

Project Title: My Project
Engineer: Me
Project ID: 210002
Project Descr: A really desirable project

Composite Steel Beam

Project File: examples.ec6

LIC# : KW-06000005, Build:20.23.08.30

ENERCALC, LLC

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DESCRIPTION: Sample Composite Steel Beam Calc

CODE REFERENCES

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : IBC 2018

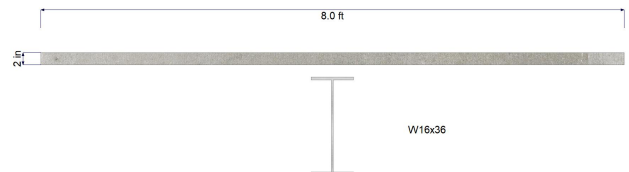
Material Properties

Analysis Method : Allowable Stress Design

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

Load Combination IBC 2018

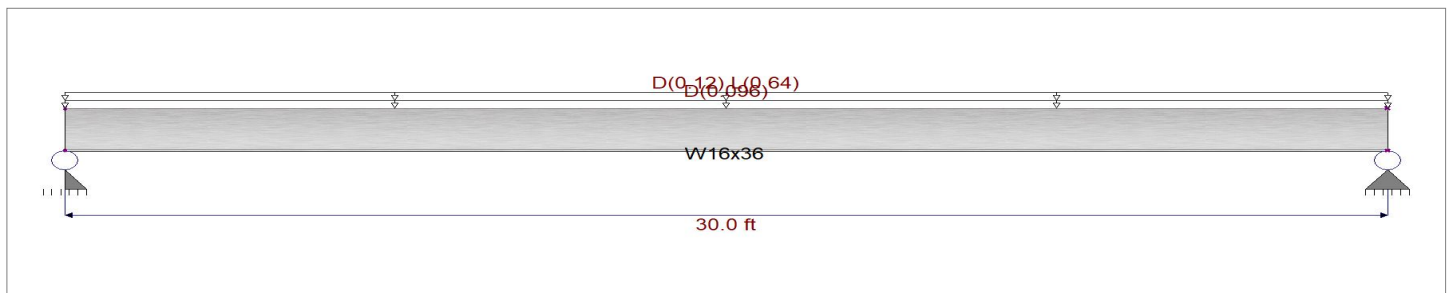
Fy : Steel Yield : 50.0 ksi E: Modulus : 29,000.0 ksi



Beam is UNSHORED for Concrete Placement

Composite Beam Section Data

Total Slab Thickness	4.0 in	Concrete f'c	4.0 ksi	Stud Diameter	3/4" in
Effective Width	8.0 ft	Concrete Density	145.0 pcf	Qn : Stud Capacity	19.890 k
Metal Deck . . . Vulcraft, 2 VLI		Rib Height	2.0 in	Top Width	7.0 in
Ribs : Perpendicular		Rib Spacing	12.0 in	Btm Width	5.0 in



Applied Loads

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

Beam + Slab self weight calculated and added to loads

Load for Span Number 1

Uniform Load : L = 0.020 ksf, Tributary Width = 8.0 ft, Pre & Post Composite

Uniform Load : D = 0.0120 ksf, Tributary Width = 8.0 ft, Pre & Post Composite

Uniform Load : D = 0.0150, L = 0.080 ksf, Tributary Width = 8.0 ft, Post Composite Only

DESIGN SUMMARY

MAX Bending Ratio =	0.451 : 1	MAX Shear Ratio =	0.189 : 1
Steel section	W16x36	Vu : Applied	17.731 k
Composite		Vn/Omega : Allow	93.810 k
% Composite Action	100 %	Location of maximum	0.0 ft
Mu : Applied	132.984 k-ft	Load Combination	+D+L
Mn / Omega : Allow	294.571 k-ft		
Location of maximum	15.0 ft		
Load Combination	+D+L		
Pre-Composite			
Mu : Applied	47.484 k-ft		
Mn * Phi : Allowable	159.681 k-ft		

Design OK

DEFLECTIONS

FINAL Composite	
Max Downward	1.035 in
Max Upward	0.000 in
Defl Ratio	347
	+D+L
Transient Composite	
Max Downward	0.368 in
Max Upward	0.000 in
Defl Ratio	979
	L Only
NonComposite	
Max Downward	0.598 in
Max Upward	0.000 in
Defl Ratio	601
	PreCompDL+PreCompLL

Shear Stud Requirements

From Support 0 to 15.00 ft use 27 studs.

From 15.00 ft to Support 1 use 27 studs.

Maximum Forces & Stresses for Load Combin

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Load Comb & Design Length	Span #	Max Stress Ratios		Bending Summary		Shear Summary	
		M	V	Mu-Applied	MnTr / Omega	Va	Vn / Omega
Pre Composite : D + Const L							
Span L = 30 ft	1	0.297	0.067	47.48	159.68	6.33	93.81
Final Composite : D Only							
Span L = 30 ft	1	0.207	0.087	60.98	294.57	8.13	93.81
Final Composite : +D+L							
Span L = 30 ft	1	0.451	0.189	132.98	294.57	17.73	93.81
Final Composite : +D+0.750L							
Span L = 30 ft	1	0.390	0.163	114.98	294.57	15.33	93.81
Final Composite : +0.60D							
Span L = 30 ft	1	0.124	0.052	36.59	294.57	4.88	93.81

Maximum Deflections for Load Combinations

Load Combination	Location in Span (ft)	FINAL	DEFLECTIONS (in)		Added Post Composite	Ixx - Used in^4
			Pre-Composite	onComposite Remove		
Precomposite	Downward	15.200	0.000	0.5984		448.00
Precomposite	Upward	0.000	0.000			448.00
NonComposite Removed	Downward	15.200	0.000	0.5984		0.00
NonComposite Removed	Upward	0.000	0.000			0.00
Final Composite : D Only	Downward	15.200	0.069	0.5984	0.598	1,105.51
Final Composite : D Only	Upward	0.000	0.000			1,105.51
Final Composite : +D+L	Downward	15.200	0.437	0.5984	0.598	1,105.51
Final Composite : +D+L	Upward	0.000	0.000			1,105.51
Final Composite : +D+0.750L	Downward	15.200	0.345	0.5984	0.598	1,105.51
Final Composite : +D+0.750L	Upward	0.000	0.000			1,105.51
Final Composite : +0.60D	Downward	15.200	0.041	0.3590	0.359	1,105.51
Final Composite : +0.60D	Upward	0.000	0.000			1,105.51
Final Composite : L Only	Downward	15.200	0.368			1,105.51
Final Composite : L Only	Upward	0.000	0.000			1,105.51

Maximum Vertical Reactions

Support notation : Far left is #:

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	17.731	17.731
Max Upward from Load Combinations	17.731	17.731
Max Upward from Load Cases	9.600	9.600
Precomposite Loads	6.331	6.331
NonComposite Removed	6.331	6.331
Final Composite : D Only	8.131	8.131
Final Composite : +D+L	17.731	17.731
Final Composite : +D+0.750L	15.331	15.331
Final Composite : +0.60D	4.879	4.879
Final Composite : L Only	9.600	9.600

Steel Section Properties W16x36

Depth	=	15.900 in	I xx	=	448.00 in^4	I yy	=	24.500 in^4
Web Thick	=	0.295 in	S xx	=	56.50 in^3	S yy	=	7.000 in^3
Flange Width	=	6.990 in	R xx	=	6.510 in	R yy	=	1.520 in
Flange Thick	=	0.430 in	Zx	=	64.000 in^3	Zy	=	10.800 in^3
Area	=	10.600 in^2	J	=	0.545 in^4			
Weight	=	36.082 plf						

Composite Section Properties

Span Number	Plastic N. A. Location	Analysis Type	% Shear Connection	Plastic N.A. from Bottom	Sum Qn Shear (k)	# Studs per 1/2 Span	Mn - Capacity k-ft	Moment of Inertia		
								I-Steel	I-Trans	I-Lwr Bound
	PNA in Slab		100.0	15.900	530.000	27	491.93	448.0	1,339.1	1,105.5
	PNA in Flange		95.0	15.862	503.500	26	491.93	448.0	1,339.1	1,093.3
	PNA in Flange		90.0	15.824	477.000	24	491.93	448.0	1,339.1	1,080.0
	PNA in Flange		85.0	15.786	450.500	23	491.93	448.0	1,339.1	1,065.5
	PNA in Flange		80.0	15.748	424.000	22	488.58	448.0	1,339.1	1,049.6
	PNA in Flange		75.0	15.710	397.500	20	479.76	448.0	1,339.1	1,032.3
	PNA in Flange		70.0	15.673	371.000	19	470.87	448.0	1,339.1	1,013.4
	PNA in Flange		65.0	15.635	344.500	18	461.91	448.0	1,339.1	992.8
	PNA in Flange		60.0	15.597	318.000	16	452.87	448.0	1,339.1	970.3
	PNA in Flange		55.0	15.559	291.500	15	443.76	448.0	1,339.1	945.7
	PNA in Flange		50.0	15.521	265.000	14	434.58	448.0	1,339.1	918.9
	PNA in Flange		45.0	15.483	238.500	12	425.33	448.0	1,339.1	889.5
	PNA in Web		40.0	14.879	212.000	11	409.08	448.0	1,339.1	857.3
	PNA in Web		35.0	13.981	185.500	10	397.81	448.0	1,339.1	822.0
	PNA in Web		30.0	13.083	159.000	8	384.55	448.0	1,339.1	783.2

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Composite Section Properties

Span Number	Analysis	% Shear	Plastic N.A.	Sum Qn	# Studs per	Mn - Capacity	Moment of Inertia		
Plastic N. A. Location	Type	Connection	from Bottom	Shear (k)	1/2 Span	k-ft	I-Steel	I-Trans	I-Lwr Bound
PNA in Web		25.0	12.184	132.500	7	369.31	448.0	1,339.1	740.5
Span 1									

