



February 27, 2024

SUPPLEMENTAL STRUCTURAL CALCULATIONS
(Permit Comment Response)

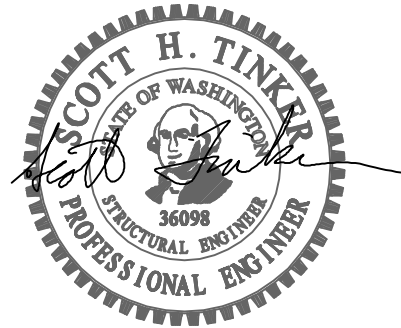
DUFFY/MCALEESE REMODEL

5330 Lansdowne Lane
Mercer Island, WA 98040

Quantum Job Number: 23488.01

Prepared for:
CHESMORE BUCK ARCHITECTURE
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Wood Column

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

(c) ENERCALC INC 1983-2022

DESCRIPTION: Slider Door Post

Code References

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

General Information

Analysis Method	Allowable Stress Design			Wood Section Name	3-2x4
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Height	8 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Species	Hem-Fir			Exact Width	4.50 in
Wood Grade	No.2			Exact Depth	3.50 in
Fb +	850 psi	Fv	150 psi	Area	15.750 in ²
Fb -	850 psi	Ft	525 psi	Ix	16.078 in ⁴
Fc - Prll	1300 psi	Density	26.84 pcf	Iy	26.578 in ⁴
Fc - Perp	405 psi			Allow Stress Modification Factors	
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Cf or Cv for Bending 1.50	
	Basic	1300	1300	1300 ksi	Cf or Cv for Compression 1.150
	Minimum	470	470		Cf or Cv for Tension 1.50
					Cm : Wet Use Factor 1.0
					Ct : Temperature Fact 1.0
					Cfu : Flat Use Factor 1.0
					Kf : Built-up columns 1.0 <i>NDS 15.3.2</i>
					Use Cr : Repetitive ? No

Brace condition for deflection (buckling) along columns :

X-X (width) axis : Unbraced Length for buckling ABOUT Y-Y Axis = 8

Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 8

Applied Loads

Service loads entered. Load Factors will be applied for calculations

Column self weight included : 23.485 lbs * Dead Load Factor

AXIAL LOADS . . .

Slider Header: Axial Load at 8.0 ft, D = 2.50, Lr = 2.0, S = 2.20 k

BENDING LOADS . . .

wind: Lat. Uniform Load creating My-y, W = 0.0320 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6288 : 1**
 Load Combination +D+S
 Governing NDS Formula Comp Only, fc/Fc'
 Location of max.above base 0.0 ft
 At maximum location values are .
 Applied Axial 4.723 k
 Applied Mx 0.0 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 476.911 psi

Maximum SERVICE Lateral Load Reactions . .
 Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k
 Top along X-X 0.1280 k Bottom along X-X 0.1280 k

Maximum SERVICE Load Lateral Deflections . . .
 Along Y-Y 0.0 in at 0.0 ft above base
 for load combination : n/a
 Along X-X 0.08628 in at 4.027 ft above base
 for load combination : W Only

Other Factors used to calculate allowable stresses . . .
 Bending Compression Tension

PASS Maximum Shear Stress Ratio = **0.03048 : 1**
 Load Combination +D+0.60W
 Location of max.above base 0.0 ft
 Applied Design Shear 7.314 psi
 Allowable Shear 240.0 psi

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.900	0.345	0.3449	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+Lr	1.250	0.257	0.5980	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+S	1.150	0.277	0.6288	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750Lr	1.250	0.257	0.5319	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.750S	1.150	0.277	0.5556	PASS	0.0 ft	0.0	PASS	8.0 ft
+D+0.60W	1.600	0.204	0.3280	PASS	0.0 ft	0.03048	PASS	0.0 ft
+D+0.750Lr+0.450W	1.600	0.204	0.5230	PASS	0.0 ft	0.02286	PASS	0.0 ft
+D+0.750S+0.450W	1.600	0.204	0.5425	PASS	0.0 ft	0.02286	PASS	0.0 ft
+0.60D+0.60W	1.600	0.204	0.1968	PASS	0.0 ft	0.03048	PASS	0.0 ft

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Wood Column

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

(c) ENERCALC INC 1983-2022

DESCRIPTION: Slider Door Post

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+0.60D	1.600	0.204	0.1968	PASS	0.0 ft	0.0	PASS	8.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						2.523				
+D+Lr						4.523				
+D+S						4.723				
+D+0.750Lr						4.023				
+D+0.750S						4.173				
+D+0.60W	0.077	0.077				2.523				
+D+0.750Lr+0.450W	0.058	0.058				4.023				
+D+0.750S+0.450W	0.058	0.058				4.173				
+0.60D+0.60W	0.077	0.077				1.514				
+0.60D						1.514				
Lr Only						2.000				
S Only						2.200				
W Only	0.128	0.128								

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance	Distance	Distance	Distance
D Only	0.0000in	0.000ft	0.000 in	0.000ft
+D+Lr	0.0000in	0.000ft	0.000 in	0.000ft
+D+S	0.0000in	0.000ft	0.000 in	0.000ft
+D+0.750Lr	0.0000in	0.000ft	0.000 in	0.000ft
+D+0.750S	0.0000in	0.000ft	0.000 in	0.000ft
+D+0.60W	0.0518in	4.027ft	0.000 in	0.000ft
+D+0.750Lr+0.450W	0.0388in	4.027ft	0.000 in	0.000ft
+D+0.750S+0.450W	0.0388in	4.027ft	0.000 in	0.000ft
+0.60D+0.60W	0.0518in	4.027ft	0.000 in	0.000ft
+0.60D	0.0000in	0.000ft	0.000 in	0.000ft
Lr Only	0.0000in	0.000ft	0.000 in	0.000ft
S Only	0.0000in	0.000ft	0.000 in	0.000ft
W Only	0.0863in	4.027ft	0.000 in	0.000ft

Wood Column

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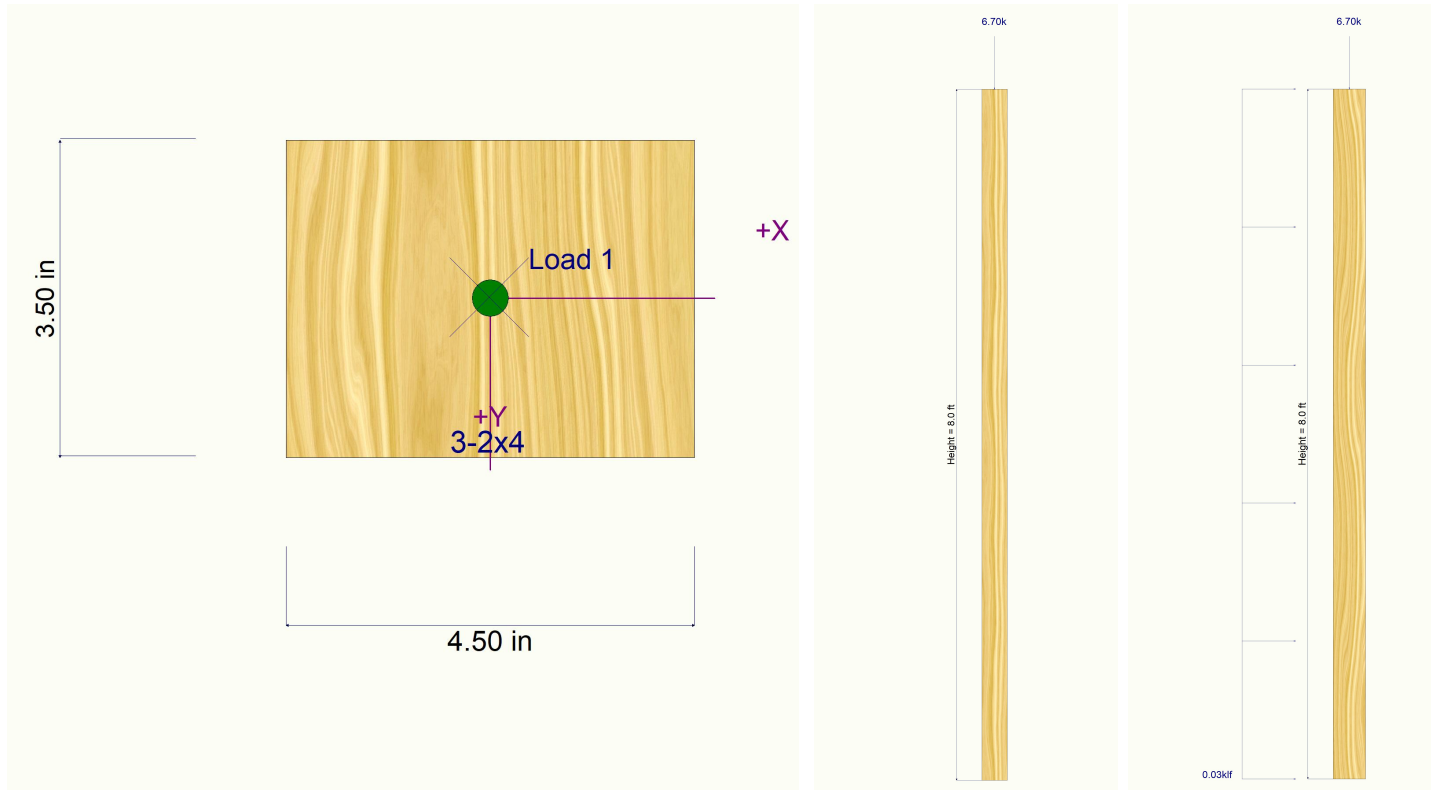
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DESCRIPTION: Slider Door Post

Sketches



Wood Column

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

(c) ENERCALC INC 1983-2022

DESCRIPTION: UB1 Bathroom Post

Code References

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

General Information

Analysis Method	Allowable Stress Design			Wood Section Name	2-2x4
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Height	7.6 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Species	Hem-Fir			Exact Width	3.0 in
Wood Grade	No.2			Exact Depth	3.50 in
Fb +	850.0 psi	Fv	150.0 psi	Area	10.50 in^2
Fb -	850.0 psi	Ft	525.0 psi	Ix	10.719 in^4
Fc - Prll	1,300.0 psi	Density	26.840 pcf	Iy	7.875 in^4
Fc - Perp	405.0 psi			Allow Stress Modification Factors	
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Cf or Cv for Bending 1.50	
	Basic	1,300.0	1,300.0	1,300.0 ksi	Cf or Cv for Compression 1.150
	Minimum	470.0	470.0		Cf or Cv for Tension 1.50
					Cm : Wet Use Factor 1.0
					Ct : Temperature Fact 1.0
					Cfu : Flat Use Factor 1.0
					Kf : Built-up columns 1.0 <i>NDS 15.3.2</i>
					Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :					
X-X (width) axis : Unbraced Length for buckling ABOUT Y-Y Axis = 7.					
Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 7.					

Applied Loads

Service loads entered. Load Factors will be applied for calculations

Column self weight included : 14.874 lbs * Dead Load Factor

AXIAL LOADS . . .

Slider Header: Axial Load at 7.60 ft, D = 0.740, Lr = 2.40 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7575 : 1**
 Load Combination +D+Lr
 Governing NDS Formula Comp Only, f_c/F_c'
 Location of max.above base 0.0 ft
 At maximum location values are .
 Applied Axial 3.155 k
 Applied Mx 0.0 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 396.667 psi

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

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

PASS Maximum Shear Stress Ratio = **0.0 : 1**
 Load Combination +0.60D
 Location of max.above base 7.60 ft
 Applied Design Shear 0.0 psi
 Allowable Shear 240.0 psi

Other Factors used to calculate allowable stresses . . .
Bending Compression Tension

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.900	0.287	0.1859	PASS	0.0 ft	0.0	PASS	7.60 ft
+D+Lr	1.250	0.212	0.7575	PASS	0.0 ft	0.0	PASS	7.60 ft
+D+0.750Lr	1.250	0.212	0.6134	PASS	0.0 ft	0.0	PASS	7.60 ft
+0.60D	1.600	0.168	0.1074	PASS	0.0 ft	0.0	PASS	7.60 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k		Y-Y Axis Reaction k		Axial Reaction k	My - End Moments k-ft		Mx - End Moments k-ft	
	@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only					0.755				
+D+Lr					3.155				
+D+0.750Lr					2.555				

Wood Column

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DESCRIPTION: UB1 Bathroom Post

Maximum Reactions

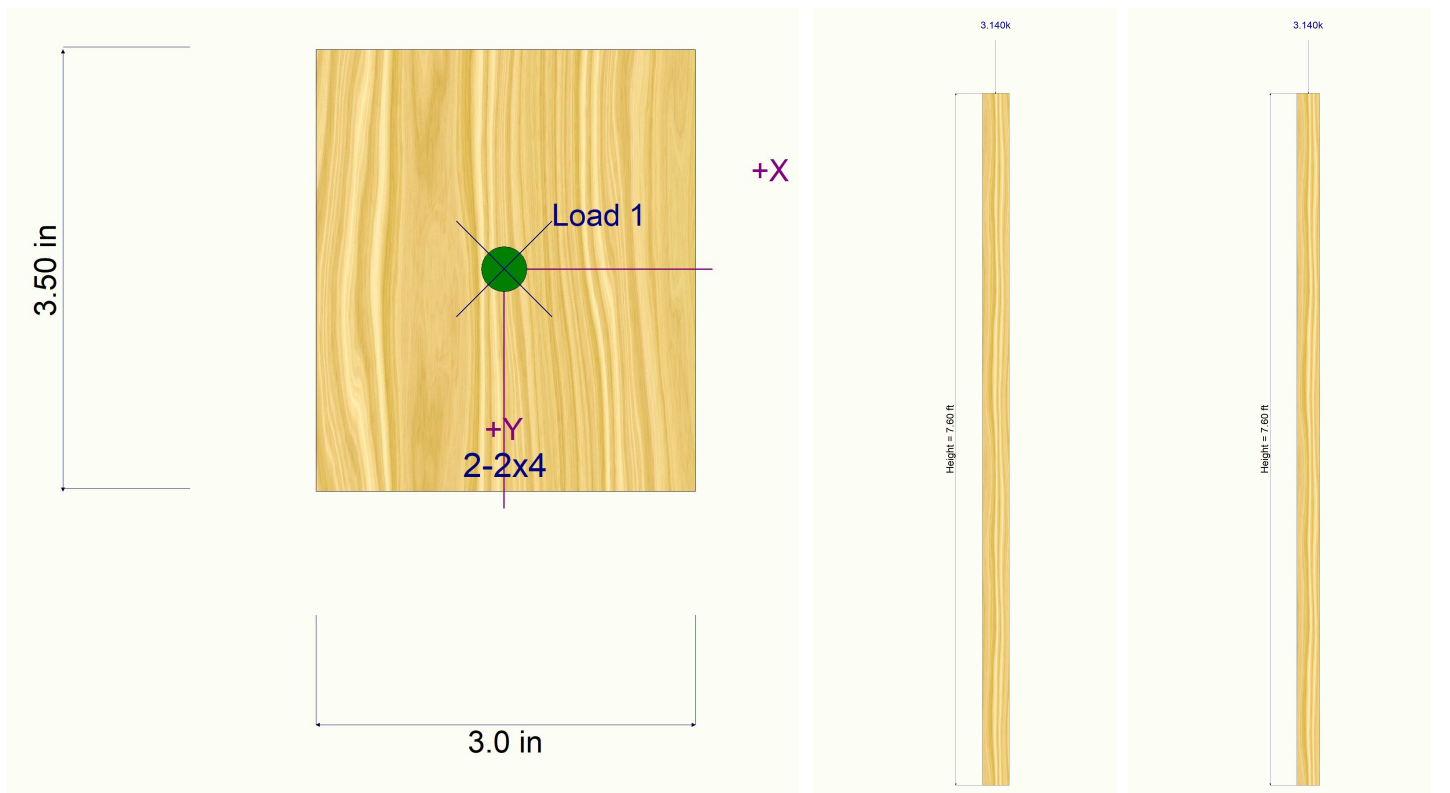
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top	@ Base	@ Top	@ Base	@ Base	@ Top	@ Base	@ Top
+0.60D					0.453				
Lr Only					2.400				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000in	0.000ft	0.000 in	0.000ft
+D+Lr	0.000in	0.000ft	0.000 in	0.000ft
+D+0.750Lr	0.000in	0.000ft	0.000 in	0.000ft
+0.60D	0.000in	0.000ft	0.000 in	0.000ft
Lr Only	0.000in	0.000ft	0.000 in	0.000ft

Sketches



Wood Column

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: UB2 Bathroom Post

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+Lr						6.422				
+D+S						6.222				
+D+0.750Lr						5.522				
+D+0.750S						5.372				
+0.60D						1.693				
Lr Only						3.600				
S Only						3.400				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000in	0.000ft	0.000 in	0.000ft
+D+Lr	0.0000in	0.000ft	0.000 in	0.000ft
+D+S	0.0000in	0.000ft	0.000 in	0.000ft
+D+0.750Lr	0.0000in	0.000ft	0.000 in	0.000ft
+D+0.750S	0.0000in	0.000ft	0.000 in	0.000ft
+0.60D	0.0000in	0.000ft	0.000 in	0.000ft
Lr Only	0.0000in	0.000ft	0.000 in	0.000ft
S Only	0.0000in	0.000ft	0.000 in	0.000ft

Sketches

