	Reaction	
N2	Reaction	Reaction	

Member Data

Member Label	I Joint	J Joint	Area in^2	Moment of Inertia in^4	Elastic Modulus ksi	End Releases I-End	End Releases J-End	Length ft
M2	N2	N3	5.24	42.5	29000	PIN	PIN	8
M4	N5	N2	5.24	28.6	29000	PIN		8.944
M5	N5	N3	5.24	28.6	29000	PIN		8.944
M6	N2	N6	5.24	28.6	29000		PIN	10.966
M7	N3	N7	5.24	28.6	29000		PIN	10.966
M8	N6	N7	5.24	42.5	29000	PIN	PIN	17

Joint Loads/Enforced Displacements

Joint Label	[L]oad or [D]isplacement	Direction	Magnitude (k, k-ft, in, rad)
N6	L	X	1.028
N3	L	X	2.189

Member Distributed Loads

Member Label	Direction	Start Magnitude (k/ft, F)	End Magnitude (k/ft, F)	Start Location (ft or %)	End Location (ft or %)
M2	Y	-.138	-.138	0	10
M8	Y	-.051	-.051	0	17

Joint Displacements

Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
N2	0	0	-2.672e-3
N3	.002	-.002	-2.678e-3
N5	0	0	0
N6	.714	.321	0
N7	.713	-.323	0

Reactions

Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
N5	1.649	1.244	0

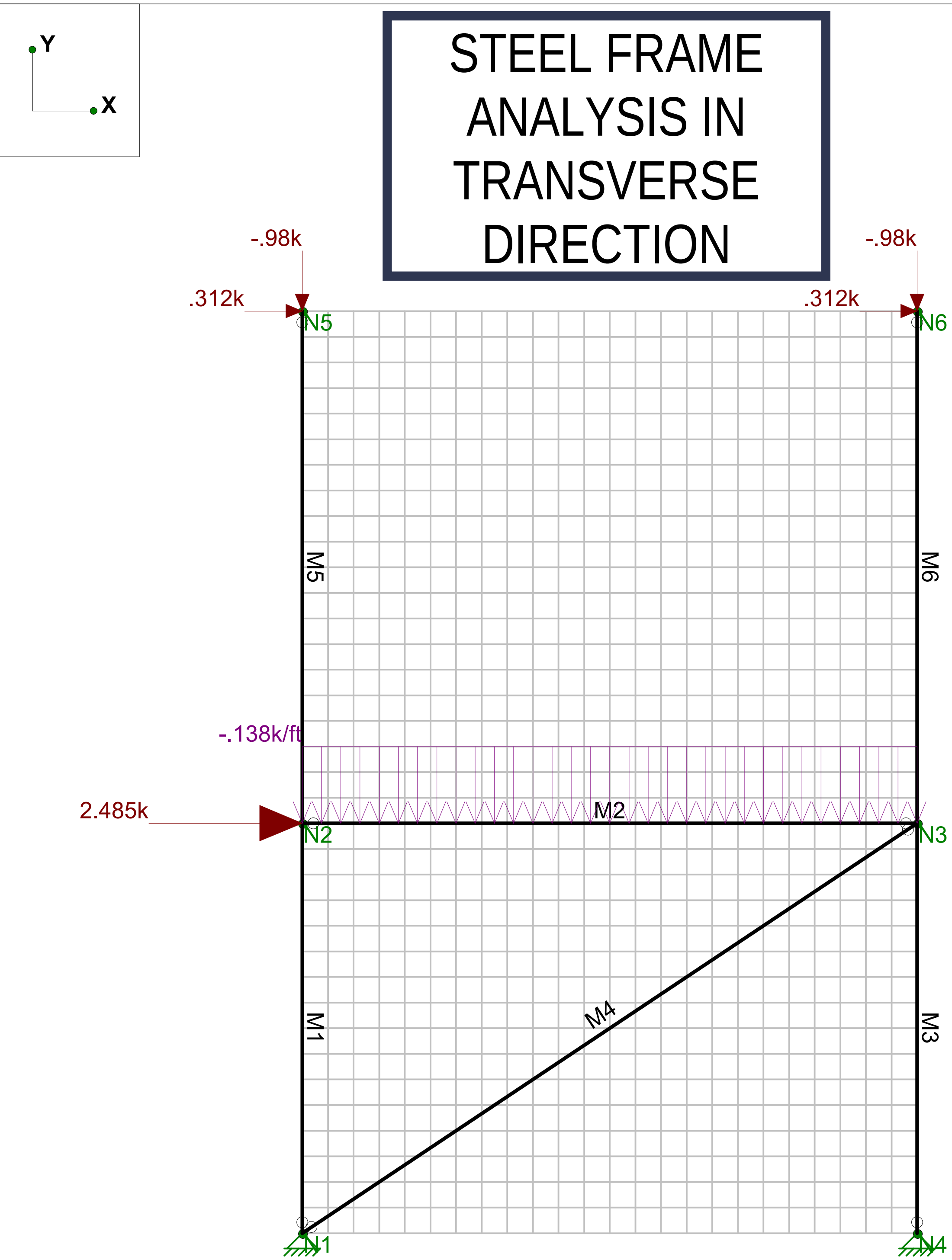
Reactions

Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
N2	-4.866	.727	0
Totals:	-3.217	1.971	

Member Section Forces

Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
M2	1	-3.638	.552	0
	2	-3.638	.276	.828
	3	-3.638	0	1.104
	4	-3.638	-.276	.828
	5	-3.638	-.552	0
M4	1	0	-.577	0
	2	0	-.577	-1.29
	3	0	-.577	-2.58
	4	0	-.577	-3.871
	5	0	-.577	-5.161
M5	1	1.388	-.572	0
	2	1.388	-.572	-1.28
	3	1.388	-.572	-2.56
	4	1.388	-.572	-3.839
	5	1.388	-.572	-5.119
M6	1	.687	.471	-5.161
	2	.687	.471	-3.871
	3	.687	.471	-2.58
	4	.687	.471	-1.29
	5	.687	.471	0
M7	1	.265	.467	-5.119
	2	.265	.467	-3.839
	3	.265	.467	-2.56
	4	.265	.467	-1.28
	5	.265	.467	0
M8	1	.317	.434	0
	2	.317	.217	1.382
	3	.317	0	1.842
	4	.317	-.217	1.382
	5	.317	-.433	0

STEEL FRAME ANALYSIS IN TRANSVERSE DIRECTION



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		Deck Alt Direction RISA Model.r2e

Global

Display Sections for Member Calcs	5

Joint Coordinates

Joint Label	X Coordinate (ft)	Y Coordinate (ft)
N1	0	0
N2	0	8
N3	12	8
N4	12	0
N5	0	18
N6	12	18

Boundary Conditions

Joint Label	X Translation (k/in)	Y Translation (k/in)	Rotation (k-ft/rad)
N1	Reaction	Reaction	
N4	Reaction	Reaction	
N5			
N6			

Member Data

Member Label	I Joint	J Joint	Area in^2	Moment of Inertia in^4	Elastic Modulus ksi	End Releases I-End	End Releases J-End	Length ft
M1	N1	N2	5.24	28.6	29000	PIN		8
M2	N2	N3	5.24	42.5	29000	PIN	PIN	12
M3	N4	N3	5.24	28.6	29000	PIN		8
M4	N1	N3	1.43	1.19	29000	PIN	PIN	14.422
M5	N2	N5	5.24	28.6	29000		PIN	10
M6	N3	N6	5.24	28.6	29000		PIN	10

Joint Loads/Enforced Displacements

Joint Label	[L]oad or [D]isplacement	Direction	Magnitude (k, k-ft, in, rad)
N2	L	X	2.485
N5	L	X	.312
N6	L	X	.312
N5	L	Y	-.98
N6	L	Y	-.98

Member Distributed Loads

Member Label	Direction	Start Magnitude (k/ft, F)	End Magnitude (k/ft, F)	Start Location (ft or %)	End Location (ft or %)
M2	Y	-.138	-.138	0	12

Joint Displacements

Joint Label	X Translation (in)	Y Translation (in)	Rotation (radians)
N1	0	0	0
N2	.028	-.001	-1.739e-3
N3	.025	-.003	-1.708e-3
N4	0	0	0
N5	.454	-.002	0
N6	.447	-.004	0

Reactions

Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)

Reactions

Joint Label	X Force (k)	Y Force (k)	Moment (k-ft)
N1	-3.499	-.785	0
N4	.39	4.401	0
Totals:	-3.109	3.616	

Member Section Forces

Member Label	Section	Axial (k)	Shear (k)	Moment (k-ft)
M1	1	1.808	-.39	0
	2	1.808	-.39	-.78
	3	1.808	-.39	-1.56
	4	1.808	-.39	-2.34
	5	1.808	-.39	-3.12
M2	1	3.187	.828	0
	2	3.187	.414	1.863
	3	3.187	0	2.484
	4	3.187	-.414	1.863
	5	3.187	-.828	0
M3	1	4.401	-.39	0
	2	4.401	-.39	-.78
	3	4.401	-.39	-1.56
	4	4.401	-.39	-2.34
	5	4.401	-.39	-3.12
M4	1	-4.674	0	0
	2	-4.674	0	0
	3	-4.674	0	0
	4	-4.674	0	0
	5	-4.674	0	0
M5	1	.98	.312	-3.12
	2	.98	.312	-2.34
	3	.98	.312	-1.56
	4	.98	.312	-.78
	5	.98	.312	0
M6	1	.98	.312	-3.12
	2	.98	.312	-2.34
	3	.98	.312	-1.56
	4	.98	.312	-.78
	5	.98	.312	0

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BEAM CALCULATIONS

Wood Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth

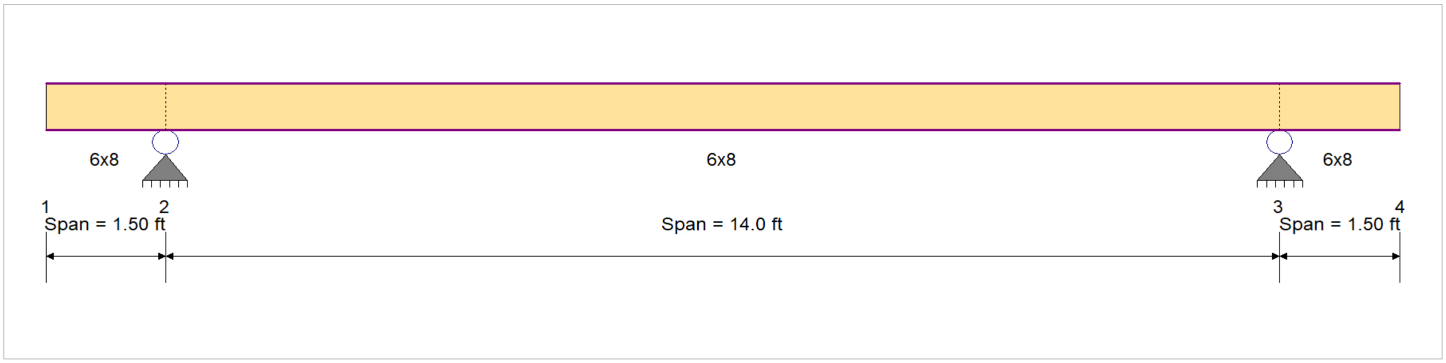
DESCRIPTION: Roof Rafters

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	700 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	700 psi	Ebend- xx	1000ksi
		Fc - Prll	650 psi	Eminbend - xx	370ksi
Wood Species :	Western Cedars	Fc - Perp	425 psi		
Wood Grade :	No.2	Fv	155 psi		
		Ft	425 psi	Density	22.47pcf
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 loading

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	**0.056** : 1	Maximum Shear Stress Ratio	=	**0.011** : 1
Section used for this span		**6x8**	Section used for this span		**6x8**
fb: Actual	=	35.01 psi	fv: Actual	=	1.50 psi
F'b	=	630.00 psi	F'v	=	139.50 psi
Load Combination		D Only	Load Combination		D Only
Location of maximum on span	=	6.941ft	Location of maximum on span	=	13.412ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.028 in	Ratio =	6097 >=180	Span: 2 : D Only
Max Upward Total Deflection	-0.009 in	Ratio =	3934 >=180	Span: 1 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 1.50 ft	1	0.003	0.011	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.01	1.7	630.0	0.04	1.5	139.5
Length = 14.0 ft	2	0.056	0.011	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.15	35.0	630.0	0.04	1.5	139.5
Length = 1.50 ft	3	0.003	0.011	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.01	1.7	630.0	0.01	1.5	139.5
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.50 ft	1	0.001	0.004	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.00	1.0	1,120.0	0.02	0.9	248.0
Length = 14.0 ft	2	0.019	0.004	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.09	21.0	1,120.0	0.02	0.9	248.0
Length = 1.50 ft	3	0.001	0.004	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.00	1.0	1,120.0	0.00	0.9	248.0

Wood Beam

DESCRIPTION: Roof Rafters

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	D Only	-0.0091	0.000
D Only	2	0.0276	7.059		0.0000	0.000
	3	0.0000	7.059	D Only	-0.0091	1.500

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Upward from all Load Conditions		0.055	0.055	
Max Upward from Load Combinations		0.033	0.033	
Max Upward from Load Cases		0.055	0.055	
D Only		0.055	0.055	
+0.60D		0.033	0.033	

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

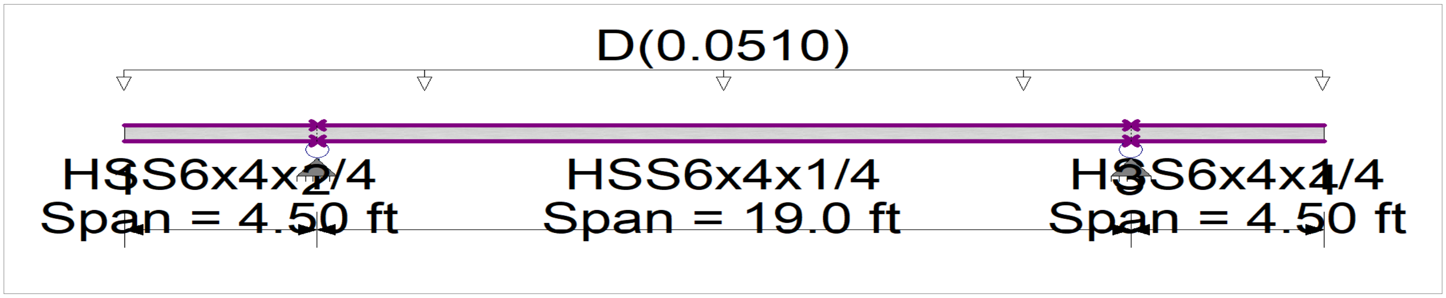
DESCRIPTION: Roof Purlins

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight calculated and added to loading
Loads on all spans...
Uniform Load on ALL spans : D = 0.0060 ksf, Tributary Width = 8.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.152** : 1	Maximum Shear Stress Ratio =	**0.020** : 1
Section used for this span	**HSS6x4x1/4**	Section used for this span	**HSS6x4x1/4**
Ma : Applied	2.332 k-ft	Va : Applied	0.6329 k
Mn / Omega : Allowable	15.323 k-ft	Vn/Omega : Allowable	31.951 k
Load Combination	D Only	Load Combination	D Only
		Location of maximum on span	19.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.238 in	Ratio =	959	>=180	Span: 3 : D Only
Max Upward Total Deflection	-0.152 in	Ratio =	709	>=180	Span: 3 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 4.50 ft	1	0.044	0.020		-0.67	0.67	25.59	15.32	1.00	1.00	0.63	53.36	31.95
Dsgn. L = 19.00 ft	2	0.152	0.020	2.33	-0.67	2.33	25.59	15.32	1.00	1.00	0.63	53.36	31.95
Dsgn. L = 4.50 ft	3	0.044	0.009		-0.67	0.67	25.59	15.32	1.00	1.00	0.30	53.36	31.95
+0.60D													
Dsgn. L = 4.50 ft	1	0.026	0.012		-0.40	0.40	25.59	15.32	1.00	1.00	0.38	53.36	31.95
Dsgn. L = 19.00 ft	2	0.091	0.012	1.40	-0.40	1.40	25.59	15.32	1.00	1.00	0.38	53.36	31.95
Dsgn. L = 4.50 ft	3	0.026	0.006		-0.40	0.40	25.59	15.32	1.00	1.00	0.18	53.36	31.95

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	D Only	-0.1523	0.000
D Only	2	0.2378	9.627		0.0000	0.000
	3	0.0000	9.627	D Only	-0.1524	4.500

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Upward from all Load Conditions		0.933	0.933	
Max Upward from Load Combinations		0.560	0.560	
Max Upward from Load Cases		0.933	0.933	
D Only		0.933	0.933	
+0.60D		0.560	0.560	

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

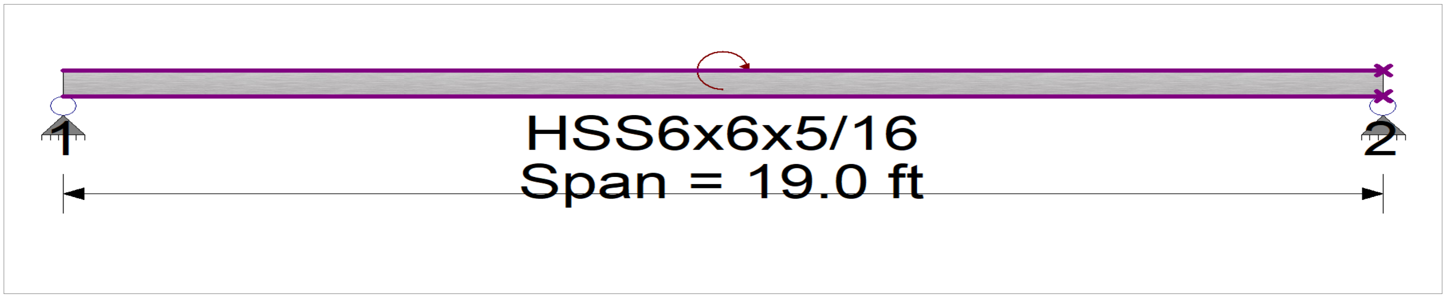
DESCRIPTION: HSS A-Frame Beam Check

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight NOT internally calculated and added
Load(s) for Span Number 1
Moment : D = 5.161 k-ft, Loc = 9.50 ft in span, (Moment Check)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.106** : 1	Maximum Shear Stress Ratio =	**0.007** : 1
Section used for this span	**HSS6x6x5/16**	Section used for this span	**HSS6x6x5/16**
Ma : Applied	2.581 k-ft	Va : Applied	0.2716 k
Mn / Omega : Allowable	24.431 k-ft	Vn/Omega : Allowable	38.594 k
Load Combination	D Only	Load Combination	D Only
		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 in	Ratio =	0	<360	n/a
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.027 in	Ratio =	8525	>=180	Span: 1 : D Only
Max Upward Total Deflection	-0.026 in	Ratio =	8720	>=180	Span: 1 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 19.00 ft	1	0.106	0.007	2.57	-2.58	2.58	40.80	24.43	1.00	1.00	0.27	64.45	38.59
+0.60D													
Dsgn. L = 19.00 ft	1	0.063	0.004	1.54	-1.55	1.55	40.80	24.43	1.00	1.00	0.16	64.45	38.59

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D Only	1	0.0267	13.626	D Only	-0.0261	5.537

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
Max Upward from all Load Conditions		0.272	0.560
Max Upward from Load Combinations		0.163	0.560
Max Upward from Load Cases		0.272	0.560
Max Downward from all Load Conditions (Resi	-0.272		0.560
Max Downward from Load Combinations (Resi	-0.163		0.560
Max Downward from Load Cases (Resisting U	-0.272		0.560
D Only	-0.272	0.272	0.560
+0.60D	-0.163	0.163	0.560

Project Title: Lands of Wings Capital LLC
Engineer: Daniel Byrne
Project ID:
Project Descr: New Deck

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

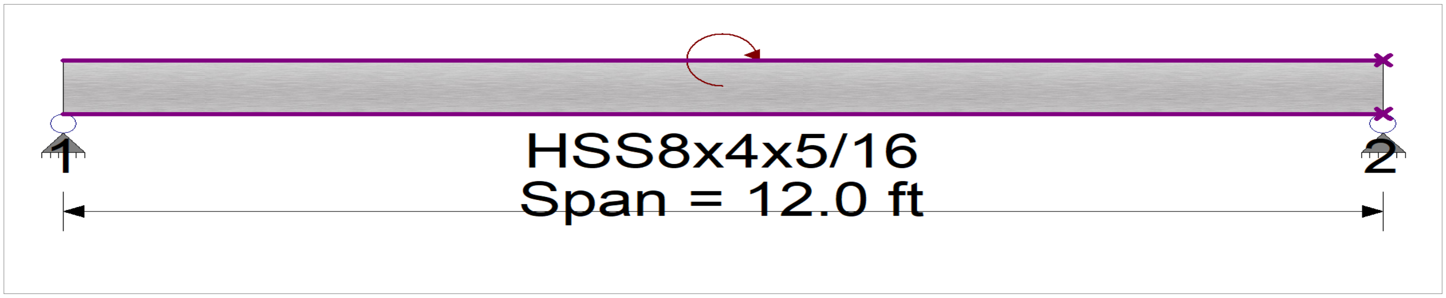
DESCRIPTION: HSS Deck Beam Check

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight NOT internally calculated and added
Load(s) for Span Number 1
Moment : D = 2.484 k-ft, Loc = 6.0 ft in span, (Moment Check)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.043** : 1	Maximum Shear Stress Ratio =	**0.004** : 1
Section used for this span	**HSS8x4x5/16**	Section used for this span	**HSS8x4x5/16**
Ma : Applied	1.242 k-ft	Va : Applied	0.2070 k
Mn / Omega : Allowable	28.922 k-ft	Vn/Omega : Allowable	53.650 k
Load Combination	D Only	Load Combination	D Only
		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 in	Ratio =	0	<360	n/a
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.003 in	Ratio =	44985	>=180	Span: 1 : D Only
Max Upward Total Deflection	-0.003 in	Ratio =	42654	>=180	Span: 1 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 12.00 ft	1	0.043	0.004	1.24	-1.23	1.24	48.30	28.92	1.00	1.00	0.21	89.59	53.65
+0.60D													
Dsgn. L = 12.00 ft	1	0.026	0.002	0.75	-0.74	0.75	48.30	28.92	1.00	1.00	0.12	89.59	53.65

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D Only	1	0.0032	8.503	D Only	-0.0034	3.497

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
Max Upward from all Load Conditions		0.207	0.560
Max Upward from Load Combinations		0.124	0.560
Max Upward from Load Cases		0.207	0.560
Max Downward from all Load Conditions (Resi	-0.207		0.560
Max Downward from Load Combinations (Resi	-0.124		0.560
Max Downward from Load Cases (Resisting U	-0.207		0.560
D Only	-0.207	0.207	0.560
+0.60D	-0.124	0.124	0.560

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

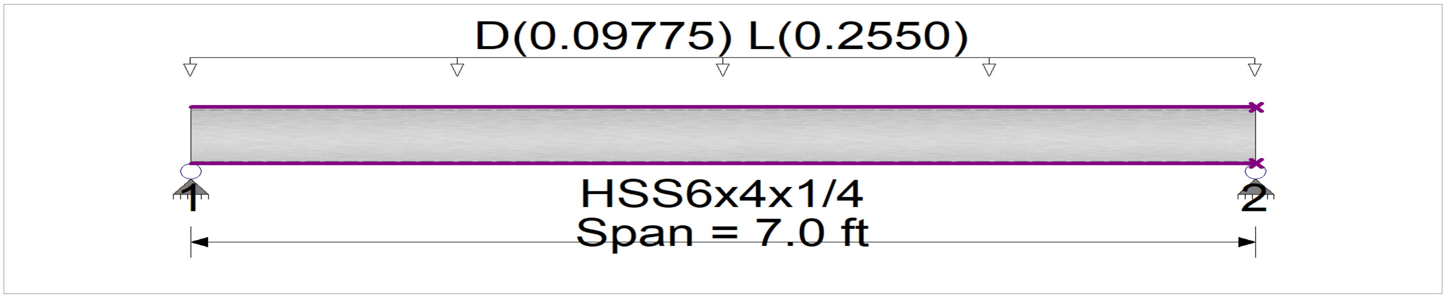
DESCRIPTION: Perpendicular Deck Beams

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight calculated and added to loading
Uniform Load : D = 0.0230, L = 0.060 ksf, Tributary Width = 4.250 ft, (Uniform Deck Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.147** : 1	Maximum Shear Stress Ratio =	**0.040** : 1
Section used for this span	**HSS6x4x1/4**	Section used for this span	**HSS6x4x1/4**
Ma : Applied	2.256 k-ft	Va : Applied	1.289 k
Mn / Omega : Allowable	15.323 k-ft	Vn/Omega : Allowable	31.951 k
Load Combination	+D+L	Load Combination	+D+L
		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	0.023 in	Ratio =	3,678	>=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.033 in	Ratio =	2547	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination			Max Stress Ratios		Summary of Moment Values								Summary of Shear Values		
Segment Length		Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega	
D Only															
Dsgn. L =	7.00 ft	1	0.045	0.012	0.69		0.69	25.59	15.32	1.00	1.00	0.40	53.36	31.95	
+D+L															
Dsgn. L =	7.00 ft	1	0.147	0.040	2.26		2.26	25.59	15.32	1.00	1.00	1.29	53.36	31.95	
+D+0.750L															
Dsgn. L =	7.00 ft	1	0.122	0.033	1.87		1.87	25.59	15.32	1.00	1.00	1.07	53.36	31.95	
+0.60D															
Dsgn. L =	7.00 ft	1	0.027	0.007	0.42		0.42	25.59	15.32	1.00	1.00	0.24	53.36	31.95	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0330	3.520		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
Max Upward from all Load Conditions	1.289	1.289	0.560
Max Upward from Load Combinations	1.289	1.289	0.560
Max Upward from Load Cases	0.893	0.893	0.560
Max Downward from all Load Conditions (Resi			0.560
Max Downward from Load Combinations (Resi			0.560
Max Downward from Load Cases (Resisting U			0.560
D Only	0.397	0.397	0.560
+D+L	1.289	1.289	0.560
+D+0.750L	1.066	1.066	0.560

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

DESCRIPTION: Perpendicular Deck Beams

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
+0.60D	0.238	0.238	0.560
L Only	0.893	0.893	0.560

Steel Column

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

DESCRIPTION: Steel Column Check

Code References

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combinations Used : ASCE 7-16

General Information

Steel Section Name : **HSS6x6x5/16**

Analysis Method :	Allowable Strength
Steel Stress Grade	
Fy : Steel Yield	36.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	10.0 ft
Top & Bottom Fixity	Top Free, Bottom Fixed
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 10.0 ft, K = 2.1
Unbraced Length for buckling ABOUT Y-Y Axis = 10.0 ft, K = 2.1

Applied Loads

Service loads entered. Load Factors will be applied for calculations

Column self weight included : 233.40 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load from Roof Purlin: Axial Load at 10.0 ft, D = 0.980 k
BENDING LOADS . . .
Seismic Load: Lat. Point Load at 10.0 ft creating Mx-x, E = 1.245 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =	**0.3649**	: 1
Load Combination	+D+0.70E	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pa : Axial	1.213	k
Pn / Omega : Allowabl	74.081	k
Ma-x : Applied	-8.715	k-ft
Mn-x / Omega : Allowable	24.431	k-ft
Ma-y : Applied	0.0	k-ft
Mn-y / Omega : Allowable	24.431	k-ft
PASS Maximum Shear Stress Rati	**0.02258**	: 1
Load Combination	+D+0.70E	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Va : Applied	0.8715	k
Vn / Omega : Allowable	38.594	k

Maximum Load Reactions . .

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

Maximum Load Deflections . . .

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

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

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios Stress Ratio	Status	Location

Maximum Reactions

Note: Only non-zero reactions are listed.

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

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance

Steel Section Properties : HSS6x6x5/16

Steel Section Properties : HSS6x6x5/16

Steel Column

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

DESCRIPTION: Steel Column Check

Depth	=	6.000 in	I xx	=	34.30 in^4	J	=	55.400 in^4
Design Thick	=	0.291 in	S xx	=	11.40 in^3			
Width	=	6.000 in	R xx	=	2.310 in			
Wall Thick	=	0.313 in	Zx	=	13.600 in^3			
Area	=	6.430 in^2	I yy	=	34.300 in^4	C	=	18.900 in^3
Weight	=	23.340 plf	S yy	=	11.400 in^3			
			R yy	=	2.310 in			
Ycg	=	0.000 in						

Sketches

Project Title:	Lands of Wings Capital LLC
Engineer:	Daniel Byrne
Project ID:	
Project Descr:	New Deck

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

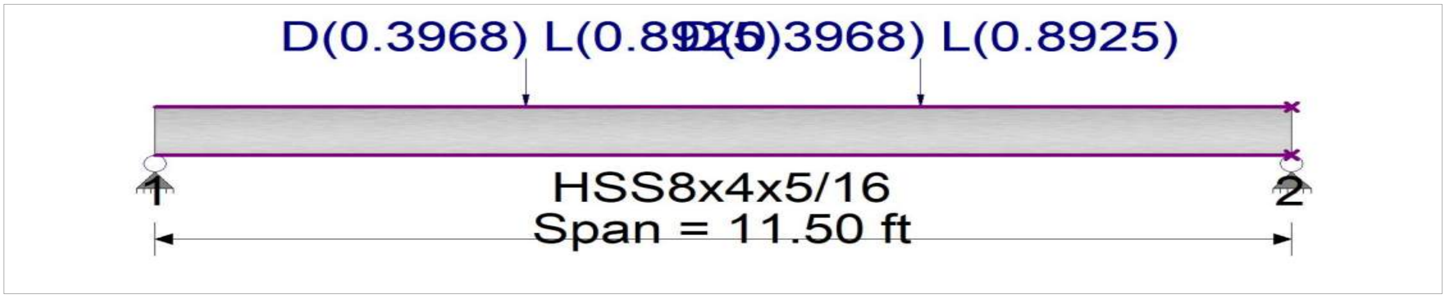
DESCRIPTION: Parallel Deck Beams

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight calculated and added to loading
Linked Load(s)
Beam Perpendicular Deck Beams, Support 1: D = 0.3968, L = 0.8925 k @ 3.75 ft from left end of beam
Beam Perpendicular Deck Beams, Support 1: D = 0.3968, L = 0.8925 k @ 3.75 ft from left end of beam
Beam Perpendicular Deck Beams, Support 1: D = 0.3968, L = 0.8925 k @ 7.75 ft from left end of beam
Beam Perpendicular Deck Beams, Support 1: D = 0.3968, L = 0.8925 k @ 7.75 ft from left end of beam

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.348** : 1	Maximum Shear Stress Ratio =	**0.051** : 1
Section used for this span	**HSS8x4x5/16**	Section used for this span	**HSS8x4x5/16**
Ma : Applied	10.056 k-ft	Va : Applied	2.713 k
Mn / Omega : Allowable	28.922 k-ft	Vn/Omega : Allowable	53.650 k
Load Combination	+D+L	Load Combination	+D+L
		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	0.111	in	Ratio =	1,238	>=360	Span: 1 : L Only
Max Upward Transient Deflection	0	in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.167	in	Ratio =	825	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0	in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 11.50 ft	1	0.116	0.017	3.36		3.36	48.30	28.92	1.00	1.00	0.93	89.59	53.65
+D+L													
Dsgn. L = 11.50 ft	1	0.348	0.051	10.06		10.06	48.30	28.92	1.00	1.00	2.71	89.59	53.65
+D+0.750L													
Dsgn. L = 11.50 ft	1	0.290	0.042	8.38		8.38	48.30	28.92	1.00	1.00	2.27	89.59	53.65
+0.60D													
Dsgn. L = 11.50 ft	1	0.070	0.010	2.02		2.02	48.30	28.92	1.00	1.00	0.56	89.59	53.65

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1672	5.783		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2	
Max Upward from all Load Conditions	2.713	2.713	0.560
Max Upward from Load Combinations	2.713	2.713	0.560
Max Upward from Load Cases	1.785	1.785	0.560
Max Downward from all Load Conditions (Resi			0.560
Max Downward from Load Combinations (Resi			0.560

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

DESCRIPTION: Parallel Deck Beams

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
Max Downward from Load Cases (Resisting U			0.560
D Only	0.928	0.928	0.560
+D+L	2.713	2.713	0.560
+D+0.750L	2.267	2.267	0.560
+0.60D	0.557	0.557	0.560
L Only	1.785	1.785	0.560

Project Title:	Lands of Wings Capital LLC
Engineer:	Daniel Byrne
Project ID:	
Project Descr:	New Deck

Steel Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

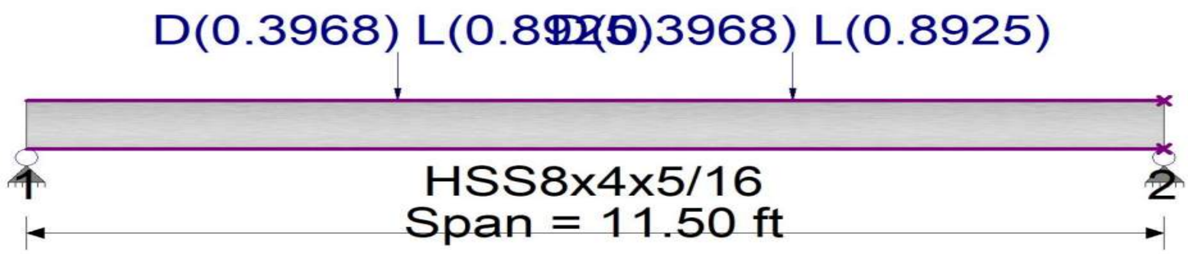
DESCRIPTION: Deck Rim Beam

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight calculated and added to loading
Linked Load(s)
Beam Perpendicular Deck Beams, Support 1: D = 0.3968, L = 0.8925 k @ 3.75 ft from left end of beam
Beam Perpendicular Deck Beams, Support 1: D = 0.3968, L = 0.8925 k @ 7.75 ft from left end of beam

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.181** : 1	Maximum Shear Stress Ratio =	**0.027** : 1
Section used for this span	**HSS8x4x5/16**	Section used for this span	**HSS8x4x5/16**
Ma : Applied	5.221 k-ft	Va : Applied	1.424 k
Mn / Omega : Allowable	28.922 k-ft	Vn/Omega : Allowable	53.650 k
Load Combination	+D+L	Load Combination	+D+L
		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	0.056 in	Ratio =	2,476	>=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.087 in	Ratio =	1591	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 11.50 ft	1	0.065	0.010	1.87		1.87	48.30	28.92	1.00	1.00	0.53	89.59	53.65
+D+L													
Dsgn. L = 11.50 ft	1	0.181	0.027	5.22		5.22	48.30	28.92	1.00	1.00	1.42	89.59	53.65
+D+0.750L													
Dsgn. L = 11.50 ft	1	0.152	0.022	4.38		4.38	48.30	28.92	1.00	1.00	1.20	89.59	53.65
+0.60D													
Dsgn. L = 11.50 ft	1	0.039	0.006	1.12		1.12	48.30	28.92	1.00	1.00	0.32	89.59	53.65

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0867	5.783		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2	
Max Upward from all Load Conditions	1.424	1.424	0.560
Max Upward from Load Combinations	1.424	1.424	0.560
Max Upward from Load Cases	0.893	0.893	0.560
Max Downward from all Load Conditions (Resi			0.560
Max Downward from Load Combinations (Resi			0.560
Max Downward from Load Cases (Resisting U			0.560
D Only	0.531	0.531	0.560

Steel Beam

DESCRIPTION: Deck Rim Beam

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
+D+L	1.424	1.424	0.560
+D+0.750L	1.200	1.200	0.560
+0.60D	0.319	0.319	0.560
L Only	0.893	0.893	0.560

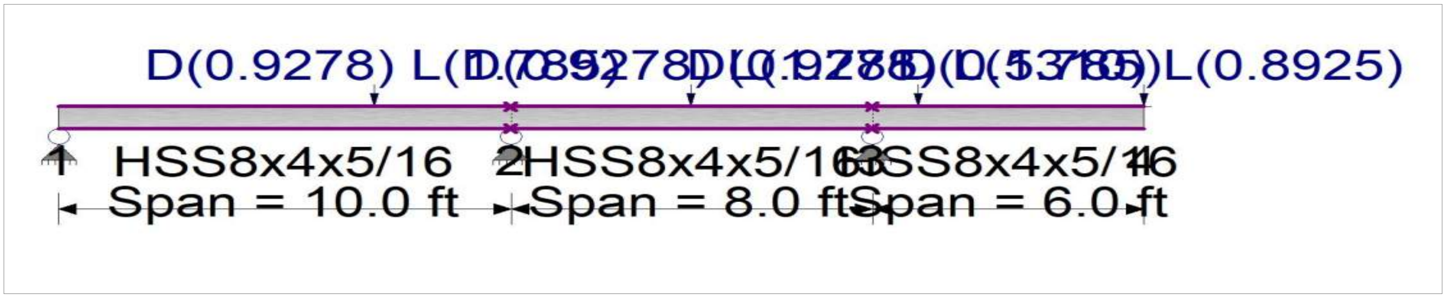
DESCRIPTION: Deck Beams along Lines 1 & 2

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	36.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight calculated and added to loading
Linked Load(s)
Beam Deck Rim Beam, Support 1: D = 0.5310, L = 0.8925 k @ 24 ft from left end of beam
Beam Parallel Deck Beams, Support 1: D = 0.9278, L = 1.785 k @ 7 ft from left end of beam
Beam Parallel Deck Beams, Support 1: D = 0.9278, L = 1.785 k @ 14 ft from left end of beam
Beam Parallel Deck Beams, Support 1: D = 0.9278, L = 1.785 k @ 19 ft from left end of beam

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.404** : 1	Maximum Shear Stress Ratio =	**0.080** : 1
Section used for this span	**HSS8x4x5/16**	Section used for this span	**HSS8x4x5/16**
Ma : Applied	11.674 k-ft	Va : Applied	4.276 k
Mn / Omega : Allowable	28.922 k-ft	Vn/Omega : Allowable	53.650 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	8.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.177 in Ratio =	814	>=360	Span: 3 : L Only
Max Upward Transient Deflection	-0.019 in Ratio =	4,972	>=360	Span: 3 : L Only
Max Downward Total Deflection	0.291 in Ratio =	494	>=180	Span: 3 : +D+L
Max Upward Total Deflection	-0.032 in Ratio =	2985	>=180	Span: 3 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 10.00 ft	1	0.057	0.016	1.65	-0.78	1.65	48.30	28.92	1.00	1.00	0.84	89.59	53.65
Dsgn. L = 8.00 ft	2	0.157	0.030	-0.00	-4.53	4.53	48.30	28.92	1.00	1.00	1.60	89.59	53.65
Dsgn. L = 6.00 ft	3	0.157	0.030		-4.53	4.53	48.30	28.92	1.00	1.00	1.60	89.59	53.65
+D+L													
Dsgn. L = 10.00 ft	1	0.153	0.042	4.44	-2.15	4.44	48.30	28.92	1.00	1.00	2.23	89.59	53.65
Dsgn. L = 8.00 ft	2	0.404	0.080	-0.00	-11.67	11.67	48.30	28.92	1.00	1.00	4.28	89.59	53.65
Dsgn. L = 6.00 ft	3	0.404	0.080		-11.67	11.67	48.30	28.92	1.00	1.00	4.28	89.59	53.65
+D+0.750L													
Dsgn. L = 10.00 ft	1	0.129	0.035	3.74	-1.81	3.74	48.30	28.92	1.00	1.00	1.88	89.59	53.65
Dsgn. L = 8.00 ft	2	0.342	0.067	-0.00	-9.89	9.89	48.30	28.92	1.00	1.00	3.61	89.59	53.65
Dsgn. L = 6.00 ft	3	0.342	0.067		-9.89	9.89	48.30	28.92	1.00	1.00	3.61	89.59	53.65
+0.60D													
Dsgn. L = 10.00 ft	1	0.034	0.009	0.99	-0.47	0.99	48.30	28.92	1.00	1.00	0.51	89.59	53.65
Dsgn. L = 8.00 ft	2	0.094	0.018	-0.00	-2.72	2.72	48.30	28.92	1.00	1.00	0.96	89.59	53.65
Dsgn. L = 6.00 ft	3	0.094	0.018		-2.72	2.72	48.30	28.92	1.00	1.00	0.96	89.59	53.65

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0408	5.400		0.0000	0.000

Steel Beam

DESCRIPTION: Deck Beams along Lines 1 & 2

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	2	0.0000	5.400	+D+L	-0.0322	5.173
+D+L	3	0.2913	6.000		0.0000	5.173

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Upward from all Load Conditions	0.716	2.490	6.917	
Max Upward from Load Combinations	0.716	2.490	6.917	
Max Upward from Load Cases	0.398	1.559	4.291	
D Only	0.317	0.931	2.626	
+D+L	0.716	2.490	6.917	
+D+0.750L	0.616	2.100	5.844	
+0.60D	0.190	0.559	1.575	
L Only	0.398	1.559	4.291	

FOUNDATION CALCULATIONS

TRUNORTH

PIER DESIGN (A-FRAME BASE)

Minimum pier diameter per Geotech = 12"

Pier diameter used = 18"

Skin friction = 500 psf

Circumference of pier = 4.712 ft

Allowable downward dead + live load per foot of embedment = 500 X 4.712 = 2356 plf

with a Safety factor of 1.5 = 1570.7 plf

Allowable uplift frictional capacity = 2/3 X 1570.7
= 1047.1 plf

Max. uplift from attached calculations = 4401 lbs.

Minimum pier embedment required = $\frac{4401}{1047.1}$
= 4.2 ft

Ignoring top 3ft of weak soils,
embedment required = 8ft

⇒ Downward capacity provided = 1570.7 X 5
= 7853.5 lbs.

DEAD LOAD ≈ 40PSF
LIVE LOAD ≈ 60PSF

125SF WORST CASE = 5000D + 7500L = 12.5K

12,500 / 1570.7 = 7.96, USE 8' + 3'
= $\boxed{11' \text{ MIN}}$

PIER DESIGN (STEPS).

Pier diameter used = 18"

Circumference of pier = 4.712 ft

Skin friction = 500 psf

Allowable downward dead + live load per foot of embedment = 500 × 4.712

= 2356 plf

With a safety factor of 1.5 = 1570.7 plf.

Max. downward load from attached grade beam calculations = 32464 lbs.

Provide total 3 piers along grade beam.

Max. downward load on each pier $= \frac{32464}{3}$

$= 10821.3$ lbs.

Minimum embedment required $= \frac{10821.3}{1570.7}$

$= 6.89$ ft

Ignoring top 3ft of weak soils,

total embedment required $= \underline{\underline{10\text{ ft}}}$

Concrete Column

DESCRIPTION: Piers at A-Frame Columns

Code References

Calculations per ACI 318-19, IBC 2021, SDPWS 2021
Load Combinations Used : ASCE 7-16

General Information

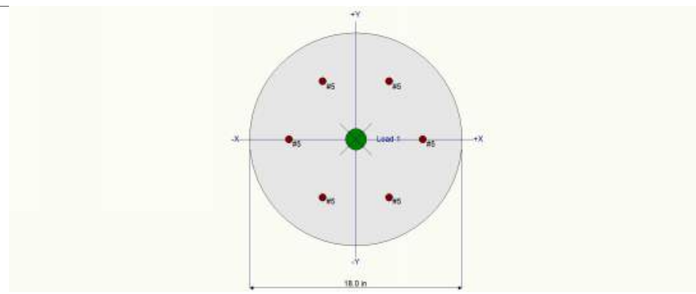
f'c : Concrete 28 day streng	=	2.50 ksi
E =	=	3122 ksi
Density	=	150 pcf
β	=	0.850
fy - Main Rebar	=	60 ksi
E - Main Rebar	=	29000 ksi
Allow. Reinforcing Limits		*ASTM A615 Bars Used*
Min. Reinf.	=	0.50 %
Max. Reinf.	=	8 %
Seismic Design Category	=	A

Overall Column Height = 6.0 ft
End Fixity Top Free, Bottom Fixed
Brace condition for deflection (buckling) along colur
X-X (width) axis :
Unbraced Length for buckling ABOUT X-X Axis = 6.0 ft, K = 0.80
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 6.0 ft, K = 0.80

Column Cross Section

Column Dimensions : 18.0in Diameter, Column Edge to Rebar Edge Cover = 3.0in

Column Reinforcing : 6 - #5 bars



Applied Loads

Entered loads are factored per load combinations specified by user

Column self weight included : 1,590.43 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Loads at each pier: Axial Load at 6.0 ft above base, D = 3.50 k
BENDING LOADS . . .
Lateral Load at each pier: Lat. Point Load at 6.0 ft creating Mx-x, E = 3.50 k

DESIGN SUMMARY

Load Combination	+0.90D+E
Location of max.above base	5.960 ft

Maximum Stress Ratio **0.361 : 1**
Ratio = (Pu^2+Mu^2)^.5 / (PhiPn^2+PhiMn^2)^.5

Pu =	4.581 k	φ * Pn =	13.653 k
Mu-x =	-21.0 k-ft	φ * Mn-x =	58.838 k-ft
Mu-y =	0.4352 k-ft	φ * Mn-y =	0.8757 k-ft
Mu Angle =	1.0 deg	φ =	0.90
Mu at Angle =	21.005 k-ft	φMn at Angle =	58.241 k-ft

Pn & Mn values located at Pu-Mu vector intersection with capacity curve

Column Capacities . .

Pnmax : Nominal Max. Compressive Axial Capac	648.39 k
Pnmin : Nominal Min. Tension Axial Capacity	k
φ Pn, max : Usable Compressive Axial Capacity	413.351 k
φ Pn, min : Usable Tension Axial Capacity	k

Maximum SERVICE 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	3.50 k

Maximum SERVICE Load Deflections . .

Along Y-Y 0.02693 in at 6.0 ft above base
for load combination : E Only
Along X-X 0.0 in at 0.0 ft above base
for load combination :

General Section Informatio β = 0.850 θ = 0.850

ρ : % Reinforcing	0.7309 %	Rebar % Ok
Reinforcing Area	1.860 in^2	
Concrete Area	254.469 in^2	

Concrete Column

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

DESCRIPTION: Piers at A-Frame Columns

Governing Load Combination Results

Governing Factored Load Combination	Moment X-X	Moment Y-Y	Dist. from base ft	Axial Load k Pu	φ * Pn	δ x	δ x * Mux	δ y	δ y * Muy	Bending Analysis k-ft Alpha (deg)	δ Mu	φ Mn	Utilization Ratio
+1.40D	Actual	M2,min	5.96	7.13	407.33	1.000		1.000	0.68	90.000	0.68	38.40	**0.018**
+1.40D	M2,min	Actual	5.96	7.13	407.26	1.000	0.68	1.000		0.000	0.68	38.09	**0.018**
+1.20D	Actual	M2,min	5.96	6.11	407.33	1.000		1.000	0.58	90.000	0.58	38.40	**0.015**
+1.20D	M2,min	Actual	5.96	6.11	407.26	1.000	0.58	1.000		0.000	0.58	38.09	**0.015**
+0.90D	Actual	M2,min	5.96	4.58	407.33	1.000		1.000	0.44	90.000	0.44	38.40	**0.011**
+0.90D	M2,min	Actual	5.96	4.58	407.26	1.000	0.44	1.000		0.000	0.44	38.09	**0.011**
+1.20D+E	Actual	M2,min	5.96	6.11	16.46	1.000	-21.00	1.000	0.58	2.000	21.01	59.43	**0.354**
+0.90D+E	Actual	M2,min	5.96	4.58	13.65	1.000	-21.00	1.000	0.44	1.000	21.00	58.24	**0.361**

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only					5.090				
+0.60D					3.054				
+D+0.70E			2.450		5.090	-14.700			
+D+0.5250E			1.838		5.090	-11.025			
+0.60D+0.70E			2.450		3.054	-14.700			
E Only			3.500			-21.000			

Maximum Moment Reactions

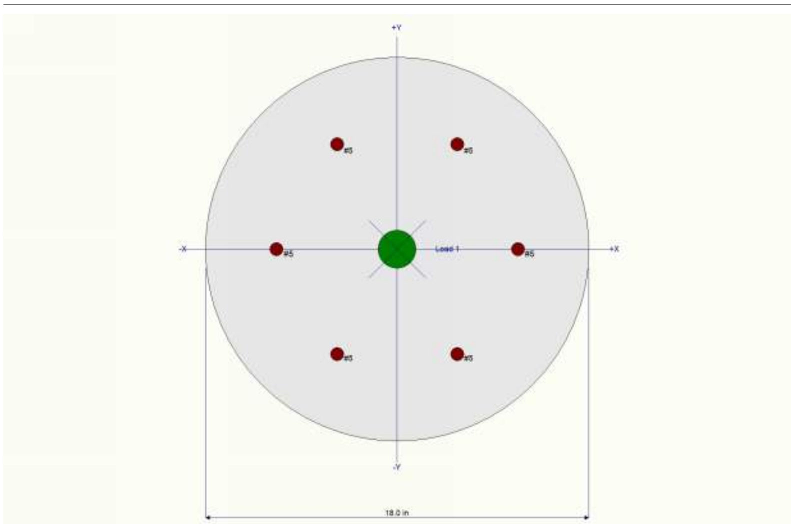
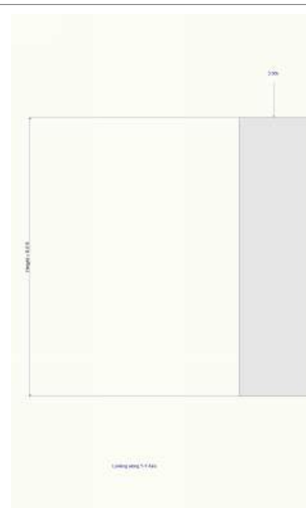
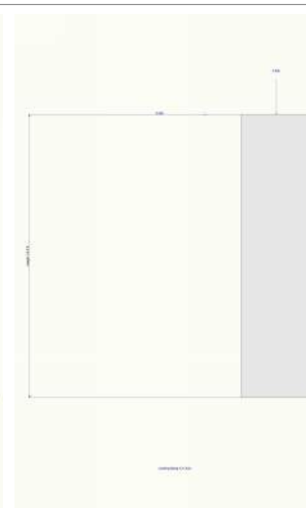
Note: Only non-zero reactions are listed.

Load Combination	Moment About X-X Axis @ Base	@ Top		Moment About Y-Y Axis @ Base	@ Top	
D Only			k-ft			k-ft
+0.60D			k-ft			k-ft
+D+0.70E	-14.700		k-ft			k-ft
+D+0.5250E	-11.025		k-ft			k-ft
+0.60D+0.70E	-14.700		k-ft			k-ft
E Only	-21.000		k-ft			k-ft

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.70E	0.0000 in	0.000 ft	0.019 in	6.000 ft
+D+0.5250E	0.0000 in	0.000 ft	0.014 in	6.000 ft
+0.60D+0.70E	0.0000 in	0.000 ft	0.019 in	6.000 ft
E Only	0.0000 in	0.000 ft	0.027 in	5.960 ft

Sketches

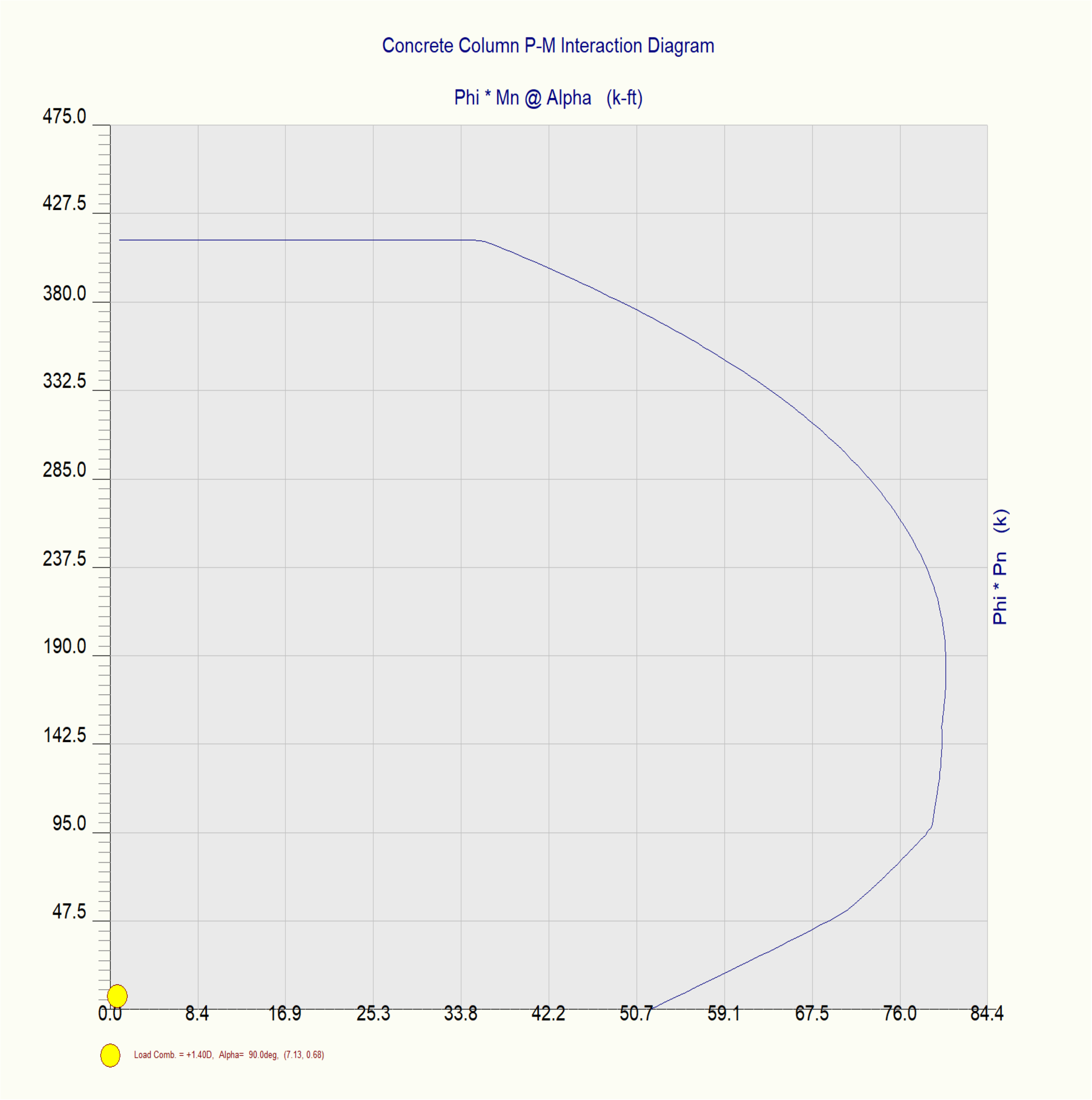
Concrete Column

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth

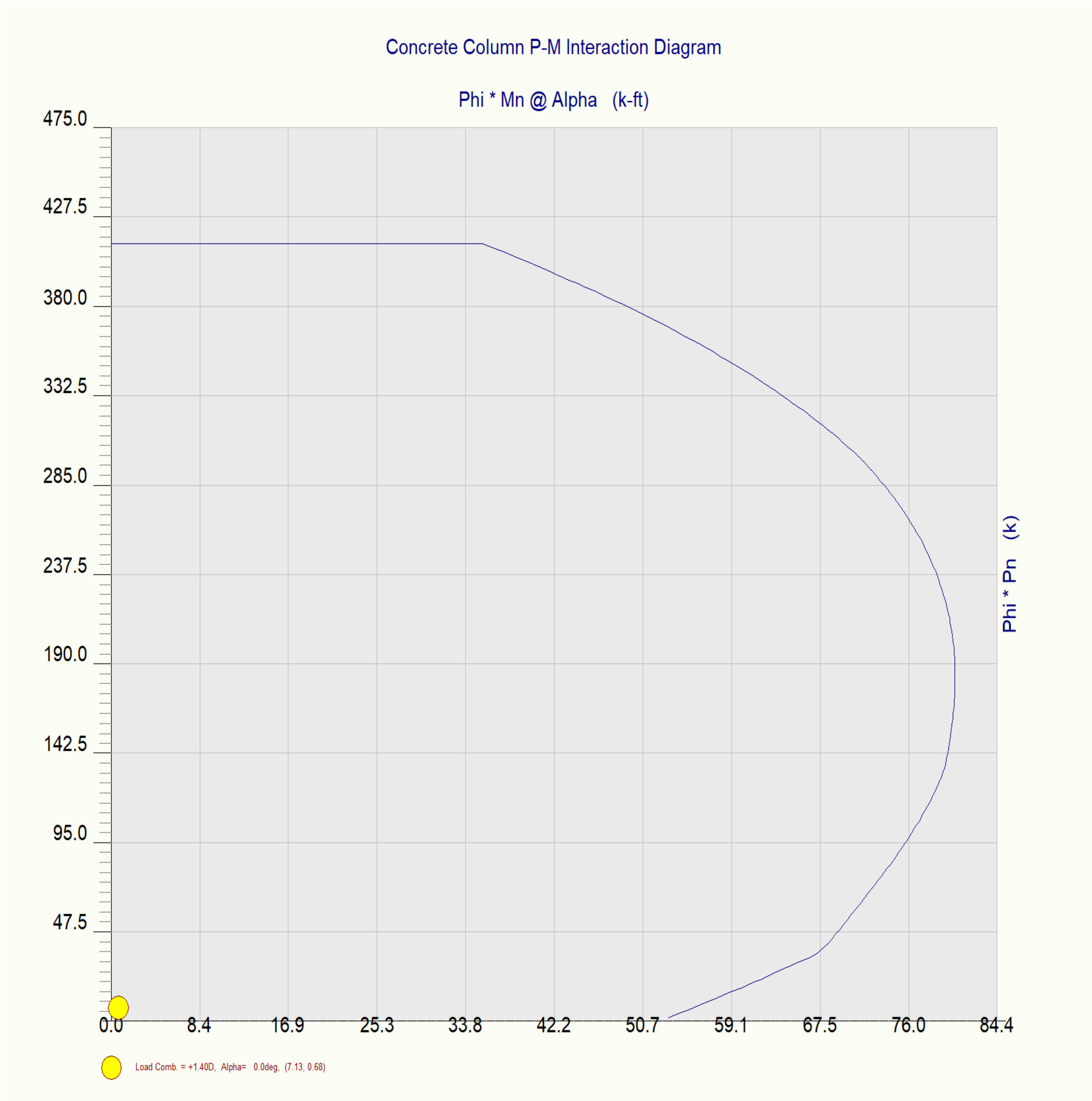
DESCRIPTION: Piers at A-Frame Columns

Interaction Diagrams



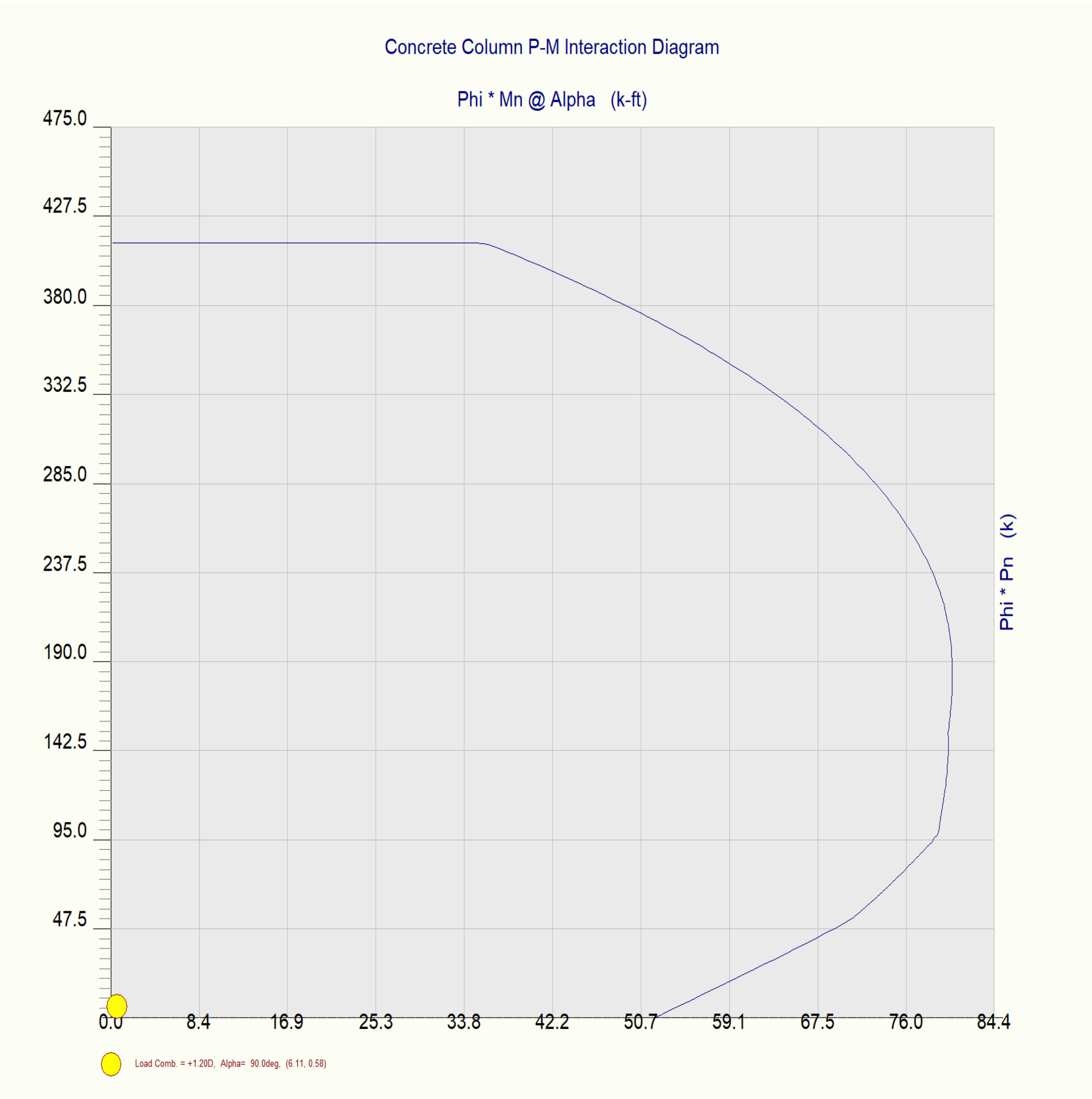
Concrete Column

DESCRIPTION: Piers at A-Frame Columns



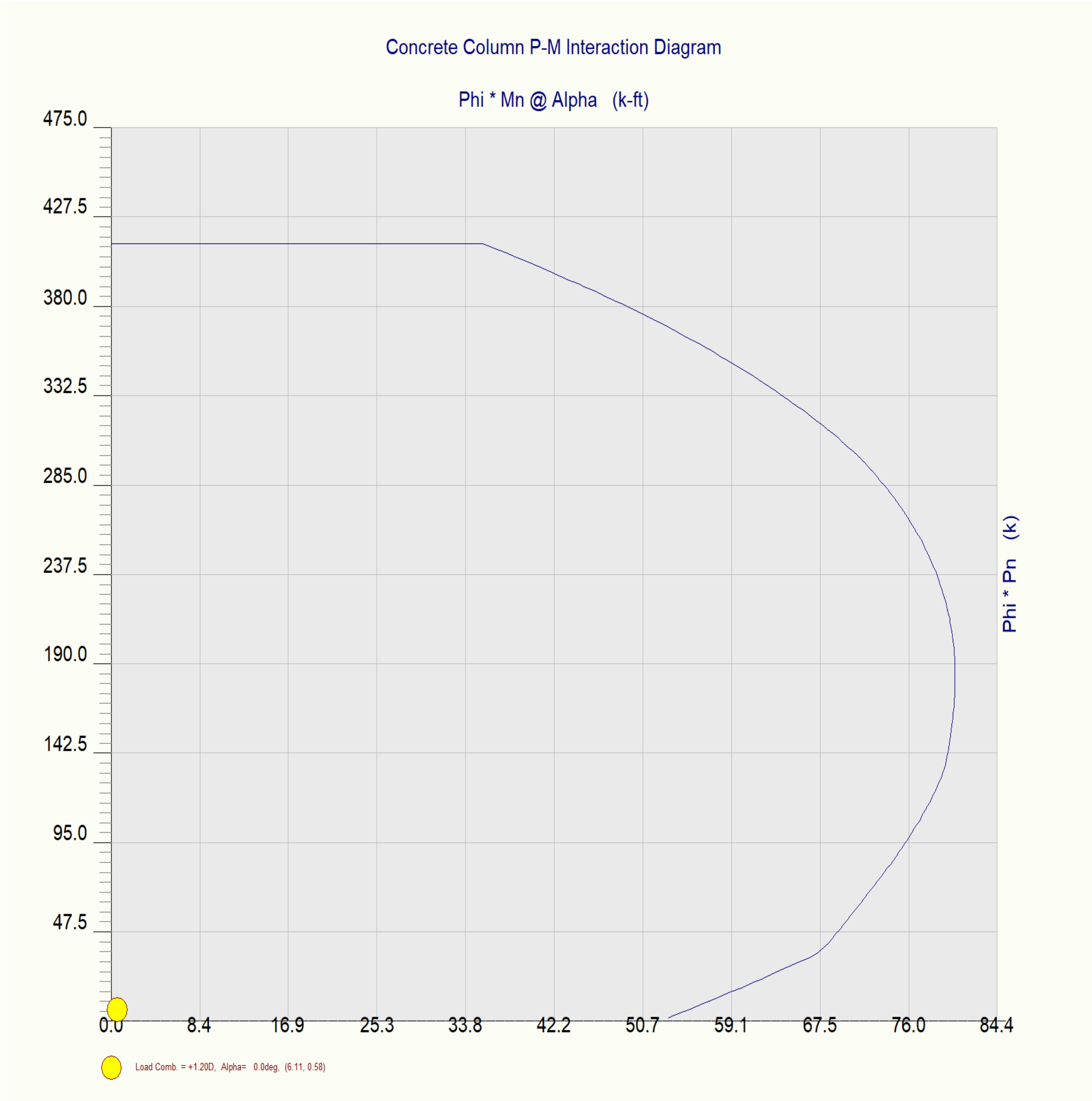
Concrete Column

DESCRIPTION: Piers at A-Frame Columns



Concrete Column

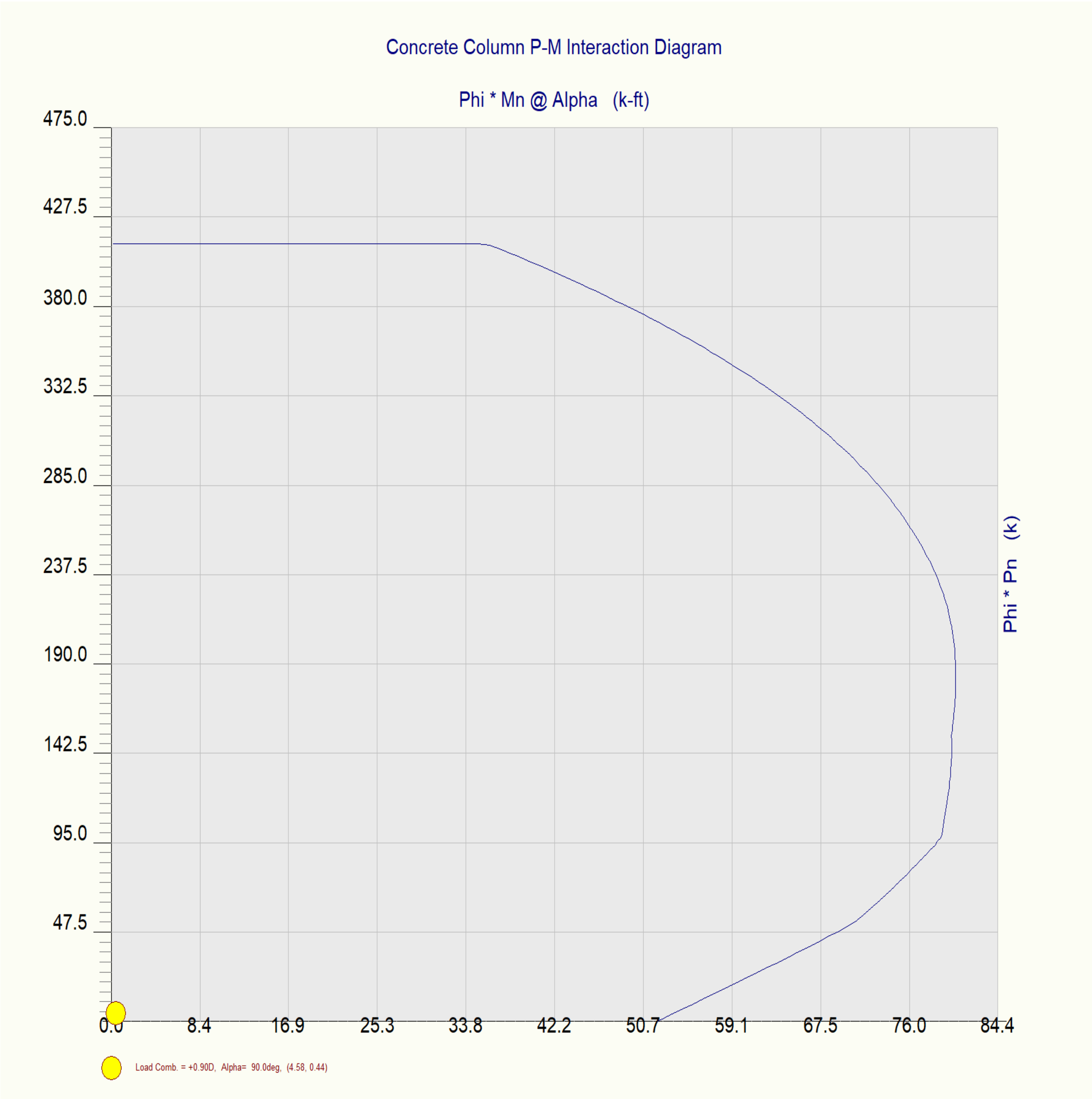
DESCRIPTION: Piers at A-Frame Columns



Concrete Column

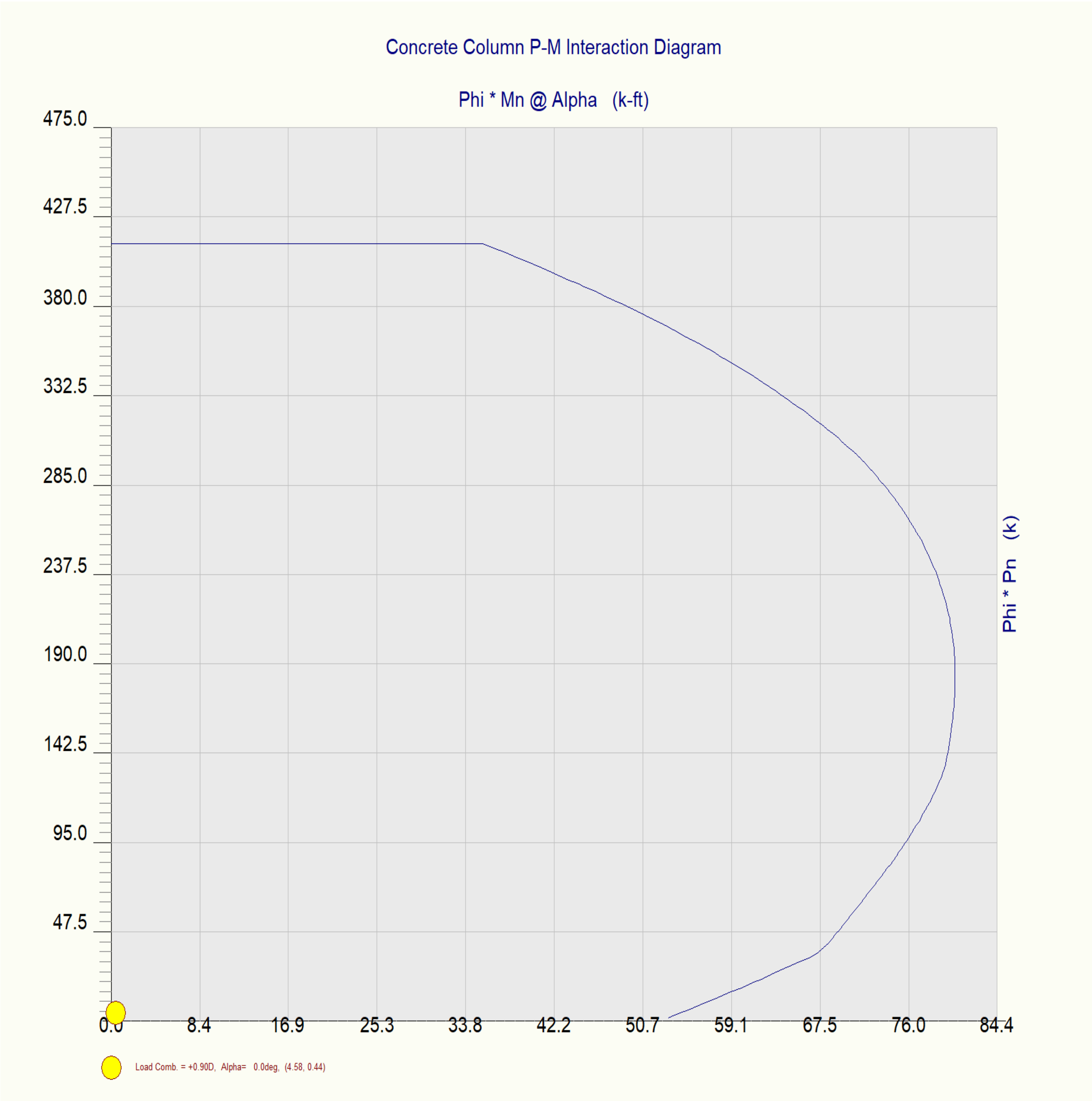
Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

DESCRIPTION: Piers at A-Frame Columns



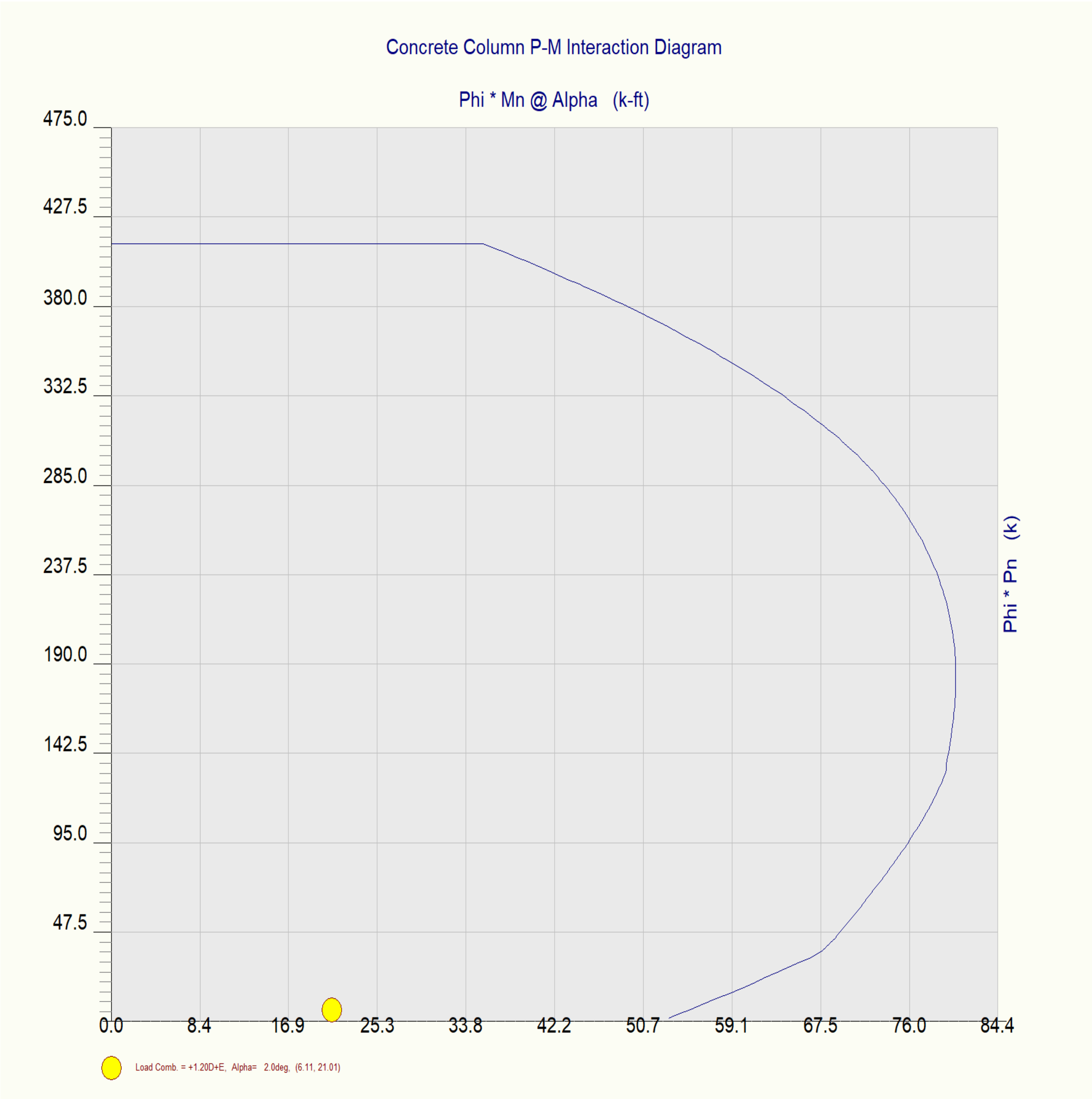
Concrete Column

DESCRIPTION: Piers at A-Frame Columns



Concrete Column

DESCRIPTION: Piers at A-Frame Columns

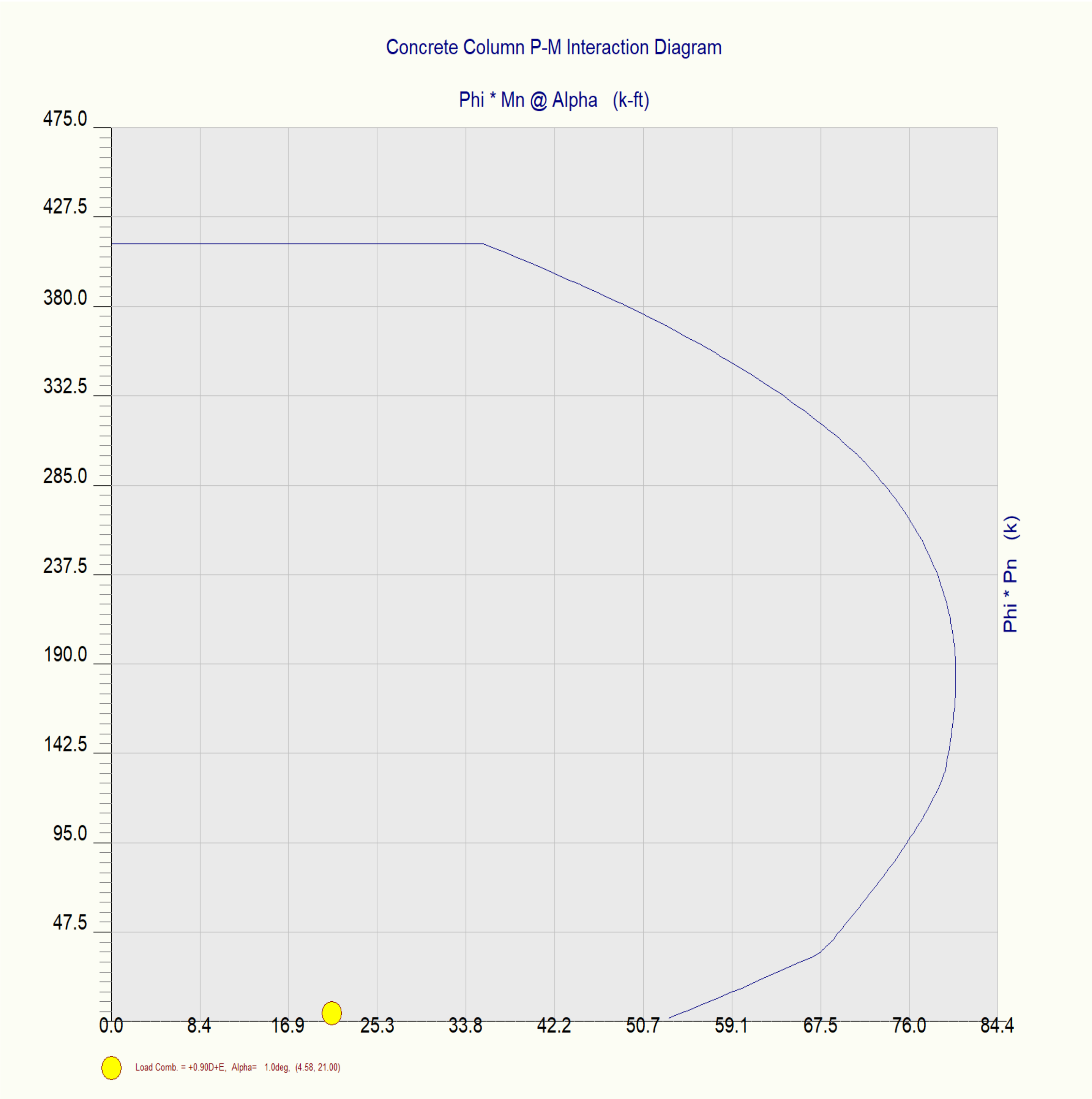


Concrete Column

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

DESCRIPTION: Piers at A-Frame Columns



Concrete Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

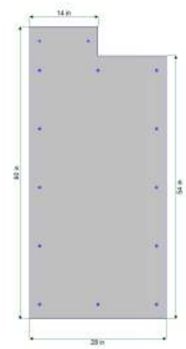
DESCRIPTION: Grade Beam at Steps

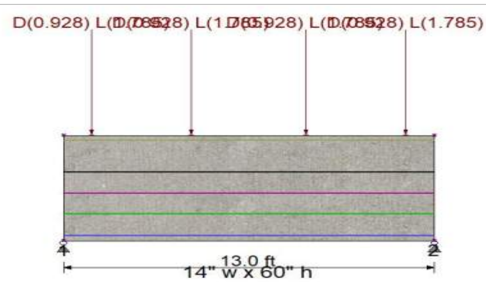
CODE REFERENCES

Calculations per ACI 318-19, IBC 2021, SDPWS 2021
Load Combination Set : ASCE 7-16

General Information

f'c =	2.50 ksi	ϕ Phi Values Flexure :	0.90
fr = f'c$^{1/2}$ * 7.50 =	375.0 psi	Shear :	0.750
ψ Density =	150.0 pcf	β_1 =	0.850
λ LtWt Factor =	1.0		
Elastic Modulus =	3,122.0 ksi	Fy - Stirrups	40.0 ksi
fy - Main Rebar =	60.0 ksi	E - Stirrups =	29,000.0 ksi
E - Main Rebar =	29,000.0 ksi	Stirrup Bar Size #	3
		Number of Resisting Legs Per Stirrup =	2
Seismic Design Category =	A		





Cross Section & Reinforcing Details

L Section, Stem Width = 14.0 in, Total Height = 60.0 in, Bottom Flange Width = 28.0 in, Flange Thickness = 54.0 in

Span #1 Reinforcing....

- 3-#5 at 3.0 in from Bottom, from 0.0 to 13.0 ft in this span
- 2-#5 at 27.0 in from Bottom, from 0.0 to 13.0 ft in this span
- 3-#5 at 9.0 in from Top, from 0.0 to 13.0 ft in this span
- 2-#5 at 15.0 in from Bottom, from 0.0 to 13.0 ft in this sp
- 2-#5 at 21.0 in from Top, from 0.0 to 13.0 ft in this span
- 2-#4 at 3.0 in from Top, from 0.0 to 13.0 ft in this span

Beam self weight calculated and added to loads

Point Load : D = 0.9280, L = 1.785 k @ 1.0 ft, (Load from Deck Beam)
Point Load : D = 0.9280, L = 1.785 k @ 4.50 ft, (Load from Deck Beam)
Point Load : D = 0.9280, L = 1.785 k @ 8.50 ft, (Load from Deck Beam)
Point Load : D = 0.9280, L = 1.785 k @ 12.0 ft, (Load from Deck Beam)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.131** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	63.977	k-ft
Mn * Phi : Allowable	489.467	k-ft
Location of maximum on span	6.488	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio = 0	<360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio = 0	<360.0	L Only
Max Downward Total Deflection	0.001 in	Ratio = 138874	>=180.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio = 0	<180.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	16.232	16.232
Max Upward from Load Combinations	16.232	16.232

Concrete Beam

DESCRIPTION: Grade Beam at Steps

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from Load Cases	12.662	12.662
D Only	12.662	12.662
+D+L	16.232	16.232
+D+0.750L	15.340	15.340
+0.60D	7.597	7.597
L Only	3.570	3.570

Shear Stirrup Requirements

Between 0.00 to 0.99 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 23 in
Between 1.02 to 11.98 ft, Ties Not Req'd, Stirrups are not required.
Between 12.01 to 12.98 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 23 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L	1	0.00	46.71	20.91	No	23.36	15.53	13.20	28.73	0.728	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.14	46.71	20.62	No	23.36	15.53	13.20	28.73	0.718	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.28	46.71	20.34	No	23.36	15.53	13.20	28.73	0.708	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.43	46.71	20.06	No	23.36	15.53	13.20	28.73	0.698	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.57	46.71	19.77	No	23.36	15.53	13.20	28.73	0.688	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.71	46.71	19.49	No	23.36	15.53	13.20	28.73	0.678	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.85	46.71	19.21	No	23.36	15.53	13.20	28.73	0.668	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	0.99	46.71	18.92	No	23.36	15.53	13.20	28.73	0.659	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	1.14	46.71	14.67	No	N/A	15.53	0.00	15.53	0.944	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	1.28	46.71	14.39	No	N/A	15.53	0.00	15.53	0.926	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	1.42	46.71	14.10	No	N/A	15.53	0.00	15.53	0.908	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	1.56	46.71	13.82	No	N/A	15.53	0.00	15.53	0.890	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	1.70	46.71	13.54	No	N/A	15.53	0.00	15.53	0.871	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	1.85	46.71	13.25	No	N/A	15.53	0.00	15.53	0.853	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	1.99	46.71	12.97	No	N/A	15.53	0.00	15.53	0.835	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.13	46.71	12.69	No	N/A	15.53	0.00	15.53	0.817	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.27	46.71	12.40	No	N/A	15.53	0.00	15.53	0.798	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.42	46.71	12.12	No	N/A	15.53	0.00	15.53	0.780	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.56	46.71	11.84	No	N/A	15.53	0.00	15.53	0.762	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.70	46.71	11.55	No	N/A	15.53	0.00	15.53	0.744	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.84	46.71	11.27	No	N/A	15.53	0.00	15.53	0.725	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	2.98	46.71	10.98	No	N/A	15.53	0.00	15.53	0.707	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.13	46.71	10.70	No	N/A	15.53	0.00	15.53	0.689	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.27	46.71	10.42	No	N/A	15.53	0.00	15.53	0.671	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.41	46.71	10.13	No	N/A	15.53	0.00	15.53	0.652	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.55	46.71	9.85	No	N/A	15.53	0.00	15.53	0.634	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.69	46.71	9.57	No	N/A	15.53	0.00	15.53	0.616	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.84	46.71	9.28	No	N/A	15.53	0.00	15.53	0.598	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	3.98	46.71	9.00	No	N/A	15.53	0.00	15.53	0.579	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	4.12	46.71	8.72	No	N/A	15.53	0.00	15.53	0.561	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	4.26	46.71	8.43	No	N/A	15.53	0.00	15.53	0.543	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	4.40	46.71	8.15	No	N/A	15.53	0.00	15.53	0.525	Eqn (c)	Ties Not Req'd
+1.40D	1	4.55	46.71	4.55	No	N/A	15.53	0.00	15.53	0.293	Eqn (c)	Ties Not Req'd
+1.40D	1	4.69	46.71	4.22	No	N/A	15.53	0.00	15.53	0.271	Eqn (c)	Ties Not Req'd
+1.40D	1	4.83	46.71	3.89	No	N/A	15.53	0.00	15.53	0.250	Eqn (c)	Ties Not Req'd
+1.40D	1	4.97	46.71	3.55	No	N/A	15.53	0.00	15.53	0.229	Eqn (c)	Ties Not Req'd
+1.40D	1	5.11	46.71	3.22	No	N/A	15.53	0.00	15.53	0.208	Eqn (c)	Ties Not Req'd
+1.40D	1	5.26	46.71	2.89	No	N/A	15.53	0.00	15.53	0.186	Eqn (c)	Ties Not Req'd
+1.40D	1	5.40	46.71	2.56	No	N/A	15.53	0.00	15.53	0.165	Eqn (c)	Ties Not Req'd
+1.40D	1	5.54	46.71	2.23	No	N/A	15.53	0.00	15.53	0.144	Eqn (c)	Ties Not Req'd
+1.40D	1	5.68	46.71	1.90	No	N/A	15.53	0.00	15.53	0.122	Eqn (c)	Ties Not Req'd
+1.40D	1	5.83	46.71	1.57	No	N/A	15.53	0.00	15.53	0.101	Eqn (c)	Ties Not Req'd
+1.40D	1	5.97	46.71	1.24	No	N/A	15.53	0.00	15.53	0.080	Eqn (c)	Ties Not Req'd
+1.40D	1	6.11	46.71	0.91	No	N/A	15.53	0.00	15.53	0.059	Eqn (c)	Ties Not Req'd
+1.40D	1	6.25	46.71	0.58	No	N/A	15.53	0.00	15.53	0.037	Eqn (c)	Ties Not Req'd
+1.40D	1	6.39	46.71	0.25	No	N/A	15.53	0.00	15.53	0.016	Eqn (c)	Ties Not Req'd
+1.40D	1	6.54	46.71	-0.08	No	N/A	15.53	0.00	15.53	0.005	Eqn (c)	Ties Not Req'd
+1.40D	1	6.68	46.71	-0.41	No	N/A	15.53	0.00	15.53	0.027	Eqn (c)	Ties Not Req'd
+1.40D	1	6.82	46.71	-0.74	No	N/A	15.53	0.00	15.53	0.048	Eqn (c)	Ties Not Req'd
+1.40D	1	6.96	46.71	-1.07	No	N/A	15.53	0.00	15.53	0.069	Eqn (c)	Ties Not Req'd
+1.40D	1	7.10	46.71	-1.41	No	N/A	15.53	0.00	15.53	0.090	Eqn (c)	Ties Not Req'd
+1.40D	1	7.25	46.71	-1.74	No	N/A	15.53	0.00	15.53	0.112	Eqn (c)	Ties Not Req'd
+1.40D	1	7.39	46.71	-2.07	No	N/A	15.53	0.00	15.53	0.133	Eqn (c)	Ties Not Req'd

Concrete Beam

Project File: 2199 Diamond Mountain Rd Deck Calculations.ec6

LIC# : KW-06020862, Build:20.24.09.03 TruNorth (c) ENERCALC, LLC 1982-2024

DESCRIPTION: Grade Beam at Steps

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.40D	1	7.53	46.71	-2.40	No	N/A	15.53	0.00	15.53	0.154	Eqn (c)	Ties Not Req'd
+1.40D	1	7.67	46.71	-2.73	No	N/A	15.53	0.00	15.53	0.176	Eqn (c)	Ties Not Req'd
+1.40D	1	7.81	46.71	-3.06	No	N/A	15.53	0.00	15.53	0.197	Eqn (c)	Ties Not Req'd
+1.40D	1	7.96	46.71	-3.39	No	N/A	15.53	0.00	15.53	0.218	Eqn (c)	Ties Not Req'd
+1.40D	1	8.10	46.71	-3.72	No	N/A	15.53	0.00	15.53	0.239	Eqn (c)	Ties Not Req'd
+1.40D	1	8.24	46.71	-4.05	No	N/A	15.53	0.00	15.53	0.261	Eqn (c)	Ties Not Req'd
+1.40D	1	8.38	46.71	-4.38	No	N/A	15.53	0.00	15.53	0.282	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	8.52	46.71	-8.01	No	N/A	15.53	0.00	15.53	0.516	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	8.67	46.71	-8.29	No	N/A	15.53	0.00	15.53	0.534	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	8.81	46.71	-8.58	No	N/A	15.53	0.00	15.53	0.552	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	8.95	46.71	-8.86	No	N/A	15.53	0.00	15.53	0.570	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.09	46.71	-9.14	No	N/A	15.53	0.00	15.53	0.589	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.23	46.71	-9.43	No	N/A	15.53	0.00	15.53	0.607	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.38	46.71	-9.71	No	N/A	15.53	0.00	15.53	0.625	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.52	46.71	-9.99	No	N/A	15.53	0.00	15.53	0.643	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.66	46.71	-10.28	No	N/A	15.53	0.00	15.53	0.662	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.80	46.71	-10.56	No	N/A	15.53	0.00	15.53	0.680	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	9.95	46.71	-10.84	No	N/A	15.53	0.00	15.53	0.698	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.09	46.71	-11.13	No	N/A	15.53	0.00	15.53	0.716	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.23	46.71	-11.41	No	N/A	15.53	0.00	15.53	0.735	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.37	46.71	-11.69	No	N/A	15.53	0.00	15.53	0.753	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.51	46.71	-11.98	No	N/A	15.53	0.00	15.53	0.771	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.66	46.71	-12.26	No	N/A	15.53	0.00	15.53	0.789	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.80	46.71	-12.54	No	N/A	15.53	0.00	15.53	0.807	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	10.94	46.71	-12.83	No	N/A	15.53	0.00	15.53	0.826	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.08	46.71	-13.11	No	N/A	15.53	0.00	15.53	0.844	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.22	46.71	-13.39	No	N/A	15.53	0.00	15.53	0.862	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.37	46.71	-13.68	No	N/A	15.53	0.00	15.53	0.880	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.51	46.71	-13.96	No	N/A	15.53	0.00	15.53	0.899	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.65	46.71	-14.24	No	N/A	15.53	0.00	15.53	0.917	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.79	46.71	-14.53	No	N/A	15.53	0.00	15.53	0.935	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	11.93	46.71	-14.81	No	N/A	15.53	0.00	15.53	0.953	Eqn (c)	Ties Not Req'd
+1.20D+1.60L	1	12.08	46.71	-19.06	No	23.36	15.53	13.20	28.73	0.663	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	12.22	46.71	-19.35	No	23.36	15.53	13.20	28.73	0.673	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	12.36	46.71	-19.63	No	23.36	15.53	13.20	28.73	0.683	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	12.50	46.71	-19.91	No	23.36	15.53	13.20	28.73	0.693	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	12.64	46.71	-20.20	No	23.36	15.53	13.20	28.73	0.703	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	12.79	46.71	-20.48	No	23.36	15.53	13.20	28.73	0.713	Eqn (c)	Max spacing per T9.7.6.
+1.20D+1.60L	1	12.93	46.71	-20.76	No	23.36	15.53	13.20	28.73	0.723	Eqn (c)	Max spacing per T9.7.6.

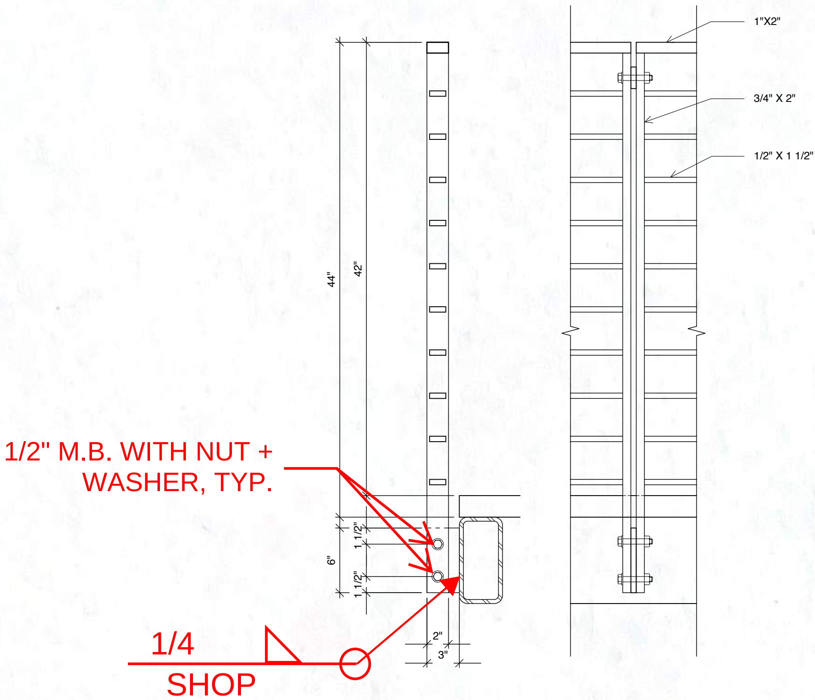
Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	13.000	63.98	489.47	0.13
+1.40D					
Span # 1	1	13.000	56.31	489.47	0.12
+1.20D+1.60L					
Span # 1	1	13.000	63.98	489.47	0.13
+1.20D+L					
Span # 1	1	13.000	58.09	489.47	0.12
+1.20D					
Span # 1	1	13.000	48.27	489.47	0.10
+0.90D					
Span # 1	1	13.000	36.20	489.47	0.07

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L	1	0.0011	6.500		0.0000	0.000

GUARD RAIL CONNECTION



$M_u = 44'' \times 200\,\text{lbs} = 8800\,\text{lbs}.$

$M_u < \dfrac{M_n}{\Omega}$ (ASD).

$\Omega = 1.67$ (AISC F.1)

$M_n > 1.67 \times 8800 = 14696$ in. lbs.

$M_p = Z_x \cdot F_y$

$Z_x = \dfrac{bh^2}{6} = \dfrac{2 \times 1.5^2}{6} = 0.75\,\text{in}^3$

$F_y = 36{,}000$ psi (A36 steel).

$M_p = 0.75 \times 36000 = 27{,}000$ in. lbs.

Reaction at bolt connection $= \frac{14696}{3}$

$= 4898.67$ lbs.

Nominal shear strength of 1/2" bolts $= F_{nv} A_b$ lbs.

(AISC J3-1) $F_{nv} A_b$

$= 54000$ psi (A325 bolts) $\times \frac{\pi}{4} \times 0.5^2$ J3-1).

$= 10,602.9$ lbs. 0.5^2

Strength of weld $= 14.85\,wl$ kips.in.

$14.85 \times (1/4") \times l > 14.696$ in.kips.

$l > \frac{14.696}{14.85 \times 0.25} = 3.96$ in.

Total weld length provided is 6" each side,
12" total. de,

12" total.