CQN

CARTER QUINN NORLIN

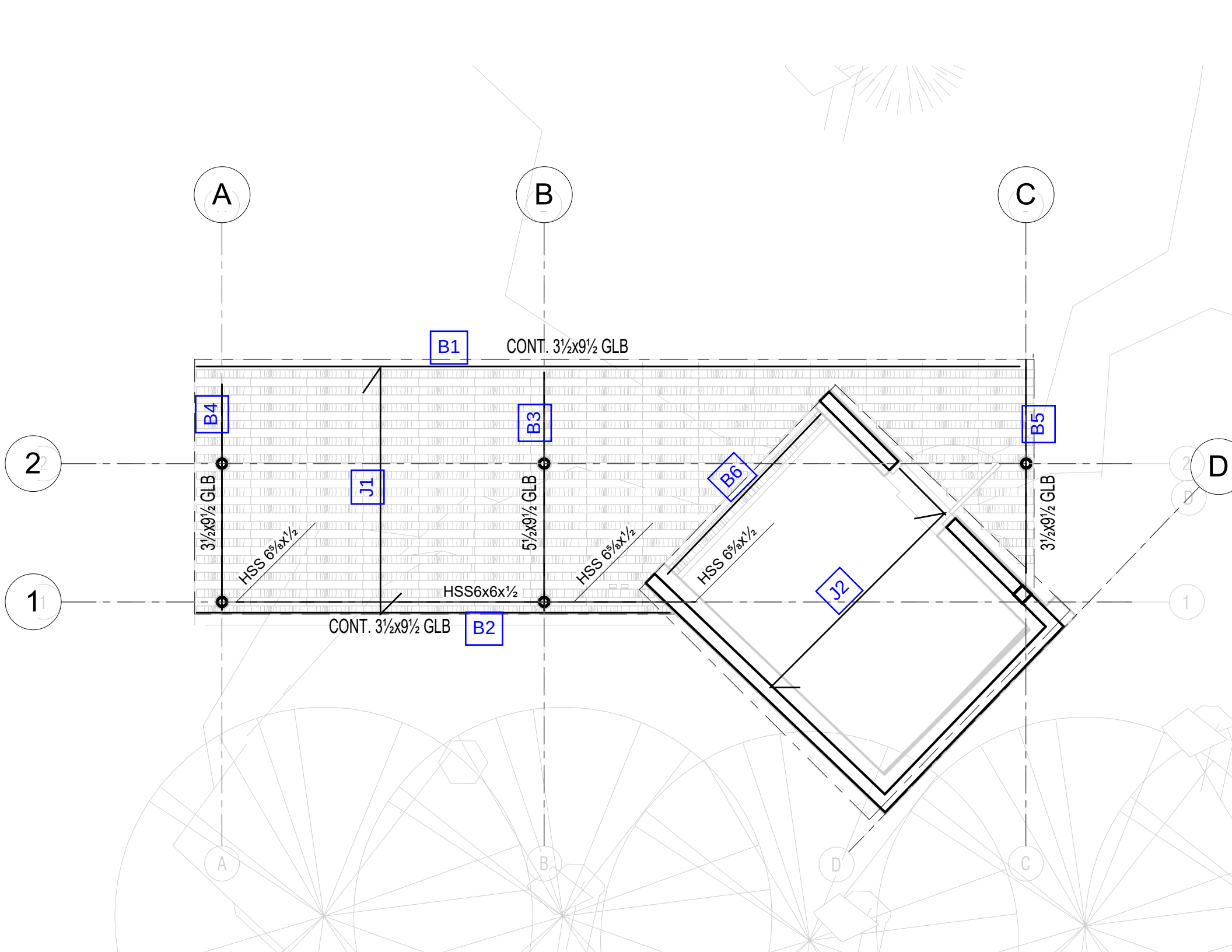
STRUCTURAL
ENGINEERING

STRUCTURAL CALCULATIONS

Yamamoto & LaRose
5245 Forest Ave. SE
Mercer Island, WA 98040

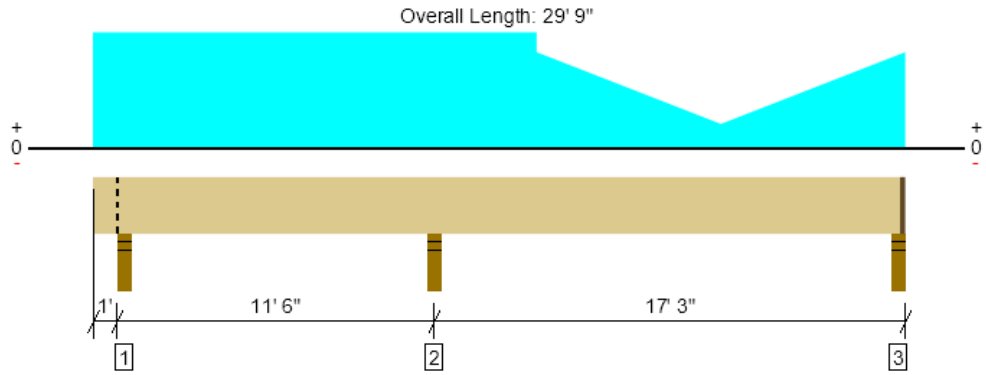
Office of Ordinary Architecture
1521 30th Ave South
Seattle, WA 98144

May 8th, 2025


A
B
C
2
1
D
B1
CONT. 3½x9½ GLB
B4
B3
B5
B6
J1
J2
3½x9½ GLB
5½x9½ GLB
3½x9½ GLB
HSS 6⅝x½
HSS 6⅝x½
HSS 6⅝x½
HSS6x6x½
CONT. 3½x9½ GLB
B2

Wood Option, B1

1 piece(s) 3 1/2" x 9 1/2" 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)	2932 @ 12' 6"	5206 (3.50")	Passed (56%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	1284 @ 11' 6 3/4"	6755	Passed (19%)	1.15	1.0 D + 1.0 S (Adj Spans)
Pos Moment (Ft-lbs)	2231 @ 22' 1 1/2"	12109	Passed (18%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-3834 @ 12' 6"	9334	Passed (41%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.143 @ 21' 7 3/8"	0.854	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.231 @ 21' 8 7/8"	1.139	Passed (L/888)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 29' 7 3/4"
System : Roof
Member Type : Flush 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.
- Volume factor of 1.00 was calculated for positive bending using length L = 14' 1/2".
- Volume factor of 1.00 was calculated for negative bending using length L = 6' 10".
- 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	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	416	699	1114	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.97"	1190	1742	2932	None
3 - Stud wall - SPF	3.50"	2.25"	1.50"	318	459	777	1 1/4" Rim Board

- 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)	29' 8" o/c	
Bottom Edge (Lu)	29' 8" 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 29' 7 3/4"	N/A	8.1	--	
1 - Uniform (PSF)	0 to 16' 3" (Front)	4' 10"	15.0	25.0	Default Load
2 - Tapered (PSF)	16' 3" to 23' (Front)	4' to 1'	15.0	25.0	
3 - Tapered (PSF)	23' to 29' 9" (Front)	1' to 4'	15.0	25.0	

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

ForteWEB Software Operator	Job Notes
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

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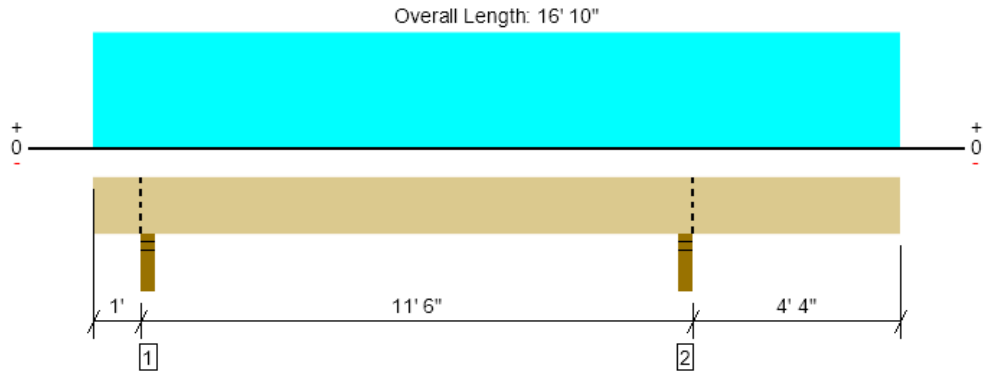
Wood Option, B2

1 piece(s) 3 1/2" x 9 1/2" 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)	2203 @ 12' 4 1/4"	5206 (3.50")	Passed (42%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	1112 @ 11' 5"	6755	Passed (16%)	1.15	1.0 D + 1.0 S (Adj Spans)
Pos Moment (Ft-lbs)	2444 @ 6' 2"	12109	Passed (20%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-2020 @ 12' 4 1/4"	9334	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.076 @ 6' 7 1/16"	0.560	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.114 @ 6' 6 1/16"	0.747	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 16' 10"
System : Roof
Member Type : Flush 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.
- Volume factor of 1.00 was calculated for positive bending using length L = 9' 10 1/4".
- Volume factor of 1.00 was calculated for negative bending using length L = 6' 3 1/2".
- 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	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	477	769	1245	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	880	1323	2203	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)	16' 10" o/c	
Bottom Edge (Lu)	16' 10" 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 16' 10"	N/A	8.1	--	
1 - Uniform (PSF)	0 to 16' 10" (Front)	4' 10"	15.0	25.0	Default Load

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

Weyerhaeuser Notes

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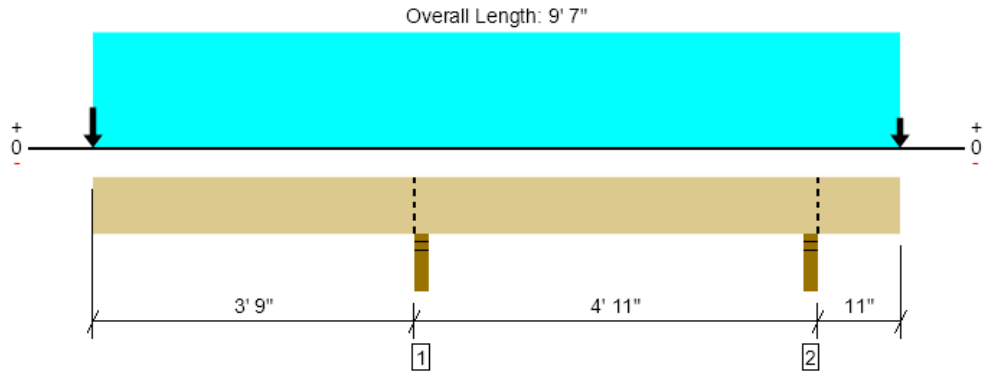
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

Weyerhaeuser

Wood Option, B3

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



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5456 @ 3' 10 3/4"	8181 (3.50")	Passed (67%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	3088 @ 2' 11 1/2"	10615	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	0 @ N/A	N/A	Passed (N/A)	--	N/A
Neg Moment (Ft-lbs)	-11823 @ 3' 10 3/4"	14667	Passed (81%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.198 @ 0	0.260	Passed (2L/472)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.334 @ 0	0.390	Passed (2L/280)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 9' 7"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Volume factor of 1.00 was calculated for negative bending using length L = 9' 7".
- -491 lbs uplift at support located at 8' 6 1/4". Strapping or other restraint may be required.
- 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	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.33"	2204	3252	5456	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	131	960/-622	1091/-491	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)	9' 7" o/c	
Bottom Edge (Lu)	9' 7" o/c	

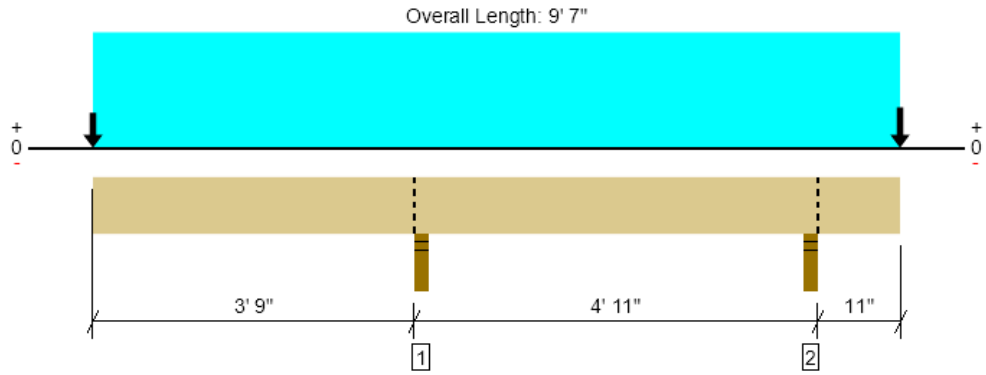
•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 7"	N/A	12.7	--	
1 - Uniform (PSF)	0 to 9' 7" (Front)	1'	15.0	25.0	Default Load
2 - Point (lb)	0 (Front)	N/A	1190	1742	Linked from: North Edge, Support 2
3 - Point (lb)	9' 7" (Back)	N/A	880	1323	Linked from: South Edge, Support 2

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

Wood Option, B4

1 piece(s) 3 1/2" x 9 1/2" 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)	2229 @ 3' 10 3/4"	5206 (3.50")	Passed (43%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	1257 @ 2' 11 1/2"	6755	Passed (19%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	0 @ N/A	N/A	Passed (N/A)	--	N/A
Neg Moment (Ft-lbs)	-4709 @ 3' 10 3/4"	9334	Passed (50%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.132 @ 0	0.260	Passed (2L/710)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.212 @ 0	0.390	Passed (2L/442)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 9' 7"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Volume factor of 1.00 was calculated for negative bending using length L = 9' 7".
- 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	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	835	1394	2229	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	279	718/-84	997	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)	9' 7" o/c	
Bottom Edge (Lu)	9' 7" 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 9' 7"	N/A	8.1	--	
1 - Uniform (PSF)	0 to 9' 7" (Front)	1'	15.0	25.0	Default Load
2 - Point (lb)	0 (Front)	N/A	416	699	Linked from: North Edge, Support 1
3 - Point (lb)	9' 7" (Front)	N/A	477	769	Linked from: South Edge, Support 1

• 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
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

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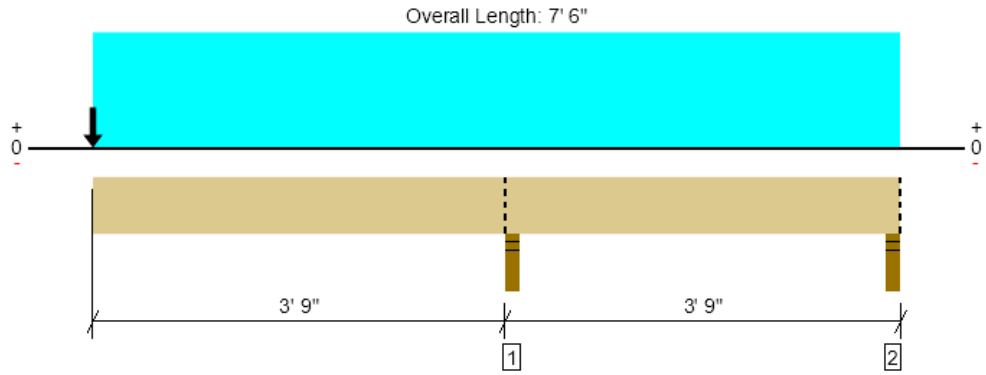
Wood Option, B5

1 piece(s) 3 1/2" x 9 1/2" 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)	2034 @ 3' 10 3/4"	5206 (3.50")	Passed (39%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1024 @ 4' 10"	6755	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	0 @ N/A	N/A	Passed (N/A)	--	N/A
Neg Moment (Ft-lbs)	-3392 @ 3' 10 3/4"	9334	Passed (36%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.071 @ 0	0.260	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.121 @ 0	0.390	Passed (2L/770)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 7' 6"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Volume factor of 1.00 was calculated for negative bending using length L = 7' 4".
- -920 lbs uplift at support located at 7' 4". Strapping or other restraint may be required.
- 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	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	859	1175	2034	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	-368	-552	-920	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)	7' 6" o/c	
Bottom Edge (Lu)	7' 6" 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 7' 6"	N/A	8.1	--	
1 - Uniform (PSF)	0 to 7' 6" (Front)	1'	15.0	25.0	Default Load
2 - Point (lb)	0 (Front)	N/A	318	459	Linked from: North Edge, Support 3

• 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
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

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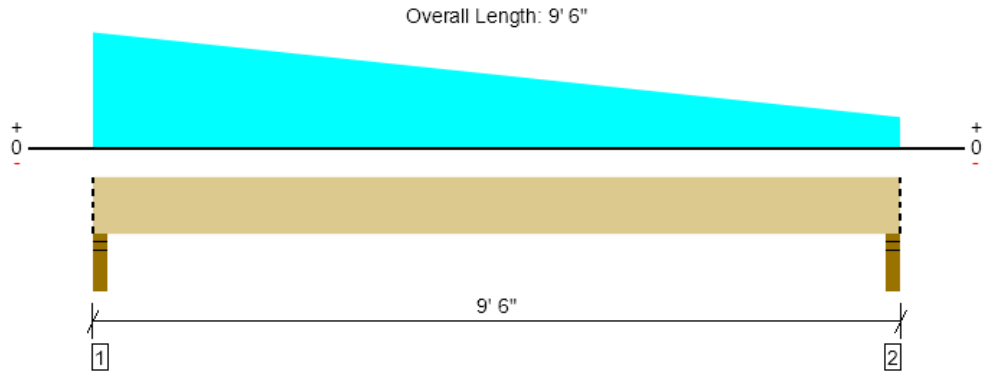
5/7/2025 1:54:35 PM UTC
ForteWEB v3.9, Engine: V8.4.3.94, Data: V8.1.7.3
File Name: Yamamoto Sauna

Wood Option, B6

2 piece(s) 2 x 8 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)	567 @ 2"	4253 (3.50")	Passed (13%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	433 @ 10 3/4"	2501	Passed (17%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1064 @ 4' 4 1/4"	2569	Passed (41%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.076 @ 4' 7 13/16"	0.458	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.129 @ 4' 7 7/8"	0.611	Passed (L/853)	--	1.0 D + 1.0 S (All Spans)

Member Length : 9' 6"
System : Roof
Member Type : Flush 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.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	229	338	567	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	162	226	387	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)	9' 6" o/c	
Bottom Edge (Lu)	9' 6" 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 9' 6"	N/A	5.5	--	
1 - Tapered (PSF)	0 to 9' 6" (Front)	3' 9" to 1'	15.0	25.0	Default Load

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

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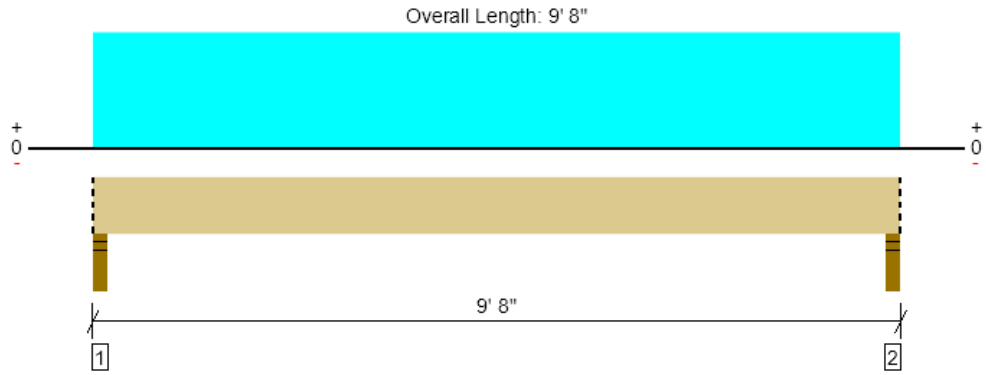
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

Weyerhaeuser

5/7/2025 1:54:35 PM UTC
ForteWEB v3.9, Engine: V8.4.3.94, Data: V8.1.7.3
File Name: Yamamoto Sauna

Wood Option, J1

1 piece(s) 2 x 10 HF No.2 @ 24" 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)	387 @ 2 1/2"	2126 (3.50")	Passed (18%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	302 @ 1' 3/4"	1596	Passed (19%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	856 @ 4' 10"	2204	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.064 @ 4' 10"	0.463	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.102 @ 4' 10"	0.617	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 9' 8"
System : Roof
Member Type : Joist
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.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	145	242	387	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	145	242	387	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)	9' 8" o/c	
Bottom Edge (Lu)	9' 8" 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 9' 8"	24"	15.0	25.0	Default Load

Weyerhaeuser Notes

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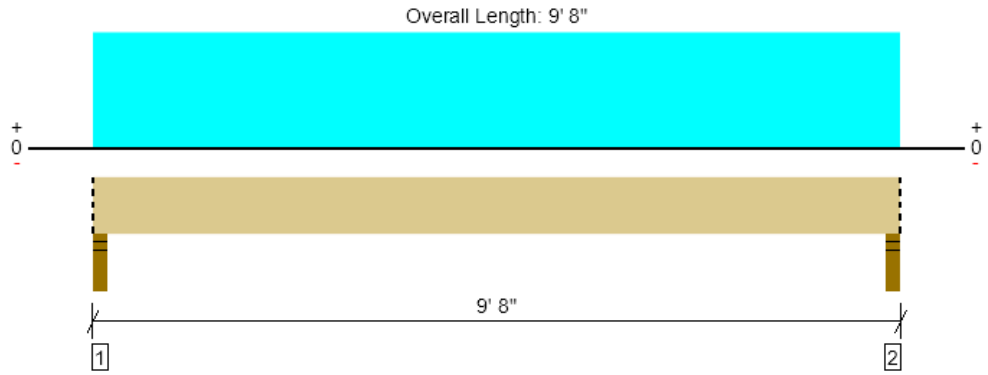
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

Weyerhaeuser

Wood Option, J2

1 piece(s) 2 x 6 HF No.2 @ 24" 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)	387 @ 2 1/2"	2126 (3.50")	Passed (18%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	327 @ 9"	949	Passed (34%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	856 @ 4' 10"	921	Passed (93%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.305 @ 4' 10"	0.463	Passed (L/364)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.487 @ 4' 10"	0.617	Passed (L/228)	--	1.0 D + 1.0 S (All Spans)

Member Length : 9' 8"
System : Roof
Member Type : Joist
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.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	145	242	387	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	145	242	387	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)	4' 5" o/c	
Bottom Edge (Lu)	9' 8" 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 9' 8"	24"	15.0	25.0	Default Load

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

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

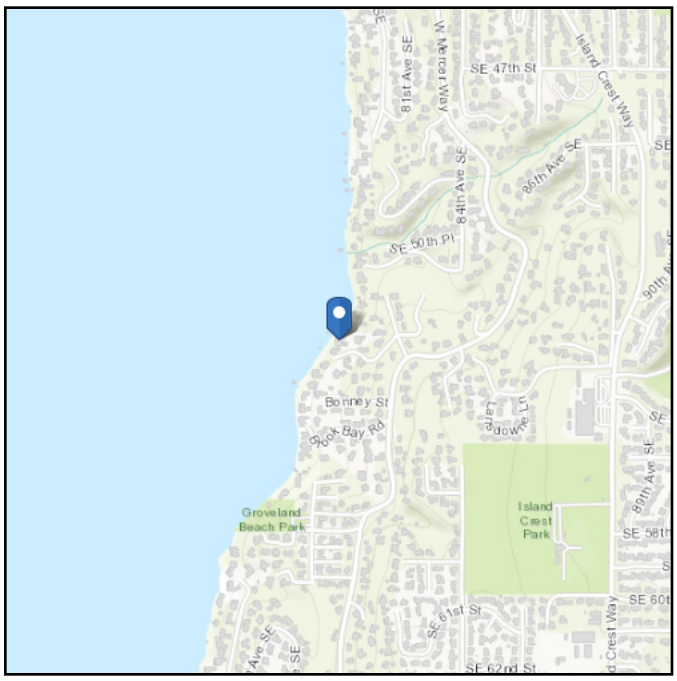
ForteWEB Software Operator	Job Notes
Ri Han Carter Quinn Norlin (206) 264-7784 wrh@cqn-se.com	

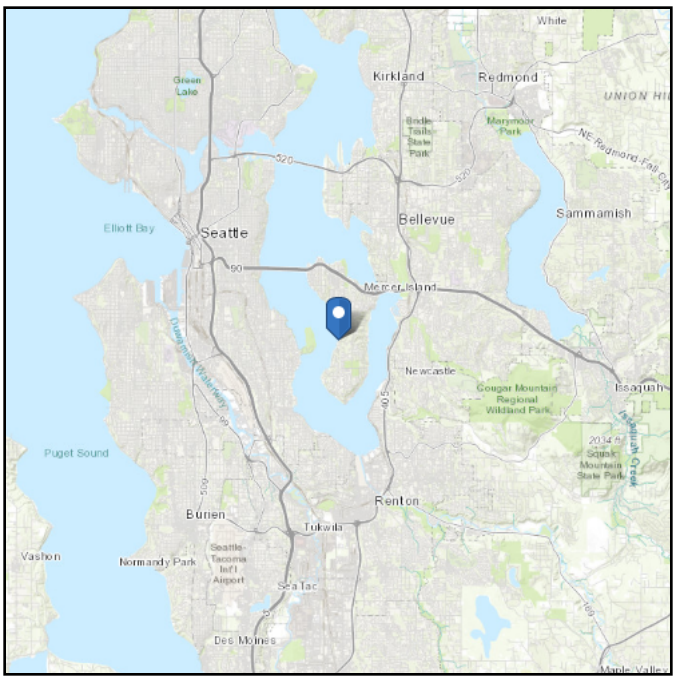
Weyerhaeuser

ASCE Hazards Report

Address:
5245 Forest Ave SE
Mercer Island, Washington
98040

Standard:	ASCE/SEI 7-16	**Latitude:**	47.555383
Risk Category:	II	**Longitude:**	-122.231389
Soil Class:	D - Stiff Soil	**Elevation:**	31.50013275997272 ft (NAVD 88)





Wind

Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	74 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed:	Mon May 05 2025

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.454	S_{D1} :	N/A
S_1 :	0.505	T_L :	6
F_a :	1	PGA :	0.623
F_v :	N/A	PGA_M :	0.685
S_{MS} :	1.454	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.97	C_v :	1.391

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Mon May 05 2025

Date Source: USGS Seismic Design Maps

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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BASE SHEAR CALCULATION

Seismic Design Parameters	
Risk Category	II
Site Class	D - Default
R	6.50
I_e	1.00
S_{ds}	0.97
S_{d1}	
S_s	1.45
S_1	0.505
F_a	1.00
F_v	
S_{ms} *(g)*	1.55
S_{m1} *(g)*	
C_s	0.15
k	1.00
V (k) (LRFD)	**0.36**
V (k) (ASD)	0.25

From ATC

Areas (ft^2)	
Sauno Roof	122

Loads	
DL-Roof (psf)	15.00
DL-Walls (psf)	10

	Height (ft)	Weight (k)	$w_x h_x^k$	C_{vx}	F_x (LRFD)	F_x (ASD)
Roof	9.33	2.44	22.77	1.00	0.364123077	0.25
TOTAL	9.33	2.44	22.77	1.00		0.25

WIND PRESSURE CALCULATION

Building Parameters				
	Height (ft)	Trib. Height (ft)	N/S	E/W
Roof	9.33	4.67	11.8	9.5
Total	9.33	-	-	-

Wind Load Parameters	
Exposure	C
Risk Category	II
Site Class	D
θ	0.0
a	3
K_{zt}	1
K_d	0.85
K_z	0.77
V (mph)	98
q_h (psf)	16.05

DETERMINE WIND PRESSURE

$p = q_h\ [(GC_{pf})-(Gc_{pi})]$ per ASCE 7-16 Eqn. 28.3-1

Gc_{pf} Values per ASCE 7-10 Figure 28.4-1			
		Case A (Trans)	Case B (Long)
Roof		0.320	
	corners	0.540	
Walls		0.690	0.690
	corners	1.040	1.040

	Wind Direction - Plan N/S					Wind Direction - Plan E/W				
	A*Gcpf	F (k)	Total (LRFD)	Min. Load	Total (ASD)	A*GCpf	F (k)	Total (LRFD)	Min. Load	Total (ASD)
Roof	20.92	0.34	0.57	0.71	0.44	18.77	0.30	0.77	0.88	0.55
corner	14.55	0.23				29.11	0.47			
Total			0.57		0.44			0.77		0.55

West

Level	Story Height (ft)	Seismic (k)	Wind (k)	Wall Length
Roof	9.33	0.36	0.59	11.50

Roof	Wall	Width (ft)	H:W Ratio	Increase Factor[1]	Shear		Weight (k)	Hold Down	
					Seismic (plf)	Wind (plf)2		Seismic (k)	Wind (k)
	1	11.50	0.8	1.00	31.30	51.04	1.07	-0.03	0.15

[1] Increase per SDPWS-2021 4.3.3.2.

[2] Per IBC 2306.2 When wind governs, wind capacities for shearwalls may be increased by 40%

South

Level	Story Height (ft)	Seismic (k)	Wind (k)	Wall Length
Roof	9.33	0.27	0.44	9.50

Roof	Wall	Width (ft)	H:W Ratio	Increase Factor[1]	Shear Seismic (plf)	Shear Wind (plf)2	Weight (k)	Hold Down Seismic (k)	Hold Down Wind (k)
	1	9.50	1.0	1.00	28.42	46.32	0.89	0.00	0.17

[1] Increase per SDPWS-2021 4.3.3.2.

[2] Per IBC 2306.2 When wind governs, wind capacities for shearwalls may be increased by 40%

NE

Level	Story Height (ft)	Seismic (k)	Wind (k)	Wall Length
Roof	9.33	0.04	0.06	3.50

Roof	Wall	Width (ft)	H:W Ratio	Increase Factor[1]	Shear Seismic (plf)	Shear Wind (plf)2	Weight (k)	Hold Down Seismic (k)	Hold Down Wind (k)
	1	3.50	2.7	1.09	11.53	18.70	0.33	0.00	0.06

[1] Increase per SDPWS-2021 4.3.3.2.

[2] Per IBC 2306.2 When wind governs, wind capacities for shearwalls may be increased by 40%

SE

Level	Story Height (ft)	Seismic (k)	Wind (k)	Wall Length
Roof	9.33	0.13	0.22	5.50

Roof	Wall	Width (ft)	H:W Ratio	Increase Factor[1]	Shear Seismic (plf)	Shear Wind (plf)2	Weight (k)	Hold Down Seismic (k)	Hold Down Wind (k)
	1	5.50	1.7	1.00	23.64	40.00	0.51	0.07	0.22

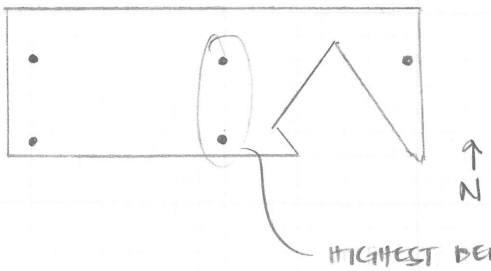
[1] Increase per SDPWS-2021 4.3.3.2.

[2] Per IBC 2306.2 When wind governs, wind capacities for shearwalls may be increased by 40%

CANOPY LATERAL

- STEEL ORDINARY CANT. COLUMN SYSTEM
  PER ASCE 7-16, TABLE 12.2-1 · R = 1.25
  Ω0 = 1.25
  Cd = 1.25

- TOTAL AREA OF CANOPY = 215 FT²
  WT. = 215 FT² × 15 PSF = 3225 LBS
  Cs = SDS / (R/I) = 0.97 / (1.25/1.0) = 0.776
  V = CsW = 0.776 × 3225 lb = 2503 lb (ULT)
  1752 lb (ASD)



(3) LINES IN N/S DIRECTION
(2) LINES IN E/W DIRECTION

HIGHEST DEMAND ≈ 50% OF BASE
LOAD: 2503 × 0.5 / 2 = 626 lb / COL (ULT)
1752 × 0.05 / 2 = 438 lb / COL (ASD)

CHECK DRIFT:
PER ASCE 7-16, TABLE 12.12-1, LIMIT: 0.02h = 0.02 × 50.25' × 12" = 1.98"
SXE = 1.537 in (PER ATTACHED ENERCALC PRINTOUT)
δx = Cd × δxe / Ie = 1.25 × 1.537 / 1.0 = 1.92" < 1.98", OK

M @ BASE: 5.165 K-FT (ULT)
(SEISMIC) 3.616 K-FT (ASD)

CQN
CARTER QUINN NORLIN
STRUCTURAL ENGINEERING
▶ 2033 Sixth Avenue #995 Seattle, WA 98121 206-264-7784 www.CQN-SE.com

PROJECT: YAMAMOTO DATE: 5/5/25
DESIGNER: RH SHEET #:

Project Title:
Engineer:
Project ID:
Project Descr:

Torsional Analysis of Rigid Diaphragm

Project File: Yamamoto.ec6

DESCRIPTION: Lateral - Seismic

General Information

IBC 2021, ASCE 7-16

Applied Lateral Force	0.270 k	Center of Shear Application :	
.....Additional Orthogonal Force	k	Distance from "X" datum point	ft
Maximum Load Used for Analysis :	0.270 k	Distance from "Y" datum point	ft
Note: This load is the vector resolved from the above two entries and will be applied to the system of elements at angular increments.		Accidental Torsion values per ASCE 7-05 12.8.4.2	
		Ecc. as % of Maximum Dimension	5.00 %
		Maximum Dimensions :	
		Along "X" Axis	ft
Load Orientation Angular Increment	15.0 deg	Along "Y" Axis	ft
Load Location Angular Increment	30.0 deg		
Center of Rigidity Location (calculated) . . .			
"X" dist. from Datum	-3.276 ft		
"Y" dist. from Datum	-5.750 ft		

Accidental Eccentricity +/- from "X" Coord. of Load Application : 0.0 ft

Accidental Eccentricity +/- from "Y" Coord. of Load Application : 0.0 ft

Wall Information

Label : NE		X Wall C.G. Location	4.75 ft	Length	3.5 ft
		Y Wall C.G. Location	4 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	90 deg	Thickness	5.5 in
Along Wall "y" Dir	1.4358E-002 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	8.0394E+004 in			E - Shear	1 Mpsi
Label : SE		X Wall C.G. Location	4.75 ft	Length	5.5 ft
		Y Wall C.G. Location	-3 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	90 deg	Thickness	5.5 in
Along Wall "y" Dir	3.9203E-003 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	5.1160E+004 in			E - Shear	1 Mpsi
Label : South		X Wall C.G. Location	0 ft	Length	10 ft
		Y Wall C.G. Location	-5.75 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	0 deg	Thickness	5.5 in
Along Wall "y" Dir	7.9423E-004 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	2.8138E+004 in			E - Shear	1 Mpsi
Label : West		X Wall C.G. Location	-4.75 ft	Length	11.5 ft
		Y Wall C.G. Location	0 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	90 deg	Thickness	5.5 in
Along Wall "y" Dir	5.6538E-004 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	2.4468E+004 in			E - Shear	1 Mpsi

ANALYSIS SUMMARY

Maximum shear forces applied to resisting elements. Eccentricity with respect to Center of Rigidity

	Max Shear along Member Local "y-y" Axis				Max Shear along Member Local "x-x" Axis			
Resisting Element	Load Angle	X-Ecc (ft)	Y-Ecc (ft)	Shear Force (k)	Load Angle	X-Ecc (ft)	Y-Ecc (ft)	Shear Force (k)
NE	345	-3.28	5.75	**0.037**	0	-3.28	5.75	**0.000**
SE	345	-3.28	5.75	**0.134**	0	-3.28	5.75	**0.000**
South	0	-3.28	5.75	**0.270**	90	-3.28	5.75	**0.000**
West	300	-3.28	5.75	**0.360**	0	-3.28	5.75	**0.000**

Project Title:
Engineer:
Project ID:
Project Descr:

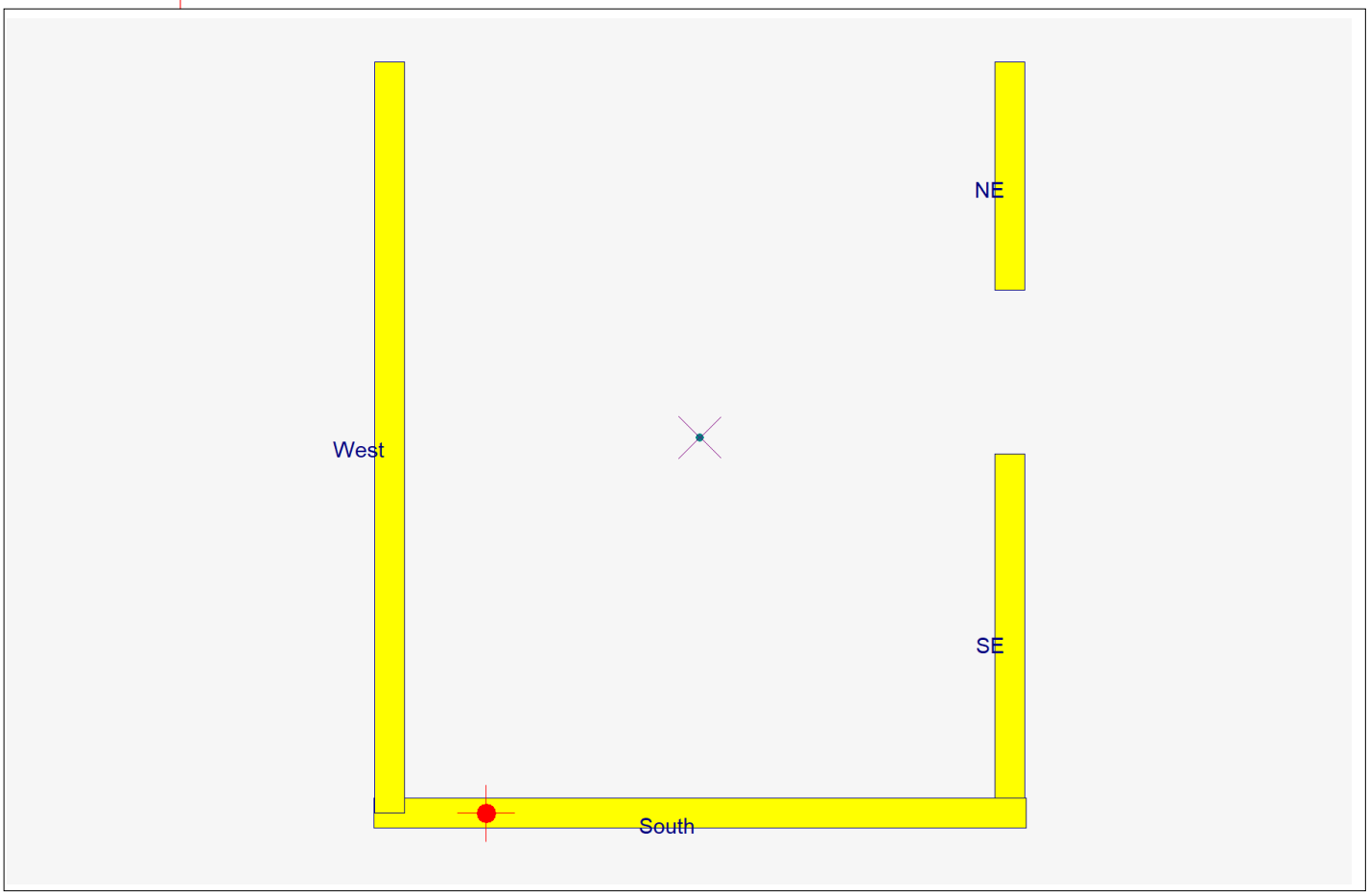
Torsional Analysis of Rigid Diaphragm

Project File: Yamamoto.ec6

DESCRIPTION: Lateral - Seismic

Layout of Resisting Elements

Legend : Defined Wall | X Datum | Center of Rigidity | Center of Mass | Accidental eccentricity application boundary



Project Title:
Engineer:
Project ID:
Project Descr:

Torsional Analysis of Rigid Diaphragm

Project File: Yamamoto.ec6

DESCRIPTION: Lateral - Seismic

Analysis Notes

This program is designed to distribute an applied shear load to a set of resisting elements.

Each resisting element data entry specifies a deflection along a "major" and "minor" axis due to a 1,000 lb load. Each resisting element may be entered as a wall or a column (whereby the deflection is calculated), or as a generic resisting element with specified deflection. The deflections define the stiffness of each resisting element.

Each resisting element is defined at an (X,Y) location from a datum the user has previously defined. A counter-clockwise rotation of the element can be entered with respect to a traditional "+X" axis line.

A main "shear" load and an optional orthogonal shear load are specified for distribution to the system of resisting elements. In addition the maximum orthogonal dimensions of the structure and minimum accidental eccentricity percentage are specified.

From the entered loads the program calculates resultant force vectors for each angular orientation that is requested. The force is applied to the resisting elements in angular increments to generate a series of resulting direct and torsional shear loads on each element. This application of force is then repeated at angular intervals along an elliptical path defined by the minimum accidental eccentricity.

The end result is a table of direct shear and torsional shear values for each element from the iterated angles of load application and accidental eccentricity. These values are then searched to find the maximum major and minor axis shears applied to each resisting element.

Project Title:
Engineer:
Project ID:
Project Descr:

Torsional Analysis of Rigid Diaphragm

Project File: Yamamoto.ec6

DESCRIPTION: Lateral - Wind

General Information

IBC 2021, ASCE 7-16

Applied Lateral Force	0.440 k	Center of Shear Application :	
.....Additional Orthogonal Force	k	Distance from "X" datum point	ft
Maximum Load Used for Analysis :	0.440 k	Distance from "Y" datum point	ft
Note: This load is the vector resolved from the above two entries and will be applied to the system of elements at angular increments.		Accidental Torsion values per ASCE 7-05 12.8.4.2	
		Ecc. as % of Maximum Dimension	5.00 %
		Maximum Dimensions :	
		Along "X" Axis	ft
Load Orientation Angular Increment	15.0 deg	Along "Y" Axis	ft
Load Location Angular Increment	30.0 deg		
Center of Rigidity Location (calculated) . . .			
"X" dist. from Datum	-3.276 ft		
"Y" dist. from Datum	-5.750 ft		

Accidental Eccentricity +/- from "X" Coord. of Load Application : 0.0 ft

Accidental Eccentricity +/- from "Y" Coord. of Load Application : 0.0 ft

Wall Information

Label : NE		X Wall C.G. Location	4.75 ft	Length	3.5 ft
		Y Wall C.G. Location	4 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	90 deg	Thickness	5.5 in
Along Wall "y" Dir	1.4358E-002 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	8.0394E+004 in			E - Shear	1 Mpsi
Label : SE		X Wall C.G. Location	4.75 ft	Length	5.5 ft
		Y Wall C.G. Location	-3 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	90 deg	Thickness	5.5 in
Along Wall "y" Dir	3.9203E-003 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	5.1160E+004 in			E - Shear	1 Mpsi
Label : South		X Wall C.G. Location	0 ft	Length	10 ft
		Y Wall C.G. Location	-5.75 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	0 deg	Thickness	5.5 in
Along Wall "y" Dir	7.9423E-004 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	2.8138E+004 in			E - Shear	1 Mpsi
Label : West		X Wall C.G. Location	-4.75 ft	Length	11.5 ft
		Y Wall C.G. Location	0 ft	Height	9.33 ft
Wall Deflections (Stiffness) for 1.0 kip load :		Wall Angle CCW	90 deg	Thickness	5.5 in
Along Wall "y" Dir	5.6538E-004 in	Wall Fixity	Fix-Pin	E - Bending	1 Mpsi
Along Wall "x" Dir	2.4468E+004 in			E - Shear	1 Mpsi

ANALYSIS SUMMARY

Maximum shear forces applied to resisting elements. Eccentricity with respect to Center of Rigidity

	Max Shear along Member Local "y-y" Axis				Max Shear along Member Local "x-x" Axis			
Resisting Element	Load Angle	X-Ecc (ft)	Y-Ecc (ft)	Shear Force (k)	Load Angle	X-Ecc (ft)	Y-Ecc (ft)	Shear Force (k)
NE	345	-3.28	5.75	**0.060**	0	-3.28	5.75	**0.000**
SE	345	-3.28	5.75	**0.219**	0	-3.28	5.75	**0.000**
South	0	-3.28	5.75	**0.440**	90	-3.28	5.75	**0.000**
West	300	-3.28	5.75	**0.587**	0	-3.28	5.75	**0.000**

Project Title:
Engineer:
Project ID:
Project Descr:

Torsional Analysis of Rigid Diaphragm

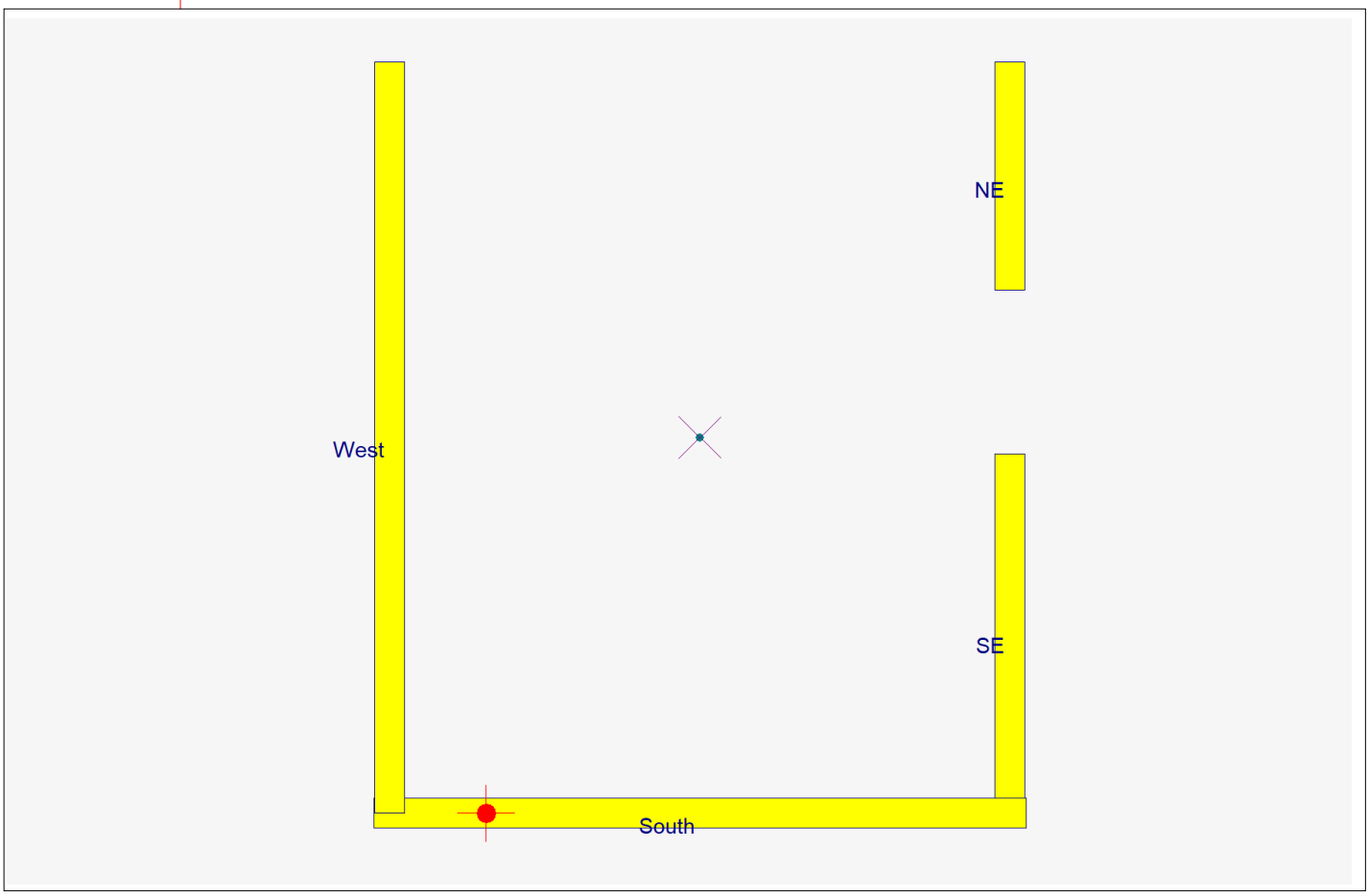
Project File: Yamamoto.ec6

DESCRIPTION: Lateral - Wind

Layout of Resisting Elements

Legend : Defined Wall X Datum

Center of Rigidity Center of Mass Accidental eccentricity application boundary



Project Title:
Engineer:
Project ID:
Project Descr:

Torsional Analysis of Rigid Diaphragm

Project File: Yamamoto.ec6

DESCRIPTION: Lateral - Wind

Analysis Notes

This program is designed to distribute an applied shear load to a set of resisting elements.

Each resisting element data entry specifies a deflection along a "major" and "minor" axis due to a 1,000 lb load. Each resisting element may be entered as a wall or a column (whereby the deflection is calculated), or as a generic resisting element with specified deflection. The deflections define the stiffness of each resisting element.

Each resisting element is defined at an (X,Y) location from a datum the user has previously defined. A counter-clockwise rotation of the element can be entered with respect to a traditional "+X" axis line.

A main "shear" load and an optional orthogonal shear load are specified for distribution to the system of resisting elements. In addition the maximum orthogonal dimensions of the structure and minimum accidental eccentricity percentage are specified.

From the entered loads the program calculates resultant force vectors for each angular orientation that is requested. The force is applied to the resisting elements in angular increments to generate a series of resulting direct and torsional shear loads on each element. This application of force is then repeated at angular intervals along an elliptical path defined by the minimum accidental eccentricity.

The end result is a table of direct shear and torsional shear values for each element from the iterated angles of load application and accidental eccentricity. These values are then searched to find the maximum major and minor axis shears applied to each resisting element.

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: Yamamoto.ec6

DESCRIPTION: Canopy Support

Code References

Calculations per AISC 360-16, IBC 2021, SDPWS 2021
Load Combinations Used : ASCE 7-16

General Information

Steel Section Name : **Pipe3-1/2STD**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	
Fy : Steel Yield	36.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	8.250 ft
Top & Bottom Fixity	Top Free, Bottom Fixed
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 8.250 ft, K = 2.1
Unbraced Length for buckling ABOUT Y-Y Axis = 8.250 ft, K = 2.1

Applied Loads

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

Column self weight included : 75.240 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 8.250 ft, D = 0.1530, S = 0.960 k
BENDING LOADS . . .
Lat. Point Load at 8.250 ft creating Mx-x, E = 0.6260 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6412** : 1

Load Combination	+1.20D+0.20S+E	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Pu	0.4659	k
0.9 * Pn	23.463	k
Mu-x	-5.165	k-ft
0.9 * Mn-x :	8.181	k-ft
Mu-y	0.0	k-ft
0.9 * Mn-y :	8.181	k-ft

PASS Maximum Shear Stress Rati **0.03091** : 1

Load Combination	+1.20D+0.20S+E	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Vu : Applied	0.6260	k
Vn * Phi : Allowable	20.250	k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.6260 k

Maximum Load Deflections . . .

Along Y-Y 1.537 in at 8.250 ft above base
for load combination : E Only

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

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios: Stress Ratio	Status	Location
+1.40D	0.014	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.000	PASS	0.00 ft
+1.20D	0.012	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.000	PASS	0.00 ft
+1.20D+0.50S	0.032	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.000	PASS	0.00 ft
+1.20D+1.60S	0.077	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.000	PASS	0.00 ft
+0.90D	0.009	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.000	PASS	0.00 ft
+1.20D+0.20S+E	0.641	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.031	PASS	0.00 ft
+0.90D+E	0.636	PASS	0.00 ft	1.67	1.00	155.15	155.15	0.031	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only	0.228									
+D+S	1.188									
+D+0.750S	0.948									
+0.60D	0.137									
+D+0.70E	0.228				0.438		-3.615			
+D+0.750S+0.5250E	0.948				0.329		-2.711			
+0.60D+0.70E	0.137				0.438		-3.615			

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: Yamamoto.ec6

DESCRIPTION: Canopy Support

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
S Only	0.960									
E Only					0.626		-5.165			

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Axial @ Base	Maximum	1.188									
"	Minimum					0.626		-5.165			
Reaction, X-X Axis Base	Maximum	0.228									
"	Minimum	0.228									
Reaction, Y-Y Axis Base	Maximum					0.626		-5.165			
"	Minimum	0.228									
Reaction, X-X Axis Top	Maximum	0.228									
"	Minimum	0.228									
Reaction, Y-Y Axis Top	Maximum	0.228									
"	Minimum	0.228									
Moment, X-X Axis Base	Maximum	0.228									
"	Minimum		-5.165			0.626		-5.165			
Moment, Y-Y Axis Base	Maximum	0.228									
"	Minimum	0.228									
Moment, X-X Axis Top	Maximum	0.228									
"	Minimum	0.228									
Moment, Y-Y Axis Top	Maximum	0.228									
"	Minimum	0.228									

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir		Distance		Max. Deflection in Y dir		Distance	
D Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+S	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750S	0.0000	in	0.000	ft	0.000	in	0.000	ft
+0.60D	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.70E	0.0000	in	0.000	ft	1.076	in	8.250	ft
+D+0.750S+0.5250E	0.0000	in	0.000	ft	0.807	in	8.250	ft
+0.60D+0.70E	0.0000	in	0.000	ft	1.076	in	8.250	ft
S Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
E Only	0.0000	in	0.000	ft	1.521	in	8.195	ft

Steel Section Properties : Pipe3-1/2STD

Depth	=	4.000 in	I xx	=	4.52 in^4	J	=	9.040 in^4	
			S xx	=	2.26 in^3				
Diameter	=	4.000 in	R xx	=	1.340 in				
Wall Thick	=	0.227 in	Zx	=	3.030 in^3				
Area	=	2.500 in^2	I yy	=	4.520 in^4				
Weight	=	9.120 plf	S yy	=	2.260 in^3				
			R yy	=	1.340 in				
Ycg	=	0.000 in							

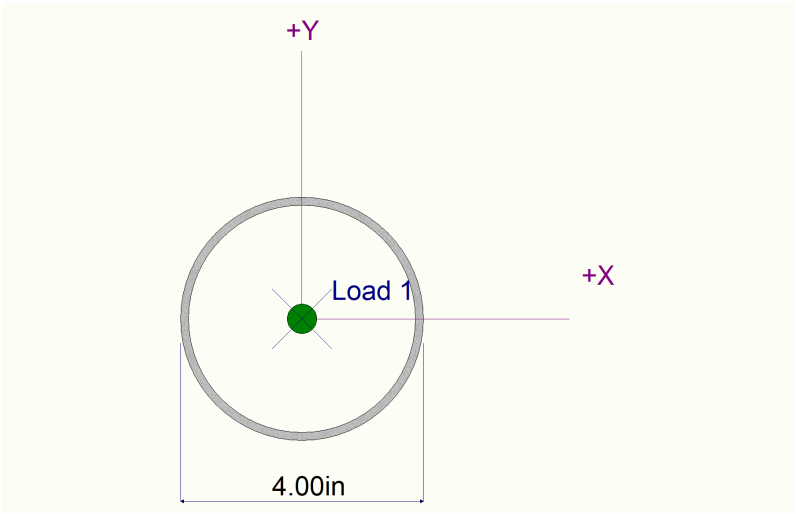
Project Title:
Engineer:
Project ID:
Project Descr:

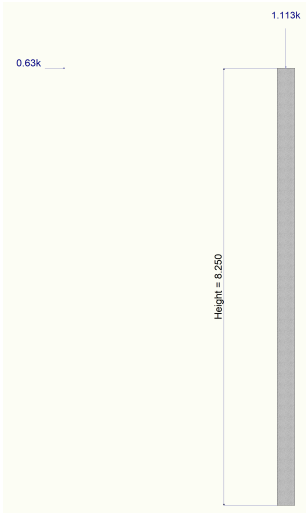
Steel Column

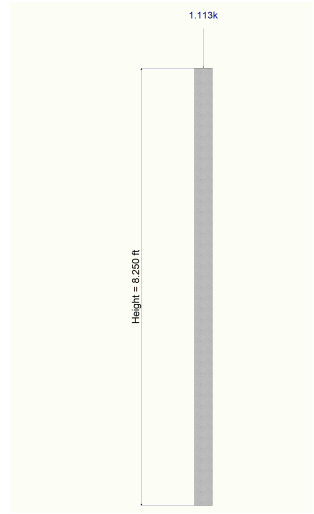
Project File: Yamamoto.ec6

DESCRIPTION: Canopy Support

Sketches







Company:		Date:	2/22/2023
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Project description:
Location:
Fastening description:

Comment:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AWS Type A
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 6.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 7.38
C_{min} (inch): 1.38
S_{min} (inch): 2.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: No
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 12.00 x 12.00 x 0.88
Yield stress: 36000 psi

Profile type/size: 3-1/2STD

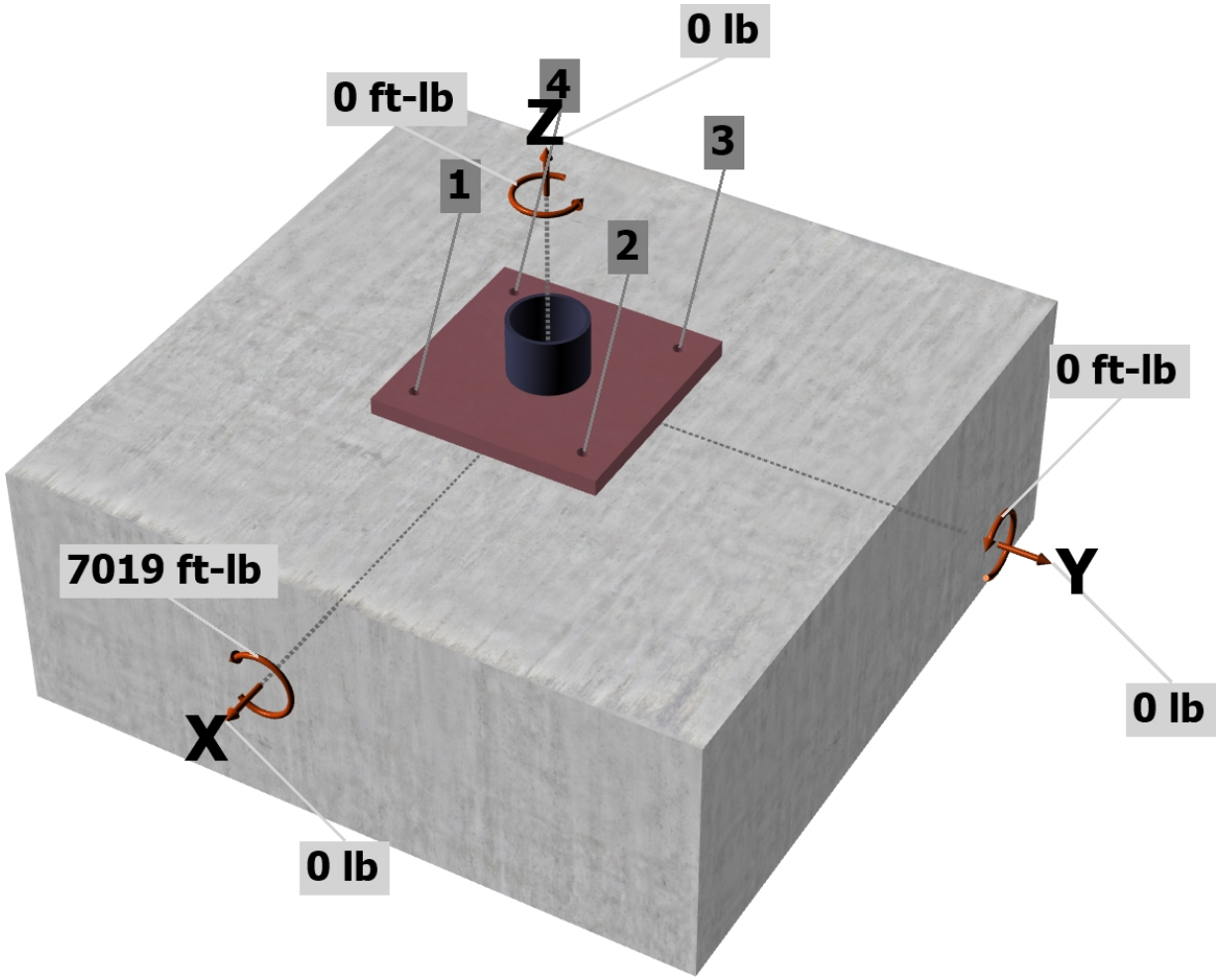
Recommended Anchor
Anchor Name: Headed Stud - 5/8"Ø AWS Type A Headed Stud

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.10.5.3 (d) is satisfied
Ductility section for shear: 17.10.6.2 not applicable
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

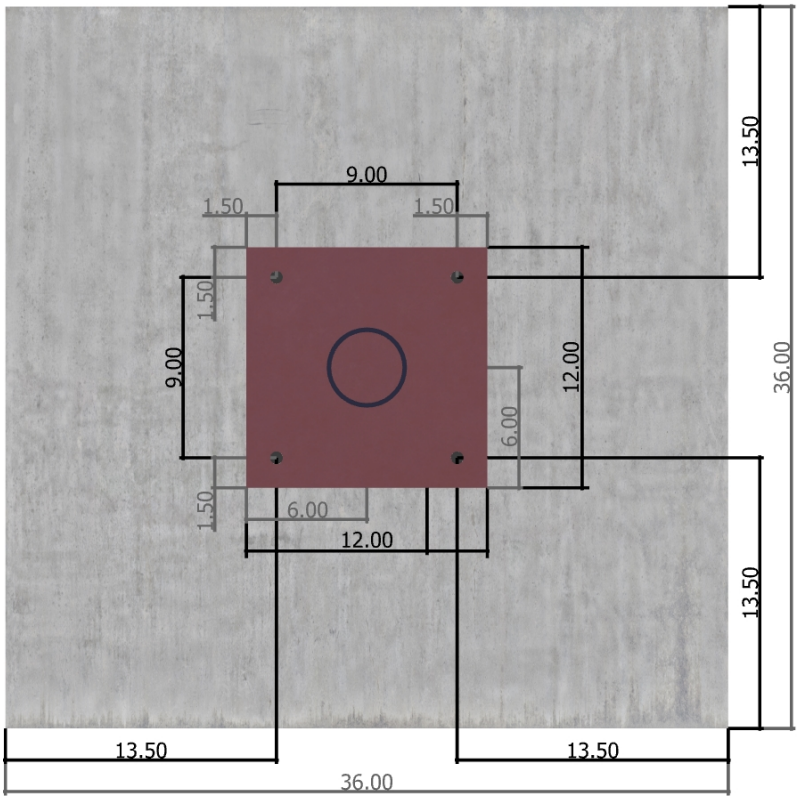
Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 0
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 7019
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



<Figure 2>

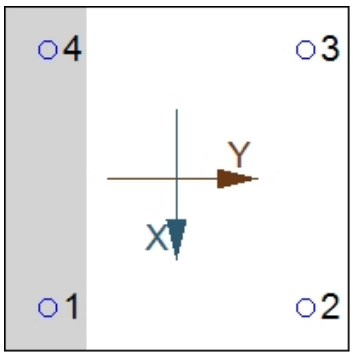


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	0.0	0.0	0.0	0.0
2	4406.1	0.0	0.0	0.0
3	4406.1	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
Sum	8812.1	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.12
Maximum concrete compression stress (psi): 520
Resultant tension force (lb): 8812
Resultant compression force (lb): 8812
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
18715	0.75	14036

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	6.000	17636

$0.75\phi N_{cbg} = 0.75\phi \left(A_{Nc} / A_{Nco} \right) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cbg}$ (lb)
486.00	324.00	13.50	1.000	1.000	1.00	1.000	17636	0.75	14881

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$0.75\phi N_{pn} = 0.75\phi \Psi_{c,P} N_p = 0.75\phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.5.1.2, Eq. 17.6.3.1 & 17.6.3.2.2a)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	0.92	2500	0.70	9660

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	4406	14036	0.31	Pass
Concrete breakout	**8812**	**14881**	**0.59**	**Pass (Governs)**
Pullout	4406	9660	0.46	Pass

5/8"Ø AWS Type A Headed Stud with hef = 6.000 inch meets the selected design criteria.

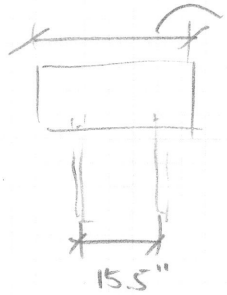
12. Warnings

- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

CANOPY COLUMN SUPPORT PILES.



GOVERNING LOAD COMBINATIONS (ASD):

LC1. $(1.0 + 0.14S_{DS})D + 0.7\Omega_0 Q_E$ } MAX. COMPRESSION

LC2. $(1.0 + 0.14S_{DS})D + 0.525\Omega_0 Q_E + 0.75S$ }

LC3. $(0.6 - 0.14S_{DS})D + 0.7\Omega_0 Q_E$, MAX TENSION

BEAM #3, WORST CASE COMP / TENSION.

FROM $\Omega \times Q_E = 1.25 \times 6261b \times 8.25' = 6455.6$ k-ft

T & C = 6455.6 k-ft / 15.5/12 = 4998 lb

MAX COMPRESSION: BM 3, SUPPORT 1

- LC1: 2204 (FROM FORTE) + 0.14 × 1.03 × 2204 + 0.7 × 4998 = 6020 lb
- LC2: 5456 (FROM FORTE) + 0.14 × 1.03 × 2204 + 0.525 × 4998 = 8398 lb ← GOVERNS.

MAX TENSION: BM 3, SUPPORT 2

- LC3: (0.6 - 0.14 × 1.03) × 131 (FROM FORTE) - 0.7 × 4998 = -3439 lb

2"ϕ PIPE PILE CAPACITY = 3 TONS = 6k

(2) PILES AXIAL CAPACITY = 12k > 8.4k, OK

TENSION TO BE RESISTED BY DEAD LOAD OF FTG:

TRY 3 × 3 × 1.5' FTG.; PILE SPACING = 27.625" w/ 3" CLEARANCE

T & C = 6455.6 k-ft / (27.625'/12) = 2804 lb.

TENSION: (0.6 - 0.14 × 1.03) × 131 - 0.7 × 2804 = 1903 lb.

FTG. WT: 3' × 3' × 1.5' × 150 PCF = 2025 lb > 1903 lb, OK

USE SAME FTG SIZE EVERYWHERE, W/ (4) 2"ϕ PIPE PILES

CQN
CARTER QUINN NORLIN
STRUCTURAL ENGINEERING
▶ 2033 Sixth Avenue #995 Seattle, WA 98121 206-264-7784 www.CQN-SE.com

PROJECT: YAMAMOTO DATE: 5/5/25

DESIGNER: RH SHEET #:

FORTEWEB

FULL DETAIL REPORT *Wood Option, B3*

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

PASSED

Summary of Loads to Supports

All load groups / combinations / patterns	3' 10 3/4" ▲		4' 7 1/2" ▲		1' 3/4"
Maximum Down (lbs) / LDF	--	5456/1.15	--	1091/1.15	--
Critical Down (lbs) / LDF	--	5456/1.15	--	1091/1.15	--
Maximum Uplift (lbs) / LDF	--	0/1.00	--	-491/1.15	--
Critical Uplift (lbs) / LDF	--	0/1.00	--	-491/1.15	--
Bearing Length	--	3.50"	--	3.50"	--
Support Fc-perp (psi)	--	425	--	425	--
Top edge required unbraced length / C_L	N/A	N/A	N/A	N/A	N/A
Bottom edge required unbraced length / C_L	115.00"/1.0000	115.00"/1.0000	N/A	115.00"/1.0000	115.00"/1.0000

1.0 Dead (LDF = 0.9)

Loading On All Spans	3' 10 3/4" ▲			4' 7 1/2" ▲			1' 3/4"
Member Reaction (lbs)	--	2204		--	131		--
Loads to Supports (lbs)	--	2204		--	131		--
Shear used for design (lbs)	--	-1272	880	--	804	883	--
Shear at support node (lbs)	--	-1298	906	--	778	909	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-4846		N/A	-951		0
Live Load Deflection (in)	0.000"	--		0.000"	--		0.000"
Total Load Deflection (in)	0.136"	--		-0.019"	--		0.014"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

Loading On All Spans	3' 10 3/4" ▲			4' 7 1/2" ▲			1' 3/4"
Member Reaction (lbs)	--	4528		--	286		--
Loads to Supports (lbs)	--	4528		--	286		--
Shear used for design (lbs)	--	-2634	1807	--	1679	1878	--
Shear at support node (lbs)	--	-2677	1851	--	1636	1922	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-10078		N/A	-2015		0
Live Load Deflection (in)	0.148"	--		-0.021"	--		0.016"
Total Load Deflection (in)	0.284"	--		-0.039"	--		0.030"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ALTERNATE span loading on odd # spans	3' 10 3/4" ▲			4' 7 1/2" ▲			1' 3/4"
Member Reaction (lbs)	--	4507		--	264		--
Loads to Supports (lbs)	--	4507		--	264		--
Shear used for design (lbs)	--	-2634	1794	--	1692	1878	--
Shear at support node (lbs)	--	-2677	1829	--	1658	1922	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-10078		N/A	-2015		0
Live Load Deflection (in)	0.148"	--		-0.021"	--		0.016"
Total Load Deflection (in)	0.285"	--		-0.039"	--		0.030"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ALTERNATE span loading on even # spans	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	3388		--	230		--
Loads to Supports (lbs)	--	3388		--	230		--
Shear used for design (lbs)	--	-1953	1357	--	1229	1381	--
Shear at support node (lbs)	--	-1988	1400	--	1185	1416	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-7462		N/A	-1483		0
Live Load Deflection (in)	0.074"	--		-0.010"	--		0.008"
Total Load Deflection (in)	0.210"	--		-0.029"	--		0.022"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ADJACENT span loading on support 1	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	4643		--	-336		--
Loads to Supports (lbs)	--	4643		--	-336		--
Shear used for design (lbs)	--	-2634	1922	--	1795	1381	--
Shear at support node (lbs)	--	-2677	1966	--	1751	1416	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-10078		N/A	-1483		0
Live Load Deflection (in)	0.144"	--		-0.019"	--		0.013"
Total Load Deflection (in)	0.280"	--		-0.038"	--		0.027"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ADJACENT span loading on support 2	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	3273		--	851		--
Loads to Supports (lbs)	--	3273		--	851		--
Shear used for design (lbs)	--	-1953	1242	--	1114	1878	--
Shear at support node (lbs)	--	-1988	1285	--	1070	1922	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-7462		N/A	-2015		0
Live Load Deflection (in)	0.078"	--		-0.012"	--		0.010"
Total Load Deflection (in)	0.214"	--		-0.031"	--		0.024"

1.0 Dead + 1.0 Snow (LDF = 1.15)

Loading On All Spans	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	5303		--	337		--
Loads to Supports (lbs)	--	5303		--	337		--
Shear used for design (lbs)	--	-3088	2116	--	1971	2210	--
Shear at support node (lbs)	--	-3137	2166	--	1922	2259	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-11823		N/A	-2370		0
Live Load Deflection (in)	0.197"	--		-0.027"	--		0.021"
Total Load Deflection (in)	0.334"	--		-0.046"	--		0.035"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ALTERNATE span loading on odd # spans

	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	5274		--	308		--
Loads to Supports (lbs)	--	5274		--	308		--
Shear used for design (lbs)	--	-3088	2099	--	1988	2210	--
Shear at support node (lbs)	--	-3137	2137	--	1951	2259	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-11823		N/A	-2370		0
Live Load Deflection (in)	0.198"	--		-0.028"	--		0.021"
Total Load Deflection (in)	0.334"	--		-0.046"	--		0.035"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ALTERNATE span loading on even # spans

	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	3782		--	263		--
Loads to Supports (lbs)	--	3782		--	263		--
Shear used for design (lbs)	--	-2180	1515	--	1371	1547	--
Shear at support node (lbs)	--	-2218	1565	--	1321	1584	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-8334		N/A	-1661		0
Live Load Deflection (in)	0.098"	--		-0.013"	--		0.010"
Total Load Deflection (in)	0.234"	--		-0.032"	--		0.024"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ADJACENT span loading on support 1

	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	5456		--	-491		--
Loads to Supports (lbs)	--	5456		--	-491		--
Shear used for design (lbs)	--	-3088	2270	--	2125	1547	--
Shear at support node (lbs)	--	-3137	2319	--	2075	1584	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-11823		N/A	-1661		0
Live Load Deflection (in)	0.192"	--		-0.025"	--		0.017"
Total Load Deflection (in)	0.328"	--		-0.044"	--		0.031"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ADJACENT span loading on support 2

	3' 10 3/4"	▲		4' 7 1/2"	▲		1' 3/4"
Member Reaction (lbs)	--	3629		--	1091		--
Loads to Supports (lbs)	--	3629		--	1091		--
Shear used for design (lbs)	--	-2180	1362	--	1217	2210	--
Shear at support node (lbs)	--	-2218	1411	--	1168	2259	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-8334		N/A	-2370		0
Live Load Deflection (in)	0.103"	--		-0.016"	--		0.014"
Total Load Deflection (in)	0.240"	--		-0.034"	--		0.028"