LAGUNA NIGUEL ADUs

PLAN 2

LAGUNA NIGUEL, CA

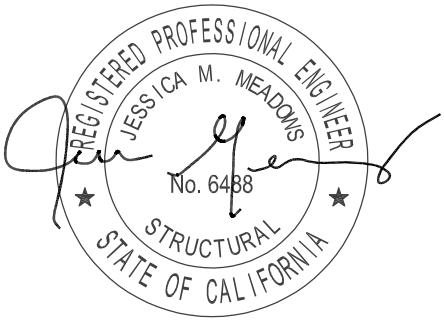
RRM Project No. 2889-01-CU22

STRUCTURAL CALCULATIONS

January 10, 2025

Prepared by: Ian Kelly EIT

Under Direction of: Jessica Meadows, SE



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a California corporation • Lenny Grant, Architect C26973 • Robert Camacho, PE 76597 • Steve Webster, LS 7561 • Jeff Ferber, LA 2844

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Index of Structural Calculations

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PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: PROJECT DESIGN CRITERIA

PROJECT DESIGN CRITERIA

PROJECT LOCATION:

Address: PLAN 1
LAGUNA NIGUEL, CA

Latitude: N 33.498759°
Longitude: W 117.733465°

DESIGN CODES:

Notation	Code/ Standard Reference	Title
A	ASCE 7-16	Minimum Design Loads for Buildings and Other Structures
C	2022 CBC	2022 California Building Code
I	ACI 318-19	2019 Building Code Requirements for Structural Concrete
M	TMS 402/ 602-16	2016 Building Code Requirements and Specification for Masonry Structures
S	AISC 360-16	2016 Steel Construction Manual 15th Edition
W	2018 NDS	2018 National Design Specification for Wood Construction
SDP	2021 SDPWS	2021 Seismic Deisgn Provisions for Wind and Seismic (American Wood Council)

MATERIAL REFERENCES:

Notation	Material Reference	Title
B		Design of Wood Structures ASD/LRFD, Breyer, 6th Edition
T	TJ-4000	Weyerhaeuser Specifier's Guide

PROJECT DESCRIPTION:

The calculations herewith represent the following structures as described:

Pre-Approved Accessory Dwelling Units:

Configuration: Accessory Dwelling Units (ADUs)

Gravity System: Plywood sheathing spans to pre-manufactured wood trusses at roof. Wood framing bears on wood beams, wood stud bearing walls and wood headers. Wood beams & headers span to wood posts or king studs.

Lateral System: Plywood sheathed diaphragm distributes lateral load to collectors. Continuous chords resist diaphragm tension and compression loads. Collectors drag lateal loads to plywood sheathed wood stud shear walls. Shear walls distribute shear lateral load to foundation thru sill anchor bolts and overturning lateral load thru end columns and uplift connectors.

Foundation System: Shallow continuous concrete strip footings support bearing walls.

PROJECT DESIGN CRITERIA

GEOTECHNICAL PARAMETERS:

Geotechnical Report:

Prepared by: N/A

Project No: N/A
Dated: N/A

Bearing Pressure:

Allowable Bearing Pressure:	1500	psf	Presumptive load bearing values
Passive Earth Pressure:	100	psf/ft	per 2022 CBC Table 1806.2
Friction Coefficient:	0.25		
Friction + Passive:	100% + 100%		

Retaining Walls:

Allowable Bearing Pressure:	N/A	psf
Passive Earth Pressure:	N/A	psf/ft
Friction Coefficient:	0.25	
Friction + Passive:	100% + 100%	

Active Lateral Earth Pressure:	N/A	psf/ft for Level Backfill
Increase for Slope:	N/A	psf/ft per degree of incline
At Rest Lateral Earth Pressure:	N/A	psf/ft for Level Backfill
Increase for Slope:	N/A	psf/ft per degree of incline
Seismic Active Earth Pressure:	N/A	psf/ft for Level Backfill
Seismic At-Rest Earth Pressure:	N/A	psf/ft for Level Backfill

PROJECT DEAD LOADS - ROOF

ROOF: ***Clay Tile Over Trusses w/ Gyp Ceiling & PV Panels*** *5/12 Roof Slope*

Dead Load Occurs Yes

Thick	Spacing	Description	Base Weight (psf)	Slope (deg)	Factor	Layers	Total Weight (psf)	Code/Standard Reference
		Clay Tile	10	22.6	1.08	1	10.8	A Table C3-1
		PV Panels	4	22.6	1.08	1	4.3	
		Miscellaneous	1	22.6	1.08	1	1.1	
					Roof & Re-Roof Total =		16.3	Some Jurisdictions
15/32 "		Sheathing	3	22.6	1.08	1	1.5	B Appendix B
10.0 "		Batt Insulation	0.075	22.6	1.08	1	0.8	B Appendix B
5/8 "		Gyp. Ceiling	4.48	0.0	1.00	1	2.8	B Appendix B
		Lights/Ducts/Sprinklers	2	0.0	1.00	1	2.0	B Appendix B
					Joist Super Load =		23.4	
		Roof Trusses @ 24" OC						
	24 "	2x6 Top Chord	0.95	22.6	1.08	1	1.0	B Appendix A
	24 "	2x4 Web	0.6	22.6	1.08	1	0.7	B Appendix A
	24 "	2x6 Bottom Chord	0.95	0	1.00	1	1.0	B Appendix A
					Total Dead Load =		26.0	27.0 rounded

Live Load

		26. Roofs					20.0	C Table 1607.1
					Live Load =		20.0	

ROOF: ***Clay Tile Over Trusses w/ Stucco Ceiling*** *5/12 Roof Slope*

Dead Load Occurs Yes

Thick	Spacing	Description	Base Weight (psf)	Slope (deg)	Factor	Layers	Total Weight (psf)	Code/Standard Reference
		Clay Tile	10	22.6	1.08	1	10.8	A Table C3-1
		PV Panels	4	22.6	1.08	1	4.3	
		Miscellaneous	1	22.6	1.08	1	1.1	
					Roofing and Re-Roofing Total =		16.3	Some Jurisdictions
15/32 "		Sheathing	3	22.6	1.08	1	1.5	B Appendix B
		Stucco Ceiling	10.4	0	1.00	1	10.4	B Appendix B
		Lights/Ducts/Sprinklers	2	0.0	1.00	1	2.0	B Appendix B
					Joist Super Load =		30.2	
		Roof Trusses @ 24" OC						
	24 "	2x6 Top Chord	0.95	22.6	1.08	1	1.0	B Appendix A
	24 "	2x4 Web	0.6	22.6	1.08	1	0.7	B Appendix A
	24 "	2x6 Bottom Chord	0.95	0	1.00	1	1.0	B Appendix A
					Total Dead Load =		32.8	33.0 rounded

Live Load

		26. Roofs					20.0	C Table 1607.1
					Live Load =		20.0	

PROJECT DEAD LOADS - WALLS

WALL: ***Plaster/Stucco Exterior Wall (2x6)*** Occurs?: Yes

Thick	Spacing	Description	Base Weight (psf)		Layers	Total Weight (psf)	Code/Standard Reference
		Stucco	10.4		1	10.4	B Appendix B
15/32 "		Sheathing	3		1	1.4	B Appendix B
	16 "	2x6 Stud Wall	1.425		1	1.4	B Appendix B
5 1/2 "		Insulation	0.04		1	0.2	B Appendix B
5/8 "		Gyp. Board	5		1	3.1	B Appendix B
		Miscellaneous	1		1	1.0	B Appendix B
				Total Wall Load =		17.6	17.6 rounded

WALL: ***Plaster/Stucco Exterior Wall (2x4)*** Occurs?: Yes

Thick	Spacing	Description	Base Weight (psf)		Layers	Total Weight (psf)	Code/Standard Reference
		Stucco	10.4		1	10.4	B Appendix B
15/32 "		Sheathing	3		1	1.4	B Appendix B
	16 "	2x4 Stud Wall	0.9		1	0.9	B Appendix B
3 1/2 "		Insulation	0.04		1	0.1	B Appendix B
5/8 "		Gyp. Board	5		1	3.1	B Appendix B
		Miscellaneous	0.5		1	0.5	B Appendix B
				Total Wall Load =		16.4	17.0 rounded

WALL: ***Non-Bearing Partition Wall (2x4)*** Occurs?: Yes

Thick	Spacing	Description	Base Weight (psf)		Layers	Total Weight (psf)	Code/Standard Reference
	16 "	2x4 Stud Wall	0.9		1	0.9	B Appendix B
5/8 "		Gyp. Board	5		2	6.3	B Appendix B
		Miscellaneous	5		1	1.0	B Appendix B
				Total Wall Load =		8.2	8.2 rounded

TYPICAL CALCULATIONS

TYPICAL CHORD SPLICE @ 2x6 STUDS

NAILED SPLICES
ALLOWABLE TENSION

(1) 2x6 : T_{2x6} = 1(1.5)(5.5)(575psi)(1.6)(1.3) = 9867 lbs

MARK	No. 16d NAILS	CAPACITY (lbs)	
A	8	8(130lbs)(1.60) =	1671 lbs
B	12	12(130lbs)(1.60) =	2507 lbs
C	16	16(130lbs)(1.60) =	3342 lbs
D	20	20(130lbs)(1.60) =	4178 lbs
E	24	24(130lbs)(1.60) =	5013 lbs
F	28	28(130lbs)(1.60) =	5849 lbs
G	32	32(130lbs)(1.60) =	6684 lbs

< 9867 lbs

NOTE: NAIL VALUES GOVERN ALL CASES

16d COMMON NAIL CAPACITY

PER 2018 NDS TBL 12N

ts =	1.5	IN
tm =	1.5	IN
G =	0.5	(DF-L)
Z =	141	LBS
16d NAIL DIA =	0.162	IN
PENETRATION, p =	1.5" / 1.62" =	0.926
p * Z =	130	LBS

PER 2018 NDS TBL 11.3.1

$Z' = Z \times C_D \times C_M \times Ct \times Cg \times C\Delta \times Ceg \times Cdi \times Ctn \times p$

C_D = 1.6 [2018 NDS TBL 2.3.2]

$C_M = Ct = Cg = C\Delta = Ceg = Cdi = Ctn = 1.0$

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: SHEAR WALL SCHEDULE

TYPICAL CALCULATIONS

SHEAR WALL SCHEDULE

CONVENTIONAL HOLDOWNS[1]: Yes — 8% Reduction SDPWS Table 4.3A, Footnote 10
SHORT NAILS[2]: Yes — SDPWS C4.3.5.2, 5% Reduction Selected

SPECIFIC GRAVITY, G (FRAMING): 0.5 — per NDS Supplement Table 4A / 4B
FRAMING ADJUSTMENT FACTOR: 1.00 — Capacity Reduction factor per SDPWS Table 4.3A Footnote 2, for species and grades of framing other than DF-L and SP

MARK	SHEATHING THICKNESS*	EDGE NAILING	SILL PLATE SHEAR ANCHOR BOLTS	ALLOWABLE SHEAR[1,2] (plf)
A	15/32"	8d @ 6"	5/8" @ 48" o.c.	266
B	15/32"	10d @ 6"	5/8" @ 48" o.c.	294
C	15/32"	10d @ 4"	5/8" @ 32" o.c.	443
D	15/32"	10d @ 3"	5/8" @ 24" o.c.	577
E	15/32"	10d @ 2"	5/8" @ 24" o.c.**	756
F	15/32" EA. SIDE	10d @ 4"	5/8" @ 16" o.c.**	888
G	15/32" EA. SIDE	10d @ 3"	5/8" @ 16" o.c.**	1,155
H	15/32" EA. SIDE	10d @ 2"	5/8" @ 12" o.c.**	1,512

*Structural 1 Plywood
**Requires 3x sole plate to achieve prescribed anchor bolt spacing

BOUNDARY ELEMENT HOLDOWNS

SIMP. HOLDOWN	BOUNDARY ELEMENT	FASTENERS	ALLOW UPLIFT (lbs)
DTT2Z	2x MIN.	(8) ¼"x1½" SDS	1825
DTT2Z-2.5	(2) 2x MIN.	(8) ¼"x2½" SDS	2145
HDU2	(2) 2x MIN.	(6) ¼"x2½" SDS	3075
HDU4	(2) 2x MIN.	(10) ¼"x2½" SDS	4565
HDU5	(2) 2x MIN.	(14) ¼"x2½" SDS	5645
HDU8	4x MIN.	(20) ¼"x2½" SDS	6970
HDU11	6x MIN.	(30) ¼"x2½" SDS	9535
HDU14	6x MIN.	(36) ¼"x2½" SDS	14445
HDQ8	4x MIN.	(20) ¼"x3" SDS	7630
HHDQ11	6x MIN.	(24) ¼"x2½" SDS	9535
HHDQ14	6x MIN.	(30) ¼"x2½" SDS	13710
HD19	6x MIN.	(5) 1" BOLTS	19070

TYPICAL CALCULATIONS

TYPICAL PAD FOOTING

PAD FOOTING 'F2' (2'-0" SQUARE x 1'-6" THICK)

b =	2.00	ft	f_c' =	2500	psi
t =	1.50	ft	f_y =	60	ksi
q_{ALLOW} =	1500	psf	Reinf. =	#5	

BEARING CAPACITY

MAX DL+LL =	$q_{ALLOW}(b)^2$ /1000 =	6.00	kips
MAX UPLIFT =	$(0.150kcf)b^2t$ =	0.90	kips

BENDING CAPACITY

FOR fy = 60 ksi, ρ ≥ (0.0018)bt;
FOR #5 EA. WAY; As = 0.31 in2
FOR (3) #5 BARS @ 24" FTG. w/ 3" CLR.;
FOR #5 BARS @ 18" THICK FTG.;

$A_{s\_req'd}$ =	0.78	in^2
#5 =	6	bars; 3 Bottom Bars
b_w =	8.69	in
d =	14.06	in

$$\emptyset M_N = \emptyset A_s f_Y \left(d - \frac{A_s f_Y}{1.7 f_C' b_w}\right) =$$ 226.97 kip-in

AT ASD: MN_ASD = 11822 ft-lbs

$$q_{U\_ftg} = \frac{2M_{N\_ASD}}{\left(\frac{1}{2}(b - 1')\right)^2} =$$ 94572.1669 psf/ft > qallow, FLEXURE OK

TWO WAY (PUNCHING) SHEAR

$$\varphi V_C = 0.75\left[4\sqrt{f_c'}(12" + d)(4d)\right] =$$ 219.9 kips

$$V_U = 1.6\left[q_{ALLOW}\left[b^2 - \left(\frac{6" + d}{12"/ft}\right)^2\right]\right] =$$ 2.9 kips < ΦVc, PUNCHING SHEAR OK

ONE WAY (BEAM ACTION) SHEAR

$$\varphi V_C = 0.75\left[2\sqrt{f_c'}(bd(12"/ft))\right] =$$ 25.3 kips

$$V_U = 1.6\left[q_{ALLOW}\left[\frac{b}{2} - \frac{6" + d}{12"/ft}\right]b\right] =$$ -3.225 kips < ΦVc, BEAM ACTION SHEAR OK

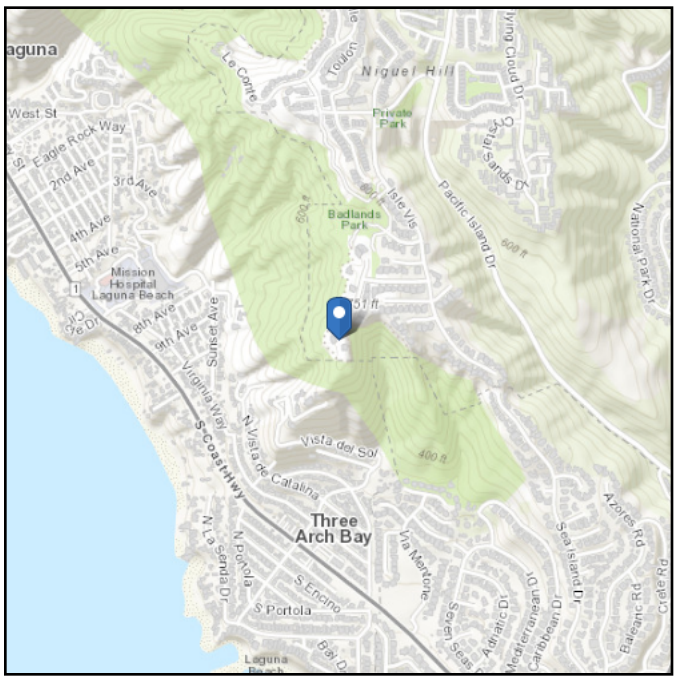
PROVIDE 2'-0" SQUARE x 1'-6" THICK FOOTING
WITH (3) #5 T&B EA. WAY @ PAD FOOTING 'F-2'

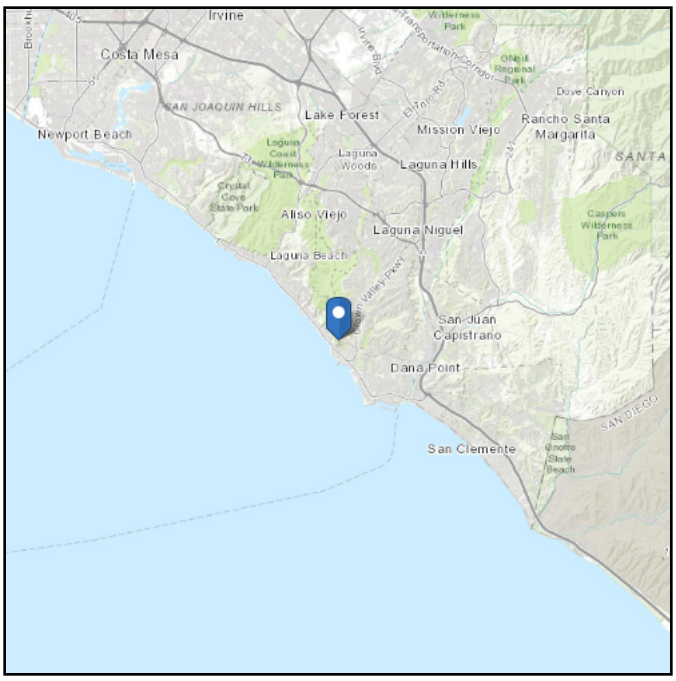
ASCE Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 33.498759
Longitude: -117.733465
Elevation: 733.402305703125 ft (NAVD 88)





Wind

Results:

Wind Speed	95 Vmph
10-year MRI	66 Vmph
25-year MRI	72 Vmph
50-year MRI	77 Vmph
100-year MRI	81 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Fri Dec 27 2024

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

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

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.314	S_{D1} :	N/A
S_1 :	0.467	T_L :	8
F_a :	1.2	PGA :	0.577
F_v :	N/A	PGA_M :	0.692
S_{MS} :	1.576	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.051	C_v :	1.363

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

Data Accessed: Fri Dec 27 2024

Date Source: USGS Seismic Design Maps

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: WIND COMPONENT & CLADDING - ASCE 7-16

WIND COMPONENT & CLADDING - ASCE 7-16 CH. 30

Input:

Roof Shape:	Gable	
Building Width:	28.0	ft
Building Length:	19.0	ft
Building Height:	10.3	ft
Roof Slope:	23.0	degrees
Enclosure:	Enclosed	
V =	95	mph
Exposure Category =	C	
K_z =	**0.85**	
K_{zt} =	1.00	
K_d =	0.85	
K_e =	1.00	
q_z =	16.67	psf
q_{zASD} =	10.00	psf
a =	3	ft
GC_{pi} =	0.18	

Roof Pressures, 1.0W: $P_w = q_h(GC_P \pm GC_{pi})$

Zone	A ≤ 2 ft^2	A ≤ 10 ft^2	A ≤ 100 ft^2	A ≤ 500 ft^2
1	-28.0	-28.0	-21.3	-16.3
2e	-28.0	-28.0	-21.3	-16.3
2n	-44.7	-44.7	-26.3	-23.0
2r	-44.7	-44.7	-26.3	-23.0
3e	-44.7	-44.7	-26.3	-23.0
3r	-63.0	-48.8	-33.0	-33.0
All Zones	16.0	16.0	16.0	16.0

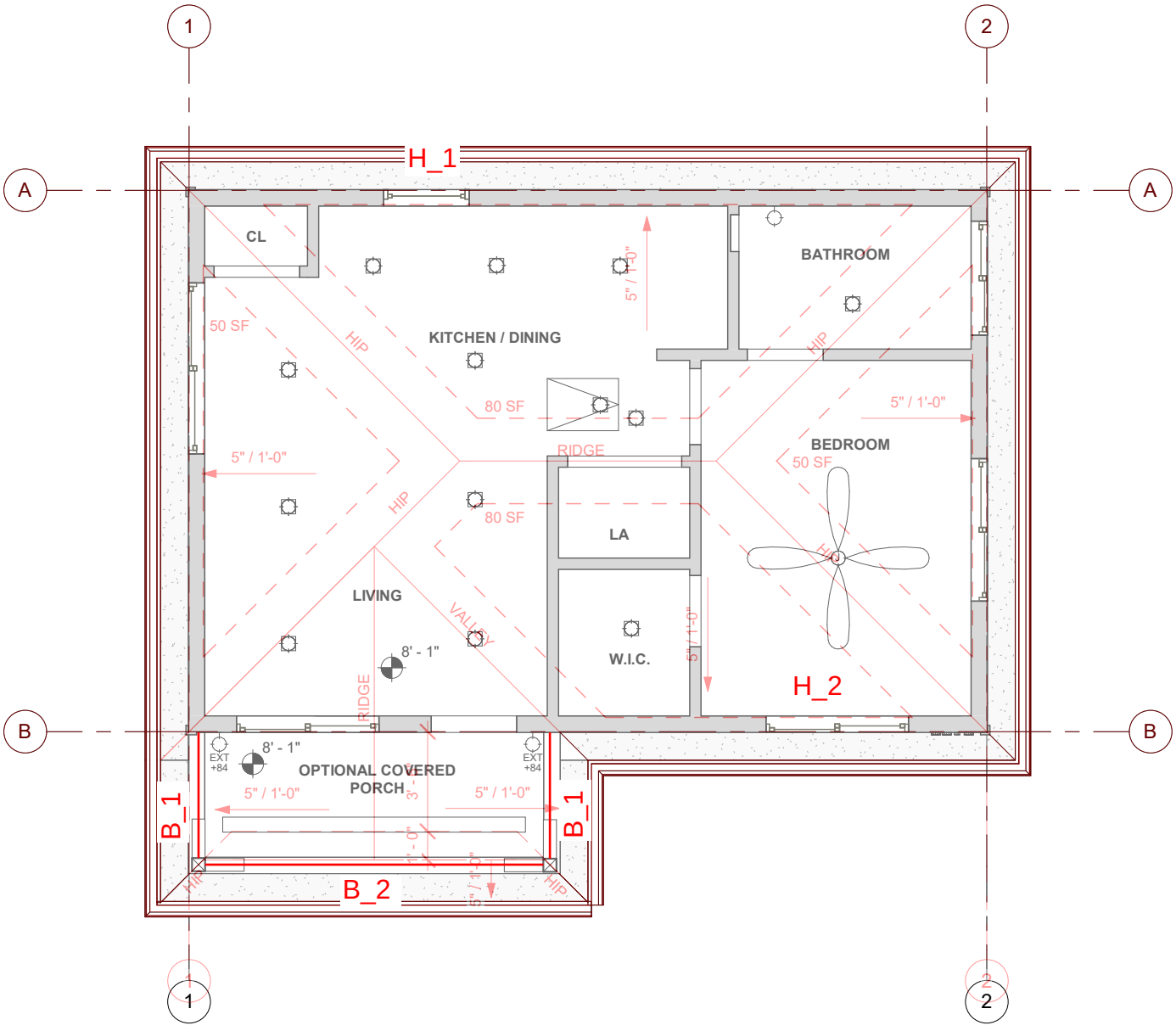
Overhang Pressures, 1.0W: $P_w = q_h(GC_P \pm GC_{pi})$

Zone	A ≤ 2 ft^2	A ≤ 10 ft^2	A ≤ 100 ft^2	A ≤ 500 ft^2
1	-36.3	-36.3	-34.7	-33.0
2e	-36.3	-36.3	-34.7	-33.0
2n	-53.0	-53.0	-42.2	-39.7
2r	-53.0	-53.0	-42.2	-39.7
3e	-63.0	-63.0	-43.0	-43.0
3r	-81.4	-63.0	-43.0	-43.0

Wall Pressures, 1.0W: $P_w = q_h(GC_P \pm GC_{pi})$

Zone	A ≤ 10 ft^2	A ≤ 100 ft^2	A ≤ 500 ft^2
4	-21.3	-18.5	-16.3
5	-26.3	-20.5	-16.3
Positive	19.7	16.3	16.0

PLAN - 2 CALIFORNIA RANCH GRAVITY MAP



1 ROOF PLAN - CAL RANCH

A2-121 SCALE: 1/4" = 1'-0"

RRM Design Group
3765 S. Higuera Street
Suite 102
San Luis Obispo, CA 93405
805-597-5287

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch H_1

IBC 2021 is the model code for CBC 2022.
Enercalc does not have CBC 2022.

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

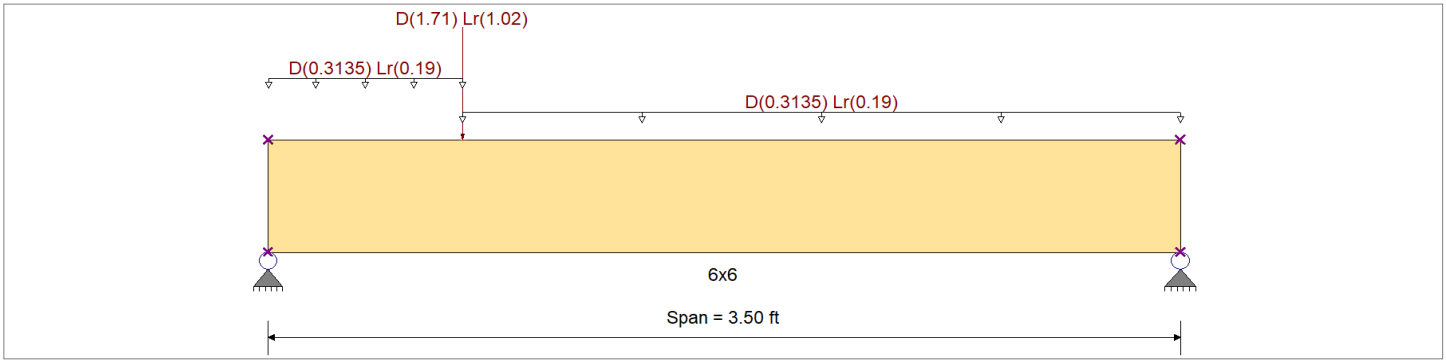
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination	IBC 2021
Wood Species :	Douglas Fir-Larch
Wood Grade :	No.1
Beam Bracing :	Completely Unbraced

Fb +	1200 psi
Fb -	1200 psi
Fc - Prll	1000 psi
Fc - Perp	625 psi
Fv	170 psi
Ft	825 psi

E : Modulus of Elasticity

Ebend- xx	1600 ksi
Eminbend - xx	580 ksi
Density	31.21 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Point Load : D = 1.710, Lr = 1.020 k @ 0.750 ft, (Girder Truss)
Uniform Load : D = 0.0330, Lr = 0.020 ksf, Extent = 0.750 -->> 3.50 ft, Tributary Width = 9.50 ft, (RT)
Uniform Load : D = 0.0330, Lr = 0.020 ksf, Extent = 0.0 -->> 0.750 ft, Tributary Width = 9.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.616 : 1	Maximum Shear Stress Ratio	=	0.656 : 1
Section used for this span		6x6	Section used for this span		6x6
fb: Actual	=	923.71 psi	fv: Actual	=	139.32 psi
F'b	=	1,500.00 psi	F'v	=	212.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	0.754 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.013 in	Ratio =	3177 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.035 in	Ratio =	1185 >=180	Span: 1 : +D+Lr
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.536	0.571	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.34	578.8	1,080.0	1.76	87.3	153.0
+D+Lr					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.616	0.656	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.13	923.7	1,500.0	2.81	139.3	212.5
+D+0.750Lr					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.558	0.594	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.94	837.5	1,500.0	2.55	126.3	212.5
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.181	0.193	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.80	347.3	1,920.0	1.06	52.4	272.0

RRM Design Group
3765 S. Higuera Street
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San Luis Obispo, CA 93405
805-597-5287

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch H_1

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0354	1.622		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	3.038	1.478
Max Upward from Load Combinations	3.038	1.478
Max Upward from Load Cases	1.904	0.927
D Only	1.904	0.927
+D+Lr	3.038	1.478
+D+0.750Lr	2.754	1.340
+0.60D	1.142	0.556
Lr Only	1.134	0.551

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Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch H_2

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2021

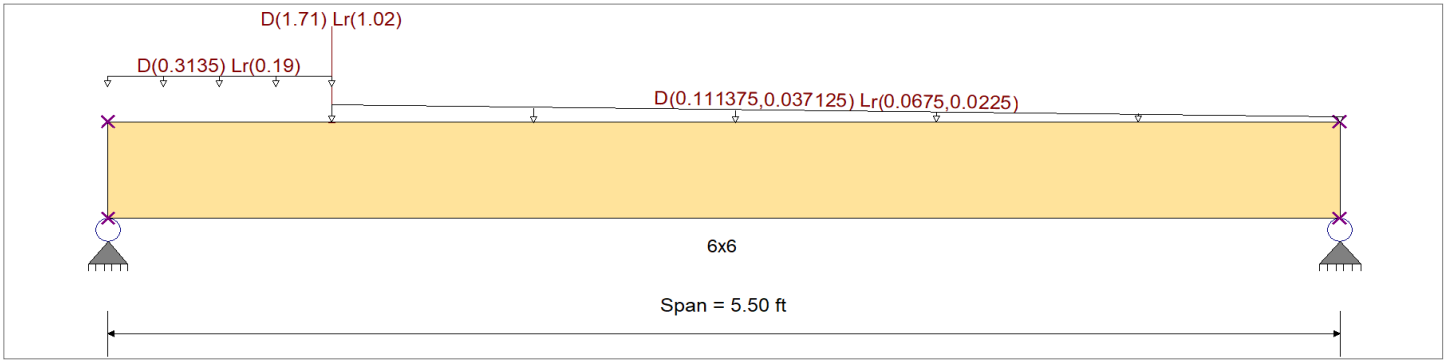
Wood Species : Douglas Fir-Larch
Wood Grade : No.1

Beam Bracing : Completely Unbraced

Fb +	1,200.0 psi
Fb -	1,200.0 psi
Fc - Prll	1,000.0 psi
Fc - Perp	625.0 psi
Fv	170.0 psi
Ft	825.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	31.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Point Load : D = 1.710, Lr = 1.020 k @ 1.0 ft, (Girder Truss)
Varying Uniform Load : D= 0.0330->0.0330, Lr= 0.020->0.020 ksf, Extent = 1.0 -->> 5.50 ft, Trib Width = 3.375->1.125 ft, (JT)

Uniform Load : D = 0.0330, Lr = 0.020 ksf, Extent = 0.0 -->> 1.0 ft, Tributary Width = 9.50 ft, (RT)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.782 : 1	Maximum Shear Stress Ratio	=	0.639 : 1
Section used for this span		6x6	Section used for this span		6x6
fb: Actual	=	1,172.55 psi	fv: Actual	=	135.88 psi
F'b	=	1,500.00 psi	F'v	=	212.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	1.004 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.037 in	Ratio =	1790 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.099 in	Ratio =	663 >=180	Span: 1 : +D+Lr
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 5.50 ft	1	0.682	0.558	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.70	736.1	1,080.0	1.72	85.3	153.0
+D+Lr					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 5.50 ft	1	0.782	0.639	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.71	1,172.5	1,500.0	2.74	135.9	212.5
+D+0.750Lr					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 5.50 ft	1	0.709	0.580	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.46	1,063.4	1,500.0	2.49	123.2	212.5
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 5.50 ft	1	0.230	0.188	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.02	441.7	1,920.0	1.03	51.2	272.0

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Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch H_2

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0995	2.469		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.966	0.841
Max Upward from Load Combinations	2.966	0.841
Max Upward from Load Cases	1.862	0.532
D Only	1.862	0.532
+D+Lr	2.966	0.841
+D+0.750Lr	2.690	0.764
+0.60D	1.117	0.319
Lr Only	1.104	0.309

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Project Title:
Engineer:
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Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

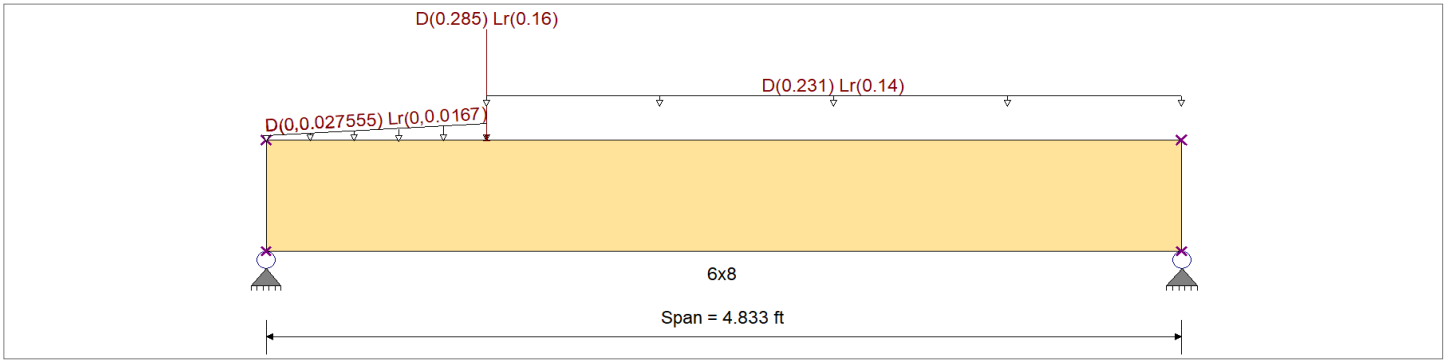
DESCRIPTION: California Ranch B_1

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	1,200.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	1,200.0 psi	Ebend- xx	1,600.0 ksi
		Fc - Prll	1,000.0 psi	Eminbend - xx	580.0 ksi
Wood Species :	Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade :	No.1	Fv	170.0 psi		
		Ft	825.0 psi	Density	31.210 pcf
Beam Bracing :	Completely Unbraced				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Varying Uniform Load : D= 0.0330->0.0330, Lr= 0.020->0.020 ksf, Extent = 0.0 -->> 1.167 ft, Trib Width = 0.0->0.8350 ft, (Jack Truss)
Point Load : D = 0.2850, Lr = 0.160 k @ 1.167 ft, (GT)
Uniform Load : D = 0.0330, Lr = 0.020 ksf, Extent = 1.167 -->> 4.833 ft, Tributary Width = 7.0 ft, (RT)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.196 : 1	Maximum Shear Stress Ratio	=	0.151 : 1
Section used for this span		6x8	Section used for this span		6x8
fb: Actual	=	292.62 psi	fv: Actual	=	32.14 psi
F'b	=	1,495.03 psi	F'v	=	212.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	2.258 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.006 in	Ratio =	9192	>=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.017 in	Ratio =	3359	>=180	Span: 1 : +D+Lr
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 4.833 ft	1	0.172	0.134	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.80	185.6	1,077.5	0.56	20.5	153.0
+D+Lr					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.833 ft	1	0.196	0.151	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.26	292.6	1,495.0	0.88	32.1	212.5
+D+0.750Lr					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.833 ft	1	0.178	0.138	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.14	265.9	1,495.0	0.80	29.2	212.5
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

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Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch B_1

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
Length = 4.833 ft	**1**	0.058	0.045	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.48	111.4	1,911.7	0.34	12.3	272.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0173	2.399		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.897	0.977
Max Upward from Load Combinations	0.897	0.977
Max Upward from Load Cases	0.572	0.619
D Only	0.572	0.619
+D+Lr	0.897	0.977
+D+0.750Lr	0.816	0.888
+0.60D	0.343	0.371
Lr Only	0.324	0.359

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Project Title:
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Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch B_2

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

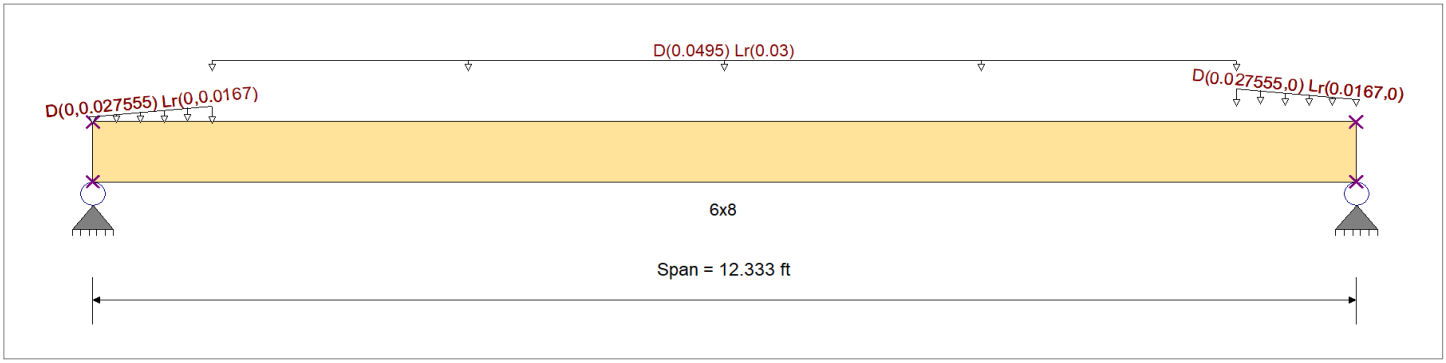
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination	IBC 2021
Wood Species :	Douglas Fir-Larch
Wood Grade :	No.1
Beam Bracing :	Completely Unbraced

Fb +	1,200.0 psi
Fb -	1,200.0 psi
Fc - Prll	1,000.0 psi
Fc - Perp	625.0 psi
Fv	170.0 psi
Ft	825.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	31.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Varying Uniform Load : D= 0.0330->0.0330, Lr= 0.020->0.020 ksf, Extent = 0.0 -->> 1.167 ft, Trib Width = 0.0->0.8350 ft, (Jack Truss To Hip)
Varying Uniform Load : D= 0.0330->0.0330, Lr= 0.020->0.020 ksf, Extent = 11.167 -->> 12.333 ft, Trib Width = 0.8350->0.0 ft, (Jack Truss To Hip)
Uniform Load : D = 0.0330, Lr = 0.020 ksf, Extent = 1.167 -->> 11.167 ft, Tributary Width = 1.50 ft, (JT)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.258 : 1	Maximum Shear Stress Ratio	=	0.080 : 1
Section used for this span		6x8	Section used for this span		6x8
fb: Actual	=	383.42 psi	fv: Actual	=	16.97 psi
F'b	=	1,487.46 psi	F'v	=	212.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	6.167 ft	Location of maximum on span	=	11.748 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.049 in	Ratio =	2995 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.146 in	Ratio =	1013 >=180	Span: 1 : +D+Lr
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 12.333 ft	1	0.236	0.074	0.90	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.09	253.7	1,073.8	0.31	11.3	153.0
+D+Lr					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.333 ft	1	0.258	0.080	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.65	383.4	1,487.5	0.47	17.0	212.5
+D+0.750Lr					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.333 ft	1	0.236	0.073	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.51	351.0	1,487.5	0.43	15.5	212.5

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Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: California Ranch B_2

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+0.60D					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.333 ft	1	0.080	0.025	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	0.65	152.2	1,898.6	0.19	6.8	272.0

Overall Maximum Deflections

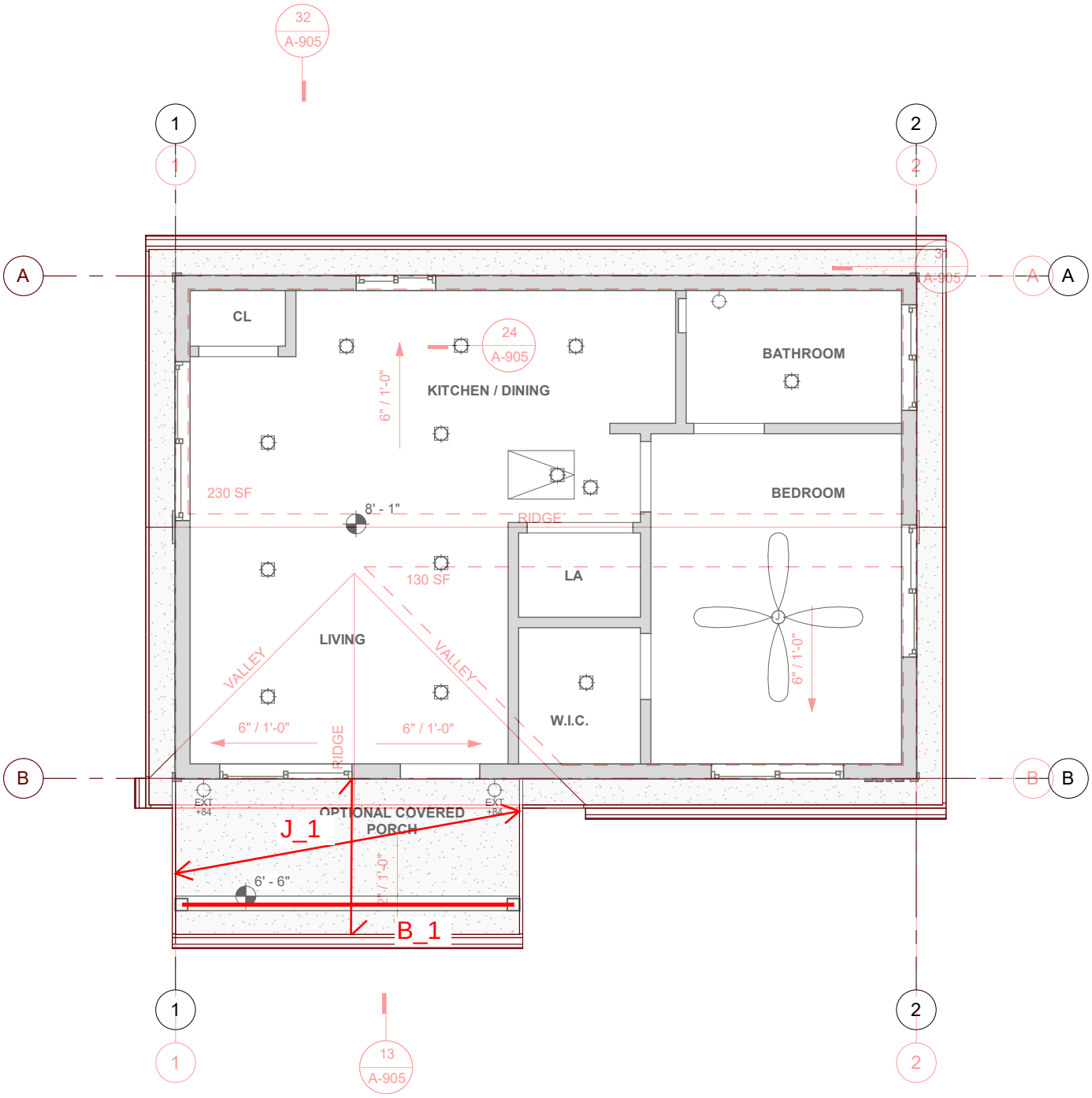
Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.1461	6.212		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.478	0.478
Max Upward from Load Combinations	0.478	0.478
Max Upward from Load Cases	0.319	0.319
D Only	0.319	0.319
+D+Lr	0.478	0.478
+D+0.750Lr	0.438	0.439
+0.60D	0.191	0.191
Lr Only	0.160	0.160

PLAN - 2 MODERN FARMHOUSE GRAVITY MAP



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Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

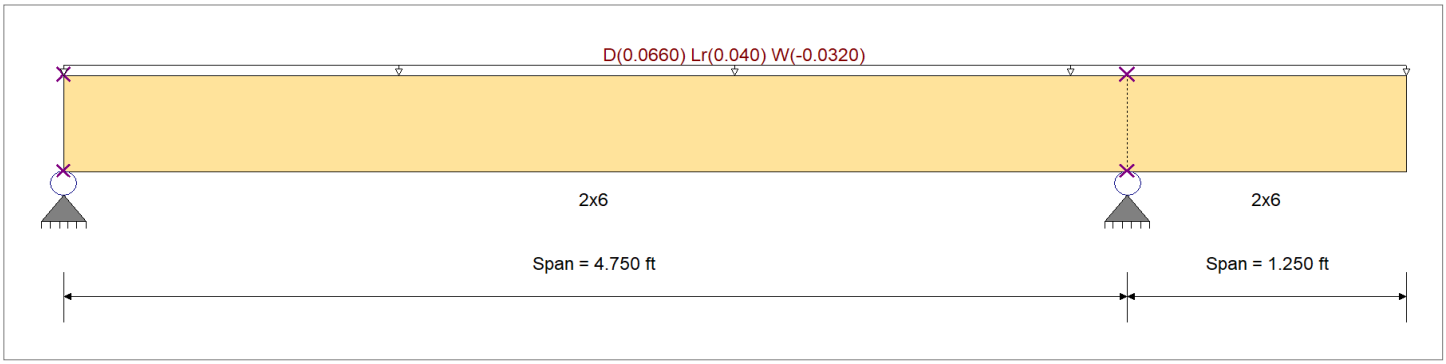
DESCRIPTION: Modern Farm J_1

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	900.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	900.0 psi	Ebend- xx	1,600.0 ksi
		Fc - Prll	1,350.0 psi	Eminbend - xx	580.0 ksi
Wood Species :	Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade :	No.2	Fv	180.0 psi		
		Ft	575.0 psi	Density	31.210 pcf
Beam Bracing :	Completely Unbraced			Repetitive Member Stress Increase	



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Loads on all spans...
Uniform Load on ALL spans : D = 0.0330, Lr = 0.020, W = -0.0160 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.267 : 1	Maximum Shear Stress Ratio	=	0.182 : 1
Section used for this span		2x6	Section used for this span		2x6
fb: Actual	=	417.87 psi	fv: Actual	=	40.93 psi
F'b	=	1,564.07 psi	F'v	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	2.203 ft	Location of maximum on span	=	4.299 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.006 in	Ratio =	4836 >=360	Span: 2 : W Only
Max Upward Transient Deflection	-0.008 in	Ratio =	3870 >=360	Span: 2 : Lr Only
Max Downward Total Deflection	0.031 in	Ratio =	1824 >=180	Span: 1 : +D+Lr
Max Upward Total Deflection	-0.021 in	Ratio =	1436 >=180	Span: 2 : +D+Lr

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.226	0.159	0.90	1.00	1.00	0.96	1.300	1.00	1.00	1.15	0.17	262.8	1,163.9	0.14	25.7	162.0
Length = 1.250 ft	2	0.070	0.159	0.90	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.05	84.0	1,201.9	0.05	25.7	162.0
+D+Lr					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.267	0.182	1.25	1.00	1.00	0.93	1.300	1.00	1.00	1.15	0.26	417.9	1,564.1	0.23	40.9	225.0
Length = 1.250 ft	2	0.080	0.182	1.25	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.08	133.6	1,663.6	0.09	40.9	225.0
+D+0.750Lr					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.242	0.165	1.25	1.00	1.00	0.93	1.300	1.00	1.00	1.15	0.24	379.1	1,564.1	0.20	37.1	225.0
Length = 1.250 ft	2	0.073	0.165	1.25	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.08	121.2	1,663.6	0.08	37.1	225.0

RRM Design Group
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Project Title:
Engineer:
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Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: Modern Farm J_1

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.60W					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.099	0.064	1.60	1.00	1.00	0.88	1.300	1.00	1.00	1.15	0.12	188.4	1,897.4	0.10	18.4	288.0
Length = 1.250 ft	2	0.028	0.064	1.60	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.04	60.2	2,121.1	0.04	18.4	288.0
+D+0.750Lr+0.450W					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.170	0.110	1.60	1.00	1.00	0.88	1.300	1.00	1.00	1.15	0.20	323.3	1,897.4	0.17	31.7	288.0
Length = 1.250 ft	2	0.049	0.110	1.60	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.07	103.4	2,121.1	0.07	31.7	288.0
+D+0.450W					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.109	0.070	1.60	1.00	1.00	0.88	1.300	1.00	1.00	1.15	0.13	207.0	1,897.4	0.11	20.3	288.0
Length = 1.250 ft	2	0.031	0.070	1.60	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.04	66.2	2,121.1	0.04	20.3	288.0
+0.60D+0.60W					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.044	0.028	1.60	1.00	1.00	0.88	1.300	1.00	1.00	1.15	0.05	83.2	1,897.4	0.04	8.2	288.0
Length = 1.250 ft	2	0.013	0.028	1.60	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.02	26.6	2,121.1	0.02	8.2	288.0
+0.60D					1.00	1.00	0.99	1.300	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 4.750 ft	1	0.083	0.054	1.60	1.00	1.00	0.88	1.300	1.00	1.00	1.15	0.10	157.7	1,897.4	0.08	15.4	288.0
Length = 1.250 ft	2	0.024	0.054	1.60	1.00	1.00	0.99	1.300	1.00	1.00	1.15	0.03	50.4	2,121.1	0.03	15.4	288.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0312	2.335		0.0000	0.000
	2	0.0000	2.335	+D+Lr	-0.0209	1.250

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	0.238	0.408	
Max Upward from Load Combinations	0.238	0.408	
Max Upward from Load Cases	0.150	0.257	
Max Downward from all Load Conditio	-0.071	-0.121	
Max Downward from Load Cases (Resis	-0.071	-0.121	
D Only	0.150	0.257	
+D+Lr	0.238	0.408	
+D+0.750Lr	0.216	0.371	
+D+0.60W	0.107	0.184	
+D+0.750Lr+0.450W	0.184	0.316	
+D+0.450W	0.118	0.202	
+0.60D+0.60W	0.047	0.081	
+0.60D	0.090	0.154	
Lr Only	0.088	0.152	
W Only	-0.071	-0.121	

RRM Design Group
3765 S. Higuera Street
Suite 102
San Luis Obispo, CA 93405
805-597-5287

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: Modern Farm B_1

CODE REFERENCES

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2021

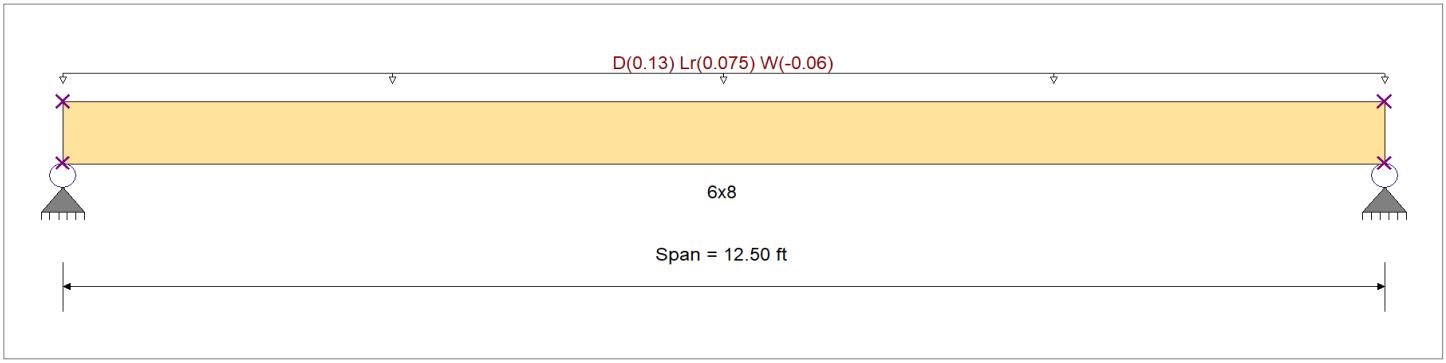
Wood Species : Douglas Fir-Larch
Wood Grade : No.1

Beam Bracing : Completely Unbraced

Fb +	1,200.0 psi
Fb -	1,200.0 psi
Fc - Prll	1,000.0 psi
Fc - Perp	625.0 psi
Fv	170.0 psi
Ft	825.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	31.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.130, Lr = 0.0750, W = -0.060 , Tributary Width = 1.0 ft, (J_1)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.654 : 1	Maximum Shear Stress Ratio	=	0.207 : 1
Section used for this span		6x8	Section used for this span		6x8
fb: Actual	=	972.46 psi	fv: Actual	=	44.01 psi
F'b	=	1,487.26 psi	F'v	=	212.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	6.250 ft	Location of maximum on span	=	11.907 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.134 in	Ratio =	1119 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	-0.107 in	Ratio =	1399 >=360	Span: 1 : W Only
Max Downward Total Deflection	0.382 in	Ratio =	392 >=180	Span: 1 : +D+Lr
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.588	0.187	0.90	1.00	1.00	0.99	1.000	1.00	1.00	1.00	2.71	631.5	1,073.7	0.79	28.6	153.0
+D+Lr					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.654	0.207	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.18	972.5	1,487.3	1.21	44.0	212.5
+D+0.750Lr					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.597	0.189	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.81	887.2	1,487.3	1.10	40.2	212.5
+D+0.60W					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.246	0.078	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	2.01	467.9	1,898.2	0.58	21.2	272.0
+D+0.750Lr+0.450W					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.403	0.127	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.28	764.5	1,898.2	0.95	34.6	272.0

RRM Design Group
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805-597-5287

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 2889-01 Laguna Niguel ADUs.ec6

DESCRIPTION: Modern Farm B_1

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.450W					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	**1**	0.268	0.085	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	2.19	508.8	1,898.2	0.63	23.0	272.0
+0.60D+0.60W					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	**1**	0.113	0.036	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	0.93	215.3	1,898.2	0.27	9.7	272.0
+0.60D					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.50 ft	**1**	0.200	0.063	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.63	378.9	1,898.2	0.47	17.1	272.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.3821	6.296		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.337	1.337
Max Upward from Load Combinations	1.337	1.337
Max Upward from Load Cases	0.868	0.868
Max Downward from all Load Conditio	-0.375	-0.375
Max Downward from Load Cases (Resis	-0.375	-0.375
D Only	0.868	0.868
+D+Lr	1.337	1.337
+D+0.750Lr	1.220	1.220
+D+0.60W	0.643	0.643
+D+0.750Lr+0.450W	1.051	1.051
+D+0.450W	0.700	0.700
+0.60D+0.60W	0.296	0.296
+0.60D	0.521	0.521
Lr Only	0.469	0.469
W Only	-0.375	-0.375

SHEET NO.:
PROJECT NO.: 2889-01-C022
DATE: 12/2024
PROJECT: LAGUNA NIGUEL ADUs
BY: IPK
SUBJECT: EXTERIOR STUD WALL DESIGN
CHECKED BY: JMM

Stud Location: Gridline A

Input:

Lumber Grade:	DF No. 2	
Stud Spacing:	16	in
Stud Height:	8.083	ft
C_D for Lateral Pressure:	1.6	
C_D for Gravity Loads:	1.25	
Wind Pressure (W):	26.3	psf
Dead Load (D):	435.3	plf
Roof Live Load (L_r):	210	plf
Live Load (L):	0	plf
Total Stud Load:	645.3	plf

Assumptions:

L_{eyy} = 0
Lexx = Stud Height
F_c(Perp.) = 625 psi
C_m = C_t = 1.0
Basic Load Combinations

Wall Finish:	Stucco
Footnote m Fire-Rated, CBC T721.1(2):	No

Lumber Stresses:

F_c =	1,350	psi
F_b =	900	psi
E =	1,600,000	psi
E_{min} =	580,000	psi

Stud Design:

Stud Size: 2x6

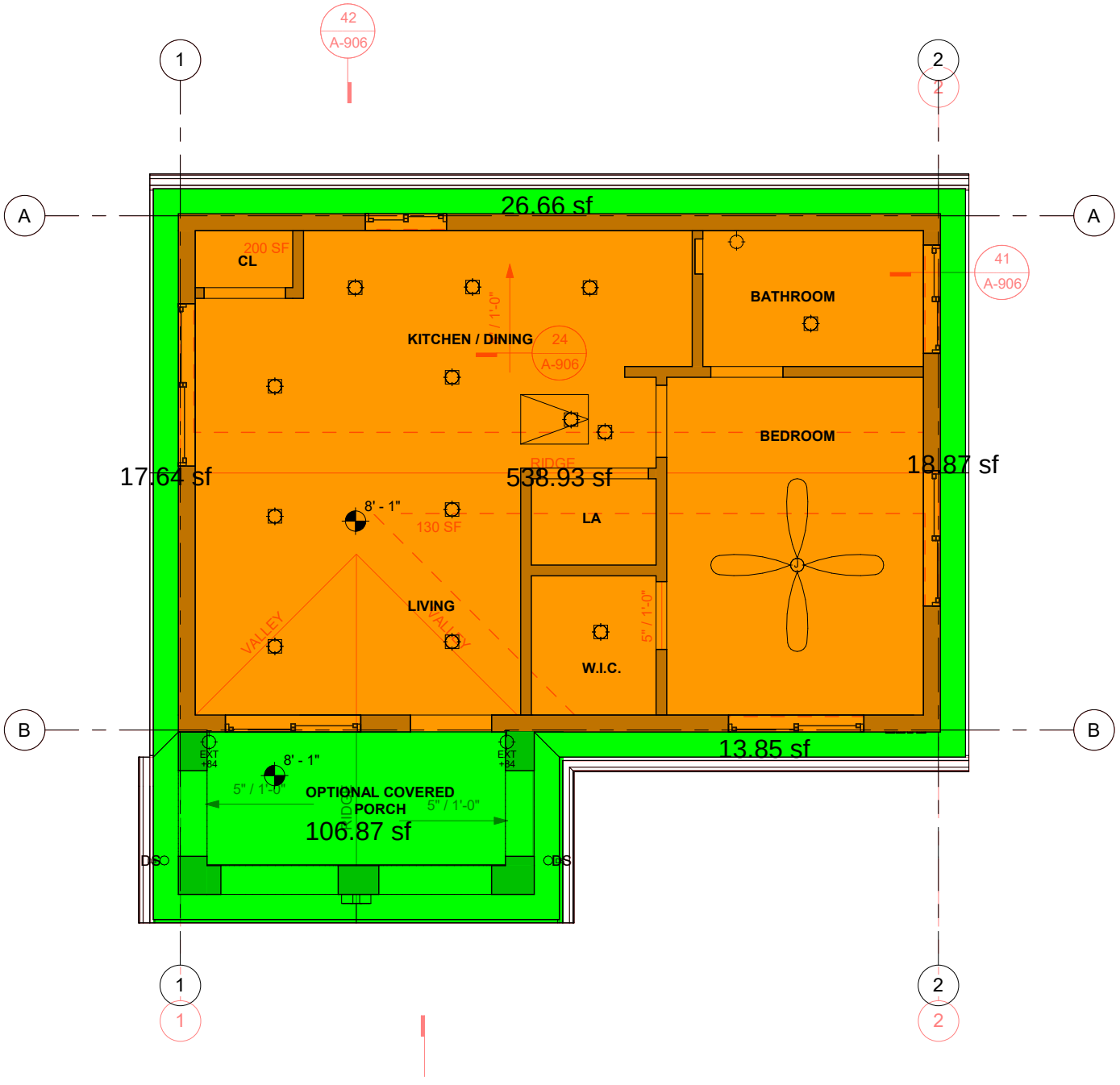
A= 8.25 in^2
I= 20.80 in^4
S= 7.56 in^3
C_r= 1.15

	D+L or D+L_r: (Eq. 16-9, 10)	D+0.75L+0.75L_r: (Eq. 16-11)	D+0.75L+0.45W+0.75L_r : (Eq. 16-13)	D+0.6W: (Eq.16-12)
P_{total} =	860.4 lbs.	790.4 lbs.	790.4 lbs.	580.4 lbs.
f_c =	104.3 psi	95.8 psi	95.8 psi	70.4 psi
F'$_c$ =	1108.7 psi	1108.7 psi	1218.2 psi	1218.2 psi
Axial Stress Ratio:	0.09	0.09	0.08	0.06
Sill Plate Crushing:	**Adequate**	**Adequate**	**Adequate**	**Adequate**
M=	N/A	N/A	128.87 lb-ft	171.83 lb-ft
f_b =	N/A	N/A	204.5 psi	272.7 psi
F'$_b$=	N/A	N/A	1656 psi	1656 psi
Bending Stress Ratio:	N/A	N/A	0.12	0.16
Combined Stress Check:	N/A	N/A	0.14	0.18
Stud Design:	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Stud Deflection[1]:	0.04 in.			
Deflection Ratio:	h/2425	**Adequate**		

Notes:

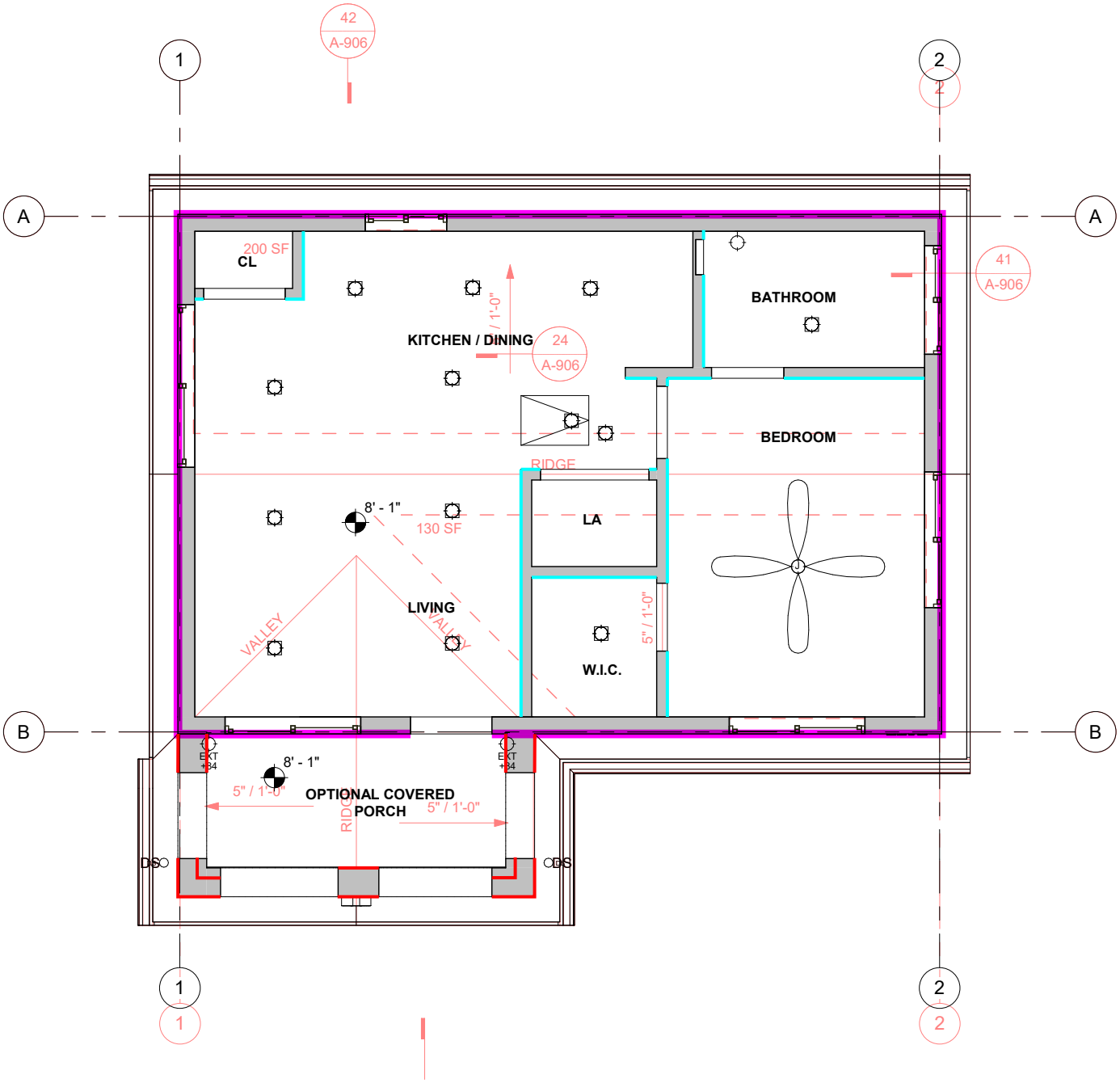
1. For Stud Deflection, use 0.42 times the Wind Pressure (W) per footnote f of Table 1604.3

PLAN 2 - MASSING



Description	Quantity	Unit
R1	538.93	sf
R2	183.89	sf

PLAN 2 - MASSING



Legend

Description	Quantity	Unit
W3	17.9462	ft
W2	37.2861	ft
W1	91.5948	ft

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: BUILDING MASS

BUILDING MASS
FLOOR AND WALL MASS SUMMARY
BUILDING: Plan 2

Floor ID	Floor	Plate Elev. (ft)	Floor Elev. (ft)	Height Below (ft)	Height Above (ft)
R	Roof (Mean)	8.1	10.3	10.3	0.0
1	Ground	0.0	0.0	0.0	10.3

Floor Type	Weight (psf)	Description
R1	27	Clay Tile Over Trusses w/ Gyp Ceiling & PV Panels
R2	33	Clay Tile Over Trusses w/ Stucco Ceiling

Wall Type	Weight (psf)	Description
W06ES	18	Plaster/Stucco Exterior Wall (2x6)
W04IP	8	Non-Bearing Partition Wall (2x4)
W04ES	17	Plaster/Stucco Exterior Wall (2x4)

FLOOR: ***Roof***

Floors		Dimensions				Weight and Mass Info			Center of Mass			
Area Label	Floor Type	Area (sf)	Wall Length (ft)	Wall Trib. Below (ft)	Wall Trib. Above (ft)	Weight (psf)	Weight (lbs)	Mass (lbm/ft/s^2)	x_{cm} (ft)	y_{cm} (ft)	$W*x_{cm}$ (lb*ft)	$W*y_{cm}$ (lb*ft)
RF1	R1	539				27	14,553	452.0			0	0
RF2	R2	184				33	6,072	188.6			0	0
Walls Above												
Walls Below												
WB1	W06ES		92.0	5.17	0	18	8,354	259.5			0	0
WB2	W04ES		18.0	5.17	0	17	1,581	49.1			0	0
WB3	W04IP		38.0	5.17	0	8	1,600	49.7			0	0
		723				Totals =	32,160	999	0.0	0.0	0	0

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: SEISMIC BASE SHEAR

SEISMIC BASE SHEAR
EQUIVALENT LATERAL FORCE PROCEDURE
ASCE 7-16 SECTION 12.8 (As ammeded by 2022 CBC)
BUILDING: Plan 2

CODE SEISMIC GROUND MOTION VALUES

Parameter	Value	Description	Eqn	Code/Standard Reference
Site class =	D (DF)			C 1613.2.2
ELFP? =	YES	Structure is designed with ELFP per A 12.8.		
Regular Structure? =	NO	Structure DOES NOT meet the requirements of A 12.8.1.3.		A 12.8.1.3
Haz Anlys Provided?	NO	Site Specific Ground Motion Analysis Requirements		
Haz Anlys Reqd?	YES	Hazard Analysis required but not provided, adjust seismic parameters per		A 11.4.8
S_S =	1.375 g	Mapped spec acc for short periods (see below for max value cap)		C 1613.2.1
S_1 =	0.5 g	Mapped spec acc for T = 1 sec		C 1613.2.1
F_a =	1.200	Site Coefficient		C Table 1613.2.3(1)
F_v =	1.800	Site Coefficient		C Table 1613.2.3(2)
S_{MS} =	1.650 g	MCE, 5% damped, spec resp acc parameter at short periods adjusted for site effects	$S_{MS} = F_a S_S$	C 1613.2.3 (Eqn 16-36)
S_{M1} =	0.9 g	MCE, 5% damped, spec resp acc parameter at 1 sec period adjusted for site effects	$S_{M1} = F_v S_1$	C 1613.2.3 (Eqn 16-37)
$S_{DS} = 2/3\ S_{MS}$ =	1.100 g	Design, 5% damped, spectral response acceleration parameter at short periods	$S_{DS} = 2/3\ S_{MS}$	C 1613.3.4 (Eqn 16-38)
$S_{D1} = 2/3\ S_{M1}$ =	0.6 g	Design, 5% damped, spectral response acceleration parameter at 1 sec period	$S_{D1} = 2/3\ S_{M1}$	C 1613.3.4 (Eqn 16-39)

GOVERNING SEISMIC GROUND MOTION VALUES

S_{DS} = 1.100 g
S_{D1} = 0.6 g

BUILDING PARAMETERS

Risk Category =	I or II			C 1604.5
I =	1.00	Importance Factor		A Table 1.5-2
SDC =	D	Seismic design category		C 1613.2.5
LFRS =	15. Light Frame (wood) walls sheathed with wood structural panels rated for shear resistance			A Table 12.2-1
R =	6.5	Response Modification Coefficient		A Table 12.2-1
Ω_O =	3	System Overstrength Factor		A Table 12.2-1
C_d =	4	Deflection Amplification Factor		A Table 12.2-1

PERIOD LIMITS

T_a =	0.096 s	Approximate Fundamental Period	$T_a = C_t\ h_n^x$ =	A 12.8.2.1 (Eqn 12.8-7)
Structure Type =	All other structural systems			A Table 12.8-2
C_t =	0.02	Approximate Period Parameter		A Table 12.8-2
x =	0.75	Approximate Period Parameter		A Table 12.8-2
h_n =	8.1 ft	height above base		See plans
T_{MAX} =	0.134 s	Maximum period Limit	$T_{MAX} = C_u\ T_a$ =	A 12.8.2
C_u =	1.4	Coefficient for Upper Limit on Calculated Period		A Table 12.8-1
T_L =	8 s	Long period transition		A Fig. 22-14 (seismic map)
T_S =	0.545 s			

	X-Dir	Y-Dir		
T =	0.0959	0.0959	Analysis Derived Fundamental Period	A 12.8.2
T =	0.0959	0.0959	Governing Fundamental Period	A 12.8.2

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: SEISMIC BASE SHEAR

SEISMIC BASE SHEAR
EQUIVALENT LATERAL FORCE PROCEDURE
ASCE 7-16 SECTION 12.8 (As ammeded by 2022 CBC)
BUILDING: Plan 2

BASE SHEAR

	X-Dir	Y-Dir			
C_s =	**0.169**	**0.169**	Base Shear Coefficient	$C_s = S_{DS} I / R$	A 12.8.1.1 (Eqn 12.8-2)
C_{sMAX} =	**0.963**	**0.963**	Max Base Shear Coefficient for $T \le T_L$	$C_{sMAX} = S_{D1} I / (T R)$	A 12.8.1.1 (Eqn 12.8-3)
C_{sMAX} =	**-**	**-**	Max Base Shear Coefficient for $T \ge T_L$	$C_{sMAX} = S_{D1} T_L I / (T^2 R)$	A 12.8.1.1 (Eqn 12.8-4)
C_{sMIN} =	**0.048**	**0.048**	Min Base Shear Coefficient	$C_{sMIN} = 0.044 S_{DS} I \ge 0.01$	A 12.8.1.1 (Eqn 12.8-5)
$C_{sMIN\ 2}$ =	**-**	**-**	Min Base Shear Coefficient for $S_1 \ge 0.6$	$C_{sMIN\ 2} = 0.5 S_1 I / R$	A 12.8.1.1 (Eqn 12.8-6)
C_s =	**0.169**	**0.169**	Governing Base Shear Coefficient		
V =	**5.4 k**	**5.4 k**	Equivalent lateral force procedure base shear	$V = C_s W$	A 12.8.1 (Eqn 12.8-1)
	0.12088	0.12088			

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: VERTICAL DISTRIBUTION OF FORCES

SHEET NO.:
PROJECT NO.: 2889-01-CU22
DATE: 12/2024
BY: IPK
CHECKED BY: JMM

VERTICAL DISTRIBUTION OF FORCES
EQUIVALENT LATERAL FORCE PROCEDURE
ASCE 7-16 SECTION 12.8.3
BUILDING: Plan 2

Parameter	Value	Description	Eqn	Code/Standard Reference
F_x =	See Table	Lateral Seismic Force at any level	$F_x = C_{vx}V$	A 12.8.3 (Eqn 12.8-11)
C_{vx} =	See Table	Vertical distribution factor	$C_{vx} = \frac{w_x h_x^k}{\sum_{i=1}^{n} w_i h_i^k}$	A 12.8.3 (Eqn 12.8-12)
k =	1	Exponent related to structural period for structures having period of 0.5s or less		A 12.8.3
Fpx =	See Table		$Fpx = \frac{\sum_{i=x}^{n} F_i}{\sum_{i=x}^{n} w_i} w_{px}$	A 12.10.1.1 (Eqn 12.10-1)

EAST-WEST

C_s = 0.169 Base Shear Coefficient — See Previous Calcs
V = **5.4 k** Equivalent lateral force procedure base shear — See Previous Calcs

Vertical Distribution												Diaphragm Shear					
Level	Area (sf)	W_x (k)	W_{tot} (k)	h_x (ft)	h_x^k (ft)	$W_x h_x^k$ (k-ft)	$C_{vx} = \frac{w_x h_x^k}{\sum_{i=1}^{n} w_i h_i^k}$	F_x (k)	f_x (psf)	F_x / W_x	F_{tot} (k)	Min $0.2S_{DS}I_eW_{px}$ (k) A 12.10.1.1 (Eqn 12.10-1)	$Fpx = \frac{\sum_{i=x}^{n} F_i}{\sum_{i=x}^{n} w_i} w_{px}$ A 12.10.1.1 (Eqn 12.10-1)	Max $0.4S_{DS}I_eW_{px}$ (k) A 12.10.1.1 (Eqn 12.10-1)	F_{px} (k)	f_{px} (psf)	F_{px}/F_x Ratio
Roof	723	32.2	32.2	10.3	10.3	332.3	**1.00**	5.4	**7.5**	0.169	5.4	7.1	5.4	14.2	**7.1**	**9.79**	1.30
Total	**723**	32.2				**332.3**	1.00	5.4	**7.5**	0.169							

NORTH-SOUTH

C_s = 0.169 Base Shear Coefficient — See Previous Calcs
V = **5.4 k** Equivalent lateral force procedure base shear — See Previous Calcs

Vertical Distribution												Diaphragm Shear					
Level	Area (sf)	W_x (k)	W_{tot} (k)	h_x (ft)	h_x^k (ft)	$W_x h_x^k$ (k-ft)	$C_{vx} = \frac{w_x h_x^k}{\sum_{i=1}^{n} w_i h_i^k}$	F_x (k)	f_x (psf)	F_x / W_x	F_{tot} (k)	Min $0.2S_{DS}I_eW_{px}$ (k) A 12.10.1.1 (Eqn 12.10-1)	$Fpx = \frac{\sum_{i=x}^{n} F_i}{\sum_{i=x}^{n} w_i} w_{px}$ A 12.10.1.1 (Eqn 12.10-1)	Max $0.4S_{DS}I_eW_{px}$ (k) A 12.10.1.1 (Eqn 12.10-1)	F_{px} (k)	f_{px} (psf)	F_{px}/F_x Ratio
Roof	723	32.2	32.2	10.3	10.3	332.3	**1.00**	5.4	**7.5**	0.169	5.4	7.1	5.4	14.2	**7.1**	**9.79**	1.30
Total	**723**	32.2				**332.3**	1.00	5.4	**7.5**	0.169							

rrm design group

SHEET NO.:
PROJECT NO.: 2889-01-CU22
DATE: 12/2024
BY: IPK
CHECKED BY: JMM

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: REDUNDANCY

REDUNDANCY

REDUNDANCY FACTOR, SEISMIC DESIGN CATEGORY D-F
ASCE 7-16 SECTION 12.3.4 (Including 12.3.4.2)
BUILDING: Plan 2

Floor	Height Below (ft)
Roof (Mean)	10.33
4th	0.00
3rd	0.00
2nd	0.00
Ground	0.00

ρ_{final} = **1.3**

Light frame construction? **YES**

ROOF

Percent Base Shear = 1.00 Level Resists more than 35% of base shear, p Calc required

EAST-WEST

Wall	Dimen.	Ht/Width	Strength Loss?
Wall grid	b (ft)	h/b ratio	h/b >1, bwall/btotal ratio
Top Side			
R_A.1	8.75	1.18	0.515
Total =	8.8	< 2 bays	
Bot Side			
R_B.1	8.25	1.25	0.485
Total =	8.3	< 2 bays	
Total Both =	17.0		

		Code/Standard Reference
Condition a	NO	A 12.3.4.2 (a)
Condition b	NO	A 12.3.4.2 (b)

ρ = 1.3

NORTH-SOUTH

Wall	Dimen.	Ht/Width	Strength Loss?
Wall grid	b (ft)	h/b ratio	h/b >1, bwall/btotal ratio
Left Side			
R_1.1	9.5	1.09	0.421
Total =	9.5	< 2 bays	
Right Side			
R_2.1	13.083	0.79	NA
Total =	13.1	2 bays	
Total Both =	22.6		

		Code/Standard Reference
Condition a	NO	A 12.3.4.2 (a)
Condition b	NO	A 12.3.4.2 (b)

PROJECT: LAGUNA NIGUEL ADUs
SUBJECT: WIND BASE SHEAR CALCULATION

SHEET NO.:
PROJECT NO.: 2889-01-CU22
DATE: 12/2024
BY: IPK
CHECKED BY: JMM

WIND BASE SHEAR CALCULATION
ALTERNATE HEIGHTS WIND DESIGN METHOD
ASCE 7-16 CH. 26/27 AND 2022 CBC SECTION 1609
BUILDING: Plan 2

Parameter	Value		Description	Eqn	Code/Standard Reference
Building =	Plan 2				
Risk Category =	I or II				C 1604.5
Enclosure =	Enclosed				A 26.12
Exp. Category =	C		Exposure Category		C 1609.4.3
V_{ULT} =	95 mph		Ultimate Wind Speed		C Fig. 1609.3(1)
V_{ASD} =	74 mph		Nominal (Allowable) Desgin Wind Speed	$V_{asd} = V_{ult}\sqrt{0.6}$	C 1609.3.1 (Eqn 16-33)
z =	10.3 ft		Height above ground level		
h =	10.3 ft	< 75 ft	Mean roof height of building		
$K_{z,windward}$ =	0.85		MWFRS Velocity pressure exposure coefficient, windward or	$K_z = 2.01(15/z_g)^{2/\alpha}$ z < 15 ft	A Tbl 26.10-1
$K_{z,leeward}$ =	0.85		leeward	$K_z = 2.01(z/z_g)^{2/\alpha}$ z > 15 ft	
$K_{zt,windward}$ =	1.00		Topographic factor, windward		A 26.8.2
$K_{zt,leeward}$ =	1.00				
K_d =	0.85		Directionality Factor		A Tbl 26.6-1
K_e =	1.00		Ground Elevation Factor		A Tbl 26.9-1
G =	0.85		Gust Effect Factor		A 26.11
GC_{pi} =	± 0.18		Internal Pressure Coefficient		A 26.13
$q_z = 0.00256K_zK_{zt}K_dK_eV^2$					*A Eqn 26.10-1*
$q_h = 0.00256K_hK_{zt}K_dK_eV^2$					*A Eqn 26.10-1*

MAIN WIND FORCE RESISTING SYSTEM

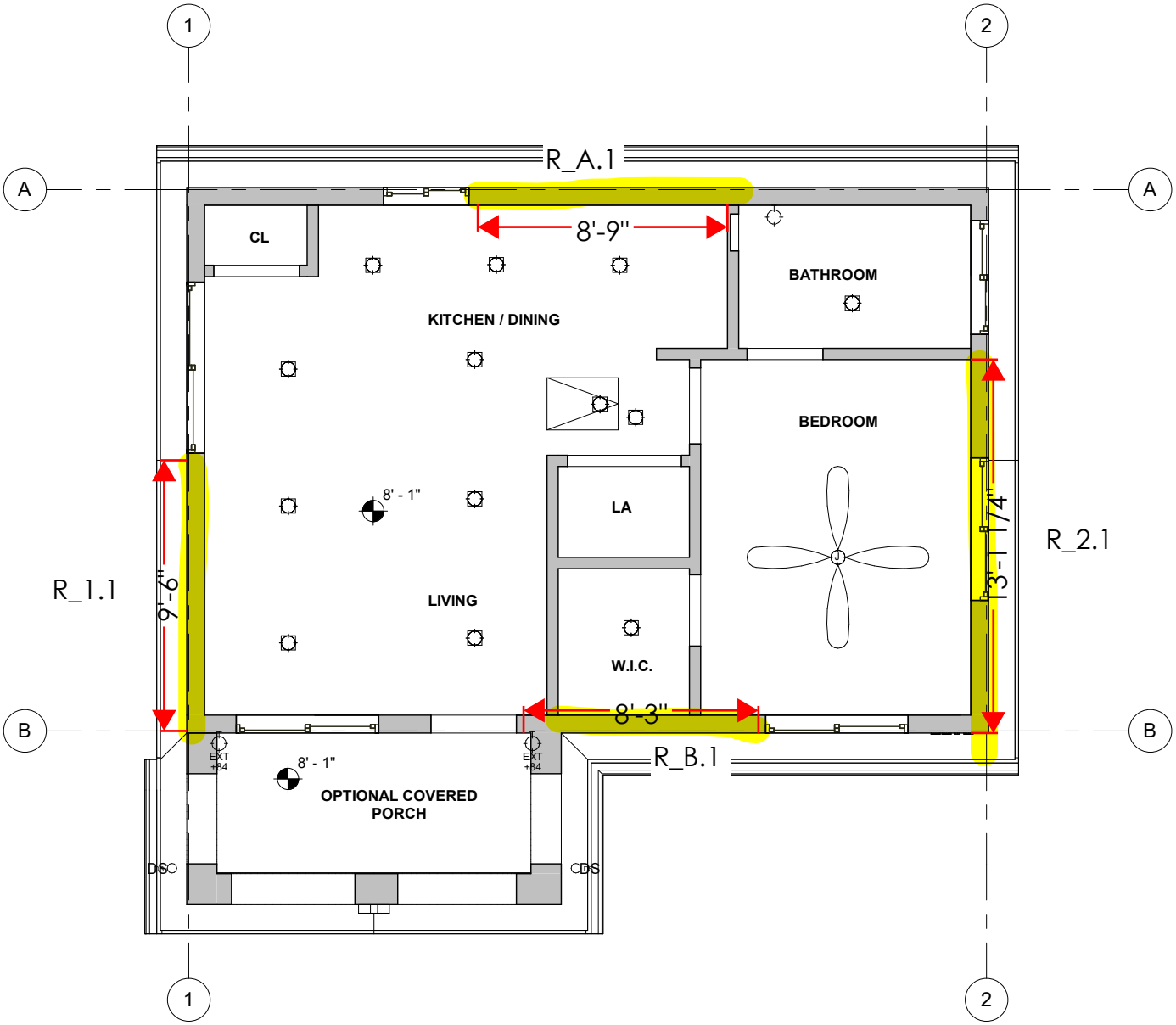
EAST-WEST

						+Internal												-Internal			
						Windward					Leeward					Total			Windward	Leeward	Total	Max
Level	**h_x (ft)**	**Trib Ht. (ft)**	**Slope (deg)**	**Trib Width (ft)**	**Trib Area (ft)**	**K_z windward**	**q_z (psf)**	**C_p windward**	**P_{net} (psf)**	**Fx (kips)**	**K_h leeward**	**q_h (psf)**	**C_p leeward**	**P_{net} (psf)**	**Fx (kips)**	**Fx total (kips)**	**wx (plf)**	**Total P_{net} (psf)**	**C_p windward**	**C_p leeward**	**Total P_{net} (psf)**	**Max P_{net} (psf)**
Roof	10.3 ft	2.21 ft	0	21.00 ft	46	**0.85**	16.67	-0.18	0.45	0.02	**0.85**	16.67	-0.9	-15.75	-0.7	0.8	35.8	14.1	-0.18	-0.9	10.2	14.1
Roof (Bot)	10.3 ft	4.04 ft	0	19.00 ft	77	**0.85**	16.67	0.8	8.34	0.6	**0.85**	16.67	-0.5	-10.09	-0.8	1.4	74.4	25.5	0.8	-0.5	18.4	25.5
Base	0.0 ft	0.00 ft	0	19.00 ft	0	**0.85**	16.67	0.8	8.34	0.0	**0.85**	16.67	-0.5	-10.09	0.0	0.0	0.0	25.5	0.8	-0.5	18.4	0.0
					123											**2.2 k**	**(Seismic Gov'n)**					

NORTH-SOUTH

						+Internal												-Internal			
						Windward					Leeward					Total			Windward	Leeward	Total	Max
Level	**h_x (ft)**	**Trib Ht. (ft)**	**Slope (deg)**	**Trib Width (ft)**	**Trib Area (ft)**	**K_z windward**	**q_z (psf)**	**C_p windward**	**P_{net} (psf)**	**Fx (kips)**	**K_h leeward**	**q_h (psf)**	**C_p leeward**	**P_{net} (psf)**	**Fx (kips)**	**Fx total (kips)**	**wx (plf)**	**Total P_{net} (psf)**	**C_p windward**	**C_p leeward**	**Total P_{net} (psf)**	**Max P_{net} (psf)**
Roof	10.3 ft	2.21 ft	0	30.00 ft	66	**0.85**	16.67	-0.18	0.45	0.03	**0.85**	16.67	-0.9	-15.75	-1.0	1.1	35.8	14.1	-0.18	-0.9	10.2	14.1
Roof (Bot)	10.3 ft	4.04 ft	0	28.00 ft	113	**0.85**	16.67	0.8	8.34	0.9	**0.85**	16.67	-0.5	-10.09	-1.1	2.1	74.4	25.5	0.8	-0.5	18.4	25.5
Base	0.0 ft	0.00 ft	0	28.00 ft	0	**0.85**	16.67	0.8	8.34	0.0	**0.85**	16.67	-0.5	-10.09	0.0	0.0	0.0	25.5	0.8	-0.5	18.4	0.0
					179											**3.2 k**	**(Seismic Gov'n)**					

PLAN - 2 SHEAR WALL MAP



SHEAR WALL DESIGN
SEGMENTED OR FORCE TRANSFER METHOD
Per SDPWS-2021 Table 4.3A

ROOF: EAST-WEST

$f_{p, Roof}$ = 7.53

$w_{p, Roof}$ = 110.3

Diaph Fpx/Fx Ratio = 1.30

ρ = 1.3

Ω₀ = 2.5

Reduce by 0.5 for structures with flexible diaphragms per A Tbl 12.2-1 footnote b.

Flexible Diaphragm? = YES

Grid	Wall	Dimen.				Seismic							Wind							Shear Wall (ASD Level)					
Wall grid line	**Wall**	**b (ft)**	**Open (ft)**	**Final b (ft)**	**North or South Diaph**	**Trib Area (sf)**	$\sum F_{Above}$ **(lb)**	$\sum F_{Above}$ Transf* North **(lb)**	$\sum F_{x\ North}$ **(lb)**	F_{tot_e} **(lb)**	$v_{seis} = \rho F_{tot}/$(Final b) **(plf)**	$v_{seis, asd} = 0.7*\rho F_{tot}/$(Final b) **(plf)**	**Trib Width (ft)**	$\sum F_{Above}$ **(lb)**	$\sum F_{Above}$ Transf* **(lb)**	$\sum F_x$ **(lb)**	F_{tot_w} **(lb)**	$v_{wind} = F_{tot}/$(Final b) **(plf)**	$v_{wind, asd} = 0.6*F_{tot}/$(Final b) **(plf)**	**Wall Height (ft)**	**Factor**	**Wall Type**	**Sheath Sides 1 or 2**	**Allow Shear Capcity S 4.3.3 (plf)**	**Edge Nail Spacing in**
Wall?	**R_A**	9.1		9.1	North	27	0	0	203	2,364	338	237					1,378	152	91						
					South	287		0	2,160				13			1,378									
Wall	R_A.1	9.1		9.1						2,364	2,364						1,378	1,378		8.08	1.00	A	1	266	6
No Wall																									
No Wall																									
No Wall																									
Wall?	**R_B**	8.3		8.3	North	287	0	0	2,160	3,079	485	340	12.5			1,378	1,378	167	100						
					South	122		0	918																
Wall	R_B.1	8.3	0.0	8.3						3,079	3,079						1,378	1,378		8.08	1.00	C	1	443	4
No Wall																									
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Wall?					North		0	0																	
					South			0																	
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Wall?					North		0	0																	
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Wall?					North		0	0																	
					South			0																	
No Wall																									
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No Wall																									
						723	0	0	5,443	10,885			25.0	0.0	0.0	2756.5	5513.0								

DIAPHRAGM DRAG DESIGN

ROOF: EAST-WEST

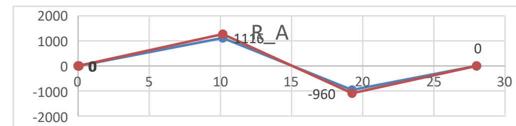
$f_{p,\ Roof}$ = 7.53 Irreg. Exists = YES f = 1.25 Per ASCE 7-16 Section 12.3.3.4 Increase forces by 25% if Type 1a, 1b, 2, 3 or 4 Horiz. Irregularity Exists

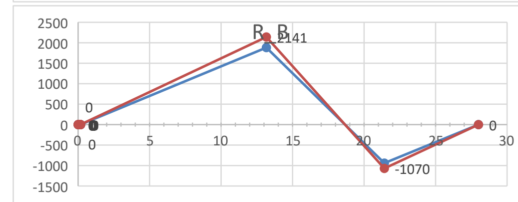
$w_{p,\ Roof}$ = 110.3 ρ = 1.3 ρ = 1.0 for diaphragm loads determined using Eq. 12.10-1 per A Ch 12.3.4.1 Note 7.

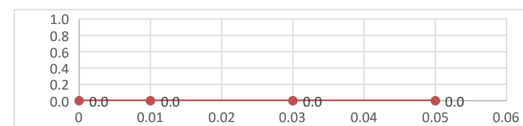
Diaph Fpx/Fx Ratio = 1.30 Ω_0 = 2.5 Reduce by 0.5 for structures with flexible diaphragms per A Tbl 12.2-1 footnote b.

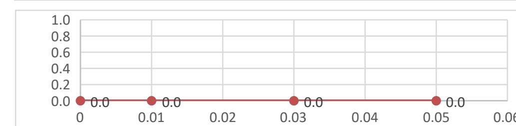
Per A Ch 12.10.2.1 In structures or portions thereof braced entirely by light frame shear walls overstrength need not apply

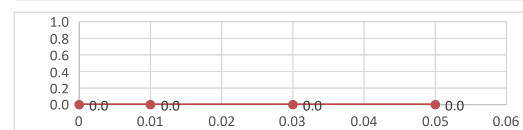
Wall	Dimen.	Seismic															
Line	**b (ft)**	**Wall Shear (lb)**	**Diaph Shear (lb)**	**Dist. from West to Diaph Start (ft)**	**Dist. from West to Diaph End**	**Diaph L (ft)**	**Diaph W (ft)**	**v (plf)**	**Braced Entirely by Light Frame Walls**	0.7*v* (f,Ω_0)	**Dist. to Wall Start (ft)**	**Dist. to Wall End (ft)**	v Wall **(plf)**	P_{Drag} Force @ Start of Diaph/ Wall **(lb)**	**0.7*P_{Drag}* (ρ*f,Ω_0) @** Start **(lb)**	P_{Drag} Force @ End of Diaph/ Wall **(lb)**	**0.7*P_{Drag}*** (ρ*f,Ω_0) @ End **(lb)**
R_A	9.1	203	264	0	28.0	28	0.5	9.4	YES	8.3			29.1	0.0	0.0	0.0	0.0
		2,160	2809	0	28.0	28	0.5	100.3	YES	87.8			309.2	0.0	0.0	0.00	0.0
R_A.1	9.1										10.167	19.25		1115.8	1269.2	-960.3	-1092.3
												0.00		0.0	0.0	0.0	0.0
												0.00		0.0	0.0	0.0	0.0
												0.00		0.0	0.0	0.0	0.0
R_B	8.3	2,160	2809	0	28.0	28	0.5	100.3	YES	87.8			340.4	0.0	0.0	0.0	0.0
		918	1194	0	28.0	28	0.5	42.6	YES	37.3			144.7	0.0	0.0	0.00	0.0
R_B.1	8.3										13.167	21.42		1882.2	2141.0	-941.0	-1070.4
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
							0.5		YES								
							0.5		YES								
							0.5		YES								
							0.5		YES								

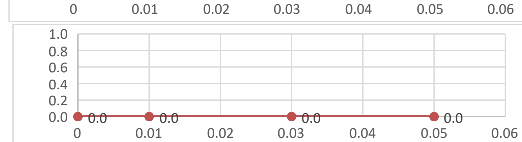












SHEAR WALL DESIGN
SEGMENTED OR FORCE TRANSFER METHOD
Per SDPWS-2021 Table 4.3A

ROOF: NORTH-SOUTH

$f_{p,\ Roof}$ = 7.53

$w_{p,\ Roof}$ = 110.3

Diaph Fpx/Fx Ratio = 1.30

ρ = 1.3

Ω_0 = 2.5

Reduce by 0.5 for structures with flexible diaphragms per A Tbl 12.2-1 footnote b.

Flexible Diaphragm? = YES

Grid	Wall	Dimen.				Seismic							Wind							Shear Wall (ASD Level)					
Wall grid line	**Line**	**b (ft)**	**Open (ft)**	**Final b (ft)**	**West or East Diaph**	**Trib Area (sf)**	$\sum F_{Above}$ **(lb)**	$\sum F_{Above}$ Transf* North **(lb)**	$\sum F_{x\ North}$ **(lb)**	F_{tot} **(lb)**	$v_{seis} = \rho F_{tot}/$(Final b) **(plf)**	$v_{seis,\ asd} = 0.7{*}\rho F_{tot}/$(Final b) **(plf)**	**Trib Width (ft)**	$\sum F_{Above}$ **(lb)**	$\sum F_{Above}$ Transf* **(lb)**	$\sum F_x$ **(lb)**	F_{tot} **(lb)**	$v_{wind} = F_{tot}/b$ **(plf)**	$v_{wind,\ asd} = 0.6{*}F_{tot}/b$ **(plf)**	**Wall Height (ft)**	**Factor**	**Wall Type**	**Sheath Sides 1 or 2**	**Allow Shear Capcity S 4.3.3 (plf)**	**Edge Nail Spacing in**
Wall?	R_1	9.5		9.5	West	27	0	0	203	3,049	417	292					772	81	49						
					East	378		0	2,845				7			772									
Wall	R_1.1	9.5		9.5						3,049	3,049						772	772		8.08	1.00	B	1	294	6
No Wall																									
No Wall																									
No Wall																									
Wall?	R_2	13.1		8.1	West	298	0	0	2,243	2,386	384	269	7.0			772	772	95	57						
					East	19		0	143																
Wall	R_2.1	13.1	5.0	8.1						2,386	2,386						772	772		8.08	1.00	B	1	294	6
No Wall																									
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Wall?					West		0	0																	
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Wall?					West		0	0																	
					East			0																	
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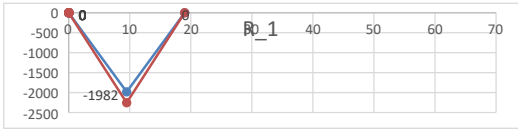
No Wall																									
No Wall																									
						722	0	0	5,435	10,870			14.0	0.0	0.0	1543.6	3087.3								

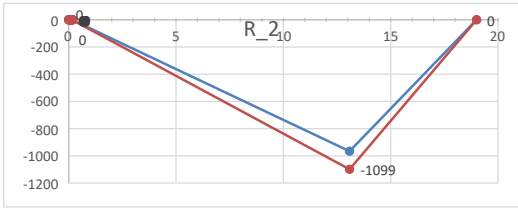
DIAPHRAGM DRAG DESIGN

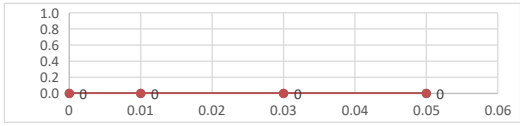
ROOF: NORTH-SOUTH

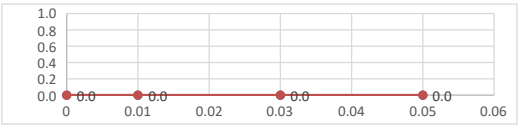
$f_{p,\ Roof}$ =	7.53	Irreg. Exists =	YES	f =	1.25	Per ASCE 7-16 Section 12.3.3.4 Increase forces by 25% if Type 1a, 1b, 2, 3 or 4 Horiz. Irregularity Exists
$w_{p,\ Roof}$ =	110.3	ρ =	1.3			ρ = 1.0 for diaphragm loads determined using Eq. 12.10-1 per A Ch 12.3.4.1 Note 7.
Diaph Fpx/Fx Ratio =	1.30	Ω_0 =	2.5			Reduce by 0.5 for structures with flexible diaphragms per A Tbl 12.2-1 footnote b.
						Per A Ch 12.10.2.1 In structures or portions thereof braced entirely by light frame shear walls overstrength need not apply

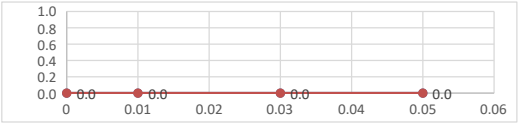
Wall	Dimen.	Seismic															
Line	**b (ft)**	**Wall Shear (lb)**	**Diaph Shear (lb)**	**Dist. from S to Diaph Start (ft)**	**Dist. from S to Diaph End**	**Diaph L (ft)**	**Diaph W (ft)**	**v (plf)**	**Braced Entirely by Light Frame Walls**	0.7*v* (f,Ω_0)	**Dist. to Wall Start (ft)**	**Dist. to Wall End (ft)**	v Wall **(plf)**	P_{Drag} Force @ Start of Diaph/ Wall **(lb)**	**0.7*P_{Drag}*** (ρ*f,Ω_0) @ Start **(lb)**	P_{Drag} Force @ End of Diaph/ Wall **(lb)**	**0.7*P_{Drag}*** (ρ*f,Ω_0) @ End **(lb)**
R_1	9.5	203	264	0	19.0	19	0.5	13.9	YES	12.2			27.8	0.0	0.0	0.0	0.0
		2,845	3699	0	19.0	19	0.5	194.7	YES	170.4			389.4	0.0	0.0	0.00	0.0
R_1.1	9.5										0.000	9.50		0.0	0.0	-1981.7	-2254.1
												0.00		0.0	0.0	0.0	0.0
												0.00		0.0	0.0	0.0	0.0
												0.00		0.0	0.0	0.0	0.0
R_2	13.1	2,243	2916	0	19.0	19	0.5	153.5	YES	134.3			222.9	0.0	0.0	0.0	0.0
		143	186	0	19.0	19	0.5	9.8	YES	8.6			14.2	0.0	0.0	0.00	0.0
R_2.1	13.1										0.000	13.08		0.0	0.0	-966.1	-1098.9
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
												0.0		0.0	0.0	0.0	0.0
							0.5		YES								
							0.5		YES								
							0.5		YES								
							0.5		YES								
							0.5		YES								
							0.5		YES								
							0.5										
							0.5										

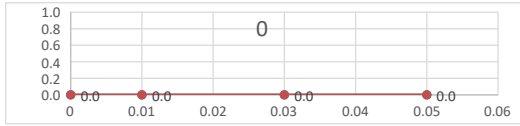












SHEAR WALL POST/HOLDOWN DESIGN

Building: Plan 2

S_{DS} 1.100 — $M_{R,ASD} = M_R * (0.6-0.14S_{DS})$ — **Compression members designed by Simpson. See ATS summary that follows

Stud Spc 16 — $C_{ASD, Total} = M_{OT}/1.4d + w_{D+L}*2\ ft + (P_D+P_L)$

Concentrated Dead Load Neglected in Uplift Calculation

e_{hold} = 5.5 — Floor ID

e_{strap} = 2.75 — ρ = 1.3 — Use 80% ICC Capacity per DSA IR A-5, §4.2? No

Dimensions							LOADING									SEISMIC										WIND							RESULTS											
LEVEL & ID				LENGTHS			LOADS									FORCES				ASD UPLIFT				ASD COMP	FORCES			ASD UPLIFT				ASD COMP	USE										
				Wall L	Ecc. Anch		Distrib.			Point Loads						Shear	Moments			Holdown		Strap		POST	Shear	Moments		Holdown		Strap		POST	Holddown		Strap		Post				Post for Sill Crush	
Level	Wall ID	Ht (ft)	Post Ht (ft)	L_w (ft)	d'_{hold} (ft)	d'_{strap} (ft)	$w_{D,wall}$ (psf)	$w_{D,flr/rf}$ (psf)	w_L (psf)	Trib Width (ft)	P_D (lbs)	P_L (lbs)	P_E (lbs)	P_W (lbs)	P Loc. (ft)	P_{seis} (lbs)	M_{ot} (ft-lbs)	M_R (ft-lbs)	$M_{R,ASD}$ (ft-lbs)	Overturn w/o Gravity	[0.7r(M_{OT})-$M_{R,ASD}$]/d (lbs)	Diff. Load per floor (lbs)	[0.7r(M_{OT})-$M_{R,ASD}$]/d (lbs)	Diff. Load per floor (lbs)	$C_{ASD, Seis}$ (lbs)	v_{wind} (plf)	M_{ot} (ft-lbs)	$M_{R,ASD}$ (ft-lbs)	[0.6(M_{OT})-$M_{R,ASD}$]/d (lbs)	Diff. Load per floor (lbs)	[0.6(M_{OT})-$M_{R,ASD}$]/d (lbs)	Diff. Load per floor (lbs)	$C_{ASD, Seis}$ (lbs)	Model -	Cap. (lbs)	Model -	Capacity (lbs)	Memb -	Tens. Cap. (lbs)	Memb -	Comp. Cap. (lbs)	Memb -	Sill Comp. Cap. (lbs)
R	R_1.1	10.3	8.1	9.5	8.813	9.0	18	27	20	2	0	0	0	0	0.0	3049	31,502	9,002	4,015	3,575	2,797	2,797	2,727	2,727	3,560	771.8	7,975	5,401	-70	-70	-68	-68	809	HDU2	3,075	CMSTC16	4,610	2x6	9,867	2x6	8,680	2x6	4,383
																					Wall =	6"	Wall Cond =		Midwall										SSTB16	3780	SSTB20	3145	Bolt =	0				
																							Bolt Type =		SSTB										Foundation		Stem Wall							
R	R_2.1	10.3	8.1	13.1	12.4	12.6	18	27	20	2	0	0	0	0	0.0	2386	24,657	17,073	7,615	1,989	1,196	1,196	1,174	1,174	2,117	771.8	7,975	10,244	-440	-440	-432	-432	652	HDU2	3,075	CS16	1,705	2x6	9,867	2x6	8,680	2x6	4,383
																					Wall =	6"	Wall Cond =		Midwall										SSTB16	3780	SSTB16	2550	Bolt =	0				
																							Bolt Type =		SSTB										Foundation		Stem Wall							
R	R_A.1	10.3	8.1	9.1	8.396	8.6	18	27	20	9.5	0	0	0	0	0.0	2364	24,424	16,582	7,396	2,909	1,766	1,766	1,719	1,719	3,266	1378.2	14,241	9,949	-167	-167	-163	-163	1,554	HDU2	3,075	CS14	2,490	2x6	9,867	2x6	8,680	2x6	4,383
																					Wall =	6"	Wall Cond =		Midwall										SSTB16	3780	SSTB16	2550	Bolt =	0				
																							Bolt Type =		SSTB										Foundation		Stem Wall							
R	R_B.1	10.3	8.1	8.3	7.563	7.8	18	27	20	9.5	0	0	0	0	0.0	3079	31,813	13,680	6,101	4,207	3,021	3,021	2,932	2,932	4,447	1378.2	14,241	8,208	45	45	43	43	1,666	HDU2	3,075	CMSTC16	4,610	2x6	9,867	2x6	8,680	3x6	7,305
																					Wall =	6"	Wall Cond =		Midwall										SSTB16	3780	SSTB20	3145	Bolt =	0				
																							Bolt Type =		SSTB										Foundation		Stem Wall							

Force Transfer Around Openings Calculator

ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

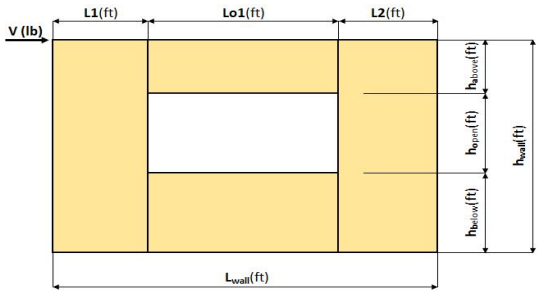
Code: **Date:**

Designer:

Client:

Project:

Wall Line: Gridline 2A



Shear Wall Calculation Variables

V	2172 lbf	Opening 1	
L1	4.58 ft	h_a	1.42 ft
L2	3.50 ft	h_o	4.00 ft
h_{wall}	8.09 ft	h_b	2.67 ft
L_{wall}	13.08 ft	Lo1	5.00 ft

Adj. Factor Method =	1.25-0.125h/bs
Wall Pier Aspect Ratio	Adj. Factor
P1=h_o/L1= 0.87	N/A
P2=h_o/L2= 1.14	N/A

1. Hold-down forces: H = Vh_{wall}/L_{wall} 1342 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(h_a+h_b) = 328 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 1642 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 931 lbf

F2 = O1(L2)/(L1+L2) = 711 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 2.83 ft

T2 = (L2*Lo1)/(L1+L2) = 2.17 ft

6. Unit shear beside opening

v1 = (V/L)(L1+T1)/L1 = 269 plf

v2 = (V/L)(T2+L2)/L2 = 269 plf

Check v1*L1+v2*L2=V? 2172 lbf **OK**

7. Resistance to corner forces

R1 = v1*L1 = 1231 lbf

R2 = v2*L2 = 940 lbf

8. Difference corner force + resistance

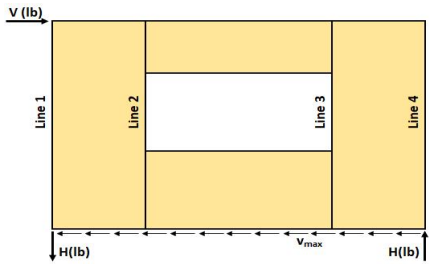
R1-F1 = 300 lbf

R2-F2 = 229 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = 65 plf

vc2 = (R2-F2)/L2 = 65 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(h_a+h_b)+v1(h_o)=H?		268	1075	1342 lbf
Line 2: va1(h_a+h_b)-vc1(h_a+h_b)-v1(h_o)=0?	1342	268	1075	0
Line 3: va1(h_a+h_b)-vc2(h_a+h_b)-v1(h_o)=0?	1342	268	1075	0
Line 4: vc2(h_a+h_b)+v2(h_o)=H?		268	1075	1342 lbf

Design Summary*

Req. Sheathing Capacity	328 plf	**4-Term Deflection**		**3-Term Deflection**	
Req. Strap Force	931 lbf	**4-Term Story Drift %**		**3-Term Story Drift %**	
Req. HD Force (H)	1342 lbf				
Req. Shear Wall Anchorage Force (v_{max})	166 plf				

***The Design Summary assumes that the shear wall is designed as blocked.**

FOUNDATION DESIGN

DESIGN OF FOOTING THICKENED EDGE

ADU

Max Bearing Pressure = 1,500 PSF Per IBC
Max Bearing Pressure = 2,000 PSF Per IBC

1-Story Condition 1 **Location:** 1-Story Sections

										Allowable Level		Strength Level		
Level	**Wall Height (ft)**	**Wall Weight (psf)**	**Floor Trib (ft)**	**DL (psf)**	**LL (psf)**	**RLL (psf)**	**w_{DL} (plf)**	**w_{LL} (plf)**	**w_{RLL} (plf)**	**$w_{DL}+w_{LL}$ (plf)**	**$w_{DL}+0.75*w_{LL}+0.75*w_{RLL}$ (plf)**	**$1.4w_{DL}$ (plf)**	**$1.2w_{DL}+1.6w_{LL}+0.5w_{RLL}$ (plf)**	**$1.2w_{DL}+1.6w_{RLL}+w_{LL}$ (plf)**
Roof	10.3	18	9.5	27	0	20	442	0	190	442	585	619	626	835
Conc Wall	0.0	100	0.0	0	0	0	0	0	0	0	0	0	0	0
						Total =	442	0	190	442 plf	585 plf	619 plf	626 plf	835 plf

Footing Width Req'd = $(w_{DL}+w_{LL})/q_{a,\ max}$ = 4.7 in **^MAX^**
Min Width per Geotech Report = 12.0 in
Standard min width = 15.0 in
Use = **15.0 in**

Maximum Point Load on 1 Story Foundation

Gravity

Edge/Corner Condition

$P_{max,\ grav}$ = (15.0 in) / 12 (width) * (24.0 in + 12) / 12 (h_{ftg}) * 0.0 ft (h_{wall}) * 1,500 psf ($q_{a,\ grav}$) = 3,750 lbs - 585 plf * (24.0 in + 12) / 12 * 0.0 ft = 2,580 lbs

Continuous Condition

$P_{max,\ grav}$ = (15.0 in) / 12 (width) * 2 * (24.0 in + 12) / 12 (h_{ftg}) * 0.0 ft (h_{wall}) * 1,500 psf ($q_{a,\ grav}$) = 7,500 lbs - 585 plf * 2 (24.0 in + 12) / 12 * 0.0 ft = 5,160 lbs

Seismic / Wind

Edge/Corner Condition

$P_{max,\ seis}$ = (15.0 in) / 12 (width) * (24.0 in + 12) / 12 (h_{ftg}) * 0.0 ft (h_{wall}) * 2,000 psf ($q_{a,\ grav}$) = 5,000 lbs - 585 plf * (24.0 in + 12) / 12 * 0.0 ft = 3,830 lbs

Continuous Condition

$P_{max,\ seis}$ = (15.0 in) / 12 (width) * 2 * (24.0 in + 12) / 12 (h_{ftg}) * 0.0 ft (h_{wall}) * 2,000 psf ($q_{a,\ grav}$) = 10,000 lbs - 585 plf * 2 (24.0 in + 12) / 12 * 0.0 ft = 7,660 lbs