



January 17, 2024

STRUCTURAL CALCULATIONS
(Permit Submittal)

DUFFY/MCALEESE REMODEL
5330 Lansdowne Lane
Mercer Island, WA 98040

Quantum Job Number: 23488.01

Prepared for:
CHESMORE BUCK ARCHITECTURE
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DUFFY/MCALEESE REMODEL

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MERCER ISLAND, WA 98040

QUANTUM JOB NUMBER: 23488.01

DESIGN CRITERIA

Structural Design Criteria

Building Code: 2018 International Building Code
Building Department: Mercer Island

Seismic Criteria

S_s: 1.45 I_e: 1.00
S₁: 0.50 Seismic Soil Site Class: D
S_{ds}: 1.16 Seismic Design Category: D
S_{d1}: 0.60 Cs: 0.18 & 0.77
R: 6.50 Light-Framed Wood Walls Sheathed With Wood Structural Panels
R: 1.50 Timber Frames

Wind Criteria

Wind Speed: 97 MPH
Risk Category: II
Wind Exposure: B
Kzt: 1.6

Geotechnical Criteria

Allowable Bearing Pressure 1500 PSF
Minimum Footing Width Continuous: 18" min., Isolated: 24" min.
Frost Depth 18" min.

Materials Criteria

Concrete (28 Day Strength):
Foundation/Slab on Grade F'c= 2,500 PSI

Reinforcing Steel:
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)
Wood Sheathing APA RATED

Residential Building Loads

Snow Load	Roof	25 psf
Live Load	Residential	40 psf

Assembly Loads

Roof Loads		Comments
Standard Roofing	4.0 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	
Miscellaneous	1.1 psf	
Total:		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:		LL=40 psf

Patio Roof Loads		Comments
Standard Roofing	4.0 psf	
1/2" Ply. Sheathing	1.5 psf	
2x6 Joists @ 16" o.c.	2.1 psf	
Miscellaneous	0.4 psf	
Total:		SL=25 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

Deflection Criteria

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

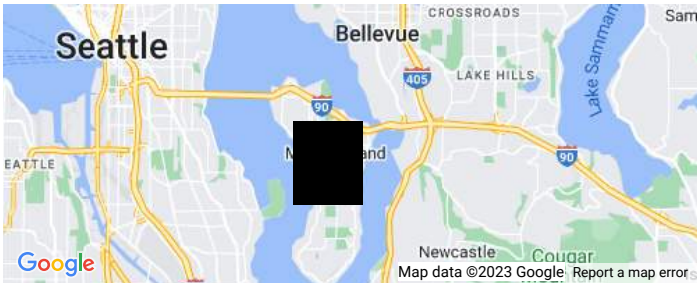
⚠ This is a beta release of the new ATC Hazards by Location website. Please [contact us](#) with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

ATC Hazards by Location

Search Information

Address: 5330 Lansdowne Ln, Mercer Island, WA 98040, USA
Coordinates: 47.5534012, -122.225403
Elevation: 266 ft
Timestamp: 2023-12-22T21:32:04.741Z
Hazard Type: Wind



ASCE 7-16

MRI 10-Year 67 mph
MRI 25-Year 73 mph
MRI 50-Year 78 mph
MRI 100-Year 83 mph
Risk Category I 92 mph
Risk Category II 97 mph
Risk Category III 104 mph
Risk Category IV 108 mph

ASCE 7-10

MRI 10-Year 72 mph
MRI 25-Year 79 mph
MRI 50-Year 85 mph
MRI 100-Year 91 mph
Risk Category I 100 mph
Risk Category II 110 mph
Risk Category III-IV 115 mph

ASCE 7-05

ASCE 7-05 Wind Speed 85 mph

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

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Disclaimer

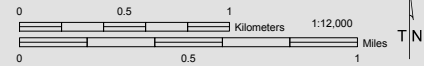
Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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

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



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 K_{zt} factor to be utilized for each specific project. The K_{zt} 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 K_{zt} 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	
	$K_{zt} = 1.0$
	$K_{zt} = 1.3$
	$K_{zt} = 1.6$
	$K_{zt} = 1.9$

PROJECT LOCATION

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 identified 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.

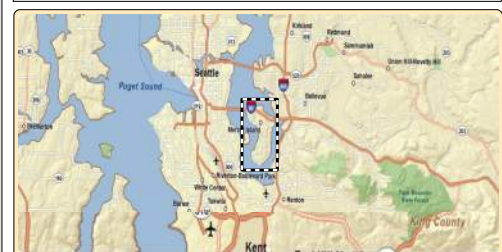
DEFINITIONS:

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)



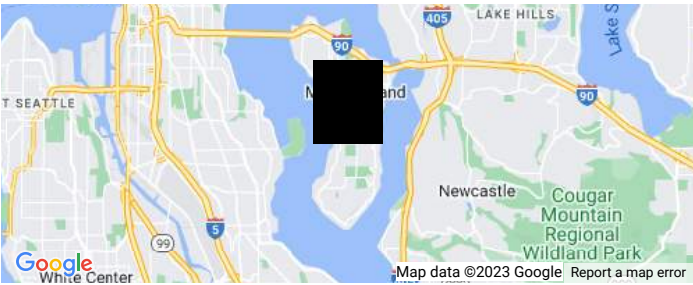
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Timestamp: 2023-12-22T21:32:34.036Z
Hazard Type: Seismic
Reference Document: ASCE7-16
Risk Category: II
Site Class: D-default



Basic Parameters

Name	Value	Description
S _S	1.454	MCE _R ground motion (period=0.2s)
S ₁	0.504	MCE _R ground motion (period=1.0s)
S _{MS}	1.745	Site-modified spectral acceleration value
S _{M1}	* null	Site-modified spectral acceleration value
S _{DS}	1.163	Numeric seismic design value at 0.2s SA
S _{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

▼Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F _a	1.2	Site amplification factor at 0.2s
F _v	* null	Site amplification factor at 1.0s
CR _S	0.902	Coefficient of risk (0.2s)
CR ₁	0.898	Coefficient of risk (1.0s)
PGA	0.623	MCE _G peak ground acceleration
F _{PGA}	1.2	Site amplification factor at PGA
PGA _M	0.747	Site modified peak ground acceleration
T _L	6	Long-period transition period (s)
SsRT	1.454	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.612	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	4.159	Factored deterministic acceleration value (0.2s)
S1RT	0.504	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.562	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.615	Factored deterministic acceleration value (1.0s)
PGAd	1.393	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).

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GRAVITY FRAMING

Upper Floor			
Member Name	Results	Current Solution	Comments
UB1	Passed	1 piece(s) 3 1/8" x 9" 24F-V4 DF Glulam	
UB2	Passed	1 piece(s) 5 1/8" x 9" 24F-V8 DF Glulam	
UB3	Passed	1 piece(s) 3 1/8" x 15" 24F-V4 DF Glulam	
UB4	Passed	1 piece(s) 3 1/8" x 9" 24F-V4 DF Glulam	
UB5	Passed	2 piece(s) 2 x 8 DF No.2	
UJ1 - Patio Roof Joists	Passed	1 piece(s) 2 x 6 DF No.2 @ 16" OC	
UB6 - Patio Roof	Passed	1 piece(s) 5 1/8" x 9" 24F-V4 DF Glulam	

ForteWEB Software Operator	Job Notes
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B-1

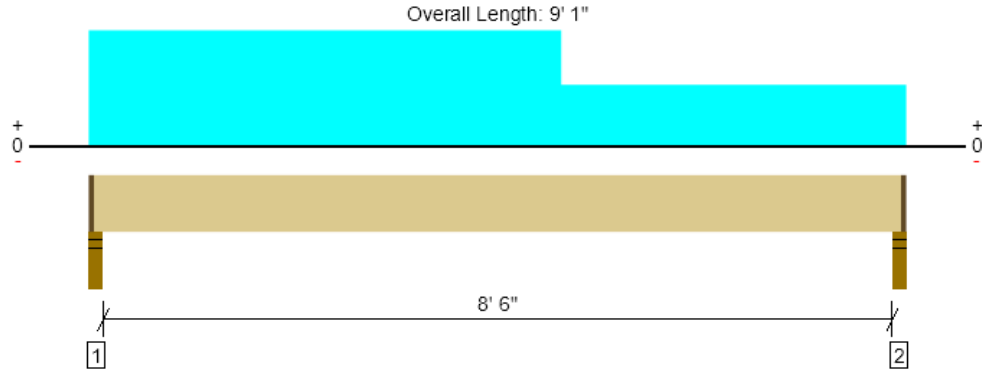
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ForteWEB v3.6

File Name: 23488 - Duffy-Mcaleese

Upper Floor, UB1

1 piece(s) 3 1/8" x 9" 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)	3033 @ 2"	4395 (2.25")	Passed (69%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2336 @ 1' 1/2"	4969	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5998 @ 4' 2 3/16"	8438	Passed (71%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.181 @ 4' 5 1/2"	0.219	Passed (L/582)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.237 @ 4' 5 1/2"	0.438	Passed (L/442)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 9".
- 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 - Stud wall - DF	3.50"	2.25"	1.55"	741	2369	3110	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	557	1756	2313	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' 11" o/c	
Bottom Edge (Lu)	8' 11" 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' 11 3/4"	N/A	6.8	--	
1 - Uniform (PSF)	0 to 5' 3" (Front)	14' 2"	12.0	40.0	upper floor
2 - Uniform (PSF)	5' 3" to 9' 1" (Front)	7' 6"	12.0	40.0	upper floor

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

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

B-2



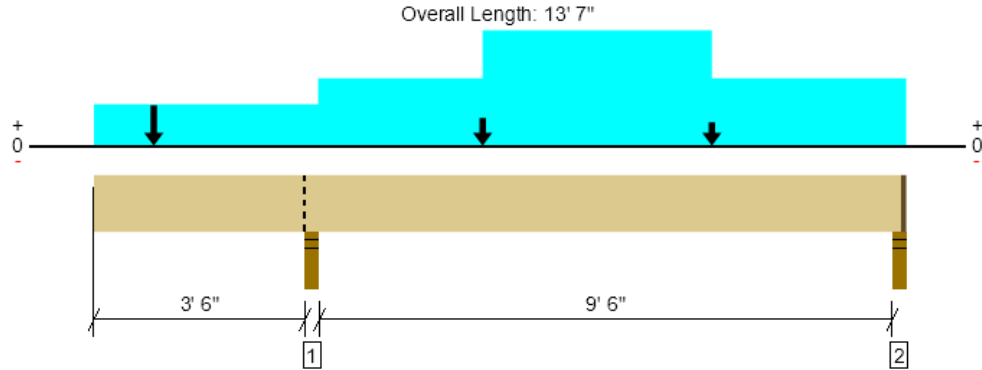
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File Name: 23488 - Duffy-Mcaleese

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Upper Floor, UB2
1 piece(s) 5 1/8" x 9" 24F-V8 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)	8122 @ 3' 7 3/4"	11211 (3.50")	Passed (72%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	4433 @ 4' 6 1/2"	9371	Passed (47%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	8282 @ 8' 10"	13838	Passed (60%)	1.00	1.0 D + 1.0 L (Alt Spans)
Neg Moment (Ft-lbs)	-7599 @ 3' 7 3/4"	15913	Passed (48%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.174 @ 0	0.200	Passed (2L/502)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.260 @ 8' 8 1/4"	0.489	Passed (L/450)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") 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/size factor of 1.00 that was calculated using length L = 9' 7/16".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 5' 4 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- 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 - DF	3.50"	3.50"	2.54"	2831	3656	3399	8122	Blocking
2 - Stud wall - DF	3.50"	2.25"	1.50"	1038	2459/-153	873	3537	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)	13' 6" o/c	
Bottom Edge (Lu)	13' 6" 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 13' 5 3/4"	N/A	11.2	--	--	
1 - Uniform (PSF)	0 to 3' 9" (Front)	7' 6"	12.0	40.0	-	upper floor
2 - Uniform (PSF)	3' 9" to 13' 7" (Front)	12' 2"	12.0	40.0	-	upper floor
3 - Point (lb)	1' (Front)	N/A	800	-	1670	upper floor post
4 - Point (lb)	6' 6" (Front)	N/A	365	-	760	upper floor post2
5 - Uniform (PSF)	6' 6" to 10' 4" (Front)	12' 2"	12.0	-	25.0	bearing wall
6 - Point (lb)	10' 4" (Front)	N/A	220	-	450	upper floor post3

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

B-3



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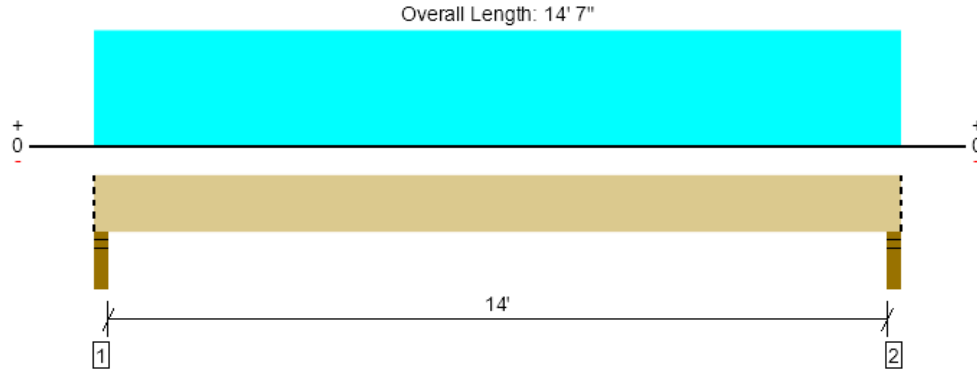
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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

B-4



Upper Floor, UB3
1 piece(s) 3 1/8" x 15" 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)	5716 @ 2"	6836 (3.50")	Passed (84%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	4508 @ 1' 6 1/2"	9523	Passed (47%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	19899 @ 7' 3 1/2"	26953	Passed (74%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.258 @ 7' 3 1/2"	0.356	Passed (L/663)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.460 @ 7' 3 1/2"	0.712	Passed (L/372)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 14' 3".
- 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	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	2.93"	2510	2042	2233	5716	Blocking
2 - Stud wall - DF	3.50"	3.50"	2.93"	2510	2042	2233	5716	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)	14' o/c	
Bottom Edge (Lu)	14' 7" 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 14' 7"	N/A	11.4	--	--	
1 - Uniform (PSF)	0 to 14' 7" (Front)	7'	12.0	40.0	-	UPPER FLOOR
2 - Uniform (PLF)	0 to 14' 7" (Front)	N/A	100.0	-	-	EXTERIOR WALL
3 - Uniform (PSF)	0 to 14' 7" (Front)	7' 3"	15.0	-	25.0	ROOF
4 - Uniform (PSF)	0 to 14' 7" (Front)	5'	8.0	-	25.0	PATIO ROOF

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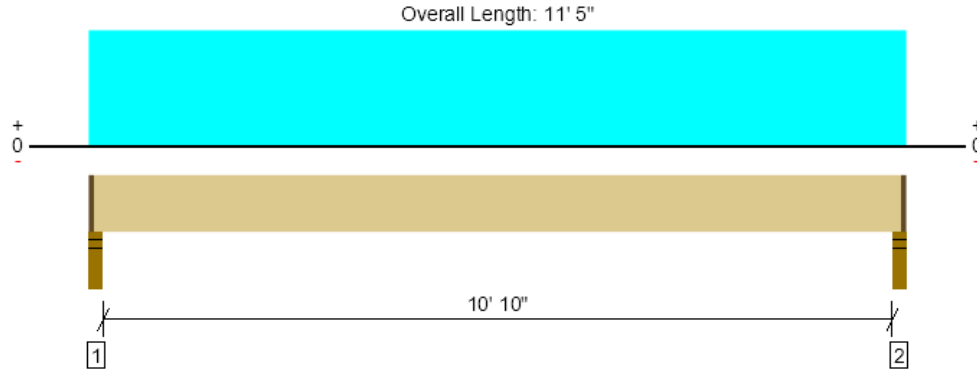
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Upper Floor, UB4
1 piece(s) 3 1/8" x 9" 24F-V4 DF Glulam



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)	1787 @ 2"	4395 (2.25")	Passed (41%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1488 @ 1' 1/2"	4969	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	4896 @ 5' 8 1/2"	8438	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.238 @ 5' 8 1/2"	0.277	Passed (L/558)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.317 @ 5' 8 1/2"	0.554	Passed (L/420)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 1".
- 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 - Stud wall - DF	3.50"	2.25"	1.50"	449	1370	1819	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	449	1370	1819	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)	11' 3" o/c	
Bottom Edge (Lu)	11' 3" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 11' 3 3/4"	N/A	6.8	--	
1 - Uniform (PSF)	0 to 11' 5" (Front)	6'	12.0	40.0	upper floor

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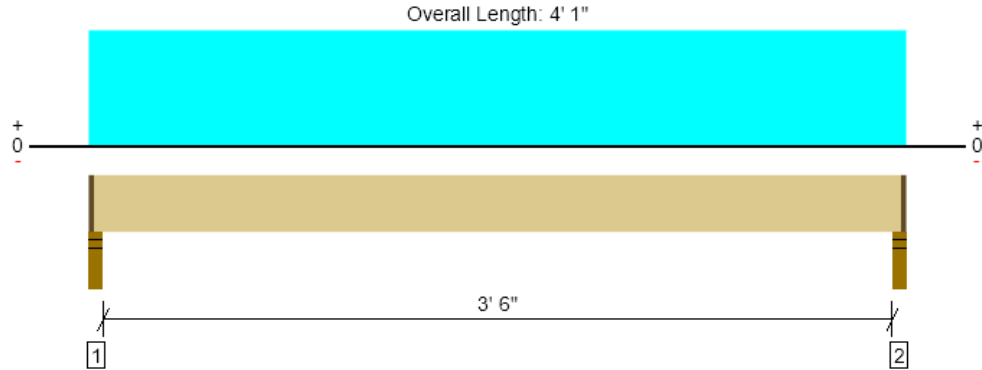
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Upper Floor, UB5
2 piece(s) 2 x 8 DF No.2



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)	1371 @ 2"	4219 (2.25")	Passed (32%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	811 @ 10 3/4"	2610	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1244 @ 2' 1/2"	2365	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.016 @ 2' 1/2"	0.094	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.021 @ 2' 1/2"	0.188	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

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

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"	341	1103	1444	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	341	1103	1444	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' 11" o/c	
Bottom Edge (Lu)	3' 11" 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 3' 11 3/4"	N/A	5.5	--	
1 - Uniform (PSF)	0 to 4' 1" (Front)	13' 6"	12.0	40.0	upper floor

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B-7



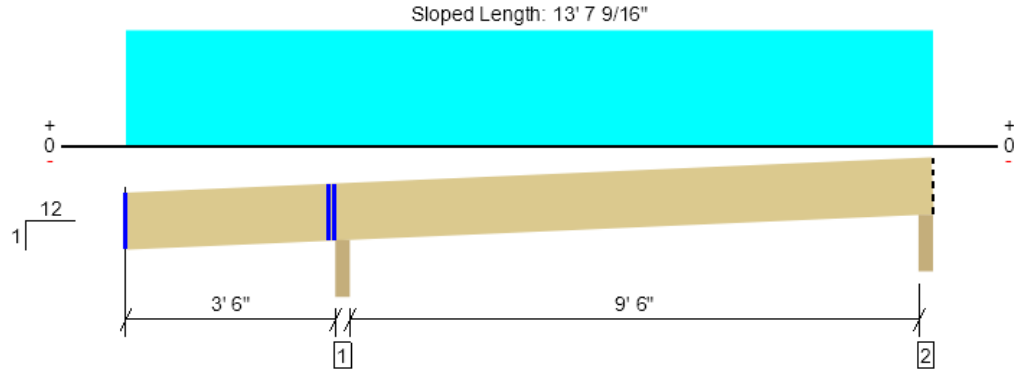
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ForteWEB v3.6, Engine: V8.3.1.5, Data: V8.1.4.1

File Name: 23488 - Duffy-Mcaleese

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Upper Floor, UJ1 - Patio Roof Joists
1 piece(s) 2 x 6 DF No.2 @ 16" OC



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

Member Length : 13' 8"

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	405 @ 3' 7 3/4"	3293 (3.50")	Passed (12%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	218 @ 4' 3"	1139	Passed (19%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	434 @ 8' 11 1/4"	975	Passed (45%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.169 @ 8' 7 3/4"	0.488	Passed (L/692)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.213 @ 8' 8 3/16"	0.651	Passed (L/551)	--	1.0 D + 1.0 S (All 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.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - DF	3.50"	3.50"	1.50"	98	306	405	Blocking
2 - Beveled Plate - DF	3.50"	3.50"	1.50"	47	158	205	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)	13' 8" o/c	
Bottom Edge (Lu)	13' 8" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 13' 7"	16"	8.0	25.0	Default Load

Location Analysis	Shear (lbs)			Moment (Ft-lbs)			Deflection (in)		Comments
	Actual	Allowed	LDF	Actual	Allowed	LDF	Live Load	Total	
1 - 3' 5"	-150	1139	1.15	-257	975	1.15	-0.011	-0.013	
2 - 0	0	891	0.90	0	763	0.90	-0.156	-0.178	
3 - 3' 6"	-154	1139	1.15	-270	975	1.15	0.000	0.000	

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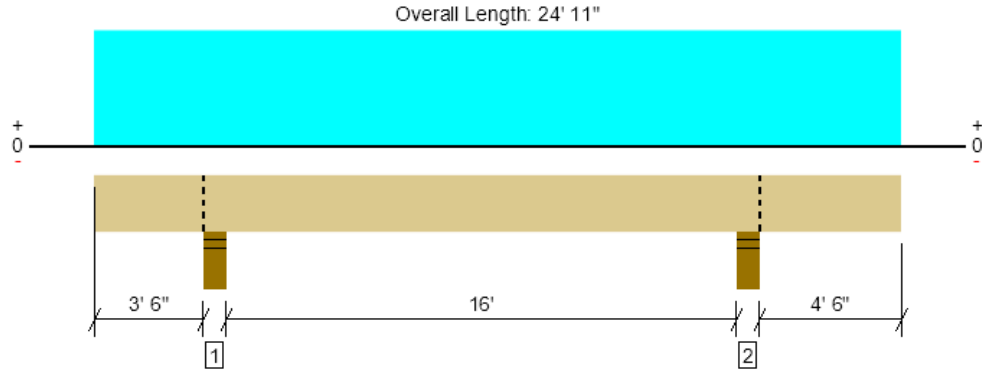
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Bryce Dacus Quantum Consulting Engineers (206) 957-3900 BDacus@quantumce.com	



Upper Floor, UB6 - Patio Roof
1 piece(s) 5 1/8" x 9" 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)	4201 @ 20' 2 1/4"	17617 (5.50")	Passed (24%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	2407 @ 19' 2 1/2"	9371	Passed (26%)	1.15	1.0 D + 1.0 S (Adj Spans)
Pos Moment (Ft-lbs)	8835 @ 11' 9 9/16"	15913	Passed (56%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-3514 @ 20' 2 1/4"	12266	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.567 @ 11' 10 15/16"	0.823	Passed (L/348)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.737 @ 11' 10 3/4"	1.097	Passed (L/268)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2018
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).
- 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/size factor of 1.00 that was calculated using length L = 15'.
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 6' 2".
- Upward deflection on left and right cantilevers exceeds 0.4".
- 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	5.50"	5.50"	1.50"	991	2763	3755	Blocking
2 - Stud wall - DF	5.50"	5.50"	1.50"	1119	3081	4201	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)	24' 11" o/c	
Bottom Edge (Lu)	24' 11" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 11"	N/A	11.2	--	
1 - Uniform (PLF)	0 to 24' 11" (Front)	N/A	73.5	229.5	Linked from: Patio Roof Joists, Support 1

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DUFFY/MCALEESE REMODEL

5330 LANSDOWNE LN

MERCER ISLAND, WA 98040

QUANTUM JOB NUMBER: 23488.01

LATERAL DESIGN

Seismic Base Shear for the Equivalent Lateral Force Procedure

Per IBC 2018 & ASCE 7-16

Structure: **Duffy/Mcaleese Remodel Patio Roof**

Address: **Mercer Island**

Latitude:

Longitude:

Structure Classification

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

Seismic Force-Resisting System: **Timber Frames**

R: **1 1/2** per ASCE Table 12.2-1

W_o: **1 1/2** per ASCE Table 12.2-1

C_d: **1 1/2** per ASCE Table 12.2-1

h_n (ft): **10.00** 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

S₁ (g-sec): **0.50** S_s (g-sec): **1.45**

Site Class: **D** **Assumed Value** per ASCE 11.4.3

ASCE 11.4.8 Exception 2 Used

F_v **1.80**

F_a **1.20**

1.2 Min Value where SC D Assumed

S_{M1} (g-sec): **0.90**

S_{MS} (g-sec): **1.74**

per ASCE 11.4.4

S_{D1} (g-sec): **0.60**

S_{DS} (g-sec): **1.16**

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: 0.52

T_a (sec): 0.11 Ct * h_{nx} per ASCE Eq. 12.8-7

T_{use} (sec): **0.11** ≤ TL

Equivalent Lateral Force Procedure Design Base Shear per ASCE 12.8

C_s: 0.77 = S_{DS} / (R/I_E) per ASCE Eq. 12.8-2

C_{s-max}: 3.56 = S_{D1} / (T_a*R/I_E) for T ≤ T_L per ASCE Eq. 12.8-3

C_{s-max}: -- = S_{D1}*T_L / (T_a²*R/I_E) for T > T_L per ASCE Eq. 12.8-4

C_{s-min}: 0.05 per ASCE Eq. 12.8-5

C_{s-min}: -- = 0.5S₁ / (R/I_E) for S₁ ≥ 0.6g per ASCE Eq. 12.8-6

C_{s-use}: 0.77

V : 0.773 W = C_{s-use} * W per ASCE Eq. 12.8-1



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

Project: **Duffy/Mcaleese**

Client: **Chesmore Buck**

Date: 1/17/24

Designer: **BSD**

Checked By:

Job No: **23488.01**

Sheet: 1

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

Per IBC 2018 & ASCE 7-16

Structure: **Duffy/Mcaleese Remodel Patio Roof**

Seismic Parameters

I_E : 1.00 per ASCE Table 1.5-2
 S_{DS} (g-sec): 1.16 per ASCE 11.4.4
 Period (Sec): 0.11 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

$C_{vx} = (w_x h_x^k) / (\sum w_i h_i^k)$ 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	10.00	2.40	100.0%	24.0	100.0%	1.86	1.86

Total WT (k): 2.40 Sum: 24

C_{s-use} : 0.773

V (k): 1.86 per ASCE 12.8.1

Vertical Distribution of Seismic Diaphragm Forces per ASCE 12.10.1.1

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

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


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

Level	w_{px} (k)	$\sum w_i$ (k)	F_x (k)	$\sum F_i$ (k)	F_{px} (k)	Notes
Roof	2.40	2.40	1.86	1.86	1.11	= F_{p-max}

Diaphragm/Story

Force Ratio

0.600

	Quantum Consulting Engineers LLC 1511 Third Avenue, Suite 323 Seattle, WA 98101	Project: Duffy/Mcaleese	Date: 1/17/24	Job No: 23488.01
		Client: Chesmore Buck	Designer: BSD	Sheet: 2
		Checked By:		

Seismic Base Shear for the Equivalent Lateral Force Procedure

Per IBC 2018 & ASCE 7-16

Structure: **Duffy/Mcaleese Remodel Patio Roof**

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): **10.00** 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

S₁ (g-sec): **0.50** S_s (g-sec): **1.45**

Site Class: **D** **Assumed Value** per ASCE 11.4.3

ASCE 11.4.8 Exception 2 Used

F_v **1.80**

F_a **1.20**

1.2 Min Value where SC D Assumed

S_{M1} (g-sec): **0.90**

S_{MS} (g-sec): **1.74**

per ASCE 11.4.4

S_{D1} (g-sec): **0.60**

S_{DS} (g-sec): **1.16**

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: 0.52

T_a (sec): 0.11 Ct * h_{nx} per ASCE Eq. 12.8-7

T_{use} (sec): **0.11** ≤ TL

Equivalent Lateral Force Procedure Design Base Shear per ASCE 12.8

C_s: 0.18 = S_{DS} / (R/I_E) per ASCE Eq. 12.8-2

C_{s-max}: 0.82 = S_{D1} / (T_a*R/I_E) for T ≤ T_L per ASCE Eq. 12.8-3

C_{s-max}: -- = S_{D1}*T_L / (T_a²*R/I_E) for T > T_L per ASCE Eq. 12.8-4

C_{s-min}: 0.05 per ASCE Eq. 12.8-5

C_{s-min}: -- = 0.5S₁ / (R/I_E) for S₁ ≥ 0.6g per ASCE Eq. 12.8-6

C_{s-use}: 0.18

V : 0.178 W = C_{s-use} * W per ASCE Eq. 12.8-1



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Seattle, WA 98101

Project: **Duffy/Mcaleese**

Client: **Chesmore Buck**

Date: 1/17/24

Designer: **BSD**

Checked By:

Job No: **23488.01**

Sheet: 1

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

Per IBC 2018 & ASCE 7-16

Structure: **Duffy/Mcaleese Remodel Patio Roof**

Seismic Parameters

I_E : 1.00 per ASCE Table 1.5-2
 S_{DS} (g-sec): 1.16 per ASCE 11.4.4
 Period (Sec): 0.11 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

$C_{vx} = (w_x h_x^k) / (\sum w_i h_i^k)$ 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	10.00	2.40	100.0%	24.0	100.0%	0.43	0.43

Total WT (k): 2.40 Sum: 24

C_{s-use} : 0.178

V (k): 0.43 per ASCE 12.8.1

Vertical Distribution of Seismic Diaphragm Forces per ASCE 12.10.1.1

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

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


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

Level	w_{px} (k)	$\sum w_i$ (k)	F_x (k)	$\sum F_i$ (k)	F_{px} (k)	Notes
Roof	2.40	2.40	0.43	0.43	0.56	= F_{p-min}

Diaphragm/Story

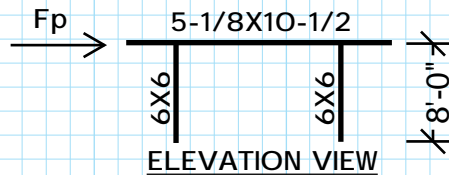
Force Ratio

1.300

	Quantum Consulting Engineers LLC 1511 Third Avenue, Suite 323 Seattle, WA 98101	Project: Duffy/Mcaleese	Date: 1/17/24	Job No: 23488.01
		Client: Chesmore Buck	Designer: BSD	Sheet: 2
		Checked By:		

PATIO ROOF SEISMIC DESIGN

EAST/WEST DIRECTION:



PATIO ROOF WEIGHT = $300\text{SF} \times 8\text{PSF} = 2,400\#$

$C_s = 0.77$ [USING TIMBER FRAME $R=1.5$]

$V_e = 1,850\#$ (LRFD)

$F_p = 1,850\# \times (63\%) \times 0.7$ [ASSUMING 63% TRIB GOES TO FRAME]
 $= 815\#$ (ASD)

USING A POST HEIGHT OF 8'-0" AND A MOMENT CONNECTION AT THE BASE OF BOTH POSTS, THE DESIGN MOMENT IS:

$M = 815\# / 2 \text{ POSTS} \times 8'-0" \text{ TALL} = 3,260\#-\text{FT}$ (ASD) <-- 4,660#-FT LRFD

USING SIMPSON MP66BZ POST BASE FOR SEISMIC CATEGORY D AND REINFORCED CONCRETE:

MOMENT CAPACITY = $3,350\#-\text{FT}$ (ASD) > $3,260\#-\text{FT}$ (ASD) OK

-AT (E) HOUSE: $F_p = 300\#$ (SEE BELOW)

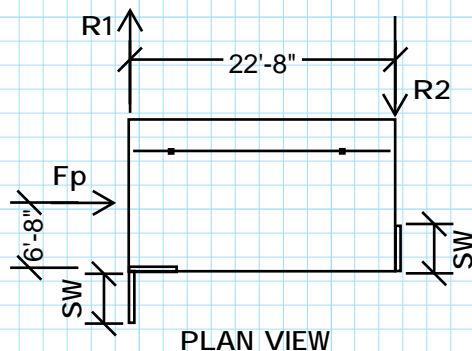
ASSUMING 37% TRIB GOES TO HOUSE...

SHEATHING 4'-0" PONY WALL UNDER ROOF RESULTS IN $(300\# \times 37\%) / 4'-0" = 28 \text{ PLF}$
 USING 6" NAIL SPACING OK

NORTH/SOUTH DIRECTION:

ASSUMPTIONS:

- ENTIRE LATERAL LOAD GOES INTO (E) HOUSE IN NORTH/SOUTH DIRECTION
- LATERAL RESISTING SYSTEM IS WOOD SHEAR WALLS UNDER EAST AND WEST ENDS OF PATIO ROOF



PATIO ROOF WEIGHT = $300\text{SF} \times 8\text{PSF} = 2,400\#$

$C_s = 0.18$ [USING SHEAR WALL $R=6.5$]

$V_e = 430\#$ (LRFD)

$F_p = 430\# \times 0.7$ [ASSUMING HALF TRIB]
 $= 300\#$ (ASD)

$R_1 = R_2 = 300\# \times 6'-8" / 22'-8"$
 $= 88\#$ (ASD)

USING SHEAR WALLS W/ 6" 8d PANEL EDGE NAIL SPACING OK



QUANTUM

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DUFFY MCALEESE REMODEL

project

PATIO ROOF POST BASE

CHESMORE & BUCK

client

2024-01-11

date

BSD

designer

checked by

23488.01

project no.

sheet

General Footing

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Patio Roof Post

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	=	2.50 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	:	Yes
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	Yes
Soil Passive Resistance (for Sliding)	=	300.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing depth

Footing base depth below soil surface	=	2.0 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

Increases based on footing plan dimension

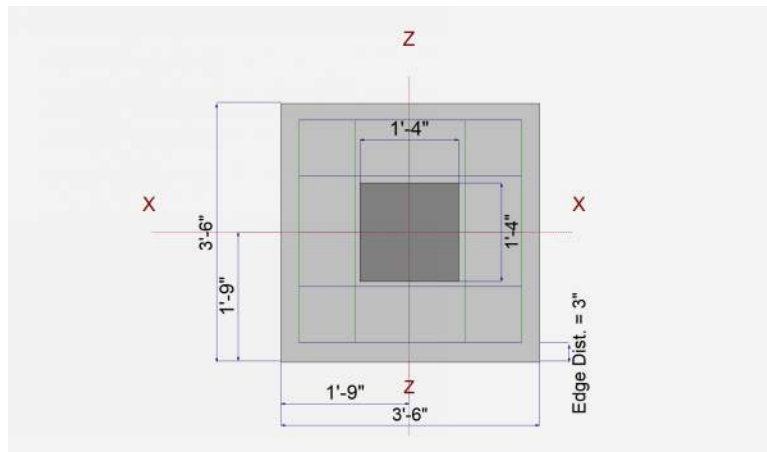
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
---	---	--------

Dimensions

Width parallel to X-X Axis	=	3.50 ft
Length parallel to Z-Z Axis	=	3.50 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	12.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



Reinforcing

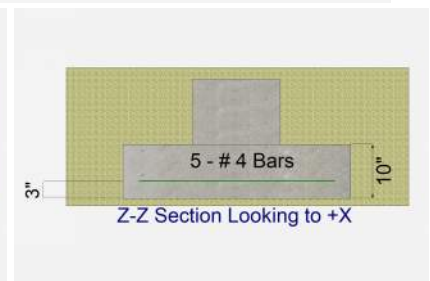
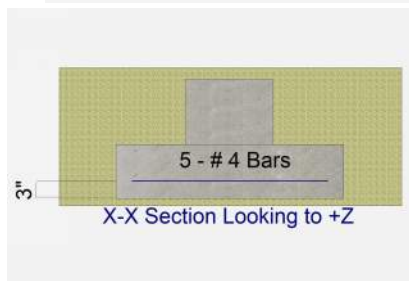
Bars parallel to X-X Axis	=	5.0
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4

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

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

# 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	=	1.0		2.70			k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=					4.660	k-ft
V-x	=						k
V-z	=						k

Project Title:
 Engineer:
 Project ID:
 Project Descr:

General Footing

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Patio Roof Post

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.6787	Soil Bearing	1.10 ksf	1.621 ksf	+0.60D+0.70E about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	1.314	Overturning - Z-Z	3.262 k-ft	4.286 k-ft	+0.60D+0.70E
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	0.08155	Z Flexure (+X)	0.6987 k-ft/ft	8.568 k-ft/ft	+0.6680D+E
PASS	0.03106	Z Flexure (-X)	0.2661 k-ft/ft	8.568 k-ft/ft	+1.20D+1.60S
PASS	0.03106	X Flexure (+Z)	0.2661 k-ft/ft	8.568 k-ft/ft	+1.20D+1.60S
PASS	0.03106	X Flexure (-Z)	0.2661 k-ft/ft	8.568 k-ft/ft	+1.20D+1.60S
PASS	0.1083	1-way Shear (+X)	8.126 psi	75.0 psi	+0.6680D+E
PASS	0.03527	1-way Shear (-X)	2.646 psi	75.0 psi	+1.20D+1.60S
PASS	0.03527	1-way Shear (+Z)	2.646 psi	75.0 psi	+1.20D+1.60S
PASS	0.03527	1-way Shear (-Z)	2.646 psi	75.0 psi	+1.20D+1.60S
PASS	0.04074	2-way Punching	6.111 psi	150.0 psi	+1.20D+1.60S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Zecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				(in)		Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.621	n/a	0.0			0.3332	0.3332	n/a	n/a	0.206
X-X, +D+S	1.621	n/a	0.0			0.5536	0.5536	n/a	n/a	0.342
X-X, +D+0.750S	1.621	n/a	0.0			0.4985	0.4985	n/a	n/a	0.308
X-X, +0.60D	1.621	n/a	0.0			0.1999	0.1999	n/a	n/a	0.123
X-X, +D+0.70E	1.621	n/a	0.0			0.3332	0.3332	n/a	n/a	0.206
X-X, +D+0.750S+0.5250E	1.621	n/a	0.0			0.4985	0.4985	n/a	n/a	0.308
X-X, +0.60D+0.70E	1.621	n/a	0.0			0.1999	0.1999	n/a	n/a	0.123
Z-Z, D Only	1.621	0.0	n/a			n/a	n/a	0.3332	0.3332	0.206
Z-Z, +D+S	1.621	0.0	n/a			n/a	n/a	0.5536	0.5536	0.342
Z-Z, +D+0.750S	1.621	0.0	n/a			n/a	n/a	0.4985	0.4985	0.308
Z-Z, +0.60D	1.621	0.0	n/a			n/a	n/a	0.1999	0.1999	0.123
Z-Z, +D+0.70E	1.621	9.590	n/a			n/a	n/a	0.0	0.8127	0.501
Z-Z, +D+0.750S+0.5250E	1.621	4.807	n/a			n/a	n/a	0.1596	0.8375	0.517
Z-Z, +0.60D+0.70E	1.621	15.983	n/a			n/a	n/a	0.0	1.10	0.679

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+S	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750S	None	0.0 k-ft	Infinity	OK
X-X, +0.60D	None	0.0 k-ft	Infinity	OK
X-X, +D+0.70E	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750S+0.5250E	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+S	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.750S	None	0.0 k-ft	Infinity	OK
Z-Z, +0.60D	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.70E	3.262 k-ft	7.143 k-ft	2.190	OK
Z-Z, +D+0.750S+0.5250E	2.447 k-ft	10.687 k-ft	4.368	OK
Z-Z, +0.60D+0.70E	3.262 k-ft	4.286 k-ft	1.314	OK

All units k

Sliding Stability

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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

General Footing

Project File: Duffy Remodel.ec6

LIC# : KW-06016450, Build:20.22.3.16

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Patio Roof Post

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	0.06905	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.40D	0.06905	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.20D	0.05919	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.20D	0.05919	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.20D+0.50S	0.1239	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.20D+0.50S	0.1239	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.20D+1.60S	0.2661	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.20D+1.60S	0.2661	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +0.90D	0.04439	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +0.90D	0.04439	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.432D+0.20S+E	0.09650	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +1.432D+0.20S+E	0.09650	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +0.6680D+E	0.03295	+Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
X-X, +0.6680D+E	0.03295	-Z	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.40D	0.06905	-X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.40D	0.06905	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.20D	0.05919	-X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.20D	0.05919	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.20D+0.50S	0.1239	-X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.20D+0.50S	0.1239	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.20D+1.60S	0.2661	-X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.20D+1.60S	0.2661	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +0.90D	0.04439	-X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +0.90D	0.04439	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.432D+0.20S+E	0.1920	-X	Top	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +1.432D+0.20S+E	0.4076	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +0.6680D+E	0.09767	-X	Top	0.2160	AsMin	0.2857	8.568	OK
Z-Z, +0.6680D+E	0.6987	+X	Bottom	0.2160	AsMin	0.2857	8.568	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.69 psi	0.69 psi	0.69 psi	0.69 psi	0.69 psi	75.00 psi	0.01	OK
+1.20D	0.59 psi	0.59 psi	0.59 psi	0.59 psi	0.59 psi	75.00 psi	0.01	OK
+1.20D+0.50S	1.23 psi	1.23 psi	1.23 psi	1.23 psi	1.23 psi	75.00 psi	0.02	OK
+1.20D+1.60S	2.65 psi	2.65 psi	2.65 psi	2.65 psi	2.65 psi	75.00 psi	0.04	OK
+0.90D	0.44 psi	0.44 psi	0.44 psi	0.44 psi	0.44 psi	75.00 psi	0.01	OK
+1.432D+0.20S+E	2.08 psi	4.32 psi	0.96 psi	0.96 psi	4.32 psi	75.00 psi	0.06	OK
+0.6680D+E	0.97 psi	8.13 psi	0.33 psi	0.33 psi	8.13 psi	75.00 psi	0.11	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	1.59 psi	150.00psi	0.01057	OK
+1.20D	1.36 psi	150.00psi	0.009061	OK
+1.20D+0.50S	2.84 psi	150.00psi	0.01896	OK
+1.20D+1.60S	6.11 psi	150.00psi	0.04074	OK
+0.90D	1.02 psi	150.00psi	0.006796	OK
+1.432D+0.20S+E	2.28 psi	150.00psi	0.01517	OK
+0.6680D+E	1.91 psi	150.00psi	0.01273	OK