Stephen Tapp

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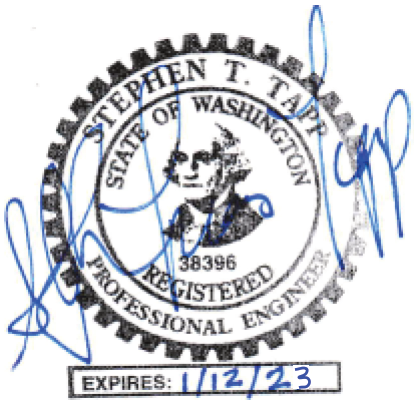
Additional Structural Calculations

for

Petrie New Residence

2431 60th Avenue SE
Mercer Island, Washington 98040



Date: April 2021
Project: T20B3
Building Code Reference: 2015 IBC

STEPHEN TAPP
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SEATTLE, WA 98112
(206) 320-0534

JOB PETRIE

SHEET NO. _____ OF _____

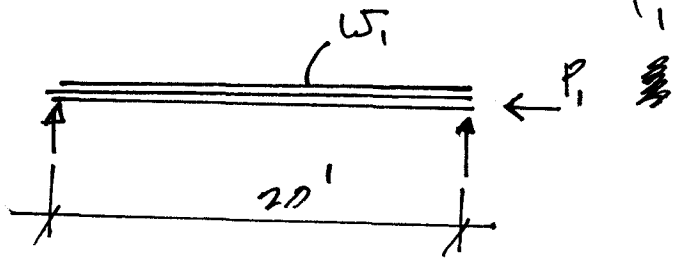
CALCULATED BY STT DATE 4/1/21

CHECKED BY _____ DATE _____

SCALE _____

CHECK COLLECTOR BEAM
GRID 'B' UPPER ROOF
Pg 25 #2

	DL	LL	W
w_1	.12 klf	.2 klf	
P_1			2.5 k



Harden Anderson Addition
1525 NW Jonquil Lane
Issaquah, Washington
0
0
0

Project Title: Petrie Residence
Engineer: STT
Project ID:
Project Descr: New Residence

Printed: 1 APR 2021, 10:08PM

Wood Column

Lic. # : KW-06011595 stephen tapp architect/pe

DESCRIPTIO Drag Strut-DS-200

Code References

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combinations Used : ASCE 7-05

General Information

Analysis Metho	Allowable Stress Design		
End Fixities	Top Free, Bottom Fixed		
Overall Column Heigh	10 ft		
(Used for non-slender calculations)			
Wood Specie	Trus Joist		
Wood Grade	Parallam PSL 2.2E		
Fb +	2900 psi	Fv	290 psi
Fb -	2900 psi	Ft	2025 psi
Fc - Prll	2900 psi	Density	45.07 pcf
Fc - Perp	625 psi		

E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
Basic	2200	2200	2200 ksi
Minimum	1118.19	1118.19	

Wood Section Name	**3.5x14.0**		
Wood Grading/Manuf.	Trus Joist		
Wood Member Type	Parallam PSL		
Exact Width	**3.50** in	Allow Stress Modification Factors	
Exact Depth	**14.0** in	Cf or Cv for Bending	0.9830
Area	49.0 in^2	Cf or Cv for Compressio	1.0
Ix	800.33 in^4	Cf or Cv for Tension	0.9830
Iy	50.021 in^4	Cm : Wet Use Factor	1.0
		Ct : Temperature Fact	1.0
		Cfu : Flat Use Factor	1.0
		Kf : Built-up columns	1.0 *NDS 15.3.2*
		Use Cr : Repetitive	No

Brace condition for deflection (buckling) along columns :
X-X (width) axis Fully braced against buckling ABOUT Y-Y Axis
Y-Y (depth) axis Fully braced against buckling ABOUT X-X Axis

Applied Loads

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

Column self weight included : 153.363 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 10.0 ft, W = 2.50 k
BENDING LOADS . . .
Lat. Uniform Load creating Mx-x, D = 0.120, S = 0.20 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5122 : 1**

Load Combination	+D+S+H
Governing NDS Formula	Comp + Mxx, NDS Eq. 3.9-3
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	0.1534 k
Applied Mx	-16.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	3,278.42 psi

PASS Maximum Shear Stress Ratio = **0.2937 : 1**

Load Combination	+D+S+H
Location of max.above base	0.0 ft
Applied Design Shear	97.959 psi
Allowable Shear	333.50 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	3.20 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.3908 in at 10.0 ft above base
for load combination : +D+S+H

Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	1.000	0.2454	PASS	0.0 ft	0.1407	PASS	0.0 ft
+D+L+H	1.000	1.000	0.2209	PASS	0.0 ft	0.1267	PASS	0.0 ft
+D+Lr+H	1.250	1.000	0.1767	PASS	0.0 ft	0.1013	PASS	0.0 ft
+D+S+H	1.150	1.000	0.5122	PASS	0.0 ft	0.2937	PASS	0.0 ft
+D+0.750Lr+0.750L+H	1.250	1.000	0.1767	PASS	0.0 ft	0.1013	PASS	0.0 ft
+D+0.750L+0.750S+H	1.150	1.000	0.4322	PASS	0.0 ft	0.2478	PASS	0.0 ft
+D+W+H	1.600	1.000	0.1382	PASS	0.0 ft	0.07917	PASS	0.0 ft
+D+0.70E+H	1.600	1.000	0.1381	PASS	0.0 ft	0.07917	PASS	0.0 ft
+D+0.750Lr+0.750L+0.750W+H	1.600	1.000	0.1381	PASS	0.0 ft	0.07917	PASS	0.0 ft

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Wood Column

Lic. # : KW-06011595

stephen tapp architect/pe

DESCRIPTIO Drag Strut-DS-200

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
+D+0.750L+0.750S+0.750W+H	1.600	1.000	0.3107	PASS	0.0 ft	0.1781	PASS	0.0 ft
+D+0.750Lr+0.750L+0.5250E+H	1.600	1.000	0.1381	PASS	0.0 ft	0.07917	PASS	0.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	1.000	0.3106	PASS	0.0 ft	0.1781	PASS	0.0 ft
+0.60D+W+H	1.600	1.000	0.08297	PASS	0.0 ft	0.04750	PASS	0.0 ft
+0.60D+0.70E+H	1.600	1.000	0.08284	PASS	0.0 ft	0.04750	PASS	0.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments @ Base	@ Top	k-ft	Mx - End Moments @ Base	@ Top
D Only				1.200		0.153				6.000	
+D+L+H				1.200		0.153				6.000	
+D+Lr+H				1.200		0.153				6.000	
+D+S+H				3.200		0.153				16.000	
+D+0.750Lr+0.750L+H				1.200		0.153				6.000	
+D+0.750L+0.750S+H				2.700		0.153				13.500	
+D+W+H				1.200		2.653				6.000	
+D+0.70E+H				1.200		0.153				6.000	
+D+0.750Lr+0.750L+0.750W+H				1.200		2.028				6.000	
+D+0.750L+0.750S+0.750W+H				2.700		2.028				13.500	
+D+0.750Lr+0.750L+0.5250E+H				1.200		0.153				6.000	
+D+0.750L+0.750S+0.5250E+H				2.700		0.153				13.500	
+0.60D+W+H				0.720		2.592				3.600	
+0.60D+0.70E+H				0.720		0.092				3.600	
D Only				1.200		0.153				6.000	
Lr Only											
L Only											
S Only				2.000						10.000	
W Only						2.500					
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000in	0.000ft	0.1466in	10.000ft
+D+L+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+Lr+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+S+H	0.0000in	0.000ft	0.3908in	10.000ft
+D+0.750Lr+0.750L+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+0.750L+0.750S+H	0.0000in	0.000ft	0.3297in	10.000ft
+D+W+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+0.70E+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+0.750Lr+0.750L+0.750W+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+0.750L+0.750S+0.750W+H	0.0000in	0.000ft	0.3297in	10.000ft
+D+0.750Lr+0.750L+0.5250E+H	0.0000in	0.000ft	0.1466in	10.000ft
+D+0.750L+0.750S+0.5250E+H	0.0000in	0.000ft	0.3297in	10.000ft
+0.60D+W+H	0.0000in	0.000ft	0.0879in	10.000ft
+0.60D+0.70E+H	0.0000in	0.000ft	0.0879in	10.000ft
D Only	0.0000in	0.000ft	0.1466in	10.000ft
Lr Only	0.0000in	0.000ft	0.0000in	0.000ft
L Only	0.0000in	0.000ft	0.0000in	0.000ft
S Only	0.0000in	0.000ft	0.2443in	10.000ft
W Only	0.0000in	0.000ft	0.0000in	0.000ft
E Only	0.0000in	0.000ft	0.0000in	0.000ft
H Only	0.0000in	0.000ft	0.0000in	0.000ft

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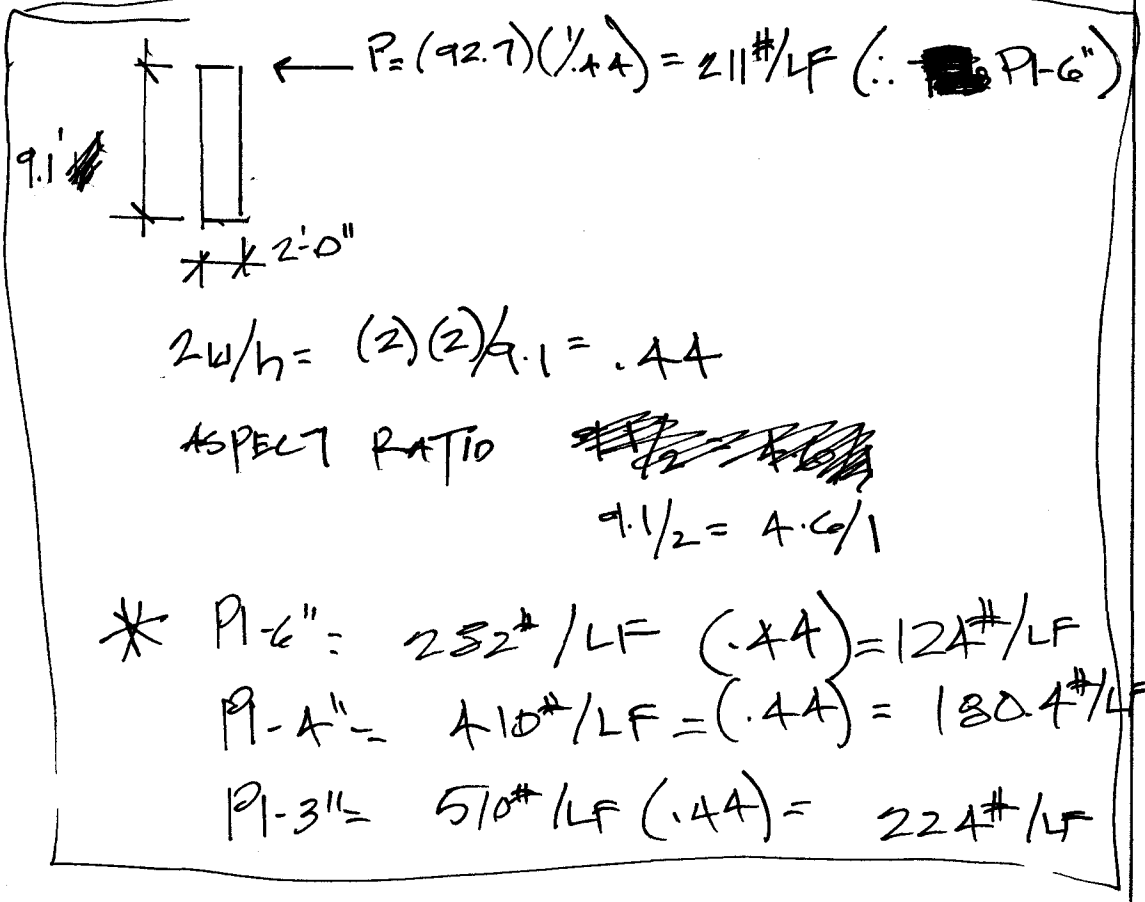
JOB PETRIE - COMMENTS - DADU
SHEET NO. _____ OF _____
CALCULATED BY STT DATE 3/9/21
CHECKED BY _____ DATE _____
SCALE _____

P26 #11

WALL PATTERN REVISED FROM P1-6" TO P1-3"



NOTE ADDED TO DETAIL 3/S7.0

SLIDING FORCE @ 10'-0" WALL = 2.72^K
ALLOW COMPRESSION FOR FOAM = 15#/□"
10'-0" FRICTION FORCE @ BTM FOOTING = 2030#
ADDED FORCE = 514#
FORCE INTO FOAM = (4)(12)(15) = 720# > 514#

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JOB PETRIE RESIDENCE

SHEET NO. _____ OF _____

CALCULATED BY STT DATE 4/7/21

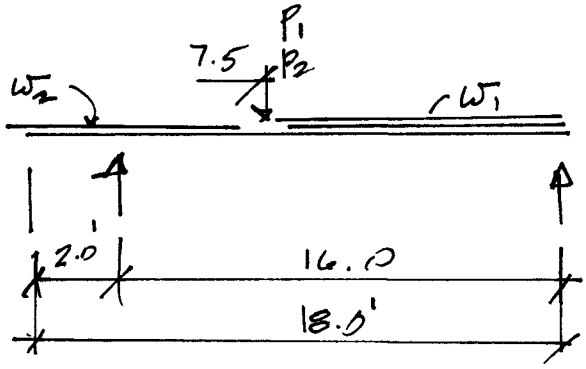
CHECKED BY _____ DATE _____

SCALE _____

CHECK BEAM #35

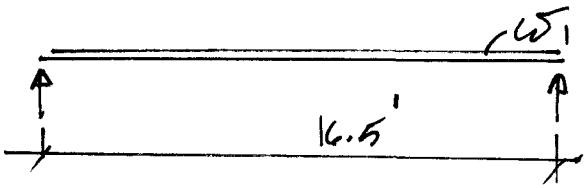
#35

5 1/8" x 21" 24FV4 GLB



	DL	LL	Ω(P1) 1.1
W1 Roof	.09	.15	3 − ½
Wall	.11		= 2½
F.J.	.13	.34	
	.33 KLF	.5 KLF	
W2 DECK	.04 KLF	.16 KLF	
P1		2.8K	1.1K
P2	2.1K	3.2K	

#34



$R_{DL} = 2.1^K$

$R_{LL} = 3.1^K$

W1 R	.09	.15
W	.11	
FLR	.024	.08
DECK	.04	.16
	.26 KLF	.39 KLF

Wood Beam

DESCRIPTIO Beam #35

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : ASCE 7-05

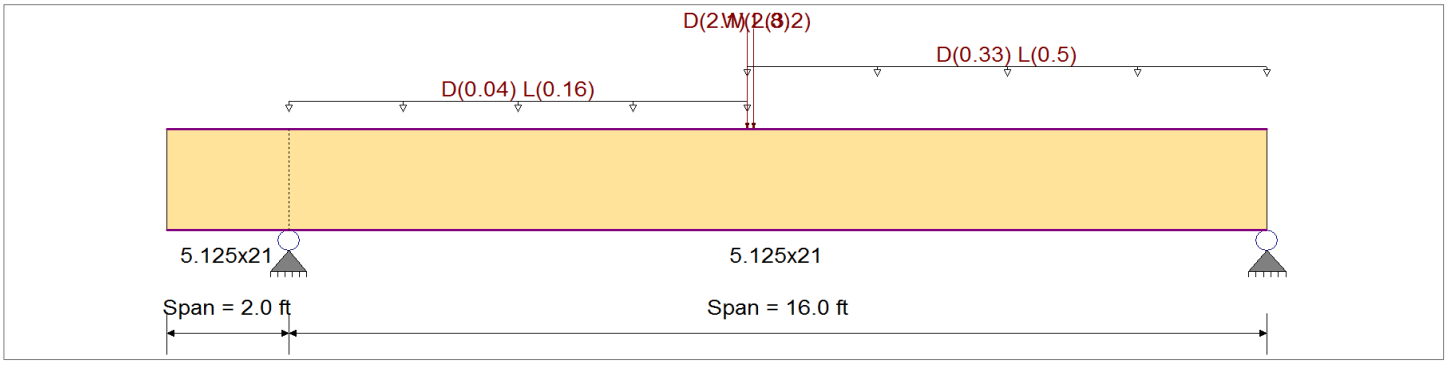
Material Properties

Analysis Metho: Allowable Stress Design
Load Combinati: ASCE 7-05

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

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

Fb +	2400 psi	*E : Modulus of Elasti*	
Fb -	1850 psi	Ebend- xx	1800 ksi
Fc - Prll	1650 psi	Eminbend - x	950 ksi
Fc - Perp	650 psi	Ebend- yy	1600 ksi
Fv	265 psi	Eminbend - y	850 ksi
Ft	1100 psi	Density	31.21 pcf



Applied Loads

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

Load for Span Number 2
- Uniform Load : D = 0.040, L = 0.160 k/ft, Extent = 0.0 -->> 7.50 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.330, L = 0.50 k/ft, Extent = 7.50 -->> 16.0 ft, Tributary Width = 1.0 ft
- Point Load : D = 2.10, L = 3.20 k @ 7.50 ft
- Point Load : W = 2.80 k @ 7.60 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.521 : 1	Maximum Shear Stress Ratio	=	0.348 : 1
Section used for this span		5.125x21	Section used for this span		5.125x21
fb: Actual	=	1,215.40 psi	fv: Actual	=	92.09 psi
Fb: Allowable	=	2,331.94 psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	7.508 ft	Location of maximum on span	=	14.302 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.139 in	Ratio =	1381 >=360
Max Upward Transient Deflection	-0.052 in	Ratio =	918 >=360
Max Downward Total Deflection	0.233 in	Ratio =	823 >=180
Max Upward Total Deflection	-0.087 in	Ratio =	550 >=180

Maximum Forces & Stresses for Load Combinations

Load Combination	Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	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 Only													0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.118	0.90	1.000	1.00	1.00	1.00	1.00	1.00			2160.00	2.02	28.19	238.50
Length = 16.0 ft	2	0.221	0.149	0.90	0.972	1.00	1.00	1.00	1.00	1.00	14.55	463.52	2098.75	2.55	35.60	238.50
+D+L+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.289	1.00	1.000	1.00	1.00	1.00	1.00	1.00			2400.00	5.50	76.63	265.00
Length = 16.0 ft	2	0.521	0.348	1.00	0.972	1.00	1.00	1.00	1.00	1.00	38.15	1,215.40	2331.94	6.61	92.09	265.00
+D+Lr+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.085	1.25	1.000	1.00	1.00	1.00	1.00	1.00			3000.00	2.02	28.19	331.25
Length = 16.0 ft	2	0.159	0.107	1.25	0.972	1.00	1.00	1.00	1.00	1.00	14.55	463.52	2914.92	2.55	35.60	331.25
+D+S+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

DESCRIPTIO Beam #35

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 2.0 ft	1		0.092	1.15	1.000	1.00	1.00	1.00	1.00	1.00			2760.00	2.02	28.19	304.75
Length = 16.0 ft	2	0.173	0.117	1.15	0.972	1.00	1.00	1.00	1.00	1.00	14.55	463.52	2681.73	2.55	35.60	304.75
+D+0.750Lr+0.750L+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.195	1.25	1.000	1.00	1.00	1.00	1.00	1.00			3000.00	4.63	64.52	331.25
Length = 16.0 ft	2	0.352	0.235	1.25	0.972	1.00	1.00	1.00	1.00	1.00	32.25	1,027.43	2914.92	5.59	77.97	331.25
+D+0.750L+0.750S+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.212	1.15	1.000	1.00	1.00	1.00	1.00	1.00			2760.00	4.63	64.52	304.75
Length = 16.0 ft	2	0.383	0.256	1.15	0.972	1.00	1.00	1.00	1.00	1.00	32.25	1,027.43	2681.73	5.59	77.97	304.75
+D+W+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.115	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	3.49	48.68	424.00
Length = 16.0 ft	2	0.219	0.128	1.60	0.972	1.00	1.00	1.00	1.00	1.00	25.69	818.39	3731.10	3.88	54.13	424.00
+D+0.70E+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.066	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	2.02	28.19	424.00
Length = 16.0 ft	2	0.124	0.084	1.60	0.972	1.00	1.00	1.00	1.00	1.00	14.55	463.52	3731.10	2.55	35.60	424.00
+D+0.750Lr+0.750L+0.750W-					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.188	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	5.73	79.89	424.00
Length = 16.0 ft	2	0.346	0.217	1.60	0.972	1.00	1.00	1.00	1.00	1.00	40.55	1,291.90	3731.10	6.59	91.87	424.00
+D+0.750L+0.750S+0.750W+					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.188	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	5.73	79.89	424.00
Length = 16.0 ft	2	0.346	0.217	1.60	0.972	1.00	1.00	1.00	1.00	1.00	40.55	1,291.90	3731.10	6.59	91.87	424.00
+D+0.750Lr+0.750L+0.5250E					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.152	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	4.63	64.52	424.00
Length = 16.0 ft	2	0.275	0.184	1.60	0.972	1.00	1.00	1.00	1.00	1.00	32.25	1,027.43	3731.10	5.59	77.97	424.00
+D+0.750L+0.750S+0.5250E-					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.152	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	4.63	64.52	424.00
Length = 16.0 ft	2	0.275	0.184	1.60	0.972	1.00	1.00	1.00	1.00	1.00	32.25	1,027.43	3731.10	5.59	77.97	424.00
+0.60D+W+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.088	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	2.68	37.40	424.00
Length = 16.0 ft	2	0.170	0.094	1.60	0.972	1.00	1.00	1.00	1.00	1.00	19.88	633.35	3731.10	2.86	39.90	424.00
+0.60D+0.70E+H					0.972	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.0 ft	1		0.040	1.60	1.000	1.00	1.00	1.00	1.00	1.00			3840.00	1.21	16.91	424.00
Length = 16.0 ft	2	0.075	0.050	1.60	0.972	1.00	1.00	1.00	1.00	1.00	8.73	278.11	3731.10	1.53	21.36	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.750S+0.750W+H	-0.0872	0.000
+D+0.750L+0.750S+0.750W+H	2	0.2332	8.134		0.0000	0.000

Maximum Deflections for Load Combinations

Load Combination	Span	Max. Downward Defl		Location in Span		Max. Upward Defl		Location in Span	
D Only	2	0.0853	in	8.134	ft	0.0000	in	0.000	ft
+D+L+H	2	0.2242	in	8.134	ft	0.0000	in	0.000	ft
+D+Lr+H	2	0.0853	in	8.134	ft	0.0000	in	0.000	ft
+D+S+H	2	0.0853	in	8.134	ft	0.0000	in	0.000	ft
+D+0.750Lr+0.750L+H	2	0.1895	in	8.134	ft	0.0000	in	0.000	ft
+D+0.750L+0.750S+H	2	0.1895	in	8.134	ft	0.0000	in	0.000	ft
+D+W+H	2	0.1435	in	8.045	ft	0.0000	in	0.000	ft
+D+0.70E+H	2	0.0853	in	8.134	ft	0.0000	in	0.000	ft
+D+0.750Lr+0.750L+0.750W+H	2	0.2332	in	8.134	ft	0.0000	in	0.000	ft
+D+0.750L+0.750S+0.750W+H	2	0.2332	in	8.134	ft	0.0000	in	0.000	ft
+D+0.750Lr+0.750L+0.5250E+H	2	0.1895	in	8.134	ft	0.0000	in	0.000	ft
+D+0.750L+0.750S+0.5250E+H	2	0.1895	in	8.134	ft	0.0000	in	0.000	ft
+0.60D+W+H	2	0.1094	in	8.045	ft	0.0000	in	0.000	ft
+0.60D+0.70E+H	2	0.0512	in	8.134	ft	0.0000	in	0.000	ft
D Only	2	0.0853	in	8.134	ft	0.0000	in	0.000	ft
L Only	2	0.1389	in	8.134	ft	0.0000	in	0.000	ft
W Only	2	0.0583	in	7.955	ft	0.0000	in	0.000	ft

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum		6.004	8.017