

2021 IECC RESIDENTIAL THERMAL ENVELOPE COMPLIANCE REPORT (REScheck™ Method)

Section R402.1.5 Total Building Thermal Conductance (UA) Alternative | Climate Zone 4A | DOE REScheck-Web 4.2.0 / IECC Total UA Engine (IECC 2015/2018/2021/2024)

✓ COMPLIANT — Proposed UA is 12.1% better than 2021 IECC maximum

Proposed Building Total UA = 138.35 BTU/h/°F vs. 2021 IECC Code Maximum UA = 157.36 BTU/h/°F (Net Savings: 19.01 BTU/h/°F | Area-Weighted Window U = 0.259, SHGC = 0.270 ≤ 0.40)

Project Title:	Glenwood Detached Backyard ADU — Full Permit Submittal Package	Code Edition:	2021 IECC Residential (Ch. 4)
Site Address:	1104 Glenwood Ave, Raleigh, NC 27605	Climate Zone:	Zone 4A (DOE / IECC Table R301.1)
Jurisdiction:	City of Raleigh Planning & Development / Inspections Dept. (Wake County, NC)	Compliance Path:	R402.1.5 Total UA Performance Alternative
Owner / Builder:	Five Points ADU Collective LLC / Oak City Infill Builders	Air Leakage Target:	≤ 2.4 ACH50 (Code Max ≤ 3.0 ACH50, R402.4.1.2)
Building Type:	Detached Backyard Accessory Dwelling Unit (ADU) (1-Story, 1 BR)	Duct System Spec:	Ductless Multi-Zone Mini-Split Heat Pump (100% Conditioned Space)
Conditioned Area:	780 sq ft Insulated Monolithic Slab-on-Grade (R-10 Perimeter, 4 ft)	Plan Set Ref:	October 2026 — Permit Submittal Set Rev. 1

1. COMPONENT PERFORMANCE SUMMARY (TOTAL UA / THERMAL CONDUCTANCE COMPARISON)

Envelope Component Category	Total Area / Perim	Prescriptive Ref	Proposed UA (BTU/h/°F)	Code Max UA (BTU/h/°F)	UA Delta (BTU/h/°F)	Status
Ceilings / Roof Assemblies	780.0 sq ft	R-60 (U-0.024)	16.38	18.72	+2.34	INCLUDED
Above-Grade Walls (Opaque)	850.0 sq ft	R-20+5ci or 13+10ci (U-0.045)	35.12	38.26	+3.14	INCLUDED
Windows, Skylights & Doors	137.0 sq ft	U-0.30 / SHGC 0.40	34.41	41.10	+6.69	INCLUDED
Framed Floors Over Uncond. Space	0.0 sq ft	R-19 (U-0.047)	0.00	0.00	+0.00	N/A (0)
Slab-on-Grade Perimeter (F x L)	114.0 lin ft	R-10, 4ft (F-0.52)	52.44	59.28	+6.84	INCLUDED
Basement & Crawlspace Walls	0.0 sq ft	R-10ci or 13 (U-0.059)	0.00	0.00	+0.00	N/A (0)
TOTAL BUILDING ENVELOPE UA (2021 IECC R402.1.5)	780 sq ft CFA	Margin: +12.1%	138.35	157.36	+19.01	PASS

THERMAL CONDUCTANCE (UA) VISUAL COMPARISON — PROPOSED VS. IECC CODE MAXIMUM

IECC Code Maximum UA: 157.36 BTU/h/°F (100.0% Max Allowed)

Proposed Design UA: 138.35 BTU/h/°F (87.9% of Max — PASSES BY 12.1%)

Net UA Savings: 19.01 BTU/h/°F | Weighted Window U: 0.259 (Max 0.30) | Weighted SHGC: 0.270 (Max 0.40) | Glazing/Floor Ratio: 14.9%

2. ENVELOPE ASSEMBLY SCHEDULE & THERMAL CONDUCTANCE CALCULATION TABLE

ID / Component Assembly Description	Orient.	Area / Perim	Proposed R-Value	Prop. U/F	Code U/F	Prop. UA	Code UA	Plan Sheet Ref
01. ADU Vaulted Rafter Roof Assembly (High-Density Spray Foam)	Horiz	780.0 sq ft	R-49 + R-10 ci	U-0.021	U-0.024	16.38	18.72	ADU-A2.1, A5.1
02. North Exterior Wall (2x6 @ 16" o.c. + R-20 Cavity + R-5 ZIP-R)	North	240.0 sq ft	R-20 + R-5 ci	U-0.042	U-0.045	10.08	10.80	ADU-A3.1, A5.1
03. South Exterior Wall (2x6 @ 16" o.c. + R-20 Cavity + R-5 ZIP-R)	South	220.0 sq ft	R-20 + R-5 ci	U-0.042	U-0.045	9.24	9.90	ADU-A3.1, A5.1

ID / Component Assembly Description	Orient.	Area / Perim	Proposed R-Value	Prop. U/F	Code U/F	Prop. UA	Code UA	Plan Sheet Ref
04. East Exterior Wall (2x6 @ 16" o.c. + R-20 Cavity + R-5 ZIP-R)	East	195.0 sq ft	R-20 + R-5 ci	U-0.042	U-0.045	8.19	8.78	ADU-A3.2, A5.1
05. West Exterior Wall (2x6 @ 16" o.c. + R-20 Cavity + R-7.5 ci)	West	195.0 sq ft	R-20 + R-7.5 ci	U-0.039	U-0.045	7.61	8.78	ADU-A3.2, A5.1
06. North Casement Windows — Pella Impervia Low-E Argon (SHGC 0.28)	North	28.0 sq ft	NFRC U-0.26	U-0.260	U-0.300	7.28	8.40	ADU-A6.1 (W1-W2)
07. South Patio Glazing & Windows — Pella Impervia Low-E Argon (SHGC 0.28)	South	48.0 sq ft	NFRC U-0.26	U-0.260	U-0.300	12.48	14.40	ADU-A6.1 (W3-W5)
08. East Bedroom Windows — Pella Impervia Low-E Argon (SHGC 0.27)	East	24.0 sq ft	NFRC U-0.26	U-0.260	U-0.300	6.24	7.20	ADU-A6.1 (W6-W7)
09. West Studio Window — Pella SunDefense Low-E3 Argon (SHGC 0.22)	West	16.0 sq ft	NFRC U-0.25	U-0.250	U-0.300	4.00	4.80	ADU-A6.1 (W8)
10. Insulated Fiberglass Entry Door (D1)	South	21.0 sq ft	R-6 Core	U-0.210	U-0.300	4.41	6.30	ADU-A6.1 (D1)
11. Insulated Monolithic Slab Perimeter (R-12 XPS, 4 ft Stem/Under)	Perim	114.0 lin ft	R-12 XPS, 4 ft	F-0.460	F-0.520	52.44	59.28	ADU-S1.1, A5.2
TOTAL ENVELOPE THERMAL CONDUCTANCE (SUM OF ALL ASSEMBLIES)	All	Glazing 116 sf	SHGC 0.27	Win U-0.259	Max U-0.30	138.35	157.36	PASS (+12.1%)

3. 2021 IECC MANDATORY REQUIREMENTS & FIELD INSPECTION CHECKLISTS (CHAPTER 4)

Inspection Stage & Requirement	IECC Section	Mandatory Code Verification Criteria & Field Protocol	Sign-Off / Status
☒ STAGE A: PLAN REVIEW & PERMIT SUBMITTAL VERIFICATION	IECC R103.2 / R402.1.5	Construction drawings specify R-values, NFRC window U-factor/SHGC ratings, air barrier details, thermal envelope boundary, and HVAC load/equipment sizing schedules.	☐ VERIFIED ON PLANS
☒ STAGE B: FOOTING, FOUNDATION & SLAB-ON-GRADE INSPECTION	IECC R402.2.9 / R402.2.10	Slab edge thermal break / perimeter insulation installed to specification prior to concrete placement; vapor retarder and termite/moisture protection verified.	☐ FIELD INSPECT
☒ STAGE C: FRAMING, FENESTRATION & ROUGH-IN AIR BARRIER	IECC R402.3 / R402.4.1.1	NFRC certification labels affixed to all windows/skylights/doors (Weighted U <= 0.259, SHGC <= 0.270). Top plates, rim joists, knee walls, tub/shower exterior walls, and penetrations air-sealed.	☐ FIELD INSPECT
☒ STAGE D: INSULATION INSTALLATION (GRADE I) & BAFFLES	IECC R402.2 / RESNET Gr. I	Wall cavity & continuous insulation installed without voids or compression; eave/soffit vent baffles installed at attic perimeter; attic depth markers placed every 300 sq ft.	☐ FIELD INSPECT
☒ STAGE E: BUILDING ENVELOPE AIR LEAKAGE TESTING (<= 3.0 ACH50)	IECC R402.4.1.2 Mandatory	Blower door pressurization/depressurization test in accordance with ASTM E779 or RESNET/ICC 380. Verified air leakage rate shall not exceed 3.0 ACH50 (Design Target: 2.4 ACH50).	☐ BLOWER DOOR TEST
☒ STAGE F: DUCT SYSTEM SEALING & LEAKAGE TESTING	IECC R403.3.5 / R403.3.6	All ducts, air handlers, and filter boxes sealed with UL 181 mastic/tape. Duct leakage test <= 3.0 CFM25 per 100 sq ft CFA (or <= 4.0 CFM25 rough-in). Project spec: Ductless Multi-Zone Mini-Split Heat Pump (100% Conditioned Space).	☐ DUCT BLASTER / N/A
☒ STAGE G: MECHANICAL CONTROLS, DAMPERS & PIPE INSULATION	IECC R403.1 / R403.4 / R403.5	Programmable/smart thermostat with heat pump lockout controls installed; hot water piping & refrigerant suction lines insulated to >= R-3; whole-house mechanical ventilation per ASHRAE 62.2.	☐ FINAL INSPECT
☒ STAGE H: LIGHTING EFFICACY & PERMANENT ENERGY CERTIFICATE	IECC R404.1 / R401.3	100% of permanent luminaires high-efficacy LED (>= 90 lm/W). Permanent IECC Energy Compliance Certificate posted on or inside electrical distribution panel.	☐ FINAL INSPECT

4. PERMANENT ENERGY COMPLIANCE CERTIFICATE DATA (IECC SECTION R401.3 PANEL LABEL)

Ceiling / Roof R-Value:	R-49 / R-38+5ci (U-0.024)	Envelope Air Leakage:	<= 2.4 ACH50 (Code Max <= 3.0 ACH50)
Above-Grade Wall R-Value:	R-19+3ci to R-20+7.5ci	Duct Leakage Test Spec:	Ductless Multi-Zone Mini-Split Heat Pump (100% Conditioned Space)
Fenestration U / SHGC:	Weighted U-0.259 / SHGC 0.270	Foundation / Slab Insulation:	Insulated Monolithic Slab-on-Grade (R-10 Perimeter, 4 ft)

PREPARER COMPLIANCE CERTIFICATION: I hereby certify that this **2021 IECC REScheck Envelope Compliance Report** for **1104 Glenwood Ave, Raleigh, NC 27605** has been prepared in full accordance with the applicable provisions of the **2021 International Energy Conservation Code (IECC)** and/or **ACCA Manual J 8th Edition / Manual S 2nd Edition / Manual D 3rd Edition** standards, using construction documents (October 2026 — Permit Submittal Set Rev. 1) provided by the applicant. The building thermal envelope and/or mechanical equipment selections meet or exceed code requirements.

Prepared & Signed By:	<i>/s/ Skyler Tran</i> Skyler Tran, Energy Code Specialist	Organization:	Energy Code Certificates Cert ID: www.energycodecerts.com +1 (917) 746-6116
Credentials:	IECC / IRC Residential Energy & Manual J8 Load Calculation Preparer	Date & Verification:	2026-10-21 Status: APPROVED FOR PERMIT

ACCA MANUAL J 8TH EDITION LOAD CALCULATION + MANUAL S EQUIPMENT

ANSI/ACCA 2 Manual J (8th Ed., Ver. 2.50) & ANSI/ACCA 3 Manual S (2nd Ed.) | ANSI/ACCA 2 Manual J 8th Ed / Manual S 2nd Ed / Manual D 3rd Ed

✓ **COMPLIANT — Selected 1.5-Ton Heat Pump is 114.9% of Manual J Cooling Load (Within 90%–130% Limit)**

Total Heating Load: 12,960 BTUh | Sensible Cooling: 11,720 BTUh + Latent: 3,080 BTUh = Total Cooling: 14,800 BTUh (1.23 Tons, SHR 0.792) | AHRI #209784103

Project Title:	Glenwood Detached Backyard ADU — Full Permit Submittal Package	Weather Station:	Raleigh-Durham International Airport, NC (WMO #723060)
Site Address:	1104 Glenwood Ave, Raleigh, NC 27605	Latitude / Elev.:	35.88° N Elevation 436 ft (ACF 0.984)
Jurisdiction:	City of Raleigh Planning & Development / Inspections Dept. (Wake County, NC)	99% Winter Outdoor:	20°F DB -> Indoor Heating 70°F DB ($\Delta T = 50^\circ F$)
Owner / Builder:	Five Points ADU Collective LLC / Oak City Infill Builders	1% Summer Outdoor:	92°F DB / 75°F WB Daily Range: Medium (20°F)
Building Type:	Detached Backyard Accessory Dwelling Unit (ADU) (1-Story, 1 BR)	Indoor Cooling:	75°F DB / 50% RH ($\Delta T = 17^\circ F$, $\Delta Grains = 38 \text{ gr/lb}$)
Conditioned Area:	780 sq ft Insulated Monolithic Slab-on-Grade (R-10 Perimeter, 4 ft)	Infiltration / Vent:	2.40 ACH50 (Blower Door Target) -> 0.13 ACH Natural Clg / 0.17 ACH Htg

1. SYSTEM THERMAL LOAD SUMMARY (ACCA MANUAL J 8TH EDITION WHOLE-HOUSE LOADS)

Load Component / Heat Transfer Pathway	Heating Load (BTUh)	Sensible Clg (BTUh)	Latent Clg (BTUh)	Total Cooling (BTUh)	% of Clg
Fenestration Solar Gain — North Orientation	0	580	0	580	3.9%
Fenestration Solar Gain — East Orientation	0	1,120	0	1,120	7.6%
Fenestration Solar Gain — South Orientation	0	1,680	0	1,680	11.4%
Fenestration Solar Gain — West Orientation	0	940	0	940	6.4%
Windows, Skylights & Glass Doors (Conductive ΔT)	2,980	1,260	0	1,260	8.5%
Above-Grade Exterior Walls & Opaque Doors (CLTD / Conductive)	3,560	1,480	0	1,480	10.0%
Roof & Ceiling Assemblies (Attic / Vaulted Rafter CLTD)	1,640	1,120	0	1,120	7.6%
Framed Floors & Slab-on-Grade Foundation Perimeter	2,180	320	0	320	2.2%
Envelope Air Infiltration (Blower Door Verified ACH50)	1,540	680	860	1,540	10.4%
ASHRAE 62.2 Mechanical Fresh Air Ventilation	1,060	820	1,240	2,060	13.9%
Internal Gains — Occupants (230S/200L) & Appliances (1,200 BTUh)	0 (Credit Omit)	1,480	980	2,460	16.6%
Supply & Return Distribution Duct Gain / Loss	0	0	0	0	0.0%
Adequate Exposure Diversity (AED) Peak Fenestration Excursion	0	240	0	240	1.6%
TOTAL SYSTEM DESIGN LOADS (SHR = 0.792 1.23 Nominal Tons)	12,960 BTUh	11,720 BTUh	3,080 BTUh	14,800 BTUh	100.0%

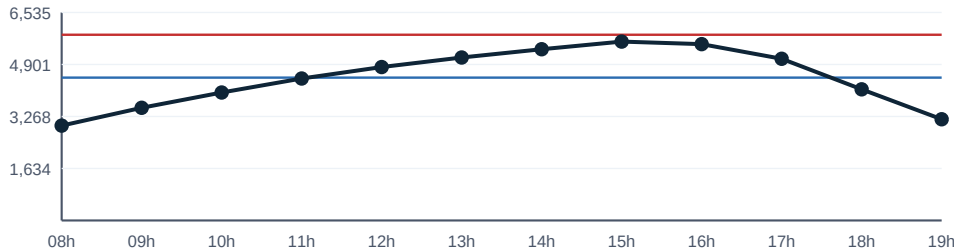
2. ROOM-BY-ROOM HEATING & COOLING LOAD AND AIRFLOW SCHEDULE (MANUAL J)

Room / Zone Name	Dimensions	Area (sf)	Exposed Wall/Glass (sf)	Htg BTUh	Htg CFM	Sens. Clg	Lat. Clg	Total Clg	Clg CFM
1. Open Living / Kitchen / Dining	20' x 17' x 9.5'	340	S: 190W/48G, W: 162W/16G	5,840	240	5,460	1,480	6,940	265
2. Primary Bedroom	15' x 14' x 9.5'	210	N: 142W/16G, E: 133W/24G	3,620	150	3,180	780	3,960	150
3. Flex Studio / Home Office	14' x 10' x 9.5'	140	N: 95W/12G, W: 95W/0G	2,180	90	1,940	460	2,400	95
4. Full Bath & Utility Laundry	10' x 9' x 9.5'	90	E: 85W/0G, Interior	1,320	55	1,140	360	1,500	55

Room / Zone Name	Dimensions	Area (sf)	Exposed Wall/Glass (sf)	Htg BTUh	Htg CFM	Sens. Clg	Lat. Clg	Total Clg	Clg CFM
TOTAL CONDITIONED ZONES (4 Rooms)	Whole House	780	All Orientations Verified	12,960	535	11,720	3,080	14,800	565

3. ADEQUATE EXPOSURE DIVERSITY (AED) HOURLY GLAZING CURVE & EXCURSION CHECK

ACCA MANUAL J SECTION 10 — ADEQUATE EXPOSURE DIVERSITY (AED) HOURLY FENESTRATION LOAD CURVE (08:00 - 19:00)



AED Excursion Check Summary

Avg Load Value (ALV): 4,488 BTUh

130% Diversity Limit: 5,835 BTUh

Peak Glazing (15:00): 5,620 BTUh

AED Excursion Added: 240 BTUh

Status: PASS — Fenestration

Diversity Within Manual J Limits

Solar Hour	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00
Glazing BTUh	2,980	3,540	4,020	4,460	4,820	5,120	5,380	5,620	5,540	5,080	4,120	3,180

4. ACCA MANUAL S EQUIPMENT SELECTION & OEM CAPACITY VERIFICATION

Selected HVAC System Type:	1.5-Ton Multi-Zone Hyper-Heating Inverter Ductless Mini-Split Heat Pump	AHRI Certified Ref #:	209784103 (SEER2 21.0 / EER2 13.5 / HSPF2 10.5)
Outdoor Unit Make/Model:	Mitsubishi M-Series MXZ-2C20NAHZ3 (Hyper-Heating H2i 18,000 BTUh)	Indoor Unit Make/Model:	Mitsubishi MSZ-FS09NA (Living 9k) + MSZ-FS06NA (Bedroom/Studio 6k)
Design Cooling Airflow:	565 CFM (377 CFM/Ton)	Supplemental Heating:	None Required (100% Rated Heating Output Down to 5°F Outdoor DB)

ACCA Manual S Sizing Parameter	Manual J Design Load	OEM Rated Capacity @ Design	Ratio (% of Load)	Manual S Permitted Limit	Verification
Total Cooling Capacity (Sensible + Latent)	14,800 BTUh	17,000 BTUh	114.9%	90% – 130% (Variable-Speed)	PASS
Sensible Cooling Capacity @ Design Conditions	11,720 BTUh	13,400 BTUh	114.3%	>= 100% Design Sensible	PASS
Latent Dehumidification Capacity @ 50% RH	3,080 BTUh	3,600 BTUh	116.9%	>= 100% Design Latent	PASS
Heating Output @ 20°F 99% Winter DB	12,960 BTUh	16,800 BTUh	129.6%	100% – 140% Heating Load	PASS

5. DISTRIBUTION SYSTEM VERIFICATION (DUCTLESS MINI-SPLIT HEAT PUMP)

ACCA MANUAL D EXEMPTION NOTE: This project utilizes a direct-refrigerant multi-zone ductless mini-split heat pump system (Mitsubishi M-Series MXZ-2C20NAHZ3 (Hyper-Heating H2i 18,000 BTUh) / Mitsubishi MSZ-FS09NA (Living 9k) + MSZ-FS06NA (Bedroom/Studio 6k)) with indoor wall-mounted air handlers located 100% inside conditioned space. Supply/return air ductwork is not used; therefore duct static pressure losses and duct thermal losses are 0 BTUh.

PREPARER COMPLIANCE CERTIFICATION: I hereby certify that this ACCA Manual J 8th Ed + Manual S Engineering Report for 1104 Glenwood Ave, Raleigh, NC 27605 has been prepared in full accordance with the applicable provisions of the 2021 International Energy Conservation Code (IECC) and/or ACCA Manual J 8th Edition / Manual S 2nd Edition / Manual D 3rd Edition standards, using construction documents (October 2026 — Permit Submittal Set Rev. 1) provided by the applicant. The building thermal envelope and/or mechanical equipment selections meet or exceed code requirements.

Prepared & Signed By:	/s/ Skyler Tran Skyler Tran, Energy Code Specialist	Organization:	Energy Code Certificates Cert ID: www.energycodecerts.com +1 (917) 746-6116
Credentials:	IECC / IRC Residential Energy & Manual J8 Load Calculation Preparer	Date & Verification:	2026-10-21 Status: APPROVED FOR PERMIT