



SUPPLEMENTAL STRUCTURAL CALCULATIONS FOR DANA POINT HARBOR BUILDING 11

KPFF Job #1900799



December 23, 2021

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Steel Column

Lic. #: KW-06003761

DESCRIPTION: GL1.3

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W18x35	Overall Column Height	29.250 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 1,025.54 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 29.250 ft, E = 95.70 k

BENDING LOADS . . .

B1: Lat. Point Load at 7.0 ft creating Mx-x, D = 4.210, LR = 2.550 k

B2: Lat. Point Load at 14.0 ft creating Mx-x, D = 4.210, LR = 2.550 k

B3: Lat. Point Load at 21.0 ft creating Mx-x, D = 4.210, LR = 2.550 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7501** : 1
Load Combination **+1.20D+E**
Location of max.above base **13.938** ft
At maximum location values are . . .

Pu	96.931	k
0.9 * Pn	224.907	k
Mu-x	75.085	k-ft
0.9 * Mn-x :	209.158	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	30.225	k-ft

PASS Maximum Shear Stress Ratio = **0.08966** : 1
Load Combination **+1.20D+1.60Lr**
Location of max.above base **0.0** ft
At maximum location values are . . .

Vu : Applied	14.283	k
Vn * Phi : Allowable	159.30	k

Maximum Load Reactions . .

Top along X-X	0.0	k
Bottom along X-X	0.0	k
Top along Y-Y	9.707	k
Bottom along Y-Y	10.573	k

Maximum Load Deflections . . .

Along Y-Y	1.006	in	at	14.723	ft	above base
for load combination : +D+Lr						
Along X-X	0.0	in	at	0.0	ft	above base
for load combination :						

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cb _x	Cb _y	K _x L _x /R _x	K _y L _y /R _y	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
+1.40D	0.422	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.058	PASS	0.00 ft	
+1.20D+0.50Lr	0.452	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.062	PASS	0.00 ft	
+1.20D	0.362	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.050	PASS	0.00 ft	
+1.20D+1.60Lr	0.652	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.090	PASS	0.00 ft	
+1.20D+E	0.750	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.050	PASS	0.00 ft	
+0.90D	0.271	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.037	PASS	0.00 ft	
+0.90D+E	0.669	PASS	13.94 ft	1.16	1.00	98.36	17.05	0.037	PASS	0.00 ft	

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		M _x - End Moments		M _y - End Moments	
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	1.026			6.585	6.045				
+D+Lr	1.026			10.573	9.707				
+D+0.750Lr	1.026			9.576	8.791				



Steel Column

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Lic. #: KW-06003761

DESCRIPTION: GL1.3

Maximum Reactions

Note: Only non-zero reactions are shown

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
+D+0.70E	68.016					6.585	6.045					
+D+0.5250E	51.268					6.585	6.045					
+0.60D	0.615					3.951	3.627					
+0.60D+0.70E	67.605					3.951	3.627					
Lr Only						3.988	3.662					
E Only	95.700											

Extreme Reactions

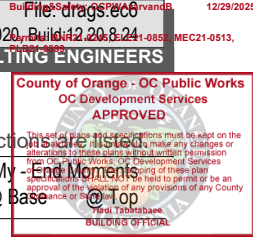
Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	95.700											
"	Minimum						3.988	3.662					
Reaction, X-X Axis Base	Maximum	1.026					6.585	6.045					
"	Minimum	1.026					6.585	6.045					
Reaction, Y-Y Axis Base	Maximum	1.026					10.573	9.707					
"	Minimum	95.700											
Reaction, X-X Axis Top	Maximum	1.026					6.585	6.045					
"	Minimum	1.026					6.585	6.045					
Reaction, Y-Y Axis Top	Maximum	1.026					6.585	6.045					
"	Minimum	95.700											
Moment, X-X Axis Base	Maximum	1.026					6.585	6.045					
"	Minimum	1.026					6.585	6.045					
Moment, Y-Y Axis Base	Maximum	1.026					6.585	6.045					
"	Minimum	1.026					6.585	6.045					
Moment, X-X Axis Top	Maximum	1.026					6.585	6.045					
"	Minimum	1.026					6.585	6.045					
Moment, Y-Y Axis Top	Maximum	1.026					6.585	6.045					
"	Minimum	1.026					6.585	6.045					

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	0.626	in	14.723	ft
+D+Lr	0.0000	in	0.000	ft	1.006	in	14.723	ft
+D+0.750Lr	0.0000	in	0.000	ft	0.911	in	14.723	ft
+D+0.70E	0.0000	in	0.000	ft	0.626	in	14.723	ft
+D+0.5250E	0.0000	in	0.000	ft	0.626	in	14.723	ft
+0.60D	0.0000	in	0.000	ft	0.376	in	14.723	ft
+0.60D+0.70E	0.0000	in	0.000	ft	0.376	in	14.723	ft
Lr Only	0.0000	in	0.000	ft	0.379	in	14.723	ft
E Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

Steel Section Properties : W18x35

Depth	=	17.700	in	I xx	=	510.00	in^4	J	=	0.506	in^4
Web Thick	=	0.300	in	S xx	=	57.60	in^3	Cw	=	1,140.00	in^6
Flange Width	=	6.000	in	R xx	=	7.040	in				
Flange Thick	=	0.425	in	Zx	=	66.500	in^3				
Area	=	10.300	in^2	I yy	=	15.300	in^4				
Weight	=	35.061	plf	S yy	=	5.120	in^3	Wno	=	25.900	in^2
Kdesign	=	0.827	in	R yy	=	1.220	in	Sw	=	16.500	in^4
K1	=	0.750	in	Zy	=	8.060	in^3	Qf	=	10.500	in^3
rts	=	1.520	in				Qw	=	32.700	in^3	
Ycg	=	0.000	in								



Steel Column

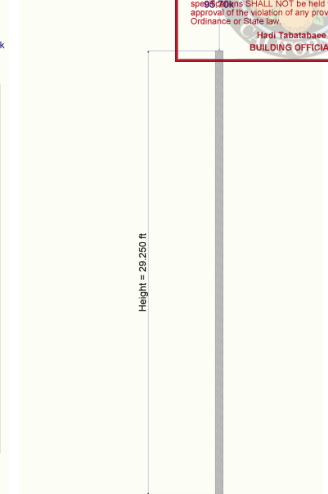
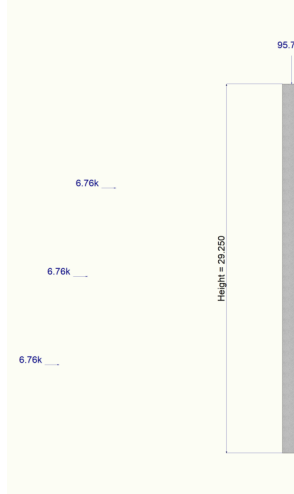
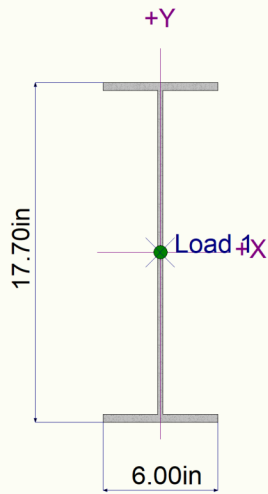
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DESCRIPTION: GL1.3

Sketches

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Buildings Department
12/29/2025
MEC21-0513



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Steel Column

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DESCRIPTION: GL4.6

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	26.750 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 696.59 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 26.750 ft, E = 82.50 k

BENDING LOADS . . .

B1: Lat. Point Load at 7.0 ft creating Mx-x, D = 2.120, LR = 1.340 k

B2: Lat. Point Load at 14.0 ft creating Mx-x, D = 2.120, LR = 1.340 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5535** : 1
Load Combination **+1.20D+E**
Location of max.above base **14.003** ft
At maximum location values are . . .

Pu	83.336	k
0.9 * Pn	214.729	k
Mu-x	25.457	k-ft
0.9 * Mn-x :	136.818	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	30.638	k-ft

Maximum Load Reactions . .

Top along X-X	0.0	k
Bottom along X-X	0.0	k
Top along Y-Y	2.716	k
Bottom along Y-Y	4.204	k

Maximum Load Deflections . . .

Along Y-Y	0.6978	in	at	13.106	ft	above base
for load combination : +D+Lr						
Along X-X	0.0	in	at	0.0	ft	above base
for load combination :						

PASS Maximum Shear Stress Ratio = **0.06766** : 1
Load Combination **+1.20D+1.60Lr**
Location of max.above base **0.0** ft
At maximum location values are . . .

Vu : Applied	5.696	k
Vn * Phi : Allowable	84.180	k

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
+1.40D	0.219	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.043	PASS	0.00 ft	
+1.20D+0.50Lr	0.237	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.046	PASS	0.00 ft	
+1.20D	0.188	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.037	PASS	0.00 ft	
+1.20D+1.60Lr	0.345	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.068	PASS	0.00 ft	
+1.20D+E	0.553	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.037	PASS	0.00 ft	
+0.90D	0.141	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.028	PASS	0.00 ft	
+0.90D+E	0.511	PASS	14.00 ft	1.20	1.00	79.47	23.21	0.028	PASS	0.00 ft	

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	0.697			2.576	1.664				
+D+Lr	0.697			4.204	2.716				
+D+0.750Lr	0.697			3.797	2.453				
+D+0.70E	58.447			2.576	1.664				
+D+0.5250E	44.009			2.576	1.664				



Steel Column

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DESCRIPTION: GL4.6

Maximum Reactions

Note: Only non-zero reactions are listed

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
+0.60D	0.418				1.545	0.999					
+0.60D+0.70E	58.168				1.545	0.999					
Lr Only					1.628	1.052					
E Only	82.500										

Extreme Reactions

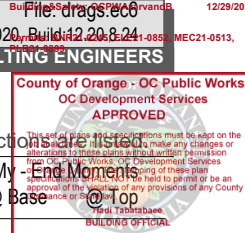
Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	82.500										
"	Minimum					1.628	1.052					
Reaction, X-X Axis Base	Maximum	0.697				2.576	1.664					
"	Minimum	0.697				2.576	1.664					
Reaction, Y-Y Axis Base	Maximum	0.697				4.204	2.716					
"	Minimum	82.500										
Reaction, X-X Axis Top	Maximum	0.697				2.576	1.664					
"	Minimum	0.697				2.576	1.664					
Reaction, Y-Y Axis Top	Maximum	0.697				2.576	1.664					
"	Minimum	82.500										
Moment, X-X Axis Base	Maximum	0.697				2.576	1.664					
"	Minimum	0.697				2.576	1.664					
Moment, Y-Y Axis Base	Maximum	0.697				2.576	1.664					
"	Minimum	0.697				2.576	1.664					
Moment, X-X Axis Top	Maximum	0.697				2.576	1.664					
"	Minimum	0.697				2.576	1.664					
Moment, Y-Y Axis Top	Maximum	0.697				2.576	1.664					
"	Minimum	0.697				2.576	1.664					

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	0.428	in	13.106	ft
+D+Lr	0.0000	in	0.000	ft	0.698	in	13.106	ft
+D+0.750Lr	0.0000	in	0.000	ft	0.630	in	13.106	ft
+D+0.70E	0.0000	in	0.000	ft	0.428	in	13.106	ft
+D+0.5250E	0.0000	in	0.000	ft	0.428	in	13.106	ft
+0.60D	0.0000	in	0.000	ft	0.257	in	13.106	ft
+0.60D+0.70E	0.0000	in	0.000	ft	0.257	in	13.106	ft
Lr Only	0.0000	in	0.000	ft	0.270	in	13.106	ft
E Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

Steel Section Properties : W12x26

Depth	=	12.200	in	I xx	=	204.00	in^4	J	=	0.300	in^4
Web Thick	=	0.230	in	S xx	=	33.40	in^3	Cw	=	607.00	in^6
Flange Width	=	6.490	in	R xx	=	5.170	in				
Flange Thick	=	0.380	in	Zx	=	37.200	in^3				
Area	=	7.650	in^2	I yy	=	17.300	in^4				
Weight	=	26.041	plf	S yy	=	5.340	in^3	Wno	=	19.200	in^2
Kdesign	=	0.680	in	R yy	=	1.510	in	Sw	=	11.800	in^4
K1	=	0.750	in	Zy	=	8.170	in^3	Qf	=	7.030	in^3
rts	=	1.750	in				Qw	=	18.300	in^3	
Ycg	=	0.000	in								



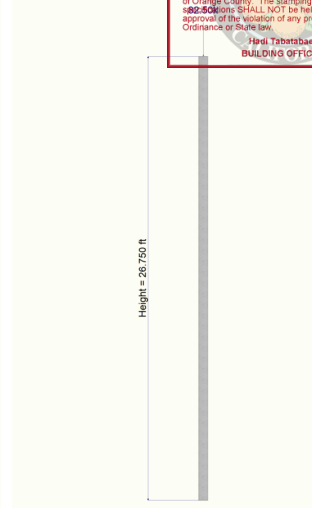
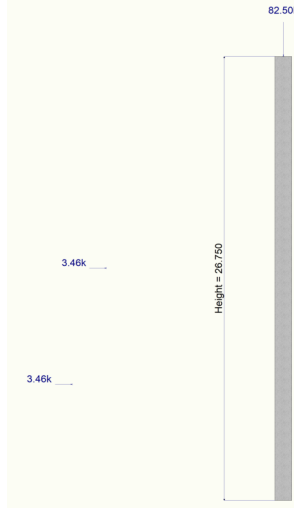
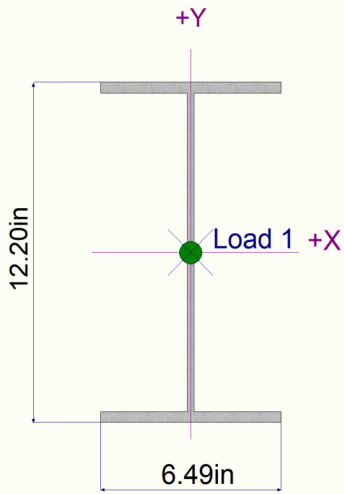
Steel Column

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DESCRIPTION: GL4.6

Sketches



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Steel Column

Lic. #: KW-06003761

DESCRIPTION: GLA.3 (1)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x14	Overall Column Height	10.5 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 148.687 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 10.50 ft, E = 15.0 k

BENDING LOADS . . .

B1: Lat. Point Load at 2.0 ft creating Mx-x, D = 0.2160, LR = 0.950 k

ELEVATOR: Lat. Uniform Load creating Mx-x, D = 0.2350, LR = 0.1250 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5416** : 1
Load Combination **+1.20D+E**
Location of max.above base **5.074** ft
At maximum location values are . . .

Pu	15.178	k
0.9 * Pn	37.005	k
Mu-x	4.150	k-ft
0.9 * Mn-x :	28.064	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	7.125	k-ft

PASS Maximum Shear Stress Ratio = **0.06179** : 1
Load Combination **+1.20D+1.60Lr**
Location of max.above base **0.0** ft
At maximum location values are . . .

Vu : Applied	3.971	k
Vn * Phi : Allowable	64.260	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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments	Note: Only non-zero reactions are listed.			
Load Combination	@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top				
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments			
		@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top			
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W12x14											



Steel Column

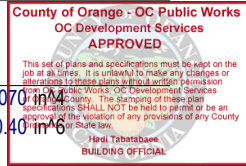
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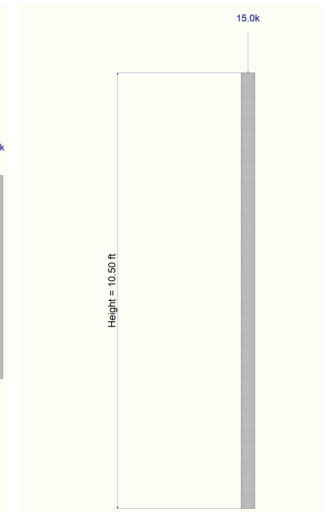
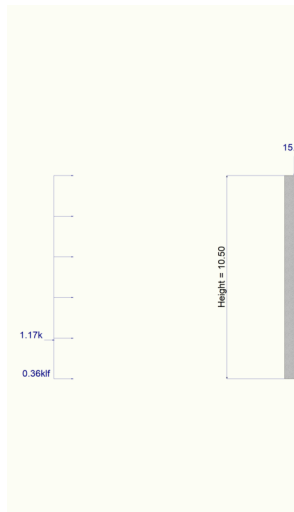
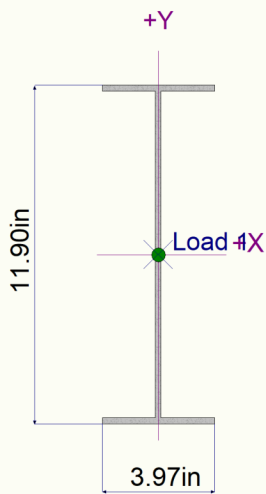
DESCRIPTION: GLA.3 (1)

Steel Section Properties : W12x14

Depth	=	11.900 in	I xx	=	88.60 in ⁴	J	=	0.070 in ⁴
Web Thick	=	0.200 in	S xx	=	14.90 in ³	Cw	=	80.40 in ⁶
Flange Width	=	3.970 in	R xx	=	4.620 in			
Flange Thick	=	0.225 in	Zx	=	17.400 in ³			
Area	=	4.160 in ²	I yy	=	2.360 in ⁴			
Weight	=	14.161 plf	S yy	=	1.190 in ³	Wno	=	11.600 in ²
Kdesign	=	0.525 in	R yy	=	0.753 in	Sw	=	2.590 in ⁴
K1	=	0.563 in	Zy	=	1.900 in ³	Qf	=	2.480 in ³
rts	=	0.962 in				Qw	=	8.490 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

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Lic. #: KW-06003761

DESCRIPTION: GLA.3 (2)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	26.0 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	



Applied Loads

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

Column self weight included : 677.06 lbs * Dead Load Factor
AXIAL LOADS . . .
drag load: Axial Load at 26.0 ft, E = 35.60 k
BENDING LOADS . . .
B1: Lat. Point Load at 7.0 ft creating Mx-x, D = 5.270, LR = 1.870 k
roof deck: Lat. Uniform Load creating Mx-x, D = 0.2110, LR = 0.1090 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5670** : 1
Load Combination **+1.20D+1.60Lr**
Location of max.above base **7.154** ft
At maximum location values are . . .
Pu **0.8125** k
0.9 * Pn **214.729** k
Mu-x **76.094** k-ft
0.9 * Mn-x : **134.649** k-ft
Mu-y **0.0** k-ft
0.9 * Mn-y : **30.638** k-ft

PASS Maximum Shear Stress Ratio = **0.1469** : 1
Load Combination **+1.20D+1.60Lr**
Location of max.above base **0.0** ft
At maximum location values are . . .
Vu : Applied **12.367** k
Vn * Phi : Allowable **84.180** k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	6.082 k
Bottom along Y-Y	9.378 k

Maximum Load Deflections . . .

Along Y-Y	1.130 in at	12.389ft	above base
for load combination : +D+Lr			
Along X-X	0.0 in at	0.0ft	above base
for load combination :			

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
+1.40D	0.428	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.110	PASS	0.00 ft	
+1.20D+0.50Lr	0.429	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.111	PASS	0.00 ft	
+1.20D	0.367	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.094	PASS	0.00 ft	
+1.20D+1.60Lr	0.567	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.147	PASS	0.00 ft	
+1.20D+E	0.450	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.094	PASS	0.00 ft	
+0.90D	0.275	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.071	PASS	0.00 ft	
+0.90D+E	0.358	PASS	7.15 ft	1.18	1.00	79.47	23.21	0.071	PASS	0.00 ft	

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	0.677			6.594	4.162				
+D+Lr	0.677			9.378	6.082				
+D+0.750Lr	0.677			8.682	5.602				
+D+0.70E	25.597			6.594	4.162				
+D+0.5250E	19.367			6.594	4.162				

Steel Column

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DESCRIPTION: GLA.3 (2)

Maximum Reactions

Note: Only non-zero reactions are listed

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
+0.60D	0.406					3.956	2.497					
+0.60D+0.70E	25.326					3.956	2.497					
Lr Only						2.784	1.920					
E Only	35.600											

Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	35.600											
"	Minimum						2.784	1.920					
Reaction, X-X Axis Base	Maximum	0.677					6.594	4.162					
"	Minimum	0.677					6.594	4.162					
Reaction, Y-Y Axis Base	Maximum	0.677					9.378	6.082					
"	Minimum	35.600											
Reaction, X-X Axis Top	Maximum	0.677					6.594	4.162					
"	Minimum	0.677					6.594	4.162					
Reaction, Y-Y Axis Top	Maximum	0.677					6.594	4.162					
"	Minimum	35.600											
Moment, X-X Axis Base	Maximum	0.677					6.594	4.162					
"	Minimum	0.677					6.594	4.162					
Moment, Y-Y Axis Base	Maximum	0.677					6.594	4.162					
"	Minimum	0.677					6.594	4.162					
Moment, X-X Axis Top	Maximum	0.677					6.594	4.162					
"	Minimum	0.677					6.594	4.162					
Moment, Y-Y Axis Top	Maximum	0.677					6.594	4.162					
"	Minimum	0.677					6.594	4.162					

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	0.790	in	12.389	ft
+D+Lr	0.0000	in	0.000	ft	1.130	in	12.389	ft
+D+0.750Lr	0.0000	in	0.000	ft	1.045	in	12.389	ft
+D+0.70E	0.0000	in	0.000	ft	0.790	in	12.389	ft
+D+0.5250E	0.0000	in	0.000	ft	0.790	in	12.389	ft
+0.60D	0.0000	in	0.000	ft	0.474	in	12.389	ft
+0.60D+0.70E	0.0000	in	0.000	ft	0.474	in	12.389	ft
Lr Only	0.0000	in	0.000	ft	0.340	in	12.389	ft
E Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

Steel Section Properties : W12x26

Depth	=	12.200	in	I xx	=	204.00	in^4	J	=	0.300	in^4
Web Thick	=	0.230	in	S xx	=	33.40	in^3	Cw	=	607.00	in^6
Flange Width	=	6.490	in	R xx	=	5.170	in				
Flange Thick	=	0.380	in	Zx	=	37.200	in^3				
Area	=	7.650	in^2	I yy	=	17.300	in^4				
Weight	=	26.041	plf	S yy	=	5.340	in^3	Wno	=	19.200	in^2
Kdesign	=	0.680	in	R yy	=	1.510	in	Sw	=	11.800	in^4
K1	=	0.750	in	Zy	=	8.170	in^3	Qf	=	7.030	in^3
rts	=	1.750	in				Qw	=	18.300	in^3	
Ycg	=	0.000	in								



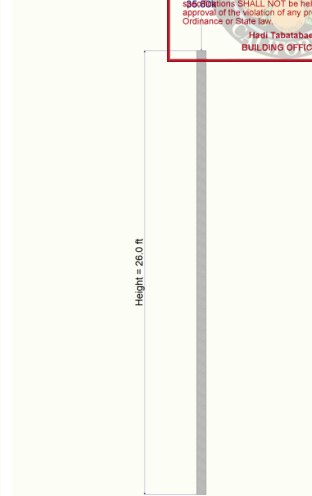
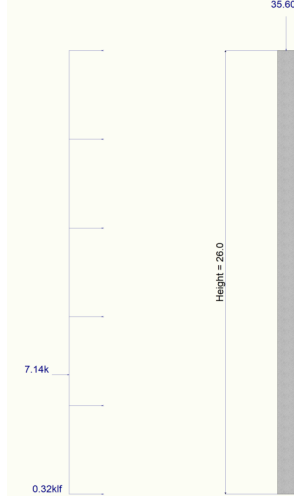
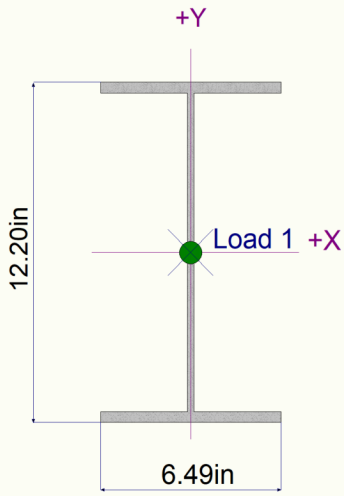
Steel Column

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DESCRIPTION: GLA.3 (2)

Sketches



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DESCRIPTION: GLC (1)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	16.50 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	



Applied Loads

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

Column self weight included : 429.670 lbs * Dead Load Factor
 AXIAL LOADS . . .
 drag load: Axial Load at 16.50 ft, E = 16.10 k
 BENDING LOADS . . .
 roof deck: Lat. Uniform Load creating Mx-x, D = 0.1860, LR = 0.0930 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.09860** : 1
 Load Combination **+1.20D+1.60Lr**
 Location of max.above base **8.195** ft
 At maximum location values are . . .

Pu	0.5156	k
0.9 * Pn	214.729	k
Mu-x	12.659	k-ft
0.9 * Mn-x :	129.966	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	30.638	k-ft

PASS Maximum Shear Stress Ratio = **0.03646** : 1
 Load Combination **+1.20D+1.60Lr**
 Location of max.above base **16.50** ft
 At maximum location values are . . .

Vu : Applied	3.069	k
Vn * Phi : Allowable	84.180	k

Maximum Load Reactions . .

Top along X-X	0.0	k
Bottom along X-X	0.0	k
Top along Y-Y	2.302	k
Bottom along Y-Y	2.302	k

Maximum Load Deflections . . .

Along Y-Y	0.07950	in	at	8.305	ft	above base
for load combination : +D+Lr						
Along X-X	0.0	in	at	0.0	ft	above base
for load combination :						

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				CbX	CbY	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
+1.40D	0.070	PASS	8.31 ft	1.14	1.00	79.47	23.21	0.026	PASS	0.00 ft	
+1.20D+0.50Lr	0.072	PASS	8.31 ft	1.14	1.00	79.47	23.21	0.026	PASS	0.00 ft	
+1.20D	0.060	PASS	8.19 ft	1.14	1.00	79.47	23.21	0.022	PASS	0.00 ft	
+1.20D+1.60Lr	0.099	PASS	8.19 ft	1.14	1.00	79.47	23.21	0.036	PASS	16.50 ft	
+1.20D+E	0.097	PASS	8.19 ft	1.14	1.00	79.47	23.21	0.022	PASS	0.00 ft	
+0.90D	0.045	PASS	8.31 ft	1.14	1.00	79.47	23.21	0.016	PASS	0.00 ft	
+0.90D+E	0.082	PASS	8.19 ft	1.14	1.00	79.47	23.21	0.016	PASS	0.00 ft	

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	0.430				1.535	1.535				
+D+Lr	0.430				2.302	2.302				
+D+0.750Lr	0.430				2.110	2.110				
+D+0.70E	11.700				1.535	1.535				
+D+0.5250E	8.882				1.535	1.535				
+0.60D	0.258				0.921	0.921				

Steel Column

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Lic. # : KW-06003761

DESCRIPTION: GLC (1)

Maximum Reactions

Note: Only non-zero reactions are listed

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
+0.60D+0.70E	11.528				0.921	0.921					
Lr Only					0.767	0.767					
E Only	16.100										



Extreme Reactions

Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	16.100										
"	Minimum					0.767	0.767					
Reaction, X-X Axis Base	Maximum	0.430				1.535	1.535					
"	Minimum	0.430				1.535	1.535					
Reaction, Y-Y Axis Base	Maximum	0.430				2.302	2.302					
"	Minimum	16.100										
Reaction, X-X Axis Top	Maximum	0.430				1.535	1.535					
"	Minimum	0.430				1.535	1.535					
Reaction, Y-Y Axis Top	Maximum	0.430				1.535	1.535					
"	Minimum	16.100										
Moment, X-X Axis Base	Maximum	0.430				1.535	1.535					
"	Minimum	0.430				1.535	1.535					
Moment, Y-Y Axis Base	Maximum	0.430				1.535	1.535					
"	Minimum	0.430				1.535	1.535					
Moment, X-X Axis Top	Maximum	0.430				1.535	1.535					
"	Minimum	0.430				1.535	1.535					
Moment, Y-Y Axis Top	Maximum	0.430				1.535	1.535					
"	Minimum	0.430				1.535	1.535					

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	0.053	in	8.305	ft
+D+Lr	0.0000	in	0.000	ft	0.079	in	8.305	ft
+D+0.750Lr	0.0000	in	0.000	ft	0.073	in	8.305	ft
+D+0.70E	0.0000	in	0.000	ft	0.053	in	8.305	ft
+D+0.5250E	0.0000	in	0.000	ft	0.053	in	8.305	ft
+0.60D	0.0000	in	0.000	ft	0.032	in	8.305	ft
+0.60D+0.70E	0.0000	in	0.000	ft	0.032	in	8.305	ft
Lr Only	0.0000	in	0.000	ft	0.026	in	8.305	ft
E Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

Steel Section Properties : W12x26

Depth	=	12.200	in	I xx	=	204.00	in^4	J	=	0.300	in^4
Web Thick	=	0.230	in	S xx	=	33.40	in^3	Cw	=	607.00	in^6
Flange Width	=	6.490	in	R xx	=	5.170	in				
Flange Thick	=	0.380	in	Zx	=	37.200	in^3				
Area	=	7.650	in^2	I yy	=	17.300	in^4				
Weight	=	26.041	plf	S yy	=	5.340	in^3	Wno	=	19.200	in^2
Kdesign	=	0.680	in	R yy	=	1.510	in	Sw	=	11.800	in^4
K1	=	0.750	in	Zy	=	8.170	in^3	Qf	=	7.030	in^3
rtc	=	1.750	in				Qw	=	18.300	in^3	
Ycg	=	0.000	in								

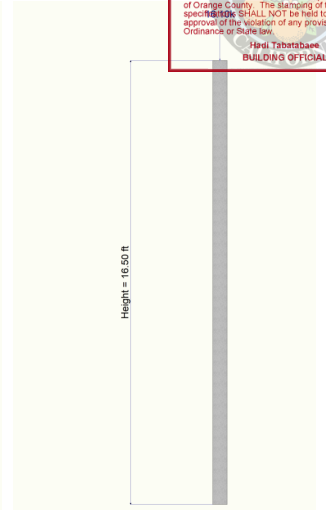
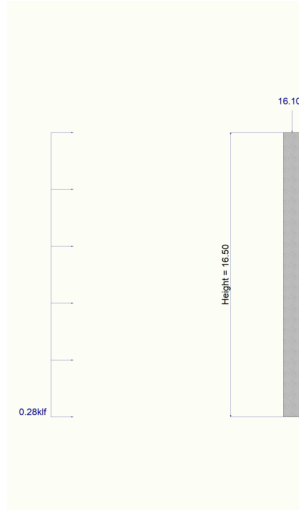
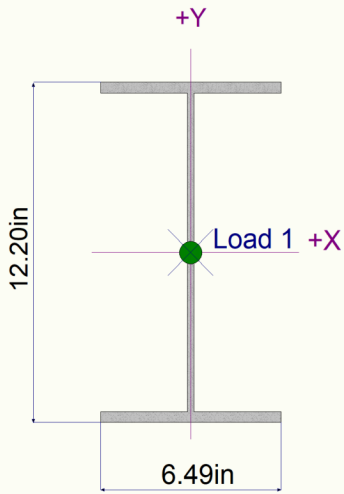
Steel Column

Lic. # : KW-06003761

DESCRIPTION: GLC (1)

Sketches

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Steel Column

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DESCRIPTION: GLC (2)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	30.0 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 781.22 lbs * Dead Load Factor
AXIAL LOADS . . .
drag load: Axial Load at 30.0 ft, E = 29.30 k
BENDING LOADS . . .
roof deck: Lat. Uniform Load creating Mx-x, D = 0.1860, LR = 0.0930 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.3242** : 1
Load Combination +1.20D+1.60Lr
Location of max.above base 14.899 ft
At maximum location values are . . .

Pu	0.9375 k
0.9 * Pn	214.729 k
Mu-x	41.848 k-ft
0.9 * Mn-x :	129.966 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	30.638 k-ft

PASS Maximum Shear Stress Ratio = **0.06629** : 1
Load Combination +1.20D+1.60Lr
Location of max.above base 0.0 ft
At maximum location values are . . .

Vu : Applied	5.580 k
Vn * Phi : Allowable	84.180 k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	4.185 k
Bottom along Y-Y	4.185 k

Maximum Load Deflections . . .

Along Y-Y	0.8688 in at	15.101 ft	above base
for load combination : +D+Lr			
Along X-X	0.0 in at	0.0 ft	above base
for load combination :			

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				CbX	CbY	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
+1.40D	0.228	PASS	15.10 ft	1.14	1.00	79.47	23.21	0.046	PASS	0.00 ft	
+1.20D+0.50Lr	0.236	PASS	14.90 ft	1.14	1.00	79.47	23.21	0.048	PASS	0.00 ft	
+1.20D	0.195	PASS	15.10 ft	1.14	1.00	79.47	23.21	0.040	PASS	0.00 ft	
+1.20D+1.60Lr	0.324	PASS	14.90 ft	1.14	1.00	79.47	23.21	0.066	PASS	0.00 ft	
+1.20D+E	0.264	PASS	15.10 ft	1.14	1.00	79.47	23.21	0.040	PASS	0.00 ft	
+0.90D	0.147	PASS	14.90 ft	1.14	1.00	79.47	23.21	0.030	PASS	0.00 ft	
+0.90D+E	0.215	PASS	14.90 ft	1.14	1.00	79.47	23.21	0.030	PASS	0.00 ft	

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	0.781				2.790	2.790				
+D+Lr	0.781				4.185	4.185				
+D+0.750Lr	0.781				3.836	3.836				
+D+0.70E	21.291				2.790	2.790				
+D+0.5250E	16.164				2.790	2.790				
+0.60D	0.469				1.674	1.674				



Steel Column

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 MEC21-0513

Lic. # : KW-06003761

DESCRIPTION: GLC (2)

Maximum Reactions

Note: Only non-zero reactions are listed

Load Combination	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
+0.60D+0.70E	20.979				1.674	1.674					
Lr Only					1.395	1.395					
E Only	29.300										

Extreme Reactions

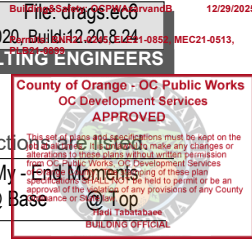
Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	29.300										
"	Minimum					1.395	1.395					
Reaction, X-X Axis Base	Maximum	0.781				2.790	2.790					
"	Minimum	0.781				2.790	2.790					
Reaction, Y-Y Axis Base	Maximum	0.781				4.185	4.185					
"	Minimum	29.300										
Reaction, X-X Axis Top	Maximum	0.781				2.790	2.790					
"	Minimum	0.781				2.790	2.790					
Reaction, Y-Y Axis Top	Maximum	0.781				2.790	2.790					
"	Minimum	29.300										
Moment, X-X Axis Base	Maximum	0.781				2.790	2.790					
"	Minimum	0.781				2.790	2.790					
Moment, Y-Y Axis Base	Maximum	0.781				2.790	2.790					
"	Minimum	0.781				2.790	2.790					
Moment, X-X Axis Top	Maximum	0.781				2.790	2.790					
"	Minimum	0.781				2.790	2.790					
Moment, Y-Y Axis Top	Maximum	0.781				2.790	2.790					
"	Minimum	0.781				2.790	2.790					

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	0.579	in	15.101	ft
+D+Lr	0.0000	in	0.000	ft	0.869	in	15.101	ft
+D+0.750Lr	0.0000	in	0.000	ft	0.796	in	15.101	ft
+D+0.70E	0.0000	in	0.000	ft	0.579	in	15.101	ft
+D+0.5250E	0.0000	in	0.000	ft	0.579	in	15.101	ft
+0.60D	0.0000	in	0.000	ft	0.348	in	15.101	ft
+0.60D+0.70E	0.0000	in	0.000	ft	0.348	in	15.101	ft
Lr Only	0.0000	in	0.000	ft	0.290	in	15.101	ft
E Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

Steel Section Properties : W12x26

Depth	=	12.200	in	I xx	=	204.00	in^4	J	=	0.300	in^4
Web Thick	=	0.230	in	S xx	=	33.40	in^3	Cw	=	607.00	in^6
Flange Width	=	6.490	in	R xx	=	5.170	in				
Flange Thick	=	0.380	in	Zx	=	37.200	in^3				
Area	=	7.650	in^2	I yy	=	17.300	in^4				
Weight	=	26.041	plf	S yy	=	5.340	in^3	Wno	=	19.200	in^2
Kdesign	=	0.680	in	R yy	=	1.510	in	Sw	=	11.800	in^4
K1	=	0.750	in	Zy	=	8.170	in^3	Qf	=	7.030	in^3
Ycg	=	1.750	in				Qw	=	18.300	in^3	
	=	0.000	in								



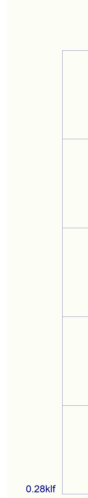
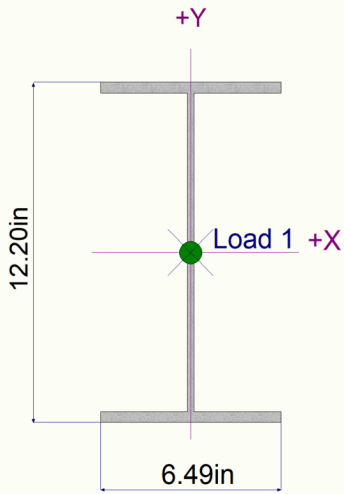
Steel Column

Lic. # : KW-06003761

DESCRIPTION: GLC (2)

Sketches

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OC Development Services
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BUILDING OFFICIAL

Steel Column

Lic. #: KW-06003761

DESCRIPTION: GL1.3 (2)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W21x62	Overall Column Height	29.250 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 1,822.08 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 29.250 ft, E = 260.20 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.0550 k/ft

B1: Lat. Point Load at 6.0 ft creating Mx-x, D = 18.050, L = 19.190 k

B2: Lat. Point Load at 15.0 ft creating Mx-x, D = 8.440, L = 10.440 k

B3: Lat. Point Load at 22.0 ft creating Mx-x, D = 8.660, L = 10.820 k

B3: Lat. Point Load at 23.50 ft creating Mx-x, D = 6.80, L = 5.630 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.9720** : 1
 Load Combination +1.20D+1.60L
 Location of max.above base 14.919 ft
 At maximum location values are . . .

Pu	2.186 k
0.9 * Pn	570.25 k
Mu-x	508.81 k-ft
0.9 * Mn-x :	524.51 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	81.375 k-ft

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 :		

PASS Maximum Shear Stress Ratio = **0.2615** : 1
 Load Combination +1.20D+1.60L
 Location of max.above base 0.0 ft
 At maximum location values are . . .

Vu : Applied	65.902 k
Vn * Phi : Allowable	252.0 k

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments
Load Combination	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W21x62											



Steel Column

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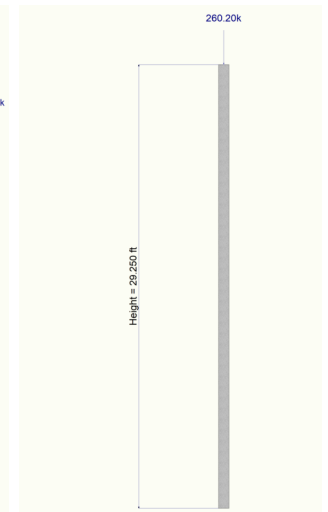
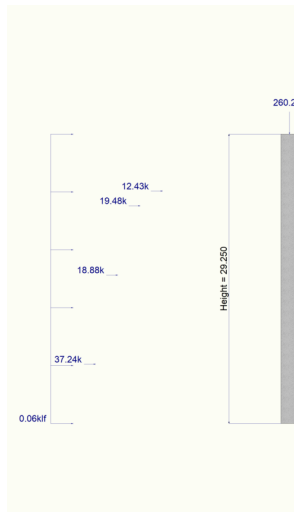
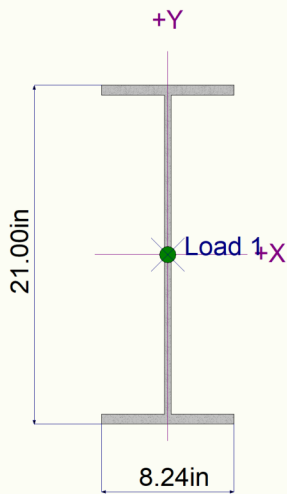
DESCRIPTION: GL1.3 (2)

Steel Section Properties : W21x62

Depth	=	21.000 in	I xx	=	1,330.00 in ⁴	J	=	1,880 in ⁴
Web Thick	=	0.400 in	S xx	=	127.00 in ³	Cw	=	5,960.00 in ⁶
Flange Width	=	8.240 in	R xx	=	8.540 in			
Flange Thick	=	0.615 in	Zx	=	144.000 in ³			
Area	=	18.300 in ²	I yy	=	57.500 in ⁴			
Weight	=	62.293 plf	S yy	=	14.000 in ³	Wno	=	42.000 in ²
Kdesign	=	1.120 in	R yy	=	1.770 in	Sw	=	53.200 in ⁴
K1	=	0.813 in	Zy	=	21.700 in ³	Qf	=	24.600 in ³
rts	=	2.150 in				Qw	=	71.200 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GL1.3 (1)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x19	Overall Column Height	8.0 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 151.682 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 8.0 ft, E = 47.0 k

BENDING LOADS . . .

B3: Lat. Uniform Load creating Mx-x, D = 0.0140 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8015** : 1
 Load Combination **+1.20D+E**
 Location of max.above base **3.973** ft
 At maximum location values are . . .

Pu	47.182 k
0.9 * Pn	59.044 k
Mu-x	0.1344 k-ft
0.9 * Mn-x :	50.073 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	11.175 k-ft

PASS Maximum Shear Stress Ratio = **0.000912** : 1
 Load Combination **+1.40D**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	0.07840 k
Vn * Phi : Allowable	86.010 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				CbX	CbY	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments	k-ft	My - End Moments		
Load Combination	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments	k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W12x19											



Steel Column

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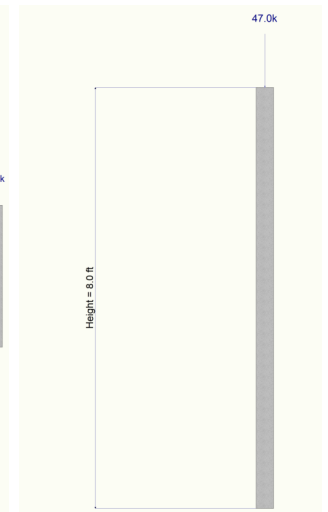
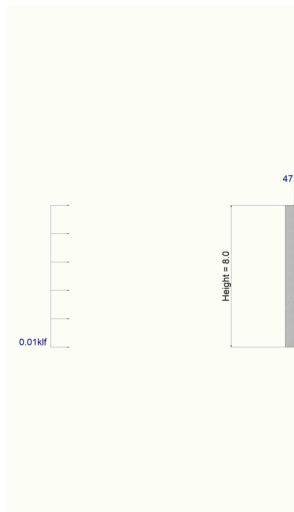
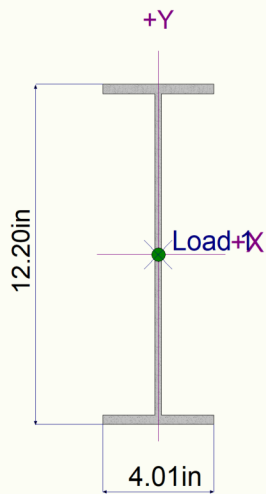
DESCRIPTION: GL1.3 (1)

Steel Section Properties : W12x19

Depth	=	12.200 in	I xx	=	130.00 in ⁴	J	=	0.180 in ⁴
Web Thick	=	0.235 in	S xx	=	21.30 in ³	Cw	=	131.00 in ⁶
Flange Width	=	4.010 in	R xx	=	4.820 in			
Flange Thick	=	0.350 in	Zx	=	24.700 in ³			
Area	=	5.570 in ²	I yy	=	3.760 in ⁴			
Weight	=	18.960 plf	S yy	=	1.880 in ³	Wno	=	11.900 in ²
Kdesign	=	0.650 in	R yy	=	0.822 in	Sw	=	4.170 in ⁴
K1	=	0.563 in	Zy	=	2.980 in ³	Qf	=	3.910 in ³
rts	=	1.020 in				Qw	=	12.200 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GL1.3 (3)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x50	Overall Column Height	18.0 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 894.57 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 18.0 ft, E = 88.20 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.0350 k/ft

B1: Lat. Point Load at 7.20 ft creating Mx-x, D = 20.840, L = 17.10 k

B2: Lat. Point Load at 15.0 ft creating Mx-x, D = 5.960, L = 5.120 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.9112** : 1
 Load Combination +1.20D+1.60L
 Location of max.above base 7.248 ft
 At maximum location values are . . .

Pu	1.073 k
0.9 * Pn	499.50 k
Mu-x	245.390 k-ft
0.9 * Mn-x :	269.625 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	79.875 k-ft

PASS Maximum Shear Stress Ratio = **0.2537** : 1
 Load Combination +1.20D+1.60L
 Location of max.above base 0.0 ft
 At maximum location values are . . .

Vu : Applied	34.356 k
Vn * Phi : Allowable	135.420 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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments			
Load Combination	@ Base	@ Base @ Top			@ Base @ Top	@ Base @ Top	@ Base @ Top	@ Base @ Top			
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments			
		@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Base @ Top	@ Base @ Top			
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W12x50											

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Steel Column

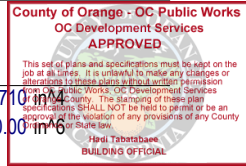
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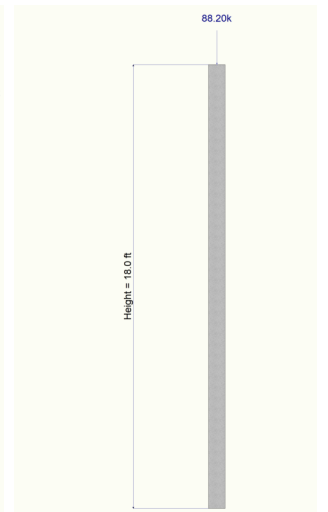
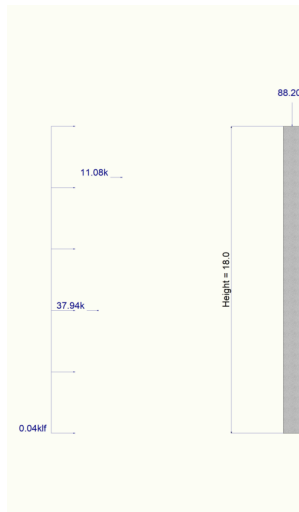
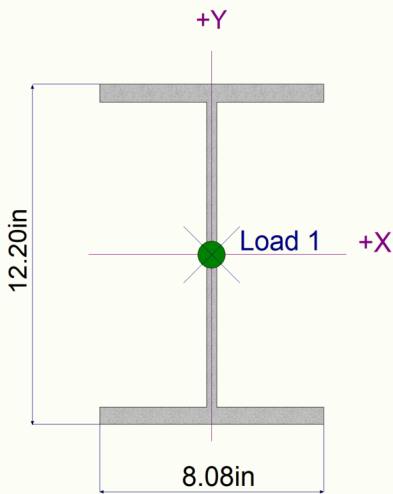
DESCRIPTION: GL1.3 (3)

Steel Section Properties : W12x50

Depth	=	12.200 in	I xx	=	391.00 in ⁴	J	=	1.710 in ⁴
Web Thick	=	0.370 in	S xx	=	64.20 in ³	Cw	=	1,880.00 in ⁶
Flange Width	=	8.080 in	R xx	=	5.180 in			
Flange Thick	=	0.640 in	Zx	=	71.900 in ³			
Area	=	14.600 in ²	I yy	=	56.300 in ⁴			
Weight	=	49.698 plf	S yy	=	13.900 in ³	Wno	=	23.400 in ²
Kdesign	=	1.140 in	R yy	=	1.960 in	Sw	=	30.200 in ⁴
K1	=	0.938 in	Zy	=	21.300 in ³	Qf	=	14.300 in ³
rts	=	2.250 in				Qw	=	35.400 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GL4.6

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	11 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 11 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 11 ft, K = 1.0	

Applied Loads

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

Column self weight included : 286.447 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 11.0 ft, E = 166.40 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.0520, L = 0.050 k/ft

B1: Lat. Point Load at 5.50 ft creating Mx-x, D = 2.390, L = 3.020 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.9315** : 1
 Load Combination **+1.20D+0.50L+E**
 Location of max.above base **5.463** ft
 At maximum location values are . . .

Pu	166.744 k
0.9 * Pn	196.886 k
Mu-x	13.281 k-ft
0.9 * Mn-x :	139.50 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	30.638 k-ft

PASS Maximum Shear Stress Ratio = **0.05504** : 1
 Load Combination **+1.20D+1.60L**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	4.633 k
Vn * Phi : Allowable	84.180 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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments	Note: Only non-zero reactions are listed.			
Load Combination	@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top				
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments			
		@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top			
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W12x26											



Steel Column

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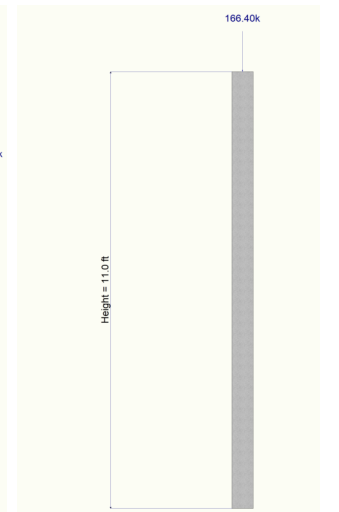
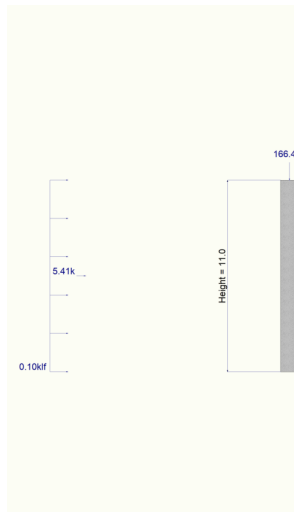
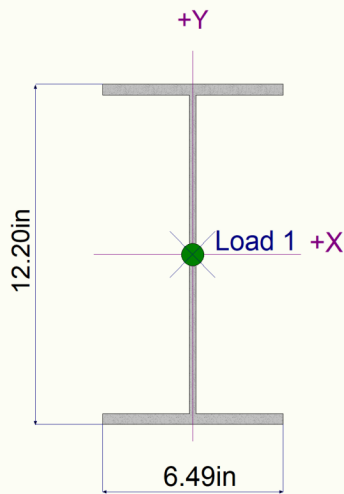
DESCRIPTION: GL4.6

Steel Section Properties : W12x26

Depth	=	12.200 in	I xx	=	204.00 in ⁴	J	=	0.300 in ⁴
Web Thick	=	0.230 in	S xx	=	33.40 in ³	Cw	=	607.00 in ⁶
Flange Width	=	6.490 in	R xx	=	5.170 in			
Flange Thick	=	0.380 in	Zx	=	37.200 in ³			
Area	=	7.650 in ²	I yy	=	17.300 in ⁴			
Weight	=	26.041 plf	S yy	=	5.340 in ³	Wno	=	19.200 in ²
Kdesign	=	0.680 in	R yy	=	1.510 in	Sw	=	11.800 in ⁴
K1	=	0.750 in	Zy	=	8.170 in ³	Qf	=	7.030 in ³
rts	=	1.750 in				Qw	=	18.300 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GLA.3 (1)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W16x50	Overall Column Height	31.5 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 1,576.22 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 31.50 ft, E = 99.40 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.720, L = 0.90 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8535** : 1
 Load Combination +1.20D+1.60L
 Location of max.above base 15.644 ft
 At maximum location values are . . .

Pu	1.891 k
0.9 * Pn	436.172 k
Mu-x	285.755 k-ft
0.9 * Mn-x :	335.670 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	61.125 k-ft

PASS Maximum Shear Stress Ratio = **0.1953** : 1
 Load Combination +1.20D+1.60L
 Location of max.above base 0.0 ft
 At maximum location values are . . .

Vu : Applied	36.288 k
Vn * Phi : Allowable	185.820 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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments	k-ft	My - End Moments		
Load Combination	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments	k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W16x50											



Steel Column

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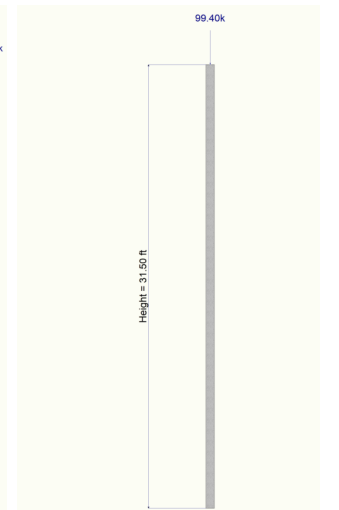
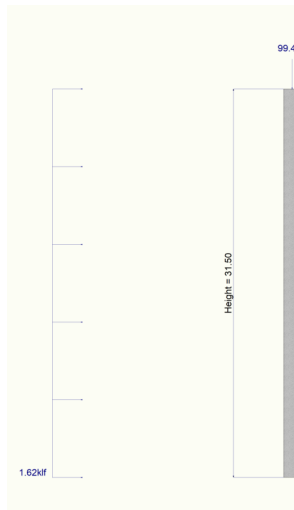
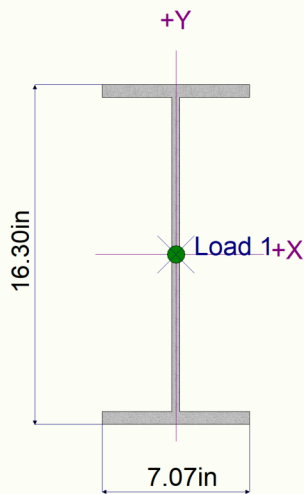
DESCRIPTION: GLA.3 (1)

Steel Section Properties : W16x50

Depth	=	16.300 in	I xx	=	659.00 in ⁴	J	=	1.520 in ⁴
Web Thick	=	0.380 in	S xx	=	81.00 in ³	Cw	=	2,270.00 in ⁶
Flange Width	=	7.070 in	R xx	=	6.680 in			
Flange Thick	=	0.630 in	Zx	=	92.000 in ³			
Area	=	14.700 in ²	I yy	=	37.200 in ⁴			
Weight	=	50.039 plf	S yy	=	10.500 in ³	Wno	=	27.700 in ²
Kdesign	=	1.030 in	R yy	=	1.590 in	Sw	=	30.800 in ⁴
K1	=	0.813 in	Zy	=	16.300 in ³	Qf	=	16.500 in ³
rts	=	1.890 in				Qw	=	45.600 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

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DESCRIPTION: GLA.3 (2)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	26.0 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	



Applied Loads

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

Column self weight included : 677.06 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 26.0 ft, E = 99.40 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.3660, L = 0.4540 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8517** : 1
 Load Combination **+1.20D+0.50L+E**
 Location of max.above base **12.913** ft
 At maximum location values are . . .

Pu	100.212	k
0.9 * Pn	214.729	k
Mu-x	56.291	k-ft
0.9 * Mn-x :	129.966	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	30.638	k-ft

PASS Maximum Shear Stress Ratio = **0.180** : 1
 Load Combination **+1.20D+1.60L**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	15.153	k
Vn * Phi : Allowable	84.180	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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	

Maximum Reactions

Note: Only non-zero reactions are listed.

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

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base @ Top	k	Y-Y Axis Reaction @ Base @ Top	Mx - End Moments @ Base @ Top	k-ft	My - End Moments @ Base @ Top
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Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
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Steel Section Properties : **W12x26**

Steel Column

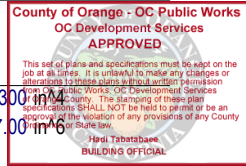
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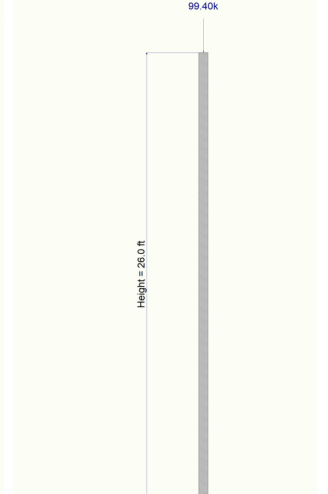
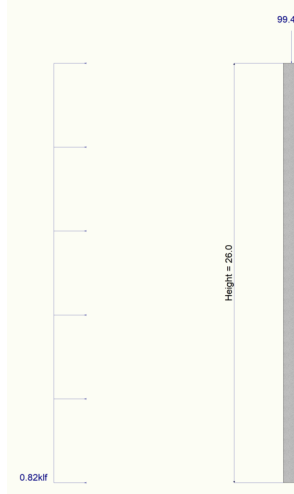
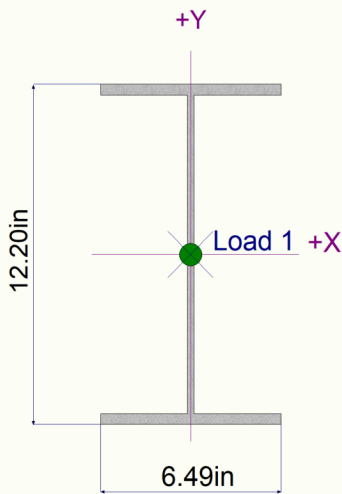
DESCRIPTION: GLA.3 (2)

Steel Section Properties : W12x26

Depth	=	12.200 in	I xx	=	204.00 in ⁴	J	=	0.300 in ⁴
Web Thick	=	0.230 in	S xx	=	33.40 in ³	Cw	=	607.00 in ⁶
Flange Width	=	6.490 in	R xx	=	5.170 in			
Flange Thick	=	0.380 in	Zx	=	37.200 in ³			
Area	=	7.650 in ²	I yy	=	17.300 in ⁴			
Weight	=	26.041 plf	S yy	=	5.340 in ³	Wno	=	19.200 in ²
Kdesign	=	0.680 in	R yy	=	1.510 in	Sw	=	11.800 in ⁴
K1	=	0.750 in	Zy	=	8.170 in ³	Qf	=	7.030 in ³
rts	=	1.750 in				Qw	=	18.300 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GLA.3 (3)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	22 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 572.89 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 22.0 ft, E = 99.40 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.5030, L = 0.6370 k/ft

B1: Lat. Point Load at 11.0 ft creating Mx-x, D = 1.512, L = 1.760 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.9347** : 1
 Load Combination **+1.20D+0.50L+E**
 Location of max.above base **10.926** ft
 At maximum location values are . . .

Pu	100.087 k
0.9 * Pn	214.729 k
Mu-x	70.504 k-ft
0.9 * Mn-x :	133.735 k-ft
Mu-y	0.0 k-ft
0.9 * Mn-y :	30.638 k-ft

PASS Maximum Shear Stress Ratio = **0.2396** : 1
 Load Combination **+1.20D+1.60L**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	20.166 k
Vn * Phi : Allowable	84.180 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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments	Note: Only non-zero reactions are listed.			
Load Combination	@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top				
Extreme Reactions											
Item	Extreme Value	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments			
		@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top			
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W12x26											



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Steel Column

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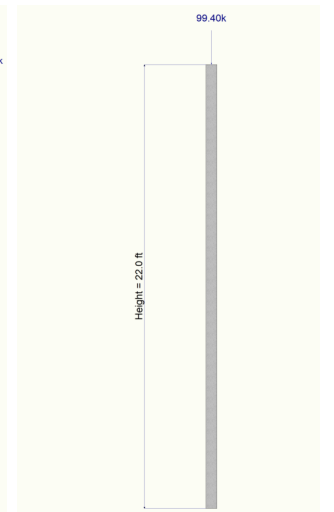
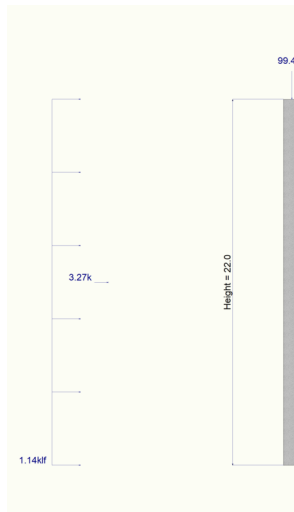
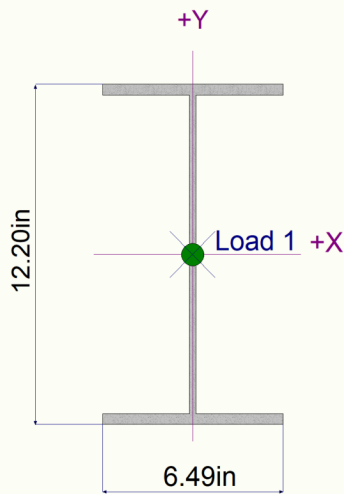
DESCRIPTION: GLA.3 (3)

Steel Section Properties : W12x26

Depth	=	12.200 in	I xx	=	204.00 in ⁴	J	=	0.300 in ⁴
Web Thick	=	0.230 in	S xx	=	33.40 in ³	Cw	=	607.00 in ⁶
Flange Width	=	6.490 in	R xx	=	5.170 in			
Flange Thick	=	0.380 in	Zx	=	37.200 in ³			
Area	=	7.650 in ²	I yy	=	17.300 in ⁴			
Weight	=	26.041 plf	S yy	=	5.340 in ³	Wno	=	19.200 in ²
Kdesign	=	0.680 in	R yy	=	1.510 in	Sw	=	11.800 in ⁴
K1	=	0.750 in	Zy	=	8.170 in ³	Qf	=	7.030 in ³
rts	=	1.750 in				Qw	=	18.300 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GLC (1)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	15.5 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 15.5 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 15.5 ft, K = 1.0	

Applied Loads

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

Column self weight included : 403.629 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 15.50 ft, E = 65.0 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.7840, L = 0.650 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.9364** : 1
 Load Combination **+1.20D+0.50L+E**
 Location of max.above base **7.698** ft
 At maximum location values are . . .

Pu	65.484	k
0.9 * Pn	113.901	k
Mu-x	38.012	k-ft
0.9 * Mn-x :	93.462	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	30.638	k-ft

PASS Maximum Shear Stress Ratio = **0.1824** : 1
 Load Combination **+1.20D+1.60L**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	15.351	k
Vn * Phi : Allowable	84.180	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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	

Maximum Reactions

Note: Only non-zero reactions are listed.

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

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base @ Top	k	Y-Y Axis Reaction @ Base @ Top	Mx - End Moments @ Base @ Top	k-ft	My - End Moments @ Base @ Top
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Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
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Steel Section Properties : **W12x26**

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Steel Column

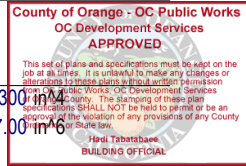
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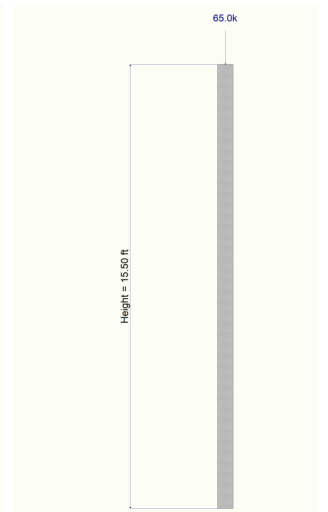
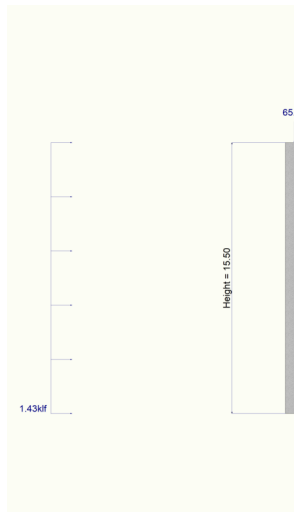
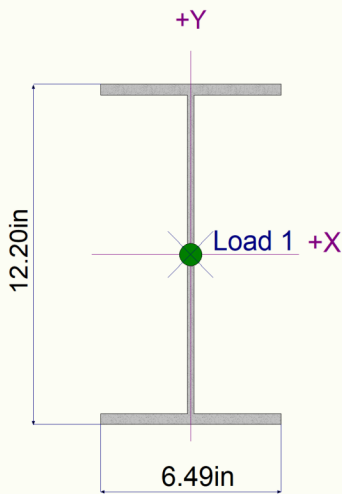
DESCRIPTION: GLC (1)

Steel Section Properties : W12x26

Depth	=	12.200 in	I xx	=	204.00 in ⁴	J	=	0.300 in ⁴
Web Thick	=	0.230 in	S xx	=	33.40 in ³	Cw	=	607.00 in ⁶
Flange Width	=	6.490 in	R xx	=	5.170 in			
Flange Thick	=	0.380 in	Zx	=	37.200 in ³			
Area	=	7.650 in ²	I yy	=	17.300 in ⁴			
Weight	=	26.041 plf	S yy	=	5.340 in ³	Wno	=	19.200 in ²
Kdesign	=	0.680 in	R yy	=	1.510 in	Sw	=	11.800 in ⁴
K1	=	0.750 in	Zy	=	8.170 in ³	Qf	=	7.030 in ³
rts	=	1.750 in				Qw	=	18.300 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

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 2019-08-21 08:24:05 MEC21-0513

DESCRIPTION: GLC (2)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W18x50	Overall Column Height	30 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	



Applied Loads

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

Column self weight included : 1,501.16 lbs * Dead Load Factor
 AXIAL LOADS . . .
 drag load: Axial Load at 30.0 ft, E = 187.30 k
 BENDING LOADS . . .
 Lat. Uniform Load creating Mx-x, D = 0.7840, L = 0.650 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7685** : 1
 Load Combination **+1.20D+0.50L+E**
 Location of max.above base **14.899** ft
 At maximum location values are . . .

Pu	189.101	k
0.9 * Pn	444.419	k
Mu-x	142.396	k-ft
0.9 * Mn-x :	368.996	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	62.250	k-ft

PASS Maximum Shear Stress Ratio = **0.1550** : 1
 Load Combination **+1.20D+1.60L**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	29.712	k
Vn * Phi : Allowable	191.70	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				CbX	CbY	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	

Maximum Reactions

Note: Only non-zero reactions are listed.

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

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base @ Top	k	Y-Y Axis Reaction @ Base @ Top	Mx - End Moments @ Base @ Top	k-ft	My - End Moments @ Base @ Top
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Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
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Steel Section Properties : **W18x50**

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Steel Column

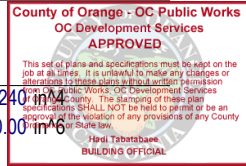
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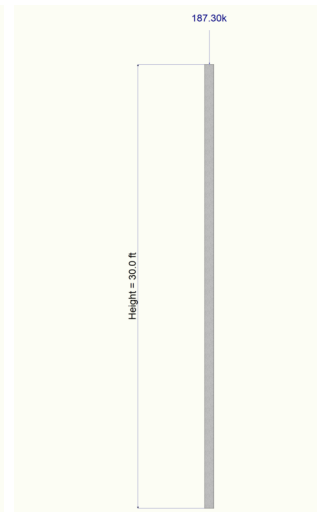
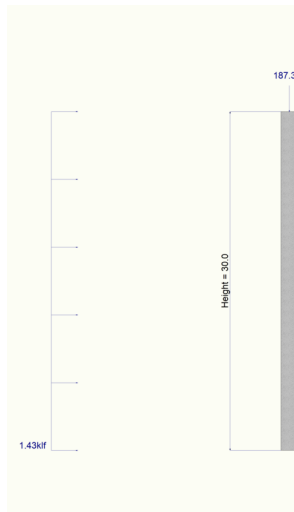
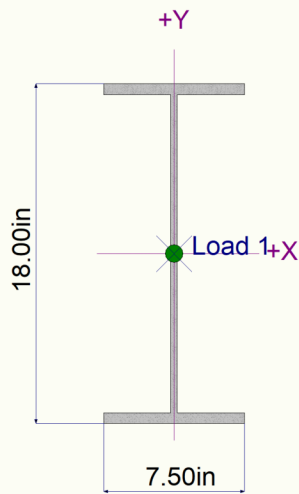
DESCRIPTION: GLC (2)

Steel Section Properties : W18x50

Depth	=	18.000 in	I xx	=	800.00 in ⁴	J	=	1.240 in ⁴
Web Thick	=	0.355 in	S xx	=	88.90 in ³	Cw	=	3,040.00 in ⁶
Flange Width	=	7.500 in	R xx	=	7.380 in			
Flange Thick	=	0.570 in	Zx	=	101.000 in ³			
Area	=	14.700 in ²	I yy	=	40.100 in ⁴			
Weight	=	50.039 plf	S yy	=	10.700 in ³	Wno	=	32.700 in ²
Kdesign	=	0.972 in	R yy	=	1.650 in	Sw	=	34.900 in ⁴
K1	=	0.813 in	Zy	=	16.600 in ³	Qf	=	17.700 in ³
rts	=	1.980 in				Qw	=	49.900 in ³
Ycg	=	0.000 in						



Sketches



Steel Column

Lic. #: KW-06003761

DESCRIPTION: GLC (3)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : IBC 2018

General Information

Steel Section Name :	W12x26	Overall Column Height	16.5 ft
Analysis Method :	Load Resistance Factor	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	50.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

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

Column self weight included : 429.670 lbs * Dead Load Factor

AXIAL LOADS . . .

drag load: Axial Load at 16.50 ft, E = 70.40 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, D = 0.720, L = 0.7250 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6157** : 1
 Load Combination **+1.20D+0.50L+E**
 Location of max.above base **8.195** ft
 At maximum location values are . . .

Pu	70.916	k
0.9 * Pn	214.729	k
Mu-x	41.737	k-ft
0.9 * Mn-x :	129.966	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	30.638	k-ft

PASS Maximum Shear Stress Ratio = **0.1984** : 1
 Load Combination **+1.20D+1.60L**
 Location of max.above base **0.0** ft
 At maximum location values are . . .

Vu : Applied	16.698	k
Vn * Phi : Allowable	84.180	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				Cbz	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
Maximum Reactions											
	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments	Note: Only non-zero reactions are listed.			
Load Combination	@ Base	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top				
Extreme Reactions											
Item	Axial Reaction	X-X Axis Reaction	k	Y-Y Axis Reaction	Mx - End Moments	k-ft	My - End Moments				
	Extreme Value	@ Base @ Top		@ Base @ Top	@ Base @ Top	@ Top	@ Base @ Top				
Maximum Deflections for Load Combinations											
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance							
Steel Section Properties : W12x26											



Steel Column

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DESCRIPTION: GLC (3)

Steel Section Properties : W12x26

Depth	=	12.200 in	I xx	=	204.00 in ⁴	J	=	0.300 in ⁴
Web Thick	=	0.230 in	S xx	=	33.40 in ³	Cw	=	607.00 in ⁶
Flange Width	=	6.490 in	R xx	=	5.170 in			
Flange Thick	=	0.380 in	Zx	=	37.200 in ³			
Area	=	7.650 in ²	I yy	=	17.300 in ⁴			
Weight	=	26.041 plf	S yy	=	5.340 in ³	Wno	=	19.200 in ²
Kdesign	=	0.680 in	R yy	=	1.510 in	Sw	=	11.800 in ⁴
K1	=	0.750 in	Zy	=	8.170 in ³	Qf	=	7.030 in ³
rts	=	1.750 in				Qw	=	18.300 in ³
Ycg	=	0.000 in						



Sketches

