# **BUILDING ENERGY ANALYSIS REPORT**

# **PROJECT:**

750 ADU

Orland, CA 95963

# **Project Designer:**

Jackson and Sands Engineering Inc 1250 East Ave #10 Chico, CA 95926

# **Report Prepared by:**

Jackson & Sands Engineering 1250 East Ave Suite 10 Chico, CA 95926 5307157184

Job Number:

23-XXX

Date:

6/16/2023

The EnergyPro computer program has been used to perform the calculations summarized in this compliance report. This program has approval and is authorized by the California Energy Commission for use with both the Residential and Nonresidential 2022 Building Energy Efficiency Standards.

This program developed by EnergySoft, LLC – www.energysoft.com.

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**Project Name:** 750 ADU **Calculation Date/Time:** 2023-05-15T14:13:18-07:00

Calculation Description: Title 24 Analysis Input File Name: Palisade Slab.ribd22x

GENER	AL INFORMATION	1,57								
01	Project Name	750 ADU	0 ADU							
02	Run Title	Title 24 Analysis	itle 24 Analysis							
03	Project Location									
04	City	Orland	2022							
06	Zip code	95963	07	Software Version	EnergyPro 9.1					
08	Climate Zone	11	09	Front Orientation (deg/ Cardinal)	All orientations					
10	Building Type	Single family	11	Number of Dwelling Units	1					
12	Project Scope	Newly Constructed	13	Number of Bedrooms	2					
14	Addition Cond. Floor Area (ft <sup>2</sup> )	0	15	Number of Stories	1					
16	Existing Cond. Floor Area (ft <sup>2</sup> )	n/a	17	Fenestration Average U-factor	0.28					
18	Total Cond. Floor Area (ft <sup>2</sup> )	749	19 Glazing Percentage (%) 16.20%							
20	ADU Bedroom Count	n/a								

COMPLIANCE RE	SULTS
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

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ENERGY DESIGN RATINGS	NERGY DESIGN RATINGS										
		Energy Design Ratings		Compliance Margins							
	Source Energy (EDR1)	Efficiency <sup>1</sup> EDR (EDR2efficiency)	Total <sup>2</sup> EDR (EDR2total)	Source Energy (EDR1)	Efficiency <sup>1</sup> EDR (EDR2efficiency)	Total <sup>2</sup> EDR (EDR2total)					
Standard Design	35.8	40.9	36.2								
Proposed Design											
North Facing	29.8	34.9	32.4	6	6	3.8					
East Facing	29.9	35.7	32.9	5.9	5.2	3.3					
South Facing	29.7	34.9	32.4	6.1	6	3.8					
West Facing	29.9 36.1		33.2	5.9	4.8	3					
			-3								

RESULT<sup>3</sup>: PASS

- Standard Design PV Capacity: 2.45 kWdc
- Proposed PV Capacity Scaling: North (2.45 kWdc) East (2.45 kWdc) South (2.45 kWdc) West (2.45 kWdc)

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<sup>&</sup>lt;sup>1</sup>Efficiency EDR includes improvements like a better building envelope and more efficient equipment

<sup>&</sup>lt;sup>2</sup>Total EDR includes efficiency and demand response measures such as photovoltaic (PV) system and batteries

<sup>&</sup>lt;sup>3</sup>Building complies when source energy, efficiency and total compliance margins are greater than or equal to zero and unmet load hour limits are not exceeded

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ENERGY USE SUMMARY				, 6		
Energy Use	Standard Design Source Energy (EDR1) (kBtu/ft <sup>2</sup> -yr)	Standard Design TDV Energy (EDR2) (kTDV/ft <sup>2</sup> -yr)	Proposed Design Source Energy (EDR1) (kBtu/ft <sup>2</sup> -yr)	Proposed Design TDV Energy (EDR2) (kTDV/ft <sup>2</sup> -yr)	Compliance Margin (EDR1)	Compliance Margin (EDR2)
Space Heating	5.9	25.94	4.42	35.23	1.48	-9.29
Space Cooling	2.36	51.59	1.67	38.26	0.69	13.33
IAQ Ventilation	0.46	4.92	0.46	4.92	0	0
Water Heating	3.55	35.37	2.06	22.25	1.49	13.12
Self Utilization/Flexibility Credit				0		0
North Facing Efficiency Compliance Total	12.27	117.82	8.61	100.66	3.66	17.16
Space Heating	5.9	25.94	4.4	35.01	1.5	-9.07
Space Cooling	2.36	51.59	1.77	40.56	0.59	11.03
IAQ Ventilation	0.46	4.92	0.46	4.92	0	0
Water Heating	3.55	35.37	2.06	22.24	1.49	13.13
Self Utilization/Flexibility Credit				0		0
East Facing Efficiency Compliance Total	12.27	117.82	8.69	102.73	3.58	15.09

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ENERGY USE SUMMARY						
Energy Use	Standard Design Source Energy (EDR1) (kBtu/ft <sup>2</sup> -yr)	Standard Design TDV Energy (EDR2) (kTDV/ft <sup>2</sup> -yr)	Proposed Design Source Energy (EDR1) (kBtu/ft <sup>2</sup> -yr)	Proposed Design TDV Energy (EDR2) (kTDV/ft <sup>2</sup> -yr)	Compliance Margin (EDR1)	Compliance Margin (EDR2)
Space Heating	5.9	25.94	4.36	34.55	1.54	-8.61
Space Cooling	2.36	51.59	1.69	38.74	0.67	12.85
IAQ Ventilation	0.46	4.92	0.46	4.92	0	0
Water Heating	3.55	35.37	2.06	22.24	1.49	13.13
Self Utilization/Flexibility Credit				0		0
South Facing Efficiency Compliance Total	12.27	117.82	8.57	100.45	3.7	17.37
Space Heating	5.9	25.94	4.39	35.05	1.51	-9.11
Space Cooling	2.36	51.59	1.81	41.94	0.55	9.65
IAQ Ventilation	0.46	4.92	0.46	4.92	0	0
Water Heating	3.55	35.37	2.06	22.24	1.49	13.13
Self Utilization/Flexibility Credit				0		0
West Facing Efficiency Compliance Total	12.27	117.82	8.72	104.15	3.55	13.67

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ENERGY USE INTENSITY			1,6	
	Standard Design (kBtu/ft <sup>2</sup> - yr )	Proposed Design (kBtu/ft <sup>2</sup> - yr )	Compliance Margin (kBtu/ft <sup>2</sup> - yr )	Margin Percentage
North Facing	•		40	
Gross EUI <sup>1</sup>	32.33	26.83	5.5	17.01
Net EUI <sup>2</sup>	15.35	9.85	5.5	35.83
East Facing	·			
Gross EUI <sup>1</sup>	32.33	27	5.33	16.49
Net EUI <sup>2</sup>	15.35	10.02	5.33	34.72
South Facing				
Gross EUI <sup>1</sup>	32.33	26.77	5.56	17.2
Net EUI <sup>2</sup>	15.35	9.79	5.56	36.22
West Facing				
Gross EUI <sup>1</sup>	32.33	27.07	5.26	16.27
Net EUI <sup>2</sup>	15.35	10.09	5.26	34.27
Notes				

1. Gross EUI is Energy Use Total (not including PV) / Total Building Area.

2. Net EUI is Energy Use Total (including PV) / Total Building Area.

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REQUIRED PV SYS	EQUIRED PV SYSTEMS												
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 (%)		
2.45	NA	Standard (14-17%)	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.

- Insulation below roof deck
- Window overhangs and/or fins
- Variable capacity heat pump compliance option (verification details from VCHP Staff report, Appendix B, and RA3)
- Northwest Energy Efficiency Alliance (NEEA) rated heat pump water heater; specific brand/model, or equivalent, must be installed

#### 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 building tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

- Indoor air quality ventilation
- Kitchen range hood
- Verified Refrigerant Charge
- Airflow in habitable rooms (SC3.1.4.1.7)
- Verified HSPF2
- Verified heat pump rated heating capacity
- Wall-mounted thermostat in zones greater than 150 ft2 (SC3.4.5)
- Ductless indoor units located entirely in conditioned space (SC3.1.4.1.8)

BUILDING - FEATURES INFORMATION											
01	02	03	03 04		06	07					
Project Name Conditioned Floor Area (ft <sup>2</sup> )		Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems					
750 ADU	749	1	2	1	0	1					

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ZONE INFORMATION										
01	02	03	04	05	06	07				
Zone Name	Zone Name Zone Type HVAC Syst		Zone Floor Area (ft <sup>2</sup> )	Avg. Ceiling Height	Water Heating System 1	Status				
Zone 1	Conditioned	HVAC System1	749	8	DHW Sys 1	New				

OPAQUE SURFACES											
01	02	02 03		05	06	07	08				
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft <sup>2</sup> )	Window and Door Area (ft2)	Tilt (deg)				
Front Wall	Zone 1	R-21 Wall	0	Front	315	67	90				
Left Wall	Zone 1	R-21 Wall	90	Left	283.5	24	90				
Rear Wall	Zone 1	R-21 Wall	180	Back	315	40	90				
Right Wall	Zone 1	R-21 Wall	270	Right	283.5	30	90				
Roof	Zone 1	R-38 Roof Attic	n/a	n/a	749	n/a	n/a				

ATTIC											
01	02	03	04	05	06	07	08				
Name	Construction	Туре	Roof Rise (x in 12)	Roof Reflectance	Roof Emittance	Radiant Barrier	Cool Roof				
Attic Zone 1	Attic RoofZone 1	Ventilated	5	0.1	0.85	No	No				

FENESTRATION /	ENESTRATION / GLAZING												
01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Туре	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft <sup>2</sup> )	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Window	Window	Front Wall	Front	0	5	4	1	20	0.28	NFRC	0.2	NFRC	Bug Screen
Window 2	Window	Front Wall	Front	0	6	4	1	24	0.28	NFRC	0.2	NFRC	Bug Screen
Window 3	Window	Front Wall	Front	0	3	1	1	3	0.28	NFRC	0.2	NFRC	Bug Screen

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FENESTRATION /	GLAZING												
01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Туре	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft <sup>2</sup> )	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Window 4	Window	Left Wall	Left	90	3	4	1	12	0.28	NFRC	0.2	NFRC	Bug Screen
Window 5	Window	Left Wall	Left	90	4	3	1	12	0.28	NFRC	0.2	NFRC	Bug Screen
Window 6	Window	Rear Wall	Back	180	5	4	1	20	0.28	NFRC	0.2	NFRC	Bug Screen
Window 7	Window	Rear Wall	Back	180	5	4	1 7	20	0.28	NFRC	0.2	NFRC	Bug Screen
Window 8	Window	Right Wall	Right	270	5	1	7	5	0.28	NFRC	0.2	NFRC	Bug Screen
Window 9	Window	Right Wall	Right	270	5	1	1	5	0.28	NFRC	0.2	NFRC	Bug Screen

OPAQUE DOORS			
01	02	03	04
Name	Side of Building	Area (ft <sup>2</sup> )	U-factor
Door	Front Wall	20	0.2
Door 2	Right Wall	20	0.2

OVERHANGS AND FINS													
01	02	03	04	05	06	07	08	09	10	11	12	13	14
	Overhang					Left Fin				Right Fin			
Window	Depth	Dist Up	Left Extent	Right Extent	Flap Ht.	Depth	Тор Uр	Dist L	Bot Up	Depth	Тор Uр	Dist R	Bot Up
Window	2	0.1	2	2	0	0	0	0	0	0	0	0	0
Window 2	2	0.1	2	2	0	0	0	0	0	0	0	0	0
Window 3	2	0.1	2	2	0	0	0	0	0	0	0	0	0
Window 4	8	0.1	8	8	0	0	0	0	0	0	0	0	0

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OVERHANGS AND FINS									5				
01	02	03	04	05	06	07	08	09	10	11	12	13	14
	Overhang						Left Fin				Right Fin		
Window	Depth	Dist Up	Left Extent	Right Extent	Flap Ht.	Depth	Тор Uр	Dist L	Bot Up	Depth	Тор Uр	Dist R	Bot Up
Window 5	2	0.1	2	2	0	0	0	0	0	0	0	0	0
Window 6	2	0.1	2	2	0	0	0	0	0	0	0	0	0
Window 7	6	0.1	6	6	0	0	0	0	0	0	0	0	0
Window 8	2	0.1	2	2	0	0	0	0	0	0	0	0	0
Window 9	2	0.1	2	2	0	0	0	0	0	0	0	0	0

SLAB FLOORS									
01	02	03	04	05	06	07	08		
Name	Zone	Area (ft <sup>2</sup> )	Perimeter (ft)	Edge Insul. R-value and Depth	Edge Insul. R-value and Depth	Carpeted Fraction	Heated		
Slab-on-Grade	Zone 1	749	133	none	0	80%	No		

OPAQUE SURFACE CONSTR	PAQUE 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-21 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	None / None	0.069	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Exterior Finish: 3 Coat Stucco					

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Calculation Description.	. Title 24 Allalysis		input rile ivalile. ralisaue Slab. ribuzzx							
OPAQUE SURFACE CONST	RUCTIONS									
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			
Attic RoofZone 1	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-19	None / 0	0.059	Roofing: Light Roof (Asphalt Shingle) Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: R-13.0 / 2x4 Around Roof Joists: R-6.0 insul.			
R-38 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-38	None / None	0.025	Over Ceiling Joists: R-28.9 insul. Cavity / Frame: R-9.1 / 2x4 Inside Finish: Gypsum Board			

BUILDING ENVELOPE - HERS VERIFICA	BUILDING ENVELOPE - HERS VERIFICATION									
01	02	03	04	05						
Quality Insulation Installation (QII)	High R-value Spray Foam Insulation	Building Envelope Air Leakage	CFM50	CFM50						
Not Required	Not Required	N/A	n/a	n/a						

WATER HEATING SYSTEMS									
01	02	03	04	05	06	07	08	09	
Name	System Type	Distribution Type	Water Heater Name	Number of Units	Solar Heating System	Compact Distribution	HERS Verification	Water Heater Name (#)	
DHW Sys 1	Domestic Hot Water (DHW)	Standard	DHW Heater 1	1	n/a	None	n/a	DHW Heater 1 (1)	

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WATER HEATERS - NEEA	WATER HEATERS - NEEA HEAT PUMP										
01	02	03	04	05	06	07	08				
Name	# of Units	Tank Vol. (gal)	NEEA Heat Pump Brand	NEEA Heat Pump Model	Tank Location	Duct Inlet Air Source	Duct Outlet Air Source				
DHW Heater 1	1	40	DirectEnergy	DirectEnergyECEPH4 015	Outside	Zone 1	Zone 1				

WATER HEATING - HERS VE	VATER HEATING - HERS VERIFICATION											
01	02	03	04	05	06	07						
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Compact Distribution Type	Recirculation Control	Shower Drain Water Heat Recovery						
DHW Sys 1 - 1/1	Not Required	Not Required	Not Required	None	Not Required	Not Required						

SPACE CONDITIONIN	PACE CONDITIONING SYSTEMS										
01	02	03	04	05	06	07	08	09			
Name	System Type	Heating Unit Name	Heating Equipment Count	Cooling Unit Name	Cooling Equipment Count	Fan Name	Distribution Name	Required Thermostat Type			
HVAC System1	Heat pump heating cooling	Heat Pump System	10	Heat Pump System 1	1	n/a	n/a	Setback			

HVAC - HEAT PUMPS												
01	02	03	04	05	06	07	08	09	10	11	12	13
				Heati	ng		Cooling					
Name	System Type	Number of Units	Efficiency Type	HSPF / HSPF2 / COP	Cap 47	Cap 17	Efficiency Type	SEER / SEER2	EER / EER / CEER	Zonally Controlled	Compressor Type	HERS Verification
Heat Pump System 1	VCHP-ductless	, <u>d</u>	HSPF2	8.2	17600	14608	EER2SEER2	14	11.7	Not Zonal	Single Speed	Heat Pump System 1-hers-htpump

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HVAC HEAT PUMPS - HERS VERIFICATION										
01	02	03	04	05	06	07	08	09		
Name	Verified Airflow	Airflow Target	Verified EER/EER2	Verified SEER/SEER2	Verified Refrigerant Charge	Verified HSPF/HSPF2	Verified Heating Cap 47	Verified Heating Cap 17		
Heat Pump System 1-hers-htpump	Not Required	0	Not Required	Not Required	Yes	No	Yes	Yes		

VARIABLE CAPACITY HEAT PUMP COMPLIANCE OPTION - HERS VERIFICATION										
01	02	03	04	05	06	07	08	09	10	
Name	Certified Low-Static VCHP System	Airflow to Habitable Rooms	Ductless Units in Conditioned Space	Wall Mount Thermostat	Air Filter Sizing & Drop Rating	Low Leakage Ducts in Conditioned Space	Minimum Airflow per RA3.3 and SC3.3.3.4.1	Certified non-continuous Fan	Indoor Fan not Running Continuously	
Heat Pump System 1	Not required	Required	Required	Required	Not required	Not required	Not required	Not required	Not required	

INDOOR AIR QUALITY	Y (IAQ) FANS							
01	02	03	04	05	06	07	08	09
Dwelling Unit	Airflow (CFM)	Fan Efficacy (W/CFM)	IAQ Fan Type	Includes Heat/Energy Recovery?	IAQ Recovery Effectiveness - SRE	Includes Fault Indicator Display?	HERS Verification	Status
SFam IAQVentRpt	44	0.35	Exhaust	No	n/a	No	Yes	

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DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:  Jackson & Sands Engineering	Signature Date: 6/16/2023
Address:	CEA/ HERS Certification Identification (If applicable):
1250 East Ave Suite 10	.6
City/State/Zip:	Phone:
Chico, CA 95926	5307157184
RESPONSIBLE PERSON'S DECLARATION STATEMENT	
	of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. nce are consistent with the information provided on other applicable compliance documents, worksheets,
Responsible Designer Name:	Responsible Designer Signature:
Company: Jackson and Sands Engineering Inc	Date Signed:
Address: 1250 East Ave #10	License:
City/State/Zip: Chico, CA 95926	Phone:

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		SURES S		<u>ARY</u>						RMS-1	
roject Name 50 ADU				Building Type ☑ Single Family ☐ Addition Alone ☐ Multi Family ☐ Existing+ Addition/Alteration							
roject Address			California Energy Climate Zone Total Cond. Floor Area Addition  CA Climate Zone 11 749 n/a						# of Units		
Orland		C	A Clima	n/a	1						
NSULATIO			0	.:4	Area	C	!-	l Faatuusa		Ctatura	
Construction			Cav	rity	(ft²)	Sp	есіа	I Features		Status	
	l Framed		R 20		1,036					New	
	ue Door		R-5		40					New	
Roof Wood Framed Attic			R 38			Add=R-1				New	
lab Unhe	ated Slab-on-Grad	e	- no in	sulation	749	Perim =	133			New	
ENESTR <i>A</i>	TION	Total Area:	121	Glazing	Percentage	: 16	5.2%	New/Altered Avera	age U-Factor:	0.28	
<b>Orientation</b>	$\mathbf{Area}(ft^2)$	U-Fac S	HGC	Overl	nang S	Sidefir	ns	Exterior Sh	ades	Status	
ront (N)	47.0	0.280	0.20	2.0	n	one		N/A		New	
eft (E)	12.0	0.280	0.20	8.0	n	one		N/A		New	
eft (E)	12.0	0.280	0.20	2.0	n	one		N/A		New	
ear (S)	20.0	0.280	0.20	2.0	n	one		N/A		New	
ear (S)	20.0	0.280	0.20	6.0	n	one		N/A		New	
ight (W)	10.0	0.280	0.20	2.0	n	one		N/A		New	
IVAC SYS											
Qty. Heat		Min. Eff		oling		Min.			mostat	Status	
1 Electric	Heat Pump	8.20 HSPF2	? Spi	it Heat Pu	тр	14.0 S	SEER2	Setback		New	
IVAC DIST	RIBUTION He	eating	Co	oling	Duct	Locat	tion		Ouct R-Value	Status	
VAC System	Ductl	ess / with Fan	Duc	tless	n/a			r	n/a	New	
VATER HE Qty. Type	_	Gall	ons	Min.	Eff D	istrib	utio	n		Status	
1 Heat F	итр	40		3.10	S	Standard				New	

