BUILDING ENERGY ANALYSIS REPORT

PROJECT:

Garage Conversion to ADU
4490 Collwood Blvd.
San Diego, CA 92115

Project Designer:

Pleasanton, CA 94566

Report Prepared by:

Job Number:

123

Date:

6/22/2023

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GENERAL INFORMATION					
01	Project Name	Garage Conversion to ADU			
02	Run Title	Title 24 Analysis			
03	Project Location	4490 Collwood Blvd.			
04	City	San Diego	05	Standards Version	2019
06	Zip code	92115	07	Software Version	EnergyPro 8.3
08	Climate Zone	7	09	Front Orientation (deg/ Cardinal)	225
10	Building Type	Multifamily	11	Number of Dwelling Units	11
12	Project Scope	AdditionOnly	13	Number of Bedrooms	11
14	Addition Cond. Floor Area (ft^2)	3585.53	15	Number of Stories	1
16	Existing Cond. Floor Area (ft^2)	4006	17	Fenestration Average U-factor	0.3
18	Total Cond. Floor Area (ft^2)	7591.53	19	Glazing Percentage (%)	13.78%
20	ADU Bedroom Count	n/a	21	ADU Conditioned Floor Area	n/a
22	Is Natural Gas Available?	Yes			

Addition Alone Project Analysis Parameters

01	02	03	04	05	06
Existing Area (excl. new addition) (ft2)	Addition Area (excl. existing) (ft2)	Total Area (ft2)	Existing Bedrooms	Addition Bedrooms	Total Bedrooms
4006	3585.53	7591.53	11	0	11

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 USE SUMMARY				
Energy Use (kTDV/ft^2-yr)	**Standard Design**	**Proposed Design**	**Compliance Margin**	**Percent Improvement**
Space Heating	6.03	0.7	5.33	88.4
Space Cooling	10.91	16.76	-5.85	-53.6
IAQ Ventilation	6.42	6.42	0	0
Water Heating	53.68	52.75	0.93	1.7
Self Utilization/Flexibility Credit	n/a	0	0	n/a
Compliance Energy Total	**77.04**	**76.63**	**0.41**	**0.5**

REQUIRED SPECIAL FEATURES

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

- 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

Building-level Verifications:
- Indoor air quality ventilation
- Enclosure air leakage for each dwelling unit
- Kitchen range hood

Cooling System Verifications:
- Verified EER
- Verified SEER
- Verified Refrigerant Charge
- Airflow in habitable rooms (SC3.1.4.1.7)

Heating System Verifications:
- Verified HSPF
- 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)

HVAC Distribution System Verifications:
- -- None --

Domestic Hot Water System Verifications:
- Pipe Insulation, All Lines

ZONE INFORMATION

01	02	03	04	05
Zone Name	**Zone Type**	**Zone Floor Area (ft^2)**	**Avg. Ceiling Height**	**Number of Dweilling Units**
Unit 2	Conditioned	333.75	8	1
Unit 3	Conditioned	335.42	8	1
Unit 5	Conditioned	341	8	1
Unit 7	Conditioned	322.86	8	1
Unit 1	Conditioned	330.49	8	1
Unit 8	Conditioned	344.63	8	1
Unit 9	Conditioned	341.81	8	1
Unit 10	Conditioned	343.44	8	1
Unit 4	Conditioned	535.75	8	1
Unit 6	Conditioned	184.65	8	1
Unit 11	Conditioned	171.73	8	1

DWELLING UNIT INFORMATION

01	02	03
Dwelling Unit Name	**Dwelling Unit Type**	**Zone**
DDU-1 Unit 2-(1/1)	DU-1 Unit 2	Unit 2
DDU-2 Unit 3-(1/1)	DU-2 Unit 3	Unit 3
DDU-3 Unit 5-(1/1)	DU-3 Unit 5	Unit 5
DDU-4 Unit 7-(1/1)	DU-4 Unit 7	Unit 7
DDU-5 Unit 1-(1/1)	DU-5 Unit 1	Unit 1
DDU-6 Unit 8-(1/1)	DU-6 Unit 8	Unit 8
DDU-7 Unit 9-(1/1)	DU-7 Unit 9	Unit 9

DWELLING UNIT INFORMATION

01	02	03
Dwelling Unit Name	**Dwelling Unit Type**	**Zone**
DDU-8 Unit 10-(1/1)	DU-8 Unit 10	Unit 10
DDU-9 Unit 4-(1/1)	DU-9 Unit 4	Unit 4
DDU-10 Unit 6-(1/1)	DU-10 Unit 6	Unit 6
DDU-11 Unit 11-(1/1)	DU-11 Unit 11	Unit 11

DWELLING UNIT TYPES

01	02	03	04	05	06	07
Name	CFA (ft2)	Number of Bedrooms	Number in Building	Space Conditioning Systems Assigned	DHW System Name	IAQ Vent Fan Name
DU-1 Unit 2	333.75	1	1	DDU-1 Unit 2 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-2 Unit 3	335.42	1	1	DDU-2 Unit 3 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-3 Unit 5	341	1	1	DDU-3 Unit 5 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-4 Unit 7	322.86	1	1	DDU-4 Unit 7 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-5 Unit 1	330.49	1	1	DDU-5 Unit 1 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-6 Unit 8	344.63	1	1	DDU-6 Unit 8 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-7 Unit 9	341.81	1	1	DDU-7 Unit 9 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-8 Unit 10	343.44	1	1	DDU-8 Unit 10 | :Heat Pump System 1:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-9 Unit 4	535.75	1	1	DDU-9 Unit 4 | :Heat Pump System 2:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-10 Unit 6	184.65	1	1	DDU-10 Unit 6 | :Heat Pump System 3:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan
DU-11 Unit 11	171.73	1	1	DDU-11 Unit 11 | :Heat Pump System 3:::2:3	DHW Sys 1	Minimum Exhaust IAQ Fan

OPAQUE SURFACES

01	02	03	04	05	06	07	08	09	10
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)	Wall Exceptions	Status
North East	Unit 2	R-15 Wall	45	Back	214	6	90	none	New
South West	Unit 2	R-15 Wall	225	Front	214	65	90	none	New
North East 2	Unit 3	R-15 Wall	45	Back	214	6	90	none	New
South West 2	Unit 3	R-15 Wall	225	Front	214	65	90	none	New
North East 3	Unit 5	R-15 Wall	45	Back	214	6	90	none	New
South West 3	Unit 5	R-15 Wall	225	Front	214	65	90	none	New
North East 4	Unit 7	R-15 Wall	45	Back	214	6	90	none	New
South West 4	Unit 7	R-15 Wall	225	Front	214	65	90	none	New
North West	Unit 7	R-15 Wall	315	Left	248	0	90	none	New
North East 5	Unit 1	R-15 Wall	45	Back	214	6	90	none	New
South West 5	Unit 1	R-15 Wall	225	Front	214	65	90	none	New
North West 2	Unit 1	R-15 Wall	315	Left	242	0	90	none	New
North East 6	Unit 8	R-15 Wall	45	Back	214	6	90	none	New
South West 6	Unit 8	R-15 Wall	225	Front	214	65	90	none	New
North East 7	Unit 9	R-15 Wall	45	Back	214	6	90	none	New
South West 7	Unit 9	R-15 Wall	225	Front	214	65	90	none	New
North East 8	Unit 10	R-15 Wall	45	Back	214	6	90	none	New
South West 8	Unit 10	R-15 Wall	225	Front	214	65	90	none	New
North East 9	Unit 4	R-15 Wall	45	Back	335	6	90	none	New
South West 9	Unit 4	R-15 Wall	225	Front	335	53	90	none	New
North East 10	Unit 6	R-15 Wall	45	Back	130	0	90	none	New
South West 10	Unit 6	R-15 Wall	225	Front	130	49	90	none	New
South East	Unit 6	R-15 Wall	225	Front	242	0	90	none	New
North East 11	Unit 11	R-15 Wall	45	Back	121	0	90	none	New
South West 11	Unit 11	R-15 Wall	225	Front	121	49	90	none	New

OPAQUE SURFACES

01	02	03	04	05	06	07	08	09	10
Name	**Zone**	**Construction**	**Azimuth**	**Orientation**	**Gross Area (ft^2)**	**Window and Door Area (ft2)**	**Tilt (deg)**	**Wall Exceptions**	**Status**
South East 2	Unit 11	R-15 Wall	225	Front	242	0	90	none	New
Adjacent to Unit 1	Unit 2>>Unit 1	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 3	Unit 2>>Unit 3	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 2	Unit 3>>Unit 2	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 4	Unit 3>>Unit 4	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 4 2	Unit 5>>Unit 4	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 6	Unit 5>>Unit 6	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 8	Unit 7>>Unit 8	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 2 2	Unit 1>>Unit 2	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 7	Unit 8>>Unit 7	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 9	Unit 8>>Unit 9	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 8 2	Unit 9>>Unit 8	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 10	Unit 9>>Unit 10	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 11	Unit 10>>Unit 11	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 9 2	Unit 10>>Unit 9	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 3 2	Unit 4>>Unit 3	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 5	Unit 4>>Unit 5	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 5 2	Unit 6>>Unit 5	R-15 Wall1	n/a	n/a	242	0	n/a		New
Adjacent to Unit 10 2	Unit 11>>Unit 10	R-15 Wall1	n/a	n/a	242	0	n/a		New

OPAQUE SURFACES

01	02	03	04	05	06	07	08	09	10
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window and Door Area (ft2)	Tilt (deg)	Wall Exceptions	Status
Ceiling	Unit 2	Ceiling 01	n/a	n/a	333.75	n/a	n/a		New
Ceiling 2	Unit 3	Ceiling 01	n/a	n/a	335.42	n/a	n/a		New
Ceiling 3	Unit 5	Ceiling 01	n/a	n/a	341	n/a	n/a		New
Ceiling 4	Unit 7	Ceiling 01	n/a	n/a	322.8	n/a	n/a		New
Ceiling 5	Unit 1	Ceiling 01	n/a	n/a	330.49	n/a	n/a		New
Ceiling 6	Unit 8	Ceiling 01	n/a	n/a	344.63	n/a	n/a		New
Ceiling 7	Unit 9	Ceiling 01	n/a	n/a	344.63	n/a	n/a		New
Ceiling 8	Unit 10	Ceiling 01	n/a	n/a	344.63	n/a	n/a		New
Ceiling 9	Unit 4	Ceiling 01	n/a	n/a	535.75	n/a	n/a		New
Ceiling 10	Unit 6	Ceiling 01	n/a	n/a	184.65	n/a	n/a		New
Ceiling 11	Unit 11	Ceiling 01	n/a	n/a	171.73	n/a	n/a		New

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
B	Window	North East	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A	Window	South West	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D	Window	South West	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 2	Window	North East 2	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 2	Window	South West 2	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 2	Window	South West 2	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 3	Window	North East 3	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 3	Window	South West 3	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 3	Window	South West 3	Front	225			1	16	0.3	NFRC	0.23	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
B 4	Window	North East 4	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 4	Window	South West 4	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 4	Window	South West 4	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 5	Window	North East 5	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 5	Window	South West 5	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 5	Window	South West 5	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 6	Window	North East 6	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 6	Window	South West 6	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 6	Window	South West 6	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 7	Window	North East 7	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 7	Window	South West 7	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 7	Window	South West 7	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 8	Window	North East 8	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 8	Window	South West 8	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
D 8	Window	South West 8	Front	225			1	16	0.3	NFRC	0.23	NFRC	Bug Screen
B 9	Window	North East 9	Back	45			1	6	0.3	NFRC	0.23	NFRC	Bug Screen
A 9	Window	South West 9	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
C	Window	South West 9	Front	225			1	4	0.3	NFRC	0.23	NFRC	Bug Screen
A 10	Window	South West 10	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen
A 11	Window	South West 11	Front	225			1	28	0.3	NFRC	0.23	NFRC	Bug Screen

OPAQUE DOORS

01	02	03	04
Name	Side of Building	Area (ft^2)	U-factor
D1	South West	21	0.2

OPAQUE DOORS

01	02	03	04
Name	**Side of Building**	**Area (ft^2)**	**U-factor**
D1 2	South West 2	21	0.2
D1 3	South West 3	21	0.2
D1 4	South West 4	21	0.2
D1 5	South West 5	21	0.2
D1 6	South West 6	21	0.2
D1 7	South West 7	21	0.2
D1 8	South West 8	21	0.2
D1 9	South West 9	21	0.2
D1 10	South West 10	21	0.2
D1 11	South West 11	21	0.2

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-on-Grade	Unit 2	333.75	0.1	none	0	80%	No
Slab-on-Grade 2	Unit 3	335.42	0.1	none	0	80%	No
Slab-on-Grade 3	Unit 5	341	0.1	none	0	80%	No
Slab-on-Grade 4	Unit 7	322.8	0.1	none	0	80%	No
Slab-on-Grade 5	Unit 1	330.49	0.1	none	0	80%	No
Slab-on-Grade 6	Unit 8	344.63	0.1	none	0	80%	No
Slab-on-Grade 7	Unit 9	344.63	0.1	none	0	80%	No
Slab-on-Grade 8	Unit 10	344.63	0.1	none	0	80%	No

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-on-Grade 9	Unit 4	535.75	0.1	none	0	80%	No
Slab-on-Grade 10	Unit 6	184.65	0.1	none	0	80%	No
Slab-on-Grade 11	Unit 11	171.73	0.1	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-15 Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	R-15	None / None	0.095	Inside Finish: Gypsum Board Cavity / Frame: R-15 / 2x4 Exterior Finish: 3 Coat Stucco
R-15 Wall1	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	R-15	None / None	0.086	Inside Finish: Gypsum Board Cavity / Frame: R-15 / 2x4 Other Side Finish: Gypsum Board
Ceiling 01	Interior Ceiling	Wood Framed Ceiling	2x10 @ 16 in. O. C.	R-30	None / None	0.033	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-30 / 2x10 Ceiling Below 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	08	09
Name	System Type	Number of Systems in Building	Multi-Family Distribution Type	Dwelling Unit Distribution Type	Water Heater Name (#)	Solar Heating System	Compact Distribution	HERS Verification
DHW Sys 1	Domestic Hot Water (DHW)	11	n/a	HERS Verified Pipe Insulation credit	DHW Heater 1 (1)	n/a	None	DHW Sys 1-hers-dhw

WATER HEATERS

01	02	03	04	05	06	07	08	09	10	11	12	13	14
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	Status	Verified Existing Condition
DHW Heater 1	Heat Pump	n/a	11	80	NEEA Rated	<= 12 kW	n/a	n/a	n/a	A. O. Smith\FPTU 80 120 (80 gal)	Outside	New	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
DDU-1 Unit 2 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-2 Unit 3 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-3 Unit 5 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-4 Unit 7 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-5 Unit 1 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required

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**
DDU-6 Unit 8 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-7 Unit 9 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-8 Unit 10 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-9 Unit 4 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-10 Unit 6 | DHW Sys 1	Required	Not Required	Not Required	None	Not Required	Not Required	Not Required
DDU-11 Unit 11 | DHW Sys 1	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**
DDU-1 Unit 2 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-2 Unit 3 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-3 Unit 5 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-4 Unit 7 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-5 Unit 1 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1

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**
DDU-6 Unit 8 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-7 Unit 9 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-8 Unit 10 | :Heat Pump System 1:::2:3	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	n/a	n/a	Setback	New	NA	1	1
DDU-9 Unit 4 | :Heat Pump System 2:::2:3	Heat pump heating cooling	Heat Pump System 2	Heat Pump System 2	n/a	n/a	Setback	New	NA	1	1
DDU-10 Unit 6 | :Heat Pump System 3:::2:3	Heat pump heating cooling	Heat Pump System 3	Heat Pump System 3	n/a	n/a	Setback	New	NA	1	1
DDU-11 Unit 11 | :Heat Pump System 3:::2:3	Heat pump heating cooling	Heat Pump System 3	Heat Pump System 3	n/a	n/a	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/HSPF2/COP	**Cap 47**	**Cap 17**	**SEER/SEER2**	**EER/EER2/CEER**			
Heat Pump System 1	VCHP-ductless	8	14	12000	10000	32	13.5	Not Zonal	Single Speed	Heat Pump System 1-hers-htpump
Heat Pump System 2	VCHP-ductless	1	14	18000	12000	28.2	13.5	Not Zonal	Single Speed	Heat Pump System 2-hers-htpump
Heat Pump System 3	VCHP-ductless	2	14	7000	5000	40	13.5	Not Zonal	Single Speed	Heat Pump System 3-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	Not Required	0	Required	Required	Yes	Yes	Yes	Yes
Heat Pump System 2-hers-htpump	Not Required	0	Required	Required	Yes	Yes	Yes	Yes
Heat Pump System 3-hers-htpump	Not Required	0	Required	Required	Yes	Yes	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 & Pressure 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
Heat Pump System 2	Not required	Required	Required	Required	Not required	Not required	Not required	Not required	Not required
Heat Pump System 3	Not required	Required	Required	Required	Not required	Not required	Not required	Not required	Not required

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
DDU-1 Unit 2 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-2 Unit 3 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-3 Unit 5 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-4 Unit 7 1/1	25	0.35	Exhaust	n/a	n/a	Yes

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**
DDU-5 Unit 1 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-6 Unit 8 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-7 Unit 9 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-8 Unit 10 1/1	25	0.35	Exhaust	n/a	n/a	Yes
DDU-9 Unit 4 1/1	31	0.35	Exhaust	n/a	n/a	Yes
DDU-10 Unit 6 1/1	21	0.35	Exhaust	n/a	n/a	Yes
DDU-11 Unit 11 1/1	20	0.35	Exhaust	n/a	n/a	Yes

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name: Mohamad Al Nhayli	Documentation Author Signature: Mohamad Al Nhayli
Company: Innodez - Digital ID	Signature Date: 06/22/2023
Address: Pleasanton	CEA/ HERS Certification Identification (If applicable):
City/State/Zip: Pleasanton, CA 94566	Phone: 2134290414

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: roberto calderon	Responsible Designer Signature: roberto calderon
Company: Calderon Design Group	Date Signed: 06/22/2023
Address: 3622 santa carlotta st	License:
City/State/Zip: la crescenta, CA 91214	Phone: 8188133598

Digitally signed by California Home Energy Efficiency Rating Services (CHEERS). 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.

RESIDENTIAL MEASURES SUMMARY

RMS-1

Project Name	Building Type	Date
Garage Conversion to ADU	☐ Single Family ☑ Addition Alone ☑ Multi Family ☐ Existing+ Addition/Alteration	*6/22/2023*

Project Address	California Energy Climate Zone	Total Cond. Floor Area	Addition	# of Units
4490 Collwood Blvd. San Diego	*CA Climate Zone 07*	*3,586*	*0*	*11*

INSULATION

Construction	Type	Cavity	Area (ft^2)	Special Features	Status
Wall	*Wood Framed*	*R 15*	*8,711*		*New*
Door	*Opaque Door*	*R-5*	*231*		*New*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*1,333*	*Perim = 0'*	*New*
Demising	*Wood Framed Rafter*	*R 30*	*334*		*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*335*		*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*341*		*Existing*
Wall	*Wood Framed*	*R 15*	*248*		*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*323*		*Existing*

FENESTRATION

Total Area: *494* Glazing Percentage: *13.8%* New/Altered Average U-Factor: *0.30*

Orientation	Area(ft^2)	U-Fac	SHGC	Overhang	Sidefins	Exterior Shades	Status
Rear (NE)	*54.0*	*0.300*	*0.23*	*none*	*none*	*N/A*	*New*
Front (SW)	*440.0*	*0.300*	*0.23*	*none*	*none*	*N/A*	*New*

HVAC SYSTEMS

Qty.	Heating	Min. Eff	Cooling	Min. Eff	Thermostat	Status
8	*Split Heat Pump*	*14.00 HSPF*	*Split Heat Pump*	*32.0 SEER*	*Setback*	*New*
1	*Split Heat Pump*	*14.00 HSPF*	*Split Heat Pump*	*28.2 SEER*	*Setback*	*New*
2	*Split Heat Pump*	*14.00 HSPF*	*Split Heat Pump*	*40.0 SEER*	*Setback*	*New*

HVAC DISTRIBUTION

Location	Heating	Cooling	Duct Location	Duct R-Value	Status
HP 1,2,3,5,7,8,9,10	*Ductless / with Fan*	*Ductless*	*n/a*	*n/a*	*New*
HP 4	*Ductless / with Fan*	*Ductless*	*n/a*	*n/a*	*New*
HP 6 & 11	*Ductless / with Fan*	*Ductless*	*n/a*	*n/a*	*New*

WATER HEATING

Qty.	Type	Gallons	Min. Eff	Distribution	Status
3	*CECDHWType_LHP*	*80*	*2.70*	*All Pipes Ins (HERS)*	*New*

RESIDENTIAL MEASURES SUMMARY

RMS-1

Project Name	Building Type	Date
Garage Conversion to ADU	☐ Single Family ☑ Addition Alone ☑ Multi Family ☐ Existing+ Addition/Alteration	*6/22/2023*

Project Address	California Energy Climate Zone	Total Cond. Floor Area	Addition	# of Units
4490 Collwood Blvd. San Diego	*CA Climate Zone 07*	*3,586*	*0*	*11*

INSULATION

Construction	Type	Cavity	Area (ft^2)	Special Features	Status
Wall	*Wood Framed*	*R 15*	*242*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*330*	*Perim = 0'*	*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*330*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*345*	*Perim = 0'*	*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*345*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*345*	*Perim = 0'*	*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*345*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*345*	*Perim = 0'*	*Existing*

FENESTRATION

Total Area: *494* | Glazing Percentage: *13.8%* | New/Altered Average U-Factor: *0.30*

Orientation	Area(ft^2)	U-Fac	SHGC	Overhang	Sidefins	Exterior Shades	Status

HVAC SYSTEMS

Qty.	Heating	Min. Eff	Cooling	Min. Eff	Thermostat	Status

HVAC DISTRIBUTION

Location	Heating	Cooling	Duct Location	Duct R-Value	Status

WATER HEATING

Qty.	Type	Gallons	Min. Eff	Distribution	Status

RESIDENTIAL MEASURES SUMMARY — RMS-1

Project Name	Building Type	Date
Garage Conversion to ADU	☐ Single Family ☑ Addition Alone ☑ Multi Family ☐ Existing+ Addition/Alteration	*6/22/2023*

Project Address	California Energy Climate Zone	Total Cond. Floor Area	Addition	# of Units
4490 Collwood Blvd. San Diego	*CA Climate Zone 07*	*3,586*	*0*	*11*

INSULATION

Construction	Type	Cavity	Area (ft^2)	Special Features	Status
Demising	*Wood Framed Rafter*	*R 30*	*345*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*536*	*Perim = 0'*	*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*536*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*185*	*Perim = 0'*	*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*185*		*Existing*
Slab	*Unheated Slab-on-Grade*	*- no insulation*	*172*	*Perim = 0'*	*Existing*
Demising	*Wood Framed Rafter*	*R 30*	*172*		*Existing*

FENESTRATION

Total Area: *494* Glazing Percentage: *13.8%* New/Altered Average U-Factor: *0.30*

Orientation	Area(ft^2)	U-Fac	SHGC	Overhang	Sidefins	Exterior Shades	Status

HVAC SYSTEMS

Qty.	Heating	Min. Eff	Cooling	Min. Eff	Thermostat	Status

HVAC DISTRIBUTION

Location	Heating	Cooling	Duct Location	Duct R-Value	Status

WATER HEATING

Qty.	Type	Gallons	Min. Eff	Distribution	Status

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
Garage Conversion to ADU	6/22/2023
System Name	**Floor Area**
HP 1,2,3,5,7,8,9,10	2,693

ENGINEERING CHECKS

Number of Systems	8
Heating System	
Output per System	12,000
Total Output (Btuh)	96,000
Output (Btuh/sqft)	35.6
Cooling System	
Output per System	12,000
Total Output (Btuh)	96,000
Total Output (Tons)	8.0
Total Output (Btuh/sqft)	35.6
Total Output (sqft/Ton)	336.7
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

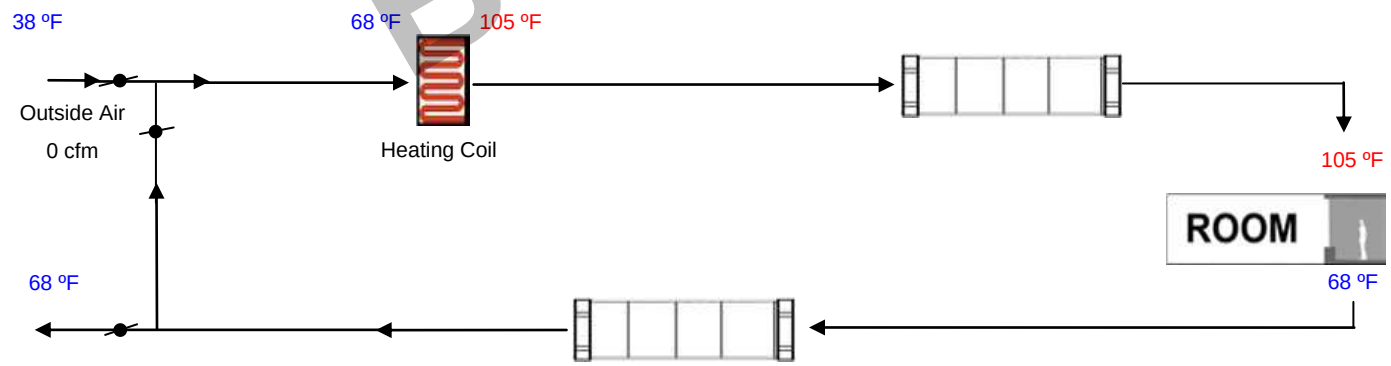
SYSTEM LOAD

	COIL COOLING PEAK			COIL HTG. PEAK	
	CFM	**Sensible**	**Latent**	**CFM**	**Sensible**
Total Room Loads	1,527	32,958	2,020	440	17,571
Return Vented Lighting		0			
Return Air Ducts		0			0
Return Fan		0			0
Ventilation	0	0	0	0	0
Supply Fan		0			0
Supply Air Ducts		0			0
TOTAL SYSTEM LOAD		32,958	2,020		17,571

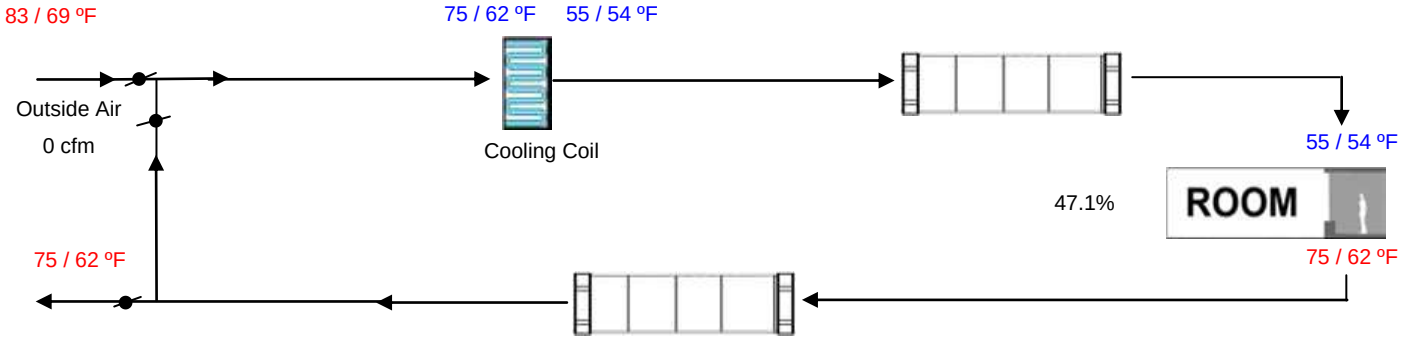
HVAC EQUIPMENT SELECTION

1 Ton HP	93,490	0		80,363
Total Adjusted System Output (Adjusted for Peak Design conditions)	93,490	0		80,363
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)



HVAC SYSTEM HEATING AND COOLING LOADS SUMMARY

Project Name	Date
Garage Conversion to ADU	6/22/2023
System Name	**Floor Area**
HP 4	536

ENGINEERING CHECKS

Number of Systems	1
Heating System	
Output per System	18,000
Total Output (Btuh)	18,000
Output (Btuh/sqft)	33.6
Cooling System	
Output per System	18,000
Total Output (Btuh)	18,000
Total Output (Tons)	1.5
Total Output (Btuh/sqft)	33.6
Total Output (sqft/Ton)	357.2
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

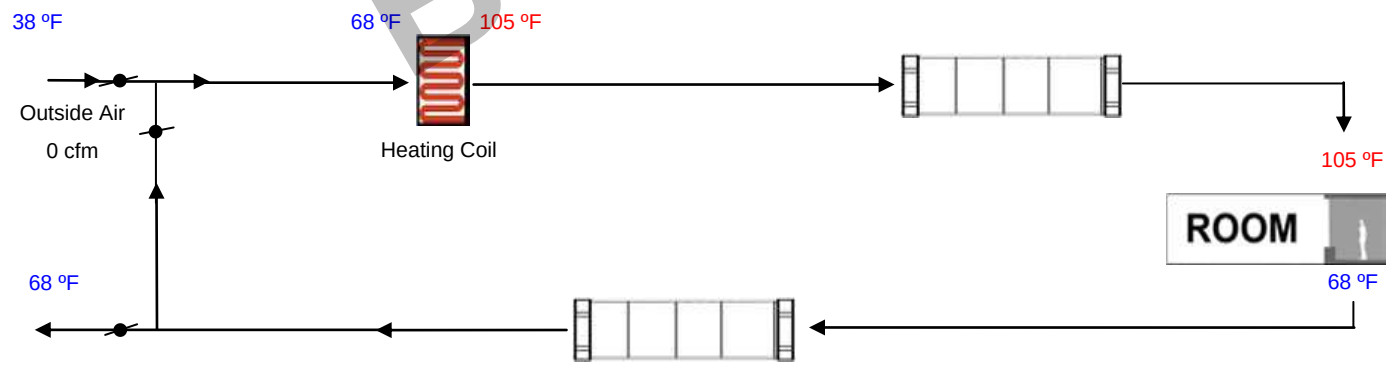
SYSTEM LOAD

	COIL COOLING PEAK			COIL HTG. PEAK	
	CFM	**Sensible**	**Latent**	**CFM**	**Sensible**
Total Room Loads	216	4,656	402	72	2,878
Return Vented Lighting		0			
Return Air Ducts		0			0
Return Fan		0			0
Ventilation	0	0	0	0	0
Supply Fan		0			0
Supply Air Ducts		0			0
TOTAL SYSTEM LOAD		4,656	402		2,878

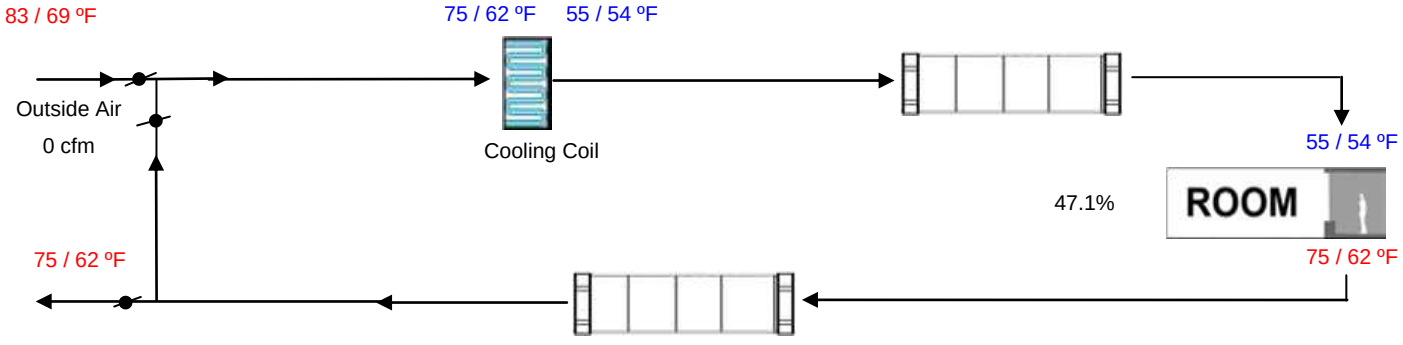
HVAC EQUIPMENT SELECTION

1.5 Ton HP	15,433	2,096		15,068
Total Adjusted System Output (Adjusted for Peak Design conditions)	15,433	2,096		15,068
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)



HVAC SYSTEM HEATING AND COOLING LOADS SUMMARY

Project Name	Date
Garage Conversion to ADU	6/22/2023
System Name	**Floor Area**
HP 6 & 11	356

ENGINEERING CHECKS

Number of Systems	2
Heating System	
Output per System	7,000
Total Output (Btuh)	14,000
Output (Btuh/sqft)	39.3
Cooling System	
Output per System	7,000
Total Output (Btuh)	14,000
Total Output (Tons)	1.2
Total Output (Btuh/sqft)	39.3
Total Output (sqft/Ton)	305.5
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

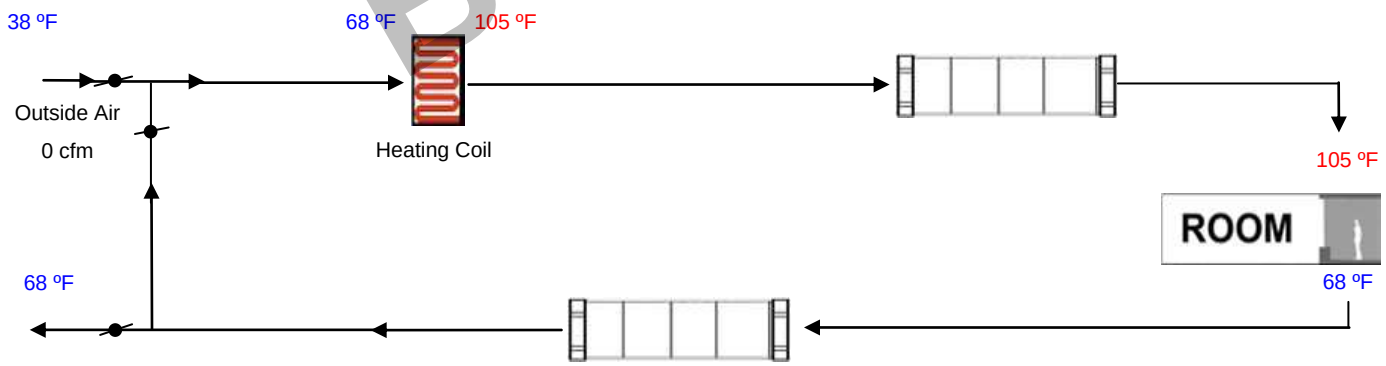
SYSTEM LOAD

	COIL COOLING PEAK			COIL HTG. PEAK	
	CFM	**Sensible**	**Latent**	**CFM**	**Sensible**
Total Room Loads	289	6,240	267	96	3,843
Return Vented Lighting		0			
Return Air Ducts		0			0
Return Fan		0			0
Ventilation	0	0	0	0	0
Supply Fan		0			0
Supply Air Ducts		0			0
TOTAL SYSTEM LOAD		6,240	267		3,843

HVAC EQUIPMENT SELECTION

0.5 Ton HP	12,861	773		11,720
Total Adjusted System Output (Adjusted for Peak Design conditions)	12,861	773		11,720
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)