Earth Systems

500 Park Center Drive, Unit 1 | Hollister, CA 95023 | 831.637.2133 | www.earthsystems.com

January 11, 2023 File No.: 305539-001

Mr. Christian Heath
2115 San Juan Road
Aromas, CA 95004

PROJECT: PROPOSED RESIDENCE
PINE TREE AVENUE, APN 011-380-009
AROMAS, CALIFORNIA

SUBJECT: Structural Plan Review

REF.: Geotechnical Engineering Report, Proposed Residence, Pine Tree Avenue, APN 011-380-009, Aromas, California by Earth Systems Pacific, dated September 21, 2022

Dear Mr. Heath:

At your request, we reviewed the below listed plans to verify that they are in conformance with the recommendations included in our geotechnical engineering report for the proposed residence in Soledad, California. The Structural Plans were prepared by *DB Engineering*, dated April 27, 2022.

- Sheet S1, revised October 24, 2022,
- Sheet S2, revised October 24, 2022,
- Sheet S3.

Based on our review, it is our opinion that the structural plans have been prepared in general conformance with our geotechnical engineering recommendations for the project. The plans were reviewed specifically with respect to geotechnical considerations. We make no representation as to the accuracy of the dimensions, calculations, or other aspects of the design.

We trust this letter provides the information requested at this time. If you have any questions or need any additional information, please contact our office.

Sincerely,

Earth Systems Pacific

Phillip Penrose, CE 92946
Project Engineer

Ajay Singh, GE 3057
Principal Engineer

Doc. No.: 2301-002.LTR/jc

Earth Systems

500 Park Center Drive, Unit 1 | Hollister, CA 95023 | 831.637.2133 | www.earthsystems.com

October 3, 2022
(Revised October 10, 2022)

File No.: 305539-001

Mr. Christian Heath
2115 San Juan Road
Aromas CA 95004

PROJECT: PROPOSED RESIDENCE
PINE TREE AVENUE, APN 011-380-009
AROMAS, CALIFORNIA

SUBJECT: Geotechnical Engineering Report Addendum

REF.: Geotechnical Engineering Report, Proposed Residence, Pine Tree Avenue, APN 011-380-009, Aromas, California, dated September 21, 2022

Dear Mr. Heath:

This letter has been prepared by Earth Systems Pacific (Earth Systems) as an addendum to the above-referenced geotechnical engineering report for the proposed one-story residence on Pine Tree Avenue (APN 011-380-009) in Aromas, California. After we published our report on September 21, 2022, you notified us of one site plan revision for the project:

- Revision No. 1: The new plans show that the house will be built approximately 10 feet to the north and 15 feet to the east from its original location on the plans. The building's footprint will remain unchanged.

Based on a review of these site plan revisions, we conclude that neither change requires revising the above-referenced geotechnical engineering report. This letter shall act as an addendum acknowledging these specific plan changes and must be included with our original report for our engineering recommendations to remain valid under our terms and conditions.

We appreciate the opportunity to have provided services for this project and look forward to working with you again in the future. Please do not hesitate to contact this office if there are any questions concerning this report.

Sincerely,

Earth Systems Pacific

LICENSED PROFESSIONAL ENGINEER
PHILLIP PENROSE
C 92946
CIVIL
STATE OF CALIFORNIA

Phillip Penrose, CE 92946
Project Engineer

Jim Woodard, GIT 1498
Staff Geologist

Doc. No: 2210-001.LTR.REV1/mg

DB ENGINEERING
2021 The Alameda, Suite 360
San Jose, CA 95126
Tel: (408) 621 – 0114
Email: db.dbengineering@gmail.com

STRUCTURAL CALCULATIONS

PROJECT No.: 22099

PROJECT: New ADU
0 Pine Tree Avenue
Aromas, CA

CLIENT: ---

OWNER: ---

DESIGNED BY: Dung Bui, PE

REFERENCES:

- 2019 California Building Code
- Architectural Design by Michael Radu
- Soil report by Earth Systems

DATE: 10/2022 Revision #1

WEIGHT TAKE-OFF						
					DL (psf)	LL (psf)
ROOF					**17.0**	**20.0**
	Roofing	Metal Sheets	3.0			
	Sheathing		2.5			
	Roof & Ceiling Framing		4.0			
	Insulation		1.0			
	Ceiling Finishes	Gypboard	2.5			
	Miscellaneous		1.0			
	Solar		3.0			
EXT. WALL					**17.0**	
	Exterior Finish	Stucco	10.0			
	Sheathing	15/32"	1.5			
	Framing	2 X 4 @ 16" o.c.	1.5			
	Insulation		0.5			
	Interior	Gypboard	2.5			
	Miscellaneous		1.0			
INT. WALL					**9.0**	
	Framing	2 x 4 @ 16" O.C.	2.0			
	Isulation		1.0			
	Ceiling Finishes	Gypboard	5.0			
	Miscellaneous		1.0			

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Wood Beam

Project File: 22099.0 pine tree.ec6

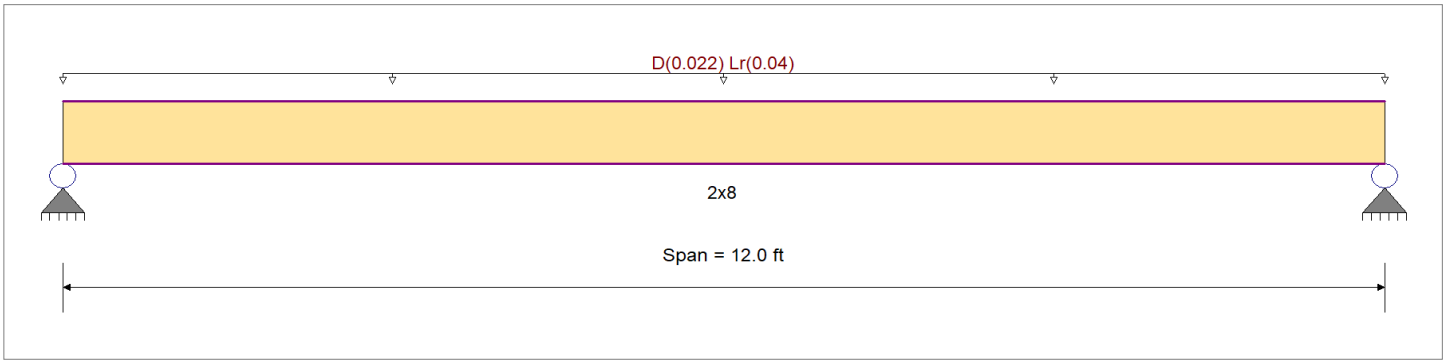
DESCRIPTION: ROOF RAFTER

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	900.0 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-16	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 :	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

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

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0110, Lr = 0.020 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.656 : 1	Maximum Shear Stress Ratio	=	0.206 : 1
Section used for this span		2x8	Section used for this span		2x8
fb: Actual	=	1,019.13 psi	fv: Actual	=	46.44 psi
Fb: Allowable	=	1,552.50 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	6.000 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	0.246 in	Ratio =	584 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.382 in	Ratio =	377 >=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.324	0.102	0.90	1.200	1.00	1.15	1.00	1.00	1.00	0.40	361.63	1117.80	0.12	16.48	162.00
+D+Lr					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.656	0.206	1.25	1.200	1.00	1.15	1.00	1.00	1.00	1.12	1,019.13	1552.50	0.34	46.44	225.00
+D+0.750Lr					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.551	0.173	1.25	1.200	1.00	1.15	1.00	1.00	1.00	0.94	854.75	1552.50	0.28	38.95	225.00
+0.60D					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.109	0.034	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.24	216.98	1987.20	0.07	9.89	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.3818	6.044		0.0000	0.000

Wood Beam

DESCRIPTION: ROOF RAFTER

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.372	0.372
Overall MINimum	0.240	0.240
D Only	0.132	0.132
+D+Lr	0.372	0.372
+D+0.750Lr	0.312	0.312
+0.60D	0.079	0.079
Lr Only	0.240	0.240

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Wood Beam

Project File: 22099.0 pine tree.ec6

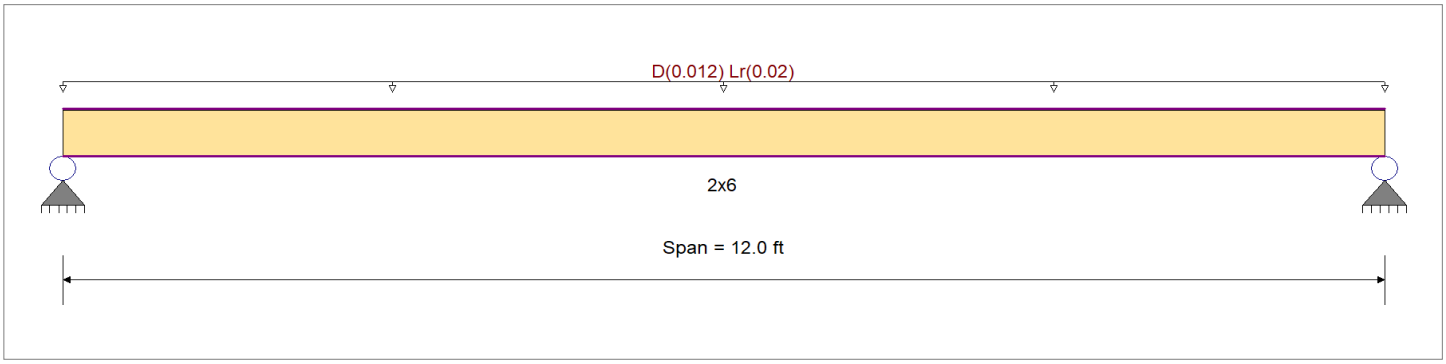
DESCRIPTION: CEILING JOIST

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	900.0 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-16	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 :	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

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

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0060, Lr = 0.010 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.543 : 1	Maximum Shear Stress Ratio	=	0.144 : 1
Section used for this span		2x6	Section used for this span		2x6
fb: Actual	=	913.98 psi	fv: Actual	=	32.36 psi
Fb: Allowable	=	1,681.88 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	6.000 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	0.282 in	Ratio =	510 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.451 in	Ratio =	319 >=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.283	0.075	0.90	1.300	1.00	1.15	1.00	1.00	1.00	0.22	342.74	1210.95	0.07	12.14	162.00
+D+Lr					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.543	0.144	1.25	1.300	1.00	1.15	1.00	1.00	1.00	0.58	913.98	1681.88	0.18	32.36	225.00
+D+0.750Lr					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.459	0.121	1.25	1.300	1.00	1.15	1.00	1.00	1.00	0.49	771.17	1681.88	0.15	27.30	225.00
+0.60D					1.300	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.0 ft	1	0.096	0.025	1.60	1.300	1.00	1.15	1.00	1.00	1.00	0.13	205.65	2152.80	0.04	7.28	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.4513	6.044		0.0000	0.000

Wood Beam

DESCRIPTION: CEILING JOIST

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.192	0.192
Overall MINimum	0.120	0.120
D Only	0.072	0.072
+D+Lr	0.192	0.192
+D+0.750Lr	0.162	0.162
+0.60D	0.043	0.043
Lr Only	0.120	0.120

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Wood Beam

Project File: 22099.0 pine tree.ec6

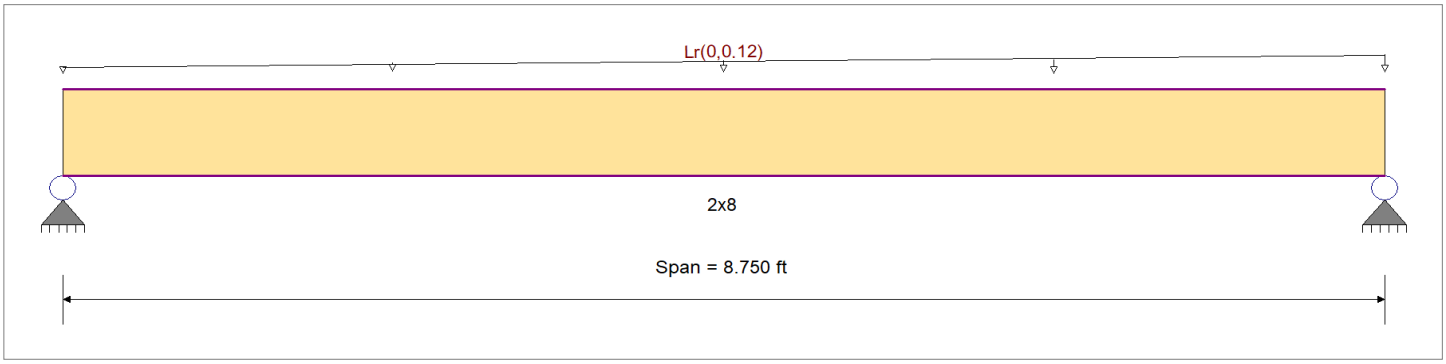
DESCRIPTION: HIP BEAM

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	900 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-16	Fb -	900 psi	Ebend- xx	1600 ksi
		Fc - Prll	1350 psi	Eminbend - xx	580 ksi
Wood Species :	Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade :	No.2	Fv	180 psi		
		Ft	575 psi	Density	31.21 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0110, Lr = 0.020 ksf, Tributary Width = 0.0->6.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.550 : 1	Maximum Shear Stress Ratio	=	0.275 : 1
Section used for this span		2x8	Section used for this span		2x8
fb: Actual	=	854.35 psi	fv: Actual	=	61.80 psi
Fb: Allowable	=	1,552.50 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	5.046 ft	Location of maximum on span	=	8.175 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.105 in	Ratio =	1003 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.166 in	Ratio =	631 >=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 8.750 ft	1	0.283	0.140	0.90	1.200	1.00	1.15	1.00	1.00	1.00	0.35	316.16	1117.80	0.16	22.73	162.00
+D+Lr					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.750 ft	1	0.550	0.275	1.25	1.200	1.00	1.15	1.00	1.00	1.00	0.94	854.35	1552.50	0.45	61.80	225.00
+D+0.750Lr					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.750 ft	1	0.464	0.231	1.25	1.200	1.00	1.15	1.00	1.00	1.00	0.79	719.80	1552.50	0.38	52.03	225.00
+0.60D					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.750 ft	1	0.095	0.047	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.21	189.69	1987.20	0.10	13.64	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.1662	4.567		0.0000	0.000

Wood Beam

DESCRIPTION: HIP BEAM

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.282	0.553
Overall MINimum	0.175	0.350
D Only	0.107	0.203
+D+Lr	0.282	0.553
+D+0.750Lr	0.238	0.465
+0.60D	0.064	0.122
Lr Only	0.175	0.350

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Wood Beam

Project File: 22099.0 pine tree.ec6

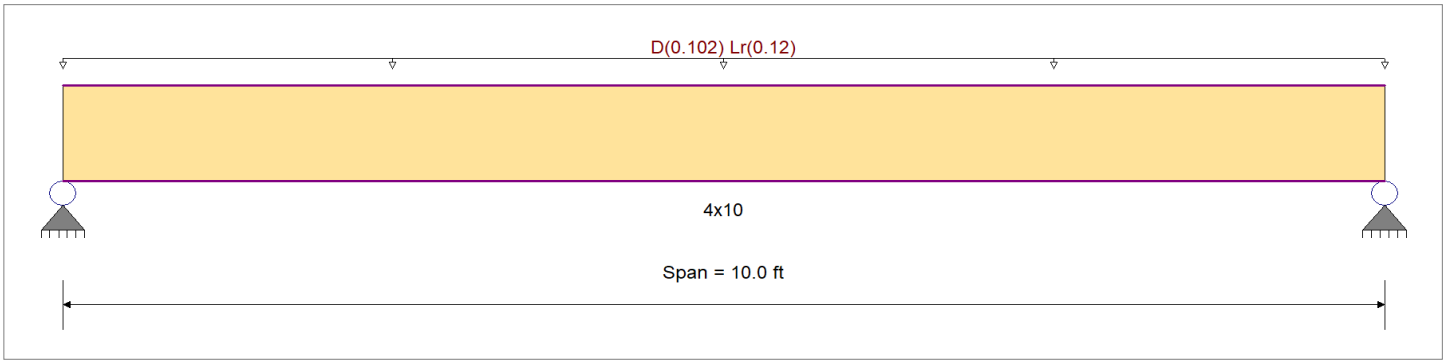
DESCRIPTION: CEILING BEAM, TYP

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	1000 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-16	Fb -	1000 psi	Ebend- xx	1700 ksi
		Fc - Prll	1500 psi	Eminbend - xx	620 ksi
Wood Species :	Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade :	No.1	Fv	180 psi		
		Ft	675 psi	Density	31.21 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0170, Lr = 0.020 ksf, Tributary Width = 6.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.399 : 1	Maximum Shear Stress Ratio	=	0.200 : 1
Section used for this span		4x10	Section used for this span		4x10
fb: Actual	=	688.27 psi	fv: Actual	=	44.92 psi
Fb: Allowable	=	1,725.00 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	5.000 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	0.069 in	Ratio =	1733 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.132 in	Ratio =	908 >=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.264	0.132	0.90	1.200	1.00	1.15	1.00	1.00	1.00	1.36	327.63	1242.00	0.46	21.38	162.00
+D+Lr					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.399	0.200	1.25	1.200	1.00	1.15	1.00	1.00	1.00	2.86	688.27	1725.00	0.97	44.92	225.00
+D+0.750Lr					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.347	0.173	1.25	1.200	1.00	1.15	1.00	1.00	1.00	2.49	598.11	1725.00	0.84	39.04	225.00
+0.60D					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.089	0.045	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.82	196.58	2208.00	0.28	12.83	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.1321	5.036		0.0000	0.000

Wood Beam

DESCRIPTION: CEILING BEAM, TYP

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.145	1.145
Overall MINimum	0.600	0.600
D Only	0.545	0.545
+D+Lr	1.145	1.145
+D+0.750Lr	0.995	0.995
+0.60D	0.327	0.327
Lr Only	0.600	0.600

22099

Pine Tree Ave, Aromas, CA 95004, USA

Latitude, Longitude: 36.8819995, -121.6422431

Date	4/27/2022, 1:16:33 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	2.211	MCE_R ground motion. (for 0.2 second period)
S_1	0.915	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.653	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.769	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	0.941	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	1.129	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	3.358	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	3.612	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.211	Factored deterministic acceleration value. (0.2 second)
S1RT	1.286	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.431	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.915	Factored deterministic acceleration value. (1.0 second)
PGAd	0.941	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.93	Mapped value of the risk coefficient at short periods
C_{R1}	0.898	Mapped value of the risk coefficient at a period of 1 s

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Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

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ASCE 7-16 Seismic Base Shear

Project File: 22099.0 pine tree.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: BUILDING

Risk Category

Calculations per ASCE 7-16

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

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

USER DEFINED Ground Motion

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 2.228 g, 0.2 sec response
S_1 = 0.9230 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North
Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) — *ASCE 7-16 Table 20.3-1*

Site Coefficients Fa & Fv — Fa = 1.20 — *ASCE 7-16 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table val — Fv = 1.70

Maximum Considered Earthquake Accelerat
S_{MS} = Fa * Ss = 2.674 — *ASCE 7-16 Eq. 11.4-1*
S_{M1} = Fv * S1 = 1.569 — *ASCE 7-16 Eq. 11.4-2*

Design Spectral Acceleration
S_{DS} = S_{MS} * 2/3 = 1.782 — *ASCE 7-16 Eq. 11.4-3*
S_{D1} = S_{M1} * 2/3 = 1.046 — *ASCE 7-16 Eq. 11.4-4*

Seismic Design Category = **E** *S1 >= 0.75* — *ASCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

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

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

NOTE! See ASCE 7-16 for all applicable footnc

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

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

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

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcul: All Other Structural Systems
" Ct " value = 0.020 " hn " : Height from base to highest leve 14.0 ft
" x " value = 0.75
" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.145 sec
"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 12.000 sec

Building Period " Ta " Calculated from Approximate Method sel = 0.145

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.782	From Eq. 12.8-2, Preliminary Cs	=	0.274
" R " : Response Modification Factor	=	6.50	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	1.112
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.071

Cs : Seismic Response Coefficient = = 0.2742

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ASCE 7-16 Seismic Base Shear

Project File: 22099.0 pine tree.ec6

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.2742 from 12.8.1.1

W (see Sum Wi below) = 0.00 k

Seismic Base Shear V = Cs * W = 0.00 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment

Sum Wi = 0.00 k Sum Wi * Hi = 0.00 k-ft Total Base Shear = 0.00 k

Base Moment = 0.0 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

ASCE 7-16 Wind Forces Chpt 28, Pt2 & Chpt 30, Pt2

Project File: 22099.0 pine tree.ec6

DESCRIPTION: BUILDING

General Design Values

Calculations per ASCE 7-16

V : Basic Wind Speed per Sect 26.5-1 or 2	**95.0**	mph
User specified minimum design pressu	16.0	psf
Occupancy per Table 1.5-1	II	All Buildings and other structures except those listed
Exposure Category per 26.7	Exposure B	
Topographic Factor Kzt per 26.8	1.00	

"Lambda" is interpolated between height tablular values.

Main Force Resisting System Valu

MRH : Mean Roof Height	13.0	ft
Roof Rise:Run Ratio	4:12	
Lambda MWFRS: per Figure 26.	1.00	

Component & Cladding Values

Effective Wind Area of Component & Clad	10.0	ft^2
Roof pitch for cladding pressu	Flat/Hip/Gable Roof	
LHD : Least Horizontal Dimension		ft
a = max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))	3.00	ft
Lambda Component & Cladding : per Figur	0.82	

Design Wind Pressures

Horizontal Pressures . . .

Zone: A =	19.80 psf		Zone: C =	16.00 psf	
Zone: B =	-16.00 psf		Zone: D =	-16.00 psf	

Vertical Pressures . . .

Zone: E =	-17.20 psf		Zone: G =	-16.00 psf	
Zone: F =	-16.00 psf		Zone: H =	-16.00 psf	

Overhangs . . .

Zone: Eoh =	-24.10 psf		Zone: Goh =	-18.80 psf	

ASCE 7-16 Section 28.5.4 Minimum Design Wind Loads requires that the load effects of the design wind pressures from Section 28.5.3 shall not be less than a minimum load defined by assuming the pressures, ps, for zones A and C equal to +16 psf, Zones B and D equal to +8 psf, while assuming ps for Zones E, F, G, and H are equal to 0 psf.

Component & Cladding Design Wind Press

*Design Wind Pressure = Lambda * Kzt * Ps30 pe*

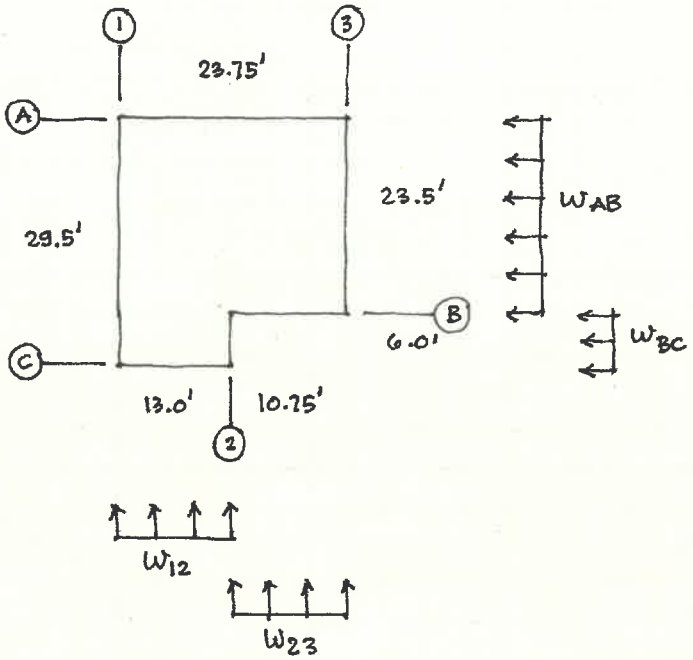
Roof Pressures	Positive	Negative		Overhang Pressures	Negative	
Zone 1	16.000	-21.238	psf	Zone 1	-19.188	psf
Zone 1'	16.000	-16.000	psf	Zone 1'	-19.188	psf
Zone 2	16.000	-27.962	psf	Zone 2	-25.912	psf
Zone 2e	***	***	psf	Zone 2e	***	psf
Zone 2n	***	***	psf	Zone 2n	***	psf
Zone 2r	***	***	psf	Zone 2r	***	psf
Zone 3	16.000	-38.130	psf	Zone 3	-36.080	psf
Zone 3e	***	***	psf	Zone 3e	***	psf
Zone 3r	***	***	psf	Zone 3r	***	psf

Wall Pressures

Wall Zone 4 :	16.000	-16.000	psf
Wall Zone 5 :	16.000	-17.794	psf

'*** : There is no value in Figure 30.4-1 Tabular Values

LATERAL ANALYSIS



S_s = ~~2.211~~ 2.228

S_1 = ~~0.915~~ 2.923

C_s = ~~0.2121~~ 2.742

BASE SHEAR ; V = 0.~~272~~ 2.742 W x 0.7 = 0.19W

$$w_{12} = 0.19\left(17psf \times 29.5ft + 17psf \times 2 \times \frac{8ft}{2} + 9psf \times 1 \times \frac{8ft}{2}\right) = 128\,plf$$

$$w_{23} = 0.19\left(17psf \times 23.5ft + 17psf \times 2 \times \frac{8ft}{2} + 9psf \times 1 \times \frac{8ft}{2}\right) = 109\,plf$$

$$w_{AB} = 0.19\left(17psf \times 23.75ft + 17psf \times 2 \times \frac{8ft}{2} + 9psf \times 1 \times \frac{8ft}{2}\right) = 109\,plf$$

$$w_{BC} = 0.19\left(17psf \times 13ft\right) = 42\,plf$$

WIND LOAD ; P = 19.8psf ÷ 1.6 = 12.4psf

$$w_{main} = 12.4psf \times \left(\frac{8ft}{2} + 4.5ft\right) = 105\,plf$$

$$w_{porch} = 12.4psf \times (2.75ft) = 34\,plf$$

SHEARWALL DESIGN

Line 1

$$F_1 = w_{12} \times \frac{13\,ft}{2} = \begin{cases} 128\,plf \times 6.5\,ft = 832\,lbs\ (seismic)\ * \\ 105\,plf \times 6.5\,ft = 683\,lbs\ (wind) \end{cases}$$

$L_1 = 5.75\,ft$

$$v_1 = \frac{832\,lbs}{5.75\,ft} = 145\,plf \rightarrow \triangle 6$$

$$T_1 = \frac{832\,lbs \times 8\,ft}{5.75\,ft - 0.5\,ft} = 1268\,lbs \rightarrow HDU2$$

Line 2

$$F_2 = w_{12} \times \frac{13\,ft}{2} + w_{23} \times \frac{10.75\,ft}{2}$$

$$= \begin{cases} 832\,lbs + 109\,plf \times 5.375\,ft = 1418\,lbs\ (seismic)\ * \\ 683\,lbs + 105\,plf \times 5.375\,ft = 1247\,lbs\ (wind) \end{cases}$$

$L_2 = 11.25\,ft$

$$v_2 = \frac{1418\,lbs}{11.25\,ft} = 126\,plf \rightarrow \triangle 6$$

$$T_2 = \frac{1418\,lbs \times 8\,ft}{11.25\,ft - 0.5\,ft} = 1055\,lbs \rightarrow HDU2$$

Line 3

$$F_3 = w_{23} \times \frac{10.75\,ft}{2} = \begin{cases} 109\,plf \times 5.375\,ft = 586\,lbs\ (seismic)\ * \\ 105\,plf \times 5.375\,ft = 564\,lbs\ (wind) \end{cases}$$

$L_3 = 10.75\,ft$

$$v_3 = \frac{586\,lbs}{10.75\,ft} = 35\,plf \rightarrow \triangle 6$$

$$T_3 = \frac{586\,lbs \times 8\,ft}{10.75\,ft - 0.5\,ft} = 288\,lbs \rightarrow HDU2$$

Line A

$$F_A = w_{AB} \times \frac{23.5\,ft}{2} = \begin{cases} 109\,plf \times 11.75\,ft = 1281\,lbs\ (seismic)\ * \\ 105\,plf \times 11.75\,ft = 1234\,lbs\ (wind) \end{cases}$$

$L_A = 7.5\,ft$

$$v_A = \frac{1281\,lbs}{7.5\,ft} = 171\,plf \rightarrow \triangle 6$$

$$T_A = \frac{1281\,lbs \times 8\,ft}{7.5\,ft - 0.5\,ft} = 1464\,lbs \rightarrow HDU2$$

Line B

$$F_B = w_{AB} \times \frac{23.5\,ft}{2} + w_{BC} \times \frac{6\,ft}{2}$$

$$= \begin{cases} 1281\,lbs + 42\,plf \times 3\,ft = 1407\,lbs\ (seismic)\ * \\ 1234\,lbs + 34\,plf \times 3\,ft = 1336\,lbs\ (wind) \end{cases}$$

$L_B = 5.5\,ft$

$$v_B = \frac{1407\,lbs}{5.5\,ft} = 256\,plf \rightarrow \triangle 6$$

$$T_B = \frac{1407\,lbs \times 8\,ft}{5.5\,ft - 0.5\,ft} = 2251\,lbs \rightarrow HDU2$$

Line C

$$F_C = w_{BC} \times \frac{6\,ft}{2} = \begin{cases} 42\,plf \times 3\,ft = 126\,lbs\ (seismic)\ * \\ 34\,plf \times 3\,ft = 102\,lbs\ (wind) \end{cases}$$

$L_C = 2$ COLUMNS

$$F_{each} = \frac{126\,lbs}{2} = 63\,lbs$$

$V_{each} = 63\,lbs$

$M_{each} = 63\,lbs \times 8\,ft = 504\,lb.ft \rightarrow MPB44Z$

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Project Descr: 0 Pine Tree Avenue, Aromas, CA

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Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: RIDGE BOARD (ENTRY)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-10

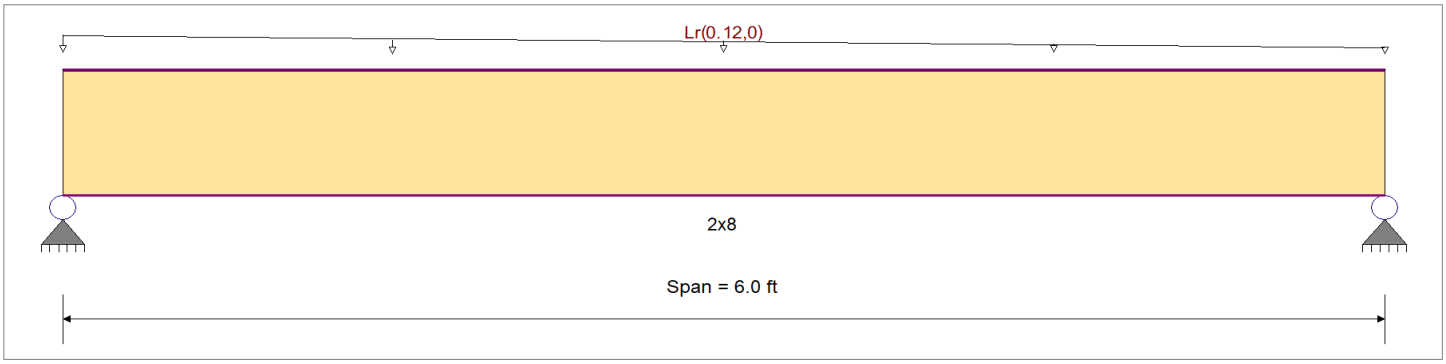
Wood Species : Douglas Fir-Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	900.0 psi
Fb -	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 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 NOT internally calculated and added
Uniform Load : D = 0.0080, Lr = 0.020 ksf, Tributary Width = 6.0->0.0 ft, (ROOF ONLY)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.262 : 1	Maximum Shear Stress Ratio	=	0.148 : 1
Section used for this span		2x8	Section used for this span		2x8
fb: Actual	=	354.30 psi	fv: Actual	=	33.32 psi
Fb: Allowable	=	1,350.00 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	2.540 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	0.023 in	Ratio =	3111	>=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.032 in	Ratio =	2222	>=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.104	0.059	0.90	1.200	1.00	1.00	1.00	1.00	1.00	0.11	101.23	972.00	0.07	9.52	162.00
+D+Lr					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.262	0.148	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.39	354.30	1350.00	0.24	33.32	225.00
+D+0.750Lr					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.216	0.122	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.32	291.03	1350.00	0.20	27.37	225.00
+0.60D					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.0 ft	1	0.035	0.020	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.07	60.74	1728.00	0.04	5.71	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0324	2.891		0.0000	0.000

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Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: RIDGE BOARD (ENTRY)

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.336	0.168
Overall MINimum	0.240	0.120
D Only	0.096	0.048
+D+Lr	0.336	0.168
+D+0.750Lr	0.276	0.138
+0.60D	0.058	0.029
Lr Only	0.240	0.120

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Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: SLEEPER

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-10

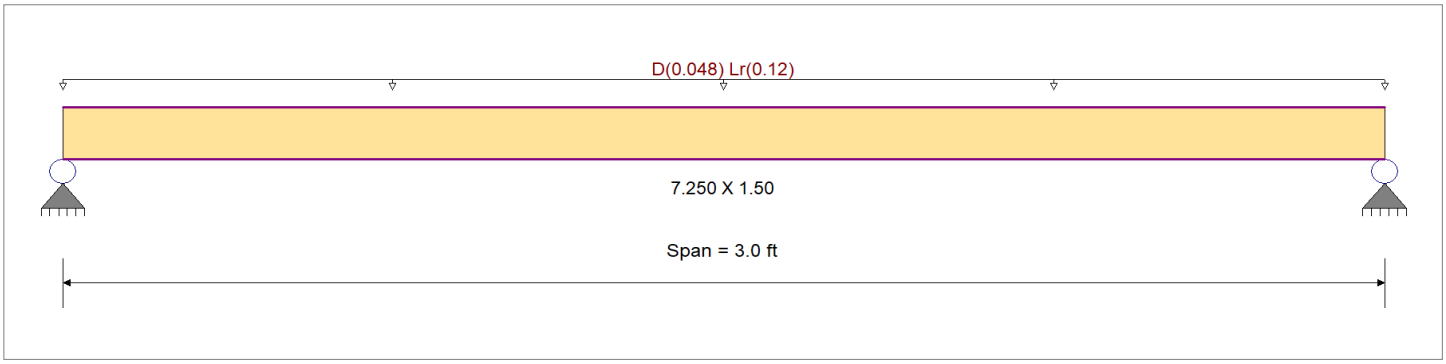
Wood Species : Douglas Fir-Larch
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	900.0 psi
Fb -	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 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 NOT internally calculated and added
Uniform Load : D = 0.0080, Lr = 0.020 ksf, Tributary Width = 6.0 ft, (ROOF ONLY)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.128 : 1	Maximum Shear Stress Ratio	=	0.142 : 1
Section used for this span		7.250 X 1.50	Section used for this span		7.250 X 1.50
fb: Actual	=	172.59 psi	fv: Actual	=	31.97 psi
Fb: Allowable	=	1,350.00 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	1.500 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	0.003 in	Ratio =	12473	>=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.004 in	Ratio =	8909	>=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 3.0 ft	1	0.051	0.056	0.90	1.200	1.00	1.00	1.00	1.00	1.00	0.05	49.31	972.00	0.07	9.13	162.00
+D+Lr					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 3.0 ft	1	0.128	0.142	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.19	172.59	1350.00	0.23	31.97	225.00
+D+0.750Lr					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 3.0 ft	1	0.105	0.117	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.16	141.77	1350.00	0.19	26.26	225.00
+0.60D					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 3.0 ft	1	0.017	0.019	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.03	29.59	1728.00	0.04	5.48	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0040	1.511		0.0000	0.000

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Project Descr: 0 Pine Tree Avenue, Aromas, CA

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Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: SLEEPER

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.252	0.252
Overall MINimum	0.180	0.180
D Only	0.072	0.072
+D+Lr	0.252	0.252
+D+0.750Lr	0.207	0.207
+0.60D	0.043	0.043
Lr Only	0.180	0.180

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Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

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Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: ROOF BEAM (ENTRY)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-10

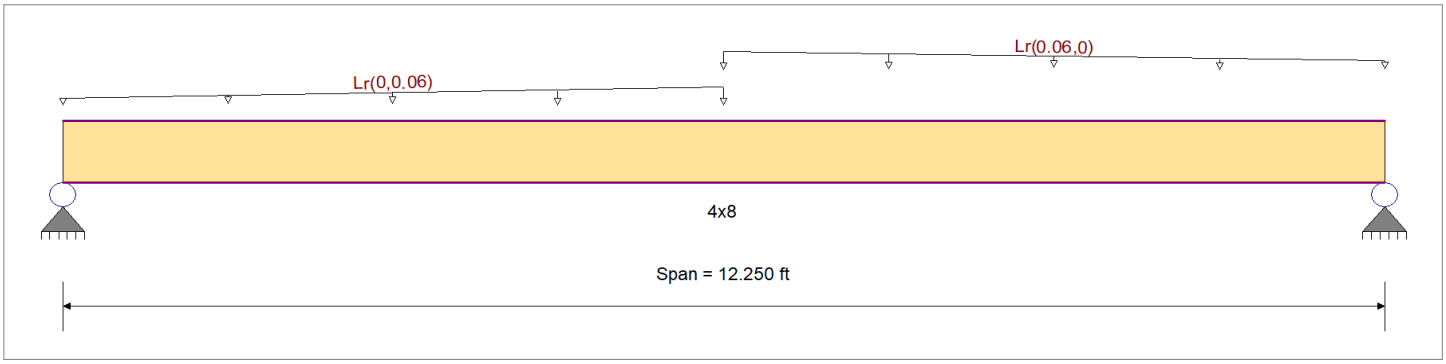
Wood Species : Douglas Fir-Larch
Wood Grade : No.1

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	1000 psi
Fb -	1000 psi
Fc - Prll	1500 psi
Fc - Perp	625 psi
Fv	180 psi
Ft	675 psi

E : Modulus of Elasticity

Ebend- xx	1700 ksi
Eminbend - xx	620 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
Load for Span Number 1
Uniform Load : D = 0.0140, Lr = 0.020 ksf, Extent = 0.0 -->> 6.125 ft, Tributary Width = 0.0->3.0 ft, (ROOF & CEILING)
Uniform Load : D = 0.0140, Lr = 0.020 ksf, Extent = 6.125 -->> 12.250 ft, Tributary Width = 3.0->0.0 ft, (ROOF & CEILING)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.332 : 1	Maximum Shear Stress Ratio	=	0.089 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	539.58 psi	fv: Actual	=	20.10 psi
Fb: Allowable	=	1,625.00 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	6.125 ft	Location of maximum on span	=	11.669 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.104 in	Ratio =	1419 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.191 in	Ratio =	770 >=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 12.250 ft	1	0.210	0.058	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.63	245.93	1170.00	0.16	9.34	162.00
+D+Lr					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.250 ft	1	0.332	0.089	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.38	539.58	1625.00	0.34	20.10	225.00
+D+0.750Lr					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.250 ft	1	0.287	0.077	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.19	466.17	1625.00	0.29	17.41	225.00
+0.60D					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 12.250 ft	1	0.071	0.019	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.38	147.56	2080.00	0.09	5.60	288.00

DB Engineering
2021 The Alameda, Suite 360
San Jose, CA 95126

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Printed: 24 OCT 2022, 2:55PM

Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: ROOF BEAM (ENTRY)

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.1909	6.170		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.346	0.346
Overall MINimum	0.184	0.184
D Only	0.162	0.162
+D+Lr	0.346	0.346
+D+0.750Lr	0.300	0.300
+0.60D	0.097	0.097
Lr Only	0.184	0.184

DB Engineering
2021 The Alameda, Suite 360
San Jose, CA 95126

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Printed: 24 OCT 2022, 2:56PM

Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: HEADER BEAM, TYP

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-10

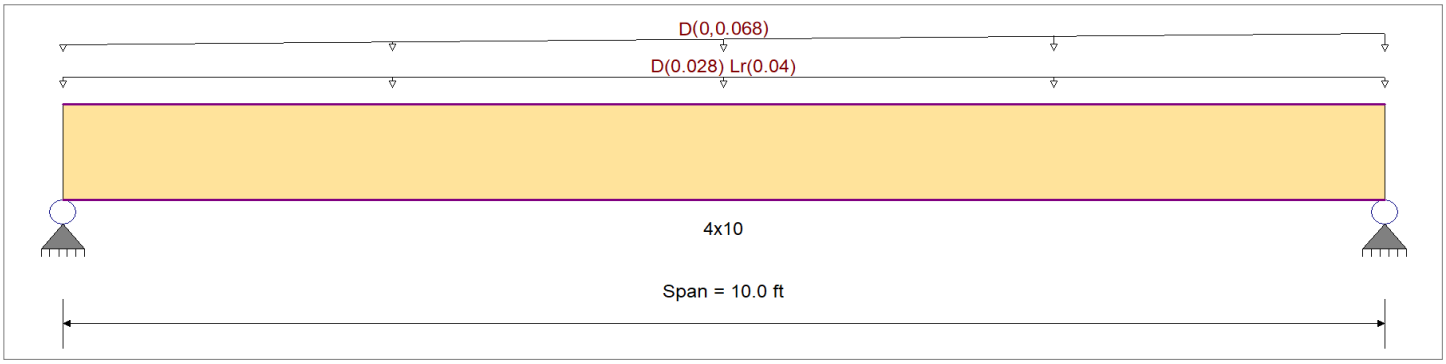
Wood Species : Douglas Fir-Larch
Wood Grade : No.1

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	1,000.0 psi
Fb -	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 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 = 0.0140, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (ROOF & CEILING)
Uniform Load : D = 0.0170 ksf, Tributary Width = 0.0->4.0 ft, (GABLE WAL)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.219 : 1	Maximum Shear Stress Ratio	=	0.102 : 1
Section used for this span		4x10	Section used for this span		4x10
fb: Actual	=	328.51 psi	fv: Actual	=	22.89 psi
Fb: Allowable	=	1,500.00 psi	Fv: Allowable	=	225.00 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	5.255 ft	Location of maximum on span	=	9.234 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.023 in	Ratio =	5201 >=360	Span: 1 : Lr Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.063 in	Ratio =	1908 >=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	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	M	fb	F'b	V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.193	0.093	0.90	1.200	1.00	1.00	1.00	1.00	1.00	0.87	208.80	1080.00	0.32	15.05	162.00
+D+Lr					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.219	0.102	1.25	1.200	1.00	1.00	1.00	1.00	1.00	1.37	328.51	1500.00	0.49	22.89	225.00
+D+0.750Lr					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.199	0.093	1.25	1.200	1.00	1.00	1.00	1.00	1.00	1.24	298.54	1500.00	0.45	20.93	225.00
+0.60D					1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.065	0.031	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.52	125.28	1920.00	0.19	9.03	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr	1	0.0629	5.073		0.0000	0.000

DB Engineering
2021 The Alameda, Suite 360
San Jose, CA 95126

Project Title: New SFR
Engineer:
Project ID: 22099
Project Descr: 0 Pine Tree Avenue, Aromas, CA

Printed: 24 OCT 2022, 2:56PM

Wood Beam

Project File: 22099.0 pine tree.ec6

DESCRIPTION: HEADER BEAM, TYP

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.488	0.602
Overall MINimum	0.200	0.200
D Only	0.288	0.402
+D+Lr	0.488	0.602
+D+0.750Lr	0.438	0.552
+0.60D	0.173	0.241
Lr Only	0.200	0.200

GEOTECHNICAL ENGINEERING REPORT
PROPOSED RESIDENCE
PINE TREE AVENUE
APN 011-380-009
AROMAS, CALIFORNIA

September 21, 2022

Prepared for:

Mr. Christian Heath
2115 San Juan Road
Aromas, CA 95004

Prepared by

Earth Systems Pacific
500 Park Center Drive, Suite 1
Hollister, CA 95023

Earth Systems

500 Park Center Drive, Unit 1 | Hollister, CA 95023 | 831.637.2133 | www.earthsystems.com

September 21, 2022 File No.: 305539-001

Mr. Christian Heath
2115 San Juan Road
Aromas, CA 95004

PROJECT: PROPOSED RESIDENCE
PINE TREE AVENUE, APN 011-380-009
AROMAS, CALIFORNIA

SUBJECT: Geotechnical Engineering Report

REF.: Proposal for Geotechnical Engineering Report for the Proposed Residence, Pine Tree Avenue, APN 011-380-009, Aromas, California, by Earth Systems Pacific, dated July 28th, 2022

Dear Mr. Heath:

In accordance with your authorization of the above referenced proposal, this geotechnical engineering report has been prepared by Earth Systems Pacific (Earth Systems) for use in the development of plans and specifications for the proposed one-story, single-family residence to be constructed on Pine Tree Avenue in Aromas, California. The conclusions and recommendations presented herein are based on our understanding of the proposed development, a review of the subsurface conditions revealed by our exploratory borings advanced as a part of this investigation, and our engineering analysis.

We appreciate the opportunity to have provided services for this project and look forward to working with you again in the future. Please do not hesitate to contact this office if there are any questions concerning this report.

Sincerely,

Earth Syst ems Pacific

K. James Woodard, GIT 1498
Staff Geologist

Phillip Penrose, CE 92946
Project Engineer

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APPENDIX A

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1.0 INTRODUCTION

This report presents the results of the geotechnical engineering study performed by Earth Systems Pacific (Earth System) for the proposed residence on Pine Tree Avenue in Aromas, California. The attached Vicinity Map (Figure 1) shows the general location of the site, and the attached Boring Location Map (Figure 2) shows the locations of the exploratory borings advanced at the site as part of this investigation.

Site Setting

The property is an irregularly shaped parcel (APN 011-380-009) located on Pine Tree Avenue in Aromas, California. The site has a latitude of 36.8824°N and a longitude of 121.6399°W, slopes to the south and west, and has an approximate area of 7.5 acres. The site is bounded by Pine Tree Avenue to the south, a private driveway to an adjacent parcel to the west. The site is near the top of a knoll and has steeper, tree-covered slopes to the north and east. At the time of our site investigation, some of these trees had been removed, with tree cuttings and cut log sections around the proposed building footprint. The rest of the site resembles the forest upslope of Pine Tree Avenue.

Project Description

Based on the preliminary plans provided by *Pacific Blue Developments*, dated May 15, 2022, it is our understanding that the proposed construction includes a new one-story, 557-square foot single-family residence built towards the southwest corner of the parcel, near Pine Tree Avenue. The location of the proposed house sits on a natural bench surrounded by slopes of approximately 30 percent to the southwest. The plans show the house will be of light wood frame construction, with two bedrooms, a bathroom, a kitchen, and a living room within the building footprint. Vehicle traffic to and from the new house will be via a gravel-paved driveway that connects to Pine Tree Avenue. Wastewater will be disposed via a conventional onsite wastewater treatment system, comprised of a septic tank and leach field.

Scope of Services

The scope of work for the geotechnical engineering study included a general site reconnaissance, exploration of subsurface soil and groundwater conditions from a geotechnical engineering standpoint, laboratory testing of collected soil samples, engineering evaluation of the information collected, and preparation of this report. The analysis and engineering

recommendations presented in the following sections of this report are based on our understanding of the proposed construction at the site and our experience with projects of a similar nature in San Benito County.

Our report and recommendations are intended to comply with the considerations of Section 1803 of the California Building Code (CBC), 2019 Edition, and common geotechnical engineering practice in this area at this time under similar conditions. Our tests were performed in general conformance with the standards noted, as modified by common geotechnical practice in this area at this time under similar conditions.

Preliminary geotechnical recommendations for site preparation and grading, foundations, slabs-on-grade, exterior flatwork, utility trench backfill, site drainage management, and geotechnical observation and testing are presented to guide the development of project plans and specifications. It is our intent that this report be used by the client to form the geotechnical basis of the design of the project as described herein, and in the preparation of plans and specifications.

Detailed evaluation of the site geology and potential geologic hazards, and analyses of the soil for mold or other microbial content, asbestos, radioisotopes, hydrocarbons, or other chemical properties are beyond the scope of this report. This report also does not address issues in the domain of contractors such as, but not limited to, site safety, loss of volume due to stripping of the site, shrinkage of soils during compaction, excavatability, shoring, temporary slope angles, and construction means and methods. Ancillary features such as temporary access roads, fences, light poles, and non-structural fills are not within our scope and are also not addressed.

To verify that pertinent issues have been addressed and to aid in conformance with the intent of this report, it is requested that final grading and foundation plans be submitted to this office for review. In the event that there are any changes in the nature, design, or locations of improvements, or if any assumptions used in the preparation of this report prove to be incorrect, the conclusions and recommendations contained herein should not be considered valid unless the changes are reviewed, and the conclusions of this report are verified or modified in writing by the Geotechnical Engineer. The criteria presented in this report are considered preliminary until such time as they are verified or modified in writing by the Geotechnical Engineer in the field during construction.

2.0 GEOLOGIC SETTING

The site is mapped as being underlain by Aromas Sands (Qar) comprising of massive (structureless), "rusty" red-brown, fine-grain eolian (dune) sands (Dibblee, 2006). The site is not within an Alquist-Priolo Earthquake Fault Zone, or any liquefaction or earthquake-induced landslide hazards zones as mapped by the State of California.

The Central Coast region of the California Coast Ranges is considered to be an active seismic region due to the presence of several active faults. Three northwest-trending major earthquake faults are responsible for the majority of the movement on the San Andreas fault system extending through the Central Coast and Greater Bay Area in California. These three regional faults are the San Andreas, Calaveras, and Hayward faults; which are approximately 1.9 miles to the northeast, 11.5 miles to the northeast, and 24.3 miles to north of the site. The Zayante-Vergeles fault located roughly 1.8 miles to the southwest.

Using information from recent earthquakes, improved mapping of active faults, and a new model for estimating earthquake probabilities, the 2014 Working Group on California Earthquake Probabilities updated the 30 years earthquake forecast for California. A summary of the significant faults in the near vicinity of the site and their respective potential moment magnitudes are listed below.

Major Active Faults

Fault	Distance from Site	Probability of $M_w \geq 6.7$ within 30 Years[1]
Zayante-Vergeles Fault Zone	1.8 mi (SW)	1%
San Andreas Fault	1.9 mi (NE)	16%
Calaveras Fault	11.5 mi (NE)	17%
Hayward Fault	24.3 mi (N)	6%

[1] Working Group on California Earthquake Probabilities, 2014

3.0 FIELD INVESTIGATION

Subsurface Exploration

Earth Systems drilled two borings on August 18, 2022, at the approximate locations shown on the Boring Location Map, Figure 2. While the original scope proposed three borings, two at the new building area and one profile boring in leach field area, we revised our exploratory boring plan after discussions with the client. The client proposed to work with San Benito County staff for siting guidance and would not require the third profile boring.

Field observations, soil sampling, and the laboratory testing of samples from these borings were used to generate the conclusions and recommendations presented in this report. A maximum depth of 25.0 feet was explored in each boring.

Drilling consisted of using a B-24 truck-mounted drill rig equipped with 6-inch diameter continuous flight augers. Once reaching the desired depth, the augers were removed and either a standard split-spoon sampler or a Modified California sampler was connected to steel rods and lowered into the hole. The respective samplers were driven into undisturbed ground with a 140-pound, safety hammer falling about 30 inches per drop. The samplers were driven up to 18 inches and the hammer blows required to drive every six inches of the samplers were recorded and are presented on the boring logs. The number of blows required to drive the final 12 inches of the sampler into the ground were used as penetration resistance to interpret soil consistency/density. An Earth Systems staff geologist supervised the drilling, described the soil conditions revealed by the borings to create a subsurface log, and collected representative samples for laboratory testing. The more cohesive samples were field tested using a pocket penetrometer to measure the unconfined compressive strength of the soils collected. After drilling to the final depth, the augers were removed, and the borings were backfilled with soil cuttings before leaving the site. The boring logs show soil descriptions including: color, major and minor components, USCS classification, changes in soil conditions with depth, moisture content, consistency/density, plasticity, sampler type, and sampling depths and laboratory test results. Copies of the boring logs are presented in Appendix A.

Subsurface Profile

Based on the drilling, sampling, and laboratory testing described above, our exploratory borings indicate the site is underlain by three major strata. At the surface, soils consist of about a foot of

a brown silty sand overlying dark brown, poorly-graded eolian (dune) sand with some thin clay lenses spread throughout. These two soil zones comprise the upper 11-13 feet of the borings, and ranged from loose to dense in consistency, generally becoming denser with depth. Below these depths, the site is underlain by Aromas Sands (Qar), an older eolian geologic formation but similar to the dune sands described above. The Aromas Sands are a series of yellow-orange, medium-grain eolian sand, with reddish "rusty" brown discoloration throughout. This formation makes up the remaining 12-14 feet of each boring and is medium-dense to dense in consistency.

Groundwater was not encountered during our drilling program, to the maximum depth drilled at 25.0 feet bgs. Variations in rainfall, temperature, and other factors may affect water levels; therefore, groundwater levels should not be considered constant.

Laboratory Testing

Six liner samples were tested for moisture content and density (ASTM D 2937-17) and one sample was sieved to determine percent fines (ASTM D 1140-17). Copies of the laboratory test results are included in Appendix B.

4.0 DATA ANALYSIS

Subsurface Soil Classification

Based on the penetration resistance data and the estimates of the unconfined compressive strength from the soil borings drilled (Appendix A), the site is assigned to Site Class D ("stiff soil") as defined by Table 20.3-1 of the ASCE 7-16.

Seismic Design Parameters

The following seismic design parameters represent the general procedure as outlined in Section 1613 of the 2019 CBC and in ASCE 7-16. The values determined below are based on the 2015 National Earthquake Hazard Reduction Program (NEHRP) maps and were obtained using the California Office of Statewide Planning and Development (OSHPD) Seismic Design Maps Web Application.

Summary of Seismic Parameters - CBC 2019

(Site Coordinates 36.8824°N, 121.6399°W)

Parameter	Design Value
Site Class	D
Mapped Short Term Spectral Response Parameter, (S_s)	2.228g
Mapped 1-second Spectral Response Parameter, (S_1)	0.923g
Site Coefficient, (F_a)	1.0
Site Coefficient, (F_v)	1.7[1]
Site Modified Short Term Response Parameter, (S_{MS})	2.228g
Site Modified 1-second Response Parameter, (S_{M1})	1.568g
Design Short Term Response Parameter, (S_{DS})	1.486g
Design 1-second Response Parameter, (S_{D1})	1.046g

[1] The 2019 CBC F_v parameter shall only be used for calculation of T_s. (ASCE Table 11.4-2, Supplement 1, Note a)

5.0 CONCLUSIONS

General

Based on the results of the field investigation and the laboratory testing program, in our opinion, the site is geotechnically suitable for the proposed development provided the recommendations contained herein are incorporated in the design and implemented during site grading and foundation construction. The primary geotechnical issue of concern is the anticipated cut/fill transition at the surface and in the near-surface of the site.

Site Preparation and Grading

Due to the anticipated cut/fill transition needed to create the pad, an over-excavation program should be implemented to create uniform fill thickness underneath the footings. Additional grading work is anticipated to include backfill work related to placement of new utility lines. Grading operations are discussed in detail in the *Recommendations* section of this report.

Soil Expansion Potential

Based on a review of the soils observed during our drilling program, the site's sandy, non-cohesive soils, at the near surface and at depth, have a low expansion potential. Low-expansive soils are not anticipated to have an adverse effect on construction.

Foundations

Due to the light loads of the proposed structures, the anticipated building loads can be supported on conventional spread/strip footings.

Groundwater

No groundwater was encountered during our exploratory drilling on Aug 18, 2022. Variations in rainfall, temperature, and other factors may affect water levels; therefore, groundwater levels should not be considered constant. Groundwater is not anticipated to have an adverse effect on the construction or performance of the proposed improvements.

Settlements

The estimated static settlements for the conventional shallow foundations constructed in accordance with the recommendations stated in this report are approximately 1-inch with approximately ½-inch of differential settlement.

Seismicity

The Central Coast region and the Greater Bay Area are recognized by geologists and seismologists as some of the most seismically active regions in the United States. The significant earthquakes in this area are generally associated with crustal movement along well-defined, active fault zones which regionally trend in a northwesterly direction. Although research on earthquake prediction has greatly increased in recent years, seismologists cannot predict when and where an earthquake will occur. Nevertheless, on the basis of current technology, it is reasonable to assume that the proposed development will be subjected to at least one moderate to severe earthquake during its lifetime. During such an earthquake, the danger from fault offset on the site is low, but strong shaking of the site is likely to occur and, therefore, the project should be designed in accordance with the seismic design provisions of the latest California Building Code. It should be understood that the California Building Code seismic design parameters are not intended to prevent structural damage during an earthquake, but to reduce damage and minimize loss of life.

6.0 RECOMMENDATIONS

Site Preparation and Grading

General Site Preparation

1. Site clearing, placement of fill, and grading operations at the site should be conducted in accordance with the recommendations provided in this report. Compaction recommendations for site grading can be found later in this section.

2. The site should be prepared for grading by removing, trees and their root systems, vegetation, debris, and other potentially deleterious materials from areas to receive improvements. Existing utility lines that will not be serving the proposed project should be either removed or abandoned. The appropriate method of utility abandonment will depend upon the type and depth of the utility. Recommendations for abandonment can be made as necessary.

3. Due to the potential ground disturbance from grading and earthwork activities, and the anticipated cut/fill transition required to create the building pad, a program of over-excavation and backfilling will be required. Loose and disturbed soil within the area of the proposed improvements should be cleaned out (excavated) to a depth of at least 1 foot below the bottom of the foundation elements. The exposed ground should be observed by the Geotechnical Engineer to determine the need for additional excavation work. Over-excavation on the order of 3 feet deep within the proposed building footprint should be expected. This over-excavation and recompaction should extend a minimum of 5 feet beyond the foundation footprint of the buildings. The excavated sandy soils may be reused as engineered fill.

4. Ruts or depressions resulting from the removal of utilities, fill soils, tree root systems, and abandoned and/or buried structures, buried debris, and remnants of the former use of the site that are discovered during site grading should be removed and properly cleaned out down to undisturbed native soil. The bottoms of the resulting depressions should be scarified and cross-scarified at least 8 inches in depth, moisture conditioned and recompacted. The depressions should then be backfilled with approved, compacted, moisture conditioned structural fill, as recommended in other sections of this report.

5. Site clearing and backfilling operations should be conducted under the field observation of the Geotechnical Engineer. The Geotechnical Engineer should be notified at least 48 hours prior to commencement of grading operations.

Compaction Recommendations

1. In general, the underlying native soil in areas proposed to receive fill, exterior flatwork, or new structures should be scarified at least 8 inches, moisture conditioned and recompacted to the recommended relative compaction presented below, unless noted otherwise.

2. The exposed native soil should be scarified at least 8 inches, moisture conditioned and recompacted to the recommended relative compaction presented below, unless noted otherwise. This scarification operation should be performed at locations designated for proposed structural fill, concrete slabs-on-grade, exterior flatwork, foundations, and pavement areas.

3. Recompacted native soils and fill soils should be compacted to a minimum relative compaction of 90 percent of maximum dry density at a moisture content above optimum.

4. In areas to be paved, the upper 8 inches of subgrade soil should be compacted to a minimum 95 percent of maximum dry density at a moisture content above optimum. The aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content that is slightly over optimum. The subgrade and base should be firm and unyielding when proof-rolled with heavy, rubber-tired equipment prior to paving. The pavement subgrade soils should be periodically moistened as necessary prior to placement of the aggregate base to maintain the soil moisture content near optimum.

Fill Recommendations

1. Structural fill is defined herein as fill material which, when properly compacted, will support foundations, building slabs, pavements, and other fills. The on-site soil may be used as structural fill provided it is free of expansive soil, debris, organics, deleterious material and rocks greater than 3 inches in size are removed.

2. Imported fill soils is not anticipated at the site. Should import fill be required, the soils should meet the following criteria:

   a. Be coarse grained and have a plasticity index of less than 12 and/or an expansion index less than 20;

   b. Be free of organics, debris or other deleterious material;

   c. Have a maximum rock size of 3 inches; and

   d. Contain sufficient clay binder to allow for stable foundation and utility trench excavations.

3. A representative sample of the proposed imported soils should be submitted at least five working days before being transported to the site for evaluation by the Geotechnical Engineer. During importation to the site the material should be further reviewed on an intermittent basis.

Foundations

1. The proposed improvements can be supported by conventional strip/spread footings bearing on the stiff native or engineered fill material. The footings should have minimum depths of 18 inches below the lowest adjacent soil pad grade. The footing excavations should be observed by the Geotechnical Engineer prior to placement of formwork or reinforcement.

2. The footings with minimum trenching depth of 18 inches below lowest adjacent grade should be designed using a maximum allowable bearing capacity of 1,800 psf dead plus live load. This value may be increased by one-third when transient loads such as wind or seismicity are included.

3. Resistance to lateral loads should be calculated based on a passive equivalent fluid pressure of 300 pcf and a friction factor of 0.35. Passive and frictional resistance can be combined in the calculations without reductions. These values are based on the assumption that backfill adjacent to foundations is properly compacted to the grading specifications discussed above.

Concrete Slab-on-Grade Construction

1. Slabs-on-grade should have a minimum thickness of 5 full inches and be reinforced as directed by the architect/engineer.

2. In areas where moisture transmitted from the subgrade would be undesirable, or where moisture sensitive materials will be stored directly on the slab, a capillary break system that consists of a vapor retarder of 10 mill minimum thickness and a 4-inch-thick, clean crushed rock layer should be placed above the pad subgrade to serve as a capillary break. The carport slab should be underlain by either 6 inches of crushed rock or compacted aggregate base.

3. A vapor retarder should be provided above the cushion rock in the slab areas. The vapor retarder should comply with ASTM Standard Specification E1745-17 and the latest recommendations of ACI Committee 302. The vapor retarder should be installed in accordance with ASTM Standard Practice E 1643-18a. Care should be taken to properly lap and seal the vapor retarder, particularly around utilities, and to protect it from damage during construction.

5. It is not recommended to place a sand layer over the vapor retarder. However, if sand, gravel or other permeable material is to be placed over the vapor retarder, the material over the vapor retarder should be only lightly moistened and not saturated prior to casting the slab. Excess water above the vapor retarder would increase the potential for moisture damage to floor coverings. Recent studies, including those by ACI Committee 302, have concluded that excess water above the vapor retarder would increase the potential for moisture damage to floor coverings and could increase the potential for mold growth or other microbial contamination. These studies also concluded that it is preferable to eliminate the sand layer and place the slab in direct contact with the vapor retarder, particularly during wet weather construction. However, placing the concrete directly on the vapor retarder would require special attention to using the proper vapor retarder, concrete mix design, and finishing and curing techniques.

6. When concrete slabs are in direct contact with vapor retarders, the concrete water to cement (w/c) ratio must be correctly specified to control bleed water and plastic shrinkage and cracking. The concrete w/c ratio for this type of application is typically in the range of 0.45 to 0.50. The concrete should be properly cured to reduce slab curling and plastic shrinkage cracking. Concrete materials, placement, and curing methods should be specified by the architect/engineer.

Exterior Flatwork

1. Exterior concrete flatwork should have a minimum thickness of 4 full inches and should be reinforced as directed by the architect/engineer. The exterior flatwork should be underlain by a 4-inch thick layer of compacted Class 2 aggregate base conforming with Section 26-1.02B of the Caltrans Standard Specifications.

2. Exterior flatwork adjacent to the structure should be designed to be independent of the foundation. The flatwork should not be doweled to foundations, and a separator should be placed between the two.

3. Prior to placement of the concrete, the non-expansive material in the flatwork area should be moistened, and no desiccation cracks should be present.

4. To reduce shrinkage cracks in concrete, the concrete aggregates should be of appropriate size and proportion, the water/cement ratio should be low, the concrete should be properly placed and finished, contraction joints should be installed, and the concrete should be properly cured. Concrete materials, placement and curing specifications should be at the direction of the architect/engineer; ACI 302.1R-04 and ACI 302.2R-04 are suggested as resources for the architect/engineer in preparing such specifications.

Utility Trench Backfills

1. A select, noncorrosive, granular, easily compacted material should be used as bedding and shading immediately around utility pipes. The site soils may be used for trench backfill above the select material.

2. Trench backfill in the upper 8 inches of subgrade beneath pavement areas should be compacted to a minimum of 95 percent of maximum dry density at a moisture content above optimum and the aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content above optimum. Trench backfill in other areas should be compacted to a minimum of 90 percent of maximum dry density at a moisture content above optimum. Jetting of utility trench backfill should not be allowed.

3. Where utility trenches extend under perimeter foundations, the trenches should be backfilled entirely with approved fill soil compacted to a minimum of 90 percent of maximum dry density. The zone of approved fill soil should extend a minimum distance of 2 feet on both sides of the foundation. If utility pipes pass through sleeves cast into the perimeter foundations, the annulus between the pipes and sleeves should be completely sealed.

4. Parallel trenches excavated in the area under foundations defined by a plane radiating at a 45-degree angle downward from the bottom edge of the footing should be avoided, if possible. Trench backfill within this zone, if necessary, should consist of Controlled Density Fill (CDF or Flowable Fill).

Management of Site Drainage and Finish Improvements

1. Unpaved ground surfaces should be finish graded to direct surface runoff away from site improvements at a minimum 5 percent grade for a minimum distance of 10 feet. If this is not practical due to the terrain or other site features, swales with improved surfaces should be provided to divert drainage away from improvements. The landscaping should be planned and installed to maintain proper surface drainage conditions.

2. Runoff from driveways, roof gutters, downspouts, planter drains and other improvements should discharge in a non-erosive manner away from foundations, pavements, and other improvements. The downspouts may discharge onto splash blocks that direct the flow away from the foundation.

3. Stabilization of surface soils, particularly those disturbed during construction, by vegetation or other means during and following construction is essential to protect the site from erosion damage. Care should be taken to establish and maintain vegetation.

4. Raised planter beds adjacent to foundations should be provided with sealed sides and bottoms so that irrigation water is not allowed to penetrate the subsurface beneath foundations. Outlets should be provided in the planters to direct accumulated irrigation water away from foundations.

5. Open areas adjacent to exterior flatwork should be irrigated or otherwise maintained so that constant moisture conditions are created throughout the year. Irrigation systems should be controlled to the minimum levels that will sustain the vegetation without saturating the soil.

Geotechnical Observation and Testing

1. It must be recognized that the recommendations contained in this report are based on a limited number of borings and rely on continuity of the subsurface conditions encountered.

2. It is assumed that the Geotechnical Engineer will be retained to provide consultation during the design phase, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

3. Unless otherwise stated, the terms "compacted" and "recompacted" refer to soils placed in level lifts not exceeding 8 inches in loose thickness and compacted to a minimum of 90 to 95 percent of maximum dry density as recommended above. The standard tests used to define maximum dry density and field density should be ASTM D 1557-12 and ASTM D 6938-17, respectively, or other methods acceptable to the Geotechnical Engineer and jurisdiction.

4. “Moisture conditioning” refers to adjusting the soil moisture to above optimum moisture content prior to application of compactive effort. If the soils are overly moist so that they become unstable, or if the recommended compaction cannot be readily achieved, drying

the soil to optimum moisture content or just above may be necessary. Placement of gravel layers or geotextiles may also be necessary to help stabilize unstable soils. The Geotechnical Engineer should be contacted for recommendations for mitigating unstable soils.

5. At a minimum, the following should be provided by the Geotechnical Engineer:

   - Review of final grading and foundation plans,
   - Professional observation during site preparation, grading, and foundation excavation,
   - Oversight of soil compaction testing during grading,
   - Oversight of soil special inspection during grading.

6. Special inspection of grading should be provided as per Section 1705.6 and Table 1705.6 and of the CBC; the soils special inspector should be under the direction of the Geotechnical Engineer. In our opinion, the following operations should be subject to *continuous* soils special inspection:

   - Scarification and recompaction,
   - Over-excavation to the recommended depth.
   - Fill placement and compaction,

7. In our opinion, the following operations may be subject to *periodic* soils special inspection; subject to approval by the Building Official:

   - Site preparation,
   - Compaction of utility trench backfill,
   - Compaction of subgrade and aggregate base,
   - Observation of foundation excavations,
   - Building pad moisture conditioning.

8. It will be necessary to develop a program of quality control prior to beginning grading. It is the responsibility of the owner, contractor, or project manager to determine any additional inspection items required by the architect/engineer or the governing jurisdiction.

9. The locations and frequencies of compaction tests should be as per the recommendations of the Geotechnical Engineer at the time of construction. The recommended test locations and frequencies may be subject to modification by the Geotechnical Engineer based upon soil and moisture conditions encountered, the size and type of equipment used by the contractor, the general trend of the compaction test results, and other factors.

10. A preconstruction conference among a representative of the owner, the Geotechnical Engineer, soils special inspector, the architect/engineer, and contractors is recommended to discuss planned construction procedures and quality control requirements. Earth Systems should be notified at least 48 hours prior to beginning grading operations.

7.0 CLOSURE

This report is valid for conditions as they exist at this time for the type of project described herein. Our intent was to perform the investigation in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project at this time under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the Scope of Services section. Application beyond the stated intent is strictly at the user's risk.

If changes with respect to the project type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions stated in this report are not correct, Earth Systems should be notified for modifications to this report. Any items not specifically addressed in this report should comply with the California Building Code and the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon the geotechnical conditions encountered during the investigation and may be augmented by additional requirements of the architect/engineer, or by additional recommendations provided by this firm based on conditions exposed at the time of construction.

If Earth Systems is not retained to provide construction observation and testing services, it will not be responsible for the interpretation of the information by others or any consequences arising there from.

FIGURES

Figure 1 – Site Vicinity Map
Figure 2 – Boring Location Map

FIGURE 1

BASE: USGS. 2021. NAIP CONUS PRIME

0 500 1000

Approximate Scale in Feet

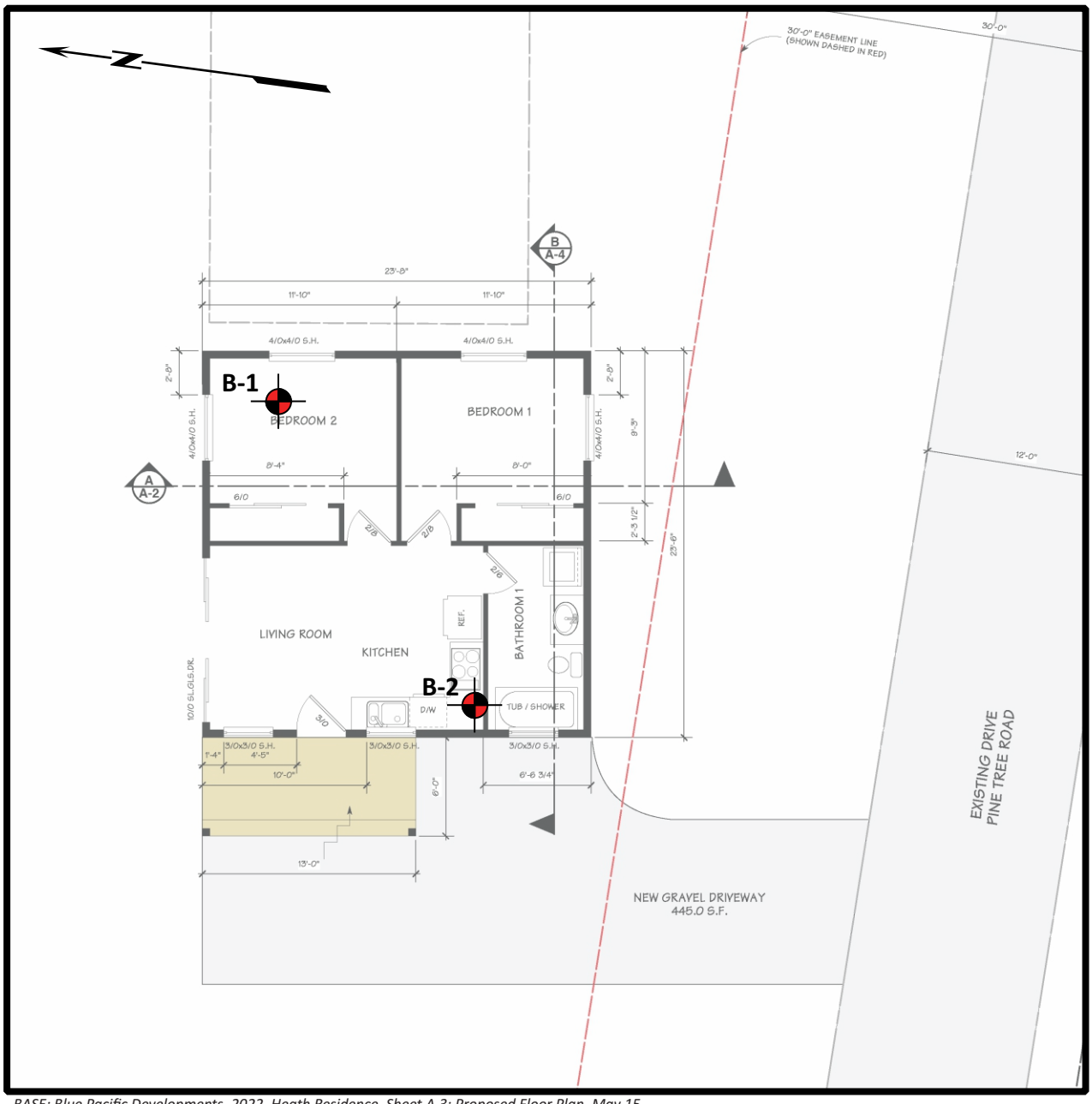
EXPLANATION

Project Site: Proposed Heath Residence
Pine Tree Avenue
Aromas, Calif.

NOTE: All features presented are approximated at this scale.

Earth Systems Pacific	**Heath Residence** **Pine Tree Avenue, APN 011-380-009** **Aromas, San Benito County, California**	**SITE VICINITY MAP** **305539-001**

FIGURE 2



BASE: Blue Pacific Developments. 2022. Heath Residence, Sheet A-3: Proposed Floor Plan. May 15

5 0 5

Approximate Scale in Feet

EXPLANATION

B-1 **Approximate Boring Locations**

NOTE: All features presented are approximated at this scale.

Earth Systems Pacific	Heath Residence Pine Tree Avenue, APN 011-380-009 Aromas, San Benito County, California	**BORING LOCATION MAP** **305539-001**

APPENDIX A

Boring Logs (2)

Earth Systems Pacific

Boring B-1
PAGE 1 OF 2

LOGGED BY: J. Woodard
RIG TYPE: B-24
AUGER TYPE: 6" Solid Stem Auger

FILE NO.: 305539-001
DATE: 08/18/2022

Heath Residence
Pine Tree Avenue
Aromas, San Benito County, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0 - 1	SM		SILTY SAND; light brown, moist, fine grained sand, trace dark brown clay, rootlets						8	
2	SM		POORLY-GRADED SAND; dark brown, moist, loose, medium grained sand, rootlets	1.5 - 2.0	1-A	■			6	
				2.0 - 2.5	1-B	■	102.0	13.7	5	
3			- minus #200 sieve = 14%						6	
									8	
4			- medium dense	3.5 - 4.0	1-C	■	100.1	3.9	15	
									21	
5			- dense, with yellow-orange mottling	4.5 - 5.0	1-D	■			21	
				5.0 - 5.5	1-E	■	104.3	5.7	24	
6 - 7	SP-CL		POORLY-GRADED SAND with CLAY; olive-gray, moist, medium grained sand, lean clay							
8 - 9									11	
			- medium dense	9.0 - 9.5	1-F	■			14	
10				9.5 - 10.0	1-G	■	99.5	10.8	15	
11 - 13	SC		CLAYEY SAND; dark brown, moist, fine grained sand							
14	SP		POORLY-GRADED SAND; yellow-orange, moist, dense, medium grained sand						22	
				14.0 - 14.5	1-H	■			24	
15				14.5 - 15.0	1-I	■			39	
16 - 18										
19									19	
			- color transitions to red-orange, fine to medium grained sand						22	
20				19.0 - 20.0	1-J	●			27	
21 - 23										
24									17	
									20	
25				24.0 - 25.0	1-K	●			24	
26			Bottom of boring approximately at 25.0'. No groundwater encountered during drilling. Boring backfilled with drilling spoils to ground surface.							

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring B-2
PAGE 2 OF 2
FILE NO.: 305539-001
DATE: 08/18/2022

LOGGED BY: J. Woodard
RIG TYPE: B-24
AUGER TYPE: 6" Solid Stem Auger

Heath Residence
Pine Tree Avenue
Aromas, San Benito County, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0 - 1	SM	SILTY SAND; light brown, moist, fine grained sand, trace dark brown clay, rootlets						6	
2	SM	SILTY SAND; brown, moist, medium dense, medium grained sand, rootlets	1.5 - 2.0	2-A	■			7	
			2.0 - 2.5	2-B	■	86.0	8.9	12	
3		- transitions to olive-gray, dense, fine to medium grained sand						17	
			3.0 - 3.5	2-C	■			14	
4			3.5 - 4.0	2-D	■	104.3	8.7	13	
								11	
5			4.5 - 5.0	2-E	■			13	
			5.0 - 5.5	2-F	■	100.4	13.5	13	
6 - 7 - 8 - 9	SP	POORLY-GRADED SAND; yellow-orange, moist, fine to medium grained sand						11	
10	CL	SANDY CLAY; olive brown, moist, very stiff, medium grained, red-orange mottling	9.0 - 9.5	2-G	■			14	
			9.5 - 10.0	2-H	■	89.7	29.4	15	> 4.5
11 - 12 - 13	SP	POORLY-GRADED SAND; yellow-orange, moist, medium grained sand							
14		- medium dense						22	
								24	
15			14.0 - 15.0	2-I	●			39	
16 - 17 - 18 - 19								19	
								22	
20			19.0 - 20.0	2-J	●			27	
21 - 22 - 23 - 24								17	
								20	
25			24.0 - 25.0	2-K	●			24	
26		Bottom of boring approximately at 25.0'. No groundwater encountered during drilling. Boring backfilled with drilling spoils to ground surface.							

LEGEND: ■ 2.5" Mod Cal Sample ▭ Shelby ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

APPENDIX B

Laboratory Test Results

Heath Residence
GER

305539-001

BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

August 19, 2022

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1-B B-1	1.5 - 2.0	3.5	105.5	102.0
1-C B-1	3.0 - 3.5	3.9	104.0	100.1
1-E B-1	5.0 - 5.5	5.7	110.3	104.3
1-G B-1	9.5 - 10.0	10.8	110.2	99.5
2-B B-2	2.0 - 2.5	8.9	93.7	86.0
2-D B-2	3.5 - 4.0	8.7	113.3	104.3
2-F B2	5.0 - 5.5	13.5	114.0	100.4
2-H B-2	9.5 - 10.0	29.4	116.0	89.7

Heath Residence
GER

305539-001

Amount of Material in Soils Finer than No. 200 Sieve

ASTM D 1140-17

August 19, 2022

	Sieve size	% Retained	% Passing
1	Boring #B-1 @ 2.0-2.5	86	13.7

BUILDING ENERGY ANALYSIS REPORT

PROJECT:

Pine Tree Ave Residence
0 Pine Tree Ave
Aromas, CA 95004

Project Designer:

Pacific Blue Developments
35 Colleen Way
Campbell, CA 95008
408-256-8433

Report Prepared by:

Adam Bailey
FRI Energy Consultants, LLC
21 N. Harrison Ave., Ste 210
Campbell, CA 95008
408-866-1620

Job Number:

0220384

Date:

5/9/2022

GENERAL INFORMATION					
01	**Project Name**	Pine Tree Ave Residence			
02	**Run Title**	Title 24 Analysis			
03	**Project Location**	0 Pine Tree Ave			
04	**City**	Aromas	05	**Standards Version**	2019
06	**Zip code**	95004	07	**Software Version**	EnergyPro 8.3
08	**Climate Zone**	4	09	**Front Orientation (deg/ Cardinal)**	345
10	**Building Type**	Single family	11	**Number of Dwelling Units**	1
12	**Project Scope**	NewConstruction	13	**Number of Bedrooms**	2
14	**Addition Cond. Floor Area (ft^2)**	0	15	**Number of Stories**	1
16	**Existing Cond. Floor Area (ft^2)**	n/a	17	**Fenestration Average U-factor**	0.35
18	**Total Cond. Floor Area (ft^2)**	557	19	**Glazing Percentage (%)**	31.90%
20	**ADU Bedroom Count**	n/a	21	**ADU Conditioned Floor Area**	n/a
22	**Is Natural Gas Available?**	Yes			

COMPLIANCE RESULTS	
01	**Building Complies with Computer Performance**
02	**This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.**
03	**This building incorporates one or more Special Features shown below**

ENERGY DESIGN RATING

	Energy Design Ratings		Compliance Margins	
	Efficiency[1] (EDR)	**Total[2] (EDR)**	**Efficiency[1] (EDR)**	**Total[2] (EDR)**
Standard Design	56.9	27.3		
Proposed Design	56.8	27.2	0.1	0.1

RESULT: [3]: COMPLIES

1: Efficiency EDR includes improvements to the building envelope and more efficient equipment
2: Total EDR includes efficiency and demand response measures such as photovoltaic (PV) systems and batteries
3: Building complies when efficiency and total compliance margins are greater than or equal to zero

- Standard Design PV Capacity: 1.96 kWdc
- PV System resized to 1.96 kWdc (a factor of 1.960) to achieve 'Standard Design PV' PV scaling

ENERGY USE SUMMARY

Energy Use (kTDV/ft^2-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	19.58	19.75	-0.17	-0.9
Space Cooling	23.14	27.85	-4.71	-20.4
IAQ Ventilation	12.23	11.05	1.18	9.6
Water Heating	37.17	33.05	4.12	11.1
Self Utilization/Flexibility Credit	n/a	0	0	n/a
Compliance Energy Total	**92.12**	**91.7**	**0.42**	**0.5**

REQUIRED PV SYSTEMS - SIMPLIFIED

01	02	03	04	05	06	07	08	09	10	11	12
DC System Size (kWdc)	**Exception**	**Module Type**	**Array Type**	**Power Electronics**	**CFI**	**Azimuth (deg)**	**Tilt Input**	**Array Angle (deg)**	**Tilt: (x in 12)**	**Inverter Eff. (%)**	**Annual Solar Access (%)**
1.96	NA	Standard	Fixed	none	true	150-270	n/a	n/a	<=7:12	96	98

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- Indoor air quality, balanced fan
- IAQ Ventilation System: as low as 0.575 W/CFM
- IAQ Ventilation System Heat Recovery: minimum 66 SRE and 66 ASRE
- IAQ Ventilation System: supply outside air inlet, filter, and H/ERV cores accessible per RACM Reference Manual
- Insulation below roof deck

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the buildng tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

Building-level Verifications:
- Indoor air quality ventilation
- Kitchen range hood

Cooling System Verifications:
- Minimum Airflow
- Verified SEER
- Fan Efficacy Watts/CFM

Heating System Verifications:
- Verified HSPF
- Verified heat pump rated heating capacity

HVAC Distribution System Verifications:
- Duct leakage testing

Domestic Hot Water System Verifications:
- -- None --

BUILDING - FEATURES INFORMATION

01	02	03	04	05	06	07
Project Name	**Conditioned Floor Area (ft^2)**	**Number of Dwelling Units**	**Number of Bedrooms**	**Number of Zones**	**Number of Ventilation Cooling Systems**	**Number of Water Heating Systems**
Pine Tree Ave Residence	557	1	2	1	0	1

ZONE INFORMATION

01	02	03	04	05	06	07
Zone Name	**Zone Type**	**HVAC System Name**	**Zone Floor Area (ft^2)**	**Avg. Ceiling Height**	**Water Heating System 1**	**Water Heating System 2**
Zone 1	Conditioned	HVAC System1	557	8.06	DHW Sys 1	N/A

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	**Zone**	**Construction**	**Azimuth**	**Orientation**	**Gross Area (ft^2)**	**Window and Door Area (ft2)**	**Tilt (deg)**
Front Wall	Zone 1	R-19 Wall	345	Front	190	47	90
Left Wall	Zone 1	R-19 Wall	75	Left	188	82.7	90
Rear Wall	Zone 1	R-19 Wall	165	Back	190	32	90
Right Wall	Zone 1	R-19 Wall	255	Right	188	16	90
Roof	Zone 1	R-30 HP Attic	n/a	n/a	557	n/a	n/a

ATTIC

01	02	03	04	05	06	07	08
Name	**Construction**	**Type**	**Roof Rise (x in 12)**	**Roof Reflectance**	**Roof Emittance**	**Radiant Barrier**	**Cool Roof**
Attic Zone 1	Attic RoofZone 1	Ventilated	4	0.1	0.85	No	No

FENESTRATION / GLAZING

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	**Type**	**Surface**	**Orientation**	**Azimuth**	**Width (ft)**	**Height (ft)**	**Mult.**	**Area (ft^2)**	**U-factor**	**U-factor Source**	**SHGC**	**SHGC Source**	**Exterior Shading**
Window	Window	Front Wall	Front	345			1	9	0.35	NFRC	0.25	NFRC	Bug Screen
Window 2	Window	Front Wall	Front	345			1	9	0.35	NFRC	0.25	NFRC	Bug Screen
Door	Window	Front Wall	Front	345			1	20	0.35	NFRC	0.25	NFRC	Bug Screen
Window 3	Window	Front Wall	Front	345			1	9	0.35	NFRC	0.25	NFRC	Bug Screen
Door 2	Window	Left Wall	Left	75			1	66.7	0.35	NFRC	0.25	NFRC	Bug Screen

FENESTRATION / GLAZING

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Type	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft^2)	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Window 4	Window	Left Wall	Left	75			1	16	0.35	NFRC	0.25	NFRC	Bug Screen
Window 5	Window	Rear Wall	Back	165			1	16	0.35	NFRC	0.25	NFRC	Bug Screen
Window 6	Window	Rear Wall	Back	165			1	16	0.35	NFRC	0.25	NFRC	Bug Screen
Window 7	Window	Right Wall	Right	255			1	16	0.35	NFRC	0.25	NFRC	Bug Screen

SLAB FLOORS

01	02	03	04	05	06	07	08
Name	Zone	Area (ft^2)	Perimeter (ft)	Edge Insul. R-value and Depth	Edge Insul. R-value and Depth	Carpeted Fraction	Heated
Slab	Zone 1	557	95	none	0	80%	No

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
R-19 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-19	None / None	0.074	Inside Finish: Gypsum Board Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6 Exterior Finish: 3 Coat Stucco
Attic RoofZone 1	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-13	None / None	0.078	Roofing: Light Roof (Asphalt Shingle) Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: R-13.0 / 2x4 Around Roof Joists: R-0.0 insul.

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07	08
Construction Name	**Surface Type**	**Construction Type**	**Framing**	**Total Cavity R-value**	**Interior / Exterior Continuous R-value**	**U-factor**	**Assembly Layers**
R-30 HP Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-30	None / None	0.032	Over Ceiling Joists: R-20.9 insul. Cavity / Frame: R-9.1 / 2x4 Inside Finish: Gypsum Board

BUILDING ENVELOPE - HERS VERIFICATION

01	02	03	04
Quality Insulation Installation (QII)	**High R-value Spray Foam Insulation**	**Building Envelope Air Leakage**	**CFM50**
Not Required	Not Required	Not Required	n/a

WATER HEATING SYSTEMS

01	02	03	04	05	06	07
Name	**System Type**	**Distribution Type**	**Water Heater Name (#)**	**Solar Heating System**	**Compact Distribution**	**HERS Verification**
DHW Sys 1	Domestic Hot Water (DHW)	Standard Distribution System	DHW Heater 1 (1)	n/a	None	n/a

WATER HEATERS

01	02	03	04	05	06	07	08	09	10	11	12
Name	**Heating Element Type**	**Tank Type**	**# of Units**	**Tank Vol. (gal)**	**Energy Factor or Efficiency**	**Input Rating or Pilot**	**Tank Insulation R-value (Int/Ext)**	**Standby Loss or Recovery Eff**	**1st Hr. Rating or Flow Rate**	**NEEA Heat Pump Brand or Model**	**Tank Location or Ambient Condition**
DHW Heater 1	Gas	Consumer Instantaneous	1	0	0.95-UEF	<= 200 kBtu/hr	0	n/a	n/a	n/a	n/a

WATER HEATING - HERS VERIFICATION

01	02	03	04	05	06	07	08
Name	**Pipe Insulation**	**Parallel Piping**	**Compact Distribution**	**Compact Distribution Type**	**Recirculation Control**	**Central DHW Distribution**	**Shower Drain Water Heat Recovery**
DHW Sys 1 - 1/1	Not Required	Not Required	Not Required	None	Not Required	Not Required	Not Required

SPACE CONDITIONING SYSTEMS

01	02	03	04	05	06	07	08	09	10	11
Name	**System Type**	**Heating Unit Name**	**Cooling Unit Name**	**Fan Name**	**Distribution Name**	**Required Thermostat Type**	**Status**	**Verified Existing Condition**	**Heating Equipment Count**	**Cooling Equipment Count**
HVAC System1	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	HVAC Fan 1	Air Distribution System 1	Setback	New	NA	1	1

01	02	03	04	05	06	07	08	09	10	11
HVAC - HEAT PUMPS										
Name	**System Type**	**Number of Units**	**Heating**			**Cooling**		**Zonally Controlled**	**Compressor Type**	**HERS Verification**
			HSPF/COP	**Cap 47**	**Cap 17**	**SEER**	**EER/CEER**			
Heat Pump System 1	Central split HP	1	9.5	18000	12000	16	11.7	Not Zonal	Single Speed	Heat Pump System 1-hers-htpump

HVAC HEAT PUMPS - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	**Verified Airflow**	**Airflow Target**	**Verified EER**	**Verified SEER**	**Verified Refrigerant Charge**	**Verified HSPF**	**Verified Heating Cap 47**	**Verified Heating Cap 17**
Heat Pump System 1-hers-htpump	Required	350	Not Required	Required	No	Yes	Yes	Yes

HVAC - DISTRIBUTION SYSTEMS

01	02	03	04	05	06	07	08	09	10	11	12
			Duct Ins. R-value		Duct Location		Surface Area				
Name	Type	Design Type	Supply	Return	Supply	Return	Supply	Return	Bypass Duct	Duct Leakage	HERS Verification
Air Distribution System 1	Unconditioned attic	Non-Verified	R-6	R-6	Attic	Attic	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 1-hers-dist

HVAC DISTRIBUTION - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	Duct Leakage Verification	Duct Leakage Target (%)	Verified Duct Location	Verified Duct Design	Buried Ducts	Deeply Buried Ducts	Low-leakage Air Handler	Low Leakage Ducts Entirely in Conditioned Space
Air Distribution System 1-hers-dist	Yes	5.0	Not Required	Not Required	Not Required	Credit not taken	Not Required	No

HVAC - FAN SYSTEMS

01	02	03	04
Name	Type	Fan Power (Watts/CFM)	Name
HVAC Fan 1	HVAC Fan	0.35	HVAC Fan 1-hers-fan

HVAC FAN SYSTEMS - HERS VERIFICATION

01	02	03
Name	Verified Fan Watt Draw	Required Fan Efficacy (Watts/CFM)
HVAC Fan 1-hers-fan	Required	0.35

IAQ (INDOOR AIR QUALITY) FANS						
01	**02**	**03**	**04**	**05**	**06**	**07**
Dwelling Unit	**IAQ CFM**	**IAQ Watts/CFM**	**IAQ Fan Type**	**IAQ Recovery Effectiveness - SRE**	**IAQ Recovery Effectiveness - ASRE**	**HERS Verification**
SFam IAQVentRpt 1-1	40	0.575	Balanced	66	66	Yes

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name: Adam Bailey	Documentation Author Signature: Adam Bailey
Company: FRI Energy Consultants, LLC.	Signature Date: 2022-05-09 09:47:15
Address: 21 N. Harrison Ave,	CEA/ HERS Certification Identification (If applicable):
City/State/Zip: Campbell, CA 95008	Phone: 408-866-1620

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design identified on this Certificate of Compliance.
2. I certify that the energy features and performance specifications identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
3. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

Responsible Designer Name: Adam Bailey	Responsible Designer Signature: Adam Bailey
Company: FRI Energy Consultants, LLC.	Date Signed: 2022-05-09 09:47:15
Address: 21 N. Harrison Ave,	License: N/A
City/State/Zip: Campbell, CA 95008	Phone: 408-866-1620

Digitally signed by CalCERTS. This digital signature is provided in order to secure the content of this registered document, and in no way implies Registration Provider responsibility for the accuracy of the information.

Easy to Verify at CalCERTS.com

2019 Low-Rise Residential Mandatory Measures Summary

*NOTE: Low-rise residential buildings subject to the Energy Standards must comply with all applicable mandatory measures, regardless of the compliance approach used. Review the respective section for more information. *Exceptions may apply.*
(01/2020)

Building Envelope Measures:	
§ 110.6(a)1:	**Air Leakage.** Manufactured fenestration, exterior doors, and exterior pet doors must limit air leakage to 0.3 CFM per square foot or less when tested per NFRC-400, ASTM E283 or AAMA/WDMA/CSA 101/I.S.2/A440-2011.*
§ 110.6(a)5:	**Labeling.** Fenestration products and exterior doors must have a label meeting the requirements of § 10-111(a).
§ 110.6(b):	**Field fabricated exterior doors and fenestration** products must use U-factors and solar heat gain coefficient (SHGC) values from Tables 110.6-A, 110.6-B, or JA4.5 for exterior doors. They must be caulked and/or weather-stripped.*
§ 110.7:	**Air Leakage.** All joints, penetrations, and other openings in the building envelope that are potential sources of air leakage must be caulked, gasketed, or weather stripped.
§ 110.8(a):	**Insulation Certification by Manufacturers.** Insulation must be certified by the Department of Consumer Affairs, Bureau of Household Goods and Services (BHGS).
§ 110.8(g):	**Insulation Requirements for Heated Slab Floors.** Heated slab floors must be insulated per the requirements of § 110.8(g).
§ 110.8(i):	**Roofing Products Solar Reflectance and Thermal Emittance.** The thermal emittance and aged solar reflectance values of the roofing material must meet the requirements of § 110.8(i) and be labeled per §10-113 when the installation of a cool roof is specified on the CF1R.
§ 110.8(j):	**Radiant Barrier.** When required, radiant barriers must have an emittance of 0.05 or less and be certified to the Department of Consumer Affairs.
§ 150.0(a):	**Ceiling and Rafter Roof Insulation.** Minimum R-22 insulation in wood-frame ceiling; or the weighted average U-factor must not exceed 0.043. Minimum R-19 or weighted average U-factor of 0.054 or less in a rafter roof alteration. Attic access doors must have permanently attached insulation using adhesive or mechanical fasteners. The attic access must be gasketed to prevent air leakage. Insulation must be installed in direct contact with a continuous roof or ceiling which is sealed to limit infiltration and exfiltration as specified in § 110.7, including but not limited to placing insulation either above or below the roof deck or on top of a drywall ceiling.*
§ 150.0(b):	**Loose-fill Insulation.** Loose fill insulation must meet the manufacturer's required density for the labeled R-value.
§ 150.0(c):	**Wall Insulation.** Minimum R-13 insulation in 2x4 inch wood framing wall or have a U-factor of 0.102 or less, or R-20 in 2x6 inch wood framing or have a U-factor of 0.071 or less. Opaque non-framed assemblies must have an overall assembly U-factor not exceeding 0.102. Masonry walls must meet Tables 150.1-A or B.*
§ 150.0(d):	**Raised-floor Insulation.** Minimum R-19 insulation in raised wood framed floor or 0.037 maximum U-factor.*
§ 150.0(f):	**Slab Edge Insulation.** Slab edge insulation must meet all of the following: have a water absorption rate, for the insulation material alone without facings, no greater than 0.3 percent; have a water vapor permeance no greater than 2.0 perm per inch; be protected from physical damage and UV light deterioration; and, when installed as part of a heated slab floor, meet the requirements of § 110.8(g).
§ 150.0(g)1:	**Vapor Retarder.** In climate zones 1 through 16, the earth floor of unvented crawl space must be covered with a Class I or Class II vapor retarder. This requirement also applies to controlled ventilation crawl space for buildings complying with the exception to § 150.0(d).
§ 150.0(g)2:	**Vapor Retarder.** In climate zones 14 and 16, a Class I or Class II vapor retarder must be installed on the conditioned space side of all insulation in all exterior walls, vented attics, and unvented attics with air-permeable insulation.
§ 150.0(q):	**Fenestration Products.** Fenestration, including skylights, separating conditioned space from unconditioned space or outdoors must have a maximum U-factor of 0.58; or the weighted average U-factor of all fenestration must not exceed 0.58.*
Fireplaces, Decorative Gas Appliances, and Gas Log Measures:	
§ 110.5(e)	**Pilot Light.** Continuously burning pilot lights are not allowed for indoor and outdoor fireplaces.
§ 150.0(e)1:	**Closable Doors.** Masonry or factory-built fireplaces must have a closable metal or glass door covering the entire opening of the firebox.
§ 150.0(e)2:	**Combustion Intake.** Masonry or factory-built fireplaces must have a combustion outside air intake, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight-fitting damper or combustion-air control device.*
§ 150.0(e)3:	**Flue Damper.** Masonry or factory-built fireplaces must have a flue damper with a readily accessible control.*
Space Conditioning, Water Heating, and Plumbing System Measures:	
§ 110.0-§ 110.3:	**Certification.** Heating, ventilation and air conditioning (HVAC) equipment, water heaters, showerheads, faucets, and all other regulated appliances must be certified by the manufacturer to the California Energy Commission.*
§ 110.2(a):	**HVAC Efficiency.** Equipment must meet the applicable efficiency requirements in Table 110.2-A through Table 110.2-K.*
§ 110.2(b):	**Controls for Heat Pumps with Supplementary Electric Resistance Heaters.** Heat pumps with supplementary electric resistance heaters must have controls that prevent supplementary heater operation when the heating load can be met by the heat pump alone; and in which the cut-on temperature for compression heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for compression heating is higher than the cut-off temperature for supplementary heating.*
§ 110.2(c):	**Thermostats.** All heating or cooling systems not controlled by a central energy management control system (EMCS) must have a setback thermostat.*
§ 110.3(c)4:	**Water Heating Recirculation Loops Serving Multiple Dwelling Units.** Water heating recirculation loops serving multiple dwelling units must meet the air release valve, backflow prevention, pump priming, pump isolation valve, and recirculation loop connection requirements of § 110.3(c)4.
§ 110.3(c)6:	**Isolation Valves.** Instantaneous water heaters with an input rating greater than 6.8 kBtu per hour (2 kW) must have isolation valves with hose bibbs or other fittings on both cold and hot water lines to allow for flushing the water heater when the valves are closed.
§ 110.5:	**Pilot Lights.** Continuously burning pilot lights are prohibited for natural gas: fan-type central furnaces; household cooking appliances (except appliances without an electrical supply voltage connection with pilot lights that consume less than 150 Btu per hour); and pool and spa heaters.*
§ 150.0(h)1:	**Building Cooling and Heating Loads.** Heating and/or cooling loads are calculated in accordance with the ASHRAE Handbook, Equipment Volume, Applications Volume, and Fundamentals Volume; the SMACNA Residential Comfort System Installation Standards Manual; or the ACCA Manual J using design conditions specified in § 150.0(h)2.

2019 Low-Rise Residential Mandatory Measures Summary

§ 150.0(h)3A:	**Clearances.** Air conditioner and heat pump outdoor condensing units must have a clearance of at least five feet from the outlet of any dryer
§ 150.0(h)3B:	**Liquid Line Drier.** Air conditioners and heat pump systems must be equipped with liquid line filter driers if required, as specified by the manufacturer's instructions.
§ 150.0(j)1:	**Storage Tank Insulation.** Unfired hot water tanks, such as storage tanks and backup storage tanks for solar water-heating systems, must have a minimum of R-12 external insulation or R-16 internal insulation where the internal insulation R-value is indicated on the exterior of the tank.
§ 150.0(j)2A:	**Water Piping, Solar Water-heating System Piping, and Space Conditioning System Line Insulation.** All domestic hot water piping must be insulated as specified in Section 609.11 of the California Plumbing Code. In addition, the following piping conditions must have a minimum insulation wall thickness of one inch or a minimum insulation R-value of 7.7: the first five feet of cold water pipes from the storage tank; all hot water piping with a nominal diameter equal to or greater than 3/4 inch and less than one inch; all hot water piping with a nominal diameter less than 3/4 inch that is: associated with a domestic hot water recirculation system, from the heating source to storage tank or between tanks, buried below grade, and from the heating source to kitchen fixtures.*
§ 150.0(j)3:	**Insulation Protection.** Piping insulation must be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind as required by Section 120.3(b). Insulation exposed to weather must be water retardant and protected from UV light (no adhesive tapes). Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space must include, or be protected by, a Class I or Class II vapor retarder. Pipe insulation buried below grade must be installed in a waterproof and non-crushable casing or sleeve.
§ 150.0(n)1:	**Gas or Propane Water Heating Systems.** Systems using gas or propane water heaters to serve individual dwelling units must include all of the following: A dedicated 125 volt, 20 amp electrical receptacle connected to the electric panel with a 120/240 volt 3 conductor, 10 AWG copper branch circuit, within three feet of the water heater without obstruction. Both ends of the unused conductor must be labeled with the word "spare" and be electrically isolated. Have a reserved single pole circuit breaker space in the electrical panel adjacent to the circuit breaker for the branch circuit and labeled with the words "Future 240V Use"; a Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed; a condensate drain that is no more than two inches higher than the base of the water heater, and allows natural draining without pump assistance; and a gas supply line with a capacity of at least 200,000 Btu per hour.
§ 150.0(n)2:	**Recirculating Loops.** Recirculating loops serving multiple dwelling units must meet the requirements of § 110.3(c)5.
§ 150.0(n)3:	**Solar Water-heating Systems.** Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R&T), or by a listing agency that is approved by the Executive Director.
Ducts and Fans Measures:	
§ 110.8(d)3:	**Ducts.** Insulation installed on an existing space-conditioning duct must comply with § 604.0 of the California Mechanical Code (CMC). If a contractor installs the insulation, the contractor must certify to the customer, in writing, that the insulation meets this requirement.
§ 150.0(m)1:	**CMC Compliance.** All air-distribution system ducts and plenums must meet the requirements of the CMC §§ 601.0, 602.0, 603.0, 604.0, 605.0 and ANSI/SMACNA-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition. Portions of supply-air and return-air ducts and plenums must be insulated to a minimum installed level of R-6.0 or a minimum installed level of R-4.2 when ducts are entirely in conditioned space as confirmed through field verification and diagnostic testing (RA3.1.4.3.8). Portions of the duct system completely exposed and surrounded by directly conditioned space are not required to be insulated. Connections of metal ducts and inner core of flexible ducts must be mechanically fastened. Openings must be sealed with mastic, tape, or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, or UL 181B or aerosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than ¼ inch, the combination of mastic and either mesh or tape must be used. Building cavities, support platforms for air handlers, and plenums designed or constructed with materials other than sealed sheet metal, duct board or flexible duct must not be used to convey conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms must not be compressed to cause reductions in the cross-sectional area.*
§ 150.0(m)2:	**Factory-Fabricated Duct Systems.** Factory-fabricated duct systems must comply with applicable requirements for duct construction, connections, and closures; joints and seams of duct systems and their components must not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.
§ 150.0(m)3:	**Field-Fabricated Duct Systems.** Field-fabricated duct systems must comply with applicable requirements for: pressure-sensitive tapes, mastics, sealants, and other requirements specified for duct construction.
§ 150.0(m)7:	**Backdraft Damper.** Fan systems that exchange air between the conditioned space and outdoors must have backdraft or automatic dampers.
§ 150.0(m)8:	**Gravity Ventilation Dampers.** Gravity ventilating systems serving conditioned space must have either automatic or readily accessible, manually operated dampers in all openings to the outside, except combustion inlet and outlet air openings and elevator shaft vents.
§ 150.0(m)9:	**Protection of Insulation.** Insulation must be protected from damage, sunlight, moisture, equipment maintenance, and wind. Insulation exposed to weather must be suitable for outdoor service. For example, protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation must be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation.
§ 150.0(m)10:	**Porous Inner Core Flex Duct.** Porous inner core flex ducts must have a non-porous layer between the inner core and outer vapor barrier.
§ 150.0(m)11:	**Duct System Sealing and Leakage Test.** When space conditioning systems use forced air duct systems to supply conditioned air to an occupiable space, the ducts must be sealed and duct leakage tested, as confirmed through field verification and diagnostic testing, in accordance with § 150.0(m)11 and Reference Residential Appendix RA3.
§ 150.0(m)12:	**Air Filtration.** Space conditioning systems with ducts exceeding 10 feet and the supply side of ventilation systems must have MERV 13 or equivalent filters. Filters for space conditioning systems must have a two inch depth or can be one inch if sized per Equation 150.0-A. Pressure drops and labeling must meet the requirements in §150.0(m)12. Filters must be accessible for regular service.*
§ 150.0(m)13:	**Space Conditioning System Airflow Rate and Fan Efficacy.** Space conditioning systems that use ducts to supply cooling must have a hole for the placement of a static pressure probe, or a permanently installed static pressure probe in the supply plenum. Airflow must be ≥ 350 CFM per ton of nominal cooling capacity, and an air-handling unit fan efficacy ≤ 0.45 watts per CFM for gas furnace air handlers and ≤ 0.58 watts per CFM for all others. Small duct high velocity systems must provide an airflow ≥ 250 CFM per ton of nominal cooling capacity, and an air-handling unit fan efficacy ≤ 0.62 watts per CFM. Field verification testing is required in accordance with Reference Residential Appendix RA3.3.*

2019 Low-Rise Residential Mandatory Measures Summary

Requirements for Ventilation and Indoor Air Quality:	
§ 150.0(o)1:	**Requirements for Ventilation and Indoor Air Quality**. All dwelling units must meet the requirements of ASHRAE Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified in § 150.0(o)1.
§ 150.0(o)1C:	**Single Family Detached Dwelling Units.** Single family detached dwelling units, and attached dwelling units not sharing ceilings or floors with other dwelling units, occupiable spaces, public garages, or commercial spaces must have mechanical ventilation airflow provided at rates determined by ASHRAE 62.2 Sections 4.1.1 and 4.1.2 and as specified in § 150.0(o)1C.
§ 150.0(o)1E:	**Multifamily Attached Dwelling Units.** Multifamily attached dwelling units must have mechanical ventilation airflow provided at rates in accordance with Equation 150.0-B and must be either a balanced system or continuous supply or continuous exhaust system. If a balanced system is not used, all units in the building must use the same system type and the dwelling-unit envelope leakage must be ≤ 0.3 CFM at 50 Pa (0.2 inch water) per square foot of dwelling unit envelope surface area and verified in accordance with Reference Residential Appendix RA3.8.
§ 150.0(o)1F:	**Multifamily Building Central Ventilation Systems.** Central ventilation systems that serve multiple dwelling units must be balanced to provide ventilation airflow for each dwelling unit served at a rate equal to or greater than the rate specified by Equation 150.0-B. All unit airflows must be within 20 percent of the unit with the lowest airflow rate as it relates to the individual unit's minimum required airflow rate needed for compliance.
§ 150.0(o)1G:	**Kitchen Range Hoods.** Kitchen range hoods must be rated for sound in accordance with Section 7.2 of ASHRAE 62.2.
§ 150.0(o)2:	**Field Verification and Diagnostic Testing.** Dwelling unit ventilation airflow must be verified in accordance with Reference Residential Appendix RA3.7. A kitchen range hood must be verified in accordance with Reference Residential Appendix RA3.7.4.3 to confirm it is rated by HVI to comply with the airflow rates and sound requirements as specified in Section 5 and 7.2 of ASHRAE 62.2.
Pool and Spa Systems and Equipment Measures:	
§ 110.4(a):	**Certification by Manufacturers.** Any pool or spa heating system or equipment must be certified to have all of the following: a thermal efficiency that complies with the Appliance Efficiency Regulations; an on-off switch mounted outside of the heater that allows shutting off the heater without adjusting the thermostat setting; a permanent weatherproof plate or card with operating instructions; and must not use electric resistance heating.*
§ 110.4(b)1:	**Piping.** Any pool or spa heating system or equipment must be installed with at least 36 inches of pipe between the filter and the heater, or dedicated suction and return lines, or built-in or built-up connections to allow for future solar heating.
§ 110.4(b)2:	**Covers.** Outdoor pools or spas that have a heat pump or gas heater must have a cover.
§ 110.4(b)3:	**Directional Inlets and Time Switches for Pools.** Pools must have directional inlets that adequately mix the pool water, and a time switch that will allow all pumps to be set or programmed to run only during off-peak electric demand periods.
§ 110.5:	**Pilot Light.** Natural gas pool and spa heaters must not have a continuously burning pilot light.
§ 150.0(p):	**Pool Systems and Equipment Installation.** Residential pool systems or equipment must meet the specified requirements for pump sizing, flow rate, piping, filters, and valves.*
Lighting Measures:	
§ 110.9:	**Lighting Controls and Components.** All lighting control devices and systems, ballasts, and luminaires must meet the applicable requirements of § 110.9.*
§ 150.0(k)1A:	**Luminaire Efficacy.** All installed luminaires must meet the requirements in Table 150.0-A.
§ 150.0(k)1B:	**Blank Electrical Boxes.** The number of electrical boxes that are more than five feet above the finished floor and do not contain a luminaire or other device must be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, vacancy sensor control, or fan speed control.
§ 150.0(k)1C:	**Recessed Downlight Luminaires in Ceilings.** Luminaires recessed into ceilings must meet all of the requirements for: insulation contact (IC) labeling; air leakage; sealing; maintenance; and socket and light source as described in § 150.0(k)1C.
§ 150.0(k)1D:	**Electronic Ballasts for Fluorescent Lamps.** Ballasts for fluorescent lamps rated 13 watts or greater must be electronic and must have an output frequency no less than 20 kHz.
§ 150.0(k)1E:	**Night Lights, Step Lights, and Path Lights.** Night lights, step lights and path lights are not required to comply with Table 150.0-A or be controlled by vacancy sensors provided they are rated to consume no more than 5 watts of power and emit no more than 150 lumens.
§ 150.0(k)1F:	**Lighting Integral to Exhaust Fans.** Lighting integral to exhaust fans (except when installed by the manufacturer in kitchen exhaust hoods) must meet the applicable requirements of § 150.0(k).*
§ 150.0(k)1G:	**Screw based luminaires.** Screw based luminaires must contain lamps that comply with Reference Joint Appendix JA8.*
§ 150.0(k)1H:	**Light Sources in Enclosed or Recessed Luminaires.** Lamps and other separable light sources that are not compliant with the JA8 elevated temperature requirements, including marking requirements, must not be installed in enclosed or recessed luminaires.
§ 150.0(k)1I:	**Light Sources in Drawers, Cabinets, and Linen Closets.** Light sources internal to drawers, cabinetry or linen closets are not required to comply with Table 150.0-A or be controlled by vacancy sensors provided that they are rated to consume no more than 5 watts of power, emit no more than 150 lumens, and are equipped with controls that automatically turn the lighting off when the drawer, cabinet or linen closet is closed.
§ 150.0(k)2A:	**Interior Switches and Controls.** All forward phase cut dimmers used with LED light sources must comply with NEMA SSL 7A.
§ 150.0(k)2B:	**Interior Switches and Controls.** Exhaust fans must be controlled separately from lighting systems.*
§ 150.0(k)2C:	**Interior Switches and Controls.** Lighting must have readily accessible wall-mounted controls that allow the lighting to be manually turned ON and OFF.*
§ 150.0(k)2D:	**Interior Switches and Controls.** Controls and equipment must be installed in accordance with manufacturer's instructions.
§ 150.0(k)2E:	**Interior Switches and Controls.** Controls must not bypass a dimmer, occupant sensor, or vacancy sensor function if the control is installed to comply with § 150.0(k).
§ 150.0(k)2F:	**Interior Switches and Controls.** Lighting controls must comply with the applicable requirements of § 110.9.

2019 Low-Rise Residential Mandatory Measures Summary

§ 150.0(k)2G:	**Interior Switches and Controls.** An energy management control system (EMCS) may be used to comply with control requirements if it: provides functionality of the specified control according to § 110.9; meets the Installation Certificate requirements of § 130.4; meets the EMCS requirements of § 130.0(e); and meets all other requirements in § 150.0(k)2.
§ 150.0(k)2H:	**Interior Switches and Controls.** A multiscene programmable controller may be used to comply with dimmer requirements in § 150.0(k) if it provides the functionality of a dimmer according to § 110.9, and complies with all other applicable requirements in § 150.0(k)2.
§ 150.0(k)2I:	**Interior Switches and Controls.** In bathrooms, garages, laundry rooms, and utility rooms, at least one luminaire in each of these spaces must be controlled by an occupant sensor or a vacancy sensor providing automatic-off functionality. If an occupant sensor is installed, it must be initially configured to manual-on operation using the manual control required under Section 150.0(k)2C.
§ 150.0(k)2J:	**Interior Switches and Controls.** Luminaires that are or contain light sources that meet Reference Joint Appendix JA8 requirements for dimming, and that are not controlled by occupancy or vacancy sensors, must have dimming controls.*
§ 150.0(k)2K:	**Interior Switches and Controls.** Under cabinet lighting must be controlled separately from ceiling-installed lighting systems.
§ 150.0(k)3A:	**Residential Outdoor Lighting.** For single-family residential buildings, outdoor lighting permanently mounted to a residential building, or to other buildings on the same lot, must meet the requirement in item § 150.0(k)3Ai (ON and OFF switch) and the requirements in either § 150.0(k)3Aii (photocell and either a motion sensor or automatic time switch control) or § 150.0(k)3Aiii (astronomical time clock), or an EMCS.
§ 150.0(k)3B:	**Residential Outdoor Lighting.** For low-rise residential buildings with four or more dwelling units, outdoor lighting for private patios, entrances, balconies, and porches; and residential parking lots and carports with less than eight vehicles per site must comply with either § 150.0(k)3A or with the applicable requirements in Sections 110.9, 130.0, 130.2, 130.4, 140.7 and 141.0.
§ 150.0(k)3C:	**Residential Outdoor Lighting.** For low-rise residential buildings with four or more dwelling units, any outdoor lighting for residential parking lots or carports with a total of eight or more vehicles per site and any outdoor lighting not regulated by § 150.0(k)3B or § 150.0(k)3D must comply with the applicable requirements in Sections 110.9, 130.0, 130.2, 130.4, 140.7 and 141.0.
§ 150.0(k)4:	**Internally illuminated address signs.** Internally illuminated address signs must comply with § 140.8; or must consume no more than 5 watts of power as determined according to § 130.0(c).
§ 150.0(k)5:	**Residential Garages for Eight or More Vehicles.** Lighting for residential parking garages for eight or more vehicles must comply with the applicable requirements for nonresidential garages in Sections 110.9, 130.0, 130.1, 130.4, 140.6, and 141.0.
§ 150.0(k)6A:	**Interior Common Areas of Low-rise Multifamily Residential Buildings.** In a low-rise multifamily residential building where the total interior common area in a single building equals 20 percent or less of the floor area, permanently installed lighting for the interior common areas in that building must be comply with Table 150.0-A and be controlled by an occupant sensor.
§ 150.0(k)6B:	**Interior Common Areas of Low-rise Multifamily Residential Buildings.** In a low-rise multifamily residential building where the total interior common area in a single building equals more than 20 percent of the floor area, permanently installed lighting for the interior common areas in that building must: i. Comply with the applicable requirements in Sections 110.9, 130.0, 130.1, 140.6 and 141.0; and ii. Lighting installed in corridors and stairwells must be controlled by occupant sensors that reduce the lighting power in each space by at least 50 percent. The occupant sensors must be capable of turning the light fully on and off from all designed paths of ingress and egress.
Solar Ready Buildings:	
§ 110.10(a)1:	**Single Family Residences.** Single family residences located in subdivisions with 10 or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete and approved by the enforcement agency, which do not have a photovoltaic system installed, must comply with the requirements of § 110.10(b) through § 110.10(e).
§ 110.10(a)2:	**Low-rise Multifamily Buildings.** Low-rise multi-family buildings that do not have a photovoltaic system installed must comply with the requirements of § 110.10(b) through § 110.10(d).
§ 110.10(b)1:	**Minimum Solar Zone Area.** The solar zone must have a minimum total area as described below. The solar zone must comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area must be comprised of areas that have no dimension less than 5 feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet. For single family residences, the solar zone must be located on the roof or overhang of the building and have a total area no less than 250 square feet. For low-rise multi-family buildings the solar zone must be located on the roof or overhang of the building, or on the roof or overhang of another structure located within 250 feet of the building, or on covered parking installed with the building project, and have a total area no less than 15 percent of the total roof area of the building excluding any skylight area. The solar zone requirement is applicable to the entire building, including mixed occupancy.*
§ 110.10(b)2:	**Azimuth.** All sections of the solar zone located on steep-sloped roofs must be oriented between 90 degrees and 300 degrees of true north.
§ 110.10(b)3A:	**Shading.** The solar zone must not contain any obstructions, including but not limited to: vents, chimneys, architectural features, and roof mounted equipment.*
§ 110.10(b)3B:	**Shading.** Any obstruction located on the roof or any other part of the building that projects above a solar zone must be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.*
§ 110.10(b)4:	**Structural Design Loads on Construction Documents.** For areas of the roof designated as a solar zone, the structural design loads for roof dead load and roof live load must be clearly indicated on the construction documents.
§ 110.10(c):	**Interconnection Pathways.** The construction documents must indicate: a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the solar zone to the point of interconnection with the electrical service; and for single family residences and central water-heating systems, a pathway reserved for routing plumbing from the solar zone to the water-heating system.
§ 110.10(d):	**Documentation.** A copy of the construction documents or a comparable document indicating the information from § 110.10(b) through § 110.10(c) must be provided to the occupant.
§ 110.10(e)1:	**Main Electrical Service Panel.** The main electrical service panel must have a minimum busbar rating of 200 amps.
§ 110.10(e)2:	**Main Electrical Service Panel.** The main electrical service panel must have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space must be permanently marked as “For Future Solar Electric”.

HVAC SYSTEM HEATING AND COOLING LOADS SUMMARY

Project Name	Date
Pine Tree Ave Residence	5/9/2022
System Name	**Floor Area**
HVAC System	557

ENGINEERING CHECKS

Number of Systems	1
Heating System	
Output per System	18,000
Total Output (Btuh)	18,000
Output (Btuh/sqft)	32.3
Cooling System	
Output per System	18,000
Total Output (Btuh)	18,000
Total Output (Tons)	1.5
Total Output (Btuh/sqft)	32.3
Total Output (sqft/Ton)	371.3
Air System	
CFM per System	0
Airflow (cfm)	0
Airflow (cfm/sqft)	0.00
Airflow (cfm/Ton)	0.0
Outside Air (%)	0.0%
Outside Air (cfm/sqft)	0.00
Note: values above given at ARI conditions	

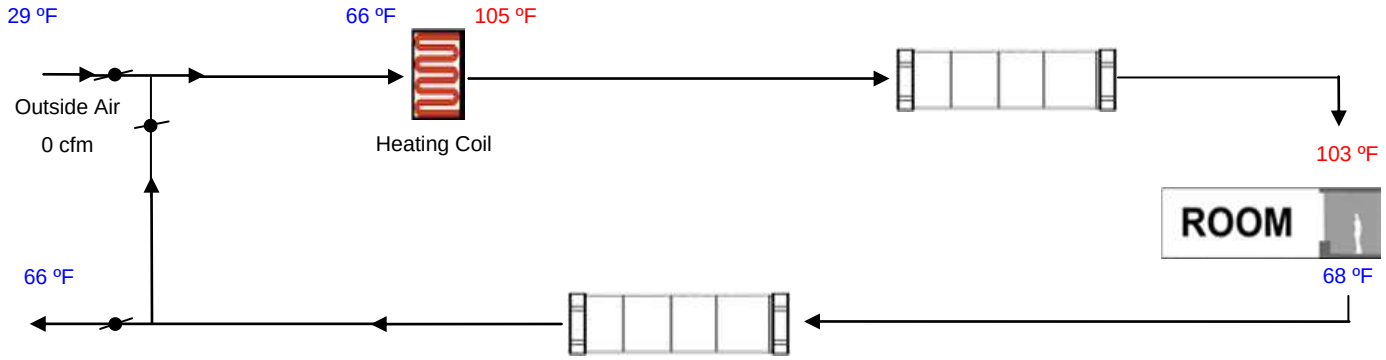
SYSTEM LOAD

	COIL COOLING PEAK			COIL HTG. PEAK	
	CFM	**Sensible**	**Latent**	**CFM**	**Sensible**
Total Room Loads	300	6,158	250	212	8,115
Return Vented Lighting		0			
Return Air Ducts		279			451
Return Fan		0			0
Ventilation	0	0	0	0	0
Supply Fan		0			0
Supply Air Ducts		279			451
TOTAL SYSTEM LOAD		6,716	250		9,017

HVAC EQUIPMENT SELECTION

Standard Heat Pump	17,296	0		12,176
Total Adjusted System Output (Adjusted for Peak Design conditions)	17,296	0		12,176
TIME OF SYSTEM PEAK	Aug 3 PM			Jan 1 AM

HEATING SYSTEM PSYCHROMETRICS (Airstream Temperatures at Time of Heating Peak)



COOLING SYSTEM PSYCHROMETRICS (Airstream Temperatures at Time of Cooling Peak)