DHP-Engineering
Structural Building Consultants

DATE: 2022-04-01
DESIGN BY: COK

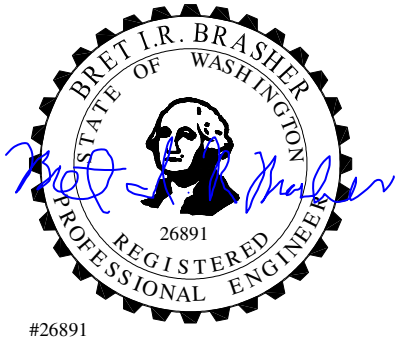
Main Remodel

Vertical, Lateral, and Foundation Structural Calculations

Project & Location: **Mak Remodel**
6521 80th Ave SE
Mercer Island, WA 98040

Client: **Cypress Point Development, LLC**
7530 164th Ave NE
Redmond, WA 98052

Structural Engineer: **DHP Engineering, PS**
Structural Building Consultants
32008 32nd Ave S. #B
Federal Way, WA 98001



#26891

4-1-22

Project Number: 22.017

Jurisdiction: Mercer Island

Code: 2018 IBC

Loads:

I. Vertical Live Loads

Roof (Snow)	25	PSF
Floor	40	PSF

II. Lateral Loads

Wind

Exposure C Basic Wind Speed 98 (mph)
Internal Pressure Coefficients GCpi = +/-0.18 (Enclosed)

Seismic

Design Category	D		Occupancy Category	II
Site Class	D		Importance Factor	1.00
Structural Response:	S_S	1.472 g	S_1	0.566 g
Acceleration:	S_{DS}	1.178 g	S_{D1}	0.667 g

III. Soils Data (Assumed)

Bearing Capacity 1500 (psf)

PROJECT NAME: Mak Remodel

PROJECT NUMBER: 22.017

DHP ENGINEERING, PS **DATE:** 2022-03-02

STRUCTURAL BUILDING CONSULTANTS **DESIGN BY:** COK

Design Loads

Roof Loads	
Asphalt Shingle Roofing Material	3.00 PSF
APA Rated 1/2" OSB or PW Sheathing	1.70 PSF
P.E. Trusses @ 24" o.c.	2.50 PSF
Insulation	1.00 PSF
(2) Layer of 5/8" Gypsum Ceiling Board	5.00 PSF
Mechanical & Electrical	0.80 PSF
Miscellaneous	1.00 PSF
Total Roof Dead Load:	15.00 PSF
Total Live Load:	25.00 PSF
Total Roof Load:	**40.00 PSF**

Floor Loads	
3/4" Plywood	2.30 PSF
2x_ Framing Members @ 16" o.c.	2.50 PSF
Insulation	1.00 PSF
(1) Layers of 5/8" Gypsum Ceiling Board	2.50 PSF
Mechanical & Electrical	1.20 PSF
Miscellaneous	2.50 PSF
Total Floor Dead Load:	12.00 PSF
Total Live Load:	40.00 PSF
Total Roof Load:	**52.00 PSF**

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

ROOF SNOW LOAD[a] (psf)	WIND DESIGN				SEISMIC DESIGN CATEGORY	SUBJECT TO DAMAGE FROM			OUTDOOR DESIGN TEMP (F) - Heat/Cool	ICE BARRIER UNDERLAYMENT REQUIRED	FLOOD HAZARD[e]	AIR FREZING INDEX	MEAN ANNUAL TEMP
	Speed[b] (mph)	Topographic effects[c]	Special wind region	Windborne debris zone		Weathering[d]	Frost line depth	Termite					
25	110	Yes	No	No	D2	Moderate	12”	Slight to Moderate	83/24	No	N.A.	113	53

MANUAL J DESIGN CRITERIA							
Elevation	Latitude	Winter heating	Summer cooling	Altitude correction factor	Indoor design temperature	Design temperature cooling	Heating temperature difference
338 feet	47°34'39''	72ºF max	75ºF min	0.99	72ºF	75ºF	48ºF
Cooling temperature difference	Wind velocity heating	Wind velocity cooling	Coincident wet bulb	Daily range	Winter humidity	Summer humidity	
8ºF	N.A.	N.A.	66	Medium	75%	68%	

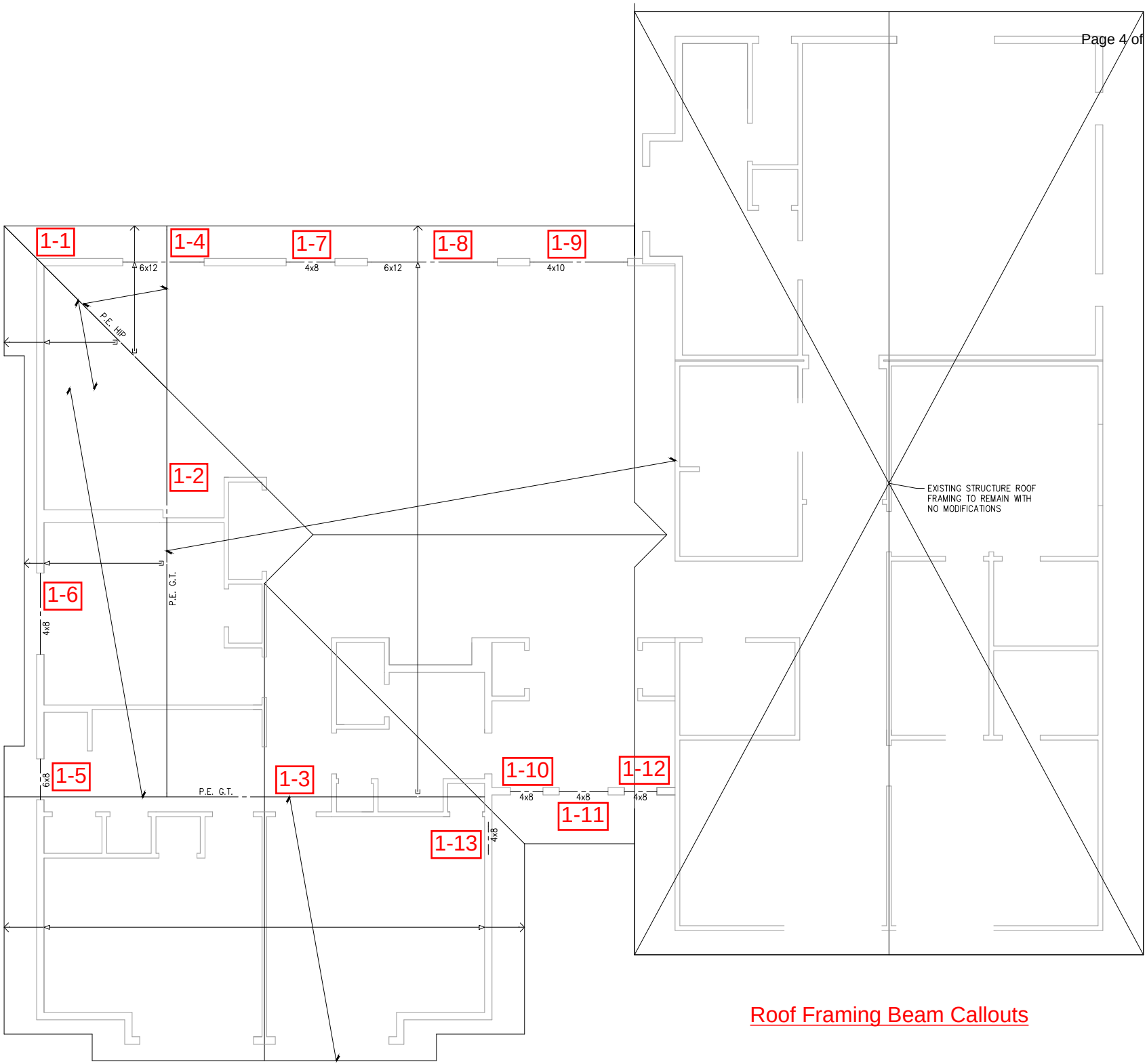
a. This is the minimum roof snow load. When using this snow load it will be left to the engineer's judgment whether to consider drift or sliding snow. However, rain on snow surcharge of 5 psf must be considered for roof slopes less than 5 degrees.

b. The 110 mph Ultimate Design Wind Speed (3-second gust) as adopted by the 2018 IRC/ASCE 7-10 (or if using the IBC for structural design, the 98 mph Basic Design Wind Speed as adopted by the 2018 IBC/ASCE 7-16 may be used).

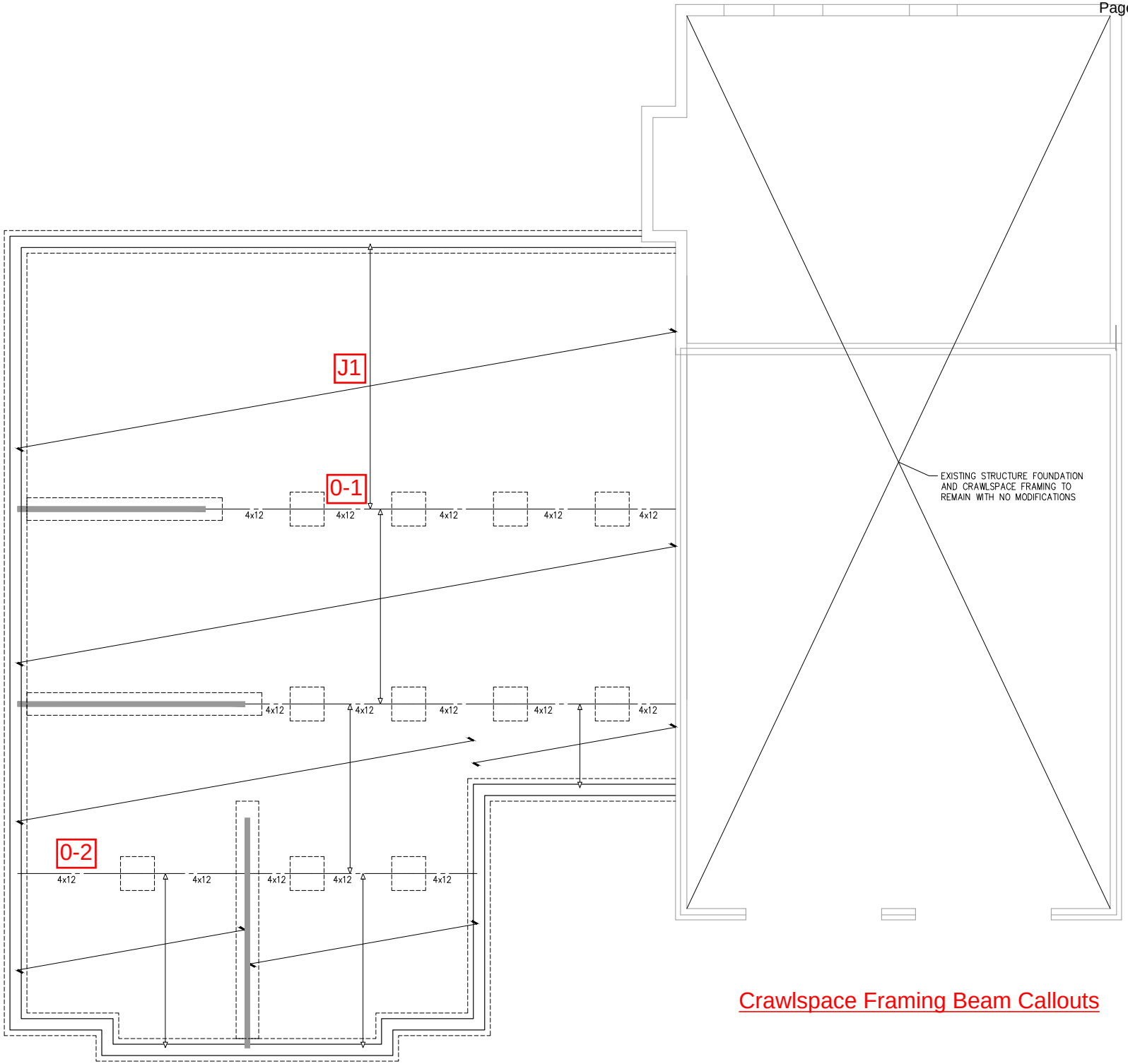
c. Wind exposure category and Topographic effects (Wind Speed-up Kzt factor) shall be determined on a site-specific basis by the Engineer of Record (components and cladding need not consider topographic effects unless otherwise determined by the engineer of record).

d. Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The grade of masonry units shall be determined from ASTM C 34, C 55, C 62, C 73, C 90, C 129, C 145, C 216 or C 652.

e. The City of Mercer Island participates in the National Flood Insurance Program (NFIP); Regular Program (No Special Flood Hazard Area). Further NFIP participation information: CID 530083, Initial FHBM Identified 06/28/74, Initial FIRM Identified 05/16/95, Current Effective Map Date (NSFHA), Reg-Emer Date 06/30/97, 53033C0654G effective 8/19/2020.



Roof Framing Beam Callouts

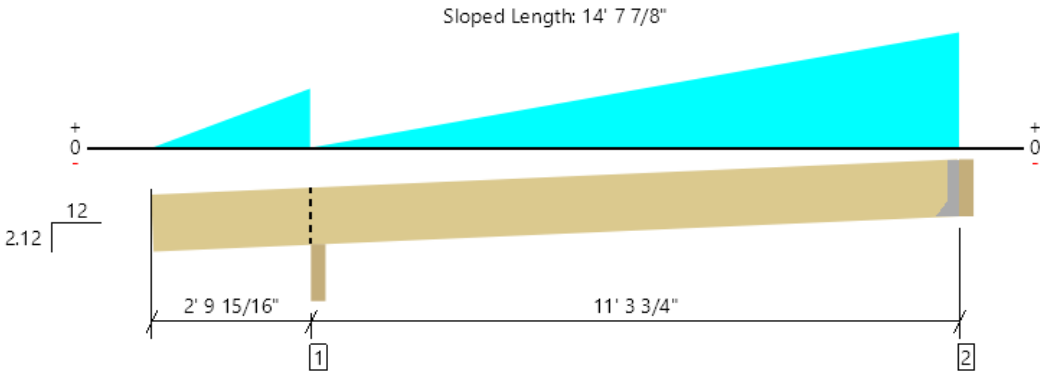


Crawlspace Framing Beam Callouts

Roof Framing			
Member Name	Results	Current Solution	Comments
1-1 (For Reactions Only)	Passed	1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL	
1-2 (For Reactions Only)	Passed	1 piece(s) 5 1/2" x 16 1/2" 24F-V4 DF Glulam	
1-3 (For Reactions Only)	Passed	1 piece(s) 5 1/2" x 21" 24F-V4 DF Glulam	
1-4	Passed	1 piece(s) 6 x 12 DF No.2	
1-5	Passed	1 piece(s) 6 x 8 DF No.2	
1-6	Passed	1 piece(s) 4 x 8 HF No.2	
1-7	Passed	1 piece(s) 4 x 8 HF No.2	
1-8	Passed	1 piece(s) 6 x 12 DF No.2	
1-9	Passed	1 piece(s) 4 x 10 HF No.2	
1-10	Passed	1 piece(s) 4 x 8 HF No.2	
1-11	Passed	1 piece(s) 4 x 8 HF No.2	
1-12	Passed	1 piece(s) 4 x 8 HF No.2	
1-13	Passed	1 piece(s) 4 x 8 HF No.2	
Crawlspace Framing			
Member Name	Results	Current Solution	Comments
0-1	Passed	1 piece(s) 4 x 12 HF No.2	
0-2	Passed	1 piece(s) 4 x 12 HF No.2	
J1	Passed	1 piece(s) 2 x 12 HF No.2 @ 16" OC	

Roof Framing, 1-1 (For Reactions Only)

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Member Length : 14' 6 7/16"

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 2.12/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	895 @ 14' 1 11/16"	4725 (1.50")	Passed (19%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	673 @ 13' 2"	9878	Passed (7%)	1.15	1.0 D + 1.0 S (Alt Spans)
Moment (Ft-lbs)	1933 @ 9' 5 1/4"	18346	Passed (11%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.037 @ 8' 9 3/8"	0.567	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.064 @ 8' 9 3/8"	0.756	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

- 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beveled Plate - SPF	3.50"	3.50"	1.50"	343	380	723	Blocking
2 - Hanger on 11 7/8" SPF beam	3.50"	Hanger[1]	1.50"	370	525	895	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)	14' 4" 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	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	

- 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' 1 11/16"	N/A	13.0	--	
1 - Tapered (PLF)	0 to 2' 9 15/16"	N/A	0.0 to 43.1	0.0 to 70.7	Generated from Roof Geometry
2 - Tapered (PLF)	2' 9 15/16" to 14' 1 11/16"	N/A	0.0 to 80.7	0.0 to 141.4	Generated from Roof Geometry

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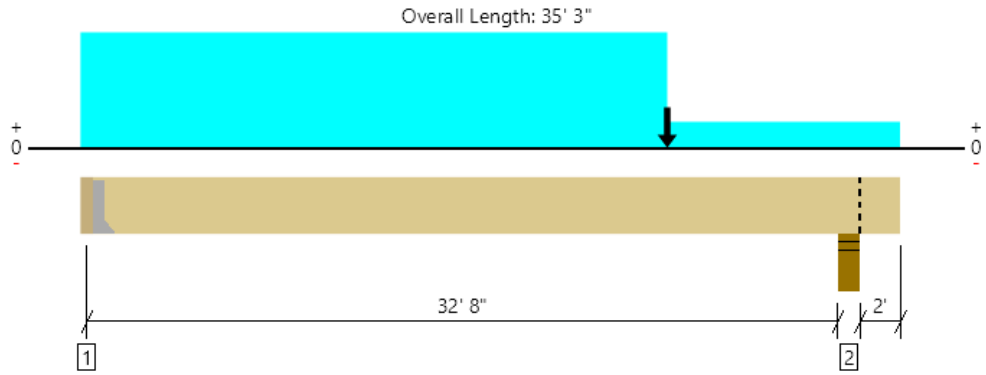
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-2 (For Reactions Only)

1 piece(s) 5 1/2" x 16 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3391 @ 3"	5363 (1.50")	Passed (63%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	3113 @ 1' 7 1/2"	18437	Passed (17%)	1.15	1.0 D + 1.0 S (Alt Spans)
Pos Moment (Ft-lbs)	28441 @ 17' 1/4"	52813	Passed (54%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-154 @ 33' 1/4"	44245	Passed (0%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.862 @ 16' 8 3/16"	1.092	Passed (L/456)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	1.484 @ 16' 8 7/16"	1.639	Passed (L/265)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
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). Upward deflection on right cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 0.92 that was calculated using length L = 32' 8 3/4".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 2' 3 3/8".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Hanger on 16 1/2" HF beam	3.00"	Hanger[1]	1.50"	1425	2012	3437	See note [1]
2 - Stud wall - HF	5.50"	5.50"	1.50"	1409	1747	3156	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	35' o/c	
Bottom Edge (Lu)	35' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HU614	2.50"	N/A	24-16d	12-16d	

- 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)	3" to 35' 3"	N/A	22.1	--	
1 - Uniform (PSF)	0 to 35' 3" (Front)	1'	15.0	25.0	Default Load
2 - Point (lb)	25' 1" (Back)	N/A	370	525	Linked from: 1-1 (For Reactions Only), Support 2
3 - Uniform (PSF)	0 to 25' 1" (Back)	3' 9"	12.4	25.0	

ForteWEB Software Operator	Job Notes
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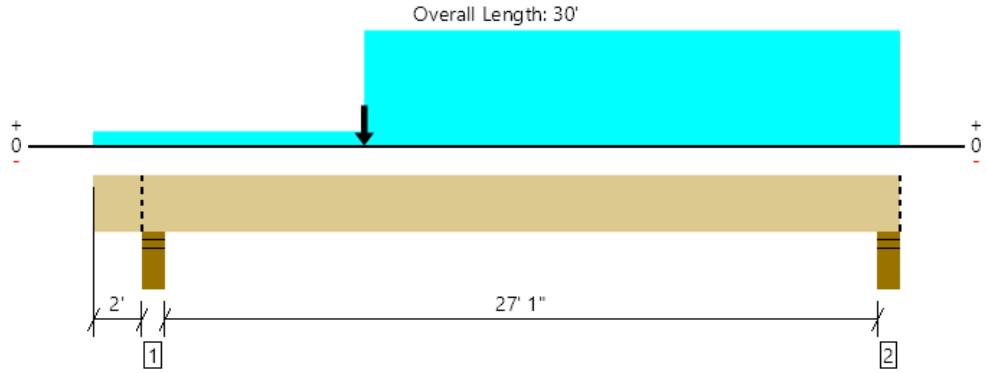
Roof Framing, 1-3 (For Reactions Only)

1 piece(s) 5 1/2" x 21" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9791 @ 29' 8"	12251 (5.50")	Passed (80%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	8306 @ 27' 9 1/2"	23466	Passed (35%)	1.15	1.0 D + 1.0 S (Alt Spans)
Pos Moment (Ft-lbs)	68053 @ 15' 5 1/4"	85003	Passed (80%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-269 @ 2' 2 3/4"	71670	Passed (0%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.753 @ 15' 11 3/16"	0.915	Passed (L/437)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	1.201 @ 15' 10 11/16"	1.372	Passed (L/274)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
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). Upward deflection on left cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 0.91 that was calculated using length L = 27' 4 15/16".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 2' 3 3/16".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	3.65"	3213	4917	8130	Blocking
2 - Stud wall - HF	5.50"	5.50"	4.40"	3559	6232	9791	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)	28' o/c	
Bottom Edge (Lu)	30' 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 30'	N/A	28.1	--	
1 - Uniform (PSF)	0 to 30' (Front)	1'	15.0	25.0	Default Load
2 - Uniform (PSF)	10' 1" to 30' (Back)	16' 4"	12.0	25.0	
3 - Uniform (PSF)	0 to 10' 1" (Front)	1'	15.0	25.0	Default Load
4 - Point (lb)	10' 1" (Back)	N/A	1425	2012	Linked from: 1-2 (For Reactions Only), Support 1

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

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

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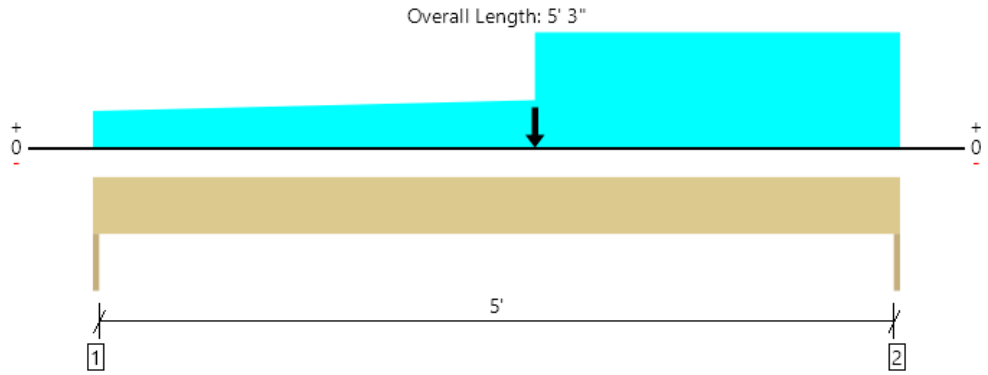
Roof Framing, 1-4

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3169 @ 5' 3"	5156 (1.50")	Passed (61%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2357 @ 4' 2"	8244	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5413 @ 2' 10 1/2"	10166	Passed (53%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.014 @ 2' 8 7/16"	0.175	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.025 @ 2' 8 5/16"	0.262	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	955	425	1037	2417	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1370	170	1799	3339	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 3" o/c	
Bottom Edge (Lu)	5' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 5' 3"	N/A	16.0	--	--	
1 - Tapered (PSF)	0 to 2' 10 1/2"	4' 6" to 5' 10"	12.0	40.0	-	Default Load
2 - Point (lb)	2' 10 1/2"	N/A	1409	-	1747	Linked from: 1-2 (For Reactions Only), Support 2
3 - Uniform (PSF)	2' 10 1/2" to 5' 3"	18' 4"	15.0	-	25.0	

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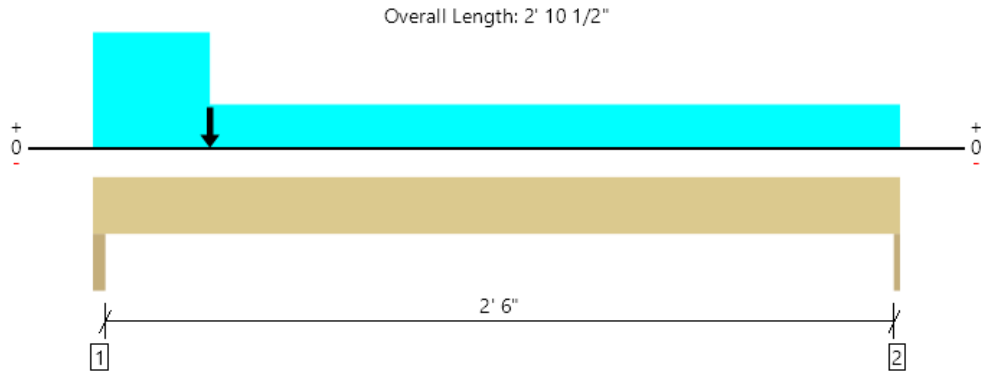
Roof Framing, 1-5

1 piece(s) 6 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7789 @ 1 1/2"	10313 (3.00")	Passed (76%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1452 @ 10 1/2"	5376	Passed (27%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2222 @ 5"	3706	Passed (60%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.005 @ 1' 4 11/16"	0.092	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.009 @ 1' 4 11/16"	0.138	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	3.00"	3.00"	2.27"	3077	4711	7788	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	478	726	1204	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' 11" o/c	
Bottom Edge (Lu)	2' 11" 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 2' 10 1/2"	N/A	10.4	--	
1 - Uniform (PSF)	0 to 5"	15' 6"	15.0	25.0	
2 - Point (lb)	5"	N/A	3213	4917	Linked from: 1-3 (For Reactions Only), Support 1
3 - Uniform (PSF)	5" to 2' 10 1/2"	5' 10"	15.0	25.0	

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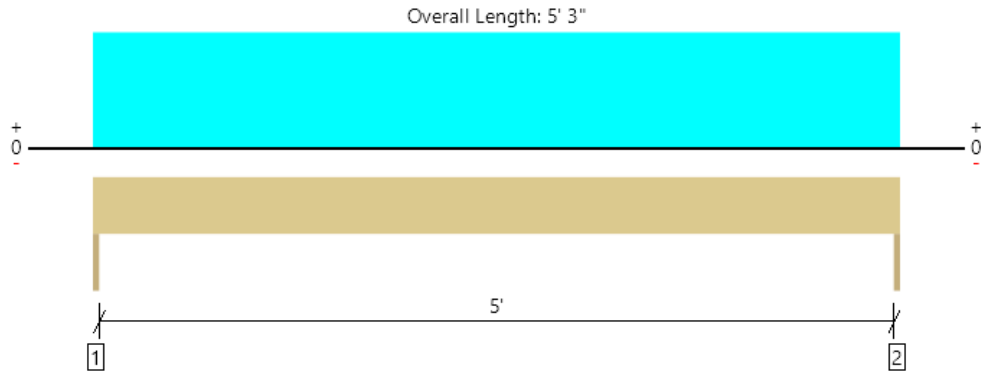
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Roof Framing, 1-6

1 piece(s) 4 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	630 @ 0	2126 (1.50")	Passed (30%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	455 @ 8 3/4"	2918	Passed (16%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	826 @ 2' 7 1/2"	3247	Passed (25%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.017 @ 2' 7 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.028 @ 2' 7 1/2"	0.262	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	247	383	630	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	247	383	630	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 3" o/c	
Bottom Edge (Lu)	5' 3" 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 5' 3"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 5' 3"	5' 10"	15.0	25.0	

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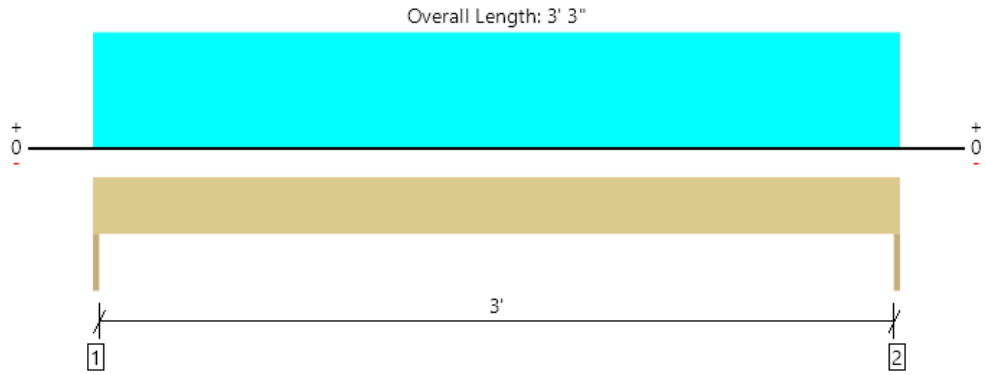
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-7

1 piece(s) 4 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1202 @ 0	2126 (1.50")	Passed (57%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	663 @ 8 3/4"	2918	Passed (23%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	977 @ 1' 7 1/2"	3247	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.008 @ 1' 7 1/2"	0.108	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.013 @ 1' 7 1/2"	0.162	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	457	745	1202	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	457	745	1202	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 3" o/c	
Bottom Edge (Lu)	3' 3" 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' 3"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 3"	18' 4"	15.0	25.0	

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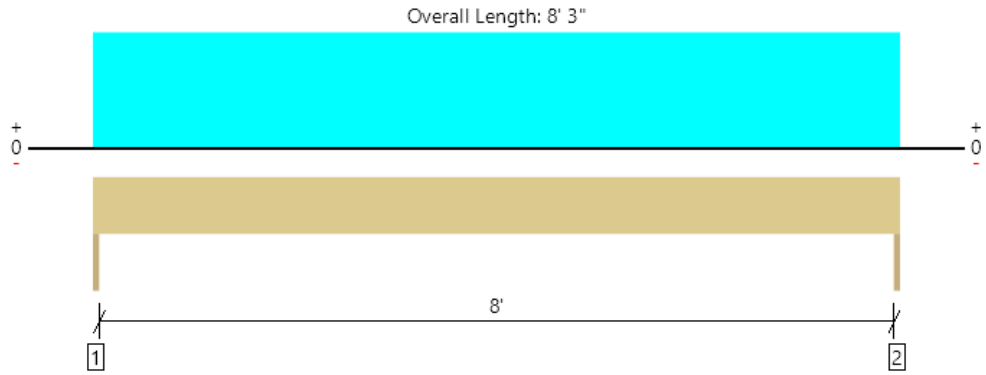
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-8

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3091 @ 0	5156 (1.50")	Passed (60%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2279 @ 1' 1"	8244	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6375 @ 4' 1 1/2"	10166	Passed (63%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.053 @ 4' 1 1/2"	0.275	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.086 @ 4' 1 1/2"	0.412	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	1200	1891	3091	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	1200	1891	3091	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 3" o/c	
Bottom Edge (Lu)	8' 3" 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 8' 3"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 8' 3"	18' 4"	15.0	25.0	

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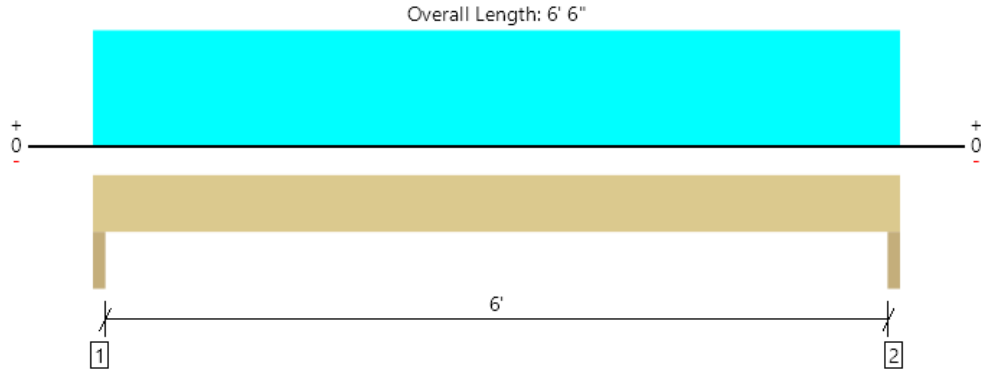
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Roof Framing, 1-9

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2410 @ 1 1/2"	4253 (3.00")	Passed (57%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1653 @ 1' 1/4"	3723	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3621 @ 3' 3"	4879	Passed (74%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.052 @ 3' 3"	0.208	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.085 @ 3' 3"	0.313	Passed (L/884)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	3.00"	3.00"	1.70"	920	1490	2410	None
2 - Trimmer - HF	3.00"	3.00"	1.70"	920	1490	2410	None

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 6' 6"	18' 4"	15.0	25.0	

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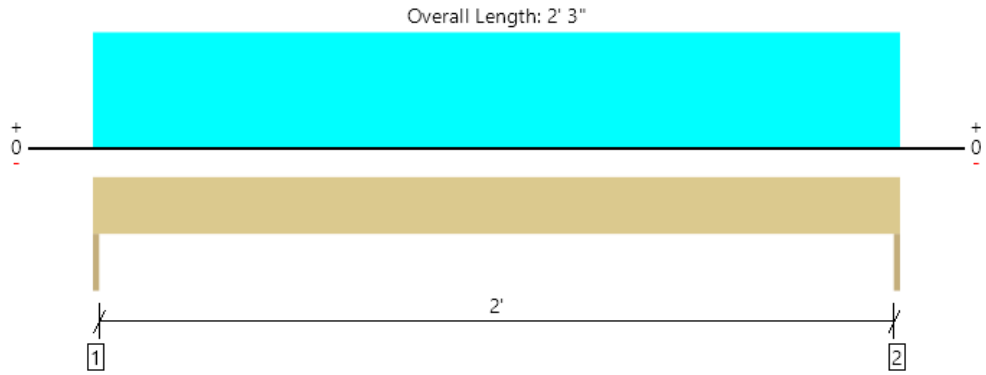
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-10

1 piece(s) 4 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	877 @ 0	2126 (1.50")	Passed (41%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	309 @ 8 3/4"	2918	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	493 @ 1' 1 1/2"	3247	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.002 @ 1' 1 1/2"	0.075	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.003 @ 1' 1 1/2"	0.112	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	333	544	877	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	333	544	877	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' 3" o/c	
Bottom Edge (Lu)	2' 3" 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 2' 3"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 2' 3"	19' 4"	15.0	25.0	

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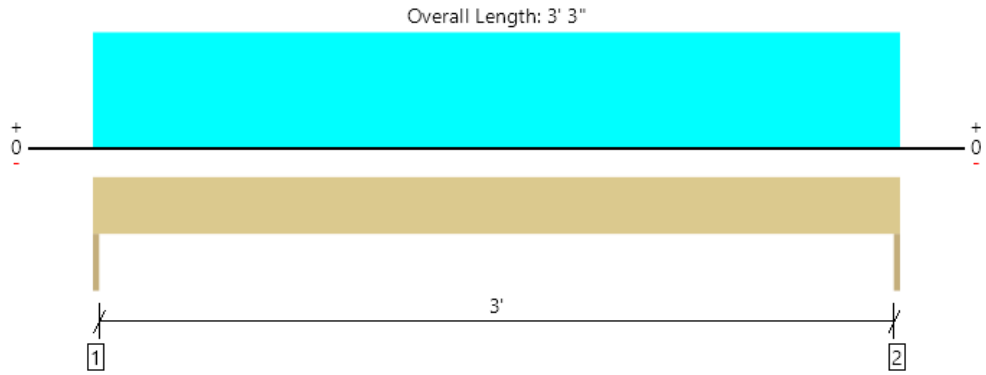
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-11

1 piece(s) 4 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1267 @ 0	2126 (1.50")	Passed (60%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	699 @ 8 3/4"	2918	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1030 @ 1' 7 1/2"	3247	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.008 @ 1' 7 1/2"	0.108	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.014 @ 1' 7 1/2"	0.162	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	482	785	1267	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	482	785	1267	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 3" o/c	
Bottom Edge (Lu)	3' 3" 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' 3"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 3' 3"	19' 4"	15.0	25.0	

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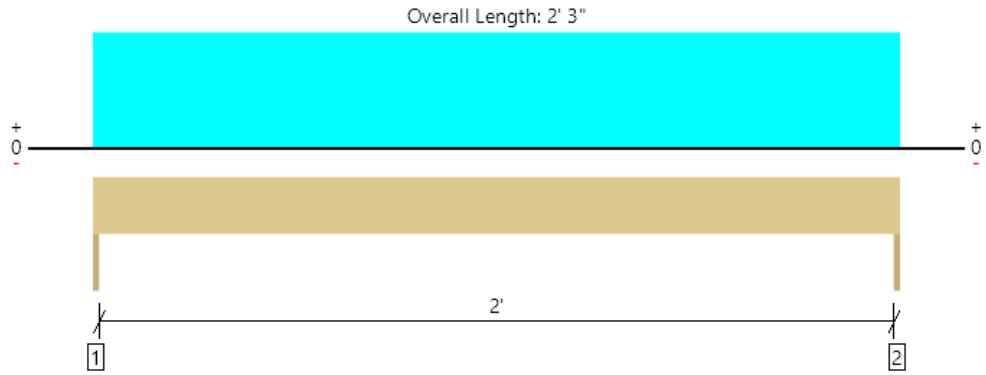
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-12

1 piece(s) 4 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	877 @ 0	2126 (1.50")	Passed (41%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	309 @ 8 3/4"	2918	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	493 @ 1' 1 1/2"	3247	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.002 @ 1' 1 1/2"	0.075	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.003 @ 1' 1 1/2"	0.112	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	333	544	877	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	333	544	877	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' 3" o/c	
Bottom Edge (Lu)	2' 3" 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 2' 3"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 2' 3"	19' 4"	15.0	25.0	

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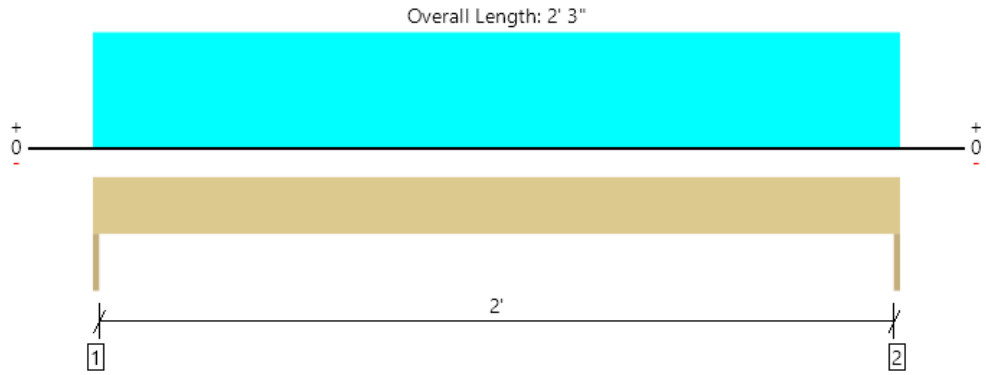
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Roof Framing, 1-13

1 piece(s) 4 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	705 @ 0	2126 (1.50")	Passed (33%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	248 @ 8 3/4"	2918	Passed (8%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	396 @ 1' 1 1/2"	3247	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.002 @ 1' 1 1/2"	0.075	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.002 @ 1' 1 1/2"	0.112	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2015
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	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	269	436	705	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	269	436	705	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' 3" o/c	
Bottom Edge (Lu)	2' 3" 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 2' 3"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 2' 3"	15' 6"	15.0	25.0	

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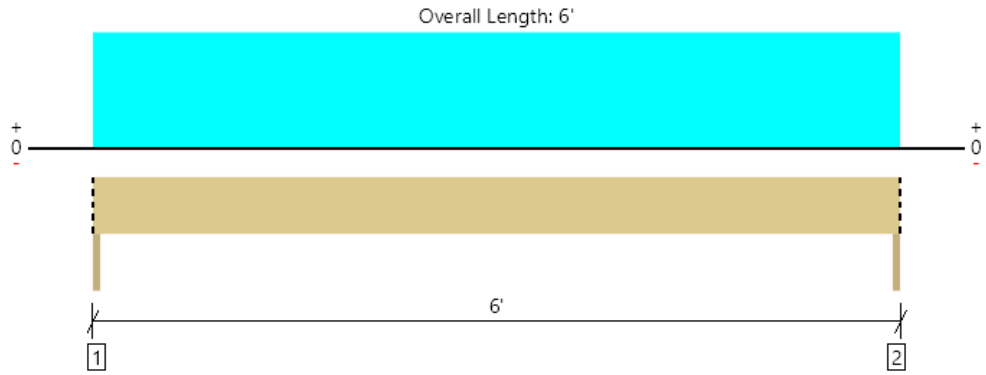
ForteWEB Software Operator	Job Notes
Connor Kelly DHP Engineering (253) 220-0848 connor@dhpengineering.com	

Weyerhaeuser

Crawlspace Framing, 0-1
1 piece(s) 4 x 12 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2136 @ 1/4"	2481 (1.75")	Passed (86%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1365 @ 1' 1"	3938	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3160 @ 3'	5752	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.028 @ 3'	0.199	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.037 @ 3'	0.298	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - HF	1.75"	1.75"	1.51"	516	1620	2136	Blocking
2 - Column - HF	1.75"	1.75"	1.51"	516	1620	2136	Blocking

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6'	N/A	10.0	--	
1 - Uniform (PSF)	0 to 6' (Top)	13' 6"	12.0	40.0	Default Load

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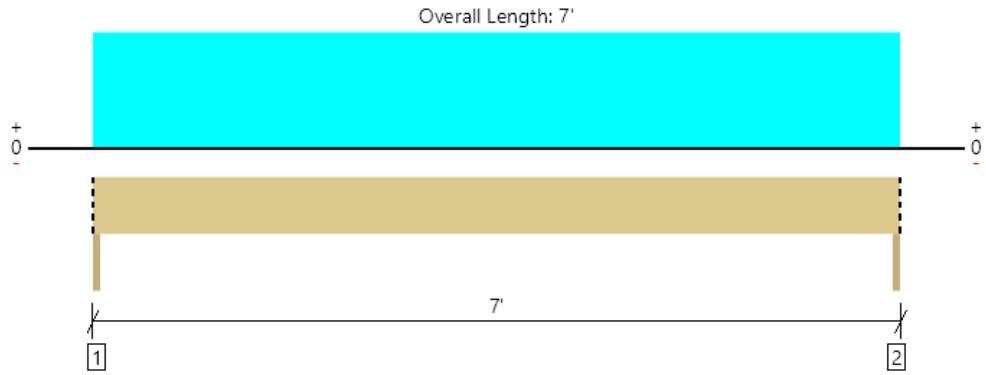
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Crawlspace Framing, 0-2
1 piece(s) 4 x 12 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1855 @ 1/4"	2481 (1.75")	Passed (75%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1281 @ 1' 1"	3938	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3208 @ 3' 6"	5752	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.039 @ 3' 6"	0.232	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.052 @ 3' 6"	0.348	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - HF	1.75"	1.75"	1.50"	455	1400	1855	Blocking
2 - Column - HF	1.75"	1.75"	1.50"	455	1400	1855	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' o/c	
Bottom Edge (Lu)	7' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 7'	N/A	10.0	--	
1 - Uniform (PSF)	0 to 7' (Top)	10'	12.0	40.0	Default Load

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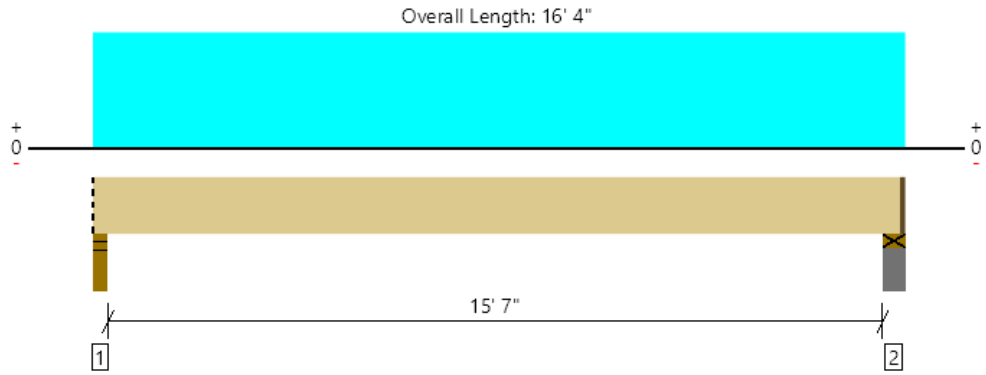
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Crawlspace Framing, J1

1 piece(s) 2 x 12 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	560 @ 2 1/2"	2126 (3.50")	Passed (26%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	475 @ 1' 2 3/4"	1688	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2150 @ 8' 1"	2577	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.319 @ 8' 1"	0.394	Passed (L/592)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.415 @ 8' 1"	0.788	Passed (L/456)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.50"	3.50"	1.50"	129	431	560	Blocking
2 - Plate on concrete - HF	5.50"	4.25"	1.50"	132	440	572	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)	4' 6" o/c	
Bottom Edge (Lu)	16' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 4"	16"	12.0	40.0	Default Load

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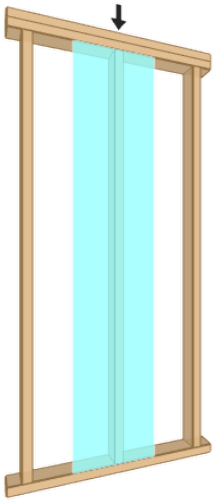
Studs/Posts, Typical Exterior Studs
1 piece(s) 2 x 6 HF No.2 @ 16" OC

Wall Height: 10' Member Height: 9' 7 1/2" O. C. Spacing: 16.00"



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	21	50	Passed (42%)	--	--
Compression (lbs)	1520	6189	Passed (25%)	1.15	1.0 D + 1.0 S
Plate Bearing (lbs)	1520	4177	Passed (36%)	--	1.0 D + 1.0 S
Lateral Reaction (lbs)	162	--	--	1.60	1.0 D + 0.6 W
Lateral Shear (lbs)	147	1320	Passed (11%)	1.60	1.0 D + 0.6 W
Lateral Moment (ft-lbs)	390 @ mid-span	1264	Passed (31%)	1.60	1.0 D + 0.6 W
Total Deflection (in)	0.18 @ mid-span	0.96	Passed (L/625)	--	1.0 D + 0.6 W
Bending/Compression	0.42	1	Passed (42%)	1.60	1.0 D + 0.45 W + 0.75 L + 0.75 S

- Lateral deflection criteria: Wind (L/120)
- Input axial load eccentricity for this design is 16.67% of applicable member side dimension.
- Applicable calculations are based on NDS.
- A bearing area factor of 1.25 has been applied to base plate bearing capacity.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.

Supports	Type	Material
Top	Dbl 2X	Hem Fir
Base	2X	Hem Fir

System : Wall
Member Type : Stud
Building Code : IBC 2015
Design Methodology : ASD

Max Unbraced Length	Comments
1'	

Lateral Connections

Supports	Connector	Type/Model	Quantity	Connector Nailing
Top	Nails	8d x 2.5" Box (Toe)	2	N/A
Base	Nails	8d x 2.5" Box (Toe)	2	N/A

- Nailed connection at the top of the member is assumed to be nailed through the bottom 2x plate prior to placement of the top 2x of the double top plate assembly.

Vertical Load	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Point (lb)	N/A	570	950	Default Load

Lateral Load	Location	Spacing	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	16.00"	42.1	

- IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

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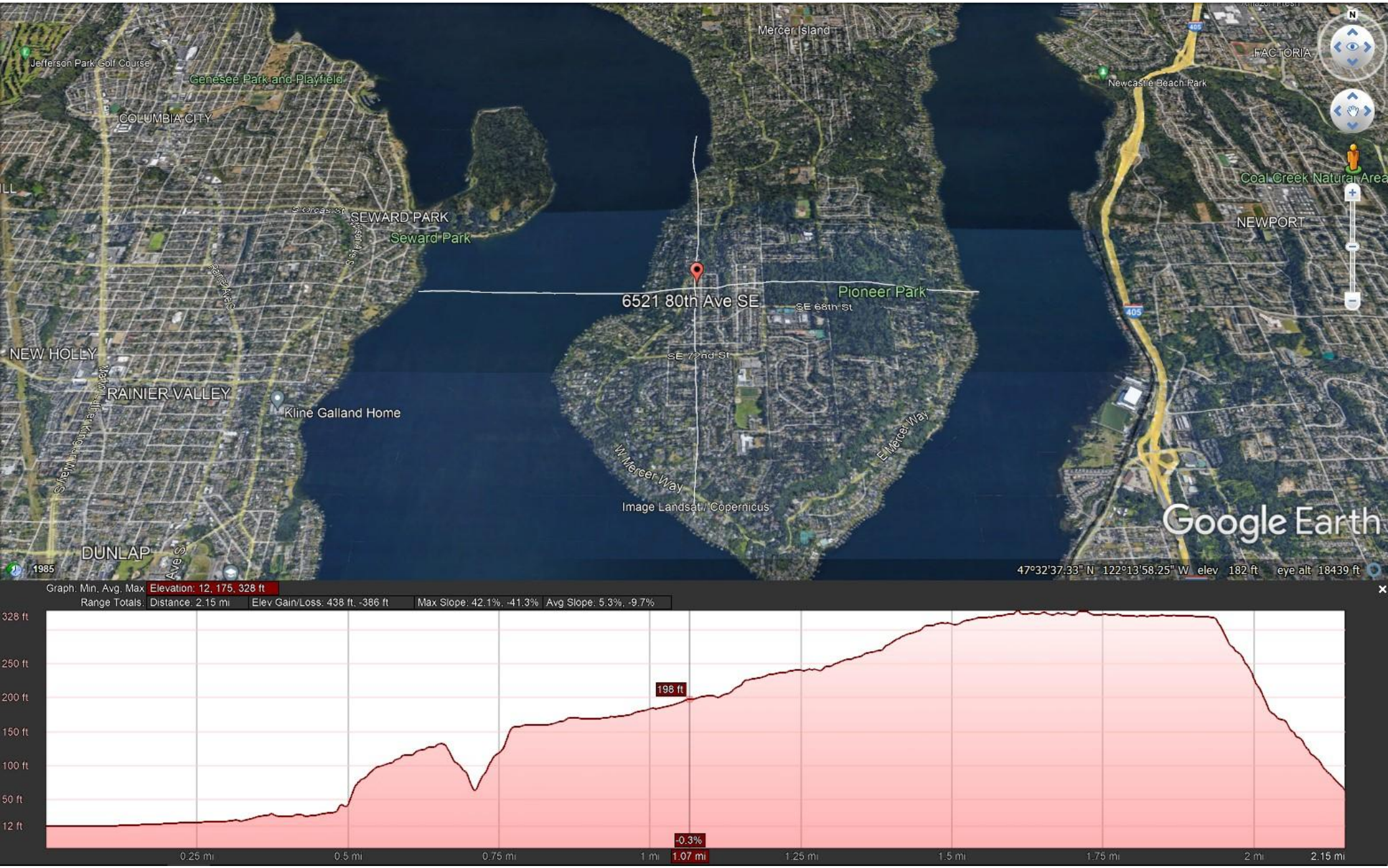
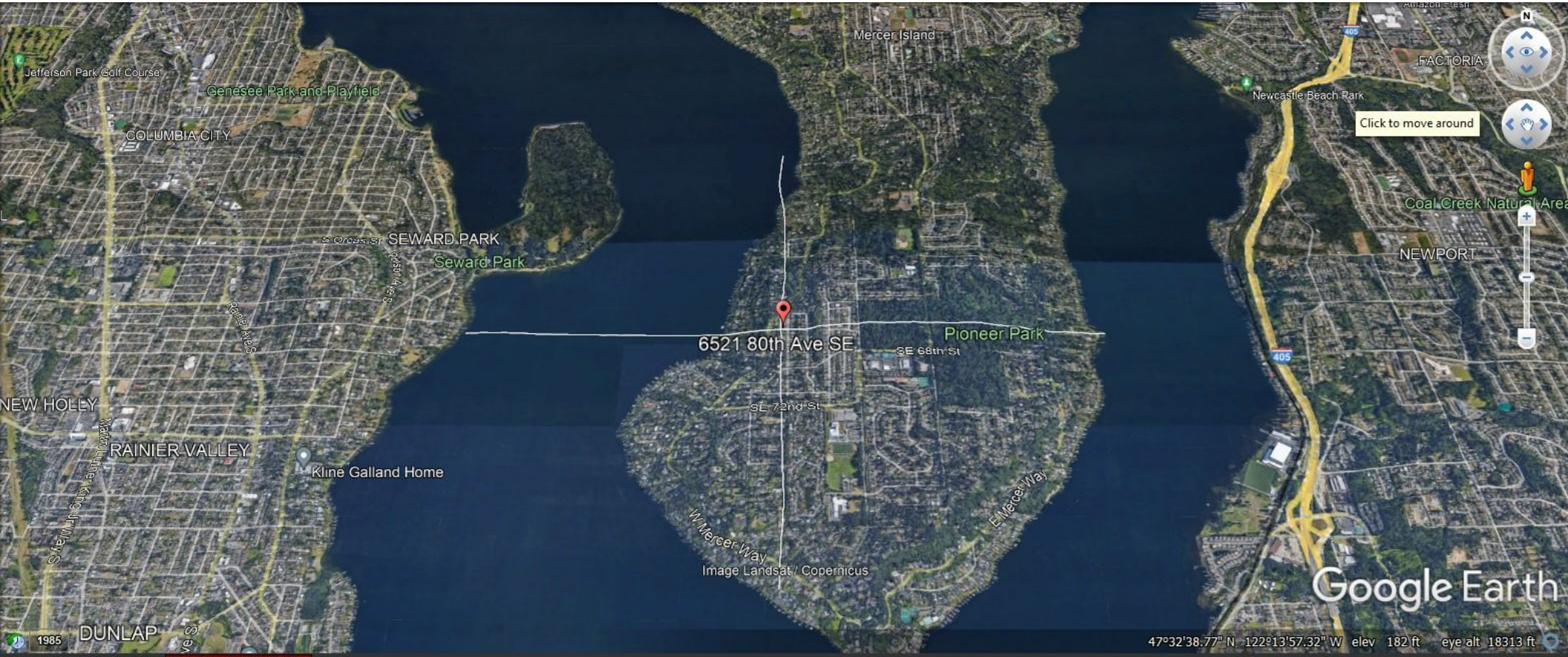
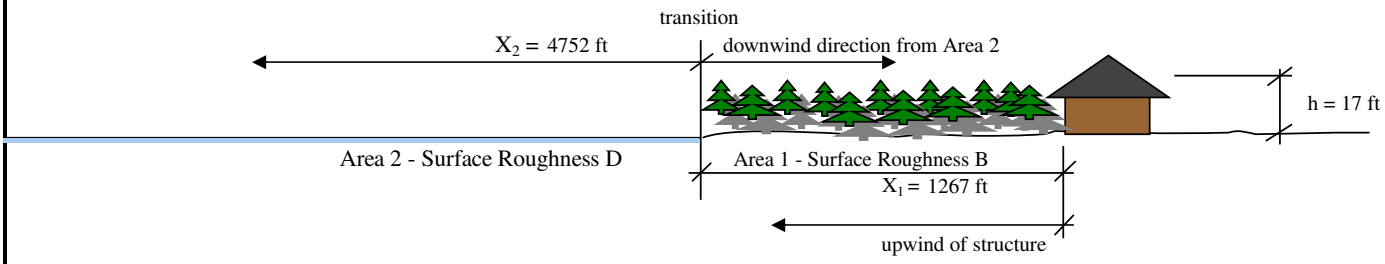

Mercer Island
Jefferson Park Golf Course
Genesee Park and Playfield
COLUMBIA CITY
FACTORIA
Newcastle Beach Park
Coal Creek Natural Area
SEWARD PARK
Seward Park
NEWPORT
6521 80th Ave SE
Pioneer Park
SE 68th St
SE 72nd St
NEW HOLLY
RAINIER VALLEY
Kline Galland Home
W Mercer Way
E Mercer Way
Image Landsat / Copernicus
Google Earth
DUNLAP
1985
47°32'37.33" N 122°13'58.25" W elev 182 ft eye alt 18439 ft
Graph: Min, Avg, Max Elevation: 12, 175, 328 ft
Range Totals: Distance: 2.15 mi Elev Gain/Loss: 438 ft, -386 ft Max Slope: 42.1%, -41.3% Avg Slope: 5.3%, -9.7%
328 ft
250 ft
200 ft
150 ft
100 ft
50 ft
12 ft
198 ft
-0.3%
0.25 mi
0.5 mi
0.75 mi
1 mi
1.07 mi
1.25 mi
1.5 mi
1.75 mi
2 mi
2.15 mi


Mercer Island
Jefferson Park Golf Course
Genesee Park and Playfield
COLUMBIA CITY
FACTORIA
Newcastle Beach Park
Click to move around
Coal Creek Natural Area
SEWARD PARK
Seward Park
NEWPORT
6521 80th Ave SE
Pioneer Park
SE 68th St
SE 72nd St
NEW HOLLY
RAINIER VALLEY
Kline Galland Home
W Mercer Way
E Mercer Way
Image Landsat / Copernicus
Google Earth
DUNLAP
1985
47°32'38.77" N 122°13'57.32" W elev 182 ft eye alt 18313 ft


Graph: Min, Avg, Max Elevation: -0, 132, 334 ft
Range Totals: Distance: 2.32 mi Elev Gain/Loss: 429 ft, -429 ft Max Slope: 50.8%, -46.2% Avg Slope: 5.6%, -7.6%
334 ft
300 ft
250 ft
200 ft
150 ft
100 ft
50 ft
-0 ft
196 ft
6.4%
0.25 mi
0.5 mi
0.75 mi
1 mi
1.14 mi
1.25 mi
1.5 mi
1.75 mi
2 mi
2.32 mi

Exposure Category per ASCE 7-16 Section 26.7:



Data Input:		
Building Height (mean roof), h =	17.25 ft	
Area 1 horizontal distance, X_1 =	1267 ft	Area 1 - Surface Roughness B
Area 2 horizontal distance, X_2 =	4752 ft	Area 2 - Surface Roughness D

Distance Limits Based on h	
B	1500 ft upwind
C	
D	5000 ft upwind
	600 ft downwind

* In Hurricane Prone regions use Surface Roughness Type C for Area 2.
* Where structure is located at shoreline use X_1 = 0 ft.

Exposure C Controls

* Applicable for the worst case of the two upwind sectors extending 45 degrees either side of the selected wind direction.
* Each wind direction must be evaluated separately.

Exposure per ASCE7-16 Section 26.7

26.7 EXPOSURE

For each wind direction considered, the upwind exposure shall be based on ground surface roughness that is determined from natural topography, vegetation, and constructed facilities.

26.7.1 Wind Directions and Sectors. For each selected wind direction at which the wind loads are to be determined, the exposure of the building or structure shall be determined for the two upwind sectors extending 45° on either side of the selected wind direction. The exposure in these two sectors shall be determined in accordance with Sections 26.7.2 and 26.7.3, and the exposure the use of which would result in the highest wind loads shall be used to represent the winds from that direction.

26.7.2 Surface Roughness Categories. A ground surface roughness within each 45° sector shall be determined for a distance upwind of the site, as defined in Section 26.7.3, from the categories defined in the following text, for the purpose of assigning an exposure category as defined in Section 26.7.3.

Surface Roughness B: Urban and suburban areas, wooded areas, or other terrain with numerous, closely spaced obstructions that have the size of single-family dwellings or larger.

Surface Roughness C: Open terrain with scattered obstructions that have heights generally less than 30 ft (9.1 m). This category includes flat, open country and grasslands.

Surface Roughness D: Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats, and unbroken ice.

26.7.3 Exposure Categories.

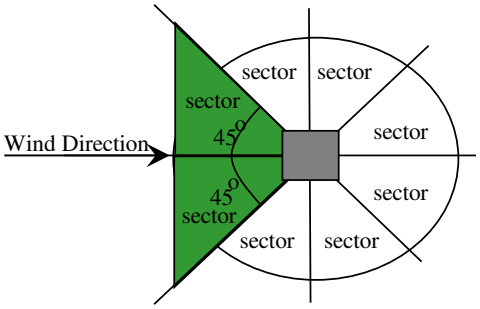
Exposure B: For buildings or other structures with a mean roof height less than or equal to 30 ft (9.1 m), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance greater than 1,500 ft (457 m). For buildings or other structures with a mean roof height greater than 30 ft (9.1 m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance greater than 2,600 ft (792 m) or 20 times the height of the building or structure, whichever is greater.

Exposure C: Exposure C shall apply for all cases where Exposure B or D does not apply.

Exposure D: Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance greater than 5,000 ft (1,524 m) or 20 times the building or structure height, whichever is greater. Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 ft (183 m) or 20 times the building or structure height, whichever is greater, from an Exposure D condition as defined in the previous sentence.

For a site located in the transition zone between exposure categories, the category resulting in the largest wind forces shall be used.

EXCEPTION: An intermediate exposure between the preceding categories is permitted in a transition zone, provided that it is determined by a rational analysis method defined in the recognized literature.



Topographic Factor, Kzt - per Section 26.8.1, ASCE 7-16: Figure 26.8-1

Verify Applicability of Conditions per Section 26.8.1 (check all boxes that apply):

1. ☑ Abrupt change is isolated and unobstructed upwind by similar topographic features of comparable height for 100H or 2 miles, whichever is less;
2. ☑ The hill, ridge, or escarp. protrudes above the height of upwind terrain features within a 2-mile radius in any quadrant by a factor of two or more;
3. ☑ Structure is located in upper half of hill or ridge or near the crest of an escarpment;
4. ☑ H/Lh is greater than or equal to 0.2;
5. ☑ H is greater than or equal to 15ft for Exp C & D; and 60ft for Exp B.

All boxes checked, Kzt shall be included in design.

Wind Exposure = C

H =	175	ft	Lh =	475	ft
Lh =	475.2	ft	H/Lh =	0.368	
x =	0	ft	x/Lh =	0.000	
z =	17.25	ft	z/Lh =	0.036	

Hill Shape = 2-D escarpment

Location = downwind of crest

Equations

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$

K_1 = determined from table below

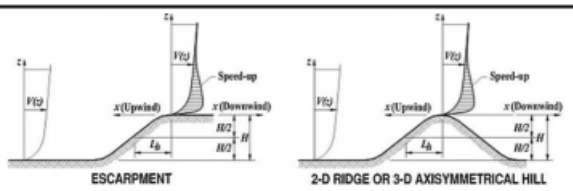
$$K_2 = (1 - |x|/\mu L_h)$$

$$K_3 = e^{-yz/L_h}$$

K_1 / (H/Lh) =	0.85
γ =	2.5
μ =	4.0
K_1 =	0.313
K_2 =	1.000
K_3 =	0.913

Kzt = $(1 + K_1 K_2 K_3)^2$ = 1.65

Diagrams



Topographic Multipliers for Exposure C[a,b,c]

K_1 Multiplier				K_2 Multiplier			K_3 Multiplier			
H/L_h	2D Ridge	2D Escarpment	3D Axisymmetrical Hill	x/L_h	2D Escarpment	All Other Cases	z/L_h	2D Ridge	2D Escarpment	3D Axisymmetrical Hill
0.20	0.29	0.17	0.21	0.00	1.00	1.00	0.00	1.00	1.00	1.00
0.25	0.36	0.21	0.26	0.50	0.88	0.67	0.10	0.74	0.78	0.67
0.30	0.43	0.26	0.32	1.00	0.75	0.33	0.20	0.55	0.61	0.45
0.35	0.51	0.30	0.37	1.50	0.63	0.00	0.30	0.41	0.47	0.30
0.40	0.58	0.34	0.42	2.00	0.50	0.00	0.40	0.30	0.37	0.20
0.45	0.65	0.38	0.47	2.50	0.38	0.00	0.50	0.22	0.29	0.14
0.50	0.72	0.43	0.53	3.00	0.25	0.00	0.60	0.17	0.22	0.09
				3.50	0.13	0.00	0.70	0.12	0.17	0.06
				4.00	0.00	0.00	0.80	0.09	0.14	0.04
							0.90	0.07	0.11	0.03
							1.00	0.05	0.08	0.02
							0.50	0.01	0.02	0.00
							2.00	0.00	0.00	0.00

[a]For values of H/L_h, x/L_h, and z/L_h other than those shown, linear interpolation is permitted.
[b]For $H/L_h > 0.5$, assume that $H/L_h = 0.5$ for evaluating K_1 and substitute $2H$ for L_h for evaluating K_2 and K_3.
[c]Multipliers are based on the assumption that wind approaches the hill or escarpment along the direction of maximum slope.

Notation

H = Height of hill or escarpment relative to the upwind terrain, in ft (m).
K_1 = Factor to account for shape of topographic feature and maximum speed-up effect.
K_2 = Factor to account for reduction in speed-up with distance upwind or downwind of crest.
K_3 = Factor to account for reduction in speed-up with height above local terrain.
L_h = Distance upwind of crest to where the difference in ground elevation is half the height of hill or escarpment, in ft (m).
x = Distance (upwind or downwind) from the crest to the site of the building or other structure, in ft (m).
z = Height above ground surface at the site of the building or other structure, in ft (m).
μ = Horizontal attenuation factor.
γ = Height attenuation factor.

Equations

$K_{zt} = (1 + K_1 K_2 K_3)^2$
K_1 = determined from table below
$K_2 = (1 - |x|/\mu L_h)$
$K_3 = e^{-\gamma z/L_h}$

Parameters for Speed-Up over Hills and Escarpments

	$K_1/(H/L_h)$					
	Exposure					
Hill Shape	B	C	D	γ	Upwind of Crest	Downwind of Crest
2D ridges (or valleys with negative H in $K_1/(H/L_h)$)	1.30	1.45	1.55	3	1.5	1.5
2D escarpments	0.75	0.85	0.95	2.5	1.5	4
3D axisymmetrical hill	0.95	1.05	1.15	4	1.5	1.5

FIGURE 26.8-1 Topographic Factor, K_{zt}

WIND LOADS per ASCE 7-16: 98 MPH, EXP 'C' with 17.25 ft MEAN ROOF HEIGHT

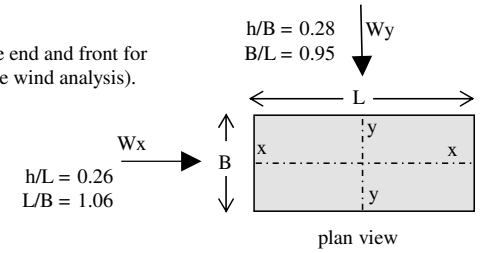
MAIN WIND-FORCE RESISTING SYSTEMS (Directional)

Section 27.3 - BUILDINGS OF ALL HEIGHTS

See section 27.3.5 for Design Wind Load Cases, defined in Figure 27.3-8

BUILDING EXPOSURE.....	C	(Per Jurisdiction)
WIND SPEED.....	98	MPH (Per Jurisdiction)
GROUND ELEVATION FACTOR, Ke.....	1.00	TABLE 26.9-1
TOPOGRAPHIC FACTOR, Kzt.....	1.65	FIGURE 26.8-1
WIND DIRECTION FACTOR, Kd.....	0.85	TABLE 26.6-1
MEAN ROOF HEIGHT, h.....	17.25	FT
BUILDING WIDTH, B	62	FT
BUILDING LENGTH, L	65.5	FT
3 :12 ROOF SLOPE	14.0	degrees (θ)

Note: Symmetricical so use end and front for opposing sides (4 side wind analysis).



plan view

Rigid Structure, freq >= 1; G=0.85

Kh =	0.87	TABLE 26.10-1
qh = 0.00256KzKztKdKe(V)^2 =	30.1	PSF (Eq. 26.10-1)

INTERNAL PRESSURE	qh(GCpi)
POSITIVE	5.43 PSF
NEGATIVE	-5.43 PSF

PRESSURE COEFFICIENTS	G	Cp		
WINWARD	0.85	0.80		PER sect 27.3.1, FIG 27.3-1
LEEWARD	0.85	-0.49	-0.50	PER sect 27.3.1, FIG 27.3-1
SIDE	0.85	-0.70		PER sect 27.3.1, FIG 27.3-1

Partially Open Buildings: GCpi = +0.18, -0.18

Internal Pressure Coefficient, Table 26.13-1

WALL LOADS			qzGCp	qhGCp			WALL PRESSURES (PSF): **P = qGCp - qh(GCpi)**				**OVERALL BUILDING LOADS TO WALLS (PSF)** qzGCp-qhGCp	
height	windward			leeward		side	windward	leeward		side wall		
z (ft)	Kz	qz (PSF)	(+) (PSF)	L/B (Wx) (PSF)	B/L (Wy) (PSF)	(PSF)	(- int : +int)	L/B (Wx) (+ int : -int)	B/L (Wy) (+ int : -int)	(+ int : -int)	**Wx**	**Wy**
30	0.98	33.9	23.0	-12.5	-12.8	-17.9	28.5 : 17.6	-17.9 : -7.1	-18.2 : -7.4	-23.4 : -12.5	**35.6**	**35.8**
20	0.90	31.1	21.1	-12.5	-12.8	-17.9	26.6 : 15.7	-17.9 : -7.1	-18.2 : -7.4	-23.4 : -12.5	**33.7**	**34.0**
10	0.85	29.3	19.9	-12.5	-12.8	-17.9	25.3 : 14.5	-17.9 : -7.1	-18.2 : -7.4	-23.4 : -12.5	**32.4**	**32.7**

*Note that wind pressures are service level and to be adjusted as required by ASCE 7-16 sections 2.3 or 2.4 for LRFD or ASD respectively

ROOF LOADS		Overall External Pressure windward (-)	windward (+)	leeward (-)		qhGCpi (PSF)	P = qGCp - qh(GCpi) (PSF) windward(-) w/ internal	windward(+) w/ internal	leeward w/ internal	TOTAL HORIZONTAL ROOF COMPNT (PSF) windward(-)	windward(+)	TOTAL VERT UPLIFT ROOF COMPNT (PSF) windward	leeward
Normal to Ridge **Wx** (for θ >= 10)	Cp	-0.55	-0.04	-0.46	(+) internal =	5.43	-19.5	-6.5	-17.3				
	qhGCp	-14.1	-1.1	-11.9	(-) internal =	-5.43	-8.6	4.3	-6.5	-0.5	2.6	-18.9	-16.8
Normal to Ridge **Wy** (for θ >= 10)	Cp	-0.56	-0.05	-0.47	(+) internal =	5.43	-19.8	-6.7	-17.4				
	qhGCp	-14.4	-1.3	-11.9	(-) internal =	-5.43	-9.0	4.1	-6.5	-0.6	2.6	-19.2	-16.8

Normal to Ridge for θ < 10 & Parallel to Ridge for all θ		Horizontal distance from windward edge range	0'-8.6'	8.6'-17.3'	17.3'-34.5'	> 34.5'	P = qGCp - qh(GCpi) (PSF) 0'-8.6'	8.6'-17.3'	17.3'-34.5'	> 34.5'	
Wx (max load case) ridge along x-x	Cp	-0.90	-0.90	-0.50	-0.30	-28.5	-28.5	-18.2	-13.1	+ internal
	qhGCp	-23.1	-23.1	-12.8	-7.7	-17.6	-17.6	-7.4	-2.3	- internal
	VERTICAL UPLIFT ROOF COMPONENT (PSF)					-27.6	-27.6	-17.7	-12.7	+ internal
Wy (max load case) ridge along y-y	Cp	-0.90	-0.90	-0.50	-0.30	-28.5	-28.5	-18.2	-13.1	+ internal
	qhGCp	-23.1	-23.1	-12.8	-7.7	-17.6	-17.6	-7.4	-2.3	- internal
	VERTICAL UPLIFT ROOF COMPONENT (PSF)					-27.6	-27.6	-17.7	-12.7	+ internal
Wx & **Wy** (min load case)	Cp	-0.18	-0.18	-0.18	-0.18	-10.0	-10.0	-10.0	-10.0	+ internal
	qhGCp	-4.6	-4.6	-4.6	-4.6	0.8	0.8	0.8	0.8	- internal
Roof Overhangs	**qhGCp**	20.5 PSF at bottom surface of windward roof overhang (per section 27.3.3)									

Roof Parapets section 27.3.4						
	hp =	0.0	ft, top of parapet elevation	windward parapet =	43.9	PSF (Eq.27.3-3)
	qp =	29.3	psf, GCpn = +1.5, -1.0	leeward parapet =	-29.3	PSF (Eq.27.3-3)

TOT HORIZ 73.2 PSF

PROJECT NAME: Mak Remodel
PROJECT NUMBER: 22.017
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2022-02-24
DESIGN BY COK

ULT WIND LOADS per ASCE 7-16: 98 MPH, EXP 'C' with 17.25 ft MEAN ROOF HEIGHT

WALL ELEMENTS & COMPONENTS (part 1) — Section 30.3 - BUILDINGS with h <= 60 ft

BUILDING EXPOSURE	C	(Per Jurisdiction)	h/B =	0.3
WIND SPEED (3-Second Gust)	98	MPH (Per Jurisdiction)		
Ke, GROUND ELEVATION FACTOR	1.00	TABLE 26.9-1		
Kd, WIND DIRECTION FACTOR	0.85	TABLE 26.6-1		
Kzt, TOPOGRAPHIC FACTOR	1.65	FIGURE 26.8-1		
Kz, VEL. PRES. EXP. COEF	0.87	TABLE 26.10-1		
qh=0.00256KzKztKdKe(V)^2	30.15	PSF (Eq. 26.10-1)		

ROOF ANGLE, θ	14	degrees
MEAN ROOF HEIGHT, h	17.25	FT
LEAST BLDG WIDTH, B	62	FT
DIST 'a'	6.2	FT
SPAN OF FRAMING ELEMENT	10	FT
TRIBUTARY SPACING/WIDTH	1.3333	FT
(M)EMBER or (F)ASTENER	M	
TRIBUTARY AREA	13.3	FT^2
EFFECTIVE WIDTH	3.33	FT
EFFECTIVE WIND AREA	33.3	FT^2

PRESSURE COEFFICIENTS			
GCp and GCpi	WALL	CORNER	Reference
GCp INWARD	0.91	0.91	PER FIGURE 30.3-1
GCp OUTWARD	-1.01	-1.22	PER FIGURE 30.3-1

Full GCp values used

Internal Pressure Coefficient, Table 26.13-1: Enclosed Buildings: GCpi = +0.18, -0.18

	Service		ASD	
P=qh[GCp-GCpi]	TYPICAL WALL STUDS	CORNER STUDS *	TYP WALL	COR STUDS
INWARD PRESSURES	**32.79** PSF	**32.79** PSF	19.67 PSF	19.67 PSF
OUTWARD PRESSURES	**-35.80** PSF	**-42.06** PSF	-21.48 PSF	-25.24 PSF

* apply over distance 'a' from corner

*Note that service wind pressures are to be adjusted as required by ASCE 7-16 sections 2.3 or 2.4 for LRFD or ASD respectively

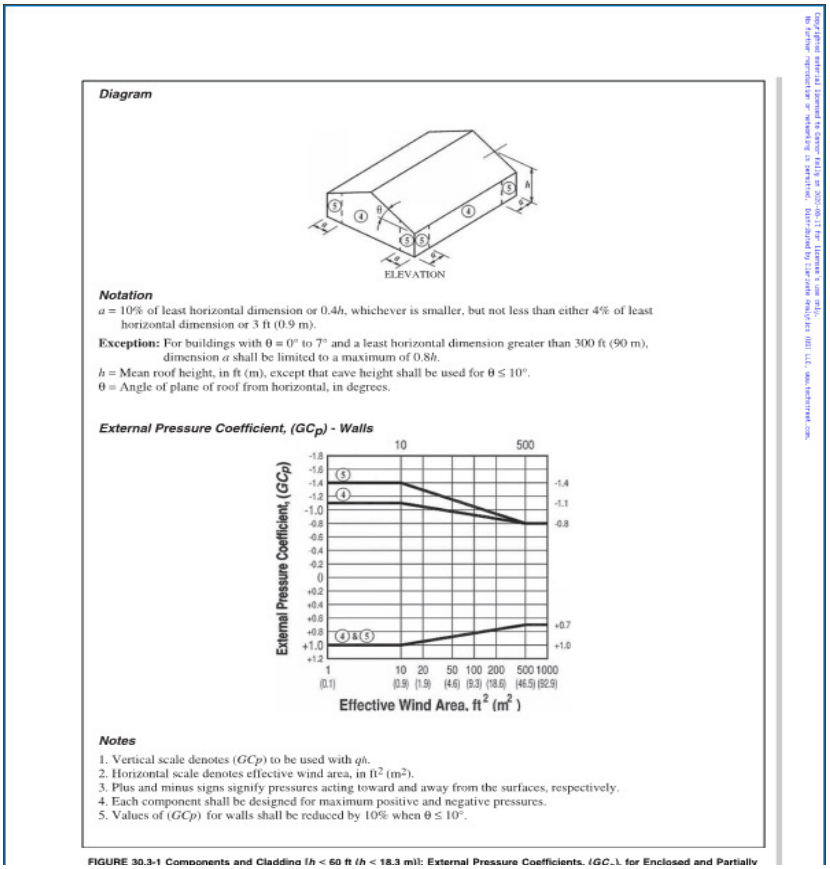


FIGURE 30.3-1 Components and Cladding [h ≤ 60 ft (h ≤ 18.3 m)]: External Pressure Coefficients, (GC...), for Enclosed and Partially

ASCE Seismic Base Shear

DESCRIPTION: Mak Remodel

Mak Remodel

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *ASCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping :

S_S = 1.472 g, 0.2 sec response
S_1 = 0.5664 g, 1.0 sec response

Latitude = 47.544 deg North
Longitude = 122.233 deg West

Site Class, Site Coeff. and Design Category

Site Classification "D" : Shear Wave Velocity 600 to 1,200 ft/sec = D — *ASCE 7-16 Table 20.3-1*

Site Coefficients Fa & Fv — *ASCE 7-16 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table values)
Fa = 1.20
Fv = 1.77

Maximum Considered Earthquake Acceleration
S_{MS} = Fa * Ss = 1.766 — *ASCE 7-16 Eq. 11.4-1*
S_{M1} = Fv * S1 = 1.000 — *ASCE 7-16 Eq. 11.4-2*

Design Spectral Acceleration
$S_{DS} = S_{MS} * 2/3$ = 1.178 — *ASCE 7-16 Eq. 11.4-3*
$S_{D1} = S_{M1} * 2/3$ = 0.667 — *ASCE 7-16 Eq. 11.4-4*

Seismic Design Category = D — *ASCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . Bearing Wall Systems
15.Light-frame (wood) walls sheathed w/wood structural panels rated for shear resistance.

Response Modification Coefficient " R " = 6.50
System Overstrength Factor " Wo " = 2.50
Deflection Amplification Factor " Cd " = 4.00

NOTE! See ASCE 7-16 for all applicable footnotes.

Building height Limits :
Category "A & B" Limit: No Limit
Category "C" Limit: No Limit
Category "D" Limit: Limit = 65
Category "E" Limit: Limit = 65
Category "F" Limit: Limit = 65

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calculation : All Other Structural Systems

" Ct " value = 0.020
" x " value = 0.75
" hn " : Height from base to highest level = 17.250 ft

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.169 sec
"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 = 6.000 sec

Building Period " Ta " Calculated from Approximate Method selected = 0.169 sec

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS}: Short Period Design Spectral Response = 1.178
" R " : Response Modification Factor = 6.50
" I " : Seismic Importance Factor = 1

From Eq. 12.8-2, Preliminary Cs = 0.181
From Eq. 12.8-3 & 12.8-4 , Cs need not exceed = 0.606
From Eq. 12.8-5 & 12.8-6, Cs not be less than = 0.052

Cs : Seismic Response Coefficient = 0.1812

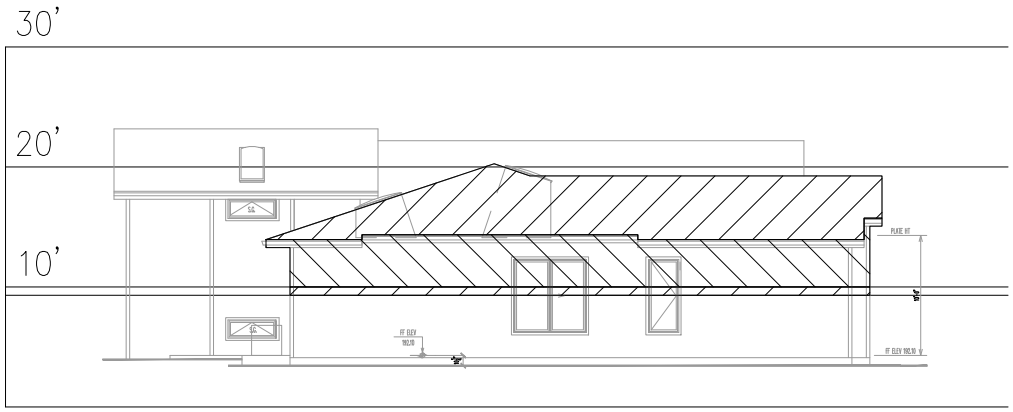
Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.1812 from 12.8.1.1

W (see Sum Wi below) = 0.00 k

Seismic Base Shear V = Cs * W = 0.00 k



LONGITUDINAL

TRANSVERSE

LEVEL 1							
	LONGITUDINAL			TRANSVERSE			
ELEVATION	ROOF	20'	10'	ROOF	30'	20'	10'
AREA	221.8 SQ. FT.	203.0 SQ. FT.	33.8 SQ. FT.	117.3 SQ. FT.	30.5 SQ. FT.	502.7 SQ. FT.	46.0 SQ. FT.

PROJECT NO. : 22.017 DESIGNED BY : COK DRAWN BY : COK ISSUE DATE :	**MAK REMODEL** **MERCER ISLAND, WA**	
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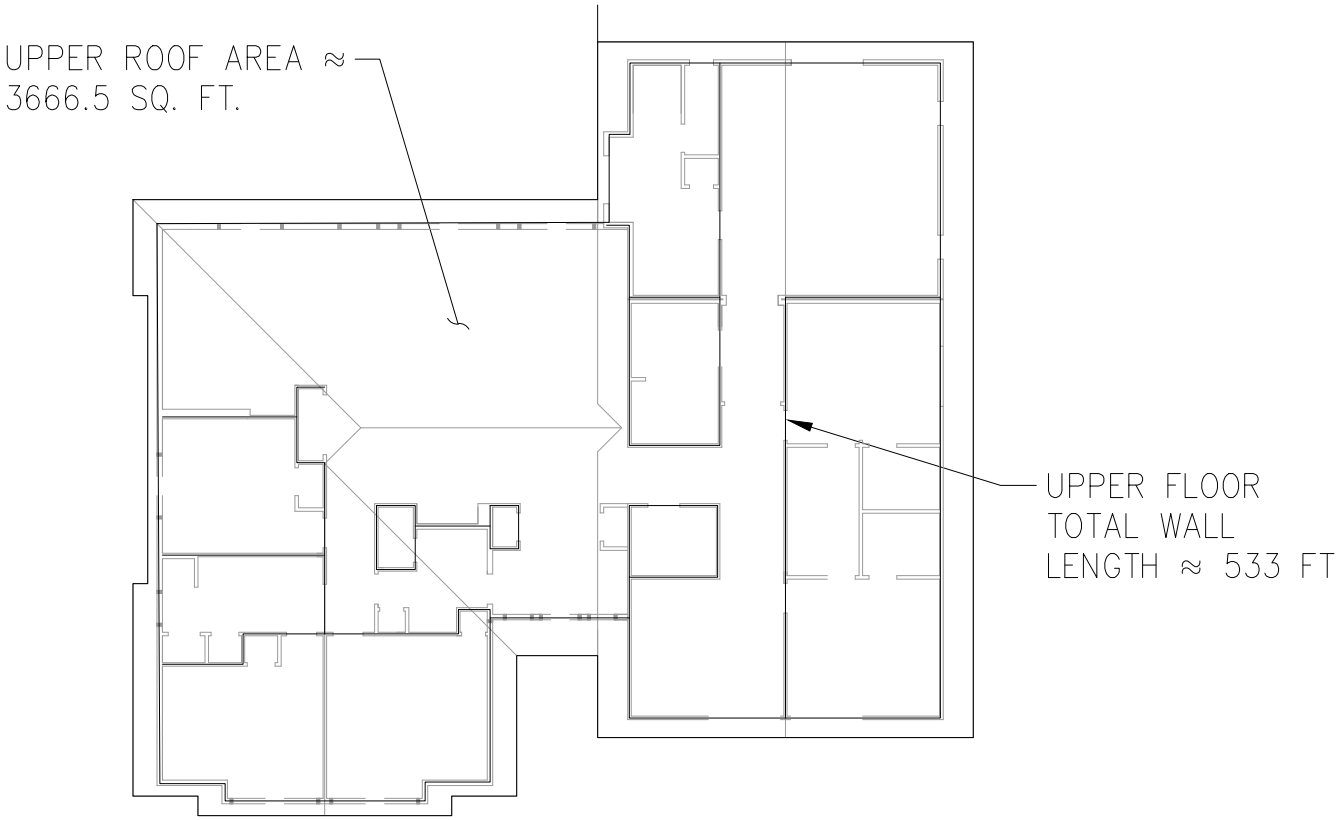

ROOF PLAN

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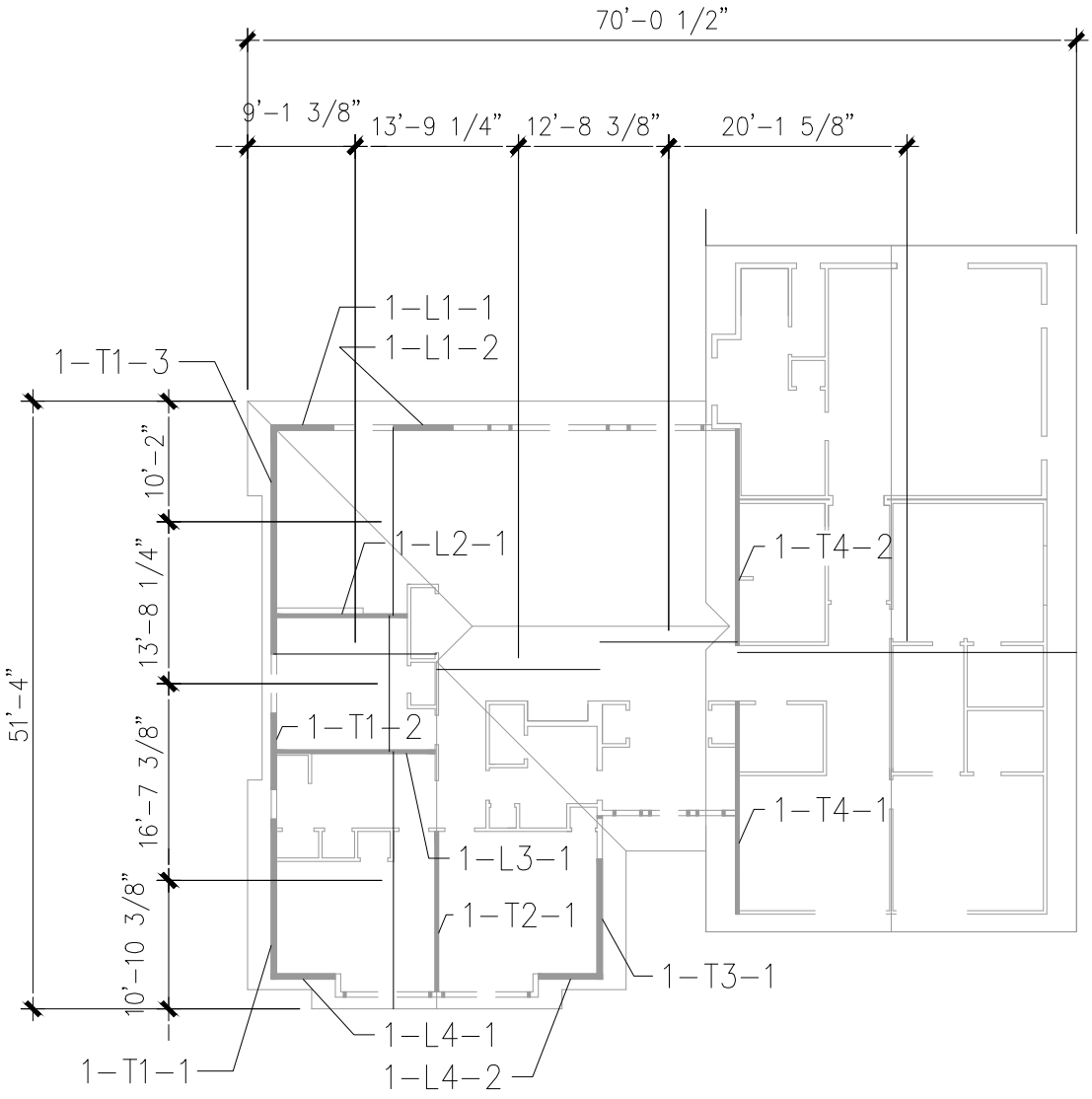

LEVEL 1	LONGITUDINAL			
SHEARWALL	1-L1	1-L2	1-L3	1-L4
TRIBUTARY WIDTH	122.0	164.3	199.4	130.4
TOTAL WIDTH	616.0			
	TRANSVERSE			
SHEARWALL	1-T1	1-T2	1-T3	1-T4
TRIBUTARY WIDTH	109.4	165.2	152.4	241.6
TOTAL WIDTH	840.5			

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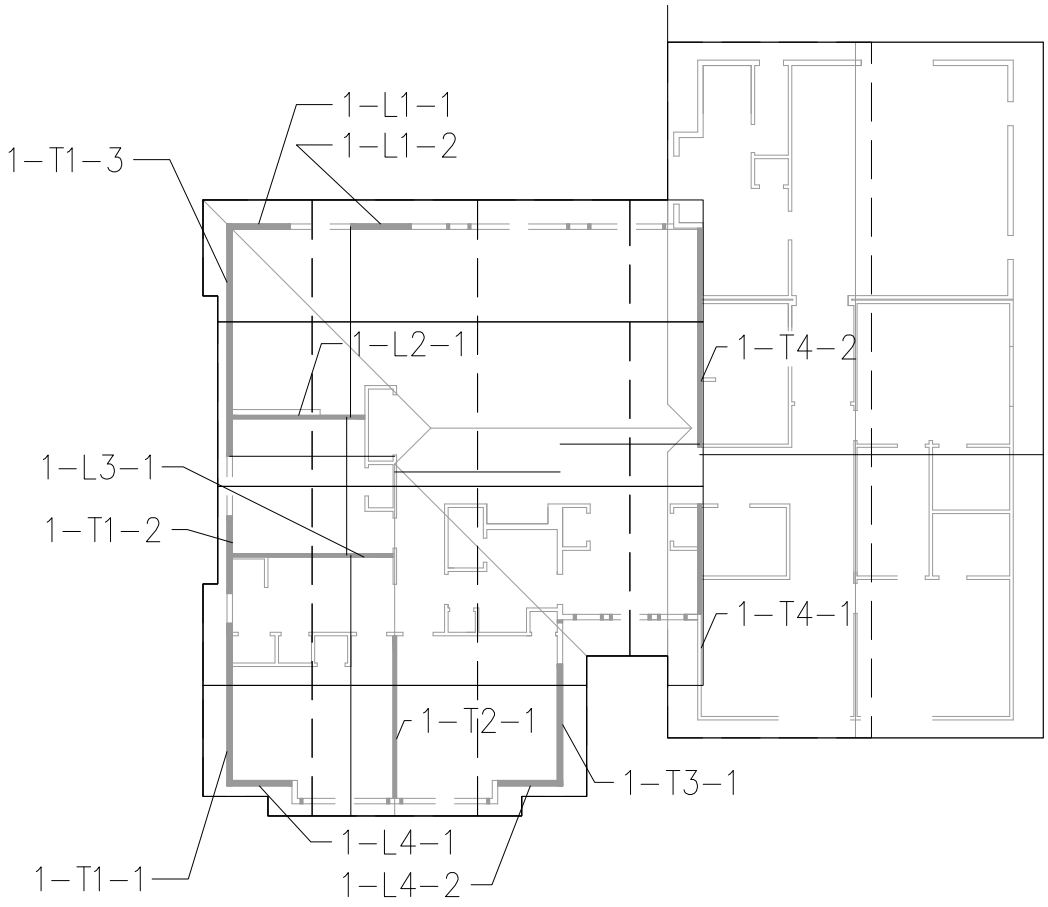

LEVEL 1	LONGITUDINAL			
SHEARWALL	1-L1	1-L2	1-L3	1-L4
AREA	421.3 SQ. FT.	553.8 SQ. FT.	666.1 SQ. FT.	330.1 SQ. FT.
	TRANSVERSE			
SHEARWALL	1-T1	1-T2	1-T3	1-T4
AREA	429.1 SQ. FT.	706.9 SQ. FT.	595.2 SQ. FT.	1104.5 SQ. FT.
TOTAL AREA	3666.5 SQ. FT.			

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PROJECT NAME: **Mak Remodel**

PROJECT NUMBER: **22.017**

DHP - ENGINEERING, P.S. 2022-03-02

STRUCTURAL BUILDING CONSULTANTS **DESIGN BY: COK**

Lateral Load Setup

Wind Loading (Exposure C, V_{basic} = 98 mph, Pressures Adjusted to ASD Level)

Level 5)	Longitudinal					Transverse				
Elevation (ft)										
Pressures (psf)										
Area (sq. ft.)										
Total Loads (lbs)				0					0	
Level 4)										
Elevation (ft)										
Pressures (psf)										
Area (sq. ft.)										
Total Loads (lbs)				0					0	
Level 3)										
Elevation (ft)										
Pressures (psf)										
Area (sq. ft.)										
Total Loads (lbs)				0					0	
Level 2)										
Elevation (ft)										
Pressures (psf)										
Area (sq. ft.)										
Total Loads (lbs)				0					0	
Level 1)										
Elevation (ft)	Roof	20'	10'			Roof	30'	20'	10'	
Pressures (psf)	4.8	20.2	19.4			4.8	21.5	20.4	19.6	
Area (sq. ft.)	221.8	203.0	33.8			117.3	30.5	502.7	46.0	
Total Loads (lbs)				5826					12376	

PROJECT NAME: **Mak Remodel**

PROJECT NUMBER: **22.017**

DHP - ENGINEERING, P.S. 2022-03-02

STRUCTURAL BUILDING CONSULTANTS **DESIGN BY: COK**

Lateral Load Setup

Effective Seismic Weight

Level 5)					
Assembly Type	Roof	Floor	Deck	Total Wall Length (ft)	0
Area (sq. ft.)	0	0	0	Wall Height (ft)	0
Dead Load (psf)	0	0	0	Wall Assembly Weight (psf)	0
Total Weight (lbs)	0				
Level 4)					
Assembly Type	Roof	Floor	Deck	Total Wall Length (ft)	0
Area (sq. ft.)	0	0	0	Wall Height (ft)	0
Dead Load (psf)	0	0	0	Wall Assembly Weight (psf)	0
Total Weight (lbs)	0				
Level 3)					
Assembly Type	Roof	Floor	Deck	Total Wall Length (ft)	0
Area (sq. ft.)	0	0	0	Wall Height (ft)	0
Dead Load (psf)	0	0	0	Wall Assembly Weight (psf)	0
Total Weight (lbs)	0				
Level 2)					
Assembly Type	Roof	Floor	Deck	Total Wall Length (ft)	0
Area (sq. ft.)	0	0	0	Wall Height (ft)	0
Dead Load (psf)	0	0	0	Wall Assembly Weight (psf)	0
Total Weight (lbs)	0				
Level 1)					
Assembly Type	Roof	Floor	Deck	Total Wall Length (ft)	533
Area (sq. ft.)	3667	0	0	Wall Height (ft)	10
Dead Load (psf)	15	0	0	Wall Assembly Weight (psf)	8
Total Weight (lbs)	76318				

PROJECT NAME: **Mak Remodel**

PROJECT NUMBER: **22.017**

DHP - ENGINEERING, P.S. 2022-03-02

STRUCTURAL BUILDING CONSULTANTS **DESIGN BY: COK**

Lateral Load Summary

	Wind Loads (lbs)		
	Longitudinal	Transverse	Seismic Loads (lbs)
Level 5			
Level 4			
Level 3			
Level 2			
Level 1	5826	12376	12841

Seismic Force Distribution

$C_{s,\ ASD}$	0.1294
ρ	1.3

S_{DS}	1.178
I_e	1.00

T (s)	0.566
k	1.03

							F_{px}		F_{px}	F_{px}
	w_x	h_x	c_{vx}	$\Sigma_x^n w_i$	F_x	$\Sigma_x^n F_i$	Min	Max	Calc	Design
Level 5	0									
Level 4	0									
Level 3	0									
Level 2	0									
Level 1	76318	10	1.000	76318	12841	12841	17980	35961	12841	17980

V	12841

Where,

ρ = Redundancy factor

S_{DS} = Design Spectral Acceleration

I_e = Earthquake Importance Factor

T (s) = Fundamental Period of the Structure

k = Structure Period Exponent

w_x = Effective Seismic Weight of Level X (lbs)

h_x = Height of Level X from the Base of Sturcture (ft)

c_{vx} = Vertical Distribution Factor for Level X

$\Sigma_x^n w_i$ = Sum of Tributary Weights (lbs)

$C_{s,\ ASD}$ = Seimsic Response Coefficient Multiplied by 0.7 for ASD Calculations

F_x = Seismic Force at Level X (lbs)

$\Sigma_x^n F_i$ = Sum of Tributary Weights (lbs)

F_{px} = Diaphragm Force at Level X (lbs)

V = Seismic base Shear (lbs)

PROJECT NAME: **Mak Remodel**

PROJECT NUMBER: **22.017**

DHP - ENGINEERING, P.S. **2022-03-02**

STRUCTURAL BUILDING CONSULTANTS **DESIGN BY: COK**

Unit Shear and Uplift

Equations)

v=V/L

T=C=vh

δsw=(8vh^3)/(EAb)+(vh)/(1000Ga)+(hΔa)/b

Where

v = Design Unit Shear (plf) (Both unadjusted and adjusted values are given where the aspect ratio reduction (v*(1.25-.125(w/h)) applies per SDPWS 4.3.4, only unadjusted values are reported otherwise)

V = Force to Shear Line (lbs) (Given for wind and seismic)

L = Sum of Wall Lengths in Shear Line (ft)

Lw = b = Individual Wall Segment Length (ft)

T = C = Uplift/Compression Loads (lbs, ±)

h = Story Height (ft)

E = Modulus of Elasticity of End Posts (psi) (Value for #1 DF is entered by default per holdown table on plans)

A = Area of End Posts Cross Section (in2)

Δa = Total Elongation of Wall Anchorage (in)

Ga = Apparent Shearwall Stiffness (k/in)

δsw = Maximum Shearwall Deflection (in)

Notes: Input loads have been ALREADY BEEN ADJUSTED per ASCE 7-16 section 2.4. Basic uplift divides factored uplift by 0.6 for wind loads and 0.7 for seismic for further use in separate analysis programs.

Widths and areas for wind and seismic force distribution are calculated separately.

ASD unit shear for wind and seismic are reported. Unadjusted values do not take segment length to story height ratio into account. Adjusted values are increased to the shear required rather than having to reduce the wall capacities as is done in the 2015 SDPWS.

ASD factored uplift loads are calculated directly from the input loads (which are already adjusted to ASD level) and service loads divide the ASD factored loads by the corresponding factor for either wind or seismic.

Shearwall naming convention is X-YY-Z, where X is the building level, YY denotes the direction of loading and the overall

Shearline 1-L1

Level 1
Longitudinal

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	122
Total Width (ft)	616

Seismic	
Tributary Area (sq.ft.)	421.3
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	1154
Seismic Load (lbs)	1475

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	5.25	5									10.25

Shearwall	2	h (ft)	10	L_w (ft)	5

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	113		W6		0.103		1876	1126
Seismic	144		W6		0.132		2056	1440

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	200
Total Unfactored Loads		200

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	1006	1246
Seismic	1352	1672

Adjusted Deadloads (lbs)	
Wind	
0.6D	120
Seismic	
(1.0+0.14SDS)D	233
(0.6-0.14SDS)D	87

Holdown	CS20
Δ_a (in)	0.010

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-L2

Level 1
Longitudinal

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	164.3
Total Width (ft)	616

Seismic	
Tributary Area (sq.ft.)	553.8
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	1554
Seismic Load (lbs)	1940

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	11.00										11.00

Shearwall	1	h (ft)	10	L_w (ft)	11

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	141		W6		0.110		2355	1413
Seismic	176		W6		0.137		2519	1763

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	440
Total Unfactored Loads		440

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	1149	1677
Seismic	1572	2276

Adjusted Deadloads (lbs)	
Wind	
0.6D	264
Seismic	
(1.0+0.14SDS)D	513
(0.6-0.14SDS)D	191

Holdown	CS20
Δ_a (in)	0.010

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-L3

Level 1
Longitudinal

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	199.4
Total Width (ft)	616

Seismic	
Tributary Area (sq.ft.)	666.1
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	1886
Seismic Load (lbs)	2333

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	13.33										13.33

Shearwall	1	h (ft)	10	L_w (ft)	13.33

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	141		W6		0.108		2358	1415
Seismic	175		W6		0.133		2500	1750

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	533
Total Unfactored Loads		533

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	1095	1735
Seismic	1518	2371

Adjusted Deadloads (lbs)	
Wind	
0.6D	320
Seismic	
(1.0+0.14SDS)D	621
(0.6-0.14SDS)D	232

Holdown	CS20
Δ_a (in)	0.010

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-L4

Level 1
Longitudinal

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	130.4
Total Width (ft)	616

Seismic	
Tributary Area (sq.ft.)	330.1
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	1233
Seismic Load (lbs)	1156

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	5.33	5.33									10.66

Shearwall	1	h (ft)	10	L_w (ft)	5.33

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	116		W6		0.104		1928	1157
Seismic	108		W6		0.098		1549	1085

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	213
Total Unfactored Loads		213

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	1029	1285
Seismic	992	1333

Adjusted Deadloads (lbs)	
Wind	
0.6D	128
Seismic	
(1.0+0.14SDS)D	248
(0.6-0.14SDS)D	93

Holdown	CS20
Δ_a (in)	0.010

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-T1

Level 1
Transverse

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	109.4
Total Width (ft)	840.5

Seismic	
Tributary Area (sq.ft.)	429.1
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	1611
Seismic Load (lbs)	1503

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	13.5	6.33	19.33								39.16

Shearwall	2

h (ft)	10

L_w (ft)	6.33

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	41		W6		0.048		686	411
Seismic	38		W6		0.045		548	384

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	253
Total Unfactored Loads		253

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	259	563
Seismic	274	679

Adjusted Deadloads (lbs)	
Wind	
0.6D	152
Seismic	
(1.0+0.14SDS)D	295
(0.6-0.14SDS)D	110

Holdown	HDU2
Δ_a (in)	0.088

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-T2

Level 1
Transverse

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	165.2
Total Width (ft)	840.5

Seismic	
Tributary Area (sq.ft.)	706.9
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	2432
Seismic Load (lbs)	2476

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	13.5										13.5

Shearwall	1	h (ft)	10	L_w (ft)	13.5

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	180		W6		0.162		3003	1802
Seismic	183		W6		0.165		2620	1834

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	540
Total Unfactored Loads		540

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	1478	2126
Seismic	1599	2463

Adjusted Deadloads (lbs)	
Wind	
0.6D	324
Seismic	
(1.0+0.14SDS)D	629
(0.6-0.14SDS)D	235

Holdown	HDU2
Δ_a (in)	0.088

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-T3

Level 1
Transverse

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	152.4
Total Width (ft)	840.5

Seismic	
Tributary Area (sq.ft.)	595.2
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	2244
Seismic Load (lbs)	2085

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	10										10

Shearwall	1	h (ft)	10	L_w (ft)	10

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	224		W6		0.220		3740	2244
Seismic	208		W6		0.205		2978	2085

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	400
Total Unfactored Loads		400

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	2004	2484
Seismic	1911	2551

Adjusted Deadloads (lbs)	
Wind	
0.6D	240
Seismic	
(1.0+0.14SDS)D	466
(0.6-0.14SDS)D	174

Holdown	HDU2
Δ_a (in)	0.088

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

Shearline 1-T4

Level 1
Transverse

Additional Loads (Where Applicable)						
Shearline						
Percentage						
Wind						
Seismic						

Wind	
Tributary Width (ft)	241.6
Total Width (ft)	840.5

Seismic	
Tributary Area (sq.ft.)	1105
Total Area (sq.ft.)	3667

Total Loads to Shear Line	
Wind Load (lbs)	3557
Seismic Load (lbs)	3868

Walls in Shearline	1	2	3	4	5	6	7	8	9	10	Total
Length (ft)	17	18									35

Shearwall	1	h (ft)	10	L_w (ft)	17

	v (plf)		Sheathing		δ_{sw} (in)		Uplift (lbs)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Service	ASD
Wind	102		W6		0.087		1694	1016
Seismic	111		W6		0.094		1579	1105

Resisiting Dead Loads		
Load Source	Weight (plf)	Unfactored Loads at Ends of Wall (lbs)
Wall	80	680
(E) Roof	97.5	829
Total Unfactored Loads		1509

	Adjusted Reactions (lbs)	
	Tension	Compression
Wind	111	1922
Seismic	449	2863

Adjusted Deadloads (lbs)	
Wind	
0.6D	905
Seismic	
(1.0+0.14SDS)D	1758
(0.6-0.14SDS)D	656

Holdown	HDU2
Δ_a (in)	0.088

G_a (k/in)	Unadj.	Adjusted
Wind	15	
Seismic	15	

Wood Species	Hem-fir
Panel Type	Sheathing, 7/16, 8d, OSB

End Post	(2)2x6
A (in^2)	16.5
E (psi)	1,700,000

PROJECT NAME: **Mak Remodel**

PROJECT NUMBER: **22.017**

DHP - ENGINEERING, P.S. **2022-03-02**

STRUCTURAL BUILDING CONSULTANTS **DESIGN BY: COK**

Simply Supported Diaphragms

Equations)

ν=Vmax/W

T=C=Mmax/W

δdia=(5νL^3)/(8EAW)+(0.25νL)/(1000Ga)+(∑xΔc)/(2W)

Where

ν = Design Unit Shear (plf)

Vmax = Maximum shear force in diaphragm, calculated by superimposing the typical uniformly distributed lateral load and any additional point loads from non stacking shear walls above and summing the shear at 1/10th points along the width of the diaphragm to find the controlling value

T = C = Diaphragm chord tension and compression forces (lbs)

Mmax = Maximum moment in diaphragm, calculated by superimposing the typical uniformly distributed lateral load and any additional point loads from non stacking shear walls above and summing the moments at 1/10th points along the width of the diaphragm to find the controlling value

W = Depth of diaphragm parallel to loading (ft)

Ltotal = Total width of building perpendicular to loading direction (ft)

L = Width of diaphragm perpendicular to loading between supports (lines of shear resistence) (ft)

nmin = The required amount of nails at splices based on Vnail (allowable shear capacity of fasteners at splices)

x = Distance between chord splices (ft), it is assumed that the distance will be the maximum length that can be used given diaphragm width based on typical 2x member length from most lumber stores (8ft, 12ft, or 16ft)

Nsplice = The total number of splices that occur alond the width of the diaphragm assuming an "x" value as noted above

xi = The distance between a given splice and the nearest diaphragm support (ft).

E = Modulus of Elasticity of chord members (psi) (Values for #2 HF or DF used as noted in analysis)

A = Area of chord (in2). As is done in 2015 SDPWS example C4.2.2-3, "A" is the area of a single framing member even when using a double top plate as theoretically a single member carries the force between splices.

Δc = Slip associated with each splice (in)

γ = Load slip modulus for dowel type fasteners per NDS section 11.3.6 (180000D^1.5)

D = Diameter of fasteners at chord splices (in)

Ga = Apparent Diaphragm Stiffness (k/in)

Controlling Diaphragm Between 1-L3 and 1-L4

Level 1
Transverse

Point Loads from Shearwalls (Where Applicable)						
Shearline						
Location						
Wind						
Seismic						

Total Loads to Shear Line	
Wind Load (lbs)	12376
Seismic Load (lbs)	17980

L_{total} (ft)	51.5

L (ft)	21.5

W (ft)	32

x (ft)	16
N_{splice}	1
x_1 (ft)	5.5
x_2 (ft)	
x_3 (ft)	
x_4 (ft)	
x_5 (ft)	

Diaphragm Load Case
Case 1

Wood Species	Hem-fir
E (psi)	1,300,000

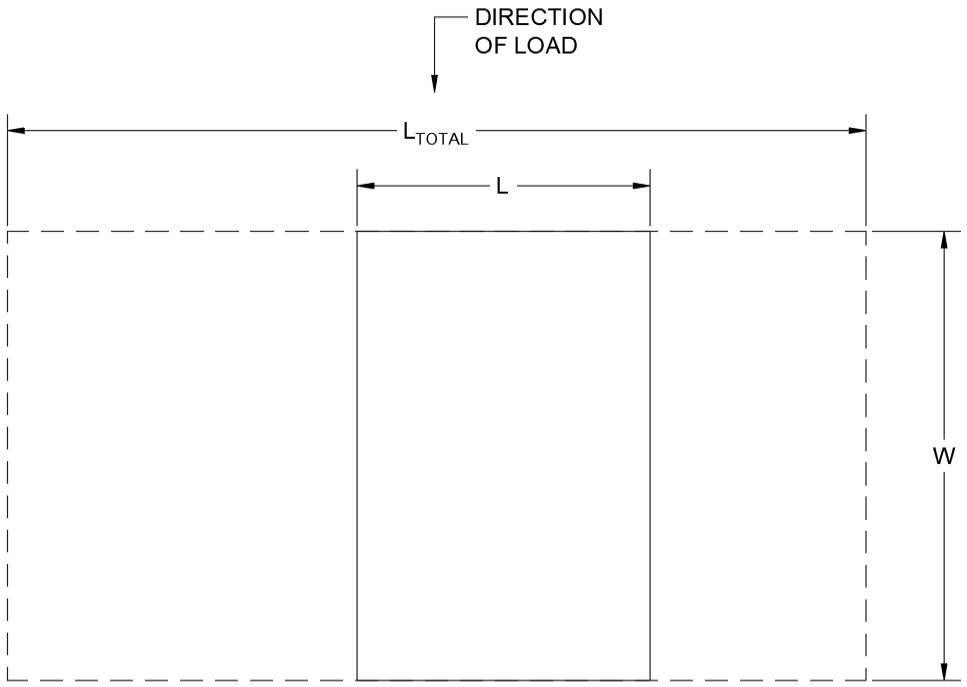
A (ft2)	8.25

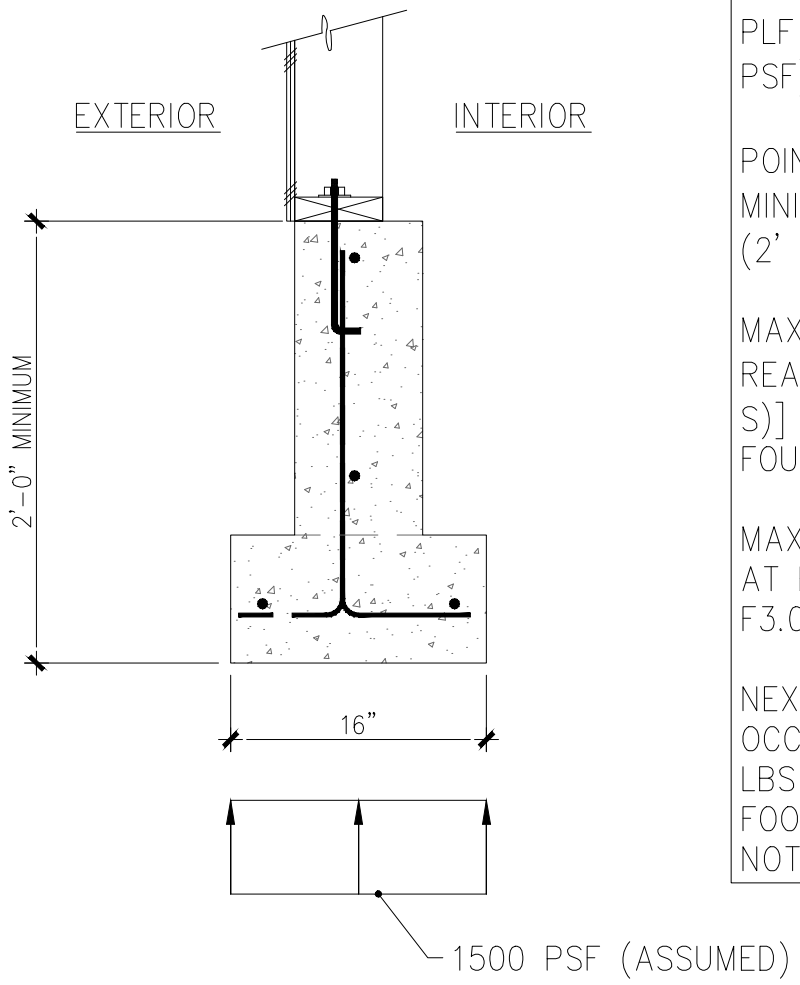
Diaphragm Condition
Simple

D (in)	0.148
γ (lb/in/nail)	10249
V_{nail} (lbs)	163.2

	Deflection Components				
	δ_{chord}	δ_{panel}	Δc (in)	δ_{slip}	G_a (k/in)
Wind	0.002	0.056	0.024	0.002	13
Seismic	0.003	0.069	0.022	0.002	

	v_{max} (plf)	T/C_{max} (lbs)	n_{min}	δ_{total} (in)
Wind	81	434	3	0.060
Seismic	117	630	4	0.074





SOIL BEARING CALCULATIONS

PLF CAPACITY OF FOOTING = (1500 PSF)*(16"/12) = 2000 PLF

POINT LOAD CAPACITY (ASSUMING 2'-0" MINIMUM TOTAL DEPTH) = (2000 PLF) * (2' * 2) = 8000 LBS)

MAXIMUM PLF AT FOOTING OCCURS AT REAR WALL = [(15 PSF, D) + (25 PSF, S)] * (19FT TRIB) = 760 PLF < 2000 PLF, FOUNDATION IS ACCEPTABLE

MAXIMUM POINT LOAD AT FOOTING OCCURS AT BEAM REACTION 1-3A = 9791 LBS F3.0 FOOTING REQUIRED

NEXT HIGHEST POINT LOAD AT FOOTING OCCURS AT BEAM REACTION 1-5A = 7788 LBS < 8000 LBS CAPACITY, TYPICAL FOOTING IS ACCEPTABLE EXCEPT WHERE NOTED

PROJECT NO. : 22.017 DESIGNED BY : COK DRAWN BY : COK ISSUE DATE :	**MAK REMODEL** **MERCER ISLAND, WA**	
DHP Engineering *Structural Building Consultants*	32008 32nd Ave S, Suite B Federal Way, WA 98001 (253) 220-0848	PREPARED FOR:

General Footing

Lic. # : KW-06004293 DHP ENGINEERING

DESCRIPTION: F1.5

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

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

Increases based on footing Depth

Footing base depth below soil surface	=	1.0	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

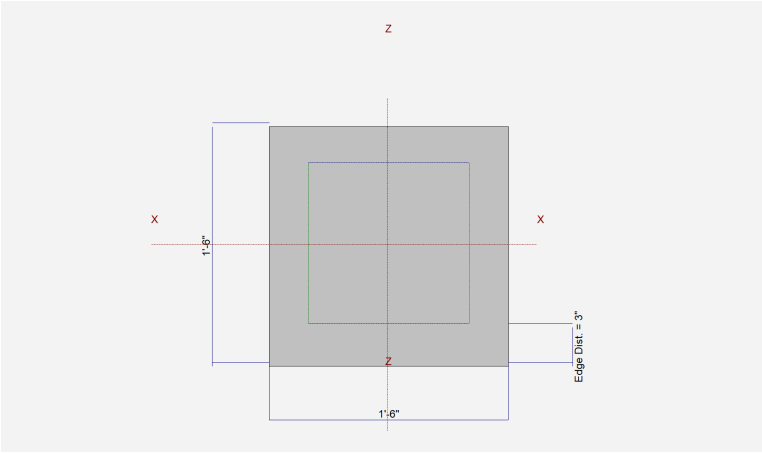
Width parallel to X-X Axis	=	1.50	ft
Length parallel to Z-Z Axis	=	1.50	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0	in

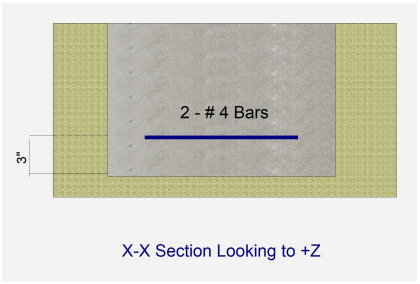


Reinforcing

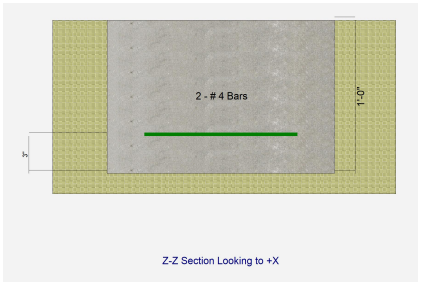
Bars parallel to X-X Axis			
Number of Bars	=		2.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		2.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



X-X Section Looking to +Z



Z-Z Section Looking to +X

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=			3.0					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

DESCRIPTION: F1.5

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9853	Soil Bearing	1.478 ksf	1.50 ksf	+D+L+H about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.05722	Z Flexure (+X)	0.60 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05722	Z Flexure (-X)	0.60 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05722	X Flexure (+Z)	0.60 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05722	X Flexure (-Z)	0.60 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	n/a	1-way Shear (+X)	0.0 psi	82.158 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	n/a	1-way Shear (+Z)	0.0 psi	82.158 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	82.158 psi	n/a
PASS	n/a	2-way Punching	11.111 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, +D+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+L+H	1.50	n/a	0.0	1.478	1.478	n/a	n/a	0.985
X-X, +D+Lr+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+S+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +D+0.60W+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.478	1.478	0.985
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058

Overturning Stability

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

Sliding Stability

All units k

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

General Footing

DESCRIPTION: F1.5

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.40D+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.60	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.60	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.60	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.60	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.3750	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.3750	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+1.60S+1.60H	0.3750	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+1.60S+1.60H	0.3750	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.3750	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.3750	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.3750	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.3750	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.20S+E+1.60H	0.3750	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.20S+E+1.60H	0.3750	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+E+0.90H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+E+0.90H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.40D+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.40D+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.60	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.60	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.60	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.60	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.3750	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.3750	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+1.60S+1.60H	0.3750	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+1.60S+1.60H	0.3750	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.3750	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.3750	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.3750	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.3750	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	0.3750	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	0.3750	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+E+0.90H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+E+0.90H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+1.60L+0.50S+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+1.60Lr+L+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+1.60S+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+L+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+0.50S+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+0.90D+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+0.20S+E+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK

General Footing

DESCRIPTION: F1.5

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
Two-Way "Punching" Shear							All units k	

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	11.11 psi	164.32 psi	0.06762	OK
+1.20D+1.60L+0.50S+1.60H	11.11 psi	164.32 psi	0.06762	OK
+1.20D+1.60Lr+L+1.60H	6.94 psi	164.32 psi	0.04226	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+1.60S+1.60H	6.94 psi	164.32 psi	0.04226	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+L+W+1.60H	6.94 psi	164.32 psi	0.04226	OK
+1.20D+L+0.50S+W+1.60H	6.94 psi	164.32 psi	0.04226	OK
+0.90D+W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+0.20S+E+1.60H	6.94 psi	164.32 psi	0.04226	OK
+0.90D+E+0.90H	0.00 psi	164.32 psi	0	OK

General Footing

Lic. # : KW-06004293 — DHP ENGINEERING

DESCRIPTION: F2.0

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

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

Increases based on footing Depth

Footing base depth below soil surface	=	1.0	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

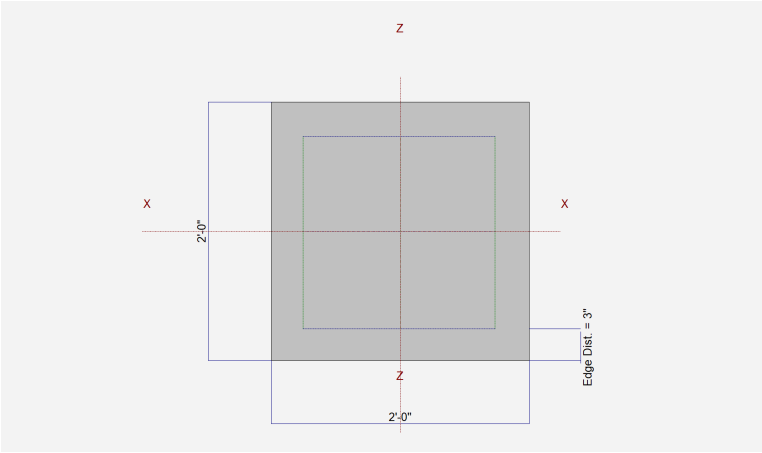
Width parallel to X-X Axis	=	2.0	ft
Length parallel to Z-Z Axis	=	2.0	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0	in

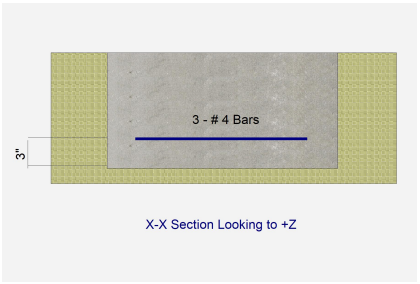


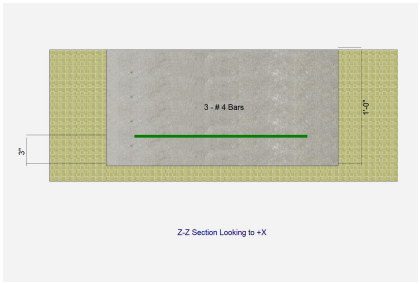
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		3.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		3.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=			5.30					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

DESCRIPTION: F2.0

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.980	Soil Bearing	1.470 ksf	1.50 ksf	+D+L+H about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.09019	Z Flexure (+X)	1.060 k-ft/ft	11.753 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.09019	Z Flexure (-X)	1.060 k-ft/ft	11.753 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.09019	X Flexure (+Z)	1.060 k-ft/ft	11.753 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.09019	X Flexure (-Z)	1.060 k-ft/ft	11.753 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05734	1-way Shear (+X)	4.711 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05734	1-way Shear (-X)	4.711 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05734	1-way Shear (+Z)	4.711 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.05734	1-way Shear (-Z)	4.711 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1363	2-way Punching	22.393 psi	164.317 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, +D+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+L+H	1.50	n/a	0.0	1.470	1.470	n/a	n/a	0.980
X-X, +D+Lr+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+S+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.139	1.139	n/a	n/a	0.759
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.139	1.139	n/a	n/a	0.759
X-X, +D+0.60W+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.139	1.139	n/a	n/a	0.759
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	1.139	1.139	n/a	n/a	0.759
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.139	1.139	n/a	n/a	0.759
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.470	1.470	0.980
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.139	1.139	0.759
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.139	1.139	0.759
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.139	1.139	0.759
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.139	1.139	0.759
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.139	1.139	0.759
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058

Overturning Stability

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

Sliding Stability

All units k

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

General Footing

Lic. # : KW-06004293 DHP ENGINEERING

DESCRIPTION: F2.0

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.40D+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.060	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.060	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.060	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.060	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.6625	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60Lr+L+1.60H	0.6625	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+L+1.60S+1.60H	0.6625	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+L+1.60S+1.60H	0.6625	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.6625	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	0.6625	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.6625	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+L+0.50S+W+1.60H	0.6625	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +0.90D+W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +0.90D+W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+L+0.20S+E+1.60H	0.6625	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +1.20D+L+0.20S+E+1.60H	0.6625	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +0.90D+E+0.90H	0.0	+Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
X-X, +0.90D+E+0.90H	0.0	-Z	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.40D+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.40D+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.060	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.060	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.060	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.060	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.6625	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	0.6625	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+L+1.60S+1.60H	0.6625	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+L+1.60S+1.60H	0.6625	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.6625	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	0.6625	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.6625	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	0.6625	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +0.90D+W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +0.90D+W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	0.6625	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	0.6625	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +0.90D+E+0.90H	0.0	-X	Bottom	0.2592	Min Temp %	0.30	11.753	OK
Z-Z, +0.90D+E+0.90H	0.0	+X	Bottom	0.2592	Min Temp %	0.30	11.753	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	4.71 psi	4.71 psi	4.71 psi	4.71 psi	4.71 psi	82.16 psi	0.06	OK
+1.20D+1.60L+0.50S+1.60H	4.71 psi	4.71 psi	4.71 psi	4.71 psi	4.71 psi	82.16 psi	0.06	OK
+1.20D+1.60Lr+L+1.60H	2.94 psi	2.94 psi	2.94 psi	2.94 psi	2.94 psi	82.16 psi	0.04	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+1.60S+1.60H	2.94 psi	2.94 psi	2.94 psi	2.94 psi	2.94 psi	82.16 psi	0.04	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+L+W+1.60H	2.94 psi	2.94 psi	2.94 psi	2.94 psi	2.94 psi	82.16 psi	0.04	OK
+1.20D+L+0.50S+W+1.60H	2.94 psi	2.94 psi	2.94 psi	2.94 psi	2.94 psi	82.16 psi	0.04	OK
+0.90D+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+0.20S+E+1.60H	2.94 psi	2.94 psi	2.94 psi	2.94 psi	2.94 psi	82.16 psi	0.04	OK

General Footing

DESCRIPTION: F2.0

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
Two-Way "Punching" Shear							All units k	

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	22.39 psi	164.32 psi	0.1363	OK
+1.20D+1.60L+0.50S+1.60H	22.39 psi	164.32 psi	0.1363	OK
+1.20D+1.60Lr+L+1.60H	14.00 psi	164.32 psi	0.08518	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+1.60S+1.60H	14.00 psi	164.32 psi	0.08518	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+L+W+1.60H	14.00 psi	164.32 psi	0.08518	OK
+1.20D+L+0.50S+W+1.60H	14.00 psi	164.32 psi	0.08518	OK
+0.90D+W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+0.20S+E+1.60H	14.00 psi	164.32 psi	0.08518	OK
+0.90D+E+0.90H	0.00 psi	164.32 psi	0	OK

General Footing

Lic. # : KW-06004293 — DHP ENGINEERING

DESCRIPTION: F2.5

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

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

Increases based on footing Depth

Footing base depth below soil surface	=	1.0	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

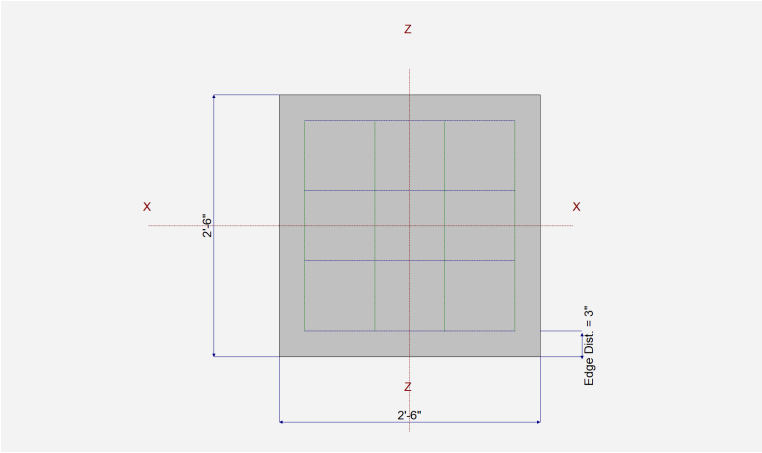
Width parallel to X-X Axis	=	2.50	ft
Length parallel to Z-Z Axis	=	2.50	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0	in

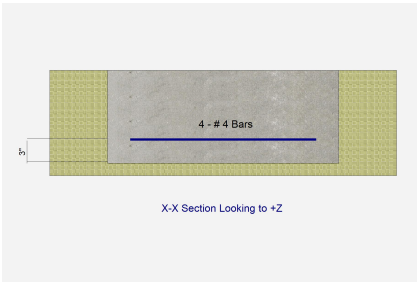


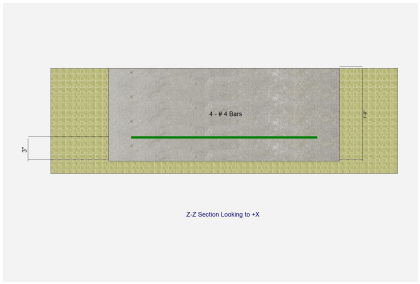
Reinforcing

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

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	
	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=			8.30					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

DESCRIPTION: F2.5

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9820	Soil Bearing	1.473 ksf	1.50 ksf	+D+L+H about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1327	Z Flexure (+X)	1.660 k-ft/ft	12.508 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1327	Z Flexure (-X)	1.660 k-ft/ft	12.508 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1327	X Flexure (+Z)	1.660 k-ft/ft	12.508 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1327	X Flexure (-Z)	1.660 k-ft/ft	12.508 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1197	1-way Shear (+X)	9.837 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1197	1-way Shear (-X)	9.837 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1197	1-way Shear (+Z)	9.837 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1197	1-way Shear (-Z)	9.837 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2270	2-way Punching	37.299 psi	164.317 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, +D+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+L+H	1.50	n/a	0.0	1.473	1.473	n/a	n/a	0.982
X-X, +D+Lr+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+S+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.141	1.141	n/a	n/a	0.761
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.141	1.141	n/a	n/a	0.761
X-X, +D+0.60W+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.141	1.141	n/a	n/a	0.761
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	1.141	1.141	n/a	n/a	0.761
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.141	1.141	n/a	n/a	0.761
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.473	1.473	0.982
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.141	1.141	0.761
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.141	1.141	0.761
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.141	1.141	0.761
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.141	1.141	0.761
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.141	1.141	0.761
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058

Overturning Stability

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

Sliding Stability

All units k

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

General Footing

DESCRIPTION: F2.5

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.40D+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.660	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.660	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.660	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.660	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60Lr+L+1.60H	1.038	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60Lr+L+1.60H	1.038	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+L+1.60S+1.60H	1.038	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+L+1.60S+1.60H	1.038	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	1.038	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	1.038	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+L+0.50S+W+1.60H	1.038	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+L+0.50S+W+1.60H	1.038	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +0.90D+W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +0.90D+W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+L+0.20S+E+1.60H	1.038	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +1.20D+L+0.20S+E+1.60H	1.038	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +0.90D+E+0.90H	0.0	+Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
X-X, +0.90D+E+0.90H	0.0	-Z	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.40D+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.40D+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.660	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.660	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.660	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.660	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	1.038	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	1.038	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.038	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.038	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	1.038	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	1.038	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	1.038	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	1.038	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +0.90D+W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +0.90D+W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	1.038	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	1.038	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +0.90D+E+0.90H	0.0	-X	Bottom	0.2592	Min Temp %	0.320	12.508	OK
Z-Z, +0.90D+E+0.90H	0.0	+X	Bottom	0.2592	Min Temp %	0.320	12.508	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	9.84 psi	9.84 psi	9.84 psi	9.84 psi	9.84 psi	82.16 psi	0.12	OK
+1.20D+1.60L+0.50S+1.60H	9.84 psi	9.84 psi	9.84 psi	9.84 psi	9.84 psi	82.16 psi	0.12	OK
+1.20D+1.60Lr+L+1.60H	6.15 psi	6.15 psi	6.15 psi	6.15 psi	6.15 psi	82.16 psi	0.07	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+1.60S+1.60H	6.15 psi	6.15 psi	6.15 psi	6.15 psi	6.15 psi	82.16 psi	0.07	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+L+W+1.60H	6.15 psi	6.15 psi	6.15 psi	6.15 psi	6.15 psi	82.16 psi	0.07	OK
+1.20D+L+0.50S+W+1.60H	6.15 psi	6.15 psi	6.15 psi	6.15 psi	6.15 psi	82.16 psi	0.07	OK
+0.90D+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+0.20S+E+1.60H	6.15 psi	6.15 psi	6.15 psi	6.15 psi	6.15 psi	82.16 psi	0.07	OK

General Footing

DESCRIPTION: F2.5

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
Two-Way "Punching" Shear							All units k	

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	37.30 psi	164.32 psi	0.227	OK
+1.20D+1.60L+0.50S+1.60H	37.30 psi	164.32 psi	0.227	OK
+1.20D+1.60Lr+L+1.60H	23.31 psi	164.32 psi	0.1419	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+1.60S+1.60H	23.31 psi	164.32 psi	0.1419	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+L+W+1.60H	23.31 psi	164.32 psi	0.1419	OK
+1.20D+L+0.50S+W+1.60H	23.31 psi	164.32 psi	0.1419	OK
+0.90D+W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+0.20S+E+1.60H	23.31 psi	164.32 psi	0.1419	OK
+0.90D+E+0.90H	0.00 psi	164.32 psi	0	OK

General Footing

Lic. # : KW-06004293 DHP ENGINEERING

DESCRIPTION: F3.0

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

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

Increases based on footing Depth

Footing base depth below soil surface	=	1.0	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

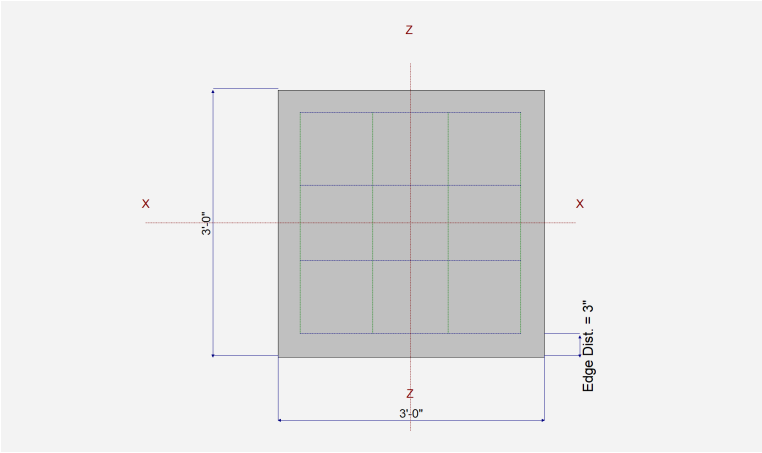
Width parallel to X-X Axis	=	3.0	ft
Length parallel to Z-Z Axis	=	3.0	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0	in

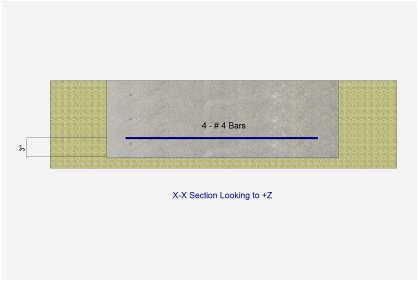


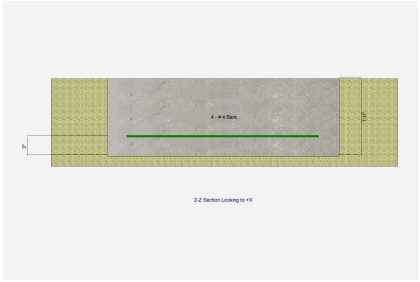
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		4.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		4.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=			12.0					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

DESCRIPTION: F3.0

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9853	Soil Bearing	1.478 ksf	1.50 ksf	+D+L+H about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2289	Z Flexure (+X)	2.40 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2289	Z Flexure (-X)	2.40 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2289	X Flexure (+Z)	2.40 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2289	X Flexure (-Z)	2.40 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1803	1-way Shear (+X)	14.815 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1803	1-way Shear (-X)	14.815 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1803	1-way Shear (+Z)	14.815 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1803	1-way Shear (-Z)	14.815 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3381	2-way Punching	55.556 psi	164.317 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, +D+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+L+H	1.50	n/a	0.0	1.478	1.478	n/a	n/a	0.985
X-X, +D+Lr+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+S+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +D+0.60W+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.145	1.145	n/a	n/a	0.763
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.478	1.478	0.985
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.145	1.145	0.763
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058

Overturning Stability

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

All units k

Sliding Stability

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

General Footing

DESCRIPTION: F3.0

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.40D+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	2.40	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	2.40	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60L+0.50S+1.60H	2.40	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60L+0.50S+1.60H	2.40	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+L+1.60H	1.50	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+L+1.60H	1.50	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+1.60S+1.60H	1.50	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+1.60S+1.60H	1.50	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	1.50	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	1.50	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.50S+W+1.60H	1.50	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.50S+W+1.60H	1.50	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.20S+E+1.60H	1.50	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +1.20D+L+0.20S+E+1.60H	1.50	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+E+0.90H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
X-X, +0.90D+E+0.90H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.40D+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.40D+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	2.40	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	2.40	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	2.40	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	2.40	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	1.50	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	1.50	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.50	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+1.60S+1.60H	1.50	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	1.50	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	1.50	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	1.50	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	1.50	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	1.50	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	1.50	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+E+0.90H	0.0	-X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK
Z-Z, +0.90D+E+0.90H	0.0	+X	Bottom	0.2592	Min Temp %	0.2667	10.486	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	14.82 psi	14.82 psi	14.82 psi	14.82 psi	14.82 psi	82.16 psi	0.18	OK
+1.20D+1.60L+0.50S+1.60H	14.82 psi	14.82 psi	14.82 psi	14.82 psi	14.82 psi	82.16 psi	0.18	OK
+1.20D+1.60Lr+L+1.60H	9.26 psi	9.26 psi	9.26 psi	9.26 psi	9.26 psi	82.16 psi	0.11	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+1.60S+1.60H	9.26 psi	9.26 psi	9.26 psi	9.26 psi	9.26 psi	82.16 psi	0.11	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+L+W+1.60H	9.26 psi	9.26 psi	9.26 psi	9.26 psi	9.26 psi	82.16 psi	0.11	OK
+1.20D+L+0.50S+W+1.60H	9.26 psi	9.26 psi	9.26 psi	9.26 psi	9.26 psi	82.16 psi	0.11	OK
+0.90D+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+0.20S+E+1.60H	9.26 psi	9.26 psi	9.26 psi	9.26 psi	9.26 psi	82.16 psi	0.11	OK

General Footing

DESCRIPTION: F3.0

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
Two-Way "Punching" Shear							All units k	

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	55.56 psi	164.32 psi	0.3381	OK
+1.20D+1.60L+0.50S+1.60H	55.56 psi	164.32 psi	0.3381	OK
+1.20D+1.60Lr+L+1.60H	34.72 psi	164.32 psi	0.2113	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+1.60S+1.60H	34.72 psi	164.32 psi	0.2113	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+L+W+1.60H	34.72 psi	164.32 psi	0.2113	OK
+1.20D+L+0.50S+W+1.60H	34.72 psi	164.32 psi	0.2113	OK
+0.90D+W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+0.20S+E+1.60H	34.72 psi	164.32 psi	0.2113	OK
+0.90D+E+0.90H	0.00 psi	164.32 psi	0	OK

General Footing

Lic. # : KW-06004293 DHP ENGINEERING

DESCRIPTION: F3.5

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

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

Increases based on footing Depth

Footing base depth below soil surface	=	1.0	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

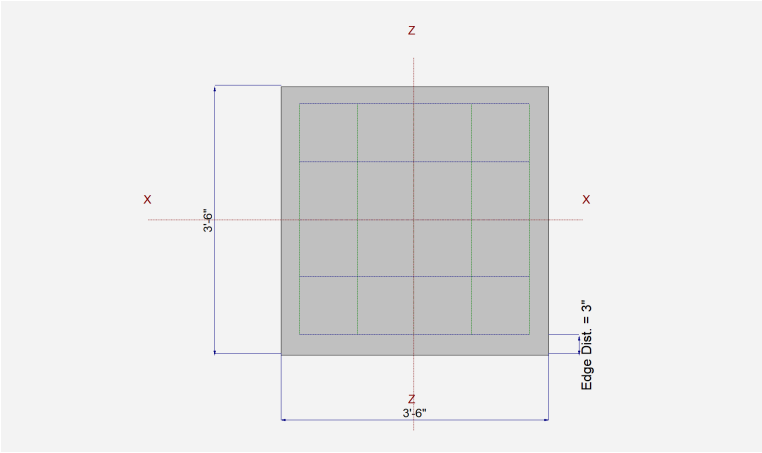
Width parallel to X-X Axis	=	3.50	ft
Length parallel to Z-Z Axis	=	3.50	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0	in

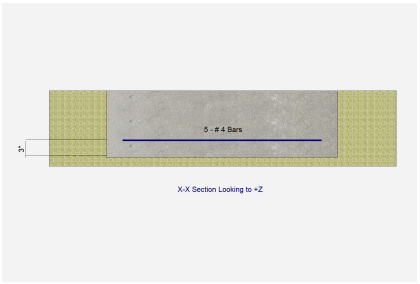


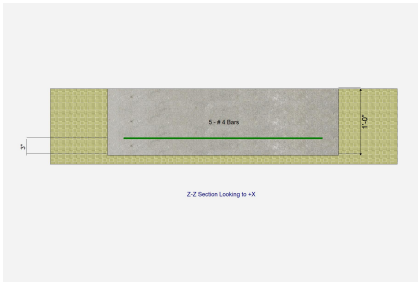
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		5.0
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		5.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	
	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=			16.30					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

Lic. # : KW-06004293 DHP ENGINEERING

DESCRIPTION: F3.5

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9840	Soil Bearing	1.476 ksf	1.50 ksf	+D+L+H about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2908	Z Flexure (+X)	3.260 k-ft/ft	11.211 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2908	Z Flexure (-X)	3.260 k-ft/ft	11.211 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2908	X Flexure (+Z)	3.260 k-ft/ft	11.211 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2908	X Flexure (-Z)	3.260 k-ft/ft	11.211 k-ft/ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2435	1-way Shear (+X)	20.008 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2435	1-way Shear (-X)	20.008 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2435	1-way Shear (+Z)	20.008 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2435	1-way Shear (-Z)	20.008 psi	82.158 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.4662	2-way Punching	76.598 psi	164.317 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, +D+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+L+H	1.50	n/a	0.0	1.476	1.476	n/a	n/a	0.984
X-X, +D+Lr+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+S+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.143	1.143	n/a	n/a	0.762
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.143	1.143	n/a	n/a	0.762
X-X, +D+0.60W+H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.143	1.143	n/a	n/a	0.762
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	1.143	1.143	n/a	n/a	0.762
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
X-X, +D+0.70E+0.60H	1.50	n/a	0.0	0.1450	0.1450	n/a	n/a	0.097
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.143	1.143	n/a	n/a	0.762
X-X, +0.60D+0.70E+H	1.50	n/a	0.0	0.0870	0.0870	n/a	n/a	0.058
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.476	1.476	0.984
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.143	1.143	0.762
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.143	1.143	0.762
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.143	1.143	0.762
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.143	1.143	0.762
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058
Z-Z, +D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.1450	0.1450	0.097
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.143	1.143	0.762
Z-Z, +0.60D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.0870	0.0870	0.058

Overturning Stability

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

All units k

Sliding Stability

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

General Footing

DESCRIPTION: F3.5

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.40D+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	3.260	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	3.260	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60L+0.50S+1.60H	3.260	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60L+0.50S+1.60H	3.260	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60Lr+L+1.60H	2.038	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60Lr+L+1.60H	2.038	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+L+1.60S+1.60H	2.038	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+L+1.60S+1.60H	2.038	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	2.038	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	2.038	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+L+0.50S+W+1.60H	2.038	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+L+0.50S+W+1.60H	2.038	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +0.90D+W+1.60H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +0.90D+W+1.60H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+L+0.20S+E+1.60H	2.038	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +1.20D+L+0.20S+E+1.60H	2.038	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +0.90D+E+0.90H	0.0	+Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
X-X, +0.90D+E+0.90H	0.0	-Z	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.40D+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.40D+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	3.260	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	3.260	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	3.260	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	3.260	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	2.038	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	2.038	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+L+1.60S+1.60H	2.038	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+L+1.60S+1.60H	2.038	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	2.038	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	2.038	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	2.038	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	2.038	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +0.90D+W+1.60H	0.0	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +0.90D+W+1.60H	0.0	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	2.038	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	2.038	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +0.90D+E+0.90H	0.0	-X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK
Z-Z, +0.90D+E+0.90H	0.0	+X	Bottom	0.2592	Min Temp %	0.2857	11.211	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	20.01 psi	20.01 psi	20.01 psi	20.01 psi	20.01 psi	82.16 psi	0.24	OK
+1.20D+1.60L+0.50S+1.60H	20.01 psi	20.01 psi	20.01 psi	20.01 psi	20.01 psi	82.16 psi	0.24	OK
+1.20D+1.60Lr+L+1.60H	12.51 psi	12.51 psi	12.51 psi	12.51 psi	12.51 psi	82.16 psi	0.15	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+1.60S+1.60H	12.51 psi	12.51 psi	12.51 psi	12.51 psi	12.51 psi	82.16 psi	0.15	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+0.50Lr+L+W+1.60H	12.51 psi	12.51 psi	12.51 psi	12.51 psi	12.51 psi	82.16 psi	0.15	OK
+1.20D+L+0.50S+W+1.60H	12.51 psi	12.51 psi	12.51 psi	12.51 psi	12.51 psi	82.16 psi	0.15	OK
+0.90D+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK
+1.20D+L+0.20S+E+1.60H	12.51 psi	12.51 psi	12.51 psi	12.51 psi	12.51 psi	82.16 psi	0.15	OK

General Footing

DESCRIPTION: F3.5

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	82.16 psi	0.00	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	76.60 psi	164.32 psi	0.4662	OK
+1.20D+1.60L+0.50S+1.60H	76.60 psi	164.32 psi	0.4662	OK
+1.20D+1.60Lr+L+1.60H	47.87 psi	164.32 psi	0.2914	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+1.60S+1.60H	47.87 psi	164.32 psi	0.2914	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+0.50Lr+L+W+1.60H	47.87 psi	164.32 psi	0.2914	OK
+1.20D+L+0.50S+W+1.60H	47.87 psi	164.32 psi	0.2914	OK
+0.90D+W+1.60H	0.00 psi	164.32 psi	0	OK
+1.20D+L+0.20S+E+1.60H	47.87 psi	164.32 psi	0.2914	OK
+0.90D+E+0.90H	0.00 psi	164.32 psi	0	OK

TABLE 1B—ALLOWABLE TENSION LOADS AND DISPLACEMENTS FOR HDU SERIES HOLD-DOWN ASSEMBLIES[1,2,3,4]

HOLD-DOWN MODEL NO.	SDS SCREW SIZE (in)	ALLOWABLE TENSION LOADS[5], P_{all} (lbs) C_D = 1.33 or C_D = 1.6						DISPLACEMENT Δ AT MAXIMUM LOAD[8,9] (in.)	
		Wood Member Thickness[6] (in.)							
		3	3.5	4.5	5.5	7.25	5.5[7]	Δ_{all}	Δ_s
HDU2	1/4 x 1.5	1,810	1,810	1,810	1,810	1,810	1,810	0.069	0.090
	¼ x 2.5	3,075	3,075	3,075	3,075	3,075	3,075	0.088	0.118
HDU4	¼ x 1.5	3,105	3,105	3,105	3,105	3,105	3,105	0.083	0.108
	¼ x 2.5	4,565	4,565	4,565	4,565	4,565	4,565	0.114	0.154
HDU5	¼ x 1.5	3,960	3,960	3,960	3,960	3,960	3,960	0.109	0.142
	¼ x 2.5	5,645	5,670	5,670	5,670	5,670	5,670	0.115	0.158
HDU8	¼ x 1.5	5,980	5,980	5,980	5,980	5,980	5,980	0.087	0.115
	¼ x 2.5	6,765	6,970	7,870	7,870	7,870	7,870	0.113	0.161
HDU11	¼ x 2.5	—	—	—	9,535	11,175[10]	11,175	0.137	0.182
HDU14	¼ x 2.5	—	—	—	—	14,390[10]	14,445	0.172	0.239

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

[1]Tabulated allowable loads are for a hold-down assembly consisting of the hold-down device attached to a wood structural member with the size of SDS wood screws noted in the table. The quantity of SDS wood screws must comply with Table 1A.
[2]The allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C_D, corresponding with wind/earthquake loading in accordance with the NDS. No further increase is allowed.
[3]When using the basic load combinations in accordance with 2021 IBC Section 1605.1 (ASCE 7-16 Section 2.4) [2018, 2015, 2012 and 2009 IBC Section 1605.3.1], the tabulated allowable loads for the hold-down assembly must not be increased for wind of earthquake loading. When using the alternative basic load combinations in 2021 IBC Section 1605.2 [2018, 2015, 2012 and 2009 IBC Section 1605.3.2] that include wind or earthquake loads that tabulated allowable loads for the hold-down assembly must not be increased by 33 1/3 percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]Anchorage to concrete or masonry must be determined in accordance with Section 4.1.3 of this report.
[5]The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ_s deformations.
[6]The minimum thickness of the wood members (i.e., the dimension parallel to the long axis of the SDS wood screws) must be as indicated in the table above. The minimum width of the wood members must be 3 1/2 inches, except as noted.
[7]The minimum width of the wood members must be 5 1/2 inches (6x6 nominal).
[8]Tabulated displacement values, Δ_{all} and Δ_s, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation, at ASD-level and strength-level forces, respectively.
[9]Elongation of the hold-down anchor rod must be calculated when the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of this report, or the actual unbraced length is greater than 6 inches. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 6 inches to 18 inches above the concrete, an additional 0.010 inch may be added to the tabulated hold-down displacement at allowable load, Δ_{all}, and an additional 0.014 inch may be added to the tabulated hold-down displacement at strength-level load, Δ_s, to account for anchor rod elongation.
[10]Requires a heavy hex anchor nut to achieve tabulated tension loads.

TABLE 1C—ALLOWABLE TENSION LOADS AND DISPLACEMENTS OF HDU SERIES HOLD-DOWN CONNECTORS[1,2,3]

HOLD-DOWN MODEL NO.	ALLOWABLE TENSION LOAD, P_{all} (lbs)	DISPLACEMENT Δ AT MAX LOAD[4] (in)	
		Δ_{all}	Δ_s
HDU2	3,505	0.081	0.110
HDU4	4,990	0.089	0.117
HDU5	5,670	0.078	0.107
HDU8	9,950	0.131	0.164
HDU11	11,905	0.121	0.157
HDU14	15,905[5]	0.124	0.172

For **SI:** 1 inch = 25.4 mm, 1 lbs = 4.45 N.

[1]This table lists the allowable tensile strength of the steel hold-down connectors exclusive of fasteners and anchor rods when tested on a steel jig.
[2]Allowable tension loads are applicable for designs complying with Section 12.11.2.2.2 of ASCE 7.
[3]When using the basic load combinations in accordance with 2021 IBC Section 1605.1 (ASCE 7-16 Section 2.4) [2018, 2015, 2012 and 2009 IBC Section 1605.3.1], the tabulated allowable loads for the hold-down must not be increased for wind of earthquake loading. When using the alternative basic load combinations in 2021 IBC Section 1605.2 [2018, 2015, 2012 and 2009 IBC Section 1605.3.2] that include wind or earthquake loads that tabulated allowable loads for the hold-down must not be increased by 33 1/3 percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
[4]Δ_{all} is the displacement at the tabulated ASD load and Δ_S is displacement at the strength-level load. Tabulated displacement values in Table 1C consist only of deformation of the hold-down (tie-down) device when tested on a steel jig. Other variables contributing to total displacement, d_a, such as fastener slip, wood shrinkage, and anchor bolt/rod elongation, must be checked by the registered design professional. The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level loads associated with the tabulated strength-level deformations, Δ_S.
[5]Requires a heavy hex anchor nut to achieve tabulated tension loads.

HDU2_CIP

Nov 02 2020

1.Project Information

Company:
Project Engineer: Connor Kelly
Address: 32008 32nd Ave S Suite B Federal Way WA 98001
Phone: M: 2532200848
Email: connor@dhpengineering.com
Project Name: Untitled
Project Address: Untitled
Notes:

Tension loads derived using the published allowable tension loads of HDU series connectors per ICC ESR-2330 adjusted to strength level per Table 1C footnote 4. As this is the deliverable limit of the HDU connector assembly irrespective of fasteners and anchorage as noted in Table 1C footnote 1, option (c) of ACI 318-14 section 17.2.3.4.3 applies.

2.Selected Anchor Information

Selected Anchor : Headed Hex Bolt
Brand: Generic
Material: 5/8" Ø Threaded Bolt Hex Head ASTM F1554
Embedment,hnom: h_{ef} 3.312 in h_{nom} 3.75 in
Approval: - -
Issued/Revision: - -

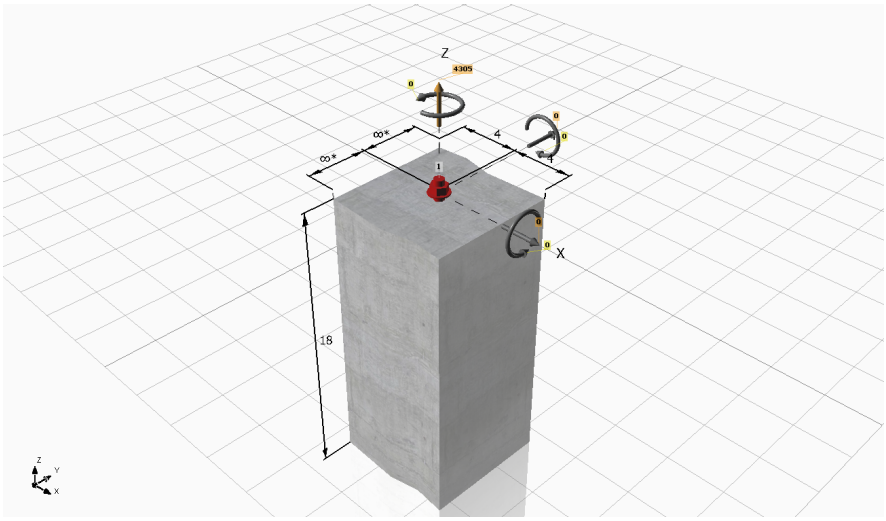
3.Design Principles

Design Method: ACI 318-14
Load Combinations: Section 5.3 User Defined Loads
Seismic Loading: Tension: 17.2.3.4.3(c) Shear: 17.2.3.5.3(b) Ω_o= User Defined

4.Base Material Information

Concrete:
Type: Cracked Normal Weight Concrete
Strength 3000 psi
Reinforcement:
Edge Reinforcement None or < #4 Rebar
Spacing Tension No (Condition B) Shear No (Condition B)
Controls Breakout Tension True Shear True
Base Plate:
Sizing Thickness 0 in Length 0 in Width 0 in
Standoff None Height 0 in
Strength 0 psi
Profile: None
Torqued Anchor Bolt:
Concrete Covers: Base Cover: 0.25 in End Cover: 0.25 in

5.Geometric Conditions



h_{min} 4.000 in c_{min} 0.782 in c_{ac} 4.968 in s_{min} 2.500 in

6.Summary Results

Tension Loading

Design Proof	Demand	(lb)	Capacity	(lb)	Utilization	Status	Critical
Steel Strength	4305.00		9831.00		0.438	OK	
Concrete Breakout Strength	0.00		0.00		0.000	OK	
Pullout Strength	4305.00		5725.00		0.752	OK	Controls

Shear Loading

Design Proof	Demand	(lb)	Capacity	(lb)	Utilization	Status	Critical
Steel Strength	0.00		0.00		0.000	OK	Controls
Concrete Breakout Strength						OK	
Pryout Strength	0.00		0.00		0.000	OK	

7.Warnings and Remarks

ANCHOR DESIGN CRITERIA IS SATISFIED

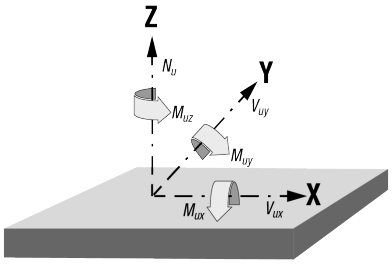
- The results of the calculations carried out by means of the DDA Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an design professional/engineer, particularly with regard to compliance with applicable standards, norms and permits, prior to using them for your specific project. The DDA Software serves only as an aid to interpret standards, norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- Calculations including seismic design requirements in accordance with ACI 318 are required for anchors in structures assigned to seismic design categories C, D, E and F.
- Under these seismic conditions, the direction of shear may not be predictable. In accordance with ACI 318 the full shear force should be assumed also in reverse direction for a safe design. Load reversal may influence the direction of the controlling concrete breakout strength.

8.Load Condition

Design Loads / Actions

Nu	4305	lb	Vux	0	lb	Vuy	0	lb
Muz	0	in-lb	Mux	0	in-lb	Muy	0	in-lb

Consider Load Reversal X Direction 100% Y Direction 100%



9.Load Distribution

Max. concrete compressive strain: 0.000 %

Max. concrete compressive stress: 0.000 psi

Anchor Eccentricity

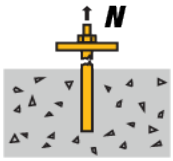
ex 0 in ey 0 in

Resulting anchor forces / Load distribution

Anchor	Tension Load (lb)	Shear Load (lb)	Component Shear Load (lb)		Anchor Coordinates (in)	
			Shear X	Shear Y	X	Y
1	4305.00	0.0	0.0	0.0	0.000	0.000

10.Design Proof Tension Loading

Steel Strength



ACI 318-14 17.4.1

Variables

N_{sa} (lb)	φ
13108.125	0.75

Results

φN_{sa}	=	9831.0	lb	Table 17.3.1.1
N_{ua}	=	4305.0	lb	
Utilization	=	43.8%		

Pullout Strength:

ACI 318-14 17.4.3

Equations

$N_{pn} = \Psi_{c,P} \cdot N_p$ Eqn. 17.4.3.1

$N_p = 8 \cdot A_{brg} \cdot f'_c$ Eqn. 17.4.3.4

Variables

$\Psi_{c,P}$	A_{brg} (in²)	f'_c (psi)	φ	φs_{eis}
1.000	0.454	3000	0.70	0.750

Results

φN_{pn}	=	5725	lb
N_{ua}	=	4305	lb
Utilization	=	75.2%	

Table 17.3.1.1

12.Interaction of Tension and Shear Loads

Reference

ACI 318-14 17.6

Equations

$$(((N_{ua} / \varphi . N_n) + (V_{ua} / \varphi . V_n)) / 1.2) <= 1.0$$ Eqn. 17.6.3

Variables

$N_{ua} / \varphi \cdot N_n$	$V_{ua} / \varphi \cdot V_n$
0.752	0.000

Results

0.752	≤	1.0
Status	:	OK

ANCHOR DESIGN CRITERIA IS SATISFIED

DEWALT DESIGN ASSIST 1.5.2.0

HDU4 and HDU5_CIP

Nov 02 2020

1.Project Information

Company:

Project Engineer: Connor Kelly

Address: 32008 32nd Ave S Suite B Federal Way WA 98001

Phone: M: 2532200848

Email: connor@dhpengineering.com

Project Name: Untitled

Project Address: Untitled

Notes:

Tension loads derived using the published allowable tension loads of HDU series connectors per ICC ESR-2330 adjusted to strength level per Table 1C footnote 4. As this is the deliverable limit of the HDU connector assembly irrespective of fasteners and anchorage as noted in Table 1C footnote 1, option (c) of ACI 318-14 section 17.2.3.4.3 applies.

2.Selected Anchor Information

Selected Anchor : Headed Heavy Hex Bolt

Brand: Generic

Material: 5/8" Ø Threaded Bolt Heavy Hex Head
ASTM F1554

Embedment,hnom: h_{ef} 3.312 in h_{nom} 3.75 in

Approval: - -

Issued/Revision: - -

3.Design Principles

Design Method: ACI 318-14

Load Combinations: Section 5.3 User Defined Loads

Seismic Loading: Tension: 17.2.3.4.3(c) Shear: 17.2.3.5.3(b) Ω_o= User Defined

4.Base Material Information

Concrete:

Type:	Cracked	Normal Weight Concrete					
Strength	3000	psi					

Reinforcement:

Edge Reinforcement	None or < #4 Rebar						
Spacing	Tension	No (Condition B)		Shear		No (Condition B)	
Controls Breakout	Tension	True		Shear		True	

Base Plate:

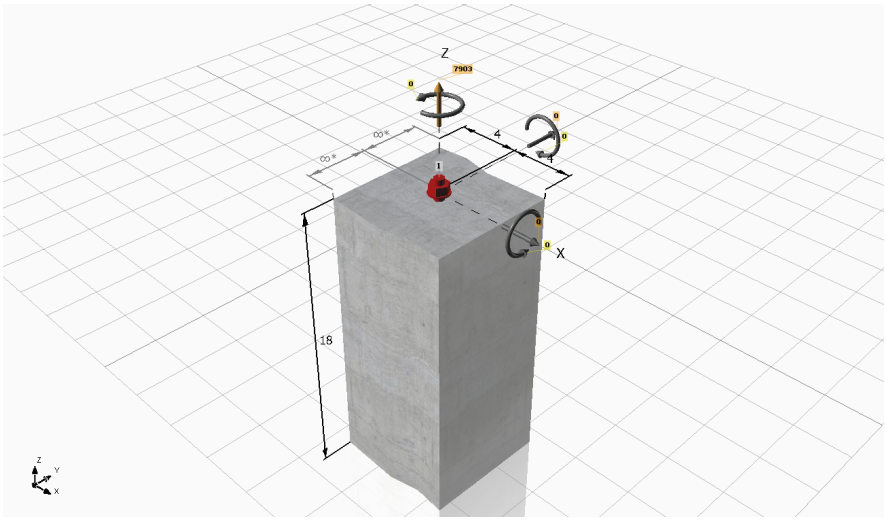
Sizing	Thickness	0	in	Length	0	in	Width	0	in
Standoff	None			Height	0	in			
Strength	0	psi							

Profile: None

Torqued Anchor Bolt:

Concrete Covers: Base Cover: 0.25 in End Cover: 0.25 in

5.Geometric Conditions



h_{min} 4.000 in c_{min} 0.875 in c_{ac} 4.968 in s_{min} 2.500 in

6.Summary Results

Tension Loading

Design Proof	Demand (lb)	Capacity (lb)	Utilization	Status	Critical
Steel Strength	7903.00	9831.00	0.804	OK	
Concrete Breakout Strength	0.00	0.00	0.000	OK	
Pullout Strength	7903.00	8442.00	0.936	OK	Controls

Shear Loading

Design Proof	Demand (lb)	Capacity (lb)	Utilization	Status	Critical
Steel Strength	0.00	0.00	0.000	OK	Controls
Concrete Breakout Strength				OK	
Pryout Strength	0.00	0.00	0.000	OK	

7.Warnings and Remarks

ANCHOR DESIGN CRITERIA IS SATISFIED

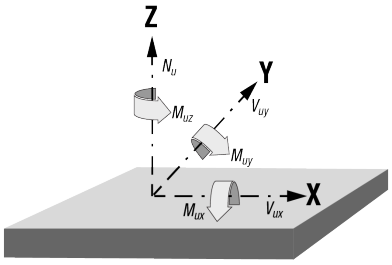
- The results of the calculations carried out by means of the DDA Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an design professional/engineer, particularly with regard to compliance with applicable standards, norms and permits, prior to using them for your specific project. The DDA Software serves only as an aid to interpret standards, norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- Calculations including seismic design requirements in accordance with ACI 318 are required for anchors in structures assigned to seismic design categories C, D, E and F.
- Under these seismic conditions, the direction of shear may not be predictable. In accordance with ACI 318 the full shear force should be assumed also in reverse direction for a safe design. Load reversal may influence the direction of the controlling concrete breakout strength.

8.Load Condition

Design Loads / Actions

Nu	7903	lb	Vux	0	lb	Vuy	0	lb
Muz	0	in-lb	Mux	0	in-lb	Muy	0	in-lb

Consider Load Reversal X Direction 100% Y Direction 100%



9.Load Distribution

Max. concrete compressive strain: 0.000 %

Max. concrete compressive stress: 0.000 psi

Anchor Eccentricity

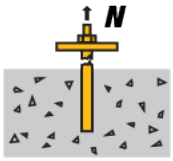
ex 0 in ey 0 in

Resulting anchor forces / Load distribution

Anchor	Tension Load (lb)	Shear Load (lb)	Component Shear Load (lb)		Anchor Coordinates (in)	
			Shear X	Shear Y	X	Y
1	7903.00	0.0	0.0	0.0	0.000	0.000

10.Design Proof Tension Loading

Steel Strength



ACI 318-14 17.4.1

Variables

N_{sa} (lb)	φ
13108.125	0.75

Results

φN_{sa}	=	9831.0	lb	Table 17.3.1.1
N_{ua}	=	7903.0	lb	
Utilization	=	80.4%		

Pullout Strength:

ACI 318-14 17.4.3

Equations

$N_{pn} = \Psi_{c,P} \cdot N_p$ Eqn. 17.4.3.1

$N_p = 8 \cdot A_{brg} \cdot f'_c$ Eqn. 17.4.3.4

Variables

$\Psi_{c,P}$	A_{brg} (in²)	f'_c (psi)	φ	φs_{eis}
1.000	0.670	3000	0.70	0.750

Results

φN_{pn}	=	8442	lb
N_{ua}	=	7903	lb
Utilization	=	93.6%	

Table 17.3.1.1

12.Interaction of Tension and Shear Loads

Reference

ACI 318-14 17.6

Equations

$$(((N_{ua} / \varphi . N_n) + (V_{ua} / \varphi . V_n)) / 1.2) <= 1.0$$ Eqn. 17.6.3

Variables

$N_{ua} / \varphi \cdot N_n$	$V_{ua} / \varphi \cdot V_n$
0.936	0.000

Results

0.936	≤	1.0
Status	:	OK

ANCHOR DESIGN CRITERIA IS SATISFIED

DEWALT DESIGN ASSIST 1.5.2.0

HDU8_CIP

Nov 02 2020

1.Project Information

Company:

Project Engineer: Connor Kelly

Address: 32008 32nd Ave S Suite B Federal Way WA 98001

Phone: M: 2532200848

Email: connor@dhpengineering.com

Project Name: Untitled

Project Address: Untitled

Notes:

Tension loads derived using the published allowable tension loads of HDU series connectors per ICC ESR-2330 adjusted to strength level per Table 1C footnote 4. As this is the deliverable limit of the HDU connector assembly irrespective of fasteners and anchorage as noted in Table 1C footnote 1, option (c) of ACI 318-14 section 17.2.3.4.3 applies.

2.Selected Anchor Information

Selected Anchor : Headed Heavy Hex Bolt

Brand: Generic

Material: 7/8" Ø Threaded Bolt Heavy Hex Head
ASTM F1554

Embedment,hnom: h_{ef} 5.187 in h_{nom} 5.75 in

Approval: - -

Issued/Revision: - -

3.Design Principles

Design Method: ACI 318-14

Load Combinations: Section 5.3 User Defined Loads

Seismic Loading: Tension: 17.2.3.4.3(c) Shear: 17.2.3.5.3(b) Ω_o= User Defined

4.Base Material Information

Concrete:

Type:	Cracked	Normal Weight Concrete					
Strength	3000	psi					

Reinforcement:

Edge Reinforcement	None or < #4 Rebar						
Spacing	Tension	No (Condition B)		Shear		No (Condition B)	
Controls Breakout	Tension	True		Shear		True	

Base Plate:

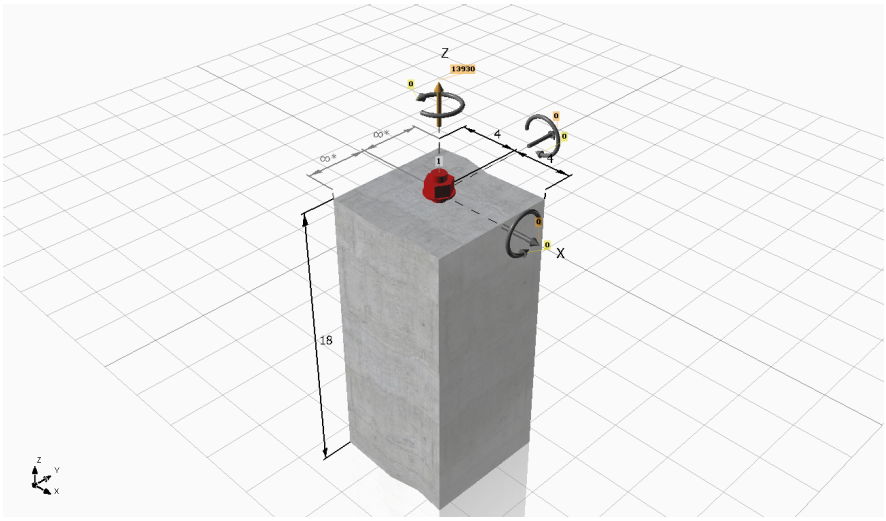
Sizing	Thickness	0	in	Length	0	in	Width	0	in
Standoff	None			Height	0	in			
Strength	0	psi							

Profile: None

Torqued Anchor Bolt:

Concrete Covers: Base Cover: 0.25 in End Cover: 0.25 in

5.Geometric Conditions



h_{min} 6.000 in c_{min} 1.094 in c_{ac} 7.781 in s_{min} 3.500 in

6.Summary Results

Tension Loading

Design Proof	Demand	(lb)	Capacity	(lb)	Utilization	Status	Critical
Steel Strength	13930.00		20085.00		0.694	OK	
Concrete Breakout Strength	0.00		0.00		0.000	OK	
Pullout Strength	13930.00		14972.00		0.930	OK	Controls

Shear Loading

Design Proof	Demand	(lb)	Capacity	(lb)	Utilization	Status	Critical
Steel Strength	0.00		0.00		0.000	OK	Controls
Concrete Breakout Strength						OK	
Pryout Strength	0.00		0.00		0.000	OK	

7.Warnings and Remarks

ANCHOR DESIGN CRITERIA IS SATISFIED

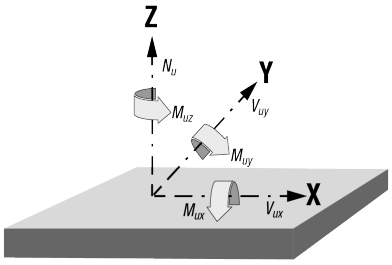
- The results of the calculations carried out by means of the DDA Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an design professional/engineer, particularly with regard to compliance with applicable standards, norms and permits, prior to using them for your specific project. The DDA Software serves only as an aid to interpret standards, norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- Calculations including seismic design requirements in accordance with ACI 318 are required for anchors in structures assigned to seismic design categories C, D, E and F.
- Under these seismic conditions, the direction of shear may not be predictable. In accordance with ACI 318 the full shear force should be assumed also in reverse direction for a safe design. Load reversal may influence the direction of the controlling concrete breakout strength.

8.Load Condition

Design Loads / Actions

Nu	13930	lb	Vux	0	lb	Vuy	0	lb
Muz	0	in-lb	Mux	0	in-lb	Muy	0	in-lb

Consider Load Reversal X Direction 100% Y Direction 100%



9.Load Distribution

Max. concrete compressive strain: 0.000 %
Max. concrete compressive stress: 0.000 psi

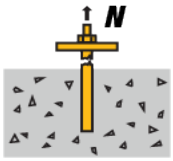
Anchor Eccentricity
ex 0 in ey 0 in

Resulting anchor forces / Load distribution

Anchor	Tension Load (lb)	Shear Load (lb)	Component Shear Load (lb)		Anchor Coordinates (in)	
			Shear X	Shear Y	X	Y
1	13930.00	0.0	0.0	0.0	0.000	0.000

10.Design Proof Tension Loading

Steel Strength



ACI 318-14 17.4.1

Variables

N_{sa} (lb)	φ
26780.592	0.75

Results

φN_{sa}	=	20085.0	lb	Table 17.3.1.1
N_{ua}	=	13930.0	lb	
Utilization	=	69.4%		

Pullout Strength:

ACI 318-14 17.4.3

Equations

$N_{pn} = \Psi_{c,P} \cdot N_p$ Eqn. 17.4.3.1

$N_p = 8 \cdot A_{brg} \cdot f'_c$ Eqn. 17.4.3.4

Variables

$\Psi_{c,P}$	A_{brg} (in²)	f'_c (psi)	φ	φs_{eis}
1.000	1.188	3000	0.70	0.750

Results

φN_{pn}	=	14972	lb
N_{ua}	=	13930	lb
Utilization	=	93.0%	

Table 17.3.1.1

12.Interaction of Tension and Shear Loads

Reference

ACI 318-14 17.6

Equations

$$(((N_{ua} / \varphi . N_n) + (V_{ua} / \varphi . V_n)) / 1.2) <= 1.0$$ Eqn. 17.6.3

Variables

$N_{ua} / \varphi \cdot N_n$	$V_{ua} / \varphi \cdot V_n$
0.930	0.000

Results

0.930	≤	1.0
Status	:	OK

ANCHOR DESIGN CRITERIA IS SATISFIED

DEWALT DESIGN ASSIST 1.5.2.0

HDU11_CIP

Nov 02 2020

1.Project Information

Company:

Project Engineer: Connor Kelly

Address: 32008 32nd Ave S Suite B Federal Way WA 98001

Phone: M: 2532200848

Email: connor@dhpengineering.com

Project Name: Untitled

Project Address: Untitled

Notes:

Tension loads derived using the published allowable tension loads of HDU series connectors per ICC ESR-2330 adjusted to strength level per Table 1C footnote 4. As this is the deliverable limit of the HDU connector assembly irrespective of fasteners and anchorage as noted in Table 1C footnote 1, option (c) of ACI 318-14 section 17.2.3.4.3 applies.

2.Selected Anchor Information

Selected Anchor : Headed Heavy Hex Bolt

Brand: Generic

Material: 1" Ø Threaded Bolt Heavy Hex Head ASTM F1554

Embedment,hnom: h_{ef} 5.062 in h_{nom} 5.75 in

Approval: - -

Issued/Revision: - -

3.Design Principles

Design Method: ACI 318-14

Load Combinations: Section 5.3 User Defined Loads

Seismic Loading: Tension: 17.2.3.4.3(c) Shear: 17.2.3.5.3(b) Ω_o= User Defined

4.Base Material Information

Concrete:

Type:	Cracked	Normal Weight Concrete					
Strength	3000	psi					

Reinforcement:

Edge Reinforcement	None or < #4 Rebar						
Spacing	Tension	No (Condition B)		Shear		No (Condition B)	
Controls Breakout	Tension	True		Shear		True	

Base Plate:

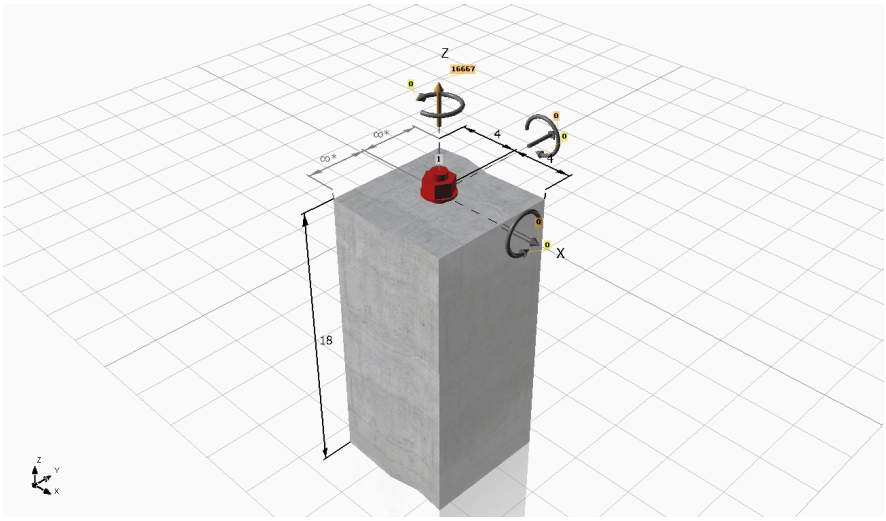
Sizing	Thickness	0	in	Length	0	in	Width	0	in
Standoff	None			Height	0	in			
Strength	0	psi							

Profile: None

Torqued Anchor Bolt:

Concrete Covers: Base Cover: 0.25 in End Cover: 0.25 in

5.Geometric Conditions



h_{min} 6.000 in c_{min} 1.188 in c_{ac} 7.593 in s_{min} 4.000 in

6.Summary Results

Tension Loading

Design Proof	Demand (lb)	Capacity (lb)	Utilization	Status	Critical
Steel Strength	16667.00	26350.00	0.633	OK	
Concrete Breakout Strength	0.00	0.00	0.000	OK	
Pullout Strength	16667.00	18918.00	0.881	OK	Controls

Shear Loading

Design Proof	Demand (lb)	Capacity (lb)	Utilization	Status	Critical
Steel Strength	0.00	0.00	0.000	OK	Controls
Concrete Breakout Strength				OK	
Pryout Strength	0.00	0.00	0.000	OK	

7.Warnings and Remarks

ANCHOR DESIGN CRITERIA IS SATISFIED

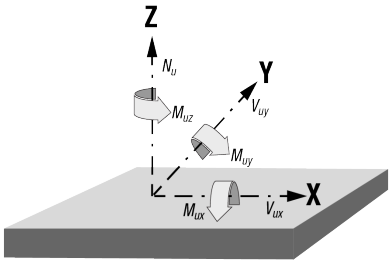
- The results of the calculations carried out by means of the DDA Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an design professional/engineer, particularly with regard to compliance with applicable standards, norms and permits, prior to using them for your specific project. The DDA Software serves only as an aid to interpret standards, norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- Calculations including seismic design requirements in accordance with ACI 318 are required for anchors in structures assigned to seismic design categories C, D, E and F.
- Under these seismic conditions, the direction of shear may not be predictable. In accordance with ACI 318 the full shear force should be assumed also in reverse direction for a safe design. Load reversal may influence the direction of the controlling concrete breakout strength.

8.Load Condition

Design Loads / Actions

Nu	16667	lb	Vux	0	lb	Vuy	0	lb
Muz	0	in-lb	Mux	0	in-lb	Muy	0	in-lb

Consider Load Reversal X Direction 100% Y Direction 100%



9.Load Distribution

Max. concrete compressive strain: 0.000 %

Max. concrete compressive stress: 0.000 psi

Anchor Eccentricity

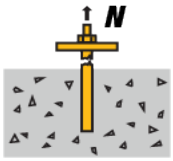
ex 0 in ey 0 in

Resulting anchor forces / Load distribution

Anchor	Tension Load (lb)	Shear Load (lb)	Component Shear Load (lb)		Anchor Coordinates (in)	
			Shear X	Shear Y	X	Y
1	16667.00	0.0	0.0	0.0	0.000	0.000

10.Design Proof Tension Loading

Steel Strength



ACI 318-14 17.4.1

Variables

N_{sa} (lb)	φ
35133.233	0.75

Results

φN_{sa}	=	26350.0	lb	Table 17.3.1.1
N_{ua}	=	16667.0	lb	
Utilization	=	63.3%		

Pullout Strength:

ACI 318-14 17.4.3

Equations

$N_{pn} = \Psi_{c,P} \cdot N_p$ Eqn. 17.4.3.1

$N_p = 8 \cdot A_{brg} \cdot f'_c$ Eqn. 17.4.3.4

Variables

$\Psi_{c,P}$	A_{brg} (in²)	f'_c (psi)	φ	φs_{eis}
1.000	1.501	3000	0.70	0.750

Results

φN_{pn}	=	18918	lb
N_{ua}	=	16667	lb
Utilization	=	88.1%	

Table 17.3.1.1

12.Interaction of Tension and Shear Loads

Reference

ACI 318-14 17.6

Equations

$$(((N_{ua} / \varphi . N_n) + (V_{ua} / \varphi . V_n)) / 1.2) <= 1.0 \quad \text{Eqn. 17.6.3}$$

Variables

$N_{ua} / \varphi \cdot N_n$	$V_{ua} / \varphi \cdot V_n$
0.881	0.000

Results

0.881	≤	1.0
Status	:	OK

ANCHOR DESIGN CRITERIA IS SATISFIED

DEWALT DESIGN ASSIST 1.5.2.0

HDU14 and HD12_CIP

Nov 02 2020

1.Project Information

Company:

Project Engineer: Connor Kelly

Address: 32008 32nd Ave S Suite B Federal Way WA 98001

Phone: M: 2532200848

Email: connor@dhpengineering.com

Project Name: Untitled

Project Address: Untitled

Notes:

Tension loads derived using the published allowable tension loads of HDU series connectors per ICC ESR-2330 adjusted to strength level per Table 1C footnote 4. As this is the deliverable limit of the HDU connector assembly irrespective of fasteners and anchorage as noted in Table 1C footnote 1, option (c) of ACI 318-14 section 17.2.3.4.3 applies.

2.Selected Anchor Information

Selected Anchor : Headed Heavy Hex Bolt

Brand: Generic

Material: 1-1/8" Ø Threaded Bolt Heavy Hex Head
ASTM F1554

Embedment,hnom: h_{ef} 3.75 in h_{nom} 4.5 in

Approval: - -

Issued/Revision: - -

3.Design Principles

Design Method: ACI 318-14

Load Combinations: Section 5.3

Seismic Loading: Tension: 17.2.3.4.3(c) Shear: 17.2.3.5.3(b) Ω_o= User Defined

4.Base Material Information

Concrete:

Type:	Cracked	Normal Weight Concrete					
Strength	3000	psi					

Reinforcement:

Edge Reinforcement	None or < #4 Rebar						
Spacing	Tension	No (Condition B)		Shear		No (Condition B)	
Controls Breakout	Tension	True		Shear		True	

Base Plate:

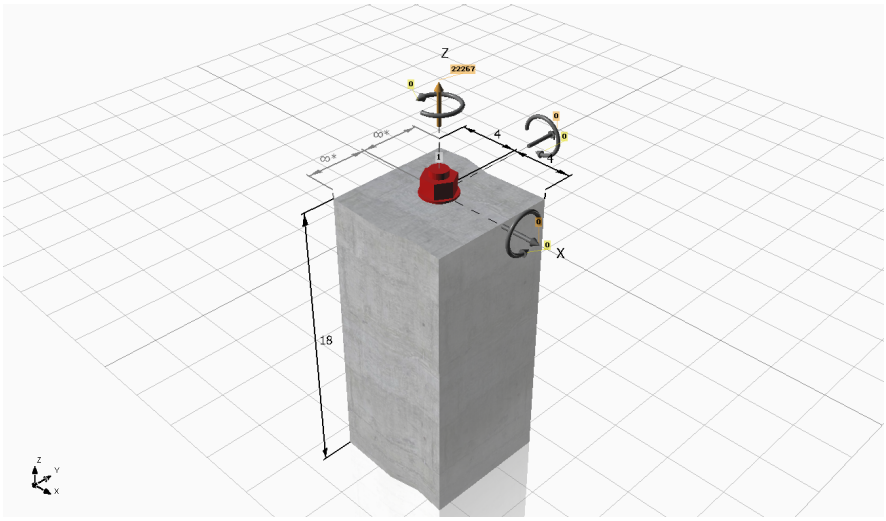
Sizing	Thickness	0	in	Length	0	in	Width	0	in
Standoff	None			Height	0	in			
Strength	0	psi							

Profile: None

Torqued Anchor Bolt:

Concrete Covers: Base Cover: 0.25 in End Cover: 0.25 in

5.Geometric Conditions



h_{min} 4.750 in c_{min} 1.282 in c_{ac} 5.625 in s_{min} 4.500 in

6.Summary Results

Tension Loading

Design Proof	Demand (lb)	Capacity (lb)	Utilization	Status	Critical
Steel Strength	22267.00	33202.00	0.671	OK	
Concrete Breakout Strength	0.00	0.00	0.000	OK	
Pullout Strength	22267.00	23323.00	0.955	OK	Controls

Shear Loading

Design Proof	Demand (lb)	Capacity (lb)	Utilization	Status	Critical
Steel Strength	0.00	0.00	0.000	OK	Controls
Concrete Breakout Strength				OK	
Pryout Strength	0.00	0.00	0.000	OK	

7.Warnings and Remarks

ANCHOR DESIGN CRITERIA IS SATISFIED

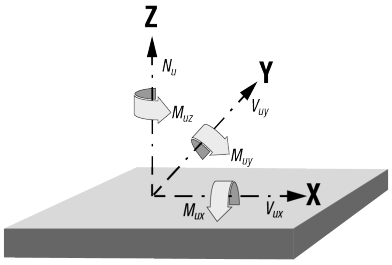
- The results of the calculations carried out by means of the DDA Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an design professional/engineer, particularly with regard to compliance with applicable standards, norms and permits, prior to using them for your specific project. The DDA Software serves only as an aid to interpret standards, norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- Calculations including seismic design requirements in accordance with ACI 318 are required for anchors in structures assigned to seismic design categories C, D, E and F.
- Under these seismic conditions, the direction of shear may not be predictable. In accordance with ACI 318 the full shear force should be assumed also in reverse direction for a safe design. Load reversal may influence the direction of the controlling concrete breakout strength.

8.Load Condition

Design Loads / Actions

Nu	22267	lb	Vux	0	lb	Vuy	0	lb
Muz	0	in-lb	Mux	0	in-lb	Muy	0	in-lb

Consider Load Reversal X Direction 100% Y Direction 100%



9.Load Distribution

Max. concrete compressive strain: 0.000 %

Max. concrete compressive stress: 0.000 psi

Anchor Eccentricity

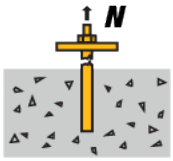
ex 0 in ey 0 in

Resulting anchor forces / Load distribution

Anchor	Tension Load (lb)	Shear Load (lb)	Component Shear Load (lb)		Anchor Coordinates (in)	
			Shear X	Shear Y	X	Y
1	22267.00	0.0	0.0	0.0	0.000	0.000

10.Design Proof Tension Loading

Steel Strength



ACI 318-14 17.4.1

Variables

N_{sa} (lb)	φ
44269.958	0.75

Results

φN_{sa}	=	33202.0	lb	Table 17.3.1.1
N_{ua}	=	22267.0	lb	
Utilization	=	67.1%		

Pullout Strength:

ACI 318-14 17.4.3

Equations

$N_{pn} = \Psi_{c,P} \cdot N_p$ Eqn. 17.4.3.1

$N_p = 8 \cdot A_{brg} \cdot f'_c$ Eqn. 17.4.3.4

Variables

$\Psi_{c,P}$	A_{brg} (in²)	f'_c (psi)	φ	φs_{eis}
1.000	1.851	3000	0.70	0.750

Results

φN_{pn}	=	23323	lb
N_{ua}	=	22267	lb
Utilization	=	95.5%	

Table 17.3.1.1

12.Interaction of Tension and Shear Loads

Reference

ACI 318-14 17.6

Equations

$$(((N_{ua} / \varphi . N_n) + (V_{ua} / \varphi . V_n)) / 1.2) <= 1.0$$ Eqn. 17.6.3

Variables

$N_{ua} / \varphi \cdot N_n$	$V_{ua} / \varphi \cdot V_n$
0.955	0.000

Results

0.955	≤	1.0
Status	:	OK

ANCHOR DESIGN CRITERIA IS SATISFIED

HOLDOWN REINFORCEMENT GEOMETRY IN TYPICAL STEMWALL (PER ACI 318-14 CH. 25)

RADIUS OF BENDS AND STRAIGHT EXTENSION LENGTH OF HOOKS PER TABLE 25.3.1

FOR 90° HOOK WITH No.3-No.8 BAR SIZE, INSIDE BEND DIAMETER = $6d_b$, $l_{ext} = 12d_b$

DIA = 6(0.5 IN) = 3 IN
l_{ext} = 12(0.5 IN) = 6 IN

DEVELOPMENT LENGTH OF STANDARD HOOKS IN TENSION PER SECTION 25.4.3.1

l_{dh} = MAX([(f_y*ψ_e*ψ_c*ψ_r)/(50*λ*SQRT(f'_c))]*d_b, 8*d_b, 6 IN)
PER TABLE 25.4.3.2
ψ_e = 1.0 FOR UNCOATED OR ZINC AND EPOXY DUAL COATED REINFORCEMENT

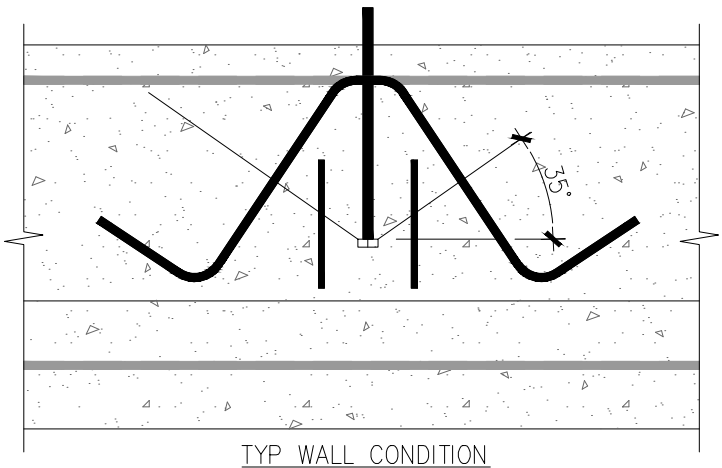
ψ_c = 0.7 FOR No.11 BAR AND SMALLER HOOKS WITH SIDE COVER (NORMAL TO PLANE OF HOOK) >= 2.5 IN AND FOR 90° HOOK WITH COVER ON BAR EXTENSION BEYOND HOOK >= 2IN

ψ_r = 1.0 FOR SECTIONS WITHIN l_{dh} NOT ENCLOSED BY STIRRUPS AT A SPACING s <= 3*d_b

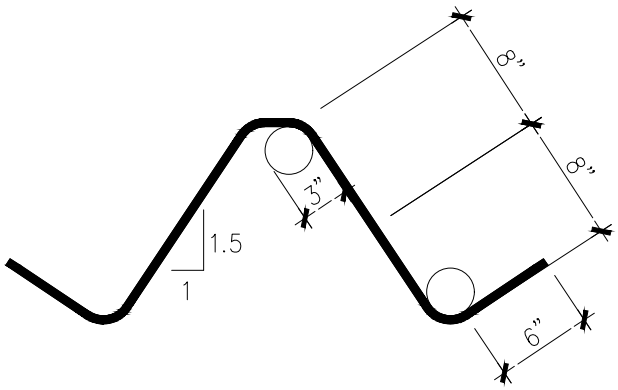
λ = 1.0 FOR NORMAL WEIGHT CONCRETE

USING f_y = 60,000 PSI AND f'_c = 3,000 PSI
l_{dh} = MAX([((60000)*(1.0)*(0.7)*(1.0))/(50*(1.0)*SQRT(3000))]*(0.5 IN), 8*(0.5 IN), 6 IN) = MAX(7.67 IN, 4 IN, 6 IN)

l_{dh} = 7.67 IN > PROVIDE 8 INCHES MINIMUM EACH SIDE OF CONCRETE BREAKOUT LINE



TYP WALL CONDITION



MAIN REINFORCEMENT SCHEMATIC

PROJECT NO. : DESIGNED BY : COK DRAWN BY : COK ISSUE DATE :	**TYPICAL HOLD-DOWN REINFORCEMENT**	
DHP Engineering *Structural Building Consultants* 32008 32nd Ave S, Suite B Federal Way, WA 98001 (253) 220-0848	PREPARED FOR:	