

# Structural Calculation Report

**PROJECT NAME** Two-Bedroom ADU - Spanish  
Revival Style

**PROJECT ADDRESS** Richmond, CA

January 29, 2025

Project: Structural Calculation Report  
Two-Bedroom ADU - Spanish Revival Style  
Richmond, CA

Dear Ms./Mr.,

The following structural design calculation has been prepared for the project above. The scope of work is the design of a one-story, two-bedroom Accessory Dwelling Unit (ADU) – Spanish Revival Style developed for the city of Richmond, California.

By using these standard calculations, the user agrees to release the City of Richmond from any and all claims, liabilities, suits, and demands on account of any injury, damage, or loss to persons or property, including injury or death, or economic losses, arising out of the use of these construction documents. The use of these plans does not eliminate or reduce the user's responsibility to verify any and all information.

These plans are for use only in the City of Richmond, California. It is understood and agreed that this ADU Master Permit Set does not include project observation or review of any contractor's performance or any other construction phaser services, and that such services will be provided for by the person or entity who has received a permit to construct the ADU (Homeowner). Any use of these documents, or modifications thereto, by the Homeowner, contractors, builders, or others (User), is performed at their own risk. The User assumes all responsibility for the use and interpretation of these documents and for construction observation and the User waives, to the fullest extent permitted by law, any claims or causes of action of any nature against the architect, its officers, directors, employees, agents, and subconsultants (collectively, Consultant), which may arise out of or that may be in any way connected thereto. In addition, the User agrees, to the fullest extent permitted by law, to defend, indemnify and hold harmless that Consultant against any and all claims, causes of action, lawsuits, damages, liabilities or costs, including reasonable attorneys' fees and defense costs (Claims), arising out of or in any way connected with the performance of such services by other persons or entities and from any and all Claims arising from use, modifications, clarifications, interpretations, adjustments, or changes made to these documents to reflect changed field or other conditions.

The plan set does not include a foundation system. Site specific foundation details are required for ADUs in the city of Richmond. The applicant must hire a general contractor or structural engineer to prepare site specific foundation details and include foundation details with the application for approval by the city of Richmond. Note this includes details and design for the hold down anchorage and bearing posts noted on the S2.1 plan.

Design criteria:

Building Code: CBC 2022

## BASIS OF DESIGN (BOD)

Project Name: Two-Bedroom ADU - Spanish Revival Style

Date: Jan. 29, 2025

Project Address: Richmond, California

The following structural design criteria has been prepared for the project above. The scope of work is the design of the one-story, two-bedroom accessory dwelling unit (ADU) – Spanish Revival Style for the city of Richmond, California.

### Design Criteria:

Building Code: 2022 California Building Code (CBC) with local amendments.

Construction Type: Type V-B [per Arch and CBC Ch. 6]

Occupancy Type: R-2 [per Arch and CBC Ch. 3]

Risk Category: II [CBC Table 1604.5]

### Gravity System:

Roof Framing: Pitched roof: 2x8 rafters at 24" o.c. with 15/32" plywood unblocked

Wall Framing: 2x6 D.F. No 2. studs at 16" o.c. typical.

### Lateral System:

The lateral system will consist of plywood wood shear wall with a hold down at each end of the wall.

### Analysis Method:

Lateral Analysis: Equivalent Force Procedure or Spectral Response is used for seismic force.

Diaphragm is designed as flexible.

### Seismic Design Criteria [from USGS Hazard Maps, ASCE 7-16]

This project provides a calculation package and plans for any home owner in the city of Richmond, California to build this particular accessory dwelling unit on their land. To allow for versatility in building locations within the city, the seismic parameters of 6 locations were investigated and the highest values were used for this project design.

Mapped  $MCE_R$  Spectral Response (short period),  $S_s$ : 2.272 g

Mapped  $MCE_R$  Spectral Response (one second),  $S_1$ : 0.877 g

Design Spectral Response (short period),  $S_{DS}$ : 1.818 g

Design Spectral Response (one second),  $S_{D1}$ : 0.994 g

Seismic Design Category: E

Seismic Importance Factor,  $I_e$ : 1 [ASCE 7-16 Table 1.5-2]

**Wind Design Criteria:**

Basic Wind Speed: 95 MPH

Exposure Category: C

**Other Design Criteria:**

Rain Intensity: 1.13 in/hr

**Live Loads:**

Roof: 20 PSF

**Special Conditions:**

Solar panel weight is accounted in the total loads design.

**Material Specifications:**

Wood:

All wood shall conform to the following:

Wood	
Joists and rafters	NO.1
Posts, beams and headers	NO.1
Studs, blockings, light framing and misc.	NO.2
Wall plates	NO.2
Wood sill (P.T.)	NO.2
Pressure treated (P.T.) Joist, beams and posts	NO.2

Engineered Wood (WEYERHAEUSER)	
LVL MICRO-LAMS	2.2E
LSL TIMBER STRAND	1.55E
PSL PARALLEL STRAND LUMBER (BEAMS)	2.2E
PSL PARALLEL STRAND LUMBER (POSTS)	1.8E
I JOIST PER PLAN	U.O.N.

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JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER:	3759.1
DESCRIPTION:	Design of ADU	DATE:	2025-01-29
VERTICAL LOAD TABLE		BY:	

ROOF PITCH		5:12 slope
ROOF LEVEL		SOLAR
COMPOSITE SHINGLE		2.5
SOLAR PANELS		5.0
15/32" PLYWOOD (OSB)		1.8
INSULATION		1.0
RAFTERS 2 x 8 @ 24" O.C.		1.3
2X8 @ 16" O.C. CEILING JOISTS		1.9
5/8" GYPBOARD		2.8
MISCELLANEOUS		1.2
TOTAL	DL (psf)	17.5
ADJUSTED TOTAL	DL (psf)	<b>19.0</b>
TOTAL	RLL (psf)	<b>20</b>

WALLS	EXTERIOR	INTERIOR
STUCCO	10.0	-
PLASTER	-	2.0
15/32" PLYWOOD (OSB)	1.8	-
STUDS 2X6 @ 16" O.C.	1.4	1.4
INSULATION	1.0	1.0
5/8" GYPBOARD	2.8	5.6
MISCELLANEOUS	1.0	1.0
TOTAL	DL (psf)	<b>18.0</b>
		<b>11.0</b>

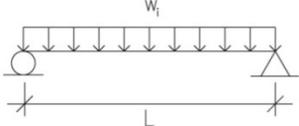


JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759
DESCRIPTION:	Beam Diagrams	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

**BEAM DIAGRAMS**

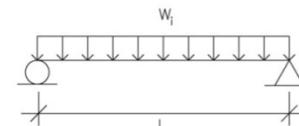
**ROOF LEVEL**

**RDG BM 1**



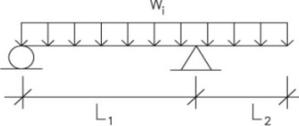
$W_{DL} = 19.0 \text{ psf} \times 13.25 \text{ ft} = 0.252 \text{ klf ROOF}$   
 $W_{RL} = 20.0 \text{ psf} \times 13.25 \text{ ft} = 0.265 \text{ klf ROOF}$   
 $L = 7.00 \text{ ft}$

**RDG BM 2**



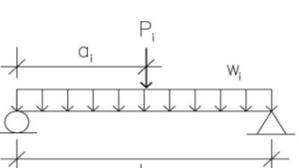
$W_{DL} = 19.0 \text{ psf} \times 8.50 \text{ ft} = 0.162 \text{ klf ROOF}$   
 $W_{RL} = 20.0 \text{ psf} \times 8.50 \text{ ft} = 0.170 \text{ klf ROOF}$   
 $L = 4.50 \text{ ft}$

**RAFTER 1**



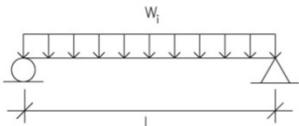
$W_{DL} = 19.0 \text{ psf} \times 2.00 \text{ ft} = 0.038 \text{ klf ROOF}$   
 $W_{RL} = 20.0 \text{ psf} \times 2.00 \text{ ft} = 0.040 \text{ klf ROOF}$   
 $L_1 = 11.25 \text{ ft} \quad L_2 = 2.00 \text{ ft}$

**BM 1**



$W_{DL} = 19.0 \text{ psf} \times 2.00 \text{ ft} = 0.038 \text{ klf ROOF}$   
 $W_{RL} = 20.0 \text{ psf} \times 2.00 \text{ ft} = 0.040 \text{ klf ROOF}$   
 $P_{DL} = 0.910 \text{ kip} \quad a_1 = 1.00 \text{ ft} \quad \text{RDG BM 1}$   
 $P_{RL} = 0.930 \text{ kip} \quad a_1 = 1.00 \text{ ft} \quad \text{RDG BM 1}$   
 $P_{DL} = 0.380 \text{ kip} \quad a_1 = 6.25 \text{ ft} \quad \text{RDG BM 2}$   
 $P_{RL} = 0.380 \text{ kip} \quad a_1 = 6.25 \text{ ft} \quad \text{RDG BM 2}$   
 $L = 12.25 \text{ ft}$

**BM 2**

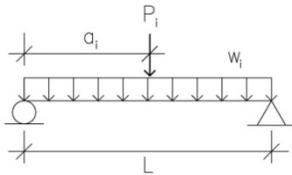


$W_{DL} = 19.0 \text{ psf} \times 6.25 \text{ ft} = 0.119 \text{ klf ROOF}$   
 $W_{RL} = 20.0 \text{ psf} \times 6.25 \text{ ft} = 0.125 \text{ klf ROOF}$   
 $L = 4.50 \text{ ft}$

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759
DESCRIPTION:	Beam Diagrams	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

**BEAM DIAGRAMS**

**HDR 1**



$$W_{DL} = 19.0 \text{ psf} \times 3.50 \text{ ft} = 0.067 \text{ klf ROOF}$$

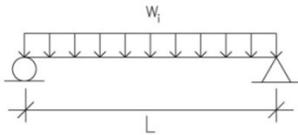
$$W_{RL} = 20.0 \text{ psf} \times 3.50 \text{ ft} = 0.070 \text{ klf ROOF}$$

$$P_{DL} = 0.380 \text{ kip} \quad a_1 = 4.00 \text{ ft} \quad \text{RDG BM 2}$$

$$P_{RL} = 0.380 \text{ kip} \quad a_1 = 4.00 \text{ ft} \quad \text{RDG BM 2}$$

$$L = 8.00 \text{ ft}$$

**HDR 2**



$$W_{DL} = 19.0 \text{ psf} \times 7.50 \text{ ft} = 0.143 \text{ klf ROOF}$$

$$W_{RL} = 20.0 \text{ psf} \times 7.50 \text{ ft} = 0.150 \text{ klf ROOF}$$

$$L = 6.00 \text{ ft}$$

**Multiple Simple Beam**

Project File: 3759.1\_ADU Framing calc.ec6

LIC# : KW-06014728, Build:20.24.12.02

(c) ENERCALC, LLC 1982-2025

**Description :** RDG BM 1, RDG BM 2, RAFTER 1, BM 1 AND BM 2

**Wood Beam Design :** RDG BM 1

Calculations per NDS 2018, IBC 2021

**BEAM Size :** 4x10, Sawn, Fully Braced

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

Fb - Tension 1,000.0 psi Fc - Prll 1,500.0 psi Fv 180.0 psi Ebend- xx 1,700.0 ksi Density 31.210 pcf  
 Fb - Compr 1,000.0 psi Fc - Perp 625.0 psi Ft 675.0 psi Eminbend - xx 620.0 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 13.250 ft

Design Summary

Max fb/Fb Ratio = 0.514 : 1  
 fb : Actual : 771.30 psi at 3.500 ft in Span # 1  
 Fb : Allowable : 1,500.00 psi  
 Load Comb : +D+Lr+H

Max fv/FvRatio = 0.294 : 1  
 fv : Actual : 66.25 psi at 6.230 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.91	0.93					
Right Support	0.91	0.93					



Max Deflections

Transient Downward	0.037 in	Total Downward	0.072 in
Ratio	2290	Ratio	1158
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

**Wood Beam Design :** RDG BM 2

Calculations per NDS 2018, IBC 2021

**BEAM Size :** 4x10, Sawn, Fully Braced

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

Fb - Tension 1,000.0 psi Fc - Prll 1,500.0 psi Fv 180.0 psi Ebend- xx 1,700.0 ksi Density 31.210 pcf  
 Fb - Compr 1,000.0 psi Fc - Perp 625.0 psi Ft 675.0 psi Eminbend - xx 620.0 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 8.50 ft

Design Summary

Max fb/Fb Ratio = 0.137 : 1  
 fb : Actual : 206.01 psi at 2.250 ft in Span # 1  
 Fb : Allowable : 1,500.00 psi  
 Load Comb : +D+Lr+H

Max fv/FvRatio = 0.104 : 1  
 fv : Actual : 23.29 psi at 0.000 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H

Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.38	0.38					
Right Support	0.38	0.38					



Max Deflections

Transient Downward	0.004 in	Total Downward	0.008 in
Ratio	9999	Ratio	6748
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

**Multiple Simple Beam**

Project File: 3759.1\_ADU Framing calc.ec6

LIC#: KW-06014728, Build:20.24.12.02

(c) ENERCALC, LLC 1982-2025

**Wood Beam Design : RAFTER 1-No. 1**

Calculations per NDS 2018, IBC 2021

BEAM Size : **2x8, Sawn, Fully Braced**

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

Applied Loads

Beam self weight calculated and added to loads  
 Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.726** : 1  
 fb : Actual : 1,088.70 psi at 5.456 ft in Span # 1  
 Fb : Allowable : 1,500.00 psi  
 Load Comb : +D+Lr+H  
 Max fv/FvRatio = **0.258** : 1  
 fv : Actual : 58.08 psi at 10.688 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	0.22	0.22					
Right Support	0.31	0.31					

Max Deflections

Transient Downward	0.166 in	Total Downward	0.333 in
Ratio	813	Ratio	405
	LC: Lr Only		LC: +D+Lr+H
Transient Upward	-0.087 in	Total Upward	-0.174 in
Ratio	552	Ratio	274
	LC: Lr Only		LC: +D+Lr+H

**Wood Beam Design : BM 1**

Calculations per NDS 2018, IBC 2021

BEAM Size : **4x10, Sawn, Fully Braced**

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

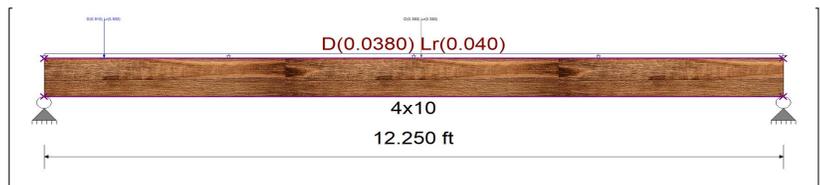
Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

Applied Loads

Beam self weight calculated and added to loads  
 Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 2.0 ft  
 1Point: D = 0.910, Lr = 0.930 k @ 1.0 ft  
 2Point: D = 0.380, Lr = 0.380 k @ 6.250 ft

Design Summary

Max fb/Fb Ratio = **0.773** : 1  
 fb : Actual : 1,159.16 psi at 6.248 ft in Span # 1  
 Fb : Allowable : 1,500.00 psi  
 Load Comb : +D+Lr+H  
 Max fv/FvRatio = **0.519** : 1  
 fv : Actual : 116.77 psi at 0.000 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	1.30	1.29					
Right Support	0.54	0.51					

Max Deflections

Transient Downward	0.155 in	Total Downward	0.315 in
Ratio	949	Ratio	466
	LC: Lr Only		LC: +D+Lr+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

**Multiple Simple Beam**

Project File: 3759.1\_ADU Framing calc.ec6

LIC# : KW-06014728, Build:20.24.12.02

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**Wood Beam Design : BM 2**

Calculations per NDS 2018, IBC 2021

BEAM Size : **4x4, Sawn, Fully Braced**

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

Fb - Tension 1,000.0 psi Fc - Prll 1,500.0 psi Fv 180.0 psi Ebend- xx 1,700.0 ksi Density 31.210 pcf  
 Fb - Compr 1,000.0 psi Fc - Perp 625.0 psi Ft 675.0 psi Eminbend - xx 620.0 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 6.250 ft

Design Summary

Max fb/Fb Ratio = **0.622** : 1  
 fb : Actual : 1,167.01 psi at 2.375 ft in Span # 1  
 Fb : Allowable : 1,875.00 psi  
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.280** : 1  
 fv : Actual : 63.06 psi at 0.000 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H

Max Reactions (k) D Lr L S W E H  
 Left Support 0.29 0.30  
 Right Support 0.29 0.30



Max Deflections

Transient Downward	0.068 in	Total Downward	0.133 in
Ratio	841	Ratio	427
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

**Wood Beam Design : RAFTER 1-No. 2**

Calculations per NDS 2018, IBC 2021

BEAM Size : **2x8, Sawn, Fully Braced**

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.2

Fb - Tension 900 psi Fc - Prll 1350 psi Fv 180 psi Ebend- xx 1600 ksi Density 31.21 pcf  
 Fb - Compr 900 psi Fc - Perp 625 psi Ft 575 psi Eminbend - xx 580 ksi

Applied Loads

Beam self weight calculated and added to loads

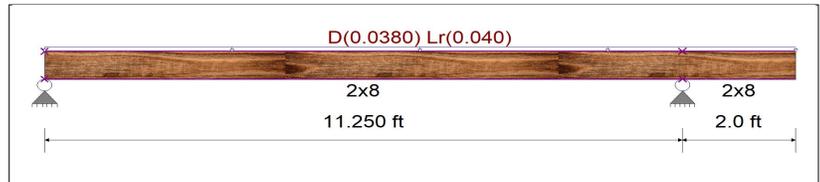
Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.806** : 1  
 fb : Actual : 1,088.70 psi at 5.456 ft in Span # 1  
 Fb : Allowable : 1,350.00 psi  
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.258** : 1  
 fv : Actual : 58.08 psi at 10.688 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H

Max Reactions (k) D Lr L S W E H  
 Left Support 0.22 0.22  
 Right Support 0.31 0.31



Max Deflections

Transient Downward	0.176 in	Total Downward	0.354 in
Ratio	765	Ratio	381
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	-0.092 in	Total Upward	-0.185 in
Ratio	520	Ratio	258
LC: Lr Only		LC: +D+Lr+H	

## Multiple Simple Beam

Project File: 3759.1\_ADU Framing calc.ec6

LIC#: KW-06014728, Build:20.24.12.02

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### Description : HDR 1 and HDR 2

#### Wood Beam Design : HDR 1

Calculations per NDS 2018, IBC 2021

#### BEAM Size : 6x8, Sawn, Fully Unbraced

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

#### Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 8.0 ft

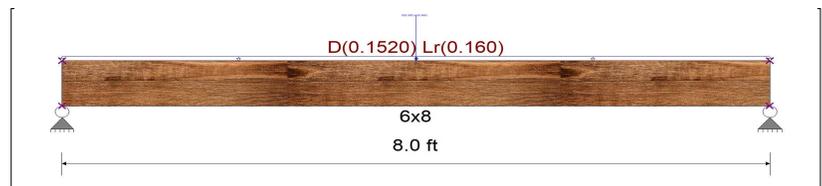
1Point: D = 0.380, Lr = 0.380 k @ 4.0 ft

#### Design Summary

Max fb/Fb Ratio = **0.764** : 1  
 fb : Actual : 951.28 psi at 4.000 ft in Span # 1  
 Fb : Allowable : 1,245.01 psi  
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.237** : 1  
 fv : Actual : 53.34 psi at 0.000 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H

Max Reactions (k)	<u>D</u>	<u>Lr</u>	<u>L</u>	<u>S</u>	<u>W</u>	<u>E</u>	<u>H</u>
Left Support	0.83	0.83					
Right Support	0.83	0.83					



#### Max Deflections

Transient Downward	0.067 in	Total Downward	0.133 in
Ratio	1443	Ratio	720
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

#### Wood Beam Design : HDR 2

Calculations per NDS 2018, IBC 2021

#### BEAM Size : 6x6, Sawn, Fully Unbraced

Using Allowable Stress Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir-Larch

Wood Grade : No.1

Fb - Tension	1,000.0 psi	Fc - Prll	1,500.0 psi	Fv	180.0 psi	Ebend- xx	1,700.0 ksi	Density	31.210 pcf
Fb - Compr	1,000.0 psi	Fc - Perp	625.0 psi	Ft	675.0 psi	Eminbend - xx	620.0 ksi		

#### Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0190, Lr = 0.020 k/ft, Trib= 7.50 ft

#### Design Summary

Max fb/Fb Ratio = **0.466** : 1  
 fb : Actual : 582.38 psi at 3.000 ft in Span # 1  
 Fb : Allowable : 1,250.00 psi  
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.169** : 1  
 fv : Actual : 37.96 psi at 5.560 ft in Span # 1  
 Fv : Allowable : 225.00 psi  
 Load Comb : +D+Lr+H

Max Reactions (k)	<u>D</u>	<u>Lr</u>	<u>L</u>	<u>S</u>	<u>W</u>	<u>E</u>	<u>H</u>
Left Support	0.45	0.45					
Right Support	0.45	0.45					



#### Max Deflections

Transient Downward	0.034 in	Total Downward	0.068 in
Ratio	2122	Ratio	1064
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER:	3759.1
DESCRIPTION:	Column Design and Capacity	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

POST DESIGN

ASD LOAD COMBINATIONS	$S_{DS}$ 1.818 g		$\Omega$ 2.5	
1) 1.000 D + 1.000 Lr + 0.000 L + 0.000 E				
2) 1.000 D + 0.000 Lr + 1.000 L + 0.000 E				
3) 1.000 D + 0.750 Lr + 0.750 L + 0.000 E				
4) 1.255 D + 0.000 Lr + 0.000 L + 1.750 E				
5) 1.191 D + 0.000 Lr + 0.750 L + 1.313 E				
6) 0.345 D + 0.000 Lr + 0.000 L + 1.750 E				

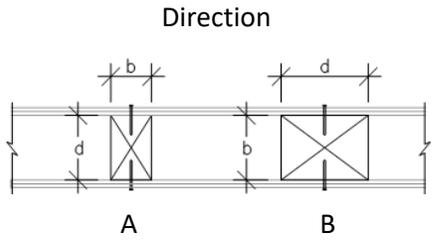
**Wall Height = 9.5 ft**

ROOF LEVEL

ID	BEARING MEMBERS	MAX LC TOTAL (K)				Post Size (Min)		Hardware	D/C	wall size
		D (k)	Lr (k)	L (k)	E (k)	D,L,Lr	D, L,Lr,E			
POST 1	BM 1	1.300	1.290			2.590	6X6	N	0.11	2x6
POST 2	(2) - RDG BM 1	1.820	1.860			3.680	4x4	Y	0.63	2x4
POST 3	(2) - BM 2	0.760	0.760			1.520	4X4	N	0.26	2x4

Column Capacity

Axial	Direction	100%	Seismic	Post Base
4x4	B	5.84 K	6.06 K	7.66 K
4x6 B	B	9.17 K	9.53 K	12.03 K
4x8	B	12.09 K	12.56 K	15.86 K
4x10	B	15.42 K	16.02 K	20.23 K
4x12	B	18.76 K	19.49 K	24.61 K
4x6 A	A	18.35 K	21.17 K	12.03 K
6x6	B	22.71 K	28.36 K	18.91 K
6x8	B	30.97 K	38.67 K	25.78 K
6x10	B	39.22 K	48.98 K	32.66 K



JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER:	3759.1
DESCRIPTION:	Stud Wall Calculation	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

STUD CALCULATION: EXTERIOR BEARING WALL  
1st STORY LEVEL  
9.5 FT STUDS

DATA		Wood Type:		Adjustment Factors:	
Member:		Species	Douglas Fir-Larch	$C_M$	1.00
Size	2x6	Class	2in-4in thick	$C_t$	1.00
Stud Spacing	16 in	Grade	No. 2	$C_L$	1.00
$L_e$ (ft)	9.50	$F_b$ (psi)	900	$C_{D1}$	1.25
$L_u$ (ft)	9.50	$F_c$ (psi)	1350	$C_{D2}$	1.60
b (in)	1.50	$F_{cL}$ (psi)	625	$C_{D3}$	1.00
d (in)	5.50	$E_{min}$ (psi)	580000	$C_i$	1.00
A (in <sup>2</sup> )	8.25	c	0.80	$C_F$	1.00
$S_{xx}$ (in. <sup>3</sup> )	7.56	$K_{cE}$	0.30	$C_b$	1.00
				$C_T$	1.00
				$C_r$	1.00

**LOADING**

Description	DL (psf)	LR (psf)	LL (psf)	H/TW (ft)	$w_{DL}$ (plf)	$w_{LR}$ (plf)	$w_{LL}$ (plf)
Roof	19	20	0	8	152	160	0
Wall Level 1	18	0	0	10	171	0	0
				Total	323	160	0

**Lateral Load:**

WIND	30 psf	$w_{WIND}$	40 plf
LL	0 psf	$w_{LL}$	0.0 plf

**GRAVITY + LATERAL**

ASD Load Combination:	Gravity (plf)	Lat. (plf)
LC2. $w_{DL} + w_{LL} =$	323.0	0.0
LC3. $w_{DL} + w_{Lr} =$	483.0	0.0
LC4. $w_{DL} + 0.75*w_{LL} + 0.75*w_{Lr} =$	443.0	30.0
LC5. $w_{DL} + 0.6*w_{WIND} =$	323.0	24.0
LC6a. $w_{DL} + 0.75*w_{LL} + 0.75*w_{Lr} + 0.75(0.6*w_{WIND}) =$	443.0	18.0

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER:	3759.1
DESCRIPTION:	Stud Wall Calculation	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

**Load combination 2**

LC2.  $w_{DL} + w_{LL}$

$p = 430.7 \text{ lb}$   
 $f_c = p / A = 52.2 \text{ psi}$

Column Capacity of Stud:

$(L_e/d)_x^2 = 396.37$   
 $E'_{min} = E_{min} C_M C_t C_T C_i = 580000 \text{ psi}$   
 $F_{cE} = 0.822 E'_{min} / (L_e/d)_x^2 = 1203 \text{ psi}$   
 $F^*_c = F_c C_{D3} C_M C_t C_F C_i = 1350 \text{ psi}$   
 $X = [1 + F_{cE} / F^*_c] / 2c = 1.18$   
 $C_P = X - [X^2 - ((F_{cE} / F^*_c) / c)]^{1/2} = 0.65$   
 $F'_c = F_c C_{D3} C_M C_t C_F C_i C_P = 877.2 \text{ psi}$   
 Check if  $F'_c > f_c$       D/C = 0.06

Bearing Check:

$F'_{cL} = F_{cL} C_M C_T C_b = 625 \text{ psi}$   
 $f'_{cL} = p/A = 52.20 \text{ psi}$   
 Check if  $F'_{cL} > f'_{cL}$       D/C = 0.08

Bending:

$w_{LAT} = 0.00 \text{ plf}$   
 $M = (w \times L_u^2) / 8 = 0.0 \text{ in-lb}$   
 $f_b = M / S_{xx} = 0 \text{ psi}$   
 $F'_b = F_b C_{D3} C_M C_t C_L C_F C_r C_i = 900 \text{ psi}$   
 Check if  $F'_b > f_b$       D/C = 0.00

Combined Stresses:

$(f_c / F'_c)^2 + (f_{bx} / F'_{bx}) * (1 / (1 - f_c / F_{cEx})) = 3.54E-03$   
 Check if  $\leq 1.0$       D/C = 0.00

**Use 2x6 Douglas Fir-Larch No. 2 Studs at 16 o.c.  
at the 1st STORY LEVEL**

**Load combination 3**

LC3.  $w_{DL} + w_{Lr}$

$p = 644.00 \text{ lb}$   
 $f_c = p / A = 78.06 \text{ psi}$

Column Capacity of Stud:

$(L_e/d)_x^2 = 396.37$   
 $E'_{min} = E_{min} C_M C_t C_T C_i = 580000 \text{ psi}$   
 $F_{cE} = 0.822 E'_{min} / (L_e/d)_x^2 = 1203 \text{ psi}$   
 $F^*_c = F_c C_{D1} C_M C_t C_F C_i = 1688 \text{ psi}$   
 $X = [1 + F_{cE} / F^*_c] / 2c = 1.07$   
 $C_P = X - [X^2 - ((F_{cE} / F^*_c) / c)]^{1/2} = 0.57$   
 $F'_c = F_c C_{D1} C_M C_t C_F C_i C_P = 954.4 \text{ psi}$   
 Check if  $F'_c > f_c$       D/C = 0.08

Bearing Check:

$F'_{cL} = F_{cL} C_M C_T C_b = 625 \text{ psi}$   
 $f'_{cL} = p/A = 78.06 \text{ psi}$   
 Check if  $F'_{cL} > f'_{cL}$       D/C = 0.12

Bending:

$w_{LAT} = 0.00 \text{ plf}$   
 $M = (w \times L_u^2) / 8 = 0.0 \text{ in-lb}$   
 $f_b = M / S_{xx} = 0 \text{ psi}$   
 $F'_b = F_b C_{D1} C_M C_t C_L C_F C_r C_i = 1125 \text{ psi}$   
 Check if  $F'_b > f_b$       D/C = 0.00

Combined Stresses:

$(f_c / F'_c)^2 + (f_{bx} / F'_{bx}) * (1 / (1 - f_c / F_{cEx})) = 6.69E-03$   
 Check if  $\leq 1.0$       D/C = 0.01

**Use 2x6 Douglas Fir-Larch No. 2 Studs at 16 o.c.  
at the 1st STORY LEVEL**

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER:	3759.1
DESCRIPTION:	Stud Wall Calculation	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

**Load combination 4**

LC4:  $w_{DL} + 0.75*w_{LL} + 0.75*w_{Lr}$

$p = 590.67 \text{ lb}$   
 $f_c = p / A = 71.60 \text{ psi}$

Column Capacity of Stud:

$(L_e/d)_x^2 = 396.37$   
 $E'_{min} = E_{min} C_M C_t C_T C_i = 580000 \text{ psi}$   
 $F_{cE} = 0.822 E'_{min} / (L_e/d)_x^2 = 1203 \text{ psi}$   
 $F^*_c = F_c C_{D1} C_M C_t C_F C_i = 1688 \text{ psi}$   
 $X = [1 + F_{cE} / F^*_c] / 2c = 1.07$   
 $C_P = X - [X^2 - ((F_{cE} / F^*_c) / c)]^{1/2} = 0.57$   
 $F'_c = F_c C_{D1} C_M C_t C_F C_i C_P = 954.4 \text{ psi}$   
 Check if  $F'_c > f_c$       D/C = 0.08

Bearing Check:

$F'_{cL} = F_{cL} C_M C_T C_b = 625 \text{ psi}$   
 $f'_{cL} = p/A = 71.60 \text{ psi}$   
 Check if  $F'_{cL} > f'_{cL}$       D/C = 0.11

Bending:

$w_{LAT} = 30.00 \text{ plf}$   
 $M = (w \times L_u^2) / 8 = 3747.0 \text{ in-lb}$   
 $f_b = M / S_{xx} = 495 \text{ psi}$   
 $F'_b = F_b C_{D2} C_M C_t C_L C_F C_r C_i = 1125 \text{ psi}$   
 Check if  $F'_b > f_b$       D/C = 0.44

Combined Stresses:

$(f_c / F'_c)^2 + (f_{bx} / F'_{bx}) * (1 / (1 - f_c / F_{cEX})) = 0.47$   
 Check if  $\leq 1.0$       D/C = 0.47

**Use 2x6 Douglas Fir-Larch No. 2 Studs at 16 o.c. at the 1st STORY LEVEL**

**Load combination 5**

LC5:  $w_{DL} + 0.6*w_{WIND}$

$p = 430.67 \text{ lb}$   
 $f_c = p / A = 52.20 \text{ psi}$

Column Capacity of Stud:

$(L_e/d)_x^2 = 396.37$   
 $E'_{min} = E_{min} C_M C_t C_T C_i = 580000 \text{ psi}$   
 $F_{cE} = 0.822 E'_{min} / (L_e/d)_x^2 = 1203 \text{ psi}$   
 $F^*_c = F_c C_{D2} C_M C_t C_F C_i = 2160 \text{ psi}$   
 $X = [1 + F_{cE} / F^*_c] / 2c = 0.97$   
 $C_P = X - [X^2 - ((F_{cE} / F^*_c) / c)]^{1/2} = 0.47$   
 $F'_c = F_c C_{D2} C_M C_t C_F C_i C_P = 1020.2 \text{ psi}$   
 Check if  $F'_c > f_c$       D/C = 0.05

Bearing Check:

$F'_{cL} = F_{cL} C_M C_T C_b = 625 \text{ psi}$   
 $f'_{cL} = p/A = 52.20 \text{ psi}$   
 Check if  $F'_{cL} > f'_{cL}$       D/C = 0.08

Bending:

$w_{LAT} = 24.00 \text{ plf}$   
 $M = (w \times L_u^2) / 8 = 2997.6 \text{ in-lb}$   
 $f_b = M / S_{xx} = 396 \text{ psi}$   
 $F'_b = F_b C_{D2} C_M C_t C_L C_F C_r C_i = 1440 \text{ psi}$   
 Check if  $F'_b > f_b$       D/C = 0.28

Combined Stresses:

$(f_c / F'_c)^2 + (f_{bx} / F'_{bx}) * (1 / (1 - f_c / F_{cEX})) = 0.29$   
 Check if  $\leq 1.0$       D/C = 0.29

**Use 2x6 Douglas Fir-Larch No. 2 Studs at 16 o.c. at the 1st STORY LEVEL**

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER:	3759.1
DESCRIPTION:	Stud Wall Calculation	DATE:	2025-01-29
VERTICAL CALCULATIONS		BY:	

**Load combination 6**

$$LC6a. w_{DL} + 0.75*w_{LL} + 0.75*w_{Lr} + 0.75(0.6*w_{WIND})$$

$$p = 590.67 \text{ lb}$$

$$f_c = p / A = 71.60 \text{ psi}$$

Column Capacity of Stud:

$$(L_e/d)_x^2 = 396.37$$

$$E'_{min} = E_{min} C_M C_t C_T C_i = 580000 \text{ psi}$$

$$F_{cE} = 0.822 E'_{min} / (L_e/d)_x^2 = 1203 \text{ psi}$$

$$F'_c = F_c C_{D2} C_M C_t C_F C_i = 2160 \text{ psi}$$

$$X = [1 + F_{cE} / F'_c] / 2C = 0.97$$

$$C_P = X - [X^2 - ((F_{cE} / F'_c) / C)]^{1/2} = 0.47$$

$$F'_c = F_c C_{D2} C_M C_t C_F C_i C_P = 1020.2 \text{ psi}$$

Check if  $F'_c > f_c$       D/C = 0.07

Bearing Check:

$$F'_{cL} = F_{cL} C_M C_T C_b = 625 \text{ psi}$$

$$f'_{cL} = p/A = 71.60 \text{ psi}$$

Check if  $F'_{cL} > f'_{cL}$       D/C = 0.11

Bending:

$$w_{LAT} = 18.00 \text{ plf}$$

$$M = (w \times L_u^2) / 8 = 2248.2 \text{ in-lb}$$

$$f_b = M / S_{xx} = 297 \text{ psi}$$

$$F'_b = F_b C_{D2} C_M C_t C_L C_F C_r C_i = 1440 \text{ psi}$$

Check if  $F'_b > f_b$       D/C = 0.21

Combined Stresses:

$$(f_c / F'_c)^2 + (f_{bx} / F'_{bx}) * (1 / (1 - f_c / F_{cEx})) = 0.22$$

Check if  $\leq 1.0$       D/C = 0.22

**Use 2x6 Douglas Fir-Larch No. 2 Studs at 16  
o.c. at the 1st STORY LEVEL**



# City of Richmond Seismic Map Points

This project provides a calculation package and plans for any home owner in the city of Richmond, CA to build this particular accessory dwelling unit on their land. To allow for versatility in building locations within the city, the seismic parameters of 6 locations were investigated.

Location 1 had the highest seismic design parameters and was used for this project design. See Appendix A for the detailed seismic parameters of all 6 locations.

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error. USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 1

Latitude, Longitude: 37.9942, -122.3581



<b>Date</b>	7/17/2024, 9:17:10 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Location 1 has the highest seismic design parameters and was used for the lateral design.

Type	Value	Description
S <sub>S</sub>	2.272	MCE <sub>R</sub> ground motion. (for 0.2 second period)
S <sub>1</sub>	0.877	MCE <sub>R</sub> ground motion. (for 1.0s period)
S <sub>MS</sub>	2.726	Site-modified spectral acceleration value
S <sub>M1</sub>	null -See Section 11.4.8	Site-modified spectral acceleration value
S <sub>DS</sub>	1.817	Numeric seismic design value at 0.2 second SA
S <sub>D1</sub>	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F <sub>a</sub>	1.2	Site amplification factor at 0.2 second
F <sub>v</sub>	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.954	MCE <sub>G</sub> peak ground acceleration
F <sub>PGA</sub>	1.2	Site amplification factor at PGA
PGA <sub>M</sub>	1.145	Site modified peak ground acceleration
T <sub>L</sub>	8	Long-period transition period in seconds
SsRT	2.574	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.882	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.272	Factored deterministic acceleration value. (0.2 second)
S1RT	0.984	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.109	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.877	Factored deterministic acceleration value. (1.0 second)
PGAd	0.954	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
PGA <sub>UH</sub>	1.123	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C <sub>RS</sub>	0.893	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.887	Mapped value of the risk coefficient at a period of 1 s
C <sub>V</sub>	1.5	Vertical coefficient

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	Seismic Weight	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

**SEISMIC WEIGHT**

ROOF LEVEL	WEIGHT (psf)	AREA (ft <sup>2</sup> )	TOTAL WT (kip)	
ROOF	19	930.00	17.67	
EXTERIOR WALL	18	570.00	10.26	
INTERIOR WALL	11	456.00	5.02	
-	0	0.00	0.00	
-	0	0.00	0.00	
-	0	0.00	0.00	
-	0	0.00	0.00	
<b>TOTAL WEIGHT</b>			<b>32.95 k</b>	<b>Net Seismic wt</b>
				35.43 psf

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759
DESCRIPTION:	Seismic Base Shear	DATE:	2025-01-29
LATERAL CALCULATIONS		BY:	

## BUILDING INFORMATION

Number of stories: 1  
 Building height for lateral calculations: 15.50 ft

## SEISMIC DESIGN CRITERIA & RESISTANCE SYSTEM COEFFICIENTS

Design Code: 2021 IBC (ASCE 7-16 Supplement 1, 2 and 3); CBC 2022  
 Calculation Method: Equivalent Lateral Force Procedure

### Risk Factor

All buildings and other structures except those listed in Risk Categories I, III, IV

Risk Category : II Table 1.5-1  
 Importance Factor,  $I_e$  : 1.00 Table 1.5-2

### Spectral Acceleration Parameters

Site Class=	D	Default D
Spectral Response Acceleration, $S_s$ =	2.272 g	Mapped Spectral Acc.
Spectral Response Acceleration, $S_1$ =	0.877 g	Mapped Spectral Acc.
Site Coefficient (0.2 Sec Period), $F_a$ =	1.2	Table 11.4-1
Site Coefficient (1.0 Sec Period), $F_v$ =	1.7	Table 11.4-2
Max Considered EQ Acc., $S_{MS} = F_a S_s$ =	2.726 g	11.4-1
Max Considered EQ Acc., $S_{M1} = F_v S_1$ =	1.491 g	11.4-2
Design Spectral Acc., $S_{DS} = 2/3 S_{MS}$ =	1.818 g	short period 11.4-3
Design Spectral Acc., $S_{D1} = 2/3 S_{M1}$ =	0.994 g	1 sec period 11.4-4
Seismic Design Category based on $S_1$ :	E	Section 11.6
Seismic Design Category based on short per.:	D	Table 11.6-1
Seismic Design Category based on 1sec per.:	D	Table 11.6-2
Design Seismic Design Category :	E	Per above or Geotech

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759
DESCRIPTION:	Seismic Base Shear	DATE:	2025-01-29
LATERAL CALCULATIONS		BY:	

## SEISMIC DESIGN CRITERIA & RESISTANCE SYSTEM COEFFICIENTS CONTINUED

### Seismic Resistance System Coefficients and Factors

System Type: **Bearing wall systems**

System Details: **Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance**

Response Modification Coefficient, $R =$	6.5	Table 12.2-1
Overstrength Coefficient, $W_0 =$	2.5	Table 12.2-1
Deflection Amplification Factor, $C_d =$	4	Table 12.2-1
Height Limitations =	65	Table 12.2-1

### Building Period

Structure Type :	<b>All other structural systems</b>	Table 12.8-2
Approximate fundamental period, $C_t =$	0.02	Table 12.8-2
Approximate fundamental per. parameter, $x =$	0.75	Table 12.8-2
Building Height from base to highest level, $h_n =$	15.50 ft	
Building Period, $T = T_a = C_t h_n^x =$	0.156 s	12.8-7
Long Period Transition, $T_L =$	12 s	Figure 22-14, p.225
$T_S = S_{D1} / S_{DS} =$	0.546838 s	

### Seismic Response Coefficient

$T \leq 1.5T_S, C_s = S_{DS} / (R / I_e) =$	0.280 W	12.8-2
For $1.5T_S < T \leq T_L, C_s = 1.5 * S_{D1} / (T R / I_e) =$	N/A	12.8-3 w/ 11.4.8 Exception
For $T > T_L, C_s = 1.5 * S_{D1} T_L / (T^2 R / I_e) =$	N/A	12.8-4 w/ 11.4.8 Exception
Minimum, $C_{s,min} =$	0.080 W	12.8-5
For $S_1 \geq 0.6g: C_{s,min} = 0.5 S_1 / (R / I_e) =$	0.067 W	12.8-6

## SEISMIC LOAD

Unfactored Seismic Load,  $V = C_s W =$  **0.280 W** Section 12.8-1, 12.4-3

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759
DESCRIPTION:	Seismic Base Shear	DATE:	2025-01-29
LATERAL CALCULATIONS		BY:	

### Unfactored Vertical Seismic Load Distribution

**\*Below Force is unfactored and does not include rho**

Seismic Load,  $F_x = C_{vx} V$  Section 12.8.3

Story Coefficient,  $C_{vx} = (w_x h_x^k) / (\sum w_i h_i^k)$  12.8-11

Exponent related to structure period,  $k = 1.00$  Section 12.8.3

Level	$w_x$ (k)	$h_x$ (ft)	$w_x h_x^k$	$C_{vx}$	$F_x = C_{vx} V$	$F_x = C_{vx} V S w_x$
ROOF	32.95	12.50	411.88	1.000	0.280 W	9.21 k
	0.00	0.00	0.00	0.000	0.000 W	0.00 k
	0.00	0.00	0.00	0.000	0.000 W	0.00 k
	0.00	0.00	0.00	0.000	0.000 W	0.00 k
Total =	32.95		411.88	1.000	0.280 W	9.21 k

### Diaphragm Seismic Forces

Diaphragm Design Force,  $F_{px} = S F_x w_x / S w_x$  12.10.1

Maximum Diaphragm Design Force,  $F_{px \max} = 0.4 S_{DS} I w_x$  Section 12.10.1

Minimum Diaphragm Design Force,  $F_{px \min} = 0.2 S_{DS} I w_x$  Section 12.10.2

Level	$w_x$ (k)	$F_x$	$F_{px}$	$F_{px \max}$	$F_{px \min}$	$F_{px \text{ design}}$
ROOF	32.95 k	9.21 k	9.21 k	23.96 k	11.98 k	11.98 k
	0.00 k	0.00 k	0.00 k	0.00 k	0.00 k	0.00 k
	0.00 k	0.00 k	0.00 k	0.00 k	0.00 k	0.00 k
	0.00 k	0.00 k	0.00 k	0.00 k	0.00 k	0.00 k



JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	ShearWall Design	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

SHEARWALL AND UPLIFT CALCULATION NOTES

STORY SHEAR DISTRIBUTION AND SHEAR WALL DESIGN:

Forces distributed by tributary area. See Lateral Key Plan for shear line definition.  
See previous lateral calculations for force distribution.

TABLE 1. SHEAR WALL SCHEDULE PER NDS 2021: SPECIAL DESIGN PROVISIONS FOR WIND AND SEISMIC, TABLE 4.3A

STRUCTURAL 1	
ALLOWABLE SHEAR	NAIL SPACING
312 plf	6
469 plf	4
611 plf	3
800 plf	2
625 plf	6DBL
938 plf	4DBL
1223 plf	3DBL
1600 plf	2DBL

- Nail spacing specified according to capacities in table above unless noted otherwise.
- FACTOR = % tributary width of shear line
- FORCE = Story shear adjusted for tributary width = Story Shear x FACTOR
- For multi-story shear walls, forces from shear lines above will be distributed by tributary area into shear lines below.
- Wall aspect ratio =  $h/L$ , has been considered for each shear wall.
- For walls with  $h/L$  between 2-3.5, a reduction Factor =  $1.25 - 0.125 * h/w$  will be applied to the shear capacity.
- For walls with  $h/L > 3.5$ , prefabricated shear wall panels will be specified.
- **HF** Denotes Hardy Frame shearwall panel and anchorage will be specified.
- **STRP** Denotes strapped shear wall. See Strapped Shear Wall Calculations for further details.
- **MF** Denotes Moment Frame. See Moment Frame Calculations for further details.
- Tabulated allowable shear value has been multiplied by 0.92 per NDS 2021: SDPWS table 4.3A footnote 10

PROJECT SPECIFIC NOTES:

- Shear walls designed using 15/32" plywood with 10d nail.
- Posts at hold downs will be specified according to manufacturer's recommendation.

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	ShearWall Design	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

SHEARWALL AND UPLIFT CALCULATION NOTES

UPLIFT CALCULATIONS AND TIE-DOWN ANCHORAGE:

TABLE 2. HOLD DOWN SCHEDULE PER SIMPSON CATALOG C-C-2021 (Pg.53)

ALLOWABLE TENSION LOADS	HOLDOWN TYPE	POST SIZE
3.075 kip	HDU2	4x4
4.565 kip	HDU4	4x4
5.645 kip	HDU5	4x4
6.97 kip	HDU8	4x4
7.87 kip	HDU8	4x6
9.535 kip	HDU11	4x6
11.175 kip	HDU11	4x8
10.77 kip	HDU14	4x6
14.39 kip	HDU14	4x8
14.445 kip	HDU14	6x6

TABLE 3. STRAP SCHEDULE PER SIMPSON CATALOG C-C-2021 (Pg. 273)

ALLOWABLE TENSION LOADS	STRAP TYPE	POST SIZE
4.69 kip	CMSTC16	4x4
1.705 kip	CS16	4x4

- Tie-downs will be specified according to capacities listed in tables above unless otherwise noted.
- Worst case tie-down anchorage will be specified on plan.
- Designed anchorages may be upsized when specified on plan.
- L' is conservative wall length. Reduction considers tie-downs offset from end of shear wall.  
 $L' = L - 1 \text{ ft}$
- Resistant moment from dead loads may not be considered if demand does not exceed minimum hardware capacity.

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	ShearWall Design	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

SHEAR WALL DESIGN

UNFACTORED STORY FORCE (F): 9.21 K      LEVEL: ROOF      RHO: 1.0      Design: ASD  
 DESIGN STORY FORCE: 6.45 K      DIRECTION: EAST - WEST      SDS: 1.818

WALL LINE	AREA (sq ft)	FACTOR	FORCE K	TOTAL FORCE	WALL HT (ft)	WALL SEGMENT LENGTHS (ft)						Σ WALL LENGTH	DEMAND plf	H/W (MIN.)	REDUCTION	NAIL SPACING	CAPACITY plf	D/C RATIO	
						W1	W2	W3	W4	W5	W6								
A	416.86	0.45	2.89	2.89	9.5	STRP STRP						16.50	216	OKAY	1.00	6	312	0.69	
B	513.51	0.55	3.56	3.56	9.5	16.5													
C		0.00	0.00	0.00															
D		0.00	0.00	0.00															
E		0.00	0.00	0.00															
F		0.00	0.00	0.00															
G		0.00	0.00	0.00															
H		0.00	0.00	0.00															
I		0.00	0.00	0.00															
J		0.00	0.00	0.00															
K		0.00	0.00	0.00															
L		0.00	0.00	0.00															
M		0.00	0.00	0.00															
N		0.00	0.00	0.00															
O		0.00	0.00	0.00															
P		0.00	0.00	0.00															
Q		0.00	0.00	0.00															
TOTAL	930.37	1.00	6.45	6.45															
TOTAL STORY SHEAR			6.45	6.45															

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	ShearWall Design	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

SHEAR WALL DESIGN

LEVEL: ROOF  
DIRECTION: EAST - WEST

(1) Refer to "Resisting Moment From Dead Load Calculator" for uplift resistance

HOLD DOWNS									
Required Tie-Down (Worst Case Wall Segment)					Required Tie-Down (User Selected Wall Segment)				
Wall Line	Wall Length	Uplift (K) <sup>(1)</sup>	Tie-Downs	D/C	Wall Length	Uplift (K) <sup>(1)</sup>	Tie-Downs	D/C	D/C
A	-	-	-	-	-	-	-	-	-
B	16.50	2.18	HDU2 W/ 4X4	0.71	-	0.00	-	#N/A	-
C	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
F	-	-	-	-	-	-	-	-	-
G	-	-	-	-	-	-	-	-	-
H	-	-	-	-	-	-	-	-	-
I	-	-	-	-	-	-	-	-	-
J	-	-	-	-	-	-	-	-	-
K	-	-	-	-	-	-	-	-	-
L	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	-	-	-
N	-	-	-	-	-	-	-	-	-
O	-	-	-	-	-	-	-	-	-
P	-	-	-	-	-	-	-	-	-
Q	-	-	-	-	-	-	-	-	-

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	ShearWall Design	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

SHEAR WALL DESIGN

UNFACTORED STORY FORCE (F<sub>i</sub>): 9.21 K      LEVEL: ROOF      RHO: 1.0      Design: ASD  
 DESIGN STORY FORCE: 6.45 K      DIRECTION: NORTH-SOUTH      SDS: 1.818

WALL LINE	AREA (sq ft)	FACTOR	FORCE K	TOTAL FORCE	WALL HT (ft)	WALL SEGMENT LENGTHS (ft)						Σ WALL LENGTH	DEMAND plf	HW (MIN.)	REDUCTION	NAIL SPACING	CAPACITY plf	D/C RATIO
						W1	W2	W3	W4	W5	W6							
1	64.41	0.07	0.45	0.45	12	STRP						6.50	437	OKAY	1.00	4	469	0.93
2	409.73	0.44	2.84	2.84	9.5	6.50						8.00	348	OKAY	1.00	4	469	0.74
3	402.10	0.43	2.79	2.79	9.5	8.00												
4	54.04	0.06	0.37	0.37	9.5	STRP												
5		0.00	0.00	0.00														
6		0.00	0.00	0.00														
7		0.00	0.00	0.00														
8		0.00	0.00	0.00														
9		0.00	0.00	0.00														
10		0.00	0.00	0.00														
11		0.00	0.00	0.00														
12		0.00	0.00	0.00														
13		0.00	0.00	0.00														
14		0.00	0.00	0.00														
15		0.00	0.00	0.00														
16		0.00	0.00	0.00														
17		0.00	0.00	0.00														
TOTAL	930.28	1.00	6.45	6.45														
TOTAL STORY SHEAR			6.45	6.45														

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUM.:	3759.1
DESCRIPTION:	ShearWall Design	DATE:	2025-01-29
	LATERAL CALCULATIONS	BY:	

SHEAR WALL DESIGN

LEVEL: ROOF  
DIRECTION: NORTH-SOUTH

(1) Refer to "Resisting Moment From Dead Load Calculator" for uplift resistance

HOLD DOWNS												
Required Tie-Down (Worst Case Wall Segment)				Required Tie-Down (User Selected Wall Segment)								
Wall Line	Wall Length	Uplift (K) <sup>(1)</sup>	Tie-Downs	D/C	Wall Length	Uplift (K) <sup>(1)</sup>	Tie-Downs	D/C	Wall Length	Uplift (K) <sup>(1)</sup>	Tie-Downs	D/C
1	-	-		-		-		-		-		-
2	6.50	4.90	HDU5 W/ 4X4	0.87		0.00		#N/A		0.00		#N/A
3	8.00	3.78	HDU4 W/ 4X4	0.83		0.00		#N/A		0.00		#N/A
4	-	-		-		-		-		-		-
5	-	-		-		-		-		-		-
6	-	-		-		-		-		-		-
7	-	-		-		-		-		-		-
8	-	-		-		-		-		-		-
9	-	-		-		-		-		-		-
10	-	-		-		-		-		-		-
11	-	-		-		-		-		-		-
12	-	-		-		-		-		-		-
13	-	-		-		-		-		-		-
14	-	-		-		-		-		-		-
15	-	-		-		-		-		-		-
16	-	-		-		-		-		-		-
17	-	-		-		-		-		-		-

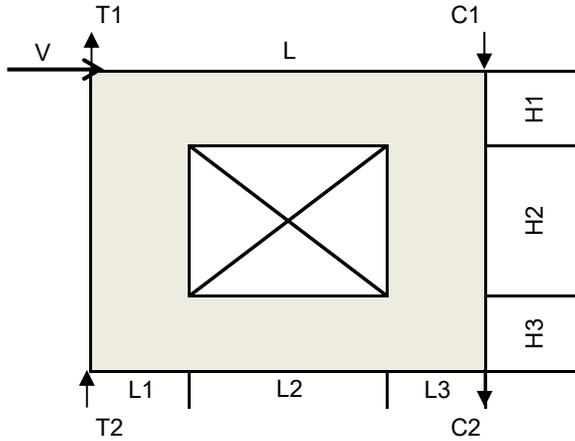
JOB NAME: <b>Two-Bedroom ADU - Spanish Revival Style</b>	JOB NUMBER: <b>3759.1</b>
DESCRIPTION: <b>Opening in shear walls</b>	DATE: <b>2025-01-29</b>
<b>LATERAL CALCULATIONS</b>	
BY:	

**FORCE TRANSFER AROUND OPENINGS SHEARWALL DESIGN**

Level: **Roof**      Line: **A**      Wall: **9 FT**

**Wall Dimensions:**

- L = 9.50 ft
- L1 = 3.50 ft
- L2 = 2.00 ft
- L3 = 4.00 ft
- H = 9.50 ft
- H1 = 1.50 ft
- H2 = 3.50 ft
- H3 = 4.50 ft



Forces on wall (ASD Level):

V = 1170 lbs

Aspect Ratio Check ( $H2/L_{pier}$ ):

- Pier 1: 1.00 **OK**
- Pier 3: 0.88 **OK**

Reactions from floor above:

T1 = 0 lbs  
C1 = 0 lbs

Holdown Type:  
Foundation

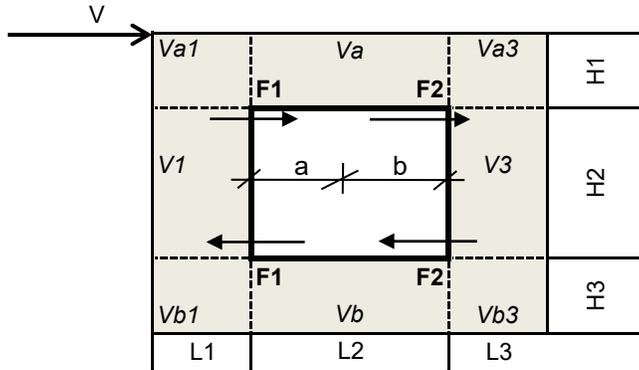
Reactions at base:

T2 = 1170 lbs  
C2 = 1170 lbs

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER: 3759.1
DESCRIPTION:	Opening in shear walls	DATE: 2025-01-29
LATERAL CALCULATIONS		BY:

PUNCHED SHEAR WALLS

Level: Roof      Line: A      Wall: 9 FT



Corner Forces

F1 = 182 lbs  
F2 = 208 lbs

Tributary Length of Openings

a = 0.9 ft  
b = 1.1 ft

Unit Shear Above/Below Openings

Va/Vb = 195 plf

Unit Shear at each Pier

V1 = 156 plf  
V3 = 156 plf

Unit Shear in Corner Zones

Va1/Vb1 = 104 plf  
Va3/Vb3 = 104 plf

Holdown:

P<sub>up</sub> = 1170 lbs  
Use HDU2  
T<sub>allow</sub> = 3075 lbs  
D/C = 0.38 **OK**

Horizontal tie strap:

T = 208 lbs  
Use CMSTC16  
T<sub>allow</sub> = 4585 lbs  
D/C = 0.05 **OK**

Shearwall nailing:

V<sub>max</sub> = 195 plf  
Use Shearwall Nailing Type **6**  
V<sub>allow</sub> = 312 plf  
D/C = 0.63 **OK**

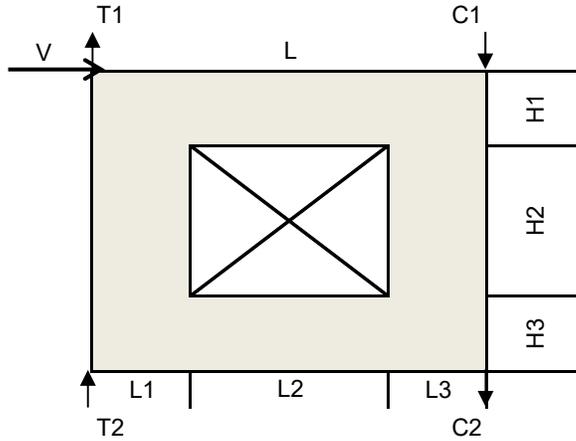
JOB NAME: Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER: 3759.1
DESCRIPTION: Opening in shear walls	DATE: 2025-01-29
<b>LATERAL CALCULATIONS</b>	
	BY:

**FORCE TRANSFER AROUND OPENINGS SHEARWALL DESIGN**

Level: **Roof**      Line: **A**      Wall: **14 FT**

Wall Dimensions:

- L = 14.00 ft
- L1 = 4.50 ft
- L2 = 6.00 ft
- L3 = 3.50 ft
- H = 9.50 ft
- H1 = 1.00 ft
- H2 = 5.50 ft
- H3 = 3.00 ft



Forces on wall (ASD Level):

V = 1725 lbs

Aspect Ratio Check ( $H2/L_{pier}$ ):

Pier 1: 1.22 **OK**

Pier 3: 1.57 **OK**

Reactions from floor above:

T1 = 0 lbs

C1 = 0 lbs

Holdown Type:

Foundation

Reactions at base:

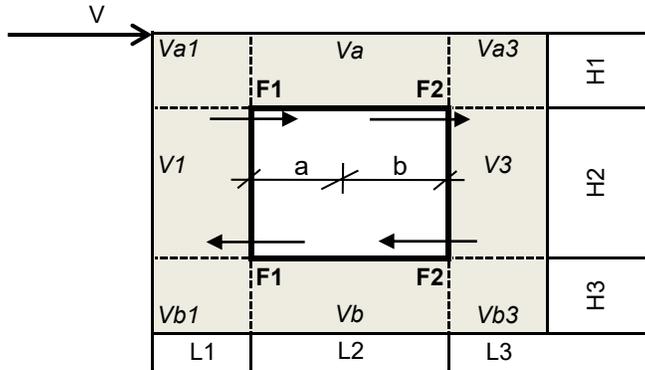
T2 = 1171 lbs

C2 = 1171 lbs

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER: 3759.1
DESCRIPTION:	Opening in shear walls	DATE: 2025-01-29
LATERAL CALCULATIONS		BY:

PUNCHED SHEAR WALLS

Level: Roof      Line: A      Wall: 14 FT



Corner Forces

F1 = 988 lbs  
F2 = 768 lbs

Tributary Length of Openings

a = 3.4 ft  
b = 2.6 ft

Unit Shear Above/Below Openings

Va/Vb = 293 plf

Unit Shear at each Pier

V1 = 216 plf  
V3 = 216 plf

Unit Shear in Corner Zones

Va1/Vb1 = -4 plf  
Va3/Vb3 = -4 plf

Holdown:

P<sub>up</sub> = 1171 lbs  
Use HDU2  
T<sub>allow</sub> = 3075 lbs  
D/C = 0.38 **OK**

Horizontal tie strap:

T = 988 lbs  
Use CMSTC16  
T<sub>allow</sub> = 4585 lbs  
D/C = 0.22 **OK**

Shearwall nailing:

V<sub>max</sub> = 293 plf  
Use Shearwall Nailing Type **6**  
V<sub>allow</sub> = 312 plf  
D/C = 0.94 **OK**

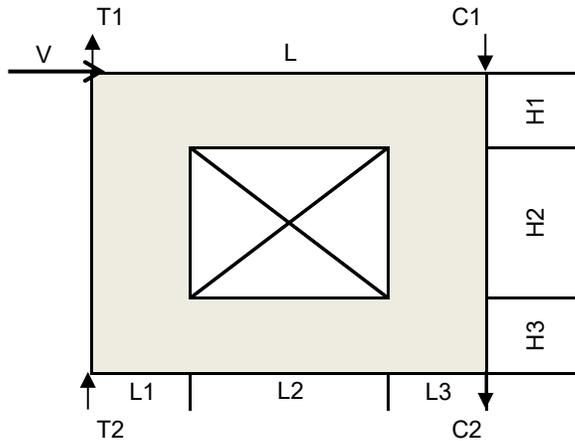
JOB NAME: <b>Two-Bedroom ADU - Spanish Revival Style</b>	JOB NUMBER: <b>3759.1</b>
DESCRIPTION: <b>Opening in shear walls</b>	DATE: <b>2025-01-29</b>
<b>LATERAL CALCULATIONS</b>	
BY:	

**FORCE TRANSFER AROUND OPENINGS SHEARWALL DESIGN**

Level: **Roof**      Line: **1**      Wall: **12 FT**

Wall Dimensions:

- L = 12.00 ft
- L1 = 2.00 ft
- L2 = 8.00 ft
- L3 = 2.00 ft
- H = 9.50 ft
- H1 = 1.00 ft
- H2 = 6.00 ft
- H3 = 2.50 ft



Forces on wall (ASD Level):

V = 450 lbs

Aspect Ratio Check ( $H2/L_{pier}$ ):

- Pier 1: 3.00 **REDUCE SHEARWALL CAPACITY**
- Pier 3: 3.00 **REDUCE SHEARWALL CAPACITY**

Reactions from floor above:

T1 = 0 lbs  
C1 = 0 lbs

Holdown Type:  
Foundation

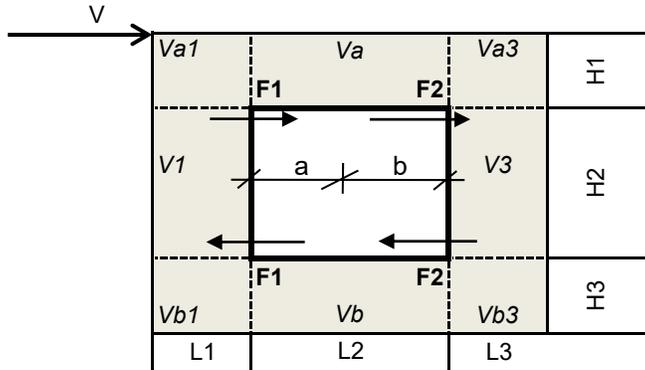
Reactions at base:

T2 = 356 lbs  
C2 = 356 lbs

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER: 3759.1
DESCRIPTION:	Opening in shear walls	DATE: 2025-01-29
LATERAL CALCULATIONS		BY:

PUNCHED SHEAR WALLS

Level: Roof      Line: 1      Wall: 12 FT



Corner Forces

F1 = 407 lbs  
F2 = 407 lbs

Tributary Length of Openings

a = 4.0 ft  
b = 4.0 ft

Unit Shear Above/Below Openings

Va/Vb = 102 plf

Unit Shear at each Pier

V1 = 113 plf  
V3 = 113 plf

Unit Shear in Corner Zones

Va1/Vb1 = -91 plf  
Va3/Vb3 = -91 plf

Holdown:

P<sub>up</sub> = 356 lbs  
Use HDU2  
T<sub>allow</sub> = 3075 lbs  
D/C = 0.12 **OK**

Horizontal tie strap:

T = 407 lbs  
Use CMSTC16  
T<sub>allow</sub> = 4585 lbs  
D/C = 0.09 **OK**

Shearwall nailing:

V<sub>max</sub> = 113 plf  
Use Shearwall Nailing Type **6**  
V<sub>allow</sub> = 208 plf  
D/C = 0.54 **OK**

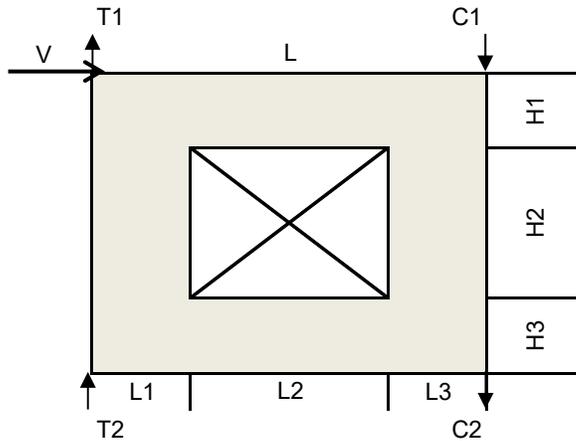
JOB NAME: <b>Two-Bedroom ADU - Spanish Revival Style</b>	JOB NUMBER: <b>3759.1</b>
DESCRIPTION: <b>Opening in shear walls</b>	DATE: <b>2025-01-29</b>
<b>LATERAL CALCULATIONS</b>	
BY: _____	

**FORCE TRANSFER AROUND OPENINGS SHEARWALL DESIGN**

Level: **Roof**      Line: **4**      Wall: **12 FT**

Wall Dimensions:

- L = 12.00 ft
- L1 = 3.00 ft
- L2 = 6.00 ft
- L3 = 3.00 ft
- H = 9.50 ft
- H1 = 1.50 ft
- H2 = 5.50 ft
- H3 = 2.50 ft



Forces on wall (ASD Level):

V = 370 lbs

Aspect Ratio Check ( $H2/L_{pier}$ ):

- Pier 1: 1.83 **OK**
- Pier 3: 1.83 **OK**

Reactions from floor above:

T1 = 0 lbs  
C1 = 0 lbs

Holdown Type:  
Foundation

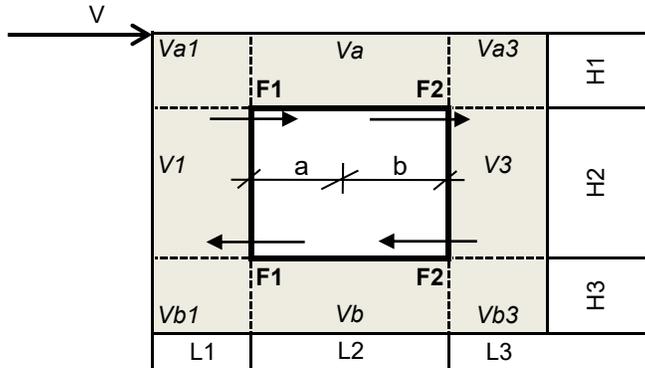
Reactions at base:

T2 = 293 lbs  
C2 = 293 lbs

JOB NAME:	Two-Bedroom ADU - Spanish Revival Style	JOB NUMBER: 3759.1
DESCRIPTION:	Opening in shear walls	DATE: 2025-01-29
LATERAL CALCULATIONS		BY: _____

PUNCHED SHEAR WALLS

Level: Roof      Line: 4      Wall: 12 FT



Corner Forces

F1 = 220 lbs  
F2 = 220 lbs

Tributary Length of Openings

a = 3.0 ft  
b = 3.0 ft

Unit Shear Above/Below Openings

Va/Vb = 73 plf

Unit Shear at each Pier

V1 = 62 plf  
V3 = 62 plf

Unit Shear in Corner Zones

Va1/Vb1 = -12 plf  
Va3/Vb3 = -12 plf

Holdown:

P<sub>up</sub> = 293 lbs  
Use HDU2  
T<sub>allow</sub> = 3075 lbs  
D/C = 0.10 **OK**

Horizontal tie strap:

T = 220 lbs  
Use CMSTC16  
T<sub>allow</sub> = 4585 lbs  
D/C = 0.05 **OK**

Shearwall nailing:

V<sub>max</sub> = 73 plf  
Use Shearwall Nailing Type **6**  
V<sub>allow</sub> = 312 plf  
D/C = 0.23 **OK**



# Appendix A: Seismic Parameters

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.  
 USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 1

Latitude, Longitude: 37.9942, -122.3581



<b>Date</b>	7/17/2024, 9:17:10 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Highest seismic design parameters used for design.

Type	Value	Description
$S_S$	2.272	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.877	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	2.726	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.817	Numeric seismic design value at 0.2 second SA
$S_{D1}$	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
$F_a$	1.2	Site amplification factor at 0.2 second
$F_v$	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.954	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.2	Site amplification factor at PGA
$PGA_M$	1.145	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	2.574	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	2.882	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	2.272	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.984	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	1.109	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.877	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.954	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
PGA <sub>UH</sub>	1.123	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C <sub>RS</sub>	0.893	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.887	Mapped value of the risk coefficient at a period of 1 s
C <sub>V</sub>	1.5	Vertical coefficient

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.  
 USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 2

Latitude, Longitude: 37.9575, -122.4199



<b>Date</b>	7/17/2024, 9:18:57 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Type	Value	Description
$S_S$	1.579	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.6	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	1.895	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.263	Numeric seismic design value at 0.2 second SA
$S_{D1}$	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
$F_a$	1.2	Site amplification factor at 0.2 second
$F_v$	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.665	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.2	Site amplification factor at PGA
$PGA_M$	0.798	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	1.959	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	2.141	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	1.579	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.753	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.833	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.6	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.665	Factored deterministic acceleration value. (Peak Ground Acceleration)

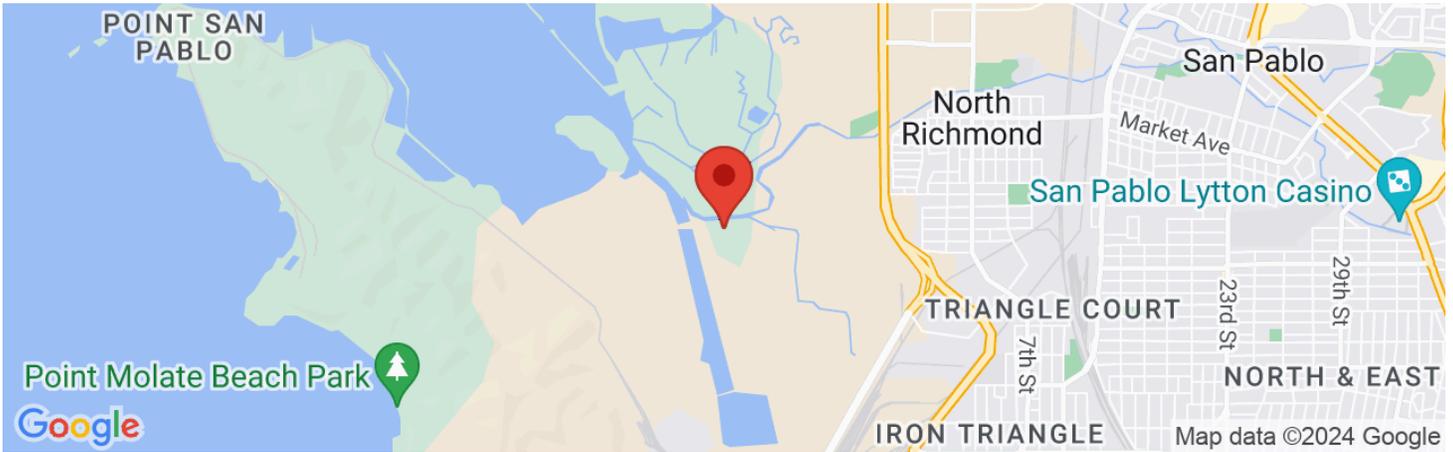
Type	Value	Description
PGA <sub>UH</sub>	0.832	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C <sub>RS</sub>	0.915	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.904	Mapped value of the risk coefficient at a period of 1 s
C <sub>V</sub>	1.416	Vertical coefficient

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.  
 USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 3

Latitude, Longitude: 37.9520, -122.3858



<b>Date</b>	7/17/2024, 9:19:54 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Type	Value	Description
$S_S$	1.8	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.685	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	2.16	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.44	Numeric seismic design value at 0.2 second SA
$S_{D1}$	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
$F_a$	1.2	Site amplification factor at 0.2 second
$F_v$	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.757	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.2	Site amplification factor at PGA
$PGA_M$	0.908	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	2.134	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	2.352	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	1.8	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.817	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.909	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.685	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.757	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
PGA <sub>UH</sub>	0.912	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C <sub>RS</sub>	0.907	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.898	Mapped value of the risk coefficient at a period of 1 s
C <sub>V</sub>	1.46	Vertical coefficient

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.  
 USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 4

Latitude, Longitude: 37.9426, -122.3548



<b>Date</b>	7/17/2024, 9:20:37 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Type	Value	Description
$S_S$	1.988	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.762	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	2.386	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.591	Numeric seismic design value at 0.2 second SA
$S_{D1}$	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
$F_a$	1.2	Site amplification factor at 0.2 second
$F_v$	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.835	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.2	Site amplification factor at PGA
$PGA_M$	1.003	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	2.318	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	2.571	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	1.988	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.886	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.992	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.762	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.835	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
PGA <sub>UH</sub>	0.999	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C <sub>RS</sub>	0.902	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.893	Mapped value of the risk coefficient at a period of 1 s
C <sub>V</sub>	1.498	Vertical coefficient

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.  
 USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 5

Latitude, Longitude: 37.9285, -122.3256



<b>Date</b>	7/17/2024, 9:21:16 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Type	Value	Description
$S_S$	2.122	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.817	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	2.547	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.698	Numeric seismic design value at 0.2 second SA
$S_{D1}$	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
$F_a$	1.2	Site amplification factor at 0.2 second
$F_v$	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.892	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.2	Site amplification factor at PGA
$PGA_M$	1.07	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	2.431	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	2.699	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	2.122	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.925	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	1.037	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.817	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.892	Factored deterministic acceleration value. (Peak Ground Acceleration)

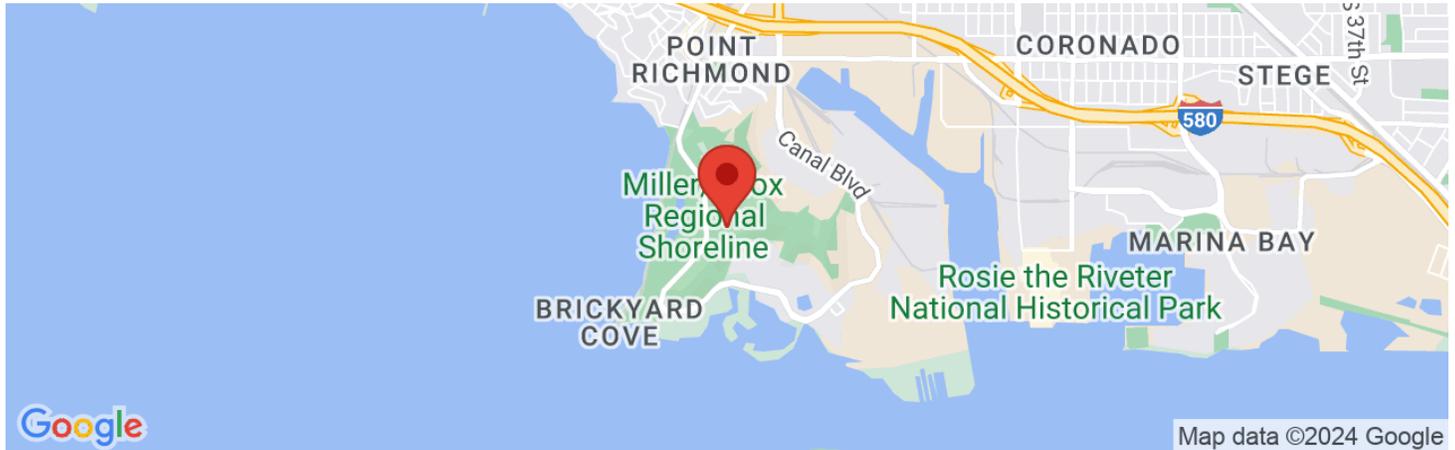
Type	Value	Description
PGA <sub>UH</sub>	1.049	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C <sub>RS</sub>	0.901	Mapped value of the risk coefficient at short periods
C <sub>R1</sub>	0.892	Mapped value of the risk coefficient at a period of 1 s
C <sub>V</sub>	1.5	Vertical coefficient

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.  
 USGS web services are now operational so this tool should work as expected.



# Richmond , CA - Location 6

Latitude, Longitude: 37.9151, -122.3822



<b>Date</b>	7/17/2024, 9:22:14 AM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Type	Value	Description
$S_S$	1.575	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.6	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	1.89	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.26	Numeric seismic design value at 0.2 second SA
$S_{D1}$	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
$F_a$	1.2	Site amplification factor at 0.2 second
$F_v$	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.663	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.2	Site amplification factor at PGA
$PGA_M$	0.796	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	1.98	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	2.156	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	1.575	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.755	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.833	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.6	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.663	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
$PGA_{UH}$	0.839	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
$C_{RS}$	0.918	Mapped value of the risk coefficient at short periods
$C_{R1}$	0.907	Mapped value of the risk coefficient at a period of 1 s
$C_V$	1.415	Vertical coefficient

