Structural Analysis and Calculations

for

New Single Family Residence
9734 SE 40th Street
Mercer Island,WA 9804

for

Russell Planchuk

by

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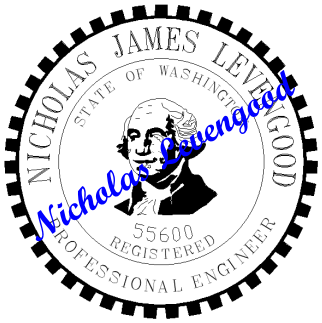
NLO#13320-24



November 24

Scope of Work:

Engineering for new SFR.

Analysis was done using the 2021 International Building Code

Materials:

Reinforcing Steel: ASTM A615 Grade 60
Concrete: f'c = 2500 psi

Design Assumptions:

Soil Properties: 1500 psf Bearing Capacity, 250 psf/ft lateral capacity (assumed)

Design Wind: 110 MPH 3 sec gust

Seismic Zone D

S_s = 160%

S_1 = 60.0%

Snow Load: 30 psf Ground

Dead Loads

Floor =	12	psf(3 Joists,3 subfloor, 4 coverings)
Wall =	10	psf(1.5 studs,2.5 sheathing,0.5 insul. 3 paneling)
Roof =	20	psf (2 psf truss, 1 insulation, 3 ceiling, 5, roofing)

Live Loads

Floor, L_f =	40 psf	(60 psf Deck)
Roof, L_r =	25 psf	

Snow Loads

Exposure Category	C		(ASCE 7-16 26.7.3)
Risk Category	II		(ASCE 7-16 1.5-1)
Ct =	1.1		(ASCE 7-16 Table 7.3-2)
Ce =	0.9		(ASCE 7-16 Table 7.3-1)
Is =	1		(ASCE 7-16 Table 1.5-2)
Cs =	1		(ASCE 7-16 Figure 7.4-1)
Pg =	30	psf	(ASCE 7-16 Table 7.2-5)

Pf = 0.7Ce*Ct*Is*Pg

Pf = 20.79 psf (ASCE 7-16 7.3-1)

Ps = Cs*Pf

Ps = 20.79 psf (ASCE 7-16 7.4-1)

Use 25 psf for design

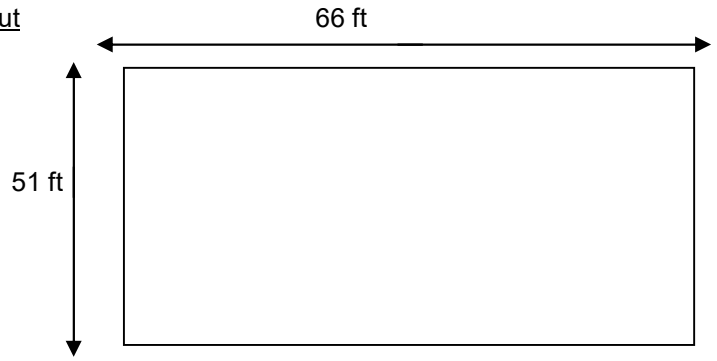
Wind Loads

Vult = 110 mph (3 Sec. Gust)
Exposure C

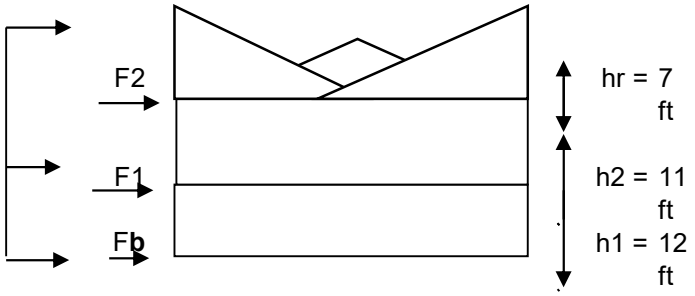
Seismic Loads

Site Class	D	(Assumed)
Ss =	1.6	(USGS)
S1 =	0.6	(USGS)

Building Layout



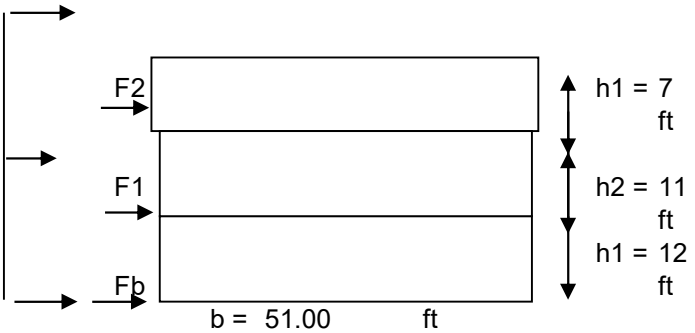
Wind Loads (Simplified Envelope Method) (Per ASCE 7-16 Section 28.4)



b = 66.00 ft

Case A - East-West Wind

Htotal = 23 ft



b = 51.00 ft

Case B - North-South Wind

Roof Angle	2.5:12 or 12	degrees	
V =	110	mph	(ASCE 7-16 Figure 26.5-1B)
a =	6.6	ft	
λ =	1.35		(ASCE 7-16 Figure 28.5-1)
A =	24.1	psf	(ASCE 7-16 Figure 28.5-1)
B =	8.0	psf	
C =	16.0	psf	
D =	8.0	psf	

Case A

F2 =	14867	lbs
F1 =	14867	lbs
Fb =	37465	lbs

Case B

F2 =	13678	lbs
F1 =	19030	lbs
Fb =	42222	lbs

Seismic Loads

Site Class D
Risk Category II

Ss =	1.6			
Fa =	1.2			(ASCE 7-16 Table 11.4-1)
Sms = Fa*Ss =	1.92			
Sds = (2/3)*Sms =	1.280	➤ Design Category	D	(ASCE 7-16 Table 11.6-1)
S1 =	0.6			
Fv =	1.7			(ASCE 7-16 Table 11.4-2)
Sm1 = S1*Fv =	1.02			
Sd1 =(2/3)*Sm1 =	0.68	➤Design Category	D	(ASCE 7-16 Table 11.6-2)

R =	6.5	(ASCE 7-16 Table 12.2-1)
O =	3	(ASCE 7-16 Table 12.2-1)
Cd =	4	(ASCE 7-16 Table 12.2-1)
Ie =	1	(ASCE 7-16 Table 1.5-2)

Approximate period per ASCE 7-16 Section 12.8.2.1

Ct =	0.02	
x =	0.75	
TL =	6	
T =	0.2101	seconds

Cs = (Sds)/(R/Ie) =	0.1969
Csmax =	0.498
Csmin =	0.0563

Use Cs = 0.197

Weight of the Structure

Weight @ Roof =	77500	lbs
Weight @ Second Floor =	81700	lbs

Wtotal =	159200	lbs	
V = CsW =	31350	lbs	Total applied earthquake load
K =	1		(ASCE 7-16 12.8.3)
Cv2 =	0.645		
Cv1 =	0.355		
F2 =	20226	lbs	
F1 =	11124	lbs	
Base Shear =	31350	lbs	

North Wall (Second Floor) (Segmented Method) (Seismic)

H =	10	ft	(Wall height)
W =	26	ft	(Wall width)
Wf =	26	ft	(Wall width w/ full height sheathing)
F =	10113	lbs	(Horizontal load)
w =	70	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 506 lb/ft vs = 560 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 7/16in sheathing w/ 8d nails@ 4in edge spacing

Check Studs

Co = 100.0%

T = C = 3889.56 lb Try 2"x6" A = 8.25 in^2

fc =	471.46	psi	Fc' =	2080	psi	Works
ft =	471.46	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 3.80 ft

Use 5/8in anchor bolts @ 48in

Check Holddowns

Fto = 4846 lbs Net Uplift

Use MSTC66

Check Deflections

Ga = 14 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 1.89 in Allowable Deflection =.02H = 2.4 in

Meets deflection criteria

South Wall (Second Floor) (Segmented Method) (Seismic)

H =	10	ft	(Wall height)
W =	21	ft	(Wall width)
Wf =	21	ft	(Wall width w/ full height sheathing)
F =	10113	lbs	(Horizontal load)
w =	70	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 620 lb/ft vs = 720 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 7/16in sheathing w/ 8d nails@ 3in edge spacing

Check Studs

Co = 100.0%

T = C = 4815.65 lb Try 2"x6" A = 8.25 in^2

fc =	583.71	psi	Fc' =	2080	psi	Works
ft =	583.71	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 3.10 ft

Use 5/8in anchor bolts @ 36in

Check Holddowns

Fto = 5848 lbs Net Uplift

Use (2)MSTC66

Check Deflections

Ga = 17 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 2.02 in Allowable Deflection =.02H = 2.4 in

Meets deflection criteria

West Wall (Second Floor) (Segmented Method) (Seismic)

H =	10	ft	(Wall height)
W =	24	ft	(Wall width)
Wf =	24	ft	(Wall width w/ full height sheathing)
F =	10113	lbs	(Horizontal load)
w =	248.5	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 548 lb/ft vs = 560 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 7/16in sheathing w/ 8d nails@ 4in edge spacing

Check Studs

Co = 100.0%

T = C = 4213.69 lb Try 2"x6" A = 8.25 in^2

fc =	510.75	psi	Fc' =	2080	psi	Works
ft =	510.75	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 3.51 ft

Use 5/8in anchor bolts @ 48in

Check Holddowns

Fto = 1232 lbs Net Uplift

Use MSTC66

Check Deflections

Ga = 14 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 2.05 in Allowable Deflection =.02H = 2.4 in

Meets deflection criteria

East Wall (Second Floor) (Segmented Method) (Seismic)

H =	10	ft	(Wall height)
W =	23.5	ft	(Wall width)
Wf =	23.5	ft	(Wall width w/ full height sheathing)
F =	10113	lbs	(Horizontal load)
w =	143.5	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 559 lb/ft vs = 560 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 7/16in sheathing w/ 8d nails@ 4in edge spacing

Check Studs

Co = 100.0%

T = C = 4303.35 lb Try 2"x6" A = 8.25 in^2

fc =	521.62	psi	Fc' =	2080	psi	Works
ft =	521.62	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 3.44 ft

Use 5/8in anchor bolts @ 48in

Check Holddowns

Fto = 5092 lbs Net Uplift

Use MSTC66

Check Deflections

Ga = 14 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 2.09 in Allowable Deflection =.02H = 2.4 in

Meets deflection criteria

North Wall (First Floor) (Segmented Method) (Seismic)

H =	12	ft	(Wall height)
W =	17.25	ft	(Wall width)
Wf =	17.25	ft	(Wall width w/ full height sheathing)
F =	12894	lbs	(Horizontal load)
w =	168	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 972 lb/ft vs = 1113.6 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 19/32in sheathing w/ 10d nails@ 2in edge spacing

Check Studs

Co = 100.0%

T = C = 8969.72 lb Try 2"x6" A = 8.25 in^2

fc =	1087.24	psi	Fc' =	2080	psi	Works
ft =	1087.24	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 1.98 ft

Use 5/8in anchor bolts @ 24in

Check Holddowns

Fto = 11325 lbs Net Uplift

Use HDU11

Check Deflections

Ga = 22 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 2.72 in Allowable Deflection =.02H = 2.88 in

Meets deflection criteria

Interior Wall (First Floor) (Segmented Method) (Seismic)

H =	12	ft	(Wall height)
W =	24	ft	(Wall width)
Wf =	24	ft	(Wall width w/ full height sheathing)
F =	5562.2	lbs	(Horizontal load)
w =	84	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 301 lb/ft vs = 560 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 7/16in sheathing w/ 8d nails@ 4in edge spacing

Check Studs

Co = 100.0%

T = C = 2781.11 lb Try 2"x6" A = 8.25 in^2

fc =	337.10	psi	Fc' =	2080	psi	Works
ft =	337.10	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 6.38 ft

Use 5/8in anchor bolts @ 48in

Check Holddowns

Fto = 3447 lbs Net Uplift

Use HDU5

Check Deflections

Ga = 14 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 1.60 in Allowable Deflection =.02H = 2.88 in

Meets deflection criteria

South Wall (APA Portal Frame) (Seismic)

Allowable Per Panel =	1006.3	lbs
# of Panels =	9	
Total Resistance =	9056.3	lbs (allowable)
Total Required =	9026	lbs

West Wall (First Floor) (Segmented Method) (Seismic)

H =	12	ft	(Wall height)
W =	24.5	ft	(Wall width)
Wf =	24.5	ft	(Wall width w/ full height sheathing)
F =	15675	lbs	(Horizontal load)
w =	84	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 832 lb/ft vs = 1064 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 19/32in sheathing w/ 10d nails@ 3in edge spacing

Check Studs

Co = 100.0%

T = C = 7677.59 lb Try 2"x6" A = 8.25 in^2

fc =	930.62	psi	Fc' =	2080	psi	Works
ft =	930.62	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 2.31 ft

Use 5/8in anchor bolts @ 24in

Check Holddowns

Fto = 10157 lbs Net Uplift

Use HDU11

Check Deflections

Ga = 18 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 2.88 in Allowable Deflection =.02H = 2.88 in

Meets deflection criteria

East Wall (First Floor) (Segmented Method) (Seismic)

H =	12	ft	(Wall height)
W =	37.5	ft	(Wall width)
Wf =	37.5	ft	(Wall width w/ full height sheathing)
F =	15675	lbs	(Horizontal load)
w =	84	lb/ft	(Vertical load)
	F		(Attatchment)

Check Shear

ρ = 1.3

v = 543 lb/ft vs = 560 lb/ft (SDPWS Table 4.3A)

φ = 0.8

Use 7/16in sheathing w/ 8d nails@ 4in edge spacing

Check Studs

Co = 100.0%

T = C = 5016.02 lb Try 2"x6" A = 8.25 in^2

fc =	608.00	psi	Fc' =	2080	psi	Works
ft =	608.00	psi	Ft' =	1260	psi	Works

Use No.2 HF 2x6 @ wall ends

Check Anchors

z = 1922.4 lb/bolt (NDS Table 11E, ts=1 1/2in, 5/8", HF)

S = 3.54 ft

Use 5/8in anchor bolts @ 36in

Check Holddowns

Fto = 5933 lbs Net Uplift

HDU5

Check Deflections

Ga = 14 Cd = 4 (ASCE 7-16 12.8.6)

Wall Deflection = 2.26 in Allowable Deflection =.02H = 2.88 in

Meets deflection criteria

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 72" Ftg.

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth	=	ksf
when footing base is below	=	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

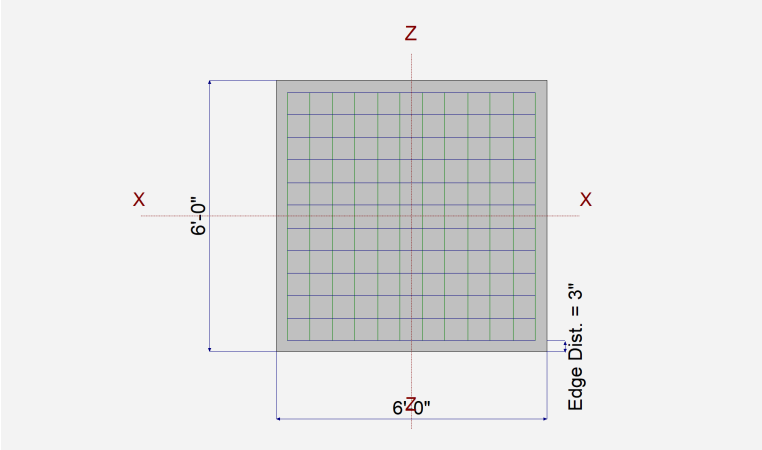
Width parallel to X-X Axis	=	6.0 ft
Length parallel to Z-Z Axis	=	6.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



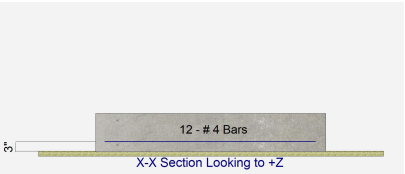
Reinforcing

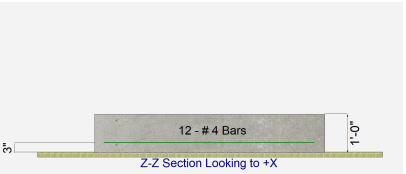
Bars parallel to X-X Axis			
Number of Bars	=		12
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		12
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation n/a

# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	15.0	17.0	2.0	17.0				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 72" Ftg.

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.6893	Soil Bearing	1.034 ksf	1.50 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3761	Z Flexure (+X)	5.775 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3761	Z Flexure (-X)	5.775 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3761	X Flexure (+Z)	5.775 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3761	X Flexure (-Z)	5.775 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3517	1-way Shear (+X)	26.380 psi	75.0 psi	+1.20D+1.60Lr+0.50L
PASS	0.3612	1-way Shear (-X)	27.093 psi	75.0 psi	+1.20D+1.60Lr+0.50L
PASS	0.3517	1-way Shear (+Z)	26.380 psi	75.0 psi	+1.20D+1.60Lr+0.50L
PASS	0.3612	1-way Shear (-Z)	27.093 psi	75.0 psi	+1.20D+1.60Lr+0.50L
PASS	0.9369	2-way Punching	140.539 psi	150.0 psi	+1.20D+1.60Lr+0.50L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.50	n/a	0.0	0.5617	0.5617	n/a	n/a	0.375
X-X, +D+L	1.50	n/a	0.0	0.6172	0.6172	n/a	n/a	0.412
X-X, +D+Lr	1.50	n/a	0.0	1.034	1.034	n/a	n/a	0.689
X-X, +D+0.70S	1.50	n/a	0.0	0.8922	0.8922	n/a	n/a	0.595
X-X, +D+0.750Lr+0.750L	1.50	n/a	0.0	0.9575	0.9575	n/a	n/a	0.638
X-X, +D+0.750L+0.5250S	1.50	n/a	0.0	0.8513	0.8513	n/a	n/a	0.568
X-X, +0.60D	1.50	n/a	0.0	0.3370	0.3370	n/a	n/a	0.225
X-X, +D+0.750L+0.10S	1.50	n/a	0.0	0.6506	0.6506	n/a	n/a	0.434
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.5617	0.5617	0.375
Z-Z, +D+L	1.50	0.0	n/a	n/a	n/a	0.6172	0.6172	0.412
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.034	1.034	0.689
Z-Z, +D+0.70S	1.50	0.0	n/a	n/a	n/a	0.8922	0.8922	0.595
Z-Z, +D+0.750Lr+0.750L	1.50	0.0	n/a	n/a	n/a	0.9575	0.9575	0.638
Z-Z, +D+0.750L+0.5250S	1.50	0.0	n/a	n/a	n/a	0.8513	0.8513	0.568
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.3370	0.3370	0.225
Z-Z, +D+0.750L+0.10S	1.50	0.0	n/a	n/a	n/a	0.6506	0.6506	0.434

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	2.625	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.40D	2.625	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50Lr+1.60L	3.713	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50Lr+1.60L	3.713	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60L+0.30S	3.288	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60L+0.30S	3.288	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60Lr+0.50L	5.775	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60Lr+0.50L	5.775	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60Lr	5.650	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 72" Ftg.

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.20D+1.60Lr	5.650	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+S	4.50	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+S	4.50	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+S	4.375	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+S	4.375	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50Lr+0.50L	3.438	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50Lr+0.50L	3.438	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.30S	3.013	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.30S	3.013	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +0.90D	1.688	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +0.90D	1.688	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.150S	2.694	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.150S	2.694	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.40D	2.625	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.40D	2.625	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+1.60L	3.713	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+1.60L	3.713	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60L+0.30S	3.288	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60L+0.30S	3.288	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr+0.50L	5.775	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr+0.50L	5.775	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr	5.650	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60Lr	5.650	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+S	4.50	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+S	4.50	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+S	4.375	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+S	4.375	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+0.50L	3.438	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50Lr+0.50L	3.438	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.30S	3.013	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.30S	3.013	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +0.90D	1.688	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +0.90D	1.688	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.150S	2.694	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.150S	2.694	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK

One Way Shear X

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	12.32 psi	11.99 psi	12.32 psi	75.00 psi	0.16	OK
+1.20D+0.50Lr+1.60L	17.42 psi	16.96 psi	17.42 psi	75.00 psi	0.23	OK
+1.20D+1.60L+0.30S	15.42 psi	15.02 psi	15.42 psi	75.00 psi	0.21	OK
+1.20D+1.60Lr+0.50L	27.09 psi	26.38 psi	27.09 psi	75.00 psi	0.36	OK
+1.20D+1.60Lr	26.51 psi	25.81 psi	26.51 psi	75.00 psi	0.35	OK
+1.20D+0.50L+S	21.11 psi	20.56 psi	21.11 psi	75.00 psi	0.28	OK
+1.20D+S	20.53 psi	19.99 psi	20.53 psi	75.00 psi	0.27	OK
+1.20D+0.50Lr+0.50L	16.13 psi	15.70 psi	16.13 psi	75.00 psi	0.22	OK
+1.20D+0.50L+0.30S	14.13 psi	13.76 psi	14.13 psi	75.00 psi	0.19	OK
+0.90D	7.92 psi	7.71 psi	7.92 psi	75.00 psi	0.11	OK
+1.20D+0.50L+0.150S	12.64 psi	12.31 psi	12.64 psi	75.00 psi	0.17	OK

One Way Shear Z

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	12.32 psi	11.99 psi	12.32 psi	75.00 psi	0.16	OK
+1.20D+0.50Lr+1.60L	17.42 psi	16.96 psi	17.42 psi	75.00 psi	0.23	OK
+1.20D+1.60L+0.30S	15.42 psi	15.02 psi	15.42 psi	75.00 psi	0.21	OK
+1.20D+1.60Lr+0.50L	27.09 psi	26.38 psi	27.09 psi	75.00 psi	0.36	OK
+1.20D+1.60Lr	26.51 psi	25.81 psi	26.51 psi	75.00 psi	0.35	OK
+1.20D+0.50L+S	21.11 psi	20.56 psi	21.11 psi	75.00 psi	0.28	OK
+1.20D+S	20.53 psi	19.99 psi	20.53 psi	75.00 psi	0.27	OK
+1.20D+0.50Lr+0.50L	16.13 psi	15.70 psi	16.13 psi	75.00 psi	0.22	OK
+1.20D+0.50L+0.30S	14.13 psi	13.76 psi	14.13 psi	75.00 psi	0.19	OK
+0.90D	7.92 psi	7.71 psi	7.92 psi	75.00 psi	0.11	OK
+1.20D+0.50L+0.150S	12.64 psi	12.31 psi	12.64 psi	75.00 psi	0.17	OK

Project Title:
Engineer:
Project ID:
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General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 72" Ftg.

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	63.88 psi	150.00 psi	0.4259	OK
+1.20D+0.50Lr+1.60L	90.35 psi	150.00 psi	0.6023	OK
+1.20D+1.60L+0.30S	80.00 psi	150.00 psi	0.5334	OK
+1.20D+1.60Lr+0.50L	140.54 psi	150.00 psi	0.9369	OK
+1.20D+1.60Lr	137.50 psi	150.00 psi	0.9166	OK
+1.20D+0.50L+S	109.51 psi	150.00 psi	0.7301	OK
+1.20D+S	106.47 psi	150.00 psi	0.7098	OK
+1.20D+0.50Lr+0.50L	83.65 psi	150.00 psi	0.5577	OK
+1.20D+0.50L+0.30S	73.31 psi	150.00 psi	0.4887	OK
+0.90D	41.07 psi	150.00 psi	0.2738	OK
+1.20D+0.50L+0.150S	65.56 psi	150.00 psi	0.437	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 48" Ftg.

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth	=	ksf
when footing base is below	=	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

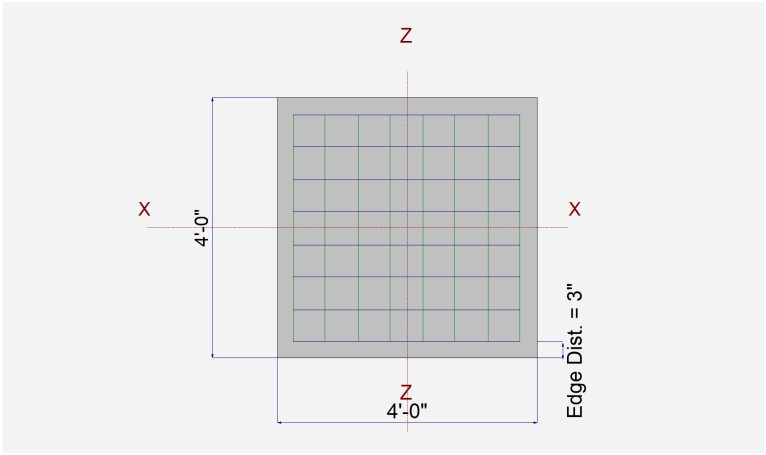
Width parallel to X-X Axis	=	4.0 ft
Length parallel to Z-Z Axis	=	4.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



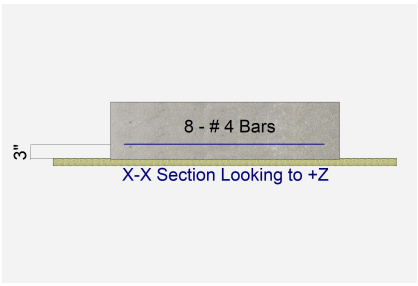
Reinforcing

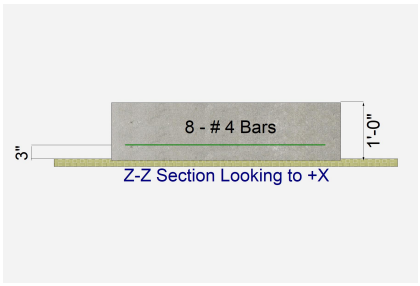
Bars parallel to X-X Axis			
Number of Bars	=		8
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		8
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation n/a

# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	2.750	0.0	11.0	4.50				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
Engineer:
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General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 48" Ftg.

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.6693	Soil Bearing	1.004 ksf	1.50 ksf	+D+L about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1812	Z Flexure (+X)	2.781 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60L+0.30S
PASS	0.1812	Z Flexure (-X)	2.781 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60L+0.30S
PASS	0.1812	X Flexure (+Z)	2.781 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60L+0.30S
PASS	0.1812	X Flexure (-Z)	2.781 k-ft/ft	15.353 k-ft/ft	+1.20D+1.60L+0.30S
PASS	0.2129	1-way Shear (+X)	15.966 psi	75.0 psi	+1.20D+1.60L+0.30S
PASS	0.2129	1-way Shear (-X)	15.966 psi	75.0 psi	+1.20D+1.60L+0.30S
PASS	0.2129	1-way Shear (+Z)	15.966 psi	75.0 psi	+1.20D+1.60L+0.30S
PASS	0.2129	1-way Shear (-Z)	15.966 psi	75.0 psi	+1.20D+1.60L+0.30S
PASS	0.4430	2-way Punching	66.448 psi	150.0 psi	+1.20D+1.60L+0.30S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.50	n/a	0.0	0.3169	0.3169	n/a	n/a	0.211
X-X, +D+L	1.50	n/a	0.0	1.004	1.004	n/a	n/a	0.669
X-X, +D+0.70S	1.50	n/a	0.0	0.5138	0.5138	n/a	n/a	0.343
X-X, +D+0.750L	1.50	n/a	0.0	0.8325	0.8325	n/a	n/a	0.555
X-X, +D+0.750L+0.5250S	1.50	n/a	0.0	0.9802	0.9802	n/a	n/a	0.654
X-X, +0.60D	1.50	n/a	0.0	0.1901	0.1901	n/a	n/a	0.127
X-X, +D+0.750L+0.10S	1.50	n/a	0.0	0.8606	0.8606	n/a	n/a	0.574
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.3169	0.3169	0.211
Z-Z, +D+L	1.50	0.0	n/a	n/a	n/a	1.004	1.004	0.669
Z-Z, +D+0.70S	1.50	0.0	n/a	n/a	n/a	0.5138	0.5138	0.343
Z-Z, +D+0.750L	1.50	0.0	n/a	n/a	n/a	0.8325	0.8325	0.555
Z-Z, +D+0.750L+0.5250S	1.50	0.0	n/a	n/a	n/a	0.9802	0.9802	0.654
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.1901	0.1901	0.127
Z-Z, +D+0.750L+0.10S	1.50	0.0	n/a	n/a	n/a	0.8606	0.8606	0.574

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.4813	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.40D	0.4813	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60L	2.613	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60L	2.613	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60L+0.30S	2.781	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+1.60L+0.30S	2.781	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L	1.10	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L	1.10	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D	0.4125	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D	0.4125	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+S	1.663	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 48" Ftg.

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.20D+0.50L+S	1.663	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+S	0.9750	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+S	0.9750	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.30S	1.269	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.30S	1.269	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +0.90D	0.3094	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +0.90D	0.3094	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.150S	1.184	+Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
X-X, +1.20D+0.50L+0.150S	1.184	-Z	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.40D	0.4813	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.40D	0.4813	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60L	2.613	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60L	2.613	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60L+0.30S	2.781	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+1.60L+0.30S	2.781	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L	1.10	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L	1.10	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D	0.4125	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D	0.4125	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+S	1.663	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+S	1.663	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+S	0.9750	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+S	0.9750	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.30S	1.269	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.30S	1.269	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +0.90D	0.3094	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +0.90D	0.3094	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.150S	1.184	-X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK
Z-Z, +1.20D+0.50L+0.150S	1.184	+X	Bottom	0.2592	ACI 7.6.1.1	0.40	15.353	OK

One Way Shear X

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	2.76 psi	2.76 psi	2.76 psi	75.00 psi	0.04	OK
+1.20D+1.60L	15.00 psi	15.00 psi	15.00 psi	75.00 psi	0.20	OK
+1.20D+1.60L+0.30S	15.97 psi	15.97 psi	15.97 psi	75.00 psi	0.21	OK
+1.20D+0.50L	6.32 psi	6.32 psi	6.32 psi	75.00 psi	0.08	OK
+1.20D	2.37 psi	2.37 psi	2.37 psi	75.00 psi	0.03	OK
+1.20D+0.50L+S	9.54 psi	9.54 psi	9.54 psi	75.00 psi	0.13	OK
+1.20D+S	5.60 psi	5.60 psi	5.60 psi	75.00 psi	0.07	OK
+1.20D+0.50L+0.30S	7.28 psi	7.28 psi	7.28 psi	75.00 psi	0.10	OK
+0.90D	1.78 psi	1.78 psi	1.78 psi	75.00 psi	0.02	OK
+1.20D+0.50L+0.150S	6.80 psi	6.80 psi	6.80 psi	75.00 psi	0.09	OK

One Way Shear Z

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	2.76 psi	2.76 psi	2.76 psi	75.00 psi	0.04	OK
+1.20D+1.60L	15.00 psi	15.00 psi	15.00 psi	75.00 psi	0.20	OK
+1.20D+1.60L+0.30S	15.97 psi	15.97 psi	15.97 psi	75.00 psi	0.21	OK
+1.20D+0.50L	6.32 psi	6.32 psi	6.32 psi	75.00 psi	0.08	OK
+1.20D	2.37 psi	2.37 psi	2.37 psi	75.00 psi	0.03	OK
+1.20D+0.50L+S	9.54 psi	9.54 psi	9.54 psi	75.00 psi	0.13	OK
+1.20D+S	5.60 psi	5.60 psi	5.60 psi	75.00 psi	0.07	OK
+1.20D+0.50L+0.30S	7.28 psi	7.28 psi	7.28 psi	75.00 psi	0.10	OK
+0.90D	1.78 psi	1.78 psi	1.78 psi	75.00 psi	0.02	OK
+1.20D+0.50L+0.150S	6.80 psi	6.80 psi	6.80 psi	75.00 psi	0.09	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	11.50 psi	150.00 psi	0.07665	OK
+1.20D+1.60L	62.42 psi	150.00 psi	0.4161	OK
+1.20D+1.60L+0.30S	66.45 psi	150.00 psi	0.443	OK
+1.20D+0.50L	26.28 psi	150.00 psi	0.1752	OK
+1.20D	9.86 psi	150.00 psi	0.0657	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: Palanchuk 40th Street SFR.ec6

DESCRIPTION: 48" Ftg.

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.20D+0.50L+S	39.72 psi	150.00 psi	0.2648	OK
+1.20D+S	23.29 psi	150.00 psi	0.1553	OK
+1.20D+0.50L+0.30S	30.31 psi	150.00 psi	0.2021	OK
+0.90D	7.39 psi	150.00 psi	0.04928	OK
+1.20D+0.50L+0.150S	28.30 psi	150.00 psi	0.1886	OK

Roof			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
Cant. Roof Beam 1	Passed (56% R)	1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam	
Cant. Roof Beam 2	Passed (82% R)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
Drop Roof Beam 1	Passed (99% M+)	1 piece(s) 5 1/2" x 24" 24F-V4 DF Glulam	
Master Slider Header	Passed (75% R)	1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam	
Typical Second Floor Header	Passed (77% M)	1 piece(s) 4 x 10 HF No.2	
Second Floor			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
Deck Beam 1	Passed (79% ΔL)	1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam	
Deck Beam 2	Passed (50% ΔL)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
Deck Joists	Passed (72% M)	1 piece(s) 2 x 12 HF No.1 @ 12" OC	
Second Floor Beam 1	Passed (95% R)	1 piece(s) 6 3/4" x 24" 24F-V4 DF Glulam	
Second Floor Beam 2	Passed (68% ΔL)	1 piece(s) 5 1/4" x 18" 2.0E Parallam® PSL	
Second Floor Beam 3	Passed (33% R)	1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL	
Second Floor Beam 4	Passed (53% ΔL)	1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL	
Second Floor Beam 5	Passed (27% R)	1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL	
Second Floor Beam 6	Passed (86% ΔL)	1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL	
Second Floor Beam 7	Passed (69% R)	1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL	
Second Floor Beam 8	Passed (80% ΔL)	1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL	
Great Room Slider Header	Passed (60% M+)	1 piece(s) 5 1/2" x 15" 24F-V4 DF Glulam	
Garage Door Header	Passed (69% M+)	1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam	
Dining Slider Header	Passed (51% M+)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
Typical First Floor Header	Passed (86% R)	1 piece(s) 4 x 12 HF No.2	
Second Floor Joists 1	Passed (96% ΔL)	1 piece(s) 11 7/8" TJI® 210 @ 16" OC	
Second Floor Joists 2	Passed (95% ΔL)	1 piece(s) 11 7/8" TJI® 360 @ 16" OC	
Second Floor Joists 3	Passed (82% ΔL)	1 piece(s) 11 7/8" TJI® 560 @ 16" OC	
First Floor Beam			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
First Floor Beam	Passed (83% M)	1 piece(s) 6 x 12 HF No.2	
Deck Beam	Passed (86% M)	1 piece(s) 6 x 12 HF No.2	

ForteWEB Software Operator	Job Notes
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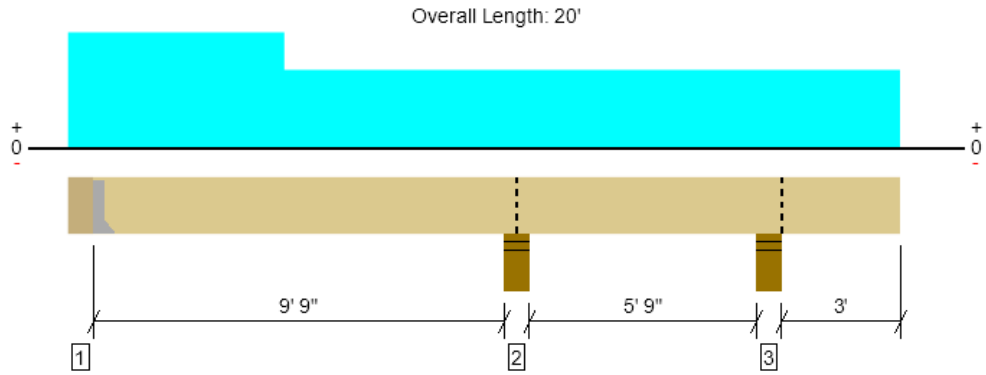
11/22/2024 7:56:05 PM UTC
ForteWEB v3.8
File Name: Palanchuck

Roof, Cant. Roof Beam 1

1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3016 @ 6"	5363 (1.50")	Passed (56%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	2906 @ 9' 6"	10057	Passed (29%)	1.15	1.0 D + 1.0 S (Adj Spans)
Pos Moment (Ft-lbs)	5851 @ 4' 4 9/16"	17078	Passed (34%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-5369 @ 10' 6"	13164	Passed (41%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.084 @ 5' 1/2"	0.500	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.150 @ 5' 1/4"	0.667	Passed (L/800)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 19' 6"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 3 7/8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 3 13/16".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Hanger on 9" HF beam	6.00"	Hanger[1]	1.50"	1526	1872	1872	3398	See note [1]
2 - Stud wall - HF	6.00"	6.00"	2.52"	2492	3131	3131	5623	Blocking
3 - Stud wall - HF	6.00"	6.00"	1.50"	1367	1828	1828	3195	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	19' 6" o/c	
Bottom Edge (Lu)	19' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HGUS5.50/8	4.00"	N/A	36-10d	12-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	6" to 20'	N/A	12.0	--	--	
1 - Uniform (PSF)	0 to 5' (Front)	17'	20.0	25.0	25.0	Default Load
2 - Uniform (PSF)	5' to 20' (Front)	11' 6"	20.0	25.0	25.0	

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

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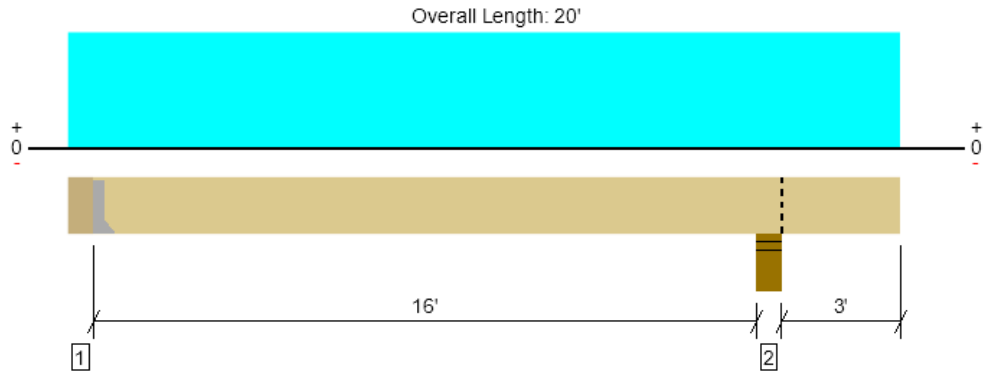
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Roof, Cant. Roof Beam 2

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4386 @ 6"	5363 (1.50")	Passed (82%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	4004 @ 15' 6"	13409	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	17297 @ 8' 4 5/8"	30360	Passed (57%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-2937 @ 16' 9"	23403	Passed (13%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.314 @ 8' 6 7/8"	0.813	Passed (L/620)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.569 @ 8' 6 1/2"	1.083	Passed (L/343)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 19' 6"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 15' 9 5/16".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 10 13/16".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Hanger on 12" HF beam	6.00"	Hanger[1]	1.50"	2117	2539	2539	4656	See note [1]
2 - Stud wall - HF	6.00"	6.00"	2.92"	2996	3510	3510	6506	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	19' 6" o/c	
Bottom Edge (Lu)	19' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HGUS5.50/10	4.00"	N/A	46-10d	16-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	6" to 20'	N/A	16.0	--	--	
1 - Uniform (PSF)	0 to 20' (Front)	12'	20.0	25.0	25.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
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ForteWEB v3.8, Engine: V8.4.1.24, Data: V8.1.6.3
File Name: Palanchuck

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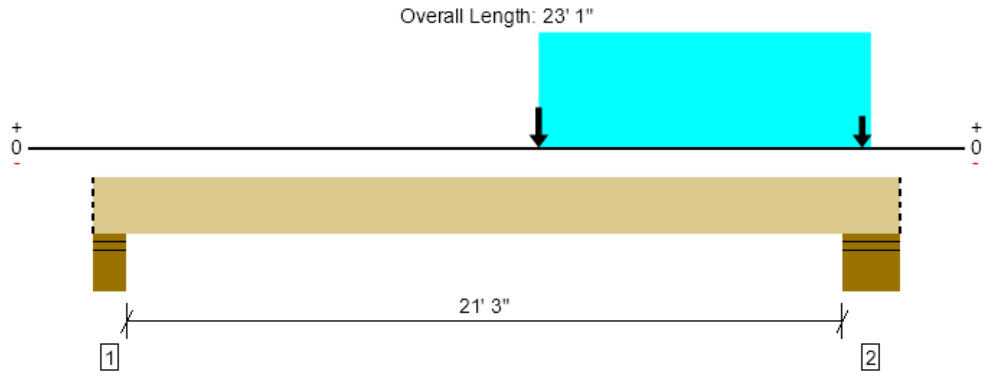
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Roof, Drop Roof Beam 1

1 piece(s) 5 1/2" x 24" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	30040 @ 22' 1/2"	31185 (14.00")	Passed (96%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	14762 @ 19' 11"	26818	Passed (55%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	111116 @ 12' 9"	112246	Passed (99%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.366 @ 11' 10 5/16"	1.075	Passed (L/706)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.674 @ 11' 10 3/16"	1.433	Passed (L/383)	--	1.0 D + 1.0 S (All Spans)

Member Length : 23' 1"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.92 that was calculated using length L = 21' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Stud wall - HF	8.00"	8.00"	4.18"	4362	4952	4952	9315	Blocking
2 - Stud wall - HF	14.00"	14.00"	13.49"	13681	16359	16359	30040	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 3" o/c	
Bottom Edge (Lu)	23' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 23' 1"	N/A	32.1	--	--	
1 - Uniform (PSF)	12' 9" to 22' 3" (Front)	24'	20.0	25.0	25.0	Default Load
2 - Point (lb)	12' 9" (Front)	N/A	5500	6800	6800	
3 - Point (lb)	12' 9" (Front)	N/A	1526	1872	1872	Linked from: Cant. Roof Beam 1, Support 1
4 - Point (lb)	22' (Front)	N/A	3600	4400	4400	
5 - Point (lb)	22' (Front)	N/A	2117	2539	2539	Linked from: Cant. Roof Beam 2, Support 1

• Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
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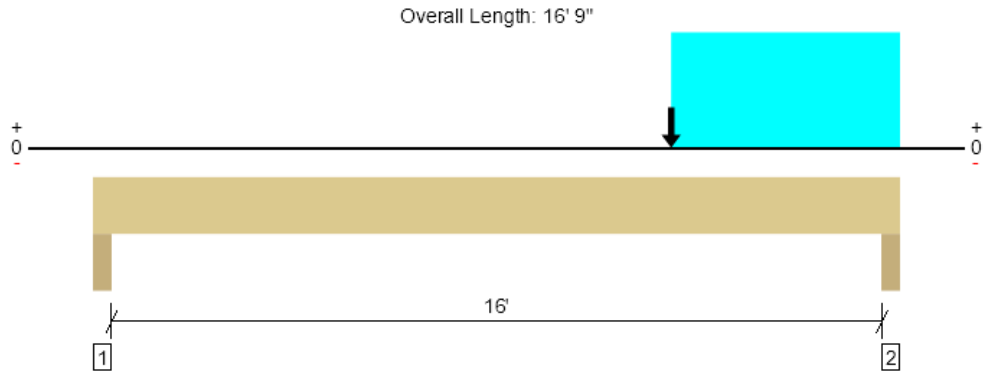
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Roof, Master Slider Header

1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12067 @ 16' 6"	16088 (4.50")	Passed (75%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	10672 @ 14' 10 1/2"	20114	Passed (53%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	45930 @ 12'	66826	Passed (69%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.188 @ 9' 3"	0.542	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.348 @ 9' 2 13/16"	0.813	Passed (L/560)	--	1.0 D + 1.0 S (All Spans)

Member Length : 16' 9"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.98 that was calculated using length L = 16' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Trimmer - HF	4.50"	4.50"	1.50"	1924	2132	2132	4056	None
2 - Trimmer - HF	4.50"	4.50"	3.38"	5499	6568	6568	12067	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	16' 9" o/c	
Bottom Edge (Lu)	16' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 16' 9"	N/A	24.1	--	--	
1 - Uniform (PSF)	12' to 16' 9"	16'	20.0	25.0	25.0	Default Load
2 - Point (lb)	12'	N/A	5500	6800	6800	

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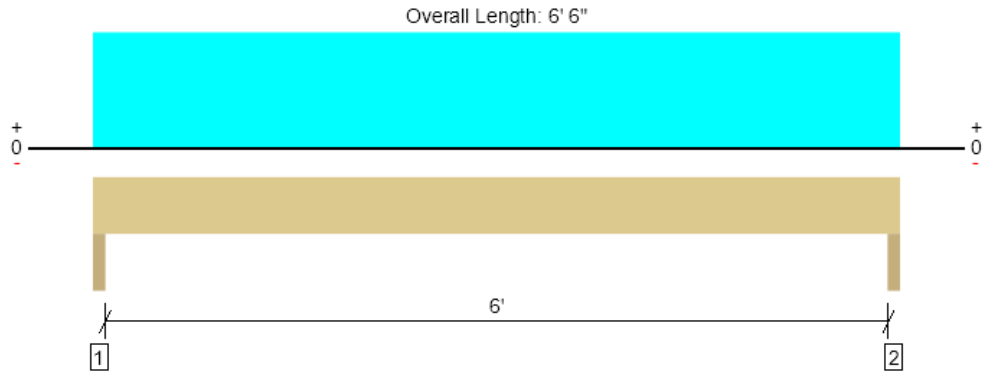
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Roof, Typical Second Floor Header

1 piece(s) 4 x 10 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2513 @ 1 1/2"	4253 (3.00")	Passed (59%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1724 @ 1' 1/4"	3723	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3775 @ 3' 3"	4879	Passed (77%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.049 @ 3' 3"	0.208	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.088 @ 3' 3"	0.313	Passed (L/848)	--	1.0 D + 1.0 S (All Spans)

Member Length : 6' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Trimmer - HF	3.00"	3.00"	1.77"	1132	1381	1381	2513	None
2 - Trimmer - HF	3.00"	3.00"	1.77"	1132	1381	1381	2513	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 6" o/c	
Bottom Edge (Lu)	6' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	8.2	--	--	
1 - Uniform (PSF)	0 to 6' 6"	17'	20.0	25.0	25.0	Default Load

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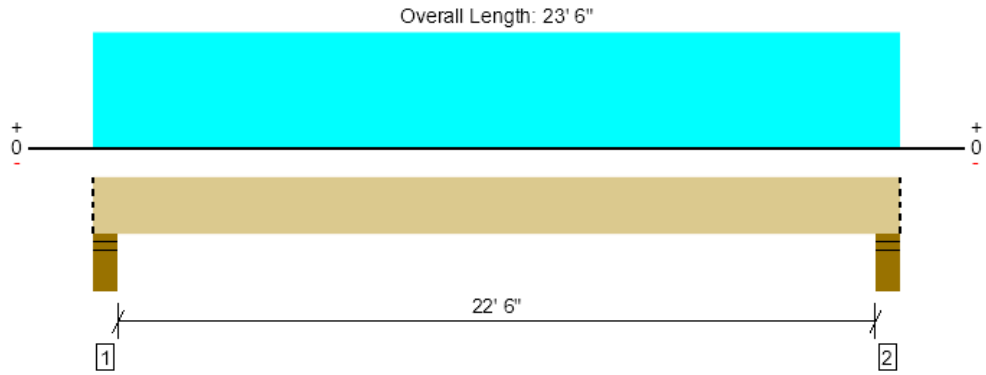
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Second Floor, Deck Beam 1

1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7223 @ 4 1/2"	13365 (6.00")	Passed (54%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	5719 @ 2'	17490	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	37948 @ 11' 9"	56187	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.599 @ 11' 9"	0.758	Passed (L/456)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.770 @ 11' 9"	1.138	Passed (L/355)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 23' 6"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.95 that was calculated using length L = 22' 9".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - HF	6.00"	6.00"	3.24"	1605	5288	2203	7223	Blocking
2 - Stud wall - HF	6.00"	6.00"	3.24"	1605	5288	2203	7223	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	23' 6" o/c	
Bottom Edge (Lu)	23' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 23' 6"	N/A	24.1	--	--	
1 - Uniform (PSF)	0 to 23' 6" (Front)	7' 6"	15.0	60.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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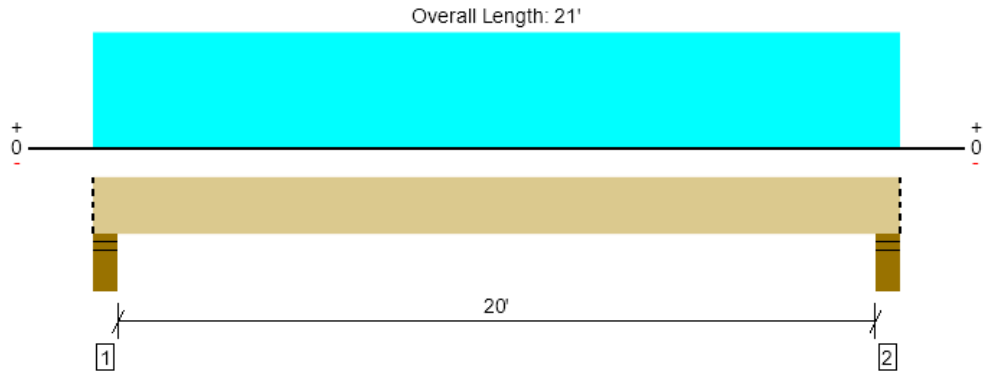
Weyerhaeuser

Second Floor, Deck Beam 2

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1822 @ 4 1/2"	13365 (6.00")	Passed (14%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1494 @ 1' 6"	11660	Passed (13%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	8511 @ 10' 6"	26310	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.338 @ 10' 6"	0.675	Passed (L/718)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.461 @ 10' 6"	1.013	Passed (L/528)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 21'
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 20' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - HF	6.00"	6.00"	1.50"	483	1260	525	1822	Blocking
2 - Stud wall - HF	6.00"	6.00"	1.50"	483	1260	525	1822	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' o/c	
Bottom Edge (Lu)	21' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 21'	N/A	16.0	--	--	
1 - Uniform (PSF)	0 to 21' (Front)	2'	15.0	60.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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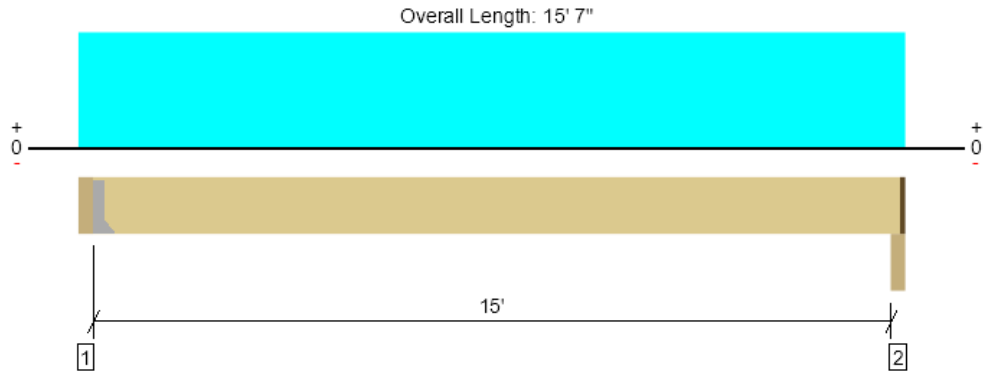
Weyerhaeuser

Second Floor, Deck Joists

1 piece(s) 2 x 12 HF No.1 @ 12" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	594 @ 3 1/2"	911 (1.50")	Passed (65%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	495 @ 1' 2 3/4"	1688	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2133 @ 7' 10"	2956	Passed (72%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.278 @ 7' 10"	0.503	Passed (L/651)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.344 @ 7' 10"	0.754	Passed (L/527)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 15' 2 1/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Hanger on 11 1/4" HF Ledger	3.50"	Hanger[1]	1.50"	117	470	196	617	See note [1]
2 - Beam - HF	3.50"	2.25"	1.50"	116	465	194	610	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 9" o/c	
Bottom Edge (Lu)	15' 2" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 7"	12"	15.0	60.0	25.0	Default Load

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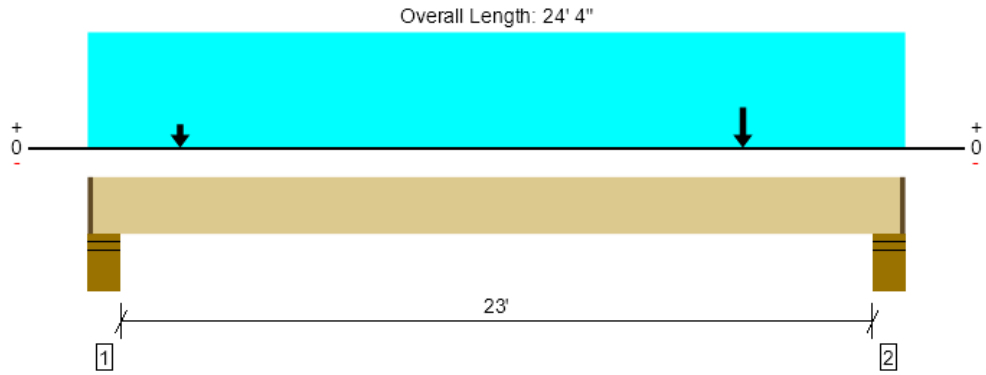
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Second Floor, Second Floor Beam 1

1 piece(s) 6 3/4" x 24" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	17448 @ 23' 9 1/2"	18453 (6.75")	Passed (95%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	15618 @ 21' 8"	32913	Passed (47%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	76275 @ 14' 4 11/16"	133912	Passed (57%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.352 @ 12' 5 1/2"	0.581	Passed (L/793)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.546 @ 12' 6 3/4"	1.163	Passed (L/511)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 24' 1 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.90 that was calculated using length L = 23' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Stud wall - HF	8.00"	6.75"	5.02"	4892	6448	3142	5423	13796	1 1/4" Rim Board
2 - Stud wall - HF	8.00"	6.75"	6.38"	6802	6448	5558	7839	17518	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	24' 2" o/c	
Bottom Edge (Lu)	24' 2" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 24' 2 3/4"	N/A	39.4	--	--	--	
1 - Uniform (PSF)	0 to 24' 4" (Front)	7' 6"	15.0	60.0	-	25.0	Default Load
2 - Uniform (PSF)	0 to 24' 4" (Front)	2'	12.0	40.0	-	-	
3 - Point (lb)	2' 9" (Top)	N/A	1924	-	2132	2132	Linked from: Master Slider Header, Support 1
4 - Point (lb)	19' 6" (Top)	N/A	5499	-	6568	6568	Linked from: Master Slider Header, Support 2

- Side loads are assumed to not induce cross-grain tension.

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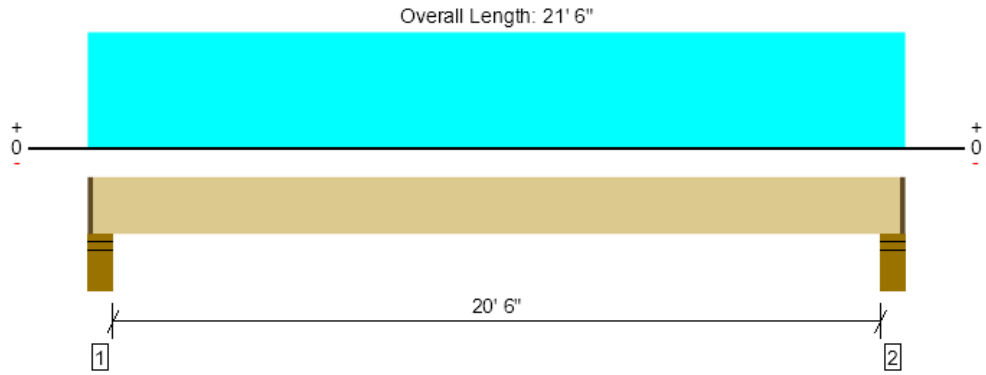
ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Second Floor, Second Floor Beam 2

1 piece(s) 5 1/4" x 18" 2.0E Parallam® PSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5850 @ 4 1/2"	10100 (4.75")	Passed (58%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4809 @ 2'	18270	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	29577 @ 10' 9"	65497	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.353 @ 10' 9"	0.519	Passed (L/705)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.485 @ 10' 9"	1.038	Passed (L/513)	--	1.0 D + 1.0 L (All Spans)

Member Length : 21' 3 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	6.00"	4.75"	2.75"	1605	4300	5905	1 1/4" Rim Board
2 - Stud wall - HF	6.00"	4.75"	2.75"	1605	4300	5905	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' 4" o/c	
Bottom Edge (Lu)	21' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 21' 4 3/4"	N/A	29.5	--	
1 - Uniform (PSF)	0 to 21' 6" (Front)	10'	12.0	40.0	

• Side loads are assumed to not induce cross-grain tension.

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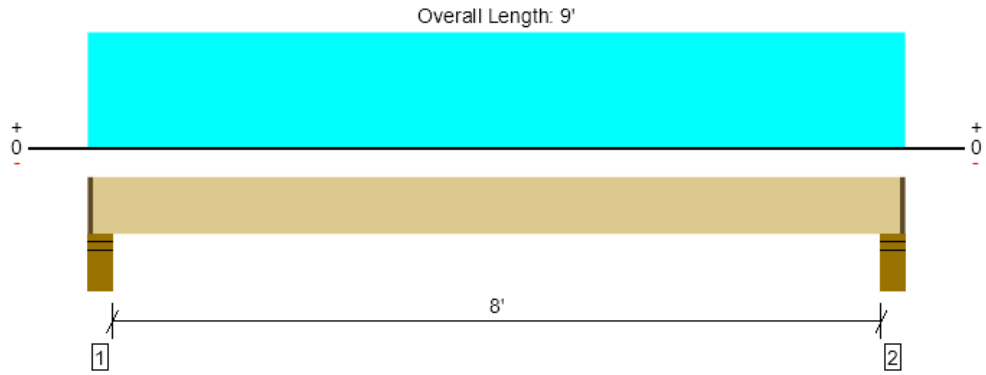
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Second Floor, Second Floor Beam 3

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3286 @ 4 1/2"	10100 (4.75")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2250 @ 1' 5 7/8"	12053	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6360 @ 4' 6"	29854	Passed (21%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.049 @ 4' 6"	0.206	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.065 @ 4' 6"	0.412	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 9 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	6.00"	4.75"	1.55"	842	2520	3362	1 1/4" Rim Board
2 - Stud wall - HF	6.00"	4.75"	1.55"	842	2520	3362	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 10" o/c	
Bottom Edge (Lu)	8' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 8' 10 3/4"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 9' (Front)	14'	12.0	40.0	

- Side loads are assumed to not induce cross-grain tension.

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ForteWEB Software Operator	Job Notes
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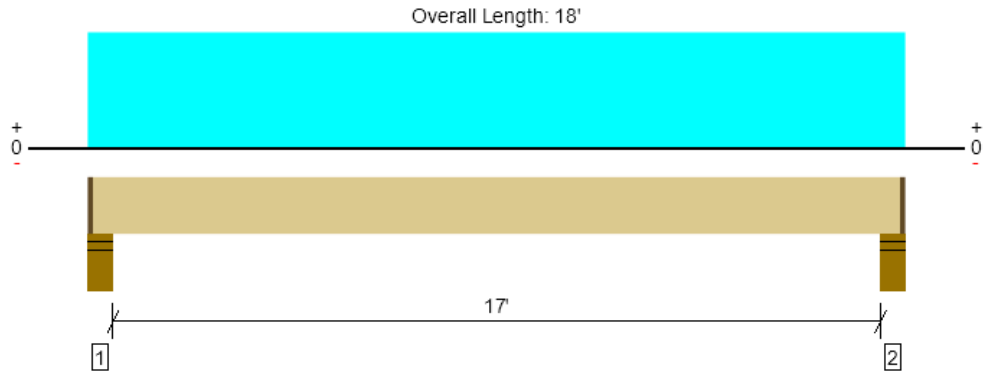
Weyerhaeuser

Second Floor, Second Floor Beam 4

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2024 @ 4 1/2"	10100 (4.75")	Passed (20%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1709 @ 1' 5 7/8"	12053	Passed (14%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	8462 @ 9'	29854	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.229 @ 9'	0.431	Passed (L/906)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.325 @ 9'	0.863	Passed (L/637)	--	1.0 D + 1.0 L (All Spans)

Member Length : 17' 9 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	6.00"	4.75"	1.50"	605	1440	2045	1 1/4" Rim Board
2 - Stud wall - HF	6.00"	4.75"	1.50"	605	1440	2045	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	17' 10" o/c	
Bottom Edge (Lu)	17' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 17' 10 3/4"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 18' (Front)	4'	12.0	40.0	

- Side loads are assumed to not induce cross-grain tension.

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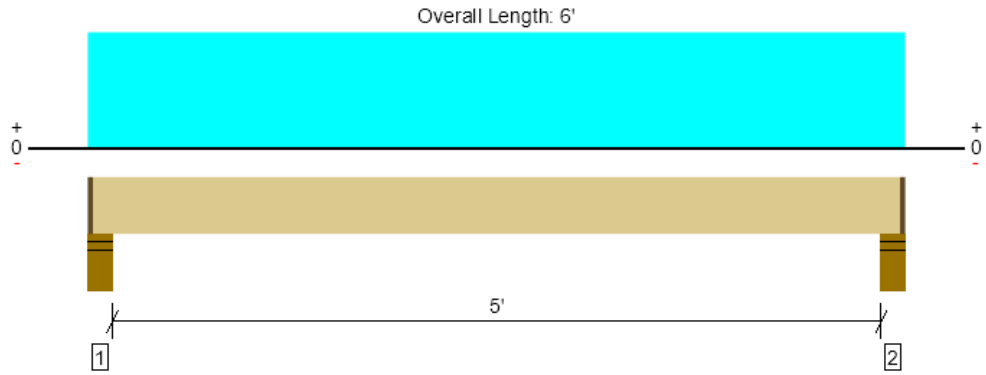
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Second Floor, Second Floor Beam 5

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2767 @ 4 1/2"	10100 (4.75")	Passed (27%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1443 @ 1' 5 7/8"	12053	Passed (12%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3292 @ 3'	29854	Passed (11%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.013 @ 3'	0.131	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.017 @ 3'	0.262	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 5' 9 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	6.00"	4.75"	1.50"	704	2160	2864	1 1/4" Rim Board
2 - Stud wall - HF	6.00"	4.75"	1.50"	704	2160	2864	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 10" o/c	
Bottom Edge (Lu)	5' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 5' 10 3/4"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 6' (Front)	18'	12.0	40.0	

- Side loads are assumed to not induce cross-grain tension.

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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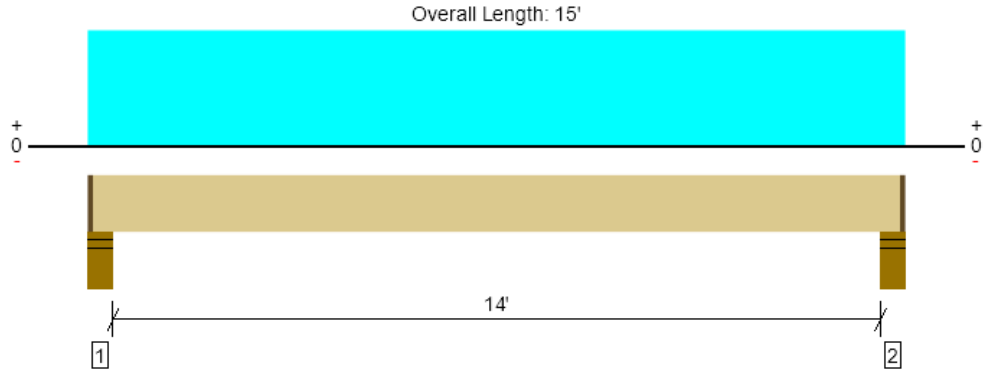
Weyerhaeuser

Second Floor, Second Floor Beam 6

1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3942 @ 4 1/2"	6733 (4.75")	Passed (59%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3203 @ 1' 5 7/8"	8035	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13528 @ 7' 6"	19902	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.408 @ 7' 6"	0.475	Passed (L/419)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.544 @ 7' 6"	0.712	Passed (L/315)	--	1.0 D + 1.0 L (All Spans)

Member Length : 14' 9 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	6.00"	4.75"	2.78"	996	3000	3996	1 1/4" Rim Board
2 - Stud wall - HF	6.00"	4.75"	2.78"	996	3000	3996	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	14' 10" o/c	
Bottom Edge (Lu)	14' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 14' 10 3/4"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 15' (Front)	10'	12.0	40.0	

- Side loads are assumed to not induce cross-grain tension.

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ForteWEB Software Operator	Job Notes
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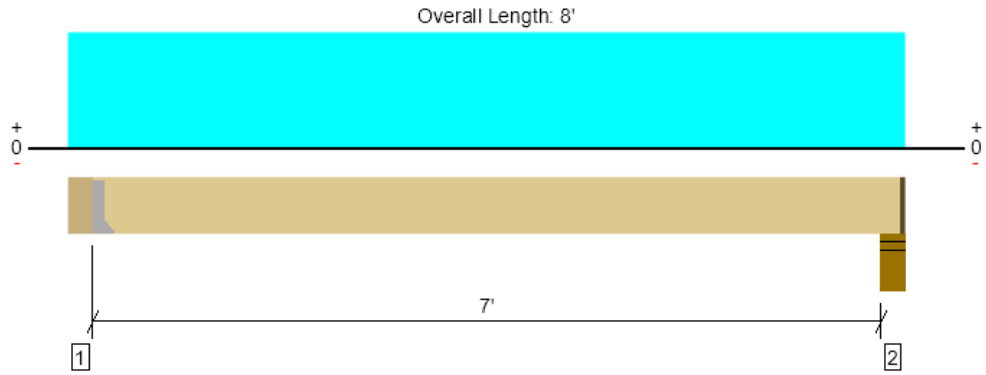
Weyerhaeuser

Second Floor, Second Floor Beam 7

1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2269 @ 6"	3281 (1.50")	Passed (69%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1639 @ 1' 5 7/8"	8035	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4042 @ 4' 3/4"	19902	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.037 @ 4' 3/4"	0.237	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.049 @ 4' 3/4"	0.356	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 7' 4 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 11 7/8" HF beam	6.00"	Hanger[1]	1.50"	631	1950	2581	See note [1]
2 - Stud wall - HF	6.00"	4.75"	1.72"	617	1890	2507	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 5" o/c	
Bottom Edge (Lu)	7' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HHUS48	3.00"	N/A	22-10d	8-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	6" to 7' 10 3/4"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 8' (Front)	12'	12.0	40.0	

- Side loads are assumed to not induce cross-grain tension.

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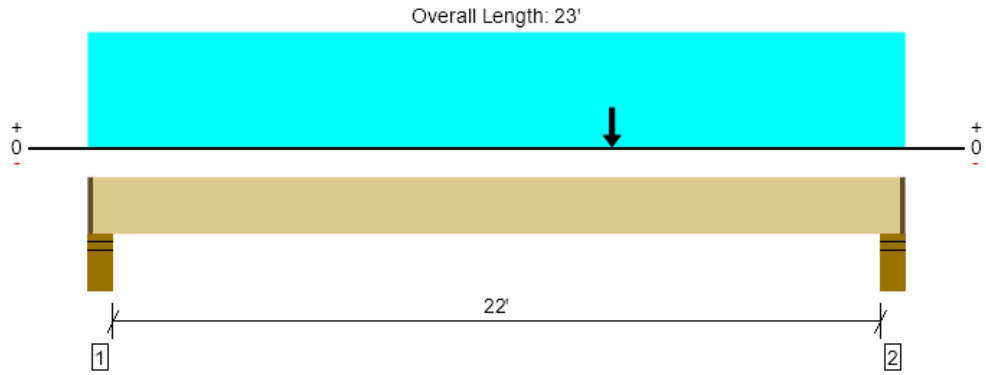
Weyerhaeuser

Second Floor, Second Floor Beam 8

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3149 @ 22' 7 1/2"	13466 (4.75")	Passed (23%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2969 @ 21' 6 1/8"	16071	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	20491 @ 14' 9"	39805	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.596 @ 12' 7/16"	0.742	Passed (L/448)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.858 @ 11' 11 7/8"	1.112	Passed (L/311)	--	1.0 D + 1.0 L (All Spans)

Member Length : 22' 9 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	6.00"	4.75"	1.50"	796	1610	2406	1 1/4" Rim Board
2 - Stud wall - HF	6.00"	4.75"	1.50"	980	2180	3160	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	22' 10" o/c	
Bottom Edge (Lu)	22' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 22' 10 3/4"	N/A	26.0	--	
1 - Uniform (PSF)	0 to 23' (Front)	2'	12.0	40.0	
2 - Point (lb)	14' 9" (Front)	N/A	631	1950	Linked from: Second Floor Beam 7, Support 1

- Side loads are assumed to not induce cross-grain tension.

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ForteWEB Software Operator	Job Notes
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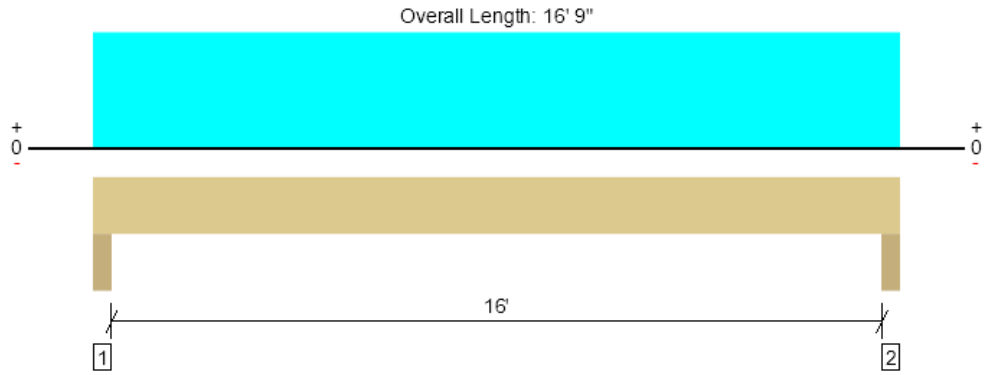
Weyerhaeuser

Second Floor, Great Room Slider Header

1 piece(s) 5 1/2" x 15" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6265 @ 3"	16088 (4.50")	Passed (39%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5049 @ 1' 7 1/2"	14575	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	24692 @ 8' 4 1/2"	41096	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.316 @ 8' 4 1/2"	0.542	Passed (L/618)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.422 @ 8' 4 1/2"	0.813	Passed (L/463)	--	1.0 D + 1.0 L (All Spans)

Member Length : 16' 9"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 16' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - HF	4.50"	4.50"	1.75"	1575	4690	6265	None
2 - Trimmer - HF	4.50"	4.50"	1.75"	1575	4690	6265	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	16' 9" o/c	
Bottom Edge (Lu)	16' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 16' 9"	N/A	20.0	--	
1 - Uniform (PSF)	0 to 16' 9"	14'	12.0	40.0	Default Load

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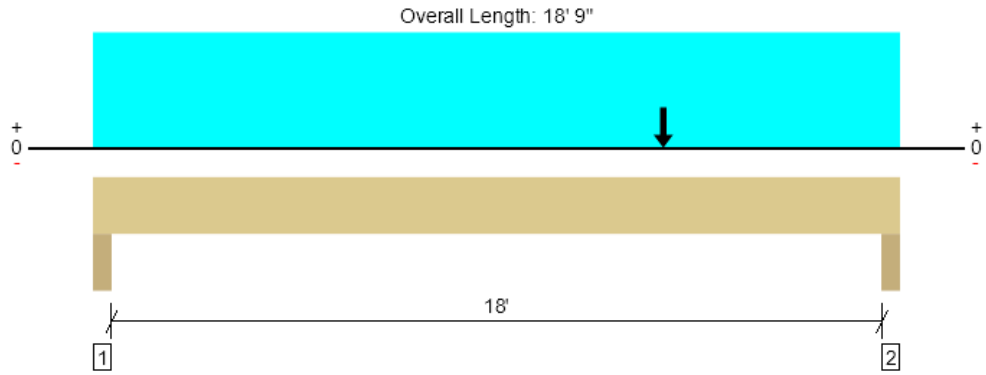
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Second Floor, Garage Door Header

1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9196 @ 18' 6"	16088 (4.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7699 @ 16' 10 1/2"	17490	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	39841 @ 10' 2 15/16"	57439	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.368 @ 9' 6 3/16"	0.608	Passed (L/596)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.498 @ 9' 6 3/8"	0.913	Passed (L/440)	--	1.0 D + 1.0 L (All Spans)

Member Length : 18' 9"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.97 that was calculated using length L = 18' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Trimmer - HF	4.50"	4.50"	2.29"	2086	6088	469	8174	None
2 - Trimmer - HF	4.50"	4.50"	2.57"	2424	6772	469	9196	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	18' 9" o/c	
Bottom Edge (Lu)	18' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 18' 9"	N/A	24.1	--	--	
1 - Uniform (PSF)	0 to 18' 9"	12'	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 18' 9"	2'	15.0	60.0	25.0	
3 - Point (lb)	13' 3"	N/A	796	1610	-	Linked from: Second Floor Beam 8, Support 1

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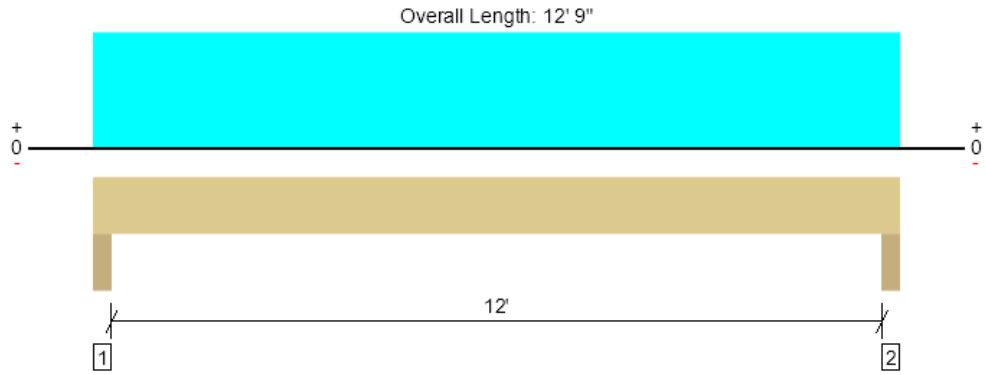
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Second Floor, Dining Slider Header

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4897 @ 3"	16088 (4.50")	Passed (30%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3613 @ 1' 4 1/2"	11660	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	13553 @ 6' 4 1/2"	26400	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.205 @ 6' 4 1/2"	0.408	Passed (L/719)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.273 @ 6' 4 1/2"	0.613	Passed (L/538)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 12' 9"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 12' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Trimmer - HF	4.50"	4.50"	1.50"	1227	3379	319	1514	4897	None
2 - Trimmer - HF	4.50"	4.50"	1.50"	1227	3379	319	1514	4897	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 9" o/c	
Bottom Edge (Lu)	12' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 9"	N/A	16.0	--	--	--	
1 - Uniform (PSF)	0 to 12' 9"	2'	12.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 12' 9"	7' 6"	15.0	60.0	-	25.0	
3 - Uniform (PSF)	0 to 12' 9"	2'	20.0	-	25.0	25.0	

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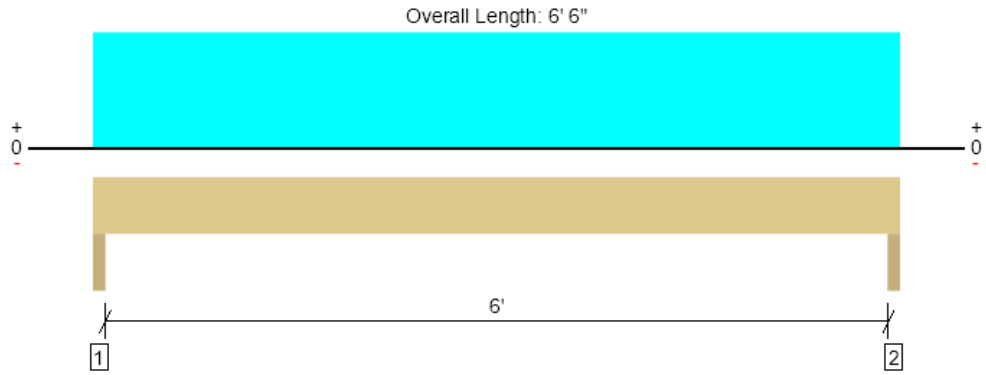
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Nicholas Levengood N.L. Olson & Associates (360) 535-3705 nlevengood17@gmail.com	

Weyerhaeuser

Second Floor, Typical First Floor Header

1 piece(s) 4 x 12 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3675 @ 1 1/2"	4253 (3.00")	Passed (86%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2332 @ 1' 2 1/4"	4528	Passed (52%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	5521 @ 3' 3"	6615	Passed (83%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.041 @ 3' 3"	0.208	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.072 @ 3' 3"	0.313	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 6' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Trimmer - HF	3.00"	3.00"	2.59"	1566	1430	1381	1381	3675	None
2 - Trimmer - HF	3.00"	3.00"	2.59"	1566	1430	1381	1381	3675	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 6" o/c	
Bottom Edge (Lu)	6' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	10.0	--	--	--	
1 - Uniform (PSF)	0 to 6' 6"	11'	12.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 6' 6"	17'	20.0	-	25.0	25.0	

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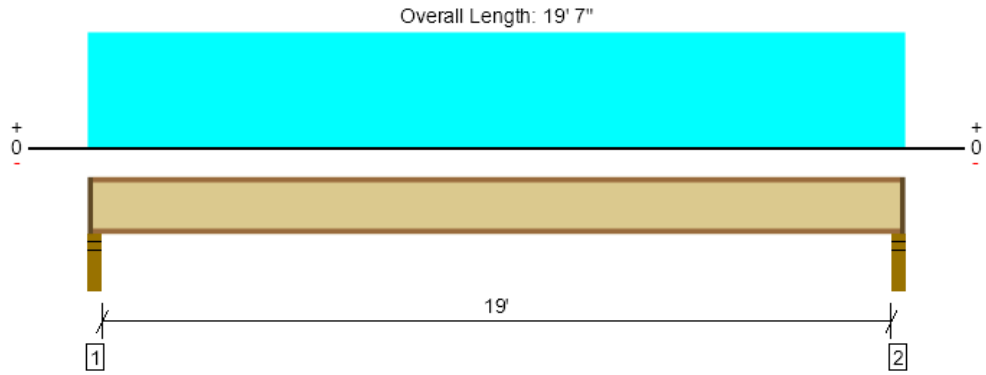
Weyerhaeuser

Second Floor, Second Floor Joists 1

1 piece(s) 11 7/8" TJI® 210 @ 16" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	672 @ 2 1/2"	1134 (2.25")	Passed (59%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	659 @ 3 1/2"	1655	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3184 @ 9' 9 1/2"	3795	Passed (84%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.462 @ 9' 9 1/2"	0.479	Passed (L/498)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.601 @ 9' 9 1/2"	0.958	Passed (L/383)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	39	25	Passed	--	--

Member Length : 19' 4 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	2.25"	1.75"	157	522	679	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.75"	157	522	679	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' o/c	
Bottom Edge (Lu)	19' 5" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 19' 7"	16"	12.0	40.0	Default Load

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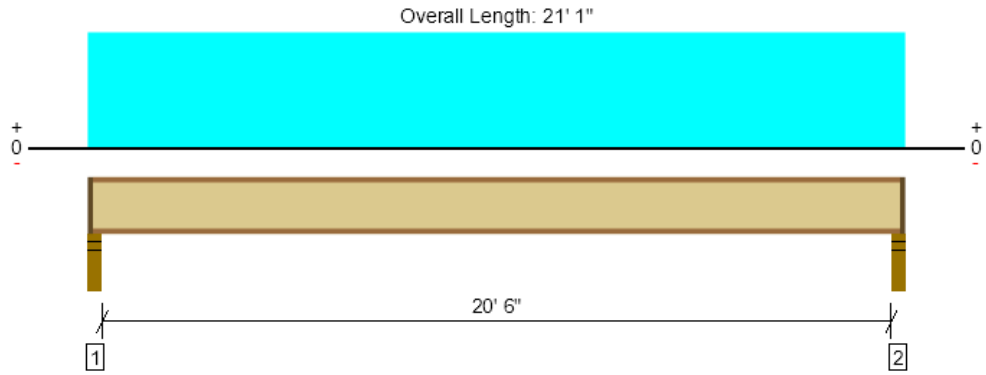
Weyerhaeuser

Second Floor, Second Floor Joists 2

1 piece(s) 11 7/8" TJI® 360 @ 16" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	724 @ 2 1/2"	1202 (2.25")	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	711 @ 3 1/2"	1705	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3702 @ 10' 6 1/2"	6180	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.492 @ 10' 6 1/2"	0.517	Passed (L/504)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.639 @ 10' 6 1/2"	1.033	Passed (L/388)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	38	25	Passed	--	--

Member Length : 20' 10 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	2.25"	1.75"	169	562	731	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.75"	169	562	731	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 10" o/c	
Bottom Edge (Lu)	20' 11" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 21' 1"	16"	12.0	40.0	Default Load

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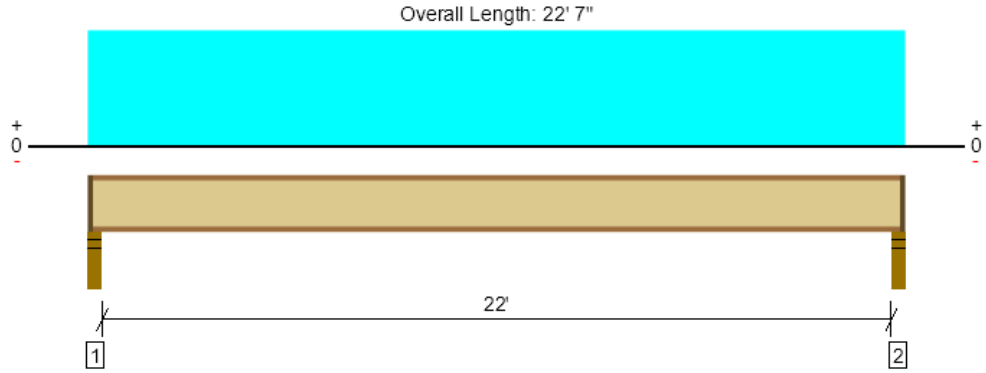
Weyerhaeuser

Second Floor, Second Floor Joists 3

1 piece(s) 11 7/8" TJI® 560 @ 16" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	776 @ 2 1/2"	1396 (2.25")	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	763 @ 3 1/2"	2050	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4258 @ 11' 3 1/2"	9500	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.452 @ 11' 3 1/2"	0.554	Passed (L/588)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.588 @ 11' 3 1/2"	1.108	Passed (L/453)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	40	25	Passed	--	--

Member Length : 22' 4 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	2.25"	1.75"	181	602	783	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.75"	181	602	783	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 7" o/c	
Bottom Edge (Lu)	22' 5" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 22' 7"	16"	12.0	40.0	Default Load

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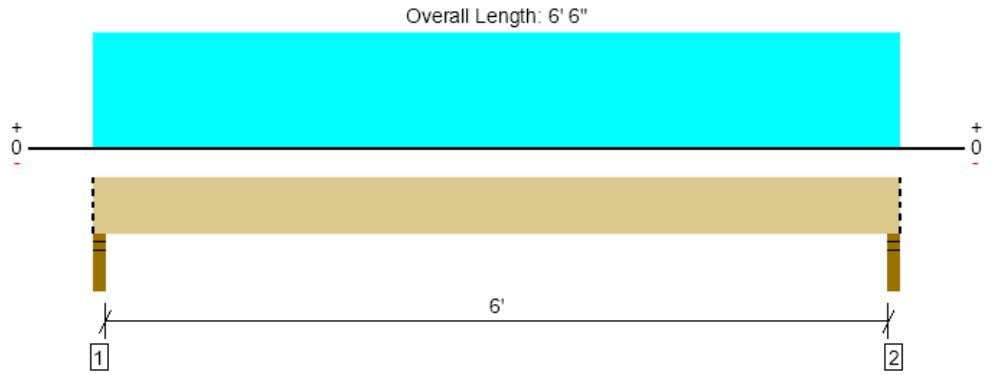
Weyerhaeuser

First Floor Beam, First Floor Beam

1 piece(s) 6 x 12 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3770 @ 1 1/2"	6683 (3.00")	Passed (56%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2368 @ 1' 2 1/2"	5903	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5664 @ 3' 3"	6819	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.039 @ 3' 3"	0.208	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.052 @ 3' 3"	0.313	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 6' 6"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.00"	3.00"	1.69"	910	2860	3770	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.69"	910	2860	3770	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 6" o/c	
Bottom Edge (Lu)	6' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	22'	12.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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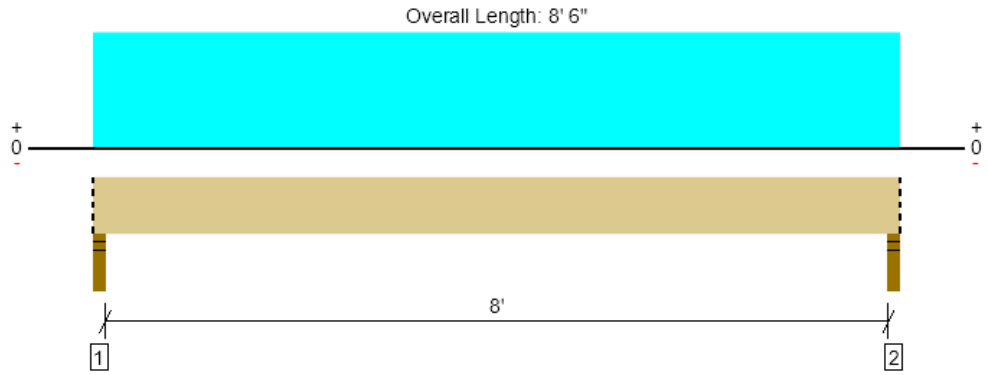
Weyerhaeuser

First Floor Beam, Deck Beam

1 piece(s) 6 x 12 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3080 @ 1 1/2"	6683 (3.00")	Passed (46%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2102 @ 1' 2 1/2"	5903	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5879 @ 4' 3"	6819	Passed (86%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.078 @ 4' 3"	0.275	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.099 @ 4' 3"	0.412	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 8' 6"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - HF	3.00"	3.00"	1.50"	642	2295	956	3080	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	642	2295	956	3080	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	16.0	--	--	
1 - Uniform (PSF)	0 to 8' 6" (Front)	9'	15.0	60.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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APA

Technical Topics

TT-100H MAY 2020

A Portal Frame with Hold Downs for Engineered Applications

The APA portal-frame design, as shown in Figure 1, was envisioned primarily for use as bracing in conventional light-frame construction. However, it can also be used in engineered applications, as described in this technical topic. The portal frame is not actually a narrow shear wall because it transfers shear by means of a semi-rigid, moment-resisting frame. The extended header is integral in the function of the portal frame, thus, the effective frame width is more than just the wall segment, but includes the header length that extends beyond the wall segment. For this shear transfer mechanism, the wall aspect ratio requirements of the code do not apply to the wall segment of the APA portal frame.

FIGURE 1

CONSTRUCTION DETAILS FOR APA PORTAL-FRAME DESIGN WITH HOLD DOWNS

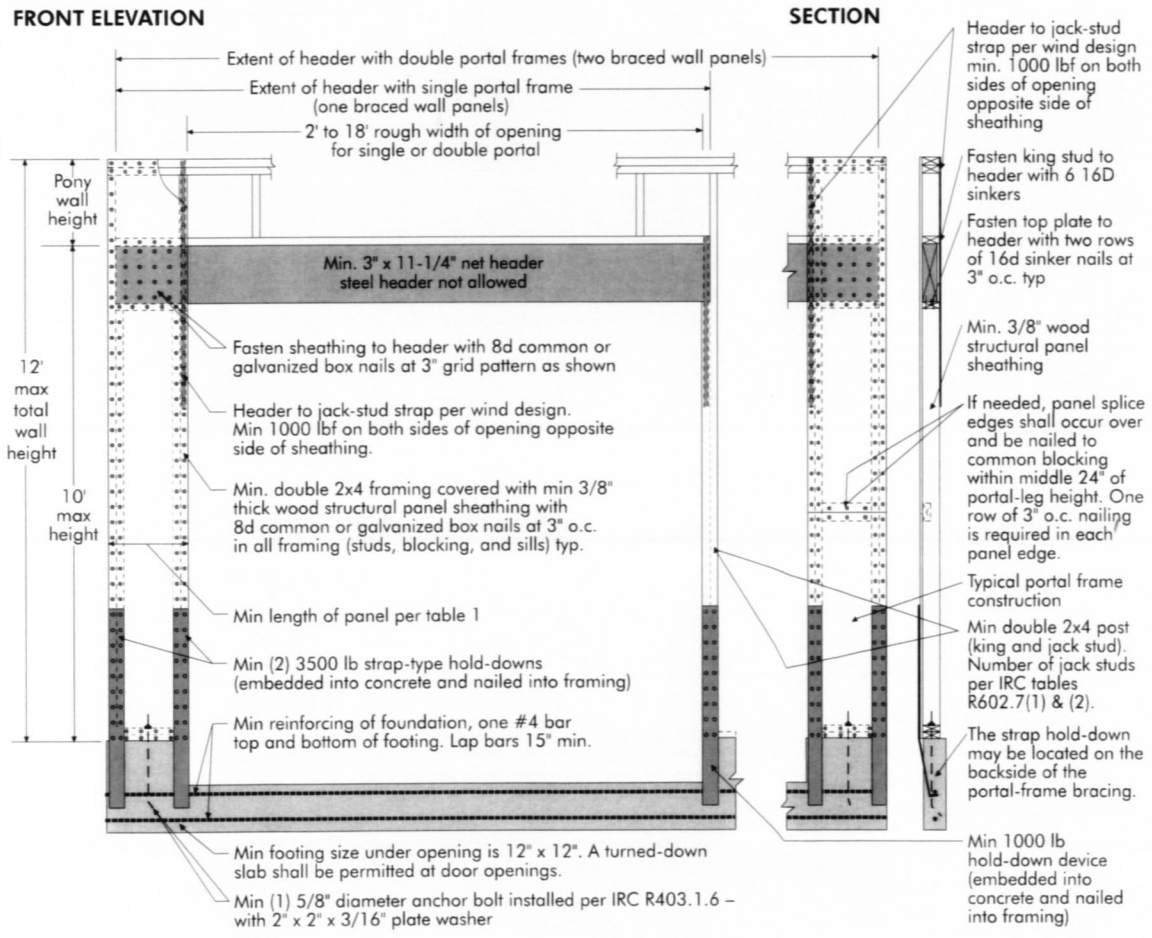

TABLE 1

RECOMMENDED ALLOWABLE DESIGN VALUES FOR A SINGLE LEG OF AN APA PORTAL FRAME USED ON A RIGID-BASE FOUNDATION FOR WIND OR SEISMIC LOADING[a,b,c,d]

Minimum Portal Width (in.)	Maximum Portal Height (ft)	Allowable Design (ASD) Values per Frame Segment		Load Factor
		Shear[e,f] (lbf)	Deflection (in.)	
16	8	850	0.33	3.09
	10	625	0.44	2.97
24	8	1,675	0.38	2.88
	10	1,125	0.51	3.42

a. Design values are based on the use of Douglas-fir or Southern pine framing. For other species of framing, multiply the above shear design value by the specific gravity adjustment factor = (1 – (0.5 – SG)), where SG = specific gravity of the actual framing. This adjustment shall not be greater than 1.0.

b. For construction as shown in Figure 1.

c. Values are for a single portal-frame segment (one vertical leg and a portion of the header). For multiple portal-frame segments, the allowable shear design values are permitted to be multiplied by the number of frame segments.

d. Interpolation of design values for heights between 8 and 10 feet, and for portal widths between 16 and 24 inches, is permitted.

e. The allowable shear design value is permitted to be multiplied by a factor of 1.4 for wind design.

f. If story drift is not a design consideration, the tabulated design shear values are permitted to be multiplied by a factor of 1.15. This factor is permitted to be used cumulatively with the wind-design adjustment factor in Footnote (e) above.

Recommended design values for engineered use of the portal frames are provided in Table 1 considering both strength and stiffness. The Table 1 values were developed using the CUREE cyclic test protocol (ASTM E2126) with a flexible load head to ensure that the code (IBC) drift limit, ductility and safety factor are maintained. For seismic design, APA recommends using the design coefficients and factors for light-frame (wood) walls sheathed with wood structural panels rated for shear resistance (Item 15 of Table 12.2-1 of ASCE 7-16). See APA Report T2004-59 for more details.

Since cyclic testing was conducted with the portal frame attached to a rigid test frame using embedded strap-type hold downs, design values provided in Table 1 of this document should be limited to portal frames constructed on similar rigid-base foundations, such as a concrete foundation, stem wall or slab, and using a similar embedded strap-type hold down.

References

APA. 2004. *Confirmation of Seismic Design Coefficients for the APA Portal Frame.* APA Report T2004-59. Tacoma, WA.

APA. 2012. *Effect of Hold-Down Capacity on IRC Bracing Method PFH and IBC Alternate Method.* APA Report T2012L-24. Tacoma, WA.

American Society of Civil Engineers. 2016. *Minimum Design Load and Associated Criteria for Buildings and Other Structures.* ASCE 7. Reston, VA.

ASTM International. 2001. *Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings.* ASTM E2126. West Conshohocken, PA.

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