



Miles Residence and Attached Beach

Project Number: 21-162

3623 E Shaver St
Portland, OR 97212

Structural Calculations

Calculations.....S1 – S6



Prepared by:
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October 26th, 2021

SUBMITTED
10/27/2021

PROJECT DESCRIPTION

REPAIR/REINFORCEMENT OF (E) WATER DAMAGED GLB IN GARAGE OF
A 2014 HOUSE LOCATED AT 3623 NE SHAVERST IN PORTLAND, OR

FLOOR LOADS

DEAD LOAD : 15 psf

LIVE LOAD: 40 psf

DECK LIVE LOAD: 60 psf

ROOF LOADS

DEAD LOAD: 15 psf

LIVE LOAD (SNOW): 25 psf

(E) BEAM LOADING

ROOF LIVE: $2.5\text{ft} \times 25\text{psf} = 63\text{plf}$

ROOF DEAD: $2.5\text{FT} \times 15\text{psf} = 38\text{plf}$

2ND FLOOR LIVE: $11\text{ft} \times 15\text{psf} = 165\text{plf}$

2ND FLOOR DEAD: $11\text{ft} \times 40\text{psf} = 440\text{plf}$

1ST FLOOR LIVE: $7\text{ft} \times 40\text{psf} = 280\text{plf}$

1ST FLOOR DECK: $3.5\text{ft} \times 60\text{psf} = 210\text{plf}$

1ST FLOOR DEAD: $10.5 \times 15\text{psf} = 158\text{plf}$

TOTAL = 1,354plf

TOTAL DEAD LOAD = $38\text{plf} + 440\text{plf} + 158\text{plf} = 636\text{plf}$

TOTAL LIVE LOAD = $165\text{plf} + 280\text{plf} + 210\text{plf} = 655\text{plf}$

TOTAL SNOW LOAD = 63plf

Top portion of GLB assumed to still endure compression from bending. Double steel angles used to strengthen bottom portion of GLB.

Calculations on the subsequent pages are for a simple span LL7x4x3/8 which is 71% overstressed in bending. However, the 19.5" deep GLB will put the neutral axis for the bending of the composite section above the angles. The angles will therefore be solely in tension.

Max moment on beam = 41.31 k-ft (see EnerCalc existing beam check)

Max tension on bottom face = $(41.31 \text{ k-ft} \times 12 \text{ in/ft}) / 19.5 \text{ in} = 8,806 \text{ lbs}$

Tension per angle = $8,806 \text{ lbs} / 2 = 4,403 \text{ lbs}$ ---> L7x4x3/8 OK by observation

Check 3/8" dia thru bolts from angles to beam:

Number of bolts: $16\text{ft} / 1.33\text{ft} = 12$

Capacity per bolt = 1,051 lbs (see AWC connection calculator printout)

Total shear capacity = $1,051 \text{ lbs} \times 12 = 12,612 \text{ lbs} > 8,806 \text{ lbs}$ OK



PROJECT: Miles Residence Damaged Beam

DESCRIPTION: Loading on Existing Garage Beam

BY: NKH

DATE: 10/26/2021

JOB #: 21-162

Page 1

NKH Engineering

S1

Wood Beam

Lic. #: KW-06013860

File: Steel Channels.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
 NKH Engineering

DESCRIPTION: Existing GLB Check

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

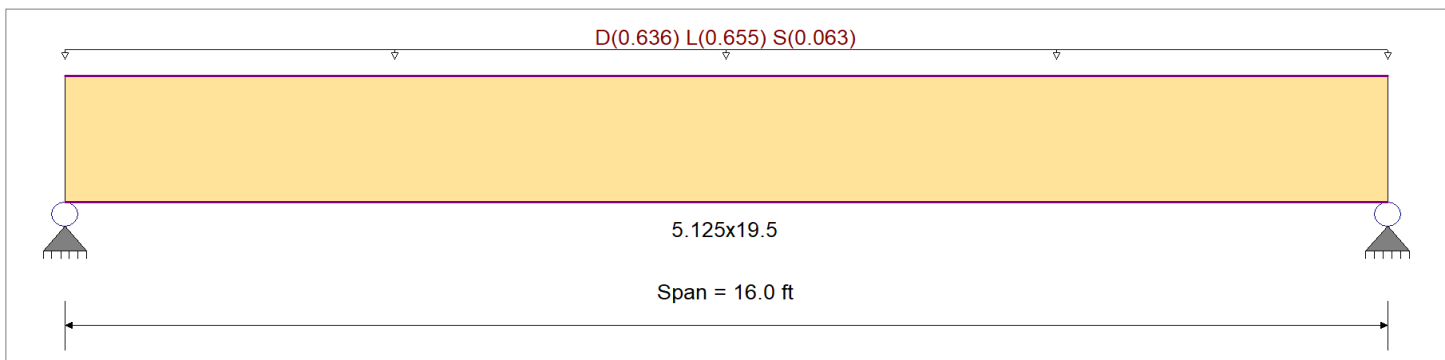
Analysis Method : Allowable Stress Design
 Load Combination : ASCE 7-16

Wood Species : DF/DF
 Wood Grade : 24F-V4

Fb + 2,400.0 psi
 Fb - 1,850.0 psi
 Fc - Prll 1,650.0 psi
 Fc - Perp 650.0 psi
 Fv 265.0 psi
 Ft 1,100.0 psi

E : Modulus of Elasticity
 Ebend-xx 1,800.0 ksi
 Eminbend-xx 950.0 ksi
 Ebend-yy 1,600.0 ksi
 Eminbend-yy 850.0 ksi
 Density 31.210 pcf

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



Applied Loads

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

Uniform Load : D = 0.6360, L = 0.6550, S = 0.0630, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.650	1	Maximum Shear Stress Ratio	=	0.470	1
Section used for this span		5.125x19.5		Section used for this span		5.125x19.5	
fb: Actual	=	1,526.32 psi		fv: Actual	=	124.47 psi	
Fb: Allowable	=	2,349.29 psi		Fv: Allowable	=	265.00 psi	
Load Combination		+D+L+H		Load Combination		+D+L+H	
Location of maximum on span	=	8.000 ft		Location of maximum on span	=	14.423 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.170 in	Ratio = 1126	>=360			
Max Upward Transient Deflection		0.000 in	Ratio = 0	<360			
Max Downward Total Deflection		0.336 in	Ratio = 571	>=180			
Max Upward Total Deflection		0.000 in	Ratio = 0	<180			

Maximum Forces & Stresses for Load Combinations

Load Combination Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
		M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.356	0.257	0.90	0.979	1.00	1.00	1.00	1.00	1.00	20.35	751.93	2114.36	4.09	61.32	238.50
+D+L+H					0.979	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.650	0.470	1.00	0.979	1.00	1.00	1.00	1.00	1.00	41.31	1,526.32	2349.29	8.29	124.47	265.00
+D+Lr+H					0.979	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.256	0.185	1.25	0.979	1.00	1.00	1.00	1.00	1.00	20.35	751.93	2936.61	4.09	61.32	331.25
+D+S+H					0.979	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.306	0.221	1.15	0.979	1.00	1.00	1.00	1.00	1.00	22.37	826.41	2701.68	4.49	67.39	304.75
+D+0.750Lr+0.750L+H					0.979	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.454	0.328	1.25	0.979	1.00	1.00	1.00	1.00	1.00	36.07	1,332.72	2936.61	7.24	108.68	331.25
+D+0.750L+0.750S+H					0.979	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.514	0.372	1.15	0.979	1.00	1.00	1.00	1.00	1.00	37.58	1,388.58	2701.68	7.54	113.23	304.75
+D+0.60W+H					0.979	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 16.0 ft	1	0.200	0.145	1.60	0.979	1.00	1.00	1.00	1.00	1.00	20.35	751.93	3758.86	4.09	61.32	424.00



Project Title: Miles Residence Damaged Beam
 Engineer: NKH
 Project ID: 21-162
 Project Descr:

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Wood Beam

File: Steel Channels.ec6

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Lic. #: KW-06013860

NKH Engineering

DESCRIPTION: Existing GLB Check

Load Combination	Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
			M	V								M	fb	F'b	V	fv	Fv
+D+0.750Lr+0.750L+0.450W+H	Length = 16.0 ft	1	0.355	0.256	1.60	0.979	1.00	1.00	1.00	1.00	1.00	36.07	1,332.72	3758.86	7.24	108.68	424.00
+D+0.750L+0.750S+0.450W+H	Length = 16.0 ft	1	0.369	0.267	1.60	0.979	1.00	1.00	1.00	1.00	1.00	37.58	1,388.58	3758.86	0.00	0.00	0.00
+0.60D+0.60W+0.60H	Length = 16.0 ft	1	0.120	0.087	1.60	0.979	1.00	1.00	1.00	1.00	1.00	12.21	451.16	3758.86	7.54	113.23	424.00
+D+0.70E+0.60H	Length = 16.0 ft	1	0.200	0.145	1.60	0.979	1.00	1.00	1.00	1.00	1.00	20.35	751.93	3758.86	0.00	0.00	0.00
+D+0.750L+0.750S+0.5250E+H	Length = 16.0 ft	1	0.369	0.267	1.60	0.979	1.00	1.00	1.00	1.00	1.00	37.58	1,388.58	3758.86	4.09	61.32	424.00
+0.60D+0.70E+H	Length = 16.0 ft	1	0.120	0.087	1.60	0.979	1.00	1.00	1.00	1.00	1.00	12.21	451.16	3758.86	0.00	0.00	0.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.3359	8.058		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	10.328	10.328
Overall MINimum	0.504	0.504
+D+H	5.088	5.088
+D+L+H	10.328	10.328
+D+Lr+H	5.088	5.088
+D+S+H	5.592	5.592
+D+0.750Lr+0.750L+H	9.018	9.018
+D+0.750L+0.750S+H	9.396	9.396
+D+0.60W+H	5.088	5.088
+D+0.750Lr+0.750L+0.450W+H	9.018	9.018
+D+0.750L+0.750S+0.450W+H	9.396	9.396
+0.60D+0.60W+0.60H	3.053	3.053
+D+0.70E+0.60H	5.088	5.088
+D+0.750L+0.750S+0.5250E+H	9.396	9.396
+0.60D+0.70E+H	3.053	3.053
D Only	5.088	5.088
L Only	5.240	5.240
S Only	0.504	0.504
H Only		



Project Title: Miles Residence Damaged Beam
Engineer: NKH
Project ID: 21-162
Project Descr:

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Steel Beam

Lic. #: KW-06013860

File: Steel Channels.ec6
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NKH Engineering

DESCRIPTION: Steel Angle Beam Reinforcing

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

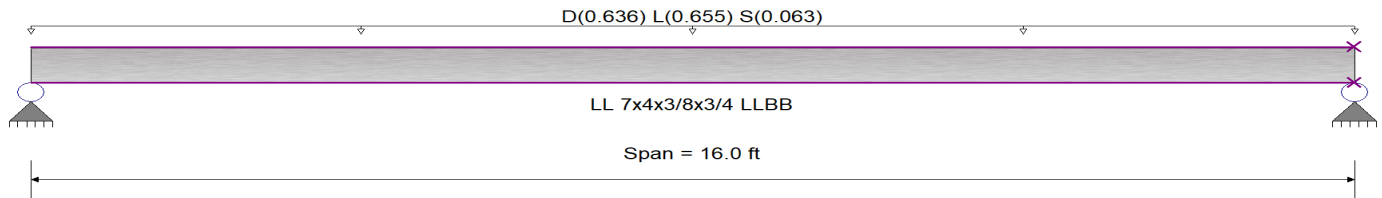
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

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

Vertical Leg Up



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.6360, L = 0.6550, S = 0.0630 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design N.G.

Maximum Bending Stress Ratio =	1.712 : 1	Maximum Shear Stress Ratio =	0.110 : 1
Section used for this span	LL 7x4x3/8x3/4 LLBB	Section used for this span	LL 7x4x3/8x3/4 LLBB
Ma : Applied	41.312 k-ft	Va : Applied	10.328 k
Mn / Omega : Allowable	24.129 k-ft	Vn / Omega : Allowable	94.311 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	8.000 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.814 in	Ratio =	235 < 360
Max Upward Transient Deflection	0.000 in	Ratio =	0 < 360
Max Downward Total Deflection	1.608 in	Ratio =	119 < 180
Max Upward Total Deflection	0.000 in	Ratio =	0 < 180

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 16.00 ft	1	0.843	0.054	20.35		20.35	40.30	24.13	1.00	1.00	5.09	157.50	94.31
+D+L+H													
Dsgn. L = 16.00 ft	1	1.712	0.110	41.31		41.31	40.30	24.13	1.00	1.00	10.33	157.50	94.31
+D+Lr+H													
Dsgn. L = 16.00 ft	1	0.843	0.054	20.35		20.35	40.30	24.13	1.00	1.00	5.09	157.50	94.31
+D+S+H													
Dsgn. L = 16.00 ft	1	0.927	0.059	22.37		22.37	40.30	24.13	1.00	1.00	5.59	157.50	94.31
+D+0.750Lr+0.750L+H													
Dsgn. L = 16.00 ft	1	1.495	0.096	36.07		36.07	40.30	24.13	1.00	1.00	9.02	157.50	94.31
+D+0.750L+0.750S+H													
Dsgn. L = 16.00 ft	1	1.558	0.100	37.58		37.58	40.30	24.13	1.00	1.00	9.40	157.50	94.31
+D+0.60W+H													
Dsgn. L = 16.00 ft	1	0.843	0.054	20.35		20.35	40.30	24.13	1.00	1.00	5.09	157.50	94.31
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 16.00 ft	1	1.495	0.096	36.07		36.07	40.30	24.13	1.00	1.00	9.02	157.50	94.31
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 16.00 ft	1	1.558	0.100	37.58		37.58	40.30	24.13	1.00	1.00	9.40	157.50	94.31
+0.60D+0.60W+0.60H													
Dsgn. L = 16.00 ft	1	0.506	0.032	12.21		12.21	40.30	24.13	1.00	1.00	3.05	157.50	94.31
+D+0.70E+0.60H													
Dsgn. L = 16.00 ft	1	0.843	0.054	20.35		20.35	40.30	24.13	1.00	1.00	5.09	157.50	94.31
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 16.00 ft	1	1.558	0.100	37.58		37.58	40.30	24.13	1.00	1.00	9.40	157.50	94.31



Project Title: Miles Residence Damaged Beam
 Engineer: NKH
 Project ID: 21-162
 Project Descr:

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Steel Beam

File: Steel Channels.ec6

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Lic. # : KW-06013860

NKH Engineering

DESCRIPTION: Steel Angle Beam Reinforcing

Load Combination		Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+H													
Dsgn. L = 16.00 ft	1	0.506	0.032	12.21		12.21	40.30	24.13	1.00	1.00	3.05	157.50	94.31

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	1.6084	8.046		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Overall MAXimum	10.328	10.328
Overall MINimum	0.504	0.504
+D+H	5.088	5.088
+D+L+H	10.328	10.328
+D+Lr+H	5.088	5.088
+D+S+H	5.592	5.592
+D+0.750Lr+0.750L+H	9.018	9.018
+D+0.750L+0.750S+H	9.396	9.396
+D+0.60W+H	5.088	5.088
+D+0.750Lr+0.750L+0.450W+H	9.018	9.018
+D+0.750L+0.750S+0.450W+H	9.396	9.396
+0.60D+0.60W+0.60H	3.053	3.053
+D+0.70E+0.60H	5.088	5.088
+D+0.750L+0.750S+0.5250E+H	9.396	9.396
+0.60D+0.70E+H	3.053	3.053
D Only	5.088	5.088
L Only	5.240	5.240
S Only	0.504	0.504
H Only		

Design Method	Allowable Stress Design (ASD) ▼
Connection Type	Lateral loading ▼
Fastener Type	Bolt ▼
Loading Scenario	Double Shear - Wood Main Member ▼

Main Member Type	Glulam Douglas Fir-Larch ▼
Main Member Thickness	5.125 in. ▼
Main Member: Angle of Load to Grain	0
Side Member Type	Steel ▼
Side Member Thickness	1/4 in. ▼
Side Member: Angle of Load to Grain	0
Fastener Diameter	3/8 in. ▼
Load Duration Factor	C _D = 1.0 ▼
Wet Service Factor	C _M = 1.0 ▼
Temperature Factor	C _t = 1.0 ▼

Connection Yield Modes

Im	2691 lbs.
Is	4078 lbs.
III _s	1051 lbs.
IV	1104 lbs.

Adjusted ASD Capacity	1051 lbs.
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- Bolt bending yield strength of 45,000 psi is assumed.
- The Adjusted ASD Capacity is only applicable for bolts with adequate end distance, edge distance and spacing per NDS chapter 11.
- ASTM A36 Steel is assumed for steel side members 1/4 in. thick, and ASTM A653 Grade 33 Steel is assumed for steel side members less than 1/4 in. thick.

While every effort has been made to insure the accuracy of the information presented, and special effort has been made to assure that the information reflects the state-of-the-art, neither the American Wood Council nor its members assume any responsibility for any particular design prepared from this on-line Connection Calculator. Those using this on-line Connection Calculator assume all liability from its use.

The Connection Calculator was designed and created by Cameron Knudson, Michael Dodson and David Pollock at Washington State University. Support for development of the Connection Calculator was provided by [American Wood Council](#).