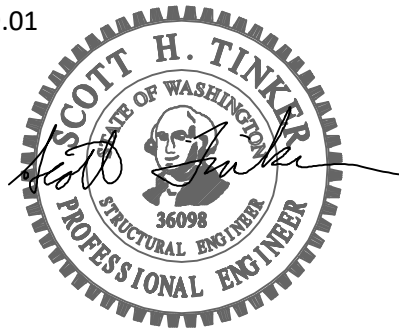
May 7, 2025

STRUCTURAL CALCULATIONS
(Permit Submittal)

LIN KICSKA RESIDENCE
5331 Forest Ave SE
Mercer Island, WA 98040

Quantum Job Number: 24429.01



Prepared for:
DIMARCO ARCHITECTURE
7541 Seward Park Ave S
Seattle, WA 98118

Prepared by:
QUANTUM CONSULTING ENGINEERS
1511 Third Avenue, Suite 323
Seattle, WA 98101
TEL 206.957.3900
FAX 206.957.3901

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FAX 206.957.3901

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MERCER ISLAND, WA 98040

QUANTUM JOB NUMBER: 24429.01

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QUANTUM | CONSULTING ENGINEERS
1511 Third Avenue, Suite 323
Seattle, WA 98101
TEL 206.957.3900
FAX 206.957.3901

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MERCER ISLAND, WA 98040

QUANTUM JOB NUMBER: 24429.01

DESIGN CRITERIA

Structural Design Criteria

Building Code: 2021 International Building Code
Building Department: Mercer Island

Seismic Criteria

S_s:	1.46	I_e:	1.00
S_1:	0.51	Seismic Soil Site Class:	D
S_{ds}:	0.97	Seismic Design Category:	D
S_{d1}:	0.60	C_s:	0.15
R:	6.50	Light-Framed Wood Walls Sheathed With Wood Structural Panels	

Wind Criteria

Wind Speed:	98 MPH
Risk Category:	II
Wind Exposure:	C
K_{zt}:	1.0

Geotechnical Criteria

Allowable Bearing Pressure	1500 PSF
Minimum Footing Width	Continuous: 18” min., Isolated: 24” min.
Frost Depth	18” min.
Soils Consultant	Geotech Consultants Engineer, Inc.
Soils Report Number	#24314
Soils Report Date	October 8, 2024
Active Soil Pressure (Restrained/Unrestrained)	40 PCF
Seismic Surcharge Pressure	9H PSF
Passive Soil Pressure	250 PCF
Coefficient of Friction	0.35

Materials Criteria

Concrete (28 Day Strength):

Foundation/Slab on Grade	F'c= 2,500 PSI
Basement Walls	F'c= 3,000 PSI

Reinforcing Steel:

Grade 60 (#5 bar and larger)	Fy= 60,000 PSI
Grade 40 (#4 bar)	Fy= 40,000 PSI

Wood Framing:

2x, 3x & 4x Framing Members	HF#2 or DF#2
6x Framing Members	DF#1
Glulam Beams	24F-V4 (V8 @ Cont. and Cant. Members)
LSL Members - Beams & Headers	1.55 E LSL
Wood Sheathing	APA RATED

Residential Building Loads

Snow Load	Roof	25 psf
Live Load	Residential	40 psf
	Residential exterior decks / balconies	60 psf

Assembly Loads

Roof Loads		Comments
Standard Roofing	3.0 psf	
1/2” Ply. Sheathing	1.5 psf	
Joists @ 24” o.c.	2.1 psf	
R38 Insulation	1.0 psf	
5/8” GWB	2.8 psf	
Lights, ducts	0.5 psf	
PV Allowance	3.0 psf	INCL W/ MISC
Miscellaneous	1.1 psf	FOR SEISMIC
Total:	**15.0 psf**	SL=25 psf

Typical Floor Loads		Comments
Flooring	3.0 psf	
3/4" Ply. Sheathing	2.3 psf	
Floor Joists @ 16" o.c.	2.5 psf	
5/8” GWB	2.8 psf	
Lights, ducts	0.8 psf	
Miscellaneous	0.6 psf	
Partitons	-	
Total:	**12.0 psf**	LL=40 psf

Interior Wall Framing	
5/8" GWB	2.8 psf
2x4 @ 16" o.c.	0.9 psf
5/8" GWB	2.8 psf
Mech./Elec.	0.5 psf
Misc.	1.0 psf
Total:	**8.0 psf**

Exterior Wood Stud Wall	
Siding	2.3 psf
1/2" Plywood	1.5 psf
2x6 studs @ 16 " o.c.	1.7 psf
Insulation	0.5 psf
1/2" GWB	2.2 psf
Mech./Elec.	0.5 psf
Misc.	1.3 psf
Total:	**10.0 psf**

Deck Loads		Comments
Porcelain Pavers	10.0 psf	
Wood Sleepers	2.5 psf	
2x + Joists @ 16” o.c.	2.6 psf	
Miscellaneous	0.9 psf	
Total:	**16.0 psf**	LL=60 PSF

Deflection Criteria

Roof	Walls			Floor
Live Load: **L/240**		**L/120**	*flexible finishes	Live Load: **L/360**
Total Load: **L/180**		**L/240**	*brittle finish	Total Load: **L/240**
		L/240	*supporting glass	

Quantum Consulting Engineers LLC
1511 Third Avenue, Suite 323
Seattle, WA 98101

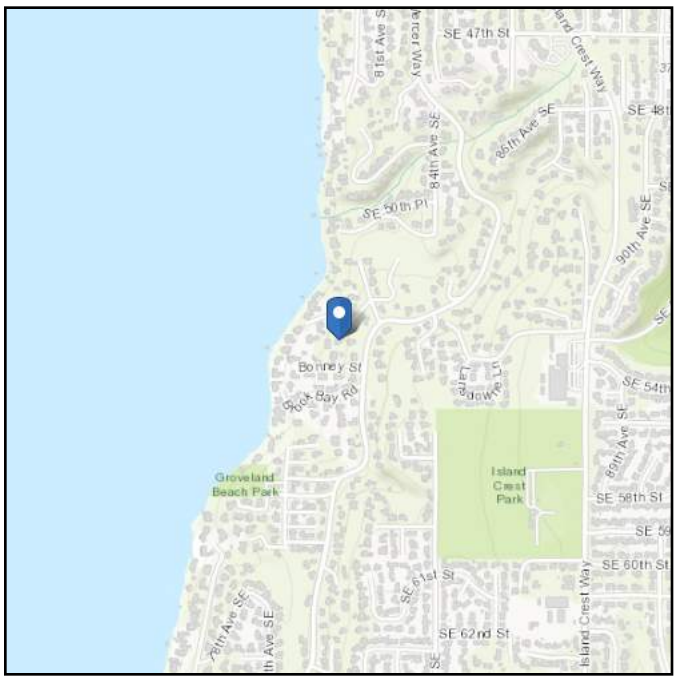
Project: Lin Kicska Residence
Client: Dimarco
Date: 1/30/25 Job No: 24429.01
Designer: BSD Sheet: 1
Checked By:

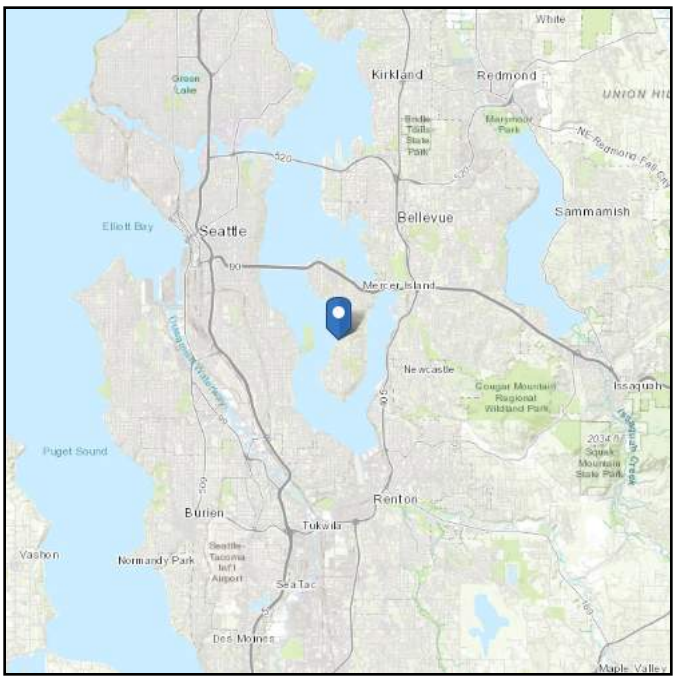
ASCE Hazards Report

Address:
5331 Forest Ave SE
Mercer Island, Washington
98040

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Latitude: 47.554535
Longitude: -122.230437
Elevation: 101.5517437516242 ft (NAVD 88)





Wind

Results:

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

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Mon Jan 20 2025

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

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

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.455	S_{D1} :	N/A
S_1 :	0.505	T_L :	6
F_a :	1	PGA :	0.623
F_v :	N/A	PGA_M :	0.686
S_{MS} :	1.455	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	0.97	C_v :	1.391

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

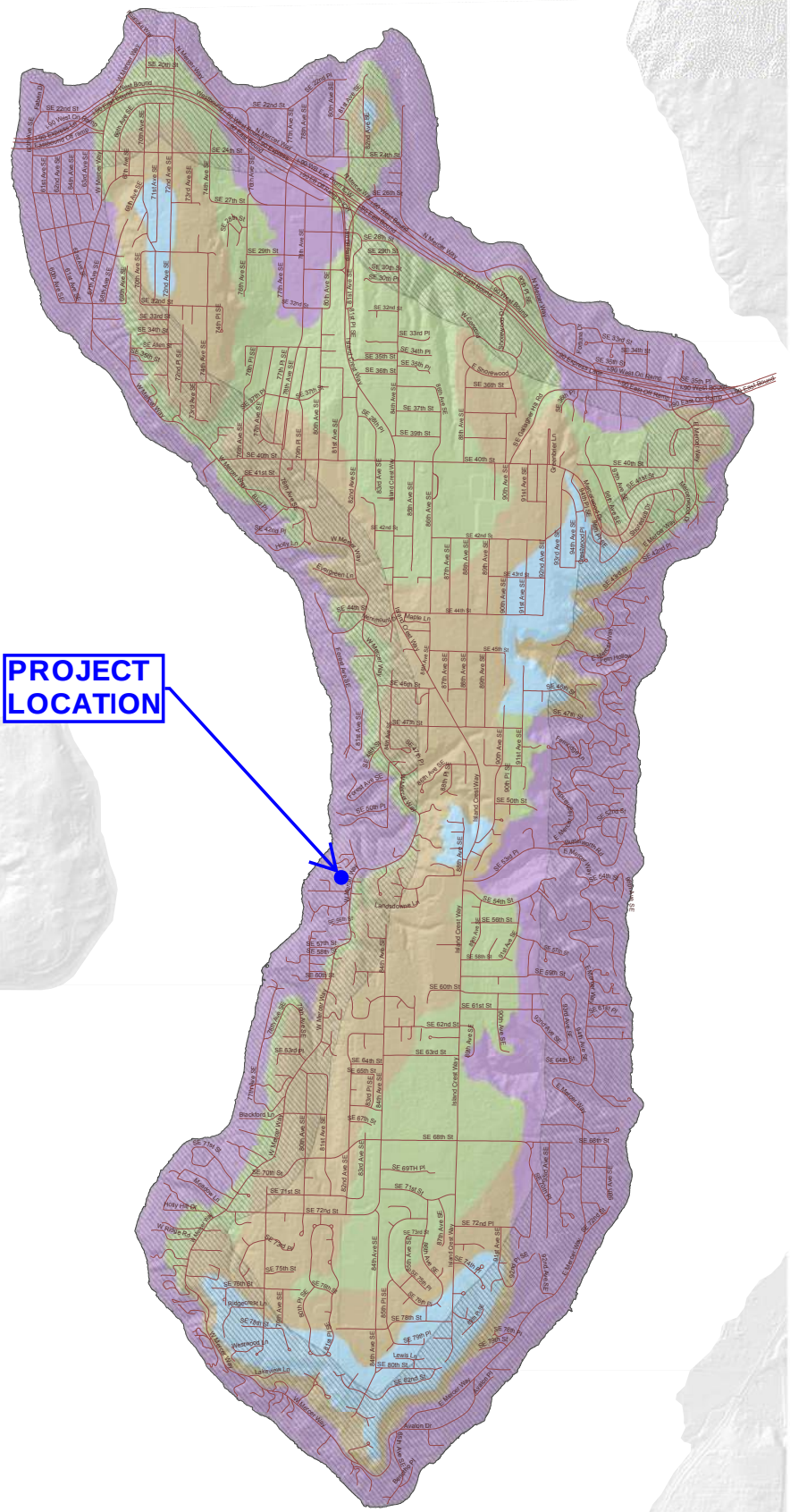
Data Accessed: Mon Jan 20 2025

Date Source: USGS Seismic Design Maps

Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

by Development Services Group (DSG), City of Mercer Island
April 2009

0 0.5 1 Kilometers 1:12,000
0 0.5 1 Miles
TN



WIND EXPOSURE CATEGORIES & WIND SPEED-UP FACTORS
(ICC Section 1609 & ASCE 7-05 Chapter 6)

It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the Kzt factor to be utilized for each specific project. The Kzt factors and wind exposure categories indicated on this map are the minimum values accepted by the City of Mercer Island without requiring the design professional to submit additional calculations and supporting topographic documentation (to verify the values utilized in their wind load determination).

Please note – The Kzt values indicated on this map are approximations based upon periodic calculations of representative samplings around Mercer Island. These values are intended for City of Mercer Island's plan review purposes only.

WIND EXPOSURE CATEGORIES

Wind Exposure Category	
	Exposure 'C' (1500 feet from Lake)
	Exposure 'B' (All other areas)

WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K_zt Factor :

K_zt Factor	
	$K_zt = 1.0$
	$K_zt = 1.3$
	$K_zt = 1.6$
	$K_zt = 1.9$

GENERAL NOTES FOR WIND EXPOSURE AND WIND SPEED-UP MAP

This map is the Wind Exposure Category and Wind Speed-up (Topographic Effects) Map for the City of Mercer island. This map shows the minimum wind exposure category and the minimum wind speed-up, "K_zt" factor, which will be accepted without site specific documentation and calculation.

Other wind speed phenomena may occur on Mercer Island that is not specifically indentified on this map. It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the appropriate design wind speed and exposure category for their specific project and location.

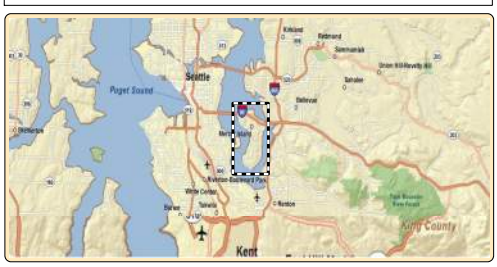
This map is for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. This map provides DSG staff a general assessment of Wind Exposure Category and Wind Speed-up (Topographic Effects). All areas have not been specifically evaluated and there may be locations that are not correctly represented on this map. It is the responsibility of individual property owners and map users to evaluate risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island with this map.

Information about data used for the map, references, and data limitation are all described the associated "Read Me" document. The digital version of this map is accompanied by a meta data file containing pertinent information about map construction. This data map is available on the City of Mercer Island website.

The City of Mercer Island is using guidance provided within ICC Section 1609 & ASCE 7-05 Chapter 6 regarding definitions used when creating this map.

DEFINITIONS:

K_zt factor:	The topographic effect of wind speed-up at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, that meet all of the conditions noted in ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, Section 6.5.7.
Exposure B:	The wind exposure category that applies where the site in question is located a minimum of 1500 feet from the shoreline and the mean roof height is less than or equal to 30 feet per IBC 2006 section 1609.4.3.
Exposure C:	The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1609.4.3.
Wind Speed:	Minimum 85 mph 3-second gust per IRC Figure R301.2(4)



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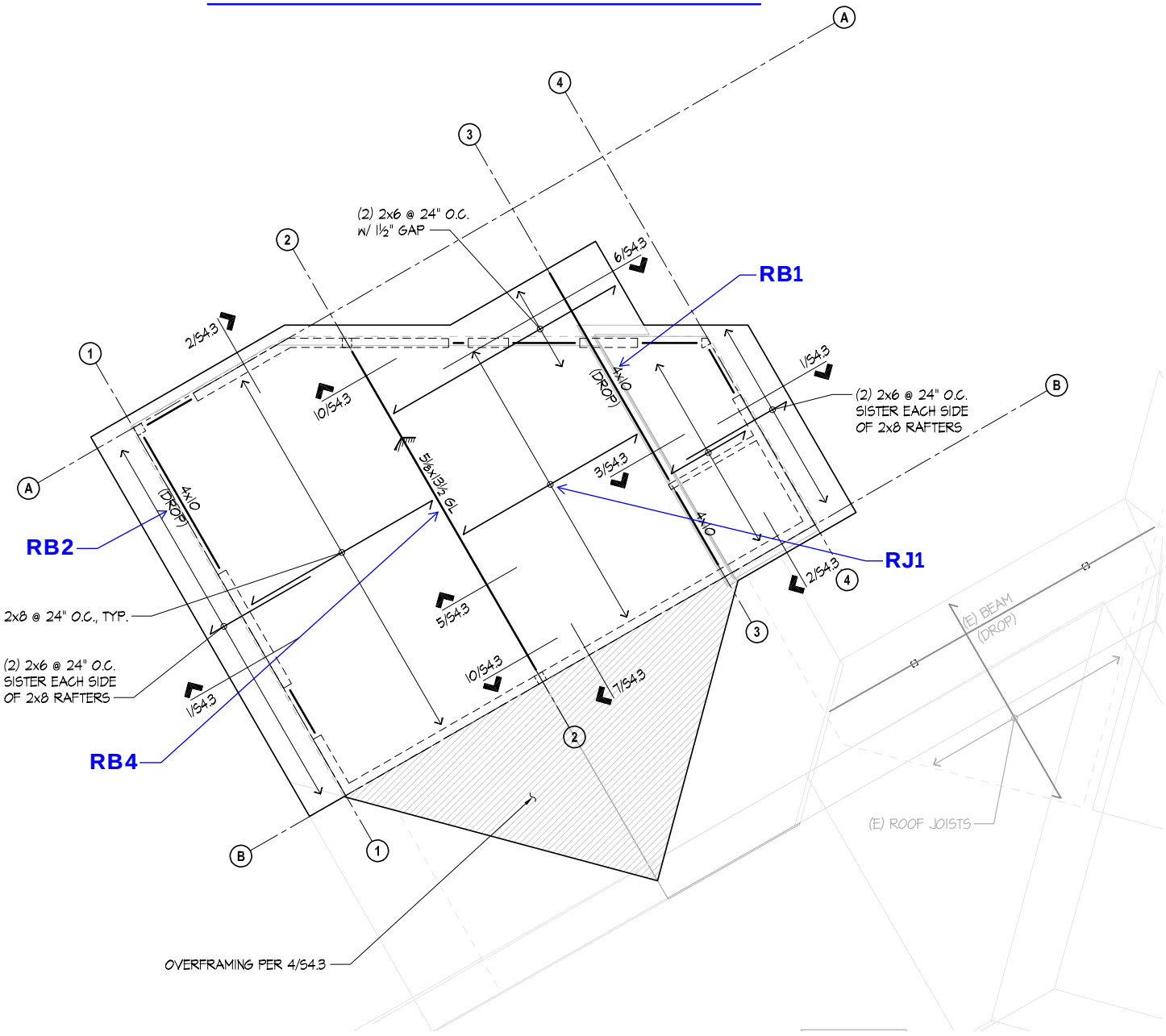
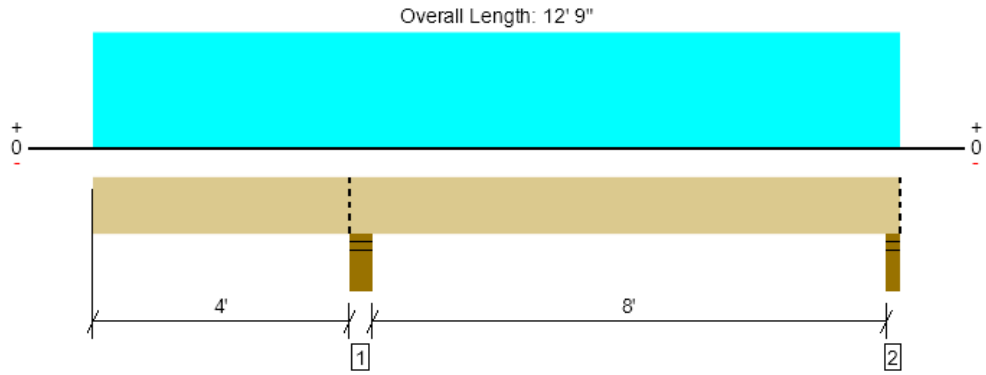
GRAVITY FRAMING

ROOF FRAMING KEY PLAN



Roof, RB1 - Entry

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3930 @ 4' 2 3/4"	12031 (5.50")	Passed (33%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1761 @ 5' 2 3/4"	4468	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-3709 @ 4' 2 3/4"	5166	Passed (72%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.115 @ 0	0.423	Passed (2L/880)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.146 @ 0	0.564	Passed (2L/696)	--	1.0 D + 1.0 S (Alt Spans)

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

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - DF	5.50"	5.50"	1.80"	1442	2488	3930	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	498	1000	1498	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)	12' 9" o/c	
Bottom Edge (Lu)	12' 9" 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 12' 9"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 12' 9" (Front)	4' 6"	12.0	25.0	EAVE RAFTERS
2 - Uniform (PSF)	0 to 12' 9" (Front)	6'	15.0	25.0	RAFTERS

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

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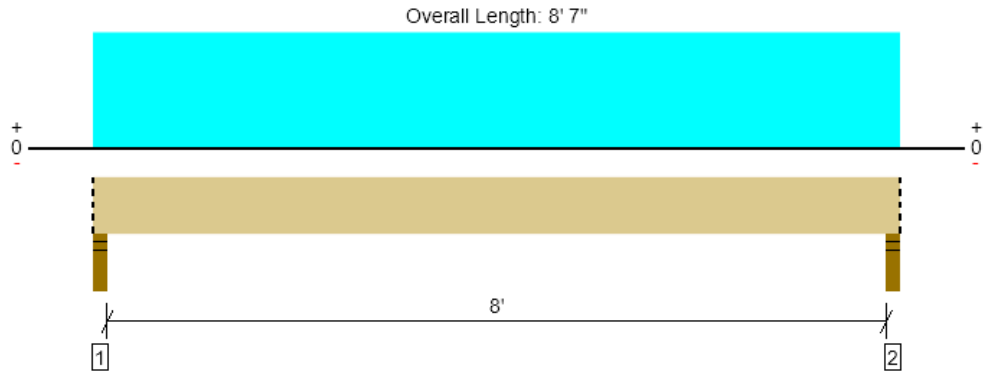
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

Weyerhaeuser

Roof, RB2 - Grid 1

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



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2224 @ 2"	4961 (3.50")	Passed (45%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1673 @ 1' 3/4"	3723	Passed (45%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4409 @ 4' 3 1/2"	4879	Passed (90%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.111 @ 4' 3 1/2"	0.412	Passed (L/894)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.180 @ 4' 3 1/2"	0.550	Passed (L/550)	--	1.0 D + 1.0 S (All Spans)

Member Length : 8' 7"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.57"	856	1368	2224	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.57"	856	1368	2224	Blocking

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 7"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 8' 7" (Front)	12' 9"	15.0	25.0	Default Load

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

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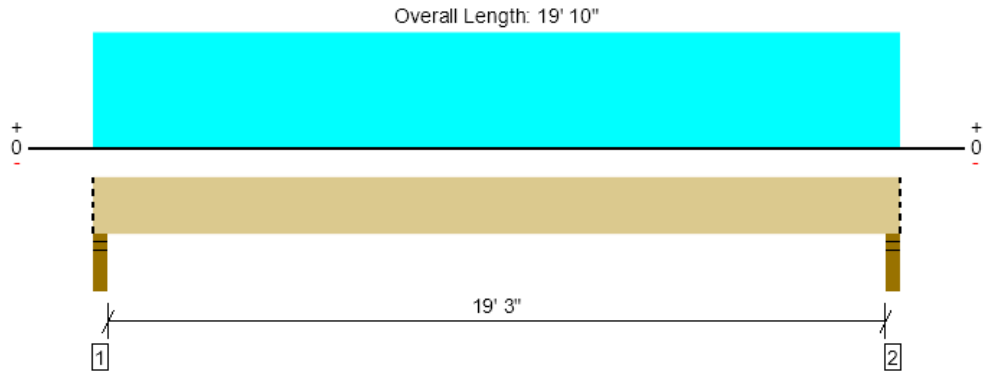
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

Weyerhaeuser

Roof, RB4 - Ridge Beam

1 piece(s) 5 1/8" x 13 1/2" 24F-V4 DF Glulam



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4530 @ 2"	11211 (3.50")	Passed (40%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3883 @ 1' 5"	14057	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	21713 @ 9' 11"	35648	Passed (61%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.473 @ 9' 11"	0.975	Passed (L/495)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.786 @ 9' 11"	1.300	Passed (L/298)	--	1.0 D + 1.0 S (All Spans)

Member Length : 19' 10"
System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 19' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	1803	2727	4530	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1803	2727	4530	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)	19' 10" o/c	
Bottom Edge (Lu)	19' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 19' 10"	N/A	16.8	--	
1 - Uniform (PSF)	0 to 19' 10" (Front)	11'	15.0	25.0	Default Load

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

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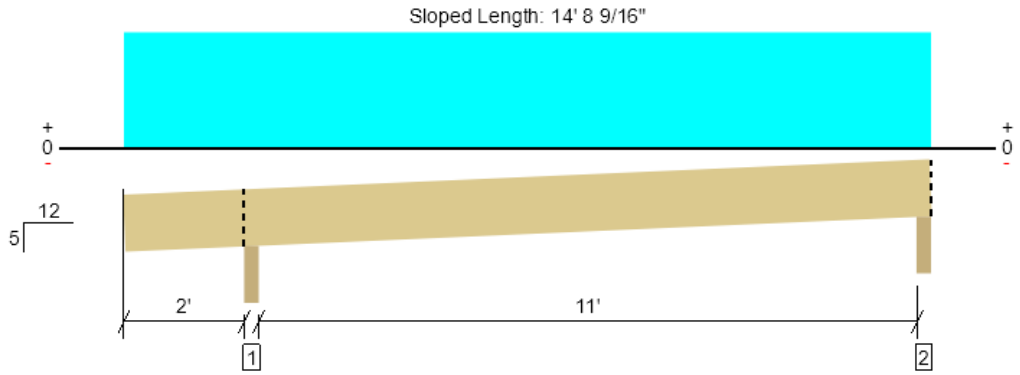
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

Weyerhaeuser

Roof, RJ1 - Rafters

1 piece(s) 2 x 8 DF No.2 @ 24" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	657 @ 2' 1 3/4"	3555 (3.50")	Passed (18%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	422 @ 2' 10 3/16"	1501	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1235 @ 7' 10 13/16"	1564	Passed (79%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.263 @ 7' 9 1/2"	0.608	Passed (L/554)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.427 @ 7' 9 11/16"	0.811	Passed (L/342)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 14' 11 5/8"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 5/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - DF	3.50"	3.50"	1.50"	259	398	657	Blocking
2 - Beveled Plate - DF	3.50"	3.50"	1.50"	183	286	469	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' 2" o/c	
Bottom Edge (Lu)	14' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

•Dimensions for lateral bracing intervals are measured along the length of the member for sloped conditions.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 13' 7"	24"	15.0	25.0	Default Load

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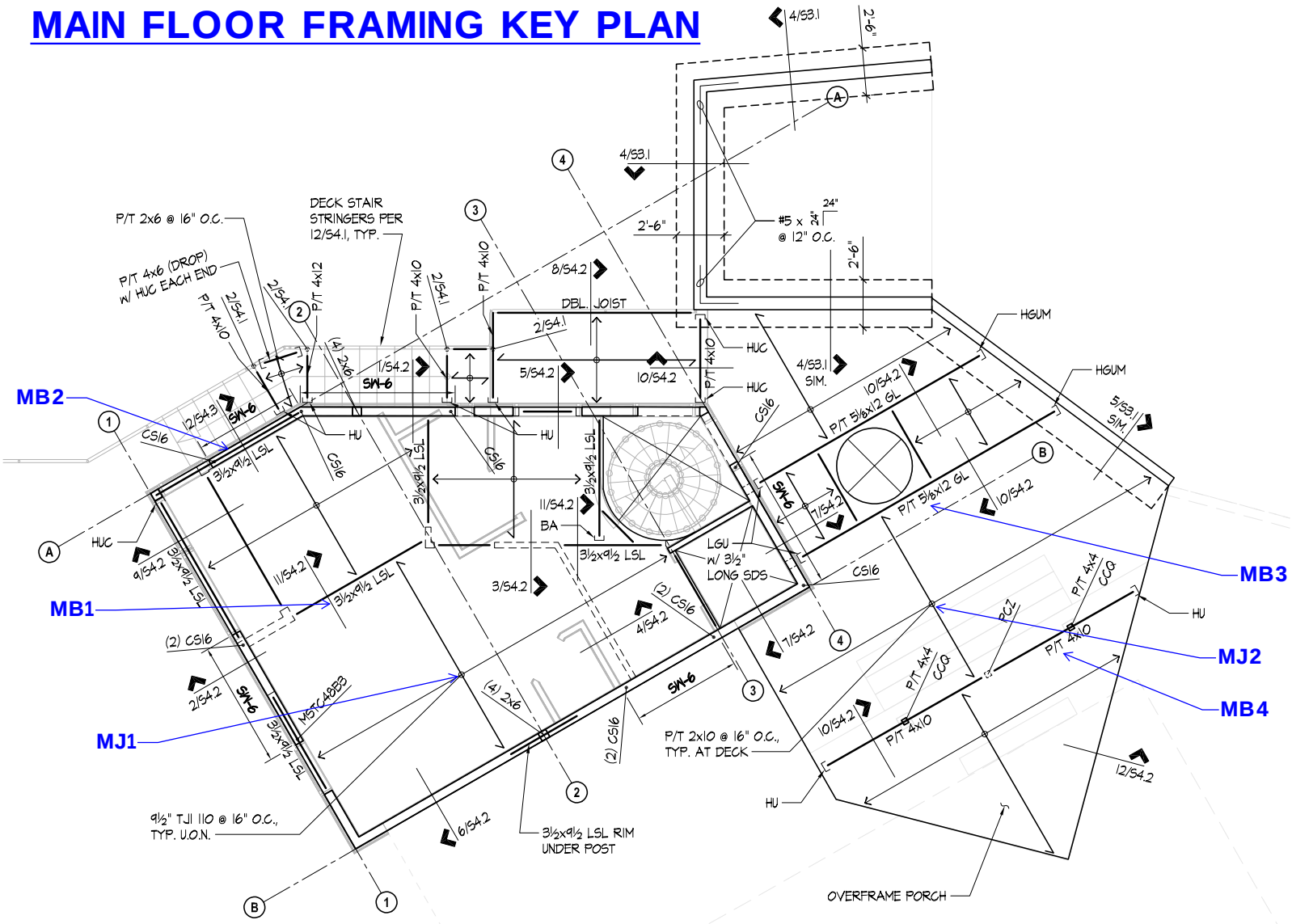
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

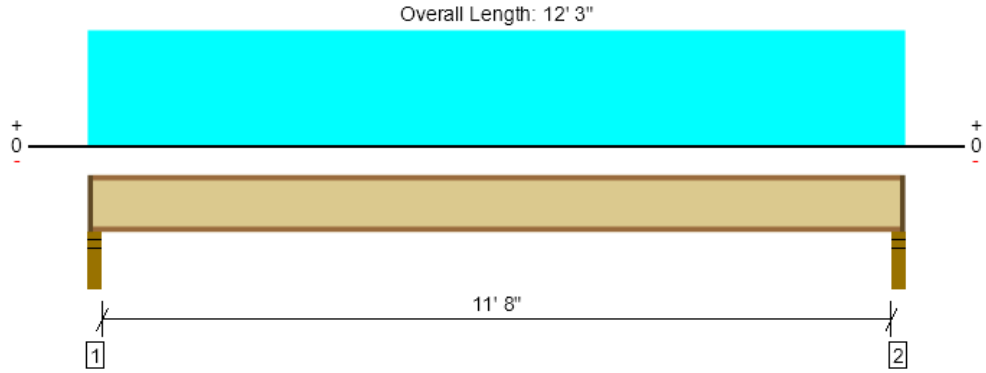
Weyerhaeuser

MAIN FLOOR FRAMING KEY PLAN



Main Level, MJ1

1 piece(s) 9 1/2" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	442 @ 2 1/2"	1041 (2.25")	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	428 @ 3 1/2"	1220	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1284 @ 6' 1 1/2"	2500	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.138 @ 6' 1 1/2"	0.296	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.189 @ 6' 1 1/2"	0.592	Passed (L/749)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	49	40	Passed	--	--

Member Length : 12' 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	2.25"	1.75"	123	327	449	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.75"	123	327	449	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 5" o/c	
Bottom Edge (Lu)	12' 1" o/c	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 12' 3"	16"	15.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

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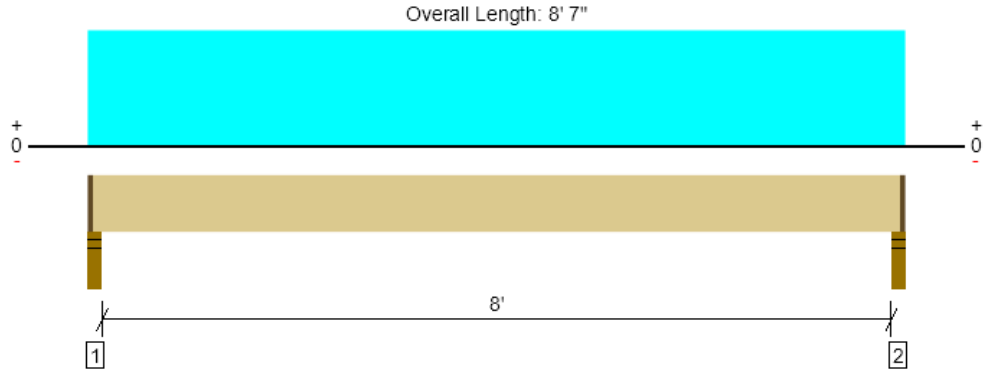
Main Level, MB1

1 piece(s) 3 1/2" x 9 1/2" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2404 @ 2"	4922 (2.25")	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1842 @ 1' 1"	6872	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4885 @ 4' 3 1/2"	10422	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.126 @ 4' 3 1/2"	0.206	Passed (L/787)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.176 @ 4' 3 1/2"	0.412	Passed (L/562)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 4 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	2.25"	1.50"	703	1760	2463	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	703	1760	2463	1 1/4" Rim Board

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 8' 5 3/4"	N/A	10.4	--	
1 - Uniform (PSF)	0 to 8' 7" (Front)	10' 3"	15.0	40.0	Default Load

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

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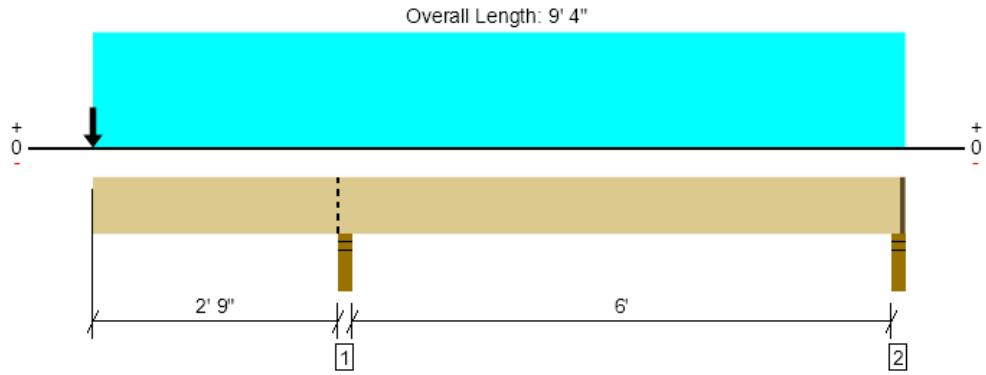
Main Level, MB2 - Cantilever

1 piece(s) 3 1/2" x 9 1/2" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5300 @ 2' 10 3/4"	7656 (3.50")	Passed (69%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2729 @ 1' 11 1/2"	7902	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-7522 @ 2' 10 3/4"	11985	Passed (63%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.179 @ 0	0.200	Passed (2L/388)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.296 @ 0	0.290	Passed (2L/234)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 9' 2 3/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -429 lbs uplift at support located at 9' 2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	2.42"	2644	1206	2335	5300	Blocking
2 - Stud wall - DF	3.50"	2.25"	1.50"	151	594/-102	-580	745/-429	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)	9' 3" o/c	
Bottom Edge (Lu)	9' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 2 3/4"	N/A	10.4	--	--	
1 - Uniform (PSF)	0 to 9' 4" (Front)	4' 6"	15.0	40.0	-	main level
2 - Uniform (PLF)	0 to 9' 4" (Front)	N/A	100.0	-	-	wall
3 - Uniform (PSF)	0 to 9' 4" (Front)	2'	15.0	-	25.0	roof
4 - Point (lb)	0 (Front)	N/A	856	-	1368	Linked from: RB2 - Grid 1, Support 1

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

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ForteWEB Software Operator	Job Notes
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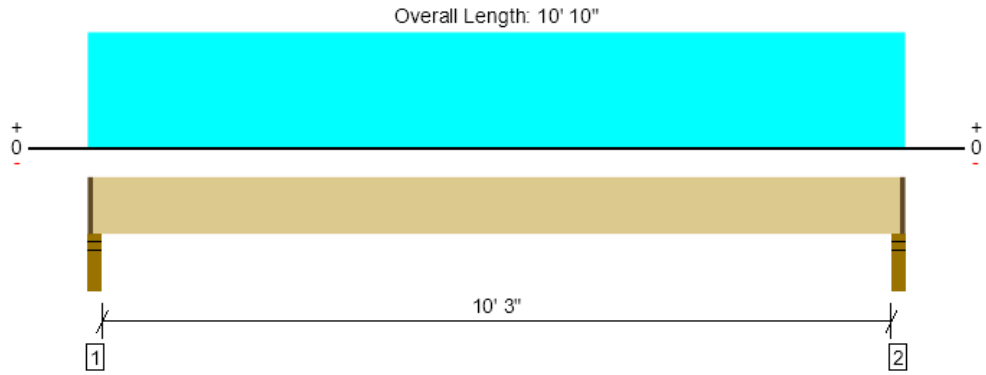
Main Level, MJ2 - Deck

1 piece(s) 2 x 10 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	602 @ 2 1/2"	1367 (2.25")	Passed (44%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	493 @ 1' 3/4"	1388	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1537 @ 5' 5"	1917	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.165 @ 5' 5"	0.260	Passed (L/759)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.233 @ 5' 5"	0.521	Passed (L/535)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 10' 7 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 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	Factored	
1 - Stud wall - DF	3.50"	2.25"	1.50"	181	433	614	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	181	433	614	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 4" o/c	
Bottom Edge (Lu)	10' 8" 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 10' 10"	16"	25.0	60.0	porcelain deck

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Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

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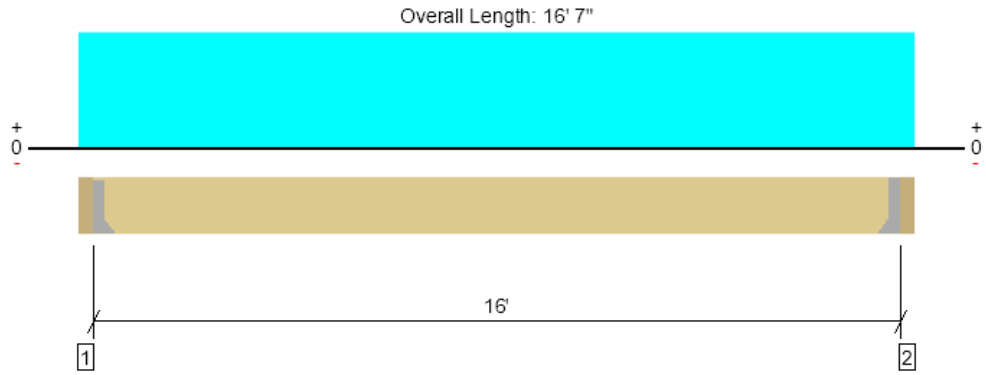
Main Level, MB3 - Deck

1 piece(s) 5 1/8" x 12" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4880 @ 3 1/2"	4997 (1.50")	Passed (98%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4270 @ 1' 3 1/2"	10865	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	19518 @ 8' 3 1/2"	24600	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.466 @ 8' 3 1/2"	0.533	Passed (L/412)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.677 @ 8' 3 1/2"	0.800	Passed (L/284)	--	1.0 D + 1.0 L (All Spans)

Member Length : 16'
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 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	Floor Live	Factored	
1 - Hanger on 12" DF beam	3.50"	Hanger[1]	1.50"	1571	3483	5053	See note [1]
2 - Hanger on 12" DF beam	3.50"	Hanger[1]	1.50"	1571	3483	5053	See note [1]

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

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

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HGUS5.25/10	4.00"	N/A	46-10d	16-10d	
2 - Face Mount Hanger	HGUS5.25/10	4.00"	N/A	46-10d	16-10d	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 16' 3 1/2"	N/A	14.9	--	
1 - Uniform (PSF)	0 to 16' 7" (Front)	7'	25.0	60.0	porcelain deck

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

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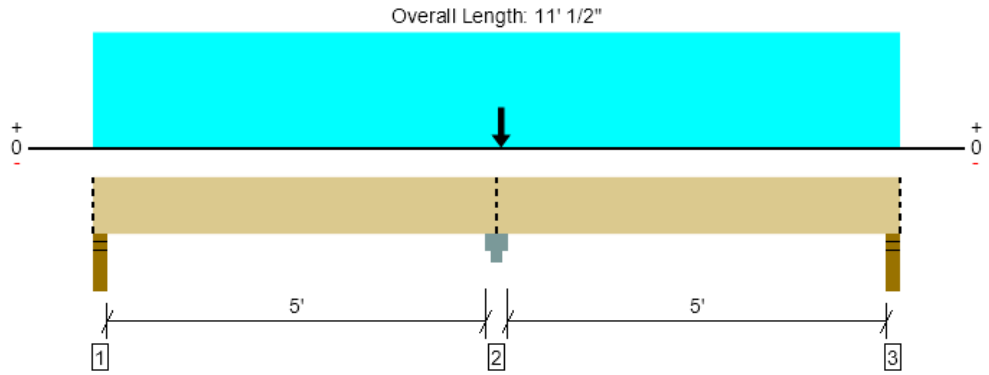
Main Level, MB4 - Porch

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5910 @ 5' 6 1/4"	7796 (5.50")	Passed (76%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1896 @ 6' 6 1/4"	3238	Passed (59%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-2896 @ 5' 6 1/4"	4242	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.026 @ 8' 4 3/16"	0.178	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.031 @ 2' 7 5/8"	0.268	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 11' 1/2"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	453	1505/-201	-	1958	Blocking
2 - Column Cap - steel	5.50"	5.50"	4.17"	1894	4016	929	5910	Blocking
3 - Stud wall - HF	3.50"	3.50"	1.50"	453	1505/-201	-	1958	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)	11' 1" o/c	
Bottom Edge (Lu)	11' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 11' 1/2"	N/A	8.2	--	--	
1 - Uniform (PSF)	0 to 11' 1/2" (Front)	5'	25.0	60.0	-	porcelain deck
2 - Uniform (PSF)	0 to 11' 1/2" (Front)	5'	15.0	60.0	-	wood porch
3 - Point (lb)	5' 7" (Front)	N/A	501	-	929	Linked from: RB3 - Main House Porch, Support 2

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

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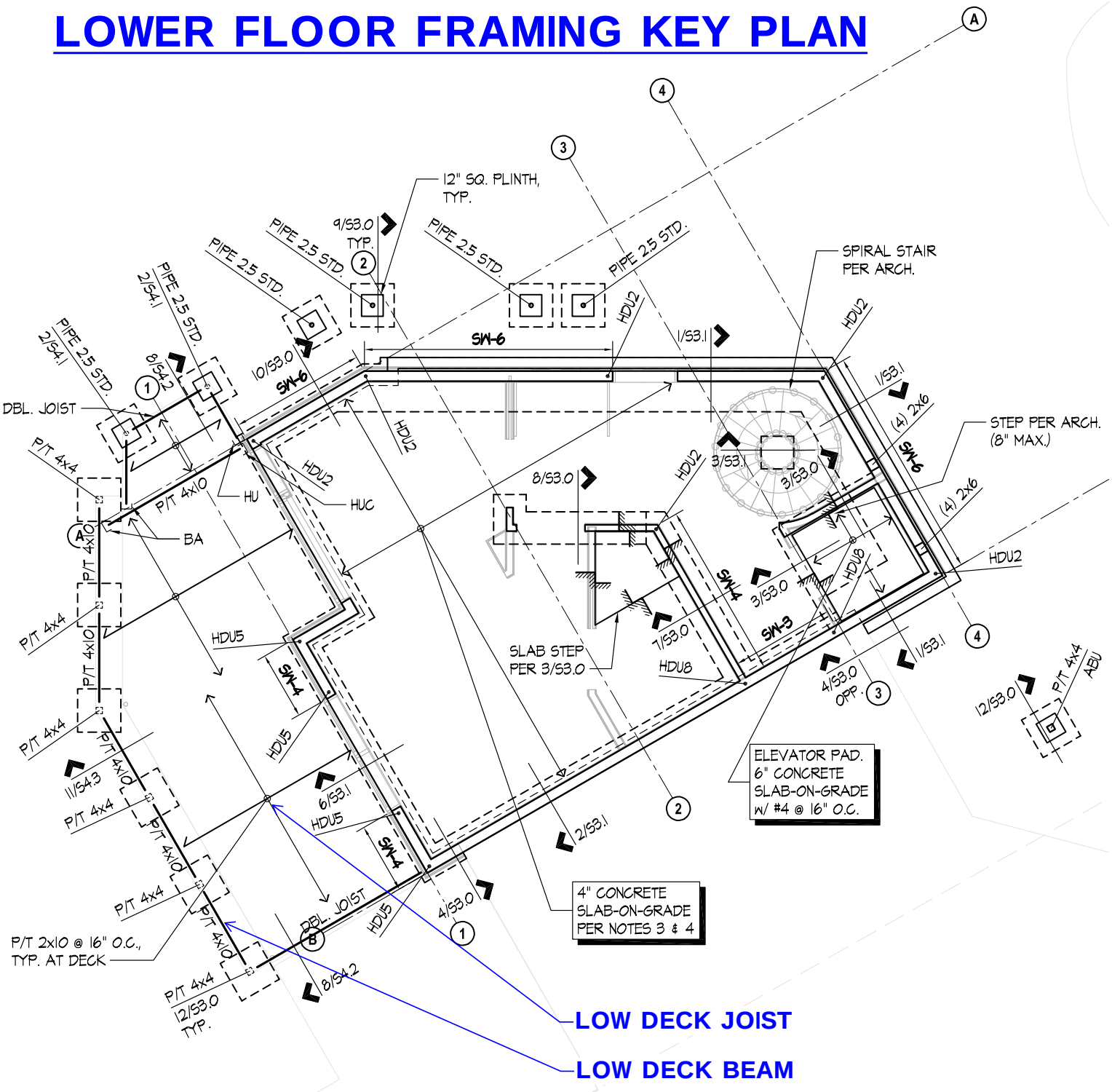
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

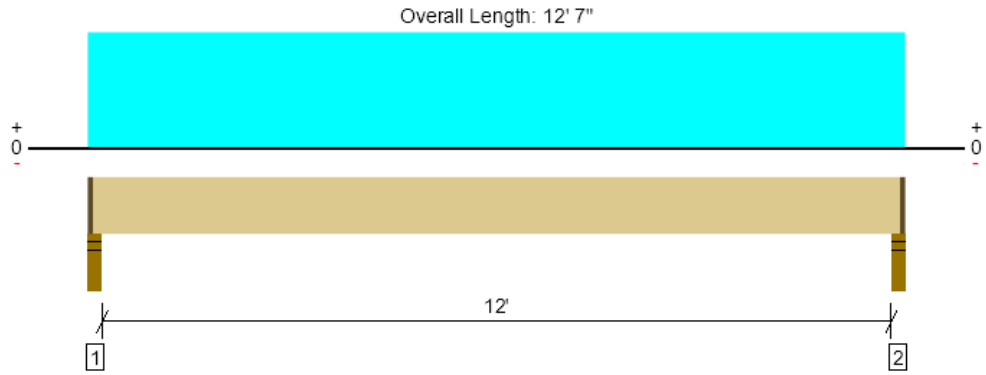
Weyerhaeuser

LOWER FLOOR FRAMING KEY PLAN



Lower Level, Low Deck Joist

1 piece(s) 2 x 10 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	594 @ 2 1/2"	1367 (2.25")	Passed (43%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	502 @ 1' 3/4"	1388	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1776 @ 6' 3 1/2"	1917	Passed (93%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.307 @ 6' 3 1/2"	0.304	Passed (L/476)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.368 @ 6' 3 1/2"	0.608	Passed (L/397)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 12' 4 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 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	Factored	
1 - Stud wall - DF	3.50"	2.25"	1.50"	101	503	604	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	101	503	604	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 5" o/c	
Bottom Edge (Lu)	12' 5" 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 12' 7"	16"	12.0	60.0	Default Load

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Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	

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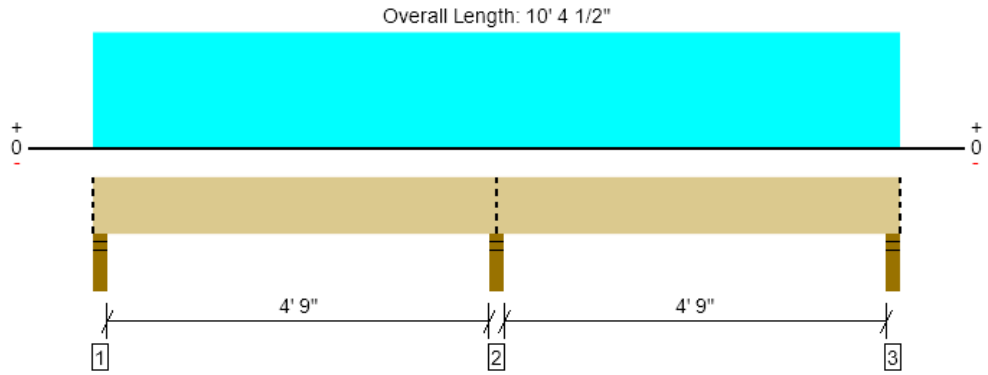
Lower Level, Low Deck Beam

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2876 @ 5' 2 1/4"	4961 (3.50")	Passed (58%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1018 @ 6' 1 1/4"	3238	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1444 @ 5' 2 1/4"	4242	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.012 @ 7' 10 1/8"	0.167	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.014 @ 2' 5 15/16"	0.251	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 10' 4 1/2"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	201	851/-113	1052	Blocking
2 - Stud wall - DF	3.50"	3.50"	2.03"	616	2259	2876	Blocking
3 - Stud wall - DF	3.50"	3.50"	1.50"	201	851/-113	1052	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 5" o/c	
Bottom Edge (Lu)	10' 5" 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 10' 4 1/2"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 10' 4 1/2" (Front)	6'	15.0	60.0	Default Load

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

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Wood Stud Post Design

Per IBC 2021 & NDS 2018

Structure: Lin Kicska Residence
Post Mark: Ridge Beam at Exterior Wall

Post Configuration

Wall Height (ft):	16.00	Bot. Plate Th.:	2x
Stud Size:	2x6	Stud Species & Grade:	DF-L #2
Number of Studs:	4	Bot. Plate Species & Grade:	DF-L #2

Wall Finish Type: Flexible Defl. Criteria: L/120 =1.6 in per IBC 1604.3.1

Post Loading

Axial Load

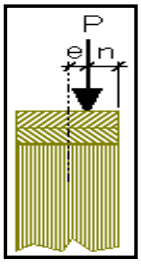
DL (lbs):	1800	
LL (lbs):		
SL (lbs):	2730	
EQ (lbs):		Strength
Wind (lbs):		Strength

Out of Plane Pressure Load

Wind (plf):	20	Strength
EQ (plf):	10	Strength
Sds:	1.0	

Post Axial Load Eccentricity

n (in):	2.75
e (in):	0.00



Post Properties

b (in):	6.00	E (psi):	1600000	per NDS Table 4A	F_b (psi):	900	per NDS Table 4A
d (in):	5.50	E' (psi):	1600000	= $E*C_M*C_t$	F_c (psi):	1350	per NDS Table 4A
A (in^2):	33.00	E_{min} (psi):	580000	per NDS Table 4A			
S (in^3):	30.25	E'_{min} (psi):	580000	= $E_{min}*C_M*C_t$			
I (in^4):	83.19						

C_P:	L_e (ft):	15.63	Post height	Bending C_F:	1.30	per NDS Table 4A
	L_e/d:	34.09		Axial C_F:	1.10	per NDS Table 4A
	F_{cE} (psi):	410	= $0.822*E'_{min}/(L_e/d)^2$	C_M:	1.00	per NDS 4.3.3
	c:	0.8	per NDS 3.7.1.5	C_t:	1.00	per NDS 4.3.4

Bot. Plate Properties

b (in): 1.50

$F_{c\perp}$ (psi):	625	per NDS Table 4A	$F'_{c\perp}$ (psi):	664	= $F_{c\perp}*C_M*C_t*C_b$
C_b:	1.06	per NDS 3.10.4	P_{all} (lb):	21914	= F'_c*A

Wood Stud Post Design

Per IBC 2021 & NDS 2018

Structure: Lin Kicska Residence
Post Mark: Ridge Beam at Exterior Wall

Check Post Axial and Flexural Capacities for Load Cases per IBC 1605.1 and ASCE 2.4

$f_c = P_{axial}/A$ $\quad f_b = M_{tot}/S$

$F'_c = F_c*C_D*C_M*C_t*C_F*C_P$ $\quad F'_b = F_b*C_D*C_M*C_t*C_F*C_r$

P_{Axial} (lb)	Bot. Plate P_{all} Status	f_c (psi)	C_D: NDS Table 2.3.2	C_P	F'_c (psi)	M_{tot} (lb-ft)	f_b (psi)	F'_b (psi)	Interaction per NDS 3.9.2	Deflection (in)	Wall Status
Load Case D + L											
1800	<= Pall: OK	55	1.00	0.26	384	0	0	1170	**0.14**	**0.00**	**OK**
Load Case D + S											
4530	<= Pall: OK	137	1.15	0.23	387	0	0	1346	**0.35**	**0.00**	**OK**
Load Case D + 0.75(L + S)											
3848	<= Pall: OK	117	1.15	0.23	387	0	0	1346	**0.30**	**0.00**	**OK**
Load Case D + 0.6W											
1800	<= Pall: OK	55	1.60	0.17	395	366	145	1872	**0.14**	**1.02**	**OK**
Load Case D + 0.75(L + S + 0.6W)											
3848	<= Pall: OK	117	1.60	0.17	395	275	109	1872	**0.30**	**0.76**	**OK**
Load Case (1.0 + 0.14Sds) D + 0.7E											
2052	<= Pall: OK	62	1.60	0.17	395	214	85	1872	**0.16**	**0.85**	**OK**
Load Case (1.0 + 0.14Sds) D + 0.75(L + S + 0.7E)											
4386	<= Pall: OK	133	1.60	0.17	395	160	64	1872	**0.34**	**0.63**	**OK**

Post:	**(4) 2x6**	**DF-L #2**	**is acceptable**

Quantum Consulting Engineers LLC
1511 Third Avenue, Suite 323
Seattle, WA 98101

Project:	Lin Kicska	Date:	1/30/25	Job No:	24429.01
		Designer:	BSD	Sheet:	1
Client:	Dimarco	Checked By:			

QUANTUM | CONSULTING ENGINEERS
1511 Third Avenue, Suite 323
Seattle, WA 98101
TEL 206.957.3900
FAX 206.957.3901

LIN KICSKA RESIDENCE
5331 FOREST AVE SE
MERCER ISLAND, WA 98040

QUANTUM JOB NUMBER: 24429.01

LATERAL DESIGN

Wind Loads Criteria

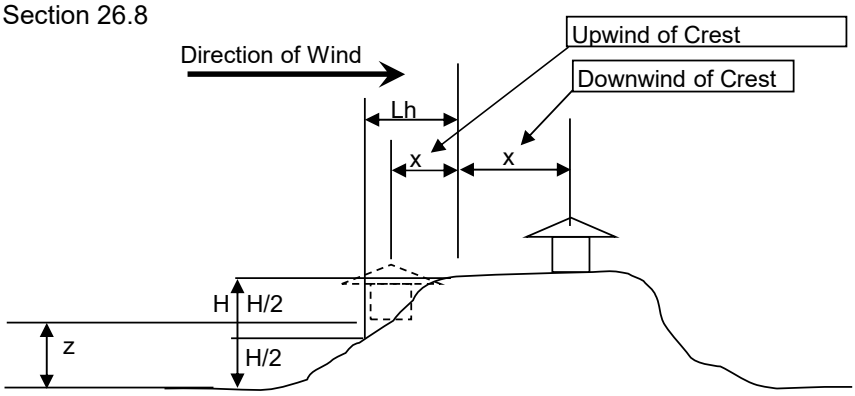
Per IBC 2021 & ASCE 7-16

Wind Load Criteria

Risk Category:	II	Table 1.5-1	Roof Type:	Gable/Mansard	
Basic Wind Speed:	98	Figure 26.5.1	Roof Slope:	8.0:12	33.7 DEG
Exposure Category:	C	Section 26.7.3	Mean Roof HT:	20.0 ft	UP TO 160FT
Ground Elevation:	100 ft		Parapet:	No	
Wall Ht:	20.0 ft				UP TO 160FT

Wind Topographic Factor, K_{zt}:

per Section 26.8



Terrain Type: 2-dimensional escarpments
Direction: Upwind of Crest

L_h:	100 ft	*DIST UPWIND OF CREST TO HALF HT OF HILL OR ESCARP.*
H:	5 ft	*HT. OF HILL OR ESCARP. RELATIVE TO THE UPWIND TERRAIN*
x:	10 ft	*DIST. (UPWIND OR DOWNWIND) FROM THE CREST TO THE BUILDING*
z:	30 ft	*HEIGHT ABOVE GROUND SURFACE AT BUILDING SITE*

K_{zt}: 1.00 *EQUATION 26.8-1*

K_{zt}: 1.00 *MANUALLY INPUT*

K_e: 0.996 ASCE 26.10.1

K_d: 0.85 ASCE 26.6

Wind Loads - Main Wind Force Resisting System

Per IBC 2021 & ASCE 7-16 Chapter 27.3 Part 1 - Enclosed Simple Diaphragm, h<160ft

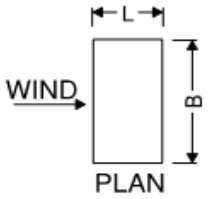
Wind Load Criteria

Risk Category:	**II**	Table 1.5-1	K_e:	**0.9964**	Section 26.10.1
Basic Wind Speed:	**98 mph**	Figure 26.5.1	K_d:	**0.85**	Section 26.6
Exposure Category:	**C**	Section 26.7.3	G:	**0.85**	Section 26.11
K_{zt}:	**1.00**	Section 26.8	Roof Height:	**20.0 ft**	

Wall Pressures:

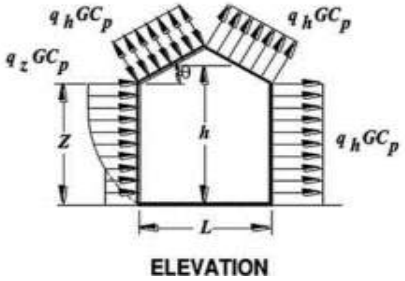
L/B Ratio:

Short Dimension:	**21.0 ft**
Long Dimension:	**28.0 ft**
Transverse Wind L/B:	0.75
Longitudinal Wind L/B:	1.33



*NOTE: INTERNAL BUILDING PRESSURE CANCEL EACH OTHER OUT IN ENCLOSED BUILDING

K_h & K_z:	0.902	At Top of Wall
K_z:	0.85	0 ft to 15 ft



ELEVATION

	Transverse Wind Direction	Longitudinal Wind Direction	
Top of Wall:	**20.8 psf**	**19.7 psf**	ASCE EQ 27.3-1
0 ft to 15 ft Wall:	**20.0 psf**	**19.0 psf**	ASCE EQ 27.3-1

*Enveloped Leeward and Windward Pressure

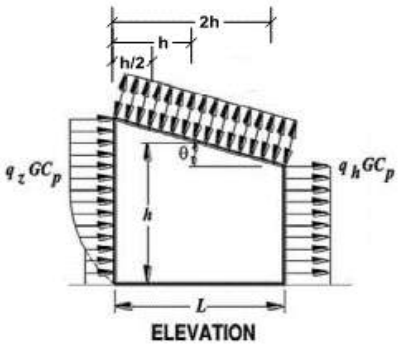
*All Values Ultimate (multiply x0.6 for ASD)

Wind Loads - Main Wind Force Resisting System (Cont.)

ASCE 7-16 Chapter 27.3 Part 1 - Enclosed Simple Diaphragm, h<160ft

Roof Pressure:

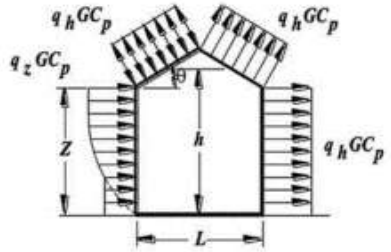
Slope:	8.0:12	=	33.7	DEGREES
Mean Roof HT:	20.0 ft			
Building Dimension:	**40.0 ft**	**Parallel to Ridge**		
Building Dimension:	**60.0 ft**	**Normal to Ridge**		
K_h & K_z:	0.902	At Mean Roof Ht		



ELEVATION

Windward Pressure Parallel to Ridge

	LC 1	LC 2	LC 1	LC 2
0 to h/2	**-17.7 psf**	**0.5 psf**		
h/2 to h	**-17.7 psf**	**0.5 psf**		
h to 2h	**-11.4 psf**	**0.5 psf**		
>2h	**-8.2 psf**	**0.5 psf**		



ELEVATION

Windward Pressure Normal to Ridge

8.3 psf ***Horizontal Projected Pressure:*** **4.6 psf**

Leeward Pressure Normal to Ridge

-13.0 psf ***Horizontal Projected Pressure:*** **-7.2 psf**

*Negative indicates pressure away from surface

*Total horizontal shear shall not be less than that determined by neglecting roof wind forces

*All Values Ultimate (multiply x0.6 for ASD)

Roof Overhang (PSF)

P_{ovh}: -25.7 psf ***Horizontal Projected Pressure:*** **-14.3 psf**

Minimum Total Projected Horizontal Pressure (PSF) **8.0 psf** ASCE 27.1.5

QUANTUM | CONSULTING ENGINEERS
1511 Third Avenue, Suite 323 T. 206.957.3900
Seattle, WA 98101 F. 206.957.3901

Project	Lin Kicska Residence	Job #	24429.01	Page	
Client	Dimarco Architecture	By	BSD	Date	01/30/25
Subject	Seismic Dead Load	Checked		Date	

SEISMIC DEAD LOAD

ROOF

ELEMENT	AREA (FT^2)	UNIT WT. (PSF)	WEIGHT (LB)
ROOF FRAMING	615.0	15.0	9225
INT. WALLS BELOW	185.0	8.0	1480
EXT. WALLS BELOW	500.0	10.0	5000

TOTAL DL	15705	LB

MAIN LEVEL

ELEMENT	AREA (FT^2)	UNIT WT. (PSF)	WEIGHT (LB)
FLOOR FRAMING	500.0	15.0	7500
DECK	150.0	12.0	1800
INT. WALLS	325.0	8.0	2600
EXT. WALLS	1000.0	10.0	10000

TOTAL DL	21900	LB

Seismic Base Shear for the Equivalent Lateral Force Procedure

Per IBC 2021 & ASCE 7-16

Structure: **Lin Kicska Residence**
Address: **Mercer Island**
Latitude: Longitude:

Structure Classification

Risk Category : **II** per ASCE Table 1.5-1

Seismic Force-Resisting System: **Light-Framed Wood Walls Sheathed with Structural Panels**
R: **6 1/2** per ASCE Table 12.2-1
W_o: **3** per ASCE Table 12.2-1
C_d: **4** per ASCE Table 12.2-1
h_n (ft): **25.00** height above the base to the highest level of the structure

Site Ground Motion

Reg. Structure/5 Stories Max: **No** Per ASCE 12.8.1.3
S_1 (g-sec): **0.51** S_S (g-sec): **1.46**
Site Class: **D** **Per Geotechnical Report** per ASCE 11.4.3

F_v **1.80** F_a **1.00**

S_{M1} (g-sec): **0.91** S_{MS} (g-sec): **1.46** per ASCE 11.4.4
S_{D1} (g-sec): **0.60** S_{DS} (g-sec): **0.97** per ASCE 11.4.5
SDC: **D** per ASCE 11.6
I_E: **1.00** per ASCE Table 1.5-2

Fundamental Period per ASCE 12.8.2

Period Method: **Approximate Fundamental Period**
Structure Type: **All Other Structural Systems**
T_L (sec): **6.00** ASCE Figures 22-14 through 22-17
T_S: 0.62

Ta (sec): 0.22 Ct * hnx per ASCE Eq. 12.8-7

T_{use} (sec): **0.22** ` <= TL

Equivalent Lateral Force Procedure Design Base Shear per ASCE 12.8

C_s: 0.15 = S_{DS} / (R/I_E) per ASCE Eq. 12.8-2
$C_{s\text{-}max}$: 0.42 = S_{D1} / (T_a*R/I_E) for T <= T_L per ASCE Eq. 12.8-3
$C_{s\text{-}max}$: -- = S_{D1}*T_L / (T_a^2*R/I_E) for T > T_L per ASCE Eq. 12.8-4
$C_{s\text{-}min}$: 0.04 per ASCE Eq. 12.8-5
$C_{s\text{-}min}$: -- = 0.5S_1 / (R/I_E) for S_1 => 0.6g per ASCE Eq. 12.8-6
$C_{s\text{-}use}$: 0.15

V : 0.149 W = $C_{S\text{-}use}$ * W per ASCE Eq. 12.8-1

Vert. Distribution of Seismic Forces for the Equiv. Lateral Force Procedure

Per IBC 2021 & ASCE 7-16

Structure: **Lin Kicska Residence**

Seismic Parameters

I_E:	1.00	per ASCE Table 1.5-2
S_{DS} (g-sec):	0.97	per ASCE 11.4.4
Period (Sec):	0.22	per ASCE 12.8.2.1
k:	1.00	per ASCE 12.8.3

Vertical Distribution of Seismic Forces per ASCE 12.8.3

$F_x = C_{vx}V$ per ASCE Eq. 12.8-11

$C_{vx} = (w_x h_x^k)/(\Sigma w_i h_i^k)$ per ASCE Eq. 12.8-12

Level	h_x (ft)	w_x (k)	% of W_{total}	$w_x * h_x^k$	C_{vx} (%)	F_x (k)	V_x (k)
Roof	22.00	15.71	41.8%	345.5	61.2%	3.43	3.43
Main	10.00	21.90	58.2%	219.0	38.8%	2.18	5.61

Total WT (k): 37.61 Sum: 565

$C_{s\text{-}use}$: 0.149

V (k): **5.61** per ASCE 12.8.1

Vertical Distribution of Seismic Diaphragm Forces per ASCE 12.10.1.1

$F_{px} = (SF_i/Sw_i) * w_{px}$ per ASCE Eq 12.10-1

$F_{px\text{-}max} = 0.4*S_{DS}*I_E*w_{px}$ per per ASCE 12.10.1.1

$F_{px\text{-}min} = 0.2*S_{DS}*I_E*w_{px}$ per per ASCE 12.10.1.1

Level	w_{px} (k)	Σw_i (k)	F_x (k)	ΣF_i (k)	F_{px} (k)	Notes	Diaphragm/Story Force Ratio
Roof	15.71	15.71	3.43	3.43	3.43		1.000
Main	21.90	37.61	2.18	5.61	4.25	= Fp-min	1.952

LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2021, ASCE 7-16, SDPWS 2021 & NDS 2018

Structure: **Lin Kicska Residence**
Floor Level: **Main Level**

Sds = 0.97
Depth of Floor Framing & Plates (Clearspan) at Interstory (in) = 17.25

Shear Wall Line Information

SW Mark		L_{SW} (ft)	Wall Pier h_{wp} (ft)	Aspect Ratio	Wall Framing Species	Specific Gravity G	Interstory or Base?	h_{sw} (ft)	Wall Wt. (psf)	Roof/Floor Trib. (ft)	Roof/Floor Wt. (psf)
SW GRID	**1**	**6.50**	-	-	-	-	-	-	-	-	-
SW Segment	1.10	6.50	11.00	1.69	DF #2	0.50	Interstory	11.00	10.0	12.3	15.0
SW GRID	**4**	**7.67**	-	-	-	-	-	-	-	-	-
SW Segment	4.10	7.67	11.00	1.43	DF #2	0.50	Interstory	11.00	10.0	5.0	15.0
SW GRID	**A**	**13.84**	-	-	-	-	-	-	-	-	-
SW Segment	A.1	5.67	11.00	1.94	DF #2	0.50	Interstory	11.00	10.0	2.0	15.0
SW Segment	A.2	8.17	11.00	1.35	DF #2	0.50	Interstory	11.00	10.0	2.0	15.0
SW GRID	**B**	**5.00**	-	-	-	-	-	-	-	-	-
SW Segment	B.1	5.00	11.00	2.20	DF #2	0.50	Interstory	11.00	10.0	2.0	15.0

Shear Wall Loads and Summary

SW Mark		EQ (lb) Wall (ULT)	Wind (lb) Wall (ULT)	Wall DL (lb)	Wall DL (lb) End 1	Wall DL (lb) End 2	Shear Wall Type	MIN. # of End Studs	Holdown
SW GRID	**1**	1715	2460	-	-	-	-	-	-
SW Segment	1.10	1715	2460	1909			**SW-6**	**2**	**(2) CS16 (3410)**
SW GRID	**4**	1715	2460				-	-	-
SW Segment	4.10	1715	2460	1419			**SW-6**	**2**	**CS16 (1705)**
SW GRID	**A**	1715	1670				-	-	-
SW Segment	A.1	703	684	794			**SW-6**	**2**	**CS16 (1705)**
SW Segment	A.2	1012	986	1144			**SW-6**	**2**	**CS16 (1705)**
SW GRID	**B**	1715	1670				-	-	-
SW Segment	B.1	1715	1670	700			**SW-6**	**2**	**(2) CS16 (3410)**

LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2021, ASCE 7-16, SDPWS 2021 & NDS 2018

Structure: **Lin Kicska Residence**
Floor Level: **Main Level**

Shear Wall Schedule (LRFD)

EQ ϕ SDPWS 4.1.4.1 ϕ_D = 0.5 WIND ϕ SDPWS 4.1.4.2 ϕ_D = 0.8

Shear Wall Type	Sheathing Grade, Sheathing Thickness, & Nail Size	Panel Edge Nail Spacing (in)	Nominal Seismic SW Capacity (plf)	LRFD Seismic SW Capacity (plf)	Nominal Wind SW Capacity (plf)	LRFD Wind SW Capacity (plf)	Sheathing Shear Stiffness, G_a (lb/in)
SW-6	APA Rated, 7/16"+15/32", 8d Common	6	730	365	730	584	11
SW-4	APA Rated, 7/16"+15/32", 8d Common	4	1065	533	1065	852	14
SW-3	APA Rated, 7/16"+15/32", 8d Common	3	1370	685	1370	1096	17
SW-2	APA Rated, 7/16"+15/32", 8d Common	2	1790	895	1790	1432	21
2SW-4	APA Rated, 7/16"+15/32", 8d Common	4	2130	1065	2130	1704	28
2SW-3	APA Rated, 7/16"+15/32", 8d Common	3	2740	1370	2740	2192	34
2SW-2	APA Rated, 7/16"+15/32", 8d Common	2	3580	1790	3580	2864	42

****See SDPWS Table 4.3A Note 2, assumes studs at 16" o.c.**

Determine Shear Wall Type (LRFD)

SW Segment Mark	Seismic Shear (plf)	Wind Shear (plf)	Aspect Ratio Reduction	Species Reduction	HD Reduction	Controlling Shear (plf)	Shear Wall Type	Shear Wall Capacity (plf)	Check	Controlling Shear
1.10	264	378	1.00	1.00	1.00	264	SW-6	365	OK	Seismic
4.10	224	321	1.00	1.00	1.00	224	SW-6	365	OK	Seismic
A.1	124	121	1.00	1.00	1.00	124	SW-6	365	OK	Seismic
A.2	124	121	1.00	1.00	1.00	124	SW-6	365	OK	Seismic
B.1	343	334	0.98	1.00	1.00	343	SW-6	365	OK	Seismic

***NOTE: CONTROLLING SHEAR IS BASED ON THE DIFFERENCE IN SHEAR WALL CAPACITY BETWEEN WIND & EQ**

Determine Shear Wall Overturning Moment Lever Arm

SW Segment Mark	Wall Length Lever Arm (ft)	Calculated Lever Arm (ft)	% Different	Override Wall Length	User Input M_{OT} Lever Arm (ft)
1.10	6.50	6.29	3.31%	No	
4.10	7.67	7.46	2.79%	No	
A.1	5.67	5.46	3.81%	No	
A.2	8.17	7.96	2.62%	No	
B.1	5.00	4.79	4.35%	No	

LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2021, ASCE 7-16, SDPWS 2021 & NDS 2018

Structure: **Lin Kicska Residence**
Floor Level: **Main Level**

Shear Wall End Axial Load (ASD)

SW Segment Mark	Seismic Tension (lb)	ASD Seismic Tension Above (lb)	Seismic Tension Total (lb)	Wind Tension (lb)	ASD Wind Tension Above (lb)	Wind Tension Total (lb)	End 1 Dead (lb)	End 2 Dead (lb)
1.10	2032		2032	2498		2498	955	955
4.10	1722		1722	2117		2117	709	709
A.1	954		954	796		796	397	397
A.2	954		954	796		796	572	572
B.1	2641		2641	2204		2204	350	350

Determine Required Holdown (ASD)

SW Segment Mark	Wind End 1 Eq. 16-15	EQ End 1 Eq. 16-16	Wind End 2 Eq. 16-15	EQ End 2 Eq. 16-16	Controlling Ten. Load (lb)	Holdown	Holdown Capacity (lb)	Status
1.10	-1925	-1588	-1925	-1588	**-1925**	**(2) CS16 (3410)**	**-3410**	**OK**
4.10	-1691	-1392	-1691	-1392	**-1691**	**CS16 (1705)**	**-1705**	**OK**
A.1	-558	-770	-558	-770	**-770**	**CS16 (1705)**	**-1705**	**OK**
A.2	-453	-689	-453	-689	**-689**	**CS16 (1705)**	**-1705**	**OK**
B.1	-1994	-2479	-1994	-2479	**-2479**	**(2) CS16 (3410)**	**-3410**	**OK**

LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2021, ASCE 7-16, SDPWS 2021 & NDS 2018

Structure: **Lin Kicska Residence**
Floor Level: **Lower Level**

Sds = 0.97
Depth of Floor Framing & Plates (Clearspan) at Interstory (in) = 17.25

Shear Wall Line Information

SW Mark		L_{SW} (ft)	Wall Pier h_{wp} (ft)	Aspect Ratio	Wall Framing Species	Specific Gravity G	Interstory or Base?	h_{sw} (ft)	Wall Wt. (psf)	Roof/Floor Trib. (ft)	Roof/Floor Wt. (psf)
SW GRID	**1**	**6.34**	-	-	-	-	-	-	-	-	-
SW Segment	1.10	3.17	9.00	2.84	DF #2	0.50	Base	9.00	10.0	2.0	15.0
SW Segment	1.20	3.17	9.00	2.84	DF #2	0.50	Base	9.00	10.0	2.0	15.0
SW GRID	**3**	**8.00**	-	-	-	-	-	-	-	-	-
SW Segment	3.10	8.00	9.00	1.13	DF #2	0.50	Base	9.00	8.0	2.0	15.0
SW GRID	**A**	**17.83**	-	-	-	-	-	-	-	-	-
SW Segment	A.1	6.33	9.00	1.42	DF #2	0.50	Base	9.00	10.0	4.0	15.0
SW Segment	A.2	11.50	9.00	0.78	DF #2	0.50	Base	9.00	10.0	4.0	15.0
SW GRID	**B**	**5.00**	-	-	-	-	-	-	-	-	-
SW Segment	B.1	5.00	9.00	1.80	DF #2	0.50	Base	9.00	10.0	4.0	15.0

Shear Wall Loads and Summary

SW Mark		EQ (lb) Wall (ULT)	Wind (lb) Wall (ULT)	Wall DL (lb)	Wall DL (lb) End 1	Wall DL (lb) End 2	Shear Wall Type	MIN. # of End Studs	Holdown
SW GRID	**1**	2260	3770	-	-	-	-	-	-
SW Segment	1.10	1130	1885	380			**SW-4**	**2**	**HDU5 (5645DF, 4340HF)**
SW Segment	1.20	1130	1885	380			**SW-4**	**2**	**HDU5 (5645DF, 4340HF)**
SW GRID	**3**	1640	3920				-	-	-
SW Segment	3.10	1640	3920	816			**SW-6**	**2**	**HDU2 (3075DF,2215HF)**
SW GRID	**A**	2800	4250				-	-	-
SW Segment	A.1	994	1509	950			**SW-6**	**2**	**HDU2 (3075DF,2215HF)**
SW Segment	A.2	1806	2741	1725			**SW-6**	**2**	**HDU2 (3075DF,2215HF)**
SW GRID	**B**	2800	4250				-	-	-
SW Segment	B.1	2800	4250	750			**SW-3**	**2**	**HDU8 (6765DF, 5820HF)**

LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2021, ASCE 7-16, SDPWS 2021 & NDS 2018

Structure: **Lin Kicska Residence**
Floor Level: **Lower Level**

Shear Wall Schedule (LRFD)

EQ ϕ SDPWS 4.1.4.1 ϕ_D = 0.5 WIND ϕ SDPWS 4.1.4.2 ϕ_D = 0.8

Shear Wall Type	Sheathing Grade, Sheathing Thickness, & Nail Size	Panel Edge Nail Spacing (in)	Nominal Seismic SW Capacity (plf)	LRFD Seismic SW Capacity (plf)	Nominal Wind SW Capacity (plf)	LRFD Wind SW Capacity (plf)	Sheathing Shear Stiffness, G_a (lb/in)
SW-6	APA Rated, 7/16"+15/32", 8d Common	6	730	365	730	584	11
SW-4	APA Rated, 7/16"+15/32", 8d Common	4	1065	533	1065	852	14
SW-3	APA Rated, 7/16"+15/32", 8d Common	3	1370	685	1370	1096	17
SW-2	APA Rated, 7/16"+15/32", 8d Common	2	1790	895	1790	1432	21
2SW-4	APA Rated, 7/16"+15/32", 8d Common	4	2130	1065	2130	1704	28
2SW-3	APA Rated, 7/16"+15/32", 8d Common	3	2740	1370	2740	2192	34
2SW-2	APA Rated, 7/16"+15/32", 8d Common	2	3580	1790	3580	2864	42

****See SDPWS Table 4.3A Note 2, assumes studs at 16" o.c.**

Determine Shear Wall Type (LRFD)

SW Segment Mark	Seismic Shear (plf)	Wind Shear (plf)	Aspect Ratio Reduction	Species Reduction	HD Reduction	Controlling Shear (plf)	Shear Wall Type	Shear Wall Capacity (plf)	Check	Controlling Shear
1.10	356	595	0.90	1.00	1.00	595	SW-4	763	OK	Wind
1.20	356	595	0.90	1.00	1.00	595	SW-4	852	OK	Wind
3.10	205	490	1.00	1.00	1.00	490	SW-6	584	OK	Wind
A.1	157	238	1.00	1.00	1.00	157	SW-6	365	OK	Seismic
A.2	157	238	1.00	1.00	1.00	157	SW-6	365	OK	Seismic
B.1	560	850	1.00	1.00	1.00	560	SW-3	685	OK	Seismic

***NOTE: CONTROLLING SHEAR IS BASED ON THE DIFFERENCE IN SHEAR WALL CAPACITY BETWEEN WIND & EQ**

Determine Shear Wall Overturning Moment Lever Arm

SW Segment Mark	Wall Length Lever Arm (ft)	Calculated Lever Arm (ft)	% Different	Override Wall Length	User Input M_{OT} Lever Arm (ft)
1.10	3.17	2.69	18.04%	No	
1.20	3.17	2.69	18.04%	No	
3.10	8.00	7.52	6.44%	No	
A.1	6.33	5.85	8.29%	No	
A.2	11.50	11.02	4.40%	No	
B.1	5.00	4.51	10.85%	No	

LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2021, ASCE 7-16, SDPWS 2021 & NDS 2018

Structure: **Lin Kicska Residence**
Floor Level: **Lower Level**

Shear Wall End Axial Load (ASD)

SW Segment Mark	Seismic Tension (lb)	ASD Seismic Tension Above (lb)	Seismic Tension Total (lb)	Wind Tension (lb)	ASD Wind Tension Above (lb)	Wind Tension Total (lb)	End 1 Dead (lb)	End 2 Dead (lb)
1.10	2246	**2032**	4277	3211	**2498**	5709	190	190
1.20	2246	**2032**	4277	3211	**2498**	5709	190	190
3.10	1292		1292	2646		2646	408	408
A.1	989	**954**	1943	1287	**796**	2084	475	475
A.2	989	**954**	1943	1287	**796**	2084	863	863
B.1	3528	**2641**	6169	4590	**2204**	6794	375	375

Determine Required Holdown (ASD)

SW Segment Mark	Wind End 1 Eq. 16-15	EQ End 1 Eq. 16-16	Wind End 2 Eq. 16-15	EQ End 2 Eq. 16-16	Controlling Ten. Load (lb)	Holdown	Holdown Capacity (lb)	Status
1.10	-5595	-4189	-5595	-4189	**-5595**	**HDU5 (5645DF, 4340HF)**	**-5645**	**OK**
1.20	-5595	-4189	-5595	-4189	**-5595**	**HDU5 (5645DF, 4340HF)**	**-5645**	**OK**
3.10	-2401	-1102	-2401	-1102	**-2401**	**HDU2 (3075DF,2215HF)**	**-3075**	**OK**
A.1	-1799	-1723	-1799	-1723	**-1799**	**HDU2 (3075DF,2215HF)**	**-3075**	**OK**
A.2	-1566	-1543	-1566	-1543	**-1566**	**HDU2 (3075DF,2215HF)**	**-3075**	**OK**
B.1	-6569	-5995	-6569	-5995	**-6569**	**HDU8 (6765DF, 5820HF)**	**-6765**	**OK**

QUANTUM | CONSULTING ENGINEERS
1511 Third Avenue, Suite 323
Seattle, WA 98101
TEL 206.957.3900
FAX 206.957.3901

LIN KICSKA RESIDENCE
5331 FOREST AVE SE
MERCER ISLAND, WA 98040

QUANTUM JOB NUMBER: 24429.01

FOUNDATION DESIGN

FRONT PORCH FOOTING BEARING CHECK

ALLOWABLE BEARING PRESSURE = 1,000 PSF

LOADS FROM FRONT PORCH ROOF AND DECK = 1,894# DL + 4,016# LL + 929# SL
CONTROLLING LOAD CASE = DL+LL = 5,910# [FORTE PORCH BEAM PRINTOUT]

FOOTING AREA = 2'-6"X2'-6" = 6.25 SF

BEARING PRESSURE = 5,910# / 6.25 SF = 945 PSF < 1,000 PSF OK

QUANTUM
CONSULTING ENGINEERS
1511 THIRD AVENUE
SUITE 323
SEATTLE, WA 98101
TEL 206.957.3900
FAX 206.957.3901
www.quantumce.com

LIN KICSKA RESIDENCE	05/07/2025	24429.01
project	date	job no.
PORCH FOOTING DESIGN	drawn by:	
DIMARCO	BSD	
client	design by:	sheet no.

Basement Wall Design (PCA Rect. Conc. Tanks, 5th ED.)

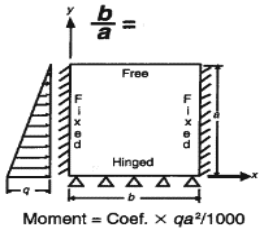
IBC 2021 and ACI 318-19

Wall Location: Planted Area
Wall Thickness: 8 in

f'c: 3 ksi b= 11 ft b/a= 1.38
fy: 40 ksi a= 8 ft

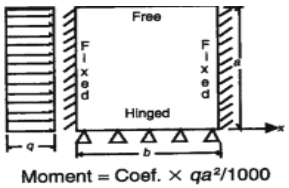
Active Pressure

q (EFP): 40 lb/ft^3
Mu= 1.6 x C x EFP x a^3 x 12" / 1000^2
Mu= C(0.39) k-in/ft



Traffic Surcharge Pressure

q (EFP): 152 lb/ft^2 **(includes 80psf traffic+9H seismic)**
Mu= 1.6 x C x EFP x a^2 x 12" / 1000^2
Mu= C(0.19) k-in/ft



Horizontal Bending

Wall End	Mu^-=	-53.9	k-in/ft	C=	-56.5	Active	C=	-169.5	Surch.
Mid Wall	Mu^+=	24.9	k-in/ft	C=	25.0	Active	C=	80.5	Surch.
Corner Bar	d:	4	in	As^-=	**0.40**	in^2/ft	**#5@12"o.c. corner bars (60ksi)**		
Horizontal Bar	d:	4	in	As^+=	**0.18**	in^2/ft	**#4@12"o.c. horiz.**		

Vertical Bending

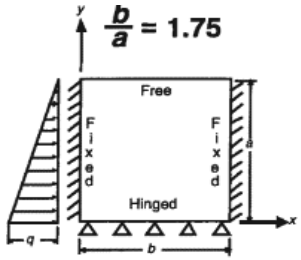
Mid Wall	Mu^+=	15.2	k-in/ft	C=	24.0	Active	C=	31.0	Surch.
Vertical Bar	d:	4	in	As^-=	**0.11**	in^2/ft			

#4@12" o.c. vert.

PCA Rectangular Concrete Tanks (Revised Fifth Edition)

Case 2

b/a=1.75

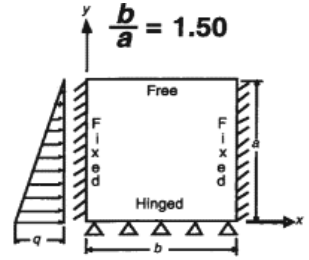


Moment = Coef. × $qa^2/1000$

My	END	0.1b	0.2b	0.3b	0.4b	
		0.9b	0.8b	0.7b	0.6b	0.5b
Top	-58	-36	-4	19	33	37
0.9a	-75	-34	-3	19	32	36
0.8a	-75	-33	-1	20	32	36
0.7a	-77	-31	0	20	32	35
0.6a	-77	-29	2	21	31	34
0.5a	-77	-26	4	21	30	32
0.4a	-73	-21	6	20	27	29
0.3a	-65	-16	6	18	23	25
0.2a	-51	-10	6	14	17	18
0.1a	-30	-5	4	8	10	10
BOT.	0	0	0	0	0	0

Mx	END	0.1b	0.2b	0.3b	0.4b	
		0.9b	0.8b	0.7b	0.6b	0.5b
Top	-12	0	0	0	0	0
0.9a	-15	-5	0	2	4	4
0.8a	-15	-6	1	6	9	10
0.7a	-15	-5	4	11	15	16
0.6a	-15	-4	7	16	21	22
0.5a	-15	-2	11	20	26	28
0.4a	-15	0	14	24	30	32
0.3a	-13	2	16	25	30	32
0.2a	-10	4	16	23	27	28
0.1a	-6	4	11	15	17	18
BOT.	0	0	0	0	0	0

b/a=1.5



Moment = Coef. × $qa^2/1000$

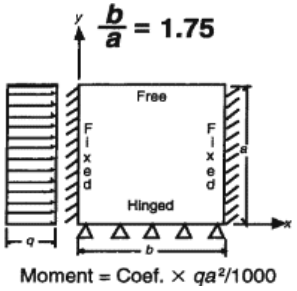
My	END	0.1b	0.2b	0.3b	0.4b	
		0.9b	0.8b	0.7b	0.6b	0.5b
Top	-37	-27	-4	13	24	27
0.9a	-53	-25	-3	14	24	27
0.8a	-56	-25	-2	15	24	28
0.7a	-59	-25	0	16	25	28
0.6a	-62	-24	1	17	26	28
0.5a	-63	-22	3	17	25	28
0.4a	-62	-19	4	17	24	26
0.3a	-56	-15	5	16	21	22
0.2a	-45	-10	5	12	16	17
0.1a	-27	-5	3	7	9	10
BOT.	0	0	0	0	0	0

Mx	END	0.1b	0.2b	0.3b	0.4b	
		0.9b	0.8b	0.7b	0.6b	0.5b
Top	-8	0	0	0	0	0
0.9a	-11	-4	-1	1	2	3
0.8a	-11	-5	0	4	6	7
0.7a	-12	-4	2	7	11	12
0.6a	-12	-3	5	12	16	17
0.5a	-13	-2	8	16	20	22
0.4a	-12	0	11	19	24	26
0.3a	-11	1	13	21	25	27
0.2a	-9	3	13	19	23	24
0.1a	-5	3	9	13	15	16
BOT.	0	0	0	0	0	0

PCA Rectangular Concrete Tanks (Revised Fifth Edition)

Case 7

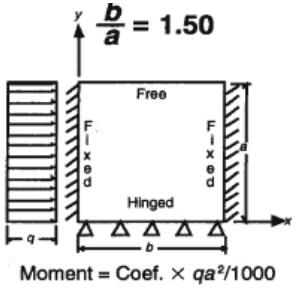
b/a=1.75



My	END	0.1b 0.9b	0.2b 0.8b	0.3b 0.7b	0.4b 0.6b	0.5b
Top	-221	-114	-3	67	107	119
0.9a	-267	-105	-2	64	101	113
0.8a	-242	-99	-1	61	95	106
0.7a	-221	-91	0	58	89	99
0.6a	-202	-81	2	54	82	91
0.5a	-182	-70	4	49	73	81
0.4a	-158	-57	5	43	63	69
0.3a	-129	-43	6	35	50	55
0.2a	-94	-29	6	25	36	39
0.1a	-51	-14	4	14	19	20
BOT.	0	0	0	0	0	0

Mx	END	0.1b 0.9b	0.2b 0.8b	0.3b 0.7b	0.4b 0.6b	0.5b
Top	-44	0	0	0	0	0
0.9a	-53	-16	0	9	13	15
0.8a	-48	-19	2	16	23	26
0.7a	-44	-17	5	21	31	34
0.6a	-40	-14	9	27	37	41
0.5a	-36	-10	13	31	41	45
0.4a	-32	-6	16	33	43	46
0.3a	-26	-2	18	32	41	43
0.2a	-19	1	17	28	34	36
0.1a	-10	3	12	18	21	22
BOT.	0	0	0	0	0	0

b/a=1.5



My	END	0.1b 0.9b	0.2b 0.8b	0.3b 0.7b	0.4b 0.6b	0.5b
Top	-182	-89	-5	51	83	93
0.9a	-200	-83	-4	49	79	89
0.8a	-184	-78	-3	47	75	84
0.7a	-171	-73	-2	45	71	79
0.6a	-159	-66	0	42	66	74
0.5a	-145	-58	2	39	60	66
0.4a	-128	-48	3	35	52	57
0.3a	-106	-37	4	29	42	46
0.2a	-79	-25	4	21	30	33
0.1a	-44	-12	5	12	16	18
BOT.	0	0	0	0	0	0

Mx	END	0.1b 0.9b	0.2b 0.8b	0.3b 0.7b	0.4b 0.6b	0.5b
Top	-37	0	0	0	0	0
0.9a	-40	-13	0	6	10	11
0.8a	-37	-16	1	11	17	19
0.7a	-34	-14	3	15	23	26
0.6a	-32	-11	6	20	28	31
0.5a	-29	-9	9	23	31	34
0.4a	-26	-6	12	25	33	36
0.3a	-21	-3	14	26	33	35
0.2a	-16	0	13	23	28	30
0.1a	-9	2	10	15	18	19
BOT.	0	0	0	0	0	0

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Basement L Wall

Code Reference

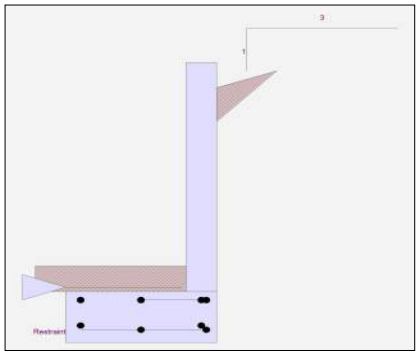
Calculations per IBC 2021, ACI 318-19, TMS 402-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	3.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	250.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform		
Multiplier Used	=	9.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	45.000
Total Seismic Force	=	225.000

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Basement L Wall

Design Summary

Wall Stability Ratios

Overturning	=	1.86	OK
Slab Resists All Sliding !			
Global Stability	=	2.04	

Total Bearing Load	=	1,237 lbs	
...resultant ecc.	=	4.76 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	966 psf	OK
Soil Pressure @ Heel	=	23 psf	OK
Allowable	=	1,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,195 psf	
ACI Factored @ Heel	=	29 psf	
Footing Shear @ Toe	=	7.7 psi	OK
Footing Shear @ Hee	=	0.0 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	657.5 lbs	

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

		Bottom			
		Stem OK			
Design Height Above Ftg	ft =	0.00			
Wall Material Above "Ht"	=	Concrete			
Design Method	=	SD	SD	SD	SD
Thickness	=	6.00			
Rebar Size	=	# 4			
Rebar Spacing	=	12.00			
Rebar Placed at	=	Center			

Design Data

fb/FB + fa/Fa	=	**0.605**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	692.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	1,042.7
Moment.....Allowable	=	1,721.3
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	19.2
Shear.....Allowable	psi =	58.2
Anet (Masonry)	in2 =	
Wall Weight	psf =	75.0
Rebar Depth 'd'	in =	3.00

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	40,000.0

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Basement L Wall

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1296 in2/ft		
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1296 in2/ft	#4@ 18.52 in	#4@ 37.04 in
Provided Area :	0.2 in2/ft	#5@ 28.70 in	#5@ 57.41 in
Maximum Area :	0.7315 in2/ft	#6@ 40.74 in	#6@ 81.48 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	0.50
Total Footing Width	=	2.50
Footing Thickness	=	12.00 in

f'c = 3,000 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,195	29	psf
Mu' : Upward	=	1,768	0	ft-#
Mu' : Downward	=	516	0	ft-#
Mu: Design	=	1,252	560	ft-#
φ Mn	=	5,579	OK - Flush	
Actual 1-Way Shear	=	7.72	0.00	psi
Allow 1-Way Shear	=	41.80	45.11	psi

Toe Reinforcing = # 4 @ 11.11 in
Heel Reinforcing = Flush heel condition. No reinforcing required.
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 18 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area 0.65 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Basement L Wall

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		500.0	1.67	833.3	Soil Over HL (ab. water tbl)			
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)			
Hydrostatic Force					Water Table			
Buoyant Force	=				Sloped Soil Over Hee	=	2.50	
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=	250.0	2.25	562.5
Added Lateral Load	=				* Axial Live Load on Stem	=			
Load @ Stem Above Soil	=				Soil Over Toe	=	130.0	1.00	130.0
Seismic Earth Load	=	157.5	2.50	393.8	Surcharge Over Toe	=			
	=				Stem Weight(s)	=	337.5	2.25	759.4
					Earth @ Stem Transitions	=			
					Footing Weight	=	375.0	1.25	468.8
					Key Weight	=			
					Vert. Component	=	144.8	2.50	361.9
Total	=	657.5	**O.T.M.** =	1,227.1	**Total =**		1,237.3 lbs	**R.M.=**	2,282.6

Resisting/Overturning Ratio = **1.86**

Vertical Loads used for Soil Pressure = 1,237.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.048	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

DESCRIPTION: Basement L Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

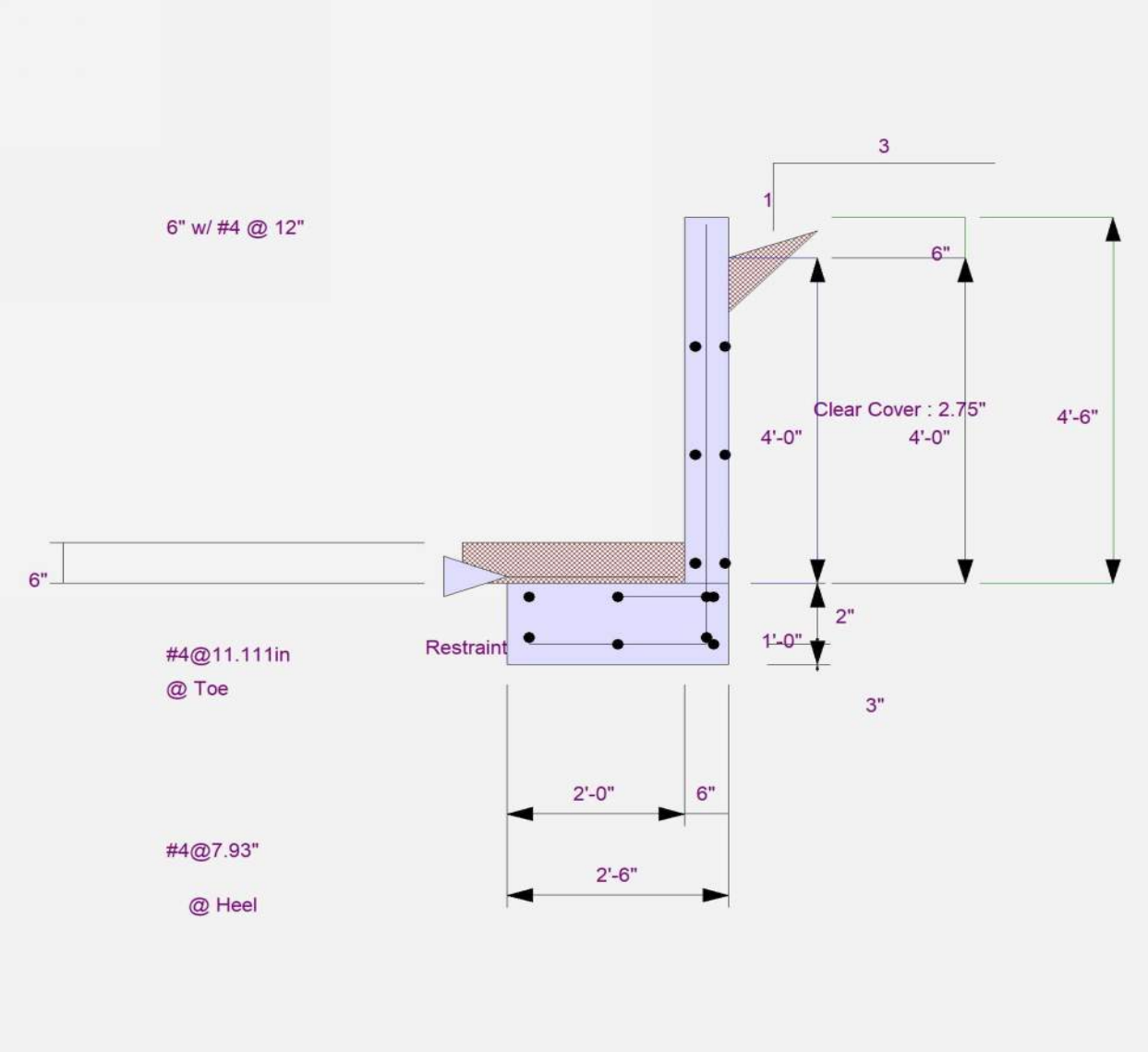
Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =	15.60 in
Development length for #4 bar specified in this stem design segment =	12.00 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	6.00 in
As Provided =	0.2000 in2/ft
As Required =	0.1728 in2/ft

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

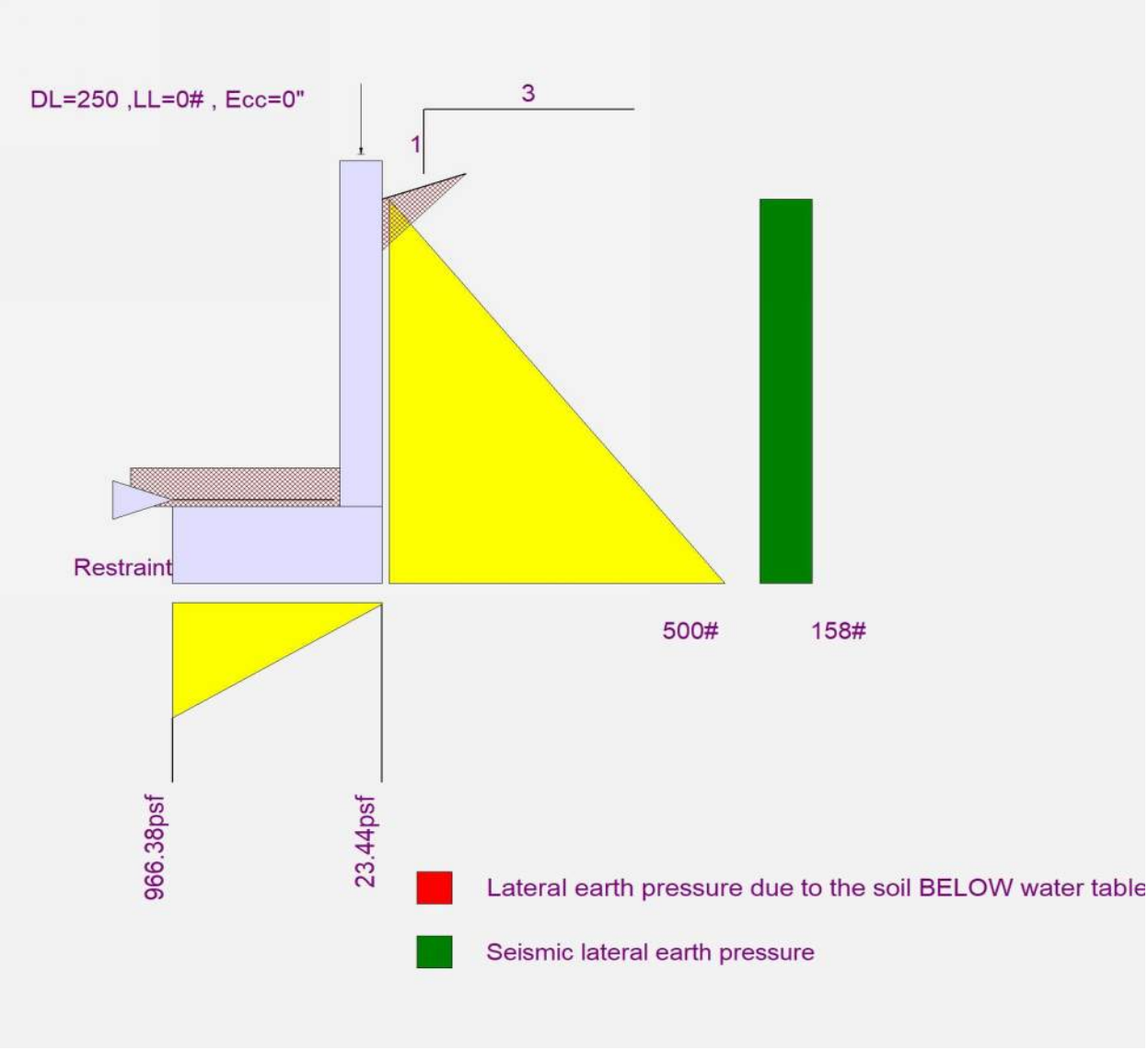
Project File: Foundations.ec6

DESCRIPTION: Basement L Wall



Cantilevered Retaining Wall

DESCRIPTION: Basement L Wall



Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Deck Retaining Wall

Code Reference

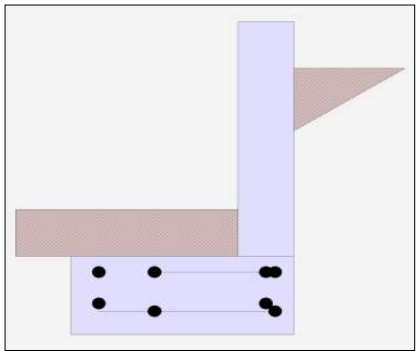
Calculations per IBC 2021, ACI 318-19, TMS 402-16

Criteria

Retained Height	=	2.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	80.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Earth Pressure Seismic Load

Method : Uniform		
Multiplier Used	=	9.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	25.500
Total Seismic Force	=	72.250

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Deck Retaining Wall

Design Summary

Wall Stability Ratios

Overturning	=	2.27	OK
Sliding	=	1.16	Ratio < 1.5!
Global Stability	=	2.41	

Total Bearing Load	=	575	lbs
...resultant ecc.	=	3.46	in

Eccentricity within middle third

Soil Pressure @ Toe	=	536	psf OK
Soil Pressure @ Heel	=	39	psf OK
Allowable	=	1,500	psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	699	psf
ACI Factored @ Heel	=	50	psf
Footing Shear @ Toe	=	3.6	psi OK
Footing Shear @ Hee	=	0.0	psi OK
Allowable	=	82.2	psi

Sliding Calcs

Lateral Sliding Force	=	280.9	lbs
less 100% Passive Force	-	97.2	lbs
less 100% Friction Force	-	230.0	lbs
Added Force Req'd	=	0.0	lbs OK
....for 1.5 Stability	=	94.1	lbs NG

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

		Bottom			
		Stem OK			
Design Height Above Ftg	ft =	0.00			
Wall Material Above "Ht"	=	Concrete			
Design Method	=	SD	SD	SD	SD
Thickness	=	6.00			
Rebar Size	=	# 4			
Rebar Spacing	=	16.00			
Rebar Placed at	=	Center			

Design Data

fb/FB + fa/Fa	=	**0.164**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	257.8
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	215.1
Moment.....Allowable	=	1,305.8
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	7.2
Shear.....Allowable	psi =	52.9
Anet (Masonry)	in2 =	
Wall Weight	psf =	75.0
Rebar Depth 'd'	in =	3.00

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	40,000.0

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Deck Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0267 in2/ft		
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1296 in2/ft	#4@ 18.52 in	#4@ 37.04 in
Provided Area :	0.15 in2/ft	#5@ 28.70 in	#5@ 57.41 in
Maximum Area :	0.7315 in2/ft	#6@ 40.74 in	#6@ 81.48 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	0.50
Total Footing Width	=	2.00
Footing Thickness	=	10.00 in

f'c = 3,000 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	699	50	psf
Mu' : Upward	=	604	0	ft-#
Mu' : Downward	=	257	0	ft-#
Mu: Design	=	347	560	ft-#
φ Mn	=	4,283	OK - Flush	
Actual 1-Way Shear	=	3.55	0.00	psi
Allow 1-Way Shear	=	45.57	48.70	psi

Toe Reinforcing = # 4 @ 11.11 in
Heel Reinforcing = Flush heel condition. No reinforcing required.
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 11.11 in, #5@ 17.22 in, #6@ 18 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: Flush heel condition. No reinforcing required.

Key: No key defined

Min footing T&S reinf Area 0.43 in2
Min footing T&S reinf Area per foot 0.22 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 11.11 in	#4@ 22.22 in
#5@ 17.22 in	#5@ 34.44 in
#6@ 24.44 in	#6@ 48.89 in

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

DESCRIPTION: Deck Retaining Wall

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		160.6	0.94	151.6	Soil Over HL (ab. water tbl)			
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)			
Hydrostatic Force					Water Table			
Buoyant Force	=				Sloped Soil Over Hee	=		
Surcharge over Heel	=	69.7	1.42	98.8	Surcharge Over Heel	=	2.00	
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	97.5	0.75	73.1
Seismic Earth Load	=	50.6	1.42	71.6	Surcharge Over Toe	=		
	=				Stem Weight(s)	=	187.5	1.75	328.1
					Earth @ Stem Transitions	=			
					Footing Weight	=	250.0	1.00	250.0
					Key Weight	=			
					Vert. Component	=	40.0	2.00	80.0
Total	=	280.9	**O.T.M.** =	322.1	**Total =**		575.0 lbs	**R.M.=**	731.2

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Resisting/Overturning Ratio = **2.27**

Vertical Loads used for Soil Pressure = 575.0 lbs

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.019	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

DESCRIPTION: Deck Retaining Wall

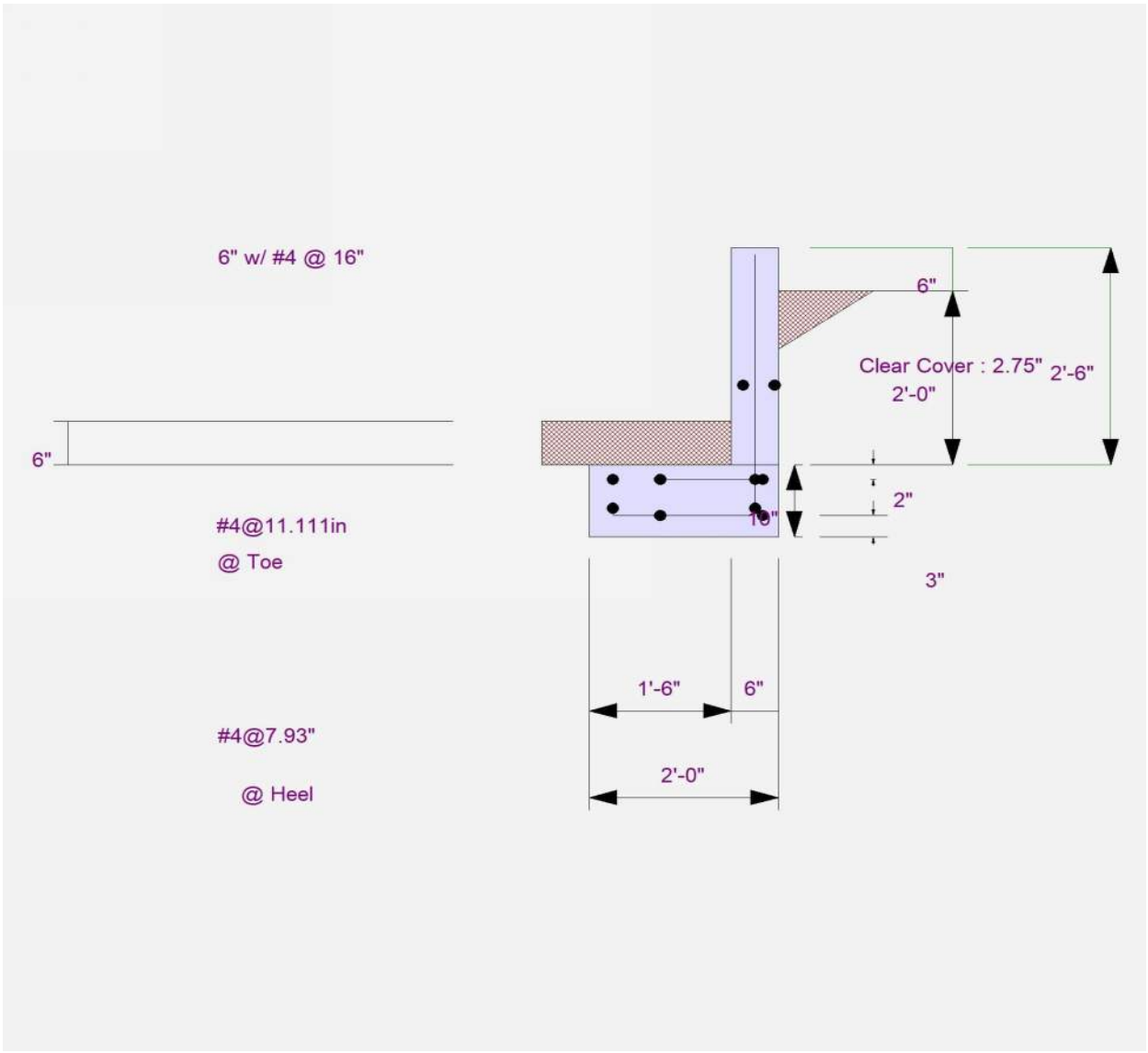
Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =	15.60 in
Development length for #4 bar specified in this stem design segment =	12.00 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	6.00 in
As Provided =	0.1500 in2/ft
As Required =	0.1296 in2/ft

Cantilevered Retaining Wall

DESCRIPTION: Deck Retaining Wall



Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06016450, Build:20.25.02.04 QUANTUM CONSULTING ENGINEERS

DESCRIPTION: Deck Retaining Wall