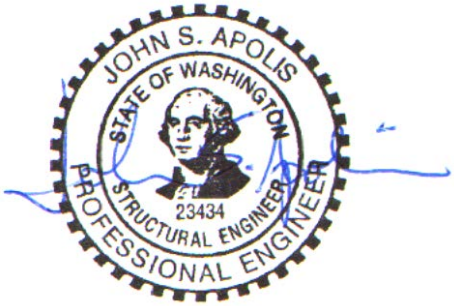
Structural Calculations Cover Sheet

Project Number: 2022.033 **Date:** September 1, 2022
Project Name: Nguyen **Architect:**

Structural Design For: Structural design for a remodel and new upper story for an existing residence.
Construction Type: Conventional wood framing with conventional concrete foundation.

CODES

2018 International Building Code (IBC)
2018 NDS
ASCE 7-16



LOADS

Dead Loads	As required
Floor Load	40 psf
Wind	110 mph, Exposure B, Per ASCE 7-10 Section 28, Kzt = 1.38
Seismic	Per ASCE 7-10 Section 12

Peak Ground Accelerations (PGA) based on USGS Hazards Program 2003, by Lat/Lon.
PGA 1 sec = .503 PGA .2 sec = 1.451 %V = .149 * DL

Material Design Values

Soils (assumed)	Minimum 1,500 psf allowed bearing (subject to field verification)	
Concrete	f'c=2,500 psi; 5-1/2 sack mix, or alternate mix pre-approved by bldg. dept.	
Reinforcing	Grade 60; Fy=60,000 psi minimum	
Sawn Lumber	Joists, Rafters:	Hem-Fir #2 and better
	Beams, Posts:	DF-L #2
	Studs & Plates:	Hem-Fir Standard
Glu-Lam Beams	24F-V4 for simple span beams, 24F-V8 for cantilevered beams	
Parallam Beams	2.2E PSL, Fb=2,900 psi, Fv=290 psi, E=2.2*10^6 psi (minimum)	
Microllam Beams	1.9E LVL, Fb=2,600 psi, Fv=285 psi, E=1.9*10^6 psi (minimum)	
Timberstrand Bms	1.7E LSL, Fb=2,600 psi, Fv=400 psi, E=1.7*10^6 psi (minimum)	
Anchor Bolts	F1554 Anchor Bolts, A307 other bolts	

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Structural Engineering Consulting and Design

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 6-Apr-22

Architect: Page number: R 1

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Typical Roof Headers

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	6.67 ft	Tributary Width:	2 ft	P Location:	6.67 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	100 lbs	DL Reaction 2:	100 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	167 lbs	SL Reaction 2:	167 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**267 lbs**	Total Reaction 2:	**267 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.33 in	Max LL defl:	0.22 in
Total defl. * I:	2.74 in^4	Required I:	8.22 in^4
LL defl. * I:	1.71 in^4	Required I:	7.7 in^4
Actual deflections:	TOTAL: 0.03 in		0.02 in

Force analysis:

Max. moment:	445 ft-lb	Max Shear:	267 lbs

Selected Member:	(2) HF#2	**1.5**	**x**	**7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	95.27 in^4		8.22 in^4
Section Modulus:	26.28 in^3		4.55 in^3
Section Area:	21.75 in^2		2.32 in^2
Bearing Area:			0.66 in^2
Minimum bearing dimensions:	3. in	x	0.22 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.033**
Project:	**Nguyen**	Date:	11-Apr-22
Architect:		Page number:	R 2

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: West 6 ft Window Headers

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	6.67 ft	Tributary Width:	15 ft	P Location:	6.67 ft
Add'l uniform DL:		DL unit load:	20 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	20 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1001 lbs	DL Reaction 2:	1001 lbs	Note: Design automatically uses
LL Reaction 1:	1001 lbs	LL Reaction 2:	1001 lbs	ASD load combinations
SL Reaction 1:	1251 lbs	SL Reaction 2:	1251 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2689 lbs**	Total Reaction 2:	**2689 lbs**	

Material Properties:

E	1.8 msi	E'	1.8 msi
Fb	2400 psi	Fb'	2760 psi
Fv	265 psi	Fv'	305 psi
Fc perp	650 psi	Fc perp'	650 psi
Emin	0.95 msi	Emin'	0.95 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.33 in	Max LL defl:	0.22 in
Total defl. * I:	24.12 in^4	Required I:	72.33 in^4
LL defl. * I:	16.7 in^4	Required I:	75.11 in^4
Actual deflections:	TOTAL: 0.2 in		0.14 in

Force analysis:

Max. moment:	4484 ft-lb	Max Shear:	2689 lbs

Selected Member: (1) GLB **3.5** **x** **7.5**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	123.05 in^4		75.11 in^4
Section Modulus:	32.81 in^3		19.49 in^3
Section Area:	26.25 in^2		13.23 in^2
Bearing Area:			4.14 in^2
Minimum bearing dimensions:	3.5 in	x	1.18 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 1

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: 9 ft French Door Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	9.5 ft	Tributary Width:	1.33 ft	P Location:	9.5 ft
Add'l uniform DL:	318.8 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	531.3 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1609 lbs	DL Reaction 2:	1609 lbs	Note: Design automatically uses
LL Reaction 1:	253 lbs	LL Reaction 2:	253 lbs	ASD load combinations
SL Reaction 1:	2523 lbs	SL Reaction 2:	2523 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**4132 lbs**	Total Reaction 2:	**4132 lbs**	

Material Properties:

E	1.8 msi	E'	1.8 msi
Fb	2400 psi	Fb'	2760 psi
Fv	265 psi	Fv'	305 psi
Fc perp	650 psi	Fc perp'	650 psi
Emin	0.95 msi	Emin'	0.95 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.48 in	Max LL defl:	0.24 in
Total defl. * I:	93.99 in^4	Required I:	197.87 in^4
LL defl. * I:	59.5 in^4	Required I:	250.55 in^4
Actual deflections:	TOTAL: 0.28 in		0.18 in

Force analysis:

Max. moment:	9814 ft-lb	Max Shear:	4132 lbs

Selected Member: (1) GLB **5.5** **x** **9**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	334.13 in^4		250.55 in^4
Section Modulus:	74.25 in^3		42.67 in^3
Section Area:	49.5 in^2		20.34 in^2
Bearing Area:			6.36 in^2
Minimum bearing dimensions:	5.5 in	x	1.16 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 2

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: North Patio Beam

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:	1	Wet Use:	

Geometry and Loads:

Span:	12.5 ft	Tributary Width:	3.25 ft	P Location:	12.5 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	305 lbs	DL Reaction 2:	305 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	508 lbs	SL Reaction 2:	508 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**813 lbs**	Total Reaction 2:	**813 lbs**	

Material Properties:

E	1.3 msi	E'	1.235 msi
Fb	850 psi	Fb'	1017 psi
Fv	150 psi	Fv'	138 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.4465 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.63 in	Max LL defl:	0.42 in
Total defl. * I:	57.82 in^4	Required I:	92.52 in^4
LL defl. * I:	36.14 in^4	Required I:	86.73 in^4
Actual deflections:	TOTAL: 0.52 in		0.33 in

Force analysis:

Max. moment:	2539 ft-lb	Max Shear:	813 lbs

Selected Member: (1) HF#2 **3.5** **x** **7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	111.15 in^4		92.52 in^4
Section Modulus:	30.66 in^3		29.97 in^3
Section Area:	25.38 in^2		8.83 in^2
Bearing Area:			2.01 in^2
Minimum bearing dimensions:	3.5 in	x	0.57 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 3

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: North East 12.5ft Floor Beam

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	12.5 ft	Tributary Width:	11.5 ft	P Location:	12.5 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1078 lbs	DL Reaction 2:	1078 lbs	Note: Design automatically uses
LL Reaction 1:	2875 lbs	LL Reaction 2:	2875 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**3953 lbs**	Total Reaction 2:	**3953 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2900 psi	Fb'	2903 psi
Fv	290 psi	Fv'	290 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.914 msi	Emin'	0.914 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.63 in	Max LL defl:	0.31 in
Total defl. * I:	173.72 in^4	Required I:	277.95 in^4
LL defl. * I:	126.34 in^4	Required I:	404.3 in^4
Actual deflections:	TOTAL: 0.36 in		0.26 in

Force analysis:

Max. moment:	12354 ft-lb	Max Shear:	3953 lbs

Selected Member: (1) PSL **3.5** **x** **11.875**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	488.41 in^4		404.3 in^4
Section Modulus:	82.26 in^3		51.06 in^3
Section Area:	41.56 in^2		20.45 in^2
Bearing Area:			6.33 in^2
Minimum bearing dimensions:	3.5 in	x	1.81 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 4

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: East Windows

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	6.5 ft	Tributary Width:	7.5 ft	P Location:	6.5 ft
Add'l uniform DL:	202.5 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	337.5 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1024 lbs	DL Reaction 2:	1024 lbs	Note: Design automatically uses
LL Reaction 1:	975 lbs	LL Reaction 2:	975 lbs	ASD load combinations
SL Reaction 1:	1097 lbs	SL Reaction 2:	1097 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2578 lbs**	Total Reaction 2:	**2578 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			480	
Max. allowed total defl:	0.33 in		Max LL defl:	0.16 in
Total defl. * I:	29.43 in^4		Required I:	90.55 in^4
LL defl. * I:	19.7 in^4		Required I:	121.2 in^4
Actual deflections:	TOTAL:	0.13 in		0.09 in

Force analysis:

Max. moment:	4189 ft-lb	Max Shear:	2578 lbs

Selected Member:	(1) HF#2	**3.5**	**x**	**9.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	230.84 in^4		121.2 in^4
Section Modulus:	49.91 in^3		42.85 in^3
Section Area:	32.38 in^2		22.41 in^2
Bearing Area:			6.36 in^2
Minimum bearing dimensions:	3.5 in	x	1.82 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 5

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Typical Window Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	3.5 ft	Tributary Width:	1.33 ft	P Location:	3.5 ft
Add'l uniform DL:	225 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	375 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	429 lbs	DL Reaction 2:	429 lbs	Note: Design automatically uses
LL Reaction 1:	93 lbs	LL Reaction 2:	93 lbs	ASD load combinations
SL Reaction 1:	656 lbs	SL Reaction 2:	656 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**1085 lbs**	Total Reaction 2:	**1085 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.18 in	Max LL defl:	0.09 in
Total defl. * I:	1.75 in^4	Required I:	9.99 in^4
LL defl. * I:	1.11 in^4	Required I:	12.71 in^4
Actual deflections:	TOTAL: 0.02 in		0.01 in

Force analysis:

Max. moment:	949 ft-lb	Max Shear:	1085 lbs

Selected Member: (2) HF#2 **1.5** **x** **7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	95.27 in^4		12.71 in^4
Section Modulus:	26.28 in^3		9.71 in^3
Section Area:	21.75 in^2		9.43 in^2
Bearing Area:			2.68 in^2
Minimum bearing dimensions:	3. in	x	0.89 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 31-Aug-22

Architect: Page number: U 6

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Garage Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	17 ft	Tributary Width:	2 ft	P Location:	17 ft
Add'l uniform DL:		DL unit load:	20 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	20 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	340 lbs	DL Reaction 2:	340 lbs	Note: Design automatically uses
LL Reaction 1:	340 lbs	LL Reaction 2:	340 lbs	ASD load combinations
SL Reaction 1:	425 lbs	SL Reaction 2:	425 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**914 lbs**	Total Reaction 2:	**914 lbs**	

Material Properties:

E	1.8 msi	E'	1.8 msi
Fb	2400 psi	Fb'	2760 psi
Fv	265 psi	Fv'	305 psi
Fc perp	650 psi	Fc perp'	650 psi
Emin	0.95 msi	Emin'	0.95 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.85 in	Max LL defl:	0.57 in
Total defl. * I:	135.72 in^4	Required I:	159.67 in^4
LL defl. * I:	93.96 in^4	Required I:	165.81 in^4
Actual deflections:	TOTAL: 0.64 in		0.44 in

Force analysis:

Max. moment:	3883 ft-lb	Max Shear:	914 lbs

Selected Member: (1) GLB **3.5** **x** **9**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	212.63 in^4		165.81 in^4
Section Modulus:	47.25 in^3		16.88 in^3
Section Area:	31.5 in^2		4.5 in^2
Bearing Area:			1.41 in^2
Minimum bearing dimensions:	3.5 in	x	0.4 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.033**
Project:	**Nguyen**	Date:	11-Apr-22
Architect:		Page number:	U 7

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Mudroom Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	5.5 ft	Tributary Width:	10.33 ft	P Location:	5.5 ft
Add'l uniform DL:	178.8 lbs/ft	DL unit load:	20 psf	Concentrated DL:	
Add'l uniform LL:	410 lbs/ft	LL unit load:	20 psf	Concentrated LL:	
Add'l uniform SL:	50 lbs/ft	SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1060 lbs	DL Reaction 2:	1060 lbs	Note: Design automatically uses
LL Reaction 1:	1696 lbs	LL Reaction 2:	1696 lbs	ASD load combinations
SL Reaction 1:	848 lbs	SL Reaction 2:	848 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2967 lbs**	Total Reaction 2:	**2967 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	978 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.28 in	Max LL defl:	0.14 in
Total defl. * I:	20.75 in^4	Required I:	75.46 in^4
LL defl. * I:	14.65 in^4	Required I:	106.53 in^4
Actual deflections:	TOTAL: 0.06 in		0.04 in

Force analysis:

Max. moment:	4080 ft-lb	Max Shear:	2967 lbs

Selected Member:	(2) HF#2	**1.5**	**x**	**11.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	355.96 in^4		106.53 in^4
Section Modulus:	63.28 in^3		50.09 in^3
Section Area:	33.75 in^2		25.8 in^2
Bearing Area:			7.33 in^2
Minimum bearing dimensions:	3. in	x	2.44 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 8

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Foyer Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	6.5 ft	Tributary Width:	1.33 ft	P Location:	6.5 ft
Add'l uniform DL:	277.5 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	462.5 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	967 lbs	DL Reaction 2:	967 lbs	Note: Design automatically uses
LL Reaction 1:	173 lbs	LL Reaction 2:	173 lbs	ASD load combinations
SL Reaction 1:	1503 lbs	SL Reaction 2:	1503 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2470 lbs**	Total Reaction 2:	**2470 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.33 in	Max LL defl:	0.16 in
Total defl. * I:	25.12 in^4	Required I:	77.3 in^4
LL defl. * I:	15.93 in^4	Required I:	98.05 in^4
Actual deflections:	TOTAL: 0.11 in		0.07 in

Force analysis:

Max. moment:	4013 ft-lb	Max Shear:	2470 lbs

Selected Member: (1) HF#2 **3.5** **x** **9.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	230.84 in^4		98.05 in^4
Section Modulus:	49.91 in^3		41.06 in^3
Section Area:	32.38 in^2		21.48 in^2
Bearing Area:			6.1 in^2
Minimum bearing dimensions:	3.5 in	x	1.74 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 9

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Stair Beam

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	7.5 ft	Tributary Width:	1.33 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	98.8125 lbs
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	164.0625 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	124 lbs	DL Reaction 2:	124 lbs	Note: Design automatically uses
LL Reaction 1:	200 lbs	LL Reaction 2:	200 lbs	ASD load combinations
SL Reaction 1:	82 lbs	SL Reaction 2:	82 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**335 lbs**	Total Reaction 2:	**335 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2900 psi	Fb'	3339 psi
Fv	290 psi	Fv'	334 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.914 msi	Emin'	0.914 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			480
Max. allowed total defl:	0.38 in	Max LL defl:	0.19 in
Total defl. * I:	4.6 in^4	Required I:	12.27 in^4
LL defl. * I:	3.14 in^4	Required I:	16.74 in^4
Actual deflections:	TOTAL: 0.01 in		0.01 in

Force analysis:

Max. moment:	837 ft-lb	Max Shear:	335 lbs

Selected Member: (1) PSL **3.5** **x** **11.875**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	488.41 in^4		16.74 in^4
Section Modulus:	82.26 in^3		3.01 in^3
Section Area:	41.56 in^2		1.51 in^2
Bearing Area:			0.54 in^2
Minimum bearing dimensions:	3.5 in	x	0.15 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 10

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Awning Joists

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:	1	P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	5.33 ft	Tributary Width:	2 ft	P Location:	5.33 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	80 lbs	DL Reaction 2:	80 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	133 lbs	SL Reaction 2:	133 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**213 lbs**	Total Reaction 2:	**213 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1686 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.27 in	Max LL defl:	0.13 in
Total defl. * I:	1.12 in^4	Required I:	4.19 in^4
LL defl. * I:	0.7 in^4	Required I:	5.24 in^4
Actual deflections:	TOTAL: 0.21 in		0.13 in

Force analysis:

Max. moment:	284 ft-lb	Max Shear:	213 lbs

Selected Member: (1) HF#2 **1.5** **x** **3.5**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	5.36 in^4		5.24 in^4
Section Modulus:	3.06 in^3		2.02 in^3
Section Area:	5.25 in^2		1.85 in^2
Bearing Area:			0.53 in^2
Minimum bearing dimensions:	1.5 in	x	0.35 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 11

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Awning Beam

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:	1	Wet Use:	

Geometry and Loads:

Span:	14.67 ft	Tributary Width:	2.25 ft	P Location:	14.67 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	248 lbs	DL Reaction 2:	248 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	413 lbs	SL Reaction 2:	413 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**660 lbs**	Total Reaction 2:	**660 lbs**	

Material Properties:

E	1.3 msi	E'	1.235 msi
Fb	850 psi	Fb'	1017 psi
Fv	150 psi	Fv'	138 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.4465 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.73 in	Max LL defl:	0.49 in
Total defl. * I:	75.94 in^4	Required I:	103.53 in^4
LL defl. * I:	47.46 in^4	Required I:	97.06 in^4
Actual deflections:	TOTAL: 0.68 in		0.43 in

Force analysis:

Max. moment:	2421 ft-lb	Max Shear:	660 lbs

Selected Member: (1) HF#2 **3.5** **x** **7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	111.15 in^4		103.53 in^4
Section Modulus:	30.66 in^3		28.58 in^3
Section Area:	25.38 in^2		7.18 in^2
Bearing Area:			1.63 in^2
Minimum bearing dimensions:	3.5 in	x	0.47 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 11-Apr-22

Architect: Page number: U 12

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: 3 ft Window Under Girder Truss

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	3.5 ft	Tributary Width:	2 ft	P Location:	0.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	3543.75 lbs
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	5906.25 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	2837 lbs	DL Reaction 2:	812 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	4728 lbs	SL Reaction 2:	1353 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**7565 lbs**	Total Reaction 2:	**2165 lbs**	

Material Properties:

E	1.8 msi	E'	1.8 msi
Fb	2400 psi	Fb'	2760 psi
Fv	265 psi	Fv'	305 psi
Fc perp	650 psi	Fc perp'	650 psi
Emin	0.95 msi	Emin'	0.95 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.18 in	Max LL defl:	0.09 in
Total defl. * I:	5.13 in^4	Required I:	29.33 in^4
LL defl. * I:	3.21 in^4	Required I:	36.66 in^4
Actual deflections:	TOTAL: 0.02 in		0.01 in

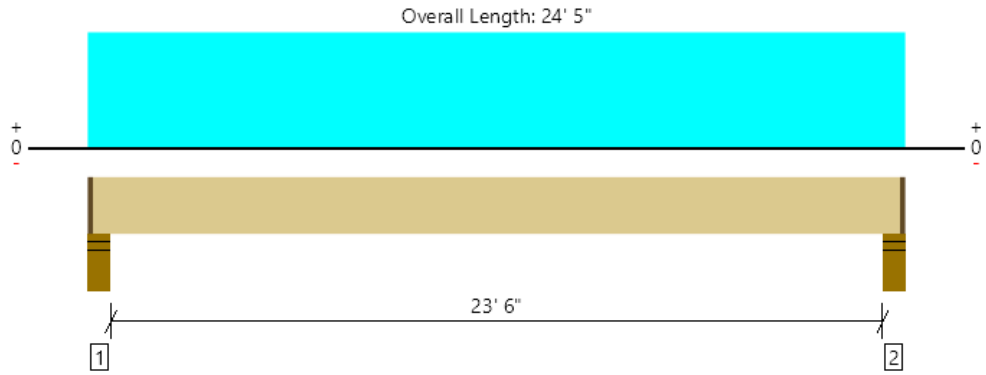
Force analysis:

Max. moment:	5651 ft-lb	Max Shear:	7565 lbs

Selected Member: (1) GLB **5.5** **x** **9**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	334.13 in^4		36.66 in^4
Section Modulus:	74.25 in^3		24.57 in^3
Section Area:	49.5 in^2		37.24 in^2
Bearing Area:			11.64 in^2
Minimum bearing dimensions:	5.5 in	x	2.12 in

Upper, Great Room Beams
1 piece(s) 7" x 18" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	10130 @ 4"	12644 (4.25")	Passed (80%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8578 @ 1' 11 1/2"	24360	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	59006 @ 12' 2 1/2"	87330	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.589 @ 12' 2 1/2"	0.594	Passed (L/484)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.850 @ 12' 2 1/2"	1.188	Passed (L/335)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) 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	Total	
1 - Stud wall - SPF	5.50"	4.25"	3.40"	3132	7081	10213	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	3.40"	3132	7081	10213	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' 3" o/c	
Bottom Edge (Lu)	24' 3" 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 24' 3 3/4"	N/A	39.4	--	
1 - Uniform (PSF)	0 to 24' 5" (Front)	14' 6"	15.0	40.0	Default Load

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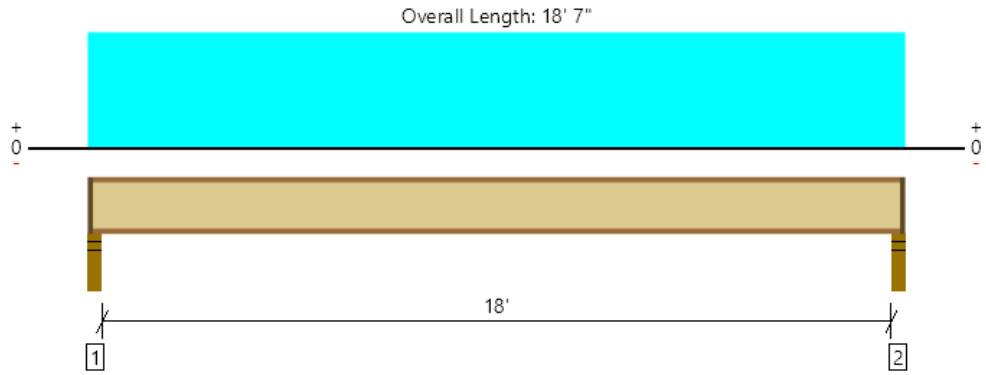
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Upper, Upper Floor Joists
1 piece(s) 11 7/8" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	674 @ 2 1/2"	1041 (2.25")	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	660 @ 3 1/2"	1560	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3025 @ 9' 3 1/2"	3160	Passed (96%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.429 @ 9' 3 1/2"	0.454	Passed (L/508)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.589 @ 9' 3 1/2"	0.908	Passed (L/370)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	34	Any	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.75"	186	496	682	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.75"	186	496	682	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)	3' 1" o/c	
Bottom Edge (Lu)	18' 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 18' 7"	16"	15.0	40.0	Upper Floor

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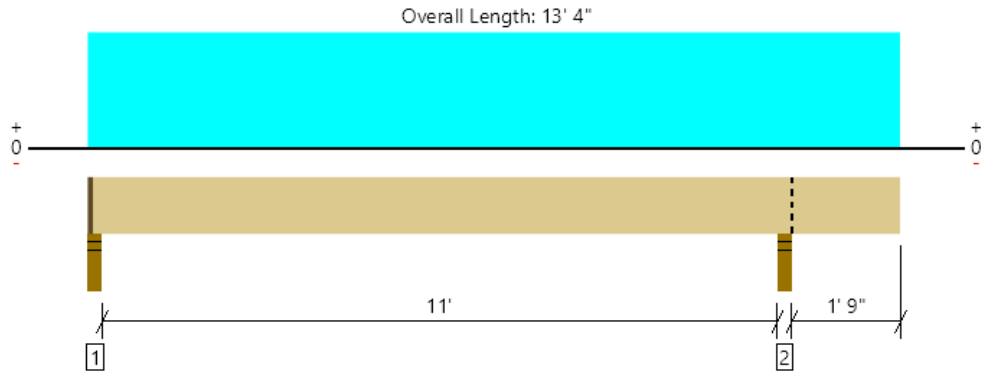
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Upper, Cantilever Patio Roof Joists
1 piece(s) 2 x 8 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	449 @ 2 1/2"	1367 (2.25")	Passed (33%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	402 @ 10' 8 1/4"	1251	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1212 @ 5' 8 9/16"	1477	Passed (82%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.279 @ 5' 9 9/16"	0.374	Passed (L/483)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.440 @ 5' 9 7/16"	0.561	Passed (L/306)	--	1.0 D + 1.0 S (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240). Upward deflection on right cantilever exceeds overhang deflection criteria.
- 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	Snow	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	170	287	457	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	3.50"	1.50"	230	384	614	Blocking

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- 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)	5' 6" o/c	
Bottom Edge (Lu)	13' 3" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 13' 4"	24"	15.0	25.0	Roof

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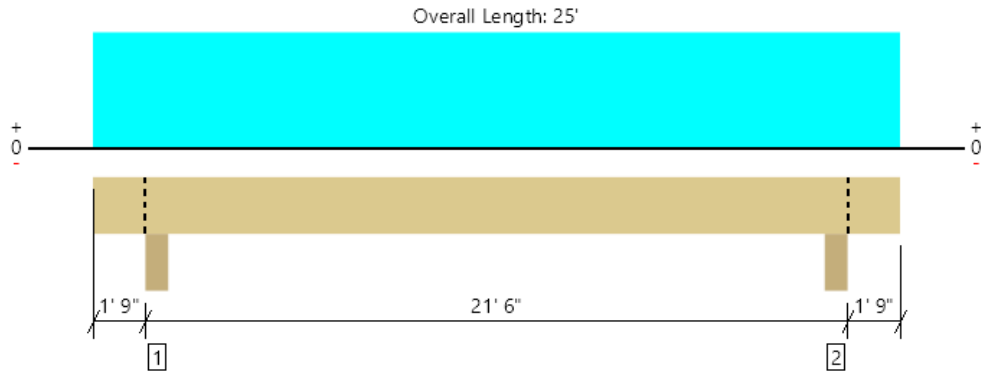
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Upper, South Patio Beam
1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3834 @ 1' 11 3/4"	19663 (5.50")	Passed (19%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	2852 @ 3' 2 1/2"	13409	Passed (21%)	1.15	1.0 D + 1.0 S (Adj Spans)
Pos Moment (Ft-lbs)	16516 @ 12' 6"	30178	Passed (55%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-599 @ 1' 11 3/4"	23403	Passed (3%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.549 @ 12' 6"	0.701	Passed (L/460)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.919 @ 12' 6"	1.052	Passed (L/275)	--	1.0 D + 1.0 S (Alt Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240). Upward deflection on left and right cantilevers exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 0.99 that was calculated using length L = 20' 9 5/16".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 2' 2".
- 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	Snow	Total	
1 - Column - SPF	5.50"	5.50"	1.50"	1560	2274	3834	Blocking
2 - Column - SPF	5.50"	5.50"	1.50"	1560	2274	3834	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)	25' o/c	
Bottom Edge (Lu)	25' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 25'	N/A	16.0	--	
1 - Uniform (PSF)	0 to 25' (Front)	7' 3"	15.0	25.0	Roof 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
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	

Weyerhaeuser

FORTEWEB™

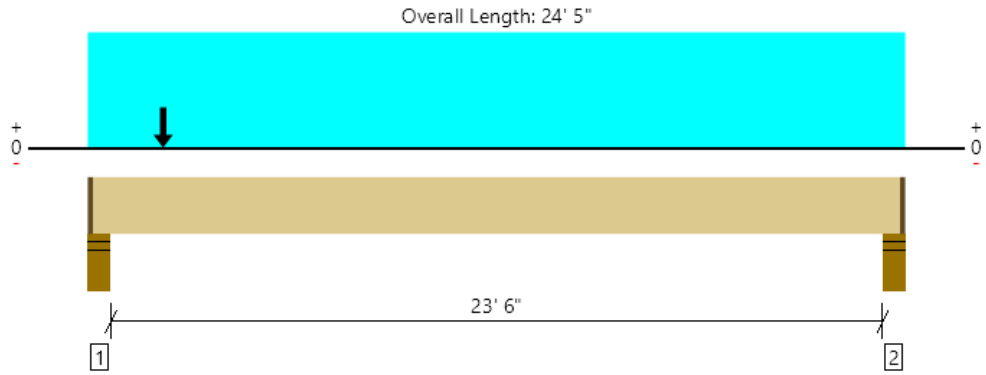
MEMBER REPORT

PASSED

U 17

Upper, East Great Room Beam

1 piece(s) 7" x 18" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8150 @ 4"	12644 (4.25")	Passed (64%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7159 @ 1' 11 1/2"	24360	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	39451 @ 11' 11 3/16"	87330	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.389 @ 12' 1 5/16"	0.594	Passed (L/732)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.572 @ 12' 1 1/2"	1.188	Passed (L/498)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) 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 - SPF	5.50"	4.25"	2.74"	2461	5740	8201	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	2.22"	2154	4513	6667	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' 3" o/c	
Bottom Edge (Lu)	24' 3" 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 24' 3 3/4"	N/A	39.4	--	
1 - Uniform (PSF)	0 to 24' 5" (Front)	9'	15.0	40.0	Default Load
2 - Point (lb)	2' 3" (Front)	N/A	366	1463	Adjacent 3.5x11.875 PSL

Weyerhaeuser Notes

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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
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	

Weyerhaeuser

8/31/2022 11:46:05 PM UTC

ForteWEB v3.4, Engine: V8.2.2.122, Data: V8.1.2.2

File Name: Nguyen 2022.033

TYPICAL PATIO ROOF LEDGER: (2) 0.25"x3.5" SDS SCREWS @ 16" O.C. TO WALL STUDS

SDS SCREW CAPACITY: 245 lb x2 = 490 lb

Roof load per 16" = (1.33'x6')x(15psf + 25psf) = 319 lb < 490 lb OK

GARAGE TRUSS LEDGER:

Roof plf = (1'x10.25')x(20 psf) = 205 plf dead
(1'x10.25')x(20 psf) = 205 plf live
(1'x10.25')x(25 psf) = 256 plf snow
Factored plf = 551 plf ∴ (2) 0.25"x3.5" SDS SCREWS @ 6" O.C.

551 plf x 0.5 = 275 lb < 490 lb OK

CONSULTING STRUCTURAL ENGINEERING SERVICES
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Project No. 2022.033 Date 9/1/22
Project Name NGUYEN
Comments
Revision Page U 18

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.033**
Project:	**Nguyen**	Date:	12-Apr-22
Architect:		Page number:	M 1

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: New Crawlspace Beams

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	4 ft	Tributary Width:	11.5 ft	P Location:	4 ft
Add'l uniform DL:	37.5 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:	100 lbs/ft	LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	420 lbs	DL Reaction 2:	420 lbs	Note: Design automatically uses
LL Reaction 1:	1120 lbs	LL Reaction 2:	1120 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**1540 lbs**	Total Reaction 2:	**1540 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1190 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			480	
Max. allowed total defl:	0.2 in		Max LL defl:	0.1 in
Total defl. * I:	3.41 in^4		Required I:	17.06 in^4
LL defl. * I:	2.48 in^4		Required I:	24.81 in^4
Actual deflections:	TOTAL:	0.07 in		0.05 in

Force analysis:

Max. moment:	1540 ft-lb	Max Shear:	1540 lbs

Selected Member:	(1) HF#2	**3.5**	**x**	**5.5**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	48.53 in^4		24.81 in^4
Section Modulus:	17.65 in^3		15.53 in^3
Section Area:	19.25 in^2		15.4 in^2
Bearing Area:			3.8 in^2
Minimum bearing dimensions:	3.5 in	x	1.09 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.033**
Project:	**Nguyen**	Date:	13-Apr-22
Architect:		Page number:	M2

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Foyer East-West Beam

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	10 ft	Tributary Width:	1.33 ft	P Location:	10 ft
Add'l uniform DL:	80 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	480 lbs	DL Reaction 2:	480 lbs	Note: Design automatically uses
LL Reaction 1:	266 lbs	LL Reaction 2:	266 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**746 lbs**	Total Reaction 2:	**746 lbs**	

Material Properties:

E	1.6 msi	E'	1.6 msi
Fb	900 psi	Fb'	1170 psi
Fv	180 psi	Fv'	180 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.58 msi	Emin'	0.58 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			480	
Max. allowed total defl:	0.5 in		Max LL defl:	0.25 in
Total defl. * I:	20.98 in^4		Required I:	41.95 in^4
LL defl. * I:	7.48 in^4		Required I:	29.93 in^4
Actual deflections:	TOTAL:	0.19 in		0.07 in

Force analysis:

Max. moment:	1865 ft-lb	Max Shear:	746 lbs

Selected Member:	(1) DF#2	**3.5**	**x**	**7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	111.15 in^4		41.95 in^4
Section Modulus:	30.66 in^3		19.12 in^3
Section Area:	25.38 in^2		6.22 in^2
Bearing Area:			1.19 in^2
Minimum bearing dimensions:	3.5 in	x	0.34 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.033**
Project:	**Nguyen**	Date:	13-Apr-22
Architect:		Page number:	M3

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Foyer North-South Beam

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	5 ft	Tributary Width:	15 ft	P Location:	5 ft
Add'l uniform DL:	80 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	650 lbs	DL Reaction 2:	650 lbs	Note: Design automatically uses
LL Reaction 1:	1500 lbs	LL Reaction 2:	1500 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2150 lbs**	Total Reaction 2:	**2150 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	875 psi	Fb'	1138 psi
Fv	170 psi	Fv'	170 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			480	
Max. allowed total defl:	0.25 in		Max LL defl:	0.13 in
Total defl. * I:	9.3 in^4		Required I:	37.21 in^4
LL defl. * I:	6.49 in^4		Required I:	51.92 in^4
Actual deflections:	TOTAL:	0.05 in		0.04 in

Force analysis:

Max. moment:	2688 ft-lb	Max Shear:	2150 lbs

Selected Member:	(1) DF#2	**5.5**	**x**	**7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	174.66 in^4		51.92 in^4
Section Modulus:	48.18 in^3		28.35 in^3
Section Area:	39.88 in^2		18.97 in^2
Bearing Area:			3.44 in^2
Minimum bearing dimensions:	5.5 in	x	0.63 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.033**
Project:	**Nguyen**	Date:	1-Sep-22
Architect:		Page number:	ST 1

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Typical Stair Beams

Fully Supported:		Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	4 ft	Tributary Width:	4.5 ft	P Location:	4 ft
Add'l uniform DL:	110 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:	80 lbs/ft	LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	355 lbs	DL Reaction 2:	355 lbs	Note: Design automatically uses
LL Reaction 1:	700 lbs	LL Reaction 2:	700 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**1055 lbs**	Total Reaction 2:	**1055 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1184 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			480	
Max. allowed total defl:	0.2 in		Max LL defl:	0.1 in
Total defl. * I:	2.34 in^4		Required I:	11.69 in^4
LL defl. * I:	1.55 in^4		Required I:	15.51 in^4
Actual deflections:	TOTAL:	0.05 in		0.03 in

Force analysis:

Max. moment:	1055 ft-lb	Max Shear:	1055 lbs

Selected Member:	(1) HF#2	**3.5**	**x**	**5.5**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	48.53 in^4		15.51 in^4
Section Modulus:	17.65 in^3		10.69 in^3
Section Area:	19.25 in^2		10.55 in^2
Bearing Area:			2.6 in^2
Minimum bearing dimensions:	3.5 in	x	0.74 in

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.033**

Project: **Nguyen** Date: 1-Sep-22

Architect: Page number: ST 2

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: Stair Landing Joists

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:	1	P.T. Lumber:		Wet Use:	

Geometry and Loads:

Span:	4 ft	Tributary Width:	1.33 ft	P Location:	4 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	40 lbs	DL Reaction 2:	40 lbs	Note: Design automatically uses
LL Reaction 1:	160 lbs	LL Reaction 2:	160 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**200 lbs**	Total Reaction 2:	**200 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1271 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.2 in	Max LL defl:	0.1 in
Total defl. * I:	0.44 in^4	Required I:	2.21 in^4
LL defl. * I:	0.35 in^4	Required I:	3.54 in^4
Actual deflections:	TOTAL: 0.02 in		0.02 in

Force analysis:

Max. moment:	200 ft-lb	Max Shear:	200 lbs

Selected Member: (1) HF#2 **1.5** **x** **5.5**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	20.8 in^4		3.54 in^4
Section Modulus:	7.56 in^3		1.88 in^3
Section Area:	8.25 in^2		2. in^2
Bearing Area:			0.49 in^2
Minimum bearing dimensions:	1.5 in	x	0.33 in

TYPICAL STAIR LEDGER: (2) 0.25"x3.5" SDS SCREWS @ 16" O.C. TO WALL STUDS

SDS SCREW CAPACITY: 245 lb x2 = 490 lb

stair load per 16" = (1.33'x4.5')x(15psf + 60psf) = 449 lb < 490 lb OK

CONSULTING STRUCTURAL ENGINEERING SERVICES

Residential and Commercial Structural Design

6311 17th Avenue NE, Seattle, WA 98115

Phone: (206)527-1288 Email: john@cses-engineering.com

Project No. 2022.033 Date 9/1/22

Project Name NGUYEN

Comments

Revision Page ST 3

North Porch Footing:

worst case point load = 813 lb × 2 = 1,626 lb

$\frac{1{,}626\ lb}{1500\ psf} \approx 1.1\ ft^2$ ∴ 1.25' × 1.25' × 12" DEEP FOOTING

$\frac{1{,}626\ lb + 1.25^2 \times 150\ pcf}{1500\ psf} = 1.24\ ft^2 < 1.56\ ft^2$ ✓

SOUTH PORCH FOOTING

Worst case point load = 3834 lb

$\frac{3834\ lb}{1500\ psf} = 2.556\ ft^2$ ∴ 2' × 2' × 12" DEEP FOOTING

$\frac{4\ ft^2 \times 150\ pcf + 3834\ lb}{1500\ psf} = 2.96\ ft^2 < 4\ ft^2$ ✓

CRAWLSPACE FOOTING

Point load = 2 × 1540 lb = 3,080 lb

∴ 2' × 2' × 12" DEEP FOOTING

CONSULTING STRUCTURAL ENGINEERING SERVICES
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Project No. 2022.033 Date 4-12-22
Project Name NGUYEN
Comments
Revision Page F1

Hazards by Location

Search Information

Address: 8937 SE 56th St, Mercer Island, WA 98040, USA

Coordinates: 47.5523167, -122.2187846

Elevation: 357 ft

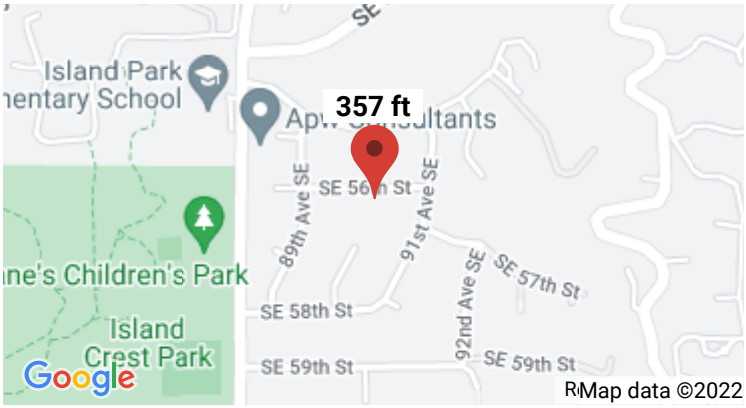
Timestamp: 2022-04-08T17:23:26.448Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D



Basic Parameters

Name	Value	Description
S_S	1.451	MCE_R ground motion (period=0.2s)
S_1	0.503	MCE_R ground motion (period=1.0s)
S_{MS}	1.451	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.967	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.898	Coefficient of risk (1.0s)
PGA	0.621	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.683	Site modified peak ground acceleration

T_L	6	Long-period transition period (s)
SsRT	1.451	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.609	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	4.2	Factored deterministic acceleration value (0.2s)
S1RT	0.503	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.56	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.625	Factored deterministic acceleration value (1.0s)
PGAd	1.404	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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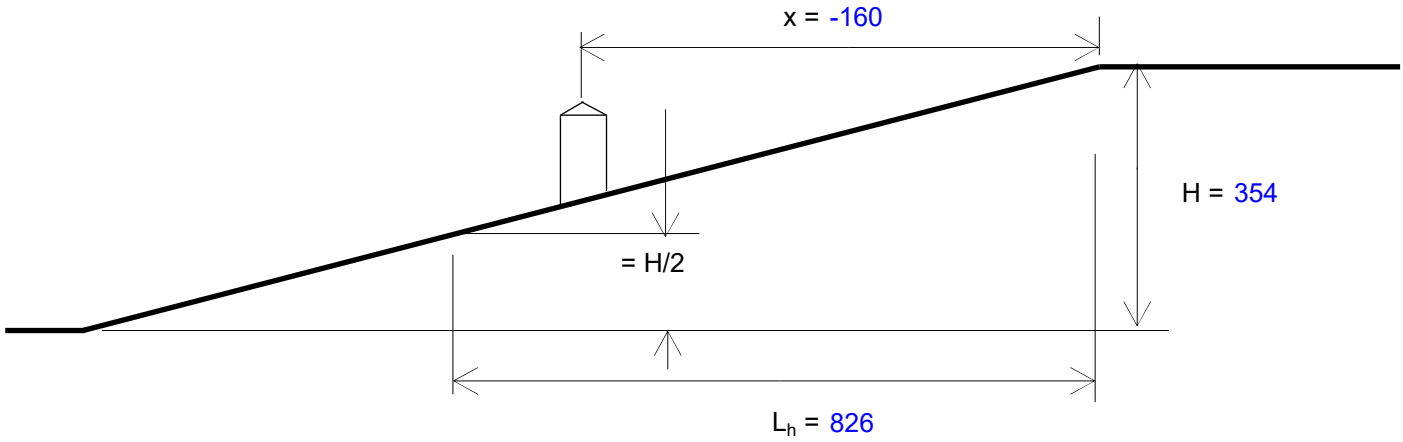
ASCE7-05, 6.5.7 Topographic Effects



Height above local ground z =	28 ft		
Hill Shape	2-dimensional escarpments		
Direction	Downwind of Crest		
Exposure	B		
Height of hill, H=	354 ft		
Distance upwind of crest to where the difference in ground elevation is half the height of hill, L_h =	826 ft		
H/L_n =	0.43		
calculate K_1 by using H/L_n =	0.43		
Distance from the crest to the building, x =	-160 ft	x/L_h =	-0.19
Figure 6-4, $K_1/(H/L_h)$ =	0.75	K_1 =	0.32
calculate K_2, K_3 by using L_n =	826		
K_2 = $1 - x/\mu L_h$		μ =	4
K_2 =	0.95		
K_3 = $e^{-\gamma z/L_h}$		γ =	2.5
K_3 =	0.92		
K_{zt} = $[1 + K_1 K_2 K_3]^2$			(6-3)
K_{zt} =	1.64		

John S. Apolis, P.E. **CSES, Inc.** Job number: **2021.075**
Project: **Darvish** Date: 12-Apr-22
Designer: **Suzanne Zahr** Page number: **L 1**

Lateral Loads Design per ASCE 7-10, Wind: Section 28 Seismic: Section 12

(Simplified Envelope Procedure Part 2) 2018 International Building Code (IBC)

WIND LOADS **110** mph Basic Wind Speed 2015 NDS

Ps = lambda * Kzt * Ps(30) * 0.6 Exposure **B** Roof Slope: **9.00** : 12 = 36.9

Least Horizontal Dimension, feet: **36** Mean Roof Ht, feet: **30** (degrees)

lambda = 1.00 a = 3.6 ft, 2a = 7.2 ft

Iw = 1.00 KzT = **1.64**

Tabulated Ps(30): (Refer to ASCE 7-10, Figure 28.6-1)	**Zone**	**Tabulated Wind Pressure**		**Calc'd Design Pressure** (*lambda*KzT*0.6)	**Min Design Pressure**
(horizontal)	A	21.6	psf	**21.3**	**21.3**
"	B	14.8	psf	**14.6**	**14.6**
"	C	17.2	psf	**16.9**	**16.9**
"	D	11.8	psf	**11.6**	**11.6**
(vertical)	E	8.3	psf	**8.2**	
"	F	-13.1	psf	**-12.9**	
"	G	7.2	psf	**7.1**	
"	H	-11.3	psf	**-11.1**	
(uplift on overhangs)	E(oh)	-7.6	psf	**-7.5**	
"	G(oh)	-8.7	psf	**-8.6**	

(Per section 28.6.4 minimum wind pressure is 16 PSF for zones A,C, and 8 PSF for zones B, D)

(Equivalent Lateral Force Procedure, Section 12.8)

SEISMIC LOADS Ie 1.0 R = 6.5 ASCE 7-16, Table 12.2.1

Seismic Parameters per ASCE 7-10) Group I Site Class: **D**

PGA (.2 sec) 1.451 Fa = 1.00 ASCE 7-16 Table 11.4-1

PGA (1 sec) 0.503 Fv = 1.50 ASCE 7-16 Table 11.4-2

Seismic Design Categories per ASCE 7-16 Tables 11.6-1, 11.6-2

Based on Sds: **D** Based on Sd1: **D**

PGA's based on peak ground accelerations per latest USGS Hazards Program (based on lat/lon).

Ss = 1.4510 Sms = Fa * Ss = 1.45 Equation 11.4-1

S1 = 0.5030 Sm1 = Fv * S1 = 0.75 Equation 11.4-2

Equations 11.4-3, 11.4-4 Sds = 2/3 * Sms = 0.97 Sd1 = 2/3 * Sm1 = 0.50

Equation 12.14-11 Cs (or %V) = (Sds / (R/I)) = 0.149 **Building period < 0.5 s per IBC eq 12.8-7**

Base Shear = %V * W * 0.7 = 7.19 psf, uniformly distributed over floor area

(0.7 reduction factor per ASCE 7-16, Section 2.4.1, Eq 5 (seismic vertical distribution per IBC eqs 12.8-11 & 12)

Base = top of footing	**Roof or Floor DL (psf)**	**Wall DL (psf) dist. over floor area**	**Story Height Above Base (ft)**	**Lateral Load (psf)**
Top Framing	**15**	**6**	**21.83**	**4.07**
Upper Floor	**12**	**12**	**12.33**	**2.63**
Main Floor	**12**	**12**	**2.33**	**0.50**
Total Seismic DL:	**69**		Sum	**7.19**

WEST SHEAR WALL, UPPER L = 29.75'

P_W = 21.3psf (7.2' × 7.9') + 14.6 psf (7.2' × 4.5') + 16.9psf (1.75' × 11.4' + 10' × 8.25' + 1.3' × 4.5') + 11.6psf (½ 1.75 × 1.5' + ½ 10' × 8' + 1.3' × 8')

= 4,115 lb

P_E = 4.07psf (½ 29.75' × 32.5') = 1,968 lb

$V = \frac{4,115\ lb}{29.75'} = 138\ plf < 230\ plf \therefore SW1$

Uplift = 138 plf × 8.5' = 1,176 lb < 1,705 lb ∴ CS16

< 4,340 lb ∴ HDU5

(GARAGE EAST WALL) L = 16.75' + 4' = 20.75'

West SHEAR WALL, LOWER

P_W = 4,115 lb + 16.9psf (10.25' × 9.83' + 18.25' × 9.75') + 11.6psf (0.5 × 7' × 9.25')

= 9200 lb

P_E = 1,968 lb + 2.63psf (½ 53' × 35' + 5' × 12.25') = 4,568 lb

$V = \frac{9200\ lb}{20.75'} = 443\ plf < 550\ plf \therefore SW3$

Uplift = 443 plf × 9.75' = 4,323 lb < 4,340 lb ∴ HDU5

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MASTER BEDROOM SHEAR WALL, UPPER L = 17.25'

$P_W = 16.9\,psf\,(20.25' \times 4.5' + \tfrac{1}{2} 9.33' \times 6.75' + 5.5' \times 8.75' + 4' \times 9.25') + 11.6\,psf\,(16.67' \times 8') = 5{,}058\,lb$

$P_E = 4.07\,psf\,(17.5' \times 35') = 2{,}493\,lb$

$V = \frac{5{,}058\,lb}{17.25'} = 293\,plf < 350\,plf \therefore SW2$

$uplift = 293\,plf \times 12' = 3{,}516\,lb < 4{,}690\,lb \therefore CMSTC16$
$< 4{,}340\,lb \therefore HDU5$

GREAT ROOM EAST SHEAR WALL, LOWER $L = 17.75' + 9.33' = 27.08'$

$P_W = \left(\frac{19}{22.75}\right) \times 5{,}058\,lb + 16.9\,psf\,(18.25' \times 9.75' + 11.5' \times 9.75') = 9{,}126\,lb$

$P_E = \left(\frac{19}{22.75}\right) \times 2493\,lb + 2.63\,psf\,(18.25' \times 47.5' + 11.5' \times 39') = 5{,}542\,lb$

$V = \frac{9{,}126\,lb}{27.08'} = 337\,plf < 350\,plf \therefore SW2$

$uplift = 337\,plf \times 9.75' = 3{,}286\,lb < 4{,}340\,plf \therefore HDU5$

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EAST SHEAR WALL UPPER $L = 4.75' + 7.5' = 12.25'$

$P_W = 21.3psf(7.2' \times 7.875') + 16.9psf(2.3' \times 11.25') = 1,645\ lb$

$P_E = 4.07psf(9.5' \times 35') = 1,353\ lb$

$V = \frac{1,645\ lb}{12.25'} = 134plf < 230plf \therefore SW1$

$Uplift = 134plf \times 8.5' = 1,141\ lb < 1,705\ lb \therefore CS16$
$< 4,340\ lb \therefore HDU5$

EAST SHEAR WALL LOWER $L = 4.33' + 7.5' + 5' = 16.83'$

$P_W = 21.3\ psf(7.2' \times 9.75') + 16.9\ psf(2.3' \times 9.75') + 1,645lb$
$+\left(\frac{3.5'}{22.75'}\right) 5,058\ lb = 4,297\ lb$

$P_E = 2.63\ psf(9.5' \times 39' + 4' \times 8') + 1,353lb + \left(\frac{3.5}{22.75}\right) \cdot 2,493\ lb$
$= 2,796\ lb$

$V = \frac{4,297\ lb}{16.83'} = 255plf < 350\ plf \therefore SW2$

$Uplift = 255plf \times 9.75' + 1,141\ lb = 3,628\ lb < 4,340\ lb \therefore$
HDU5

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South Shear wall, Upper $L = 5.33' + 4.5' + 5' = 14.83'$

$P_W = 14.6psf(3.6' \times 15') + 16.9psf(2.67' \times 7.75' + 12.75' \times 5.415')$
$+ 11.6psf(15.5' \times 3.5' + 2.67' \times 3875' + 12.75' \times 6.3') = 3,986 lb$

$P_E = 4.07 psf(32.5' \times 15' + 27' \times 17.5') = 3,907 lb$

$V = \frac{3,986 lb}{14.83'} = 269 plf < 350 plf \therefore SW2$

$Uplift = 269 plf \times 8.5' = 2,285 lb < 4,690 lb \therefore CMSTC16$
$< 4,340 lb \therefore HDU5$

SOUTH Shear Wall, Lower $L = 6.75' + 9' + 6.5' + 18' + 5.75' = 46'$

$P_W = 3,986 lb + 21.3psf(3.6' \times 3') + 14.6psf(3.6' \times 6.75') +$
$16.9psf(14' \times 3') + 11.6psf(14' \times 6.75' + 1.33' \times 6.75') = 6,481 lb$

$P_E = 3,907 lb + 2.63psf(35' \times \frac{1}{2} \times 80' + 25' \times 12.25') = 8,395 lb$

$V = \frac{8,395 lb}{46'} = 183 plf < 230 plf \therefore SW1$

$Uplift = 183 plf \times 10' + 2,285 lb = 4,110 lb < 4,340 lb$
$\therefore HDU5$

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NORTH SHEAR WALL UPPER $L = 5.5' + 6' + 3.33' \approx 14.83'$

$P_W = 14.6psf(3.6' \times 15') + 16.9psf(11.25' \times 4.375') + 11.6psf(4' \times 15' + 11.25' \times 7.25' + 15.25' \times 3.5') \approx 3,881\ lb$

$P_E = 3,907\ lb$

$V = \frac{3,907\ lb}{14.83'} = 263\ plf < 350plf\left(1.25 - 0.125 \times \frac{8.5'}{3.33'}\right) = 526plf$

$\therefore$ SW2

$Uplift = 263\ plf \times 8.5' = 2,239\ lb < 4,340\ lb \therefore HDU5$

$< 4,690\ lb \therefore CMS + CI6$

NORTH GREATROOM SHEAR WALL LOWER $L = 18.33' - 6' = 12.33'$

$P_W = 3,881\ lb + 21.3\ psf(3.6' \times 3.67') + 14.6psf(3.6' \times 6.25') + 16.9psf(13.9' \times 3.67') + 11.6psf(13.9' \times 6.25' + 1.25' \times 6.75') = 6,459\ lb$

$P_E = 4,209\ lb + 2.63\ psf\left(\frac{1}{2} 53.5' \times 35'\right) = 6,671\ lb$

$V = \frac{6,671\ lb}{12.33'} = 541\ plf < 0.83 \times 710plf = 589plf \therefore SW3X$

$Uplift = \frac{6,671\ lb}{18.33'} \times 9.75' = 3,548\ lb < 4,340\ lb \therefore HDU5$

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NORTH SHEAR WALL (EAST BUMPED OUT SECTION) LOWER L = 8.5' + 8.5' = 17'

P_W = 6,459 lb

P_E = 2.63psf (27' × ½35' + 4'×8' + 4' × 14.67') = 1,481 lb

$V = \frac{6,459\ lb}{17'} = 380\ plf < 580\ plf \therefore SW3$

Uplift = 380 plf × 9.75' = 3,704 lb < 4,340 lb ∴ HDU5

GARAGE WEST SHEAR WALL, LOWER L = 17.75'

P_W = 21.3' × (7.2' × 7.33') + 16.9 psf (3' × 11.67') = 1,716 lb

P_E = 4.07 psf (½ 22.5 × 35) = 1,603 lb

$V = \frac{1,716\ lb}{17.75'} = 97\ plf < 230\ plf \therefore SW1$

Uplift = 97 plf × 9' = 870 lb < 4,340 lb
∴ HDU5

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GREAT ROOM EAST SHEAR WALL, CRAWLSPACE L=17.75' + 9.33' = 27.08'

P_W = 9,126 lb + 16.9 psf (18.25' × 5.5' + 11.5' × 5.5') = 11,891 lb

P_E = 5,542 lb + 0.5 (46' × 47.5' + ½ 27' × 35') = 6,158 lb

$V = \frac{11,891 \text{ lb}}{27.08'}$ = 439 plf < 550 plf ∴ SW3

Uplift = 439 plf × 1.5' + 3,286 lb = 3,943 lb < 4,340 lb ∴ HDU5

WEST SHEAR WALL (GARAGE EAST WALL), CRAWLSPACE L=11.25'

P_W = (6.25/20.75) 9,200 lb + 16.9 psf (10.25' × 5.5' + 18.25' × 5.5') = 5,420 lb

P_E = (6.25/20.75) 1,568 lb + 0.5 (10.25' × 35' + 18.25' × 30') = 1,829 lb

$V = \frac{5,420 \text{ lb}}{11.25'}$ = 482 plf < 550 plf ∴ SW3

Uplift = 482 plf × 1.5' + 4,323 lb = 5,046 lb < 5,820 lb ∴ HDU8

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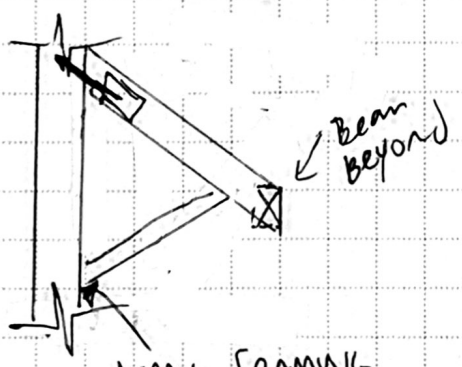
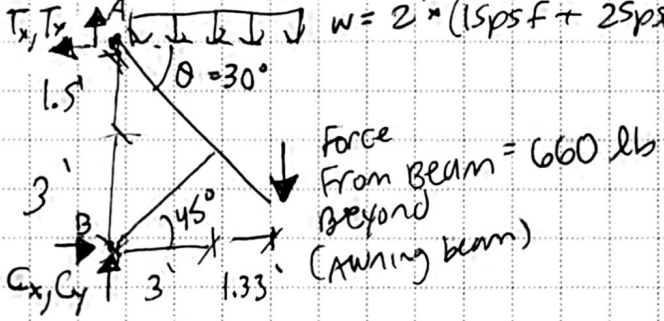
AWNING CONNECTION CALCULATION





$w = 2' \times (15psf + 25psf) = 80 plf$

$80 plf \times 4.33' = 346.4 lb$

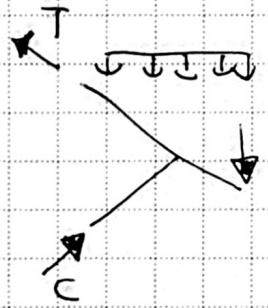
$\Sigma M_A = 0 = -4.33' \times 660 lb - 346.4 lb \times \frac{4.33'}{2} + 4.5' \times C_x$

$C_x = T_x = 801.7 lb$

$\tan 45 = \frac{C_x}{C_y}$ $\quad C_y = 801.7 lb$

$\Sigma F_y = T_y + C_y - 660 lb - 346.4 lb = 0$

$T_y = 204.7$



$T = \sqrt{801.7^2 + 204.7^2} = 827 lb$

$C = \sqrt{801.7^2 + 801.7^2} = 1,134 lb$ $< 1,800 lb$

$\therefore$ DTT2Z

LAG SCREW PENETRATION:

½" Ø screw, G = 0.5 → NDS TABLE 12.2A, $W = 378 lb/in$

$\frac{1,134 lb}{378 lb/in} \cdot 3'' \therefore 3.5'' min.$

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