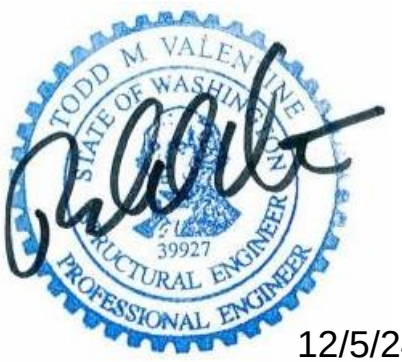
STRUCTURAL CALCULATIONS

Project:
Miles Residence
8321 SE 83rd St
Mercer Island, WA 98040

Architect:
JML Architects, LLC
Mercer Island, WA 98040

Structural Engineer:
Harriott Valentine Engineers, Inc.
1932 First Avenue, Suite 720
Seattle, WA 98101
tel. 206-624-4760



12/5/24

SECTION 1: GENERAL

CRITERIA

Gravity

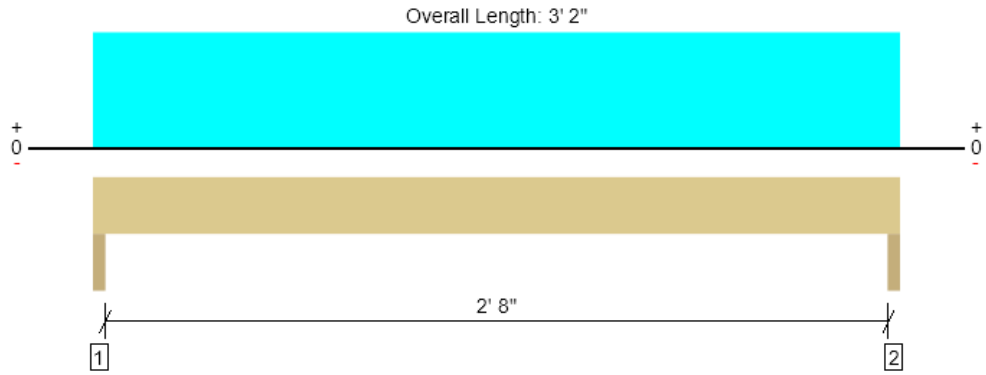
roof	dead	asphalt shingles	2.5	live	snow	25.0 psf
		1/2" plywood	1.5			
		R30 insulation	1.2			
		(2)2x6 @ 16"oc	3.4			
		5/8" gyp. wallboard	2.8			
		slope factor	2.9			
		miscellaneous	1.7 11%			
			16.0 psf			
	total	dead + live	41.0 psf			
walls						
		cement fiber board	4.1			
		battens 2x2 @ 24"oc	0.3			
		1/2" plywood	1.5			
		2x6 @ 16"oc	1.7			
		R21 insulation	0.8			
		1/2" gyp. wallboard	2.2 4%			
		miscellaneous	0.4 psf			
			11.0			

SECTION 2: FRAMING

Garage roof			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
window header	Passed (7% M)	2 piece(s) 2 x 6 HF No.2	
garage header	Passed (42% M)	1 piece(s) 3 1/2" x 9 1/4" 2.0E Parallam® PSL	
existing ridge	Passed (98% M)	1 piece(s) 4 x 12 DF No.1	
new rafter 1	Passed (54% ΔT)	1 piece(s) 2 x 6 HF No.2 @ 16" OC	
new rafter 2	Passed (91% ΔT)	2 piece(s) 1 3/4" x 5 1/2" 2.0E Microllam® LVL @ 16" OC	
new ridge beam	Passed (87% M)	1 piece(s) 4 x 12 DF No.1	
existing dropped beam	Passed (88% V)	1 piece(s) 4 x 12 DF No.1	

Garage roof, window header

2 piece(s) 2 x 6 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)	171 @ 1 1/2"	3645 (3.00")	Passed (5%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	95 @ 8 1/2"	1898	Passed (5%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	115 @ 1' 7"	1602	Passed (7%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.001 @ 1' 7"	0.097	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.003 @ 1' 7"	0.146	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 3' 2"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Trimmer - HF	3.00"	3.00"	1.50"	122	49	171	None
2 - Trimmer - HF	3.00"	3.00"	1.50"	122	49	171	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 2" o/c	
Bottom Edge (Lu)	3' 2" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 3' 2"	N/A	4.2	--	
1 - Uniform (PSF)	0 to 3' 2"	1' 3"	15.0	25.0	Default Load
2 - Uniform (PLF)	0 to 3' 2"	N/A	54.0	-	

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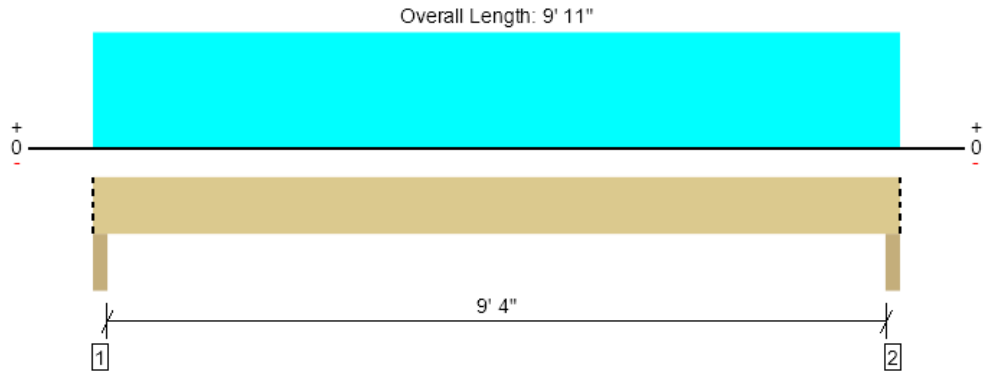
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Henry Nuckles Harriott Valentine Engineers (715) 571-0533 HNuckles@harriottvalentine.com	

Weyerhaeuser

Garage roof, garage header

1 piece(s) 3 1/2" x 9 1/4" 2.0E Parallam® PSL



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2613 @ 2"	7656 (3.50")	Passed (34%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2053 @ 1' 3/4"	7198	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6049 @ 4' 11 1/2"	14278	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.146 @ 4' 11 1/2"	0.479	Passed (L/788)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.238 @ 4' 11 1/2"	0.639	Passed (L/483)	--	1.0 D + 1.0 S (All Spans)

Member Length : 9' 11"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - HF	3.50"	3.50"	1.50"	1011	1602	2613	Blocking
2 - Column - HF	3.50"	3.50"	1.50"	1011	1602	2613	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' 11" o/c	
Bottom Edge (Lu)	9' 11" 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' 11"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 9' 11" (Front)	12' 11 1/16"	15.0	25.0	Default Load

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

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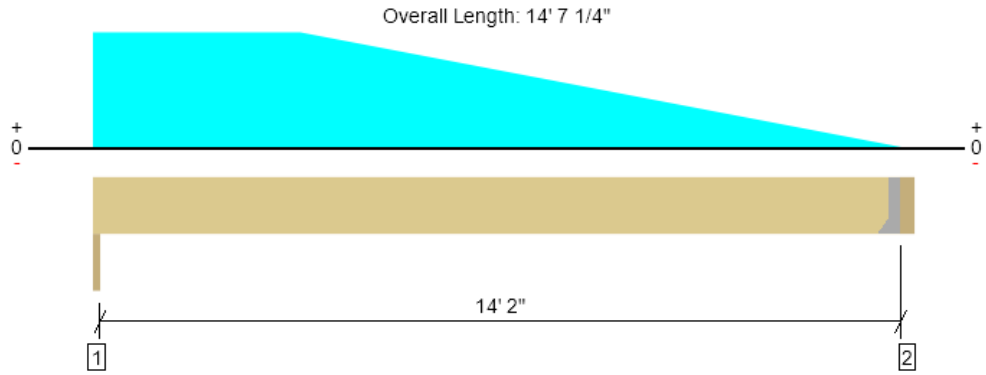
Weyerhaeuser

Garage roof, existing ridge

1 piece(s) 4 x 12 DF No.1



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2562 @ 1/4"	3828 (1.75")	Passed (67%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2092 @ 1' 1"	5434	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	7594 @ 6' 2 1/8"	7783	Passed (98%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.227 @ 6' 11"	0.715	Passed (L/754)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.386 @ 6' 11 1/8"	0.953	Passed (L/444)	--	1.0 D + 1.0 S (All Spans)

Member Length : 14' 3 3/4"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - HF	1.75"	1.75"	1.50"	1043	1519	2562	None
2 - Hanger on 11 1/4" HF beam	3.50"	Hanger[1]	1.50"	601	828	1430	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 5" o/c	
Bottom Edge (Lu)	14' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10d	6-10d	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14' 3 3/4"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 3' 9" (Front)	10' 4"	16.0	25.0	Default Load
2 - Tapered (PSF)	3' 9" to 14' 5" (Front)	10' 4" to 0	16.0	25.0	

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

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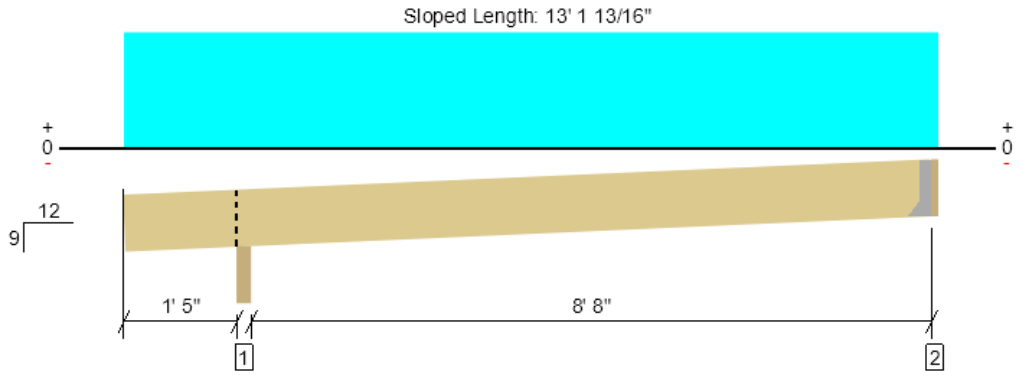
ForteWEB Software Operator	Job Notes
Henry Nuckles Harriott Valentine Engineers (715) 571-0533 HNuckles@harriottvalentine.com	

Weyerhaeuser

Garage roof, new rafter 1

1 piece(s) 2 x 6 HF No.2 @ 16" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	230 @ 10' 4 1/2"	911 (1.50")	Passed (25%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	215 @ 2' 7/8"	949	Passed (23%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	496 @ 6' 3/4"	921	Passed (54%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.252 @ 5' 11 7/8"	0.551	Passed (L/525)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.397 @ 6'	0.734	Passed (L/333)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 13' 3 3/4"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 9/12

- 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.
- 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 - Beveled Plate - SPF	3.50"	3.50"	1.50"	122	204	326	Blocking
2 - Hanger on 5 1/2" HF beam	1.75"	Hanger[1]	1.50"	88	149	237	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 7" o/c	
Bottom Edge (Lu)	13' o/c	

- Maximum allowable bracing intervals based on applied load.
- Dimensions for lateral bracing intervals are measured along the length of the member for sloped conditions.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LRU26Z	1.94"	N/A	4-10dx1.5	5-10d	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 10' 6 1/4"	16"	12.0	25.0	Default Load

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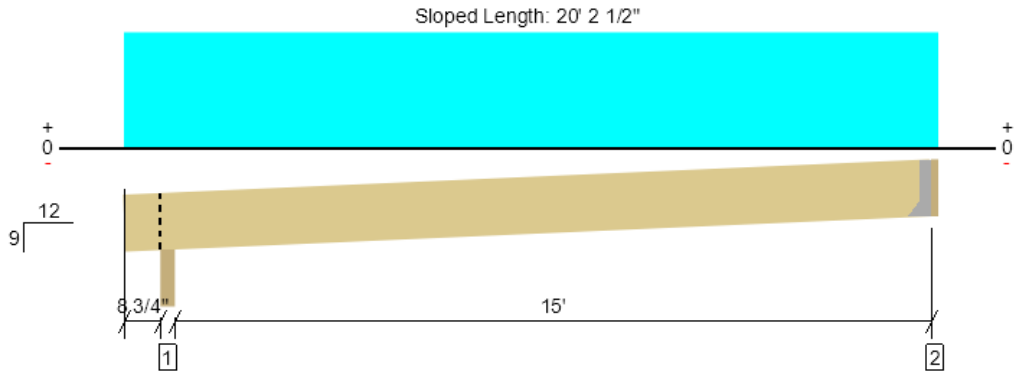
Weyerhaeuser

Garage roof, new rafter 2

2 piece(s) 1 3/4" x 5 1/2" 2.0E Microllam® LVL @ 16" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	453 @ 16' 1/4"	3938 (1.50")	Passed (12%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	431 @ 15' 7 7/8"	4206	Passed (10%)	1.15	1.0 D + 1.0 S (Alt Spans)
Moment (Ft-lbs)	1712 @ 8' 5 5/8"	5084	Passed (34%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.639 @ 8' 5 7/16"	0.947	Passed (L/356)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	1.147 @ 8' 5 7/16"	1.262	Passed (L/198)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 20' 4 7/16"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 9/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Upward deflection on left cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.50"	226	282	508	Blocking
2 - Hanger on 5 1/2" HF beam	1.75"	Hanger[1]	1.50"	204	257	461	See note [1]

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	20' o/c	
Bottom Edge (Lu)	20' o/c	

- Maximum allowable bracing intervals based on applied load.
- Dimensions for lateral bracing intervals are measured along the length of the member for sloped conditions.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	U46X SLD36	2.00"	N/A	8-10dx1.5	4-10d	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 16' 2"	16"	16.0	25.0	Default Load

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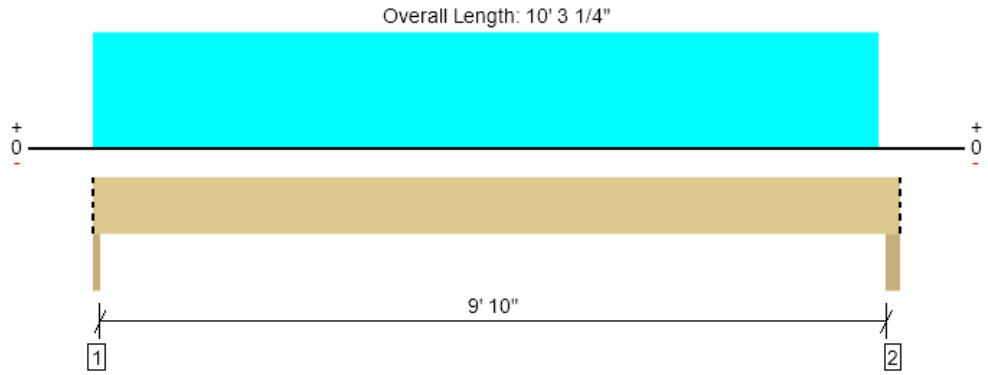
Weyerhaeuser

Garage roof, new ridge beam

1 piece(s) 4 x 12 DF No.1



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2700 @ 1/4"	3828 (1.75")	Passed (71%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2123 @ 9' 1/2"	5434	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6779 @ 5' 3/4"	7783	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.100 @ 5' 3/4"	0.504	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.176 @ 5' 3/4"	0.672	Passed (L/689)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 3 1/4"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - HF	1.75"	1.75"	1.50"	1159	1541	2700	Blocking
2 - Column - HF	3.50"	3.50"	1.50"	1133	1504	2637	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)	10' 3" o/c	
Bottom Edge (Lu)	10' 3" 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 10' 3 1/4"	N/A	10.0	--	
1 - Uniform (PLF)	0 to 10' (Front)	N/A	66.0	111.8	Linked from: new rafter 1, Support 2
2 - Uniform (PLF)	0 to 10' (Back)	N/A	153.0	192.8	Linked from: new rafter 2, Support 2

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

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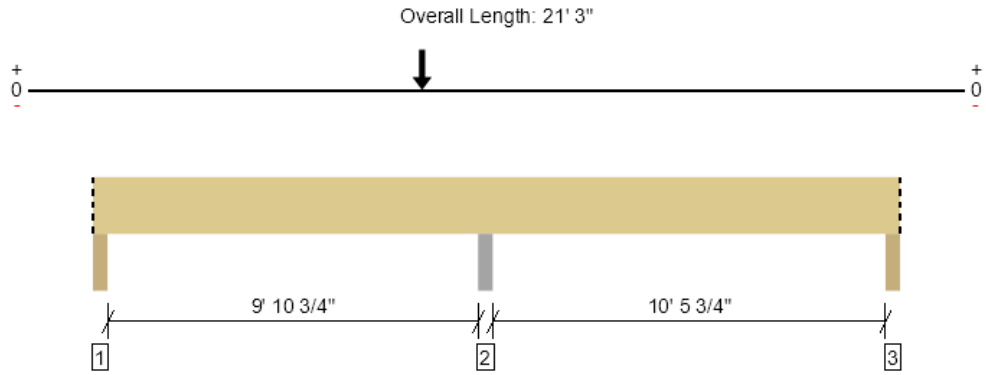
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Henry Nuckles Harriott Valentine Engineers (715) 571-0533 HNuckles@harriottvalentine.com	

Weyerhaeuser

Garage roof, existing dropped beam

1 piece(s) 4 x 12 DF No.1



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)	5156 @ 10' 4"	7656 (3.50")	Passed (67%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4775 @ 9' 3"	5434	Passed (88%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4553 @ 8' 8"	7783	Passed (59%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.049 @ 5' 10 1/4"	0.508	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.085 @ 5' 9 15/16"	0.678	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 21' 3"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -262 lbs uplift at support located at 21' 1". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - HF	3.50"	3.50"	1.50"	265	314	580	Blocking
2 - Column - steel	3.50"	3.50"	2.36"	2234	2922	5156	None
3 - Column - HF	3.50"	3.50"	1.50"	-85	-177	-262	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' 3" o/c	
Bottom Edge (Lu)	21' 3" 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 21' 3"	N/A	10.0	--	
1 - Point (lb)	8' 8" (Top)	N/A	1043	1519	Linked from: existing ridge, Support 1
2 - Point (lb)	8' 8" (Top)	N/A	1159	1541	Linked from: new ridge beam, 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
Henry Nuckles Harriott Valentine Engineers (715) 571-0533 HNuckles@harriottvalentine.com	

Weyerhaeuser

SECTION 3: LATERAL

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

Search Information

Address:	8321 SE 83rd St, Mercer Island, WA 98040, USA
Coordinates:	47.5289906, -122.228952
Elevation:	257 ft
Timestamp:	2024-11-20T20:31:56.968Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	D-default

Basic Parameters

Name	Value	Description
S_S	1.468	MCE_R ground motion (period=0.2s)
S_1	0.506	MCE_R ground motion (period=1.0s)
S_{MS}	1.761	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.174	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	1.2	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	0.628	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.753	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.468	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.627	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	4.32	Factored deterministic acceleration value (0.2s)
S1RT	0.506	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.563	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.634	Factored deterministic acceleration value (1.0s)
PGAd	1.422	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

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

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SEISMIC DESIGN

ASCE 7-16
Equivalent Lateral Force Procedure

RISK Category	II		Table 1.5-1
Seismic Design Category	D		Table 11.6-1
Importance Factor	1.00		Table 1.5-2
Site Class	D		Table 20.3-1 **per Geotech or DEFAULT**
S_S	146.80	%g	(from SEAOC/OSHPD website tool)
S_1	50.60	%g	(from SEAOC/OSHPD website tool)
F_a	1.20		Table 11.4-1 **USE Fa=1.2 for DEFAULT Site Class D**
F_v	1.80		Table 11.4-2
C_t	0.02		Table 12.8-2
x	0.75		Table 12.8-2
h_n	30.00	feet	(height to highest level)
$S_{MS} = Fa*Ss$	1.7616		Eq. 11.4-1
$S_{M1} = Fv*S1$	0.9108		Eq. 11.4-2
$S_{DS} = (2/3)*S_{MS}$	1.1744	g	Eq. 11.4-3
$S_{D1} = (2/3)*S_{M1}$	0.6072	g	Eq. 11.4-4
Period $T_a = C_t*h_n\text{^}x$	0.2564	s	Eq. 12.8-7
T_o	0.1034	s	per section 11.4.6
T_S	0.5170	s	per section 11.4.6
S_a	1.1744	g	per section 11.4.6
R	6.5		Table 12.2-1
Ωo	2.5		Table 12.2-1
C_d	4		Table 12.2-1
Section 12.8 (ELF) ok?	Yes		Table 12.6-1

Equivalent Lateral Force Procedure (section 12.8)

Cs	0.1807		Eq. 12.8-2
W, weight	8,125	lb	per table below
Q_E	1,468	lb	Eq. 12.8-1

Vertical Force Distribution (section 12.8.3)
k = 1.00

Level	Hx	Floor Area	Seismic Dead Ld	Floor Wt.	Wall Length	Wall Wt.	Total Wt.	WxHx	Cvx	(LRFD) Q_E	(ASD) $0.7Q_E$
	(ft)	(ft2)	(psf)	(k)	(ft)	(k)	(k)	(k-ft)	(%)	(k)	(k)
Garage Roof	15.88	330	15	5.0	50	3.2	8.1	129.0	100.0	1.47	1.03
							8.13	128.98	100.00	1.47	**1.03**

WIND DESIGN

ASCE 7-10
Simplified Envelope Method (Chapter 28)

$p_s = \lambda \, K_{zt} \, I \, p_{s30}$

λ = adjustment factor = 1.49
I = importance factor = 1.00
Kzt = topographic factor = 1.90

Part of Figure 28.6-1 - Adjustment Factor for Building Height and Exposure, λ

Mean Roof Height	Exposure		
(ft)	B	C	D
15	1.00	1.21	**1.47**
16	1.00	1.23	**1.49**
17	1.00	1.24	**1.50**
18	1.00	1.26	**1.52**
19	1.00	1.27	**1.53**
20	1.00	1.29	**1.55**
21	1.00	1.30	**1.56**
22	1.00	1.31	**1.57**
23	1.00	1.33	**1.59**
24	1.00	1.34	**1.60**
25	1.00	1.35	**1.61**
26	1.00	1.36	**1.62**
27	1.00	1.37	**1.63**
28	1.00	1.38	**1.64**
29	1.00	1.39	**1.65**
30	1.00	1.40	**1.66**

Zone
Computation

a = 10% of least horizontal dimension or 0.4 x h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 feet.

w =	24.50 ft	x 0.1 =	2.45 ft
h =	16.00 ft	x 0.4 =	6.40 ft
w =	24.50 ft	x 0.04 =	0.98 ft

a = 3.00 ft
2a = 6.00 ft

Zone B - end zone of roof
Zone A - end zone of wall

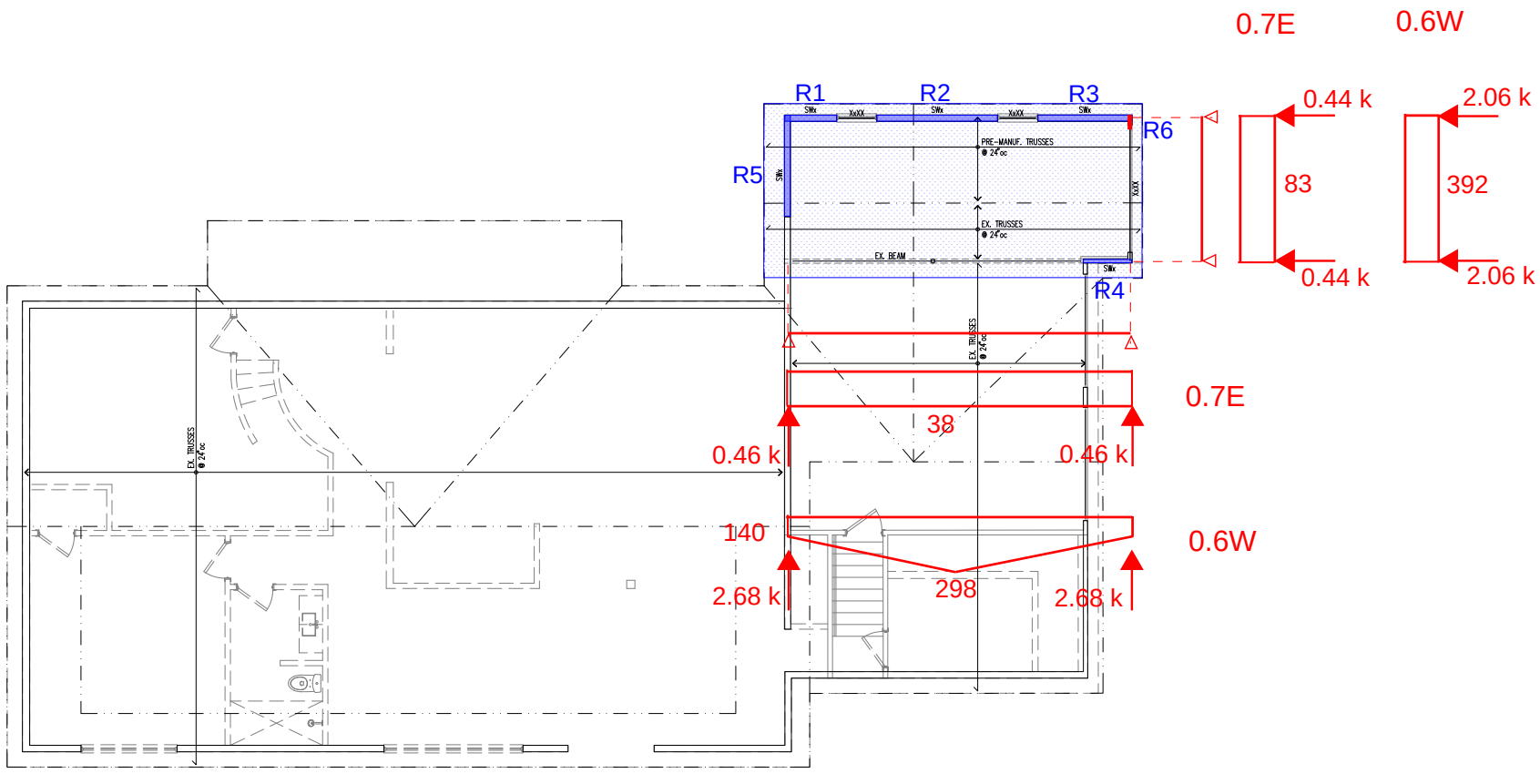
Zone D - interior zone of roof
Zone C - interior zone of wall

Part of Figure 28.6-1 - Method 2
Design Wind Pressure, p_{s30}

Basic Speed	Roof Angle	Roof Pitch	Horizontal Pressures (psf)			
			A	B	C	D
100	0 to 5	flat	15.9	-8.2	10.5	-4.9
	10	2	17.9	-7.4	11.9	-4.3
	15	3	19.9	-6.6	13.3	-3.8
	20	4	22.0	-5.8	14.6	-3.2
	25	6	19.9	3.2	14.4	3.3
	30 to 45	7 to 12	17.8	12.2	14.2	9.8

Design Wind Pressure, p_s

Basic Speed	Roof Angle	Roof Pitch	Horizontal Pressures (psf)				
			A	B	C	D	
100	0 to 5	flat	45.0	-23.2	29.7	-13.9	
	10	2	50.7	-20.9	33.7	-12.2	
	15	3	56.3	-18.7	37.7	-10.8	
	20	4	62.3	-16.4	41.3	-9.1	
	25	6	56.3	9.1	40.8	9.3	
	30 to 45	7 to 12	**50.4**	**34.5**	**40.2**	**27.7**	<<<



Garage Roof Lateral Load Distribution

LATERAL FORCE DISTRIBUTION

= Simpson Strongwall - not designed here

East-West
Walls Below Roof

va' = allowable shear values multiplied by (1.25-0.125 * h/l)
for wall aspect ratios greater than 2:1, and only for seismic

WALL				WIND					SEISMIC														
	L	h	h/l	F	V	V	v	SW	F	V	V	v	va'	SW	**SW**	M ot	M ot	M ot	OT	DL max	T	**HD**	TL	C	**POST**
	(ft)	(ft)		(lb)	(abv)	(total)	(plf)		(lb)	(abv)	(total)	(plf)				(lbft)	(abv)	(total)	(lb)	(lb)	(lb)		(lb)	(lb)	
R1	3.67	9.25	2.52	409	0	409	111	SW1	87	0	87	31	33	SW1	**SW1**	3780	0	3780	1030	112	918	**HDU2**	0	1030	**(2)2x4**
																3780	0	3780	1030	112	918	**HDU2**	0	1030	**(2)2x4**
R2	8.50	13.50	1.59	946	0	946	111	SW1	202	0	202	31	N/A	SW1	**SW1**	12778	0	12778	1503	358	1146	**HDU2**	0	1503	**(2)2x4**
																12778	0	12778	1503	358	1146	**HDU2**	0	1503	**(2)2x4**
R3	6.33	8.50	1.34	705	0	705	111	SW1	151	0	151	31	N/A	SW1	**SW1**	5991	0	5991	946	181	766	**HDU2**	0	946	**(2)2x4**
																5991	0	5991	946	181	766	**HDU2**	0	946	**(2)2x4**
R4	3.50	8.50	2.43	1	0	1	0	SW1	1	0	1	0	0	SW1	**SW1**	9	0	9	2	100	-98	**--**	0	2	**(2)2x4**
																9	0	9	2	100	-98	**--**	0	2	**(2)2x4**

North-South
Walls Below Roof

WALL				WIND					SEISMIC														
	L	h	h/l	F	V	V	v	SW	F	V	V	v	va'	SW	SW	M ot	M ot	M ot	OT	DL max	T	HD	TL	C	POST
	(ft)	(ft)		(lb)	(abv)	(total)	(plf)		(lb)	(abv)	(total)	(plf)				(lbft)	(abv)	(total)	(lb)	(lb)	(lb)		(lb)	(lb)	
R5	7.25	9.25	1.28	2680	0	2680	370	SW2	460	0	460	82	N/A	SW1	**SW2**	24790	0	24790	3419	630	2790	**HDU4**	0	3419	**(2)2x4**
																24790	0	24790	3419	630	2790	**HDU4**	0	3419	**(2)2x4**
R6	1.50	6.50	4.33	2680	0	2680	1787	--	1	0	1	1	1	--	**--**	17420	0	17420	11613	57	11556	**--**	0	11613	**--**
																17420	0	17420	11613	57	11556	**--**	0	11613	**--**

rho = 1.30 per ASCE 7-10 12.3.4.2

1932 First Avenue, Suite 720
Seattle, Washington 98101-2447
tel 206-624-4760 | fax 447-6971

SECTION 4: FOUNDATION

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: HDU2 Cast In

LRFD Loads

1.0W = 1146 lb
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 6.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.13
C_{min} (inch): 1.38
S_{min} (inch): 2.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 24.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Yes
Build-up grout pad: No

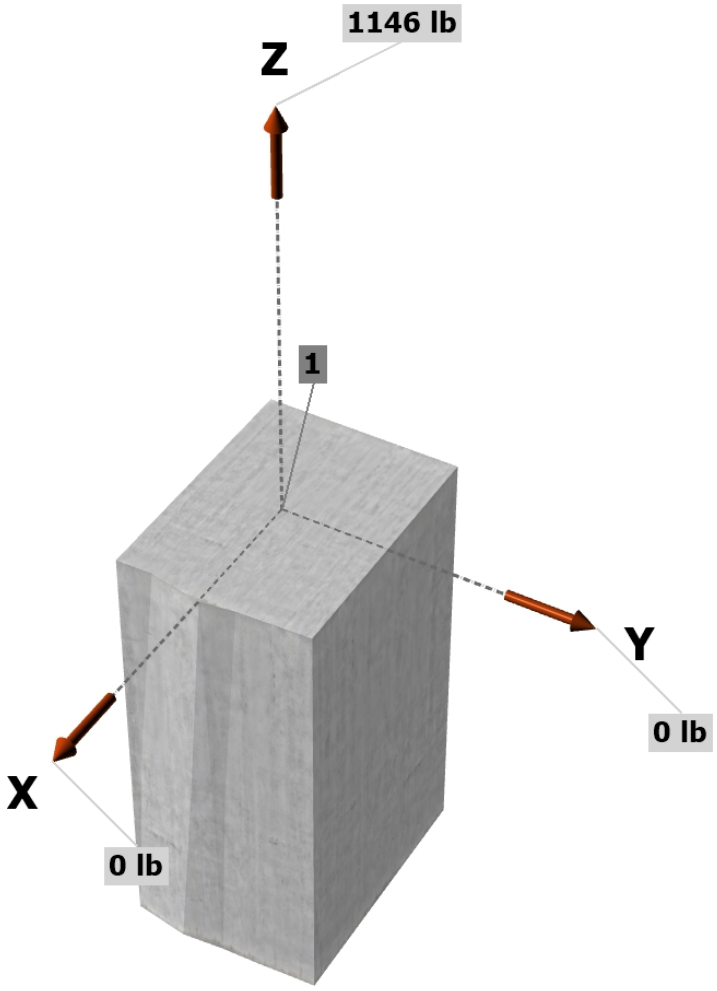
Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB5 (5/8"Ø)

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

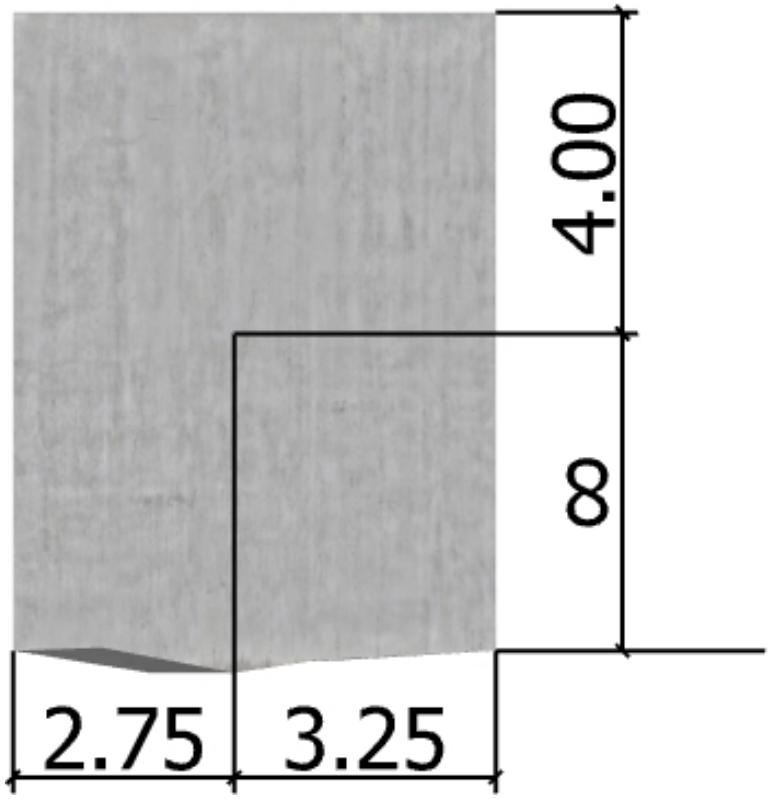
Strength level loads:

N_{ua} [lb]: 1146
V_{uax} [lb]: 0
V_{uay} [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	1146.0	0.0	0.0	0.0
Sum	1146.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1146
Resultant compression force (lb): 0
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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13100	0.75	9825

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	2.667	5226

$\phi N_{cb} = \phi \, (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
53.25	64.00	2.75	0.906	1.00	1.000	5226	0.70	2758

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} N_p = \phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.3.1, Eq. 17.4.3.1 & 17.4.3.4)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	ϕN_{pn} (lb)
1.0	2.10	2500	0.70	29372

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	1146	9825	0.12	Pass
Concrete breakout	**1146**	**2758**	**0.42**	**Pass (Governs)**
Pullout	1146	29372	0.04	Pass

PAB5 (5/8"Ø) with hef = 6.000 inch meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.

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

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: HDU2 Epoxy

LRFD Loads

1.0W = 1146 lb
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 7.38
c_{ac} (inch): 9.44
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 24.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

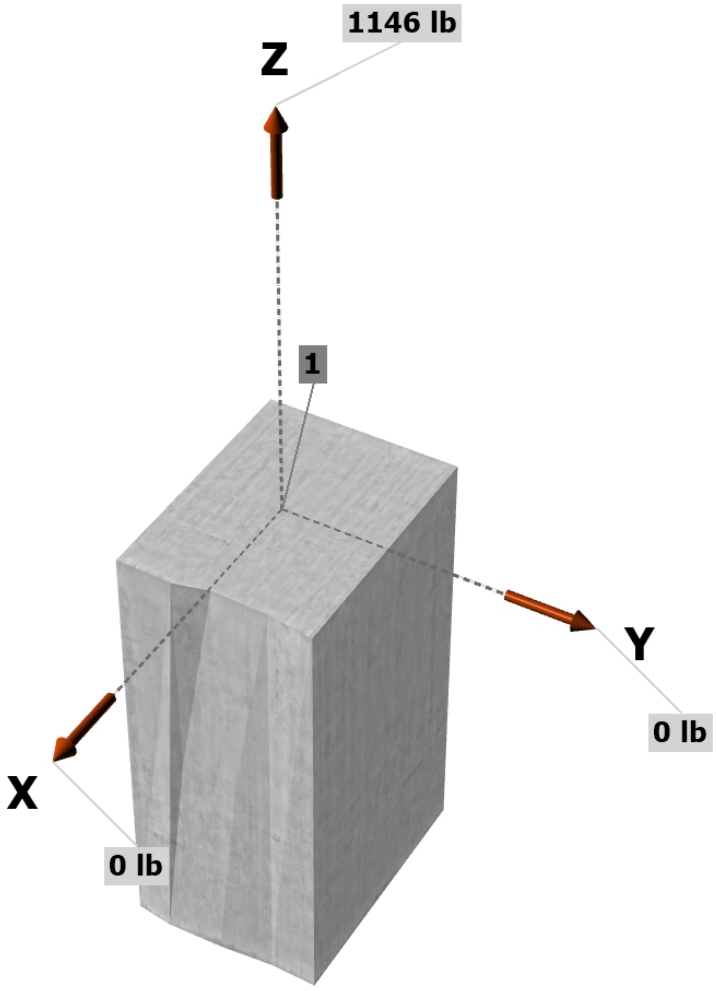
Recommended Anchor
Anchor Name: SET-3G - SET-3G w/ 5/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

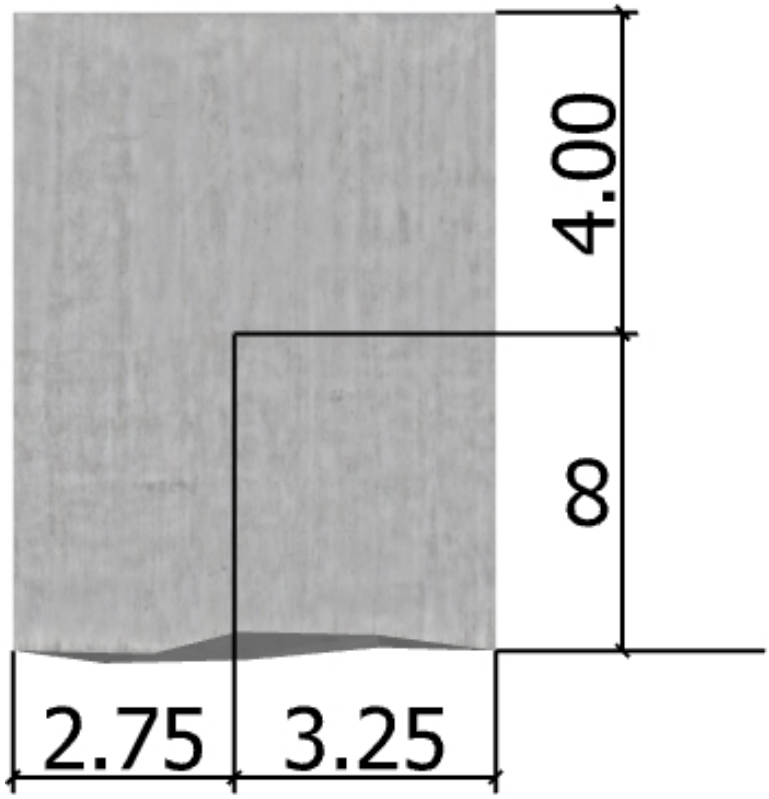
Strength level loads:

N_{ua} [lb]: 1146
V_{uax} [lb]: 0
V_{uay} [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	1146.0	0.0	0.0	0.0
Sum	1146.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1146
Resultant compression force (lb): 0
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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13110	0.75	9833

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	2.667	3701

$\phi N_{cb} = \phi \, (A_{Nc} / A_{Nco}) \, \Psi_{ed,N} \, \Psi_{c,N} \, \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in²)	A_{Nco} (in²)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
48.00	64.00	2.75	0.906	1.00	1.000	3701	0.65	1635

6. Adhesive Strength of Anchor in Tension (Sec. 17.4.5)

$\tau_{k,cr} = \tau_{k,cr} f_{short\text{-}term} K_{sat} (f'_c / 2{,}500)^n$

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	f'_c (psi)	n	$\tau_{k,cr}$ (psi)
1356	1.00	1.00	2500	0.24	1356

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (Eq. 17.4.5.2)

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	1356	0.63	6.000	15975

$\phi N_a = \phi \, (A_{Na} / A_{Na0}) \, \Psi_{ed,Na} \, \Psi_{cp,Na} N_{ba}$ (Sec. 17.3.1 & Eq. 17.4.5.1a)

A_{Na} (in²)	A_{Na0} (in²)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	ϕ	ϕN_a (lb)
76.57	307.10	8.76	2.75	0.794	1.000	15975	0.65	2056

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	1146	9833	0.12	Pass
Concrete breakout	**1146**	**1635**	**0.70**	**Pass (Governs)**
Adhesive	1146	2056	0.56	Pass

SET-3G w/ 5/8"Ø F1554 Gr. 36 with hef = 6.000 inch meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.

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

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: HDU4 Cast In

LRFD Loads

1.0W = 5069 lb
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 6.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.13
C_{min} (inch): 1.38
S_{min} (inch): 2.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 9.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Yes
Build-up grout pad: No

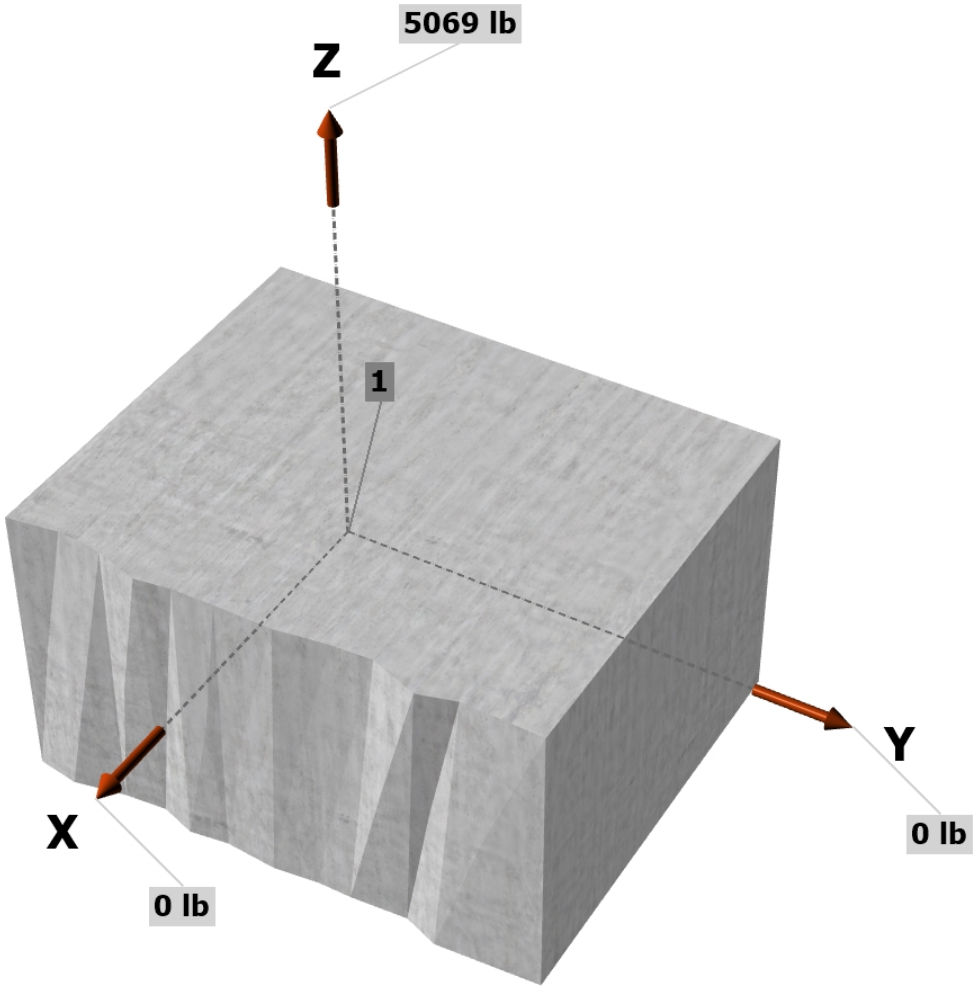
Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB5 (5/8"Ø)

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

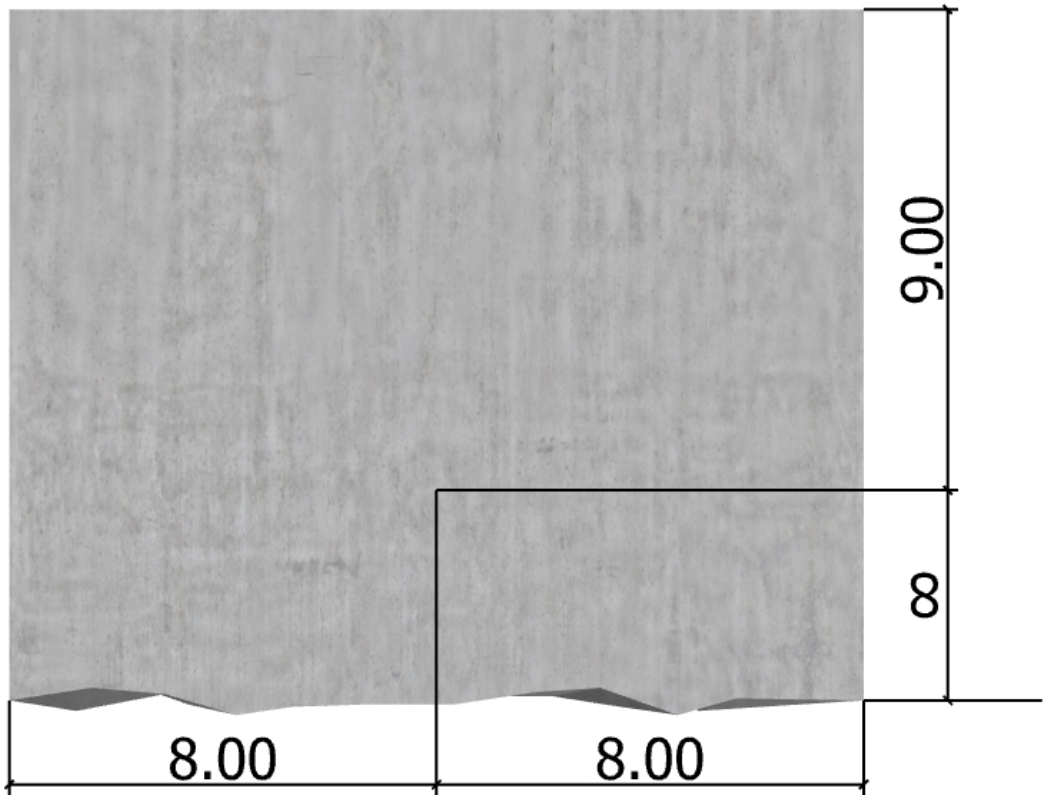
Strength level loads:

N_{ua} [lb]: 5069
V_{uax} [lb]: 0
V_{uay} [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	5069.0	0.0	0.0	0.0
Sum	5069.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 5069
Resultant compression force (lb): 0
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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13100	0.75	9825

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

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

$\phi N_{cb} = \phi \, (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
302.00	324.00	8.00	0.967	1.00	1.000	17636	0.70	11124

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} N_p = \phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.3.1, Eq. 17.4.3.1 & 17.4.3.4)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	ϕN_{pn} (lb)
1.0	2.10	2500	0.70	29372

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	**5069**	**9825**	**0.52**	**Pass (Governs)**
Concrete breakout	5069	11124	0.46	Pass
Pullout	5069	29372	0.17	Pass

PAB5 (5/8"Ø) with hef = 6.000 inch meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.

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

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: Strongwall Cast In Anchors

LRFD Loads

1.0W = 19260 lb
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 1.000
Effective Embedment depth, h_{ef} (inch): 9.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 11.63
C_{min} (inch): 1.88
S_{min} (inch): 4.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Yes
Build-up grout pad: No

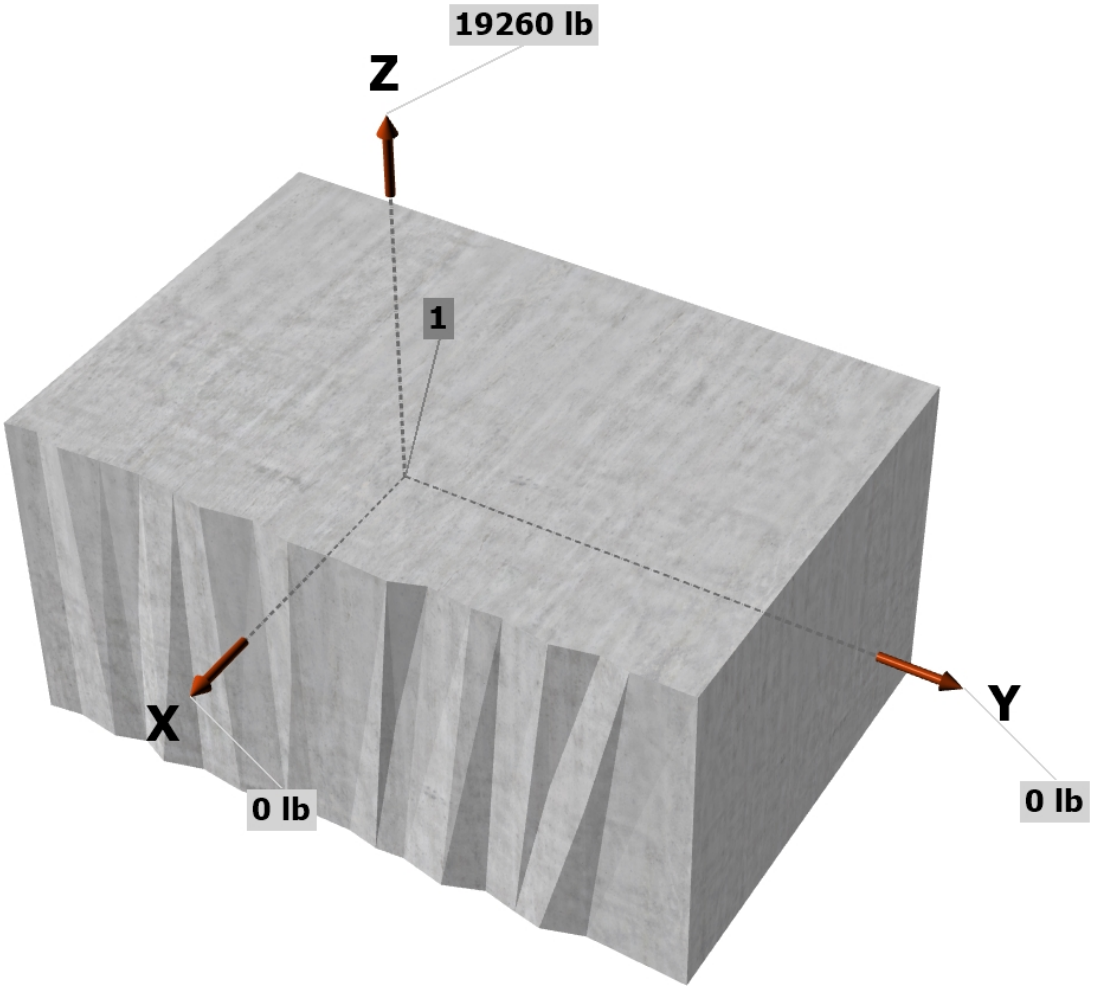
Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB8 (1"Ø)

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

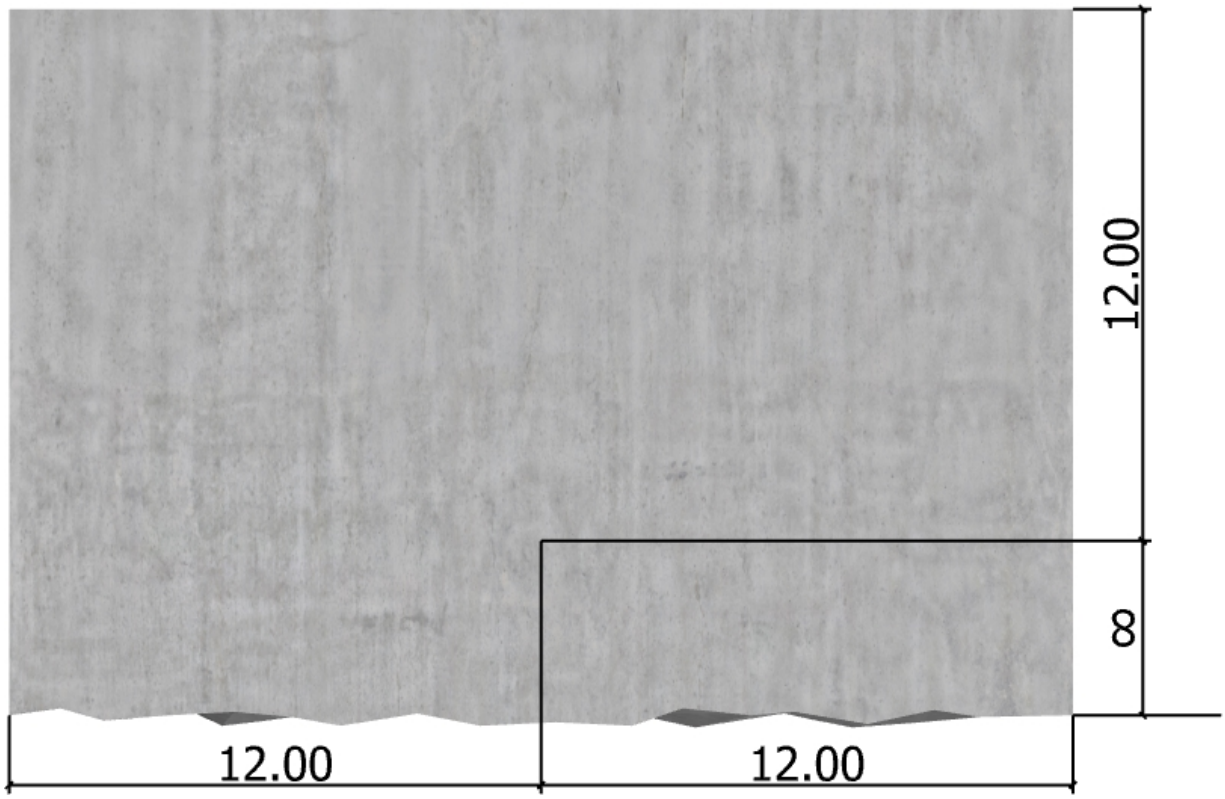
Strength level loads:

N_{ua} [lb]: 19260
V_{uax} [lb]: 0
V_{uay} [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	19260.0	0.0	0.0	0.0
Sum	19260.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 19260
Resultant compression force (lb): 0
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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
35150	0.75	26363

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	8.000	27153

$\phi N_{cb} = \phi \, (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
609.00	576.00	12.00	1.000	1.00	1.000	27153	0.70	20096

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} N_p = \phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.3.1, Eq. 17.4.3.1 & 17.4.3.4)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	ϕN_{pn} (lb)
1.0	5.15	2500	0.70	72156

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	19260	26363	0.73	Pass
Concrete breakout	**19260**	**20096**	**0.96**	**Pass (Governs)**
Pullout	19260	72156	0.27	Pass

PAB8 (1"Ø) with hef = 9.000 inch meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.

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

FOOTING WITH COMBINED AXIAL AND FLEXURAL LOADS

FOOTING UNDER STRONGWALL

Sizes and Loads:

superstructure:			
wall	3,626	lb	
footing:			
length	11.50	ft	(along same axis as applied moment)
width	2.00	ft	(perpendicular to applied moment)
depth	1.00	ft	
weight	3,335	lb	
soil abv.	0	lb	
total R =	6,961	lb	
M =	17,420	lbft	
e =	2.50	ft	
B/6 =	1.92	ft	

Bearing Pressures:

Reaction is OUTSIDE kern.					
(Use these results)			(Do not use these results)		
x =	3.25	ft	fa =	303	psf
			fb =	395	psf
fp =	715	psf	fp =	698	psf
Fa =	2,000	psf	Fa =	2,000	psf

Stability:

Mot =	17,420	lbft	(using 0.7E, per ASD Load Combinations)
Mr =	24,015	lbft	(using 0.6D, per ASD Load Combinations)