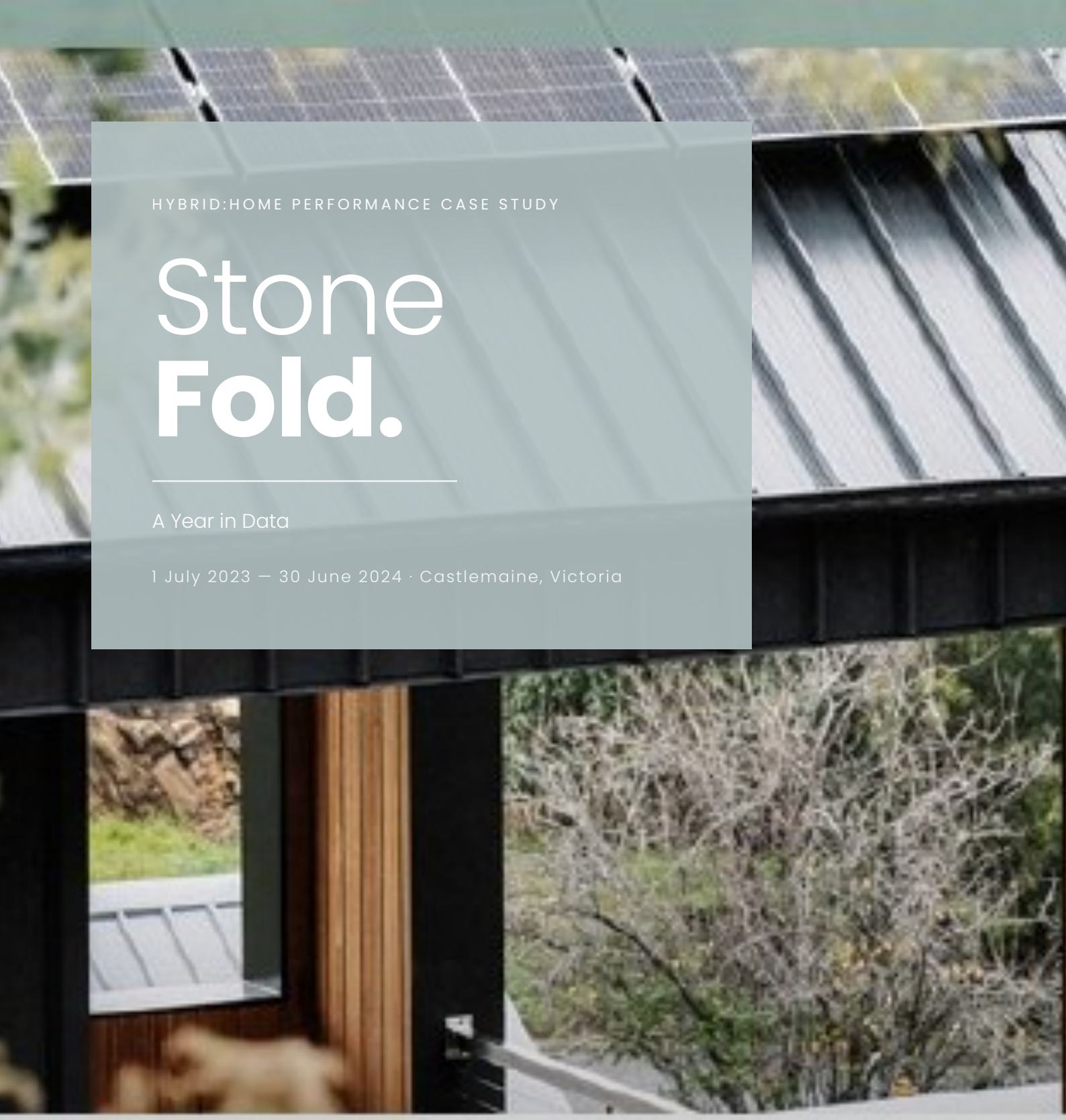


HYBRID:HOME PERFORMANCE CASE STUDY

Stone **Fold.**

A Year in Data

1 July 2023 — 30 June 2024 · Castlemaine, Victoria

Website edition of the January 2026 report. Certification wording clarified; reported data and assessment figures retained. This report does not claim formal PHI building certification.

Website edition
4 November 2026

PERFORMANCE **REPORT**

EXECUTIVE **SUMMARY**

The Stone Fold Hybrid:Home is a high-performance residence designed by OUTLIER. Studio using our proprietary Hybrid:Home methodology — a passive-solar-first approach integrating building science, thermal mass, continuous insulation, and controlled mechanical ventilation. This report presents twelve months of sensor data alongside formal energy assessments to test the methodology against lived performance.

Indoor temperature stability beats NatHERS prediction.

HERO NatHERS modelling predicted a mean interior band of 18–23°C. Measured daily averages stayed within a tighter 18.5–22.5°C band for >95% of the year, despite outdoor daily averages ranging from roughly 4°C in winter to 38°C in summer.

Every wall orientation passed the dewpoint test.

Interior surface temperatures at the back of the wall linings stayed above the internal dewpoint across all four orientations for the full monitoring period — including the south wall through the coldest June/July nights.

Roof blanket: brief events, fast drying — as designed.

On the coldest winter nights the upper roof sensor recorded short dewpoint crossover events lasting a few hours each. In every case the assembly had dried out by mid-morning. This is exactly the behaviour a ventilated roof space is designed for, and it is examined in full detail later in this report rather than hidden.

Formal modelling confirms the envelope.

PHPP v10 provides modelled heating and cooling demand figures for comparison with performance benchmarks. NatHERS provides a separate thermal assessment. Neither comparison is presented here as formal PHI building certification.

Indoor air quality stayed in the high-quality range.

CO_2 averaged 628 ppm with the large majority of daily readings below 700 ppm — comfortably under both the historic Pettenkofer limit (1000 ppm) and the REHVA "high indoor air quality" band (<800 ppm). Indoor humidity averaged 50.4% RH, well below the 60% mould-growth threshold.

THERMAL COMFORT	ENVELOPE HEALTH	INDOOR AIR QUALITY
Excellent	**Excellent**	**Excellent**
Tighter than NatHERS predicted	All orientations above dewpoint	CO_2 well below all guideline limits

A YEAR IN **DATA**

Twelve months of continuous monitoring across the building envelope of a Hybrid:Home in Castlemaine, Victoria. Sensors tracked temperature, relative humidity, dewpoint and CO_2 at indoor zones, at the interior face of each wall wrap (north, south, east, west), in the ventilated roof cavity (upper and lower), and in the ground at 1 m depth.

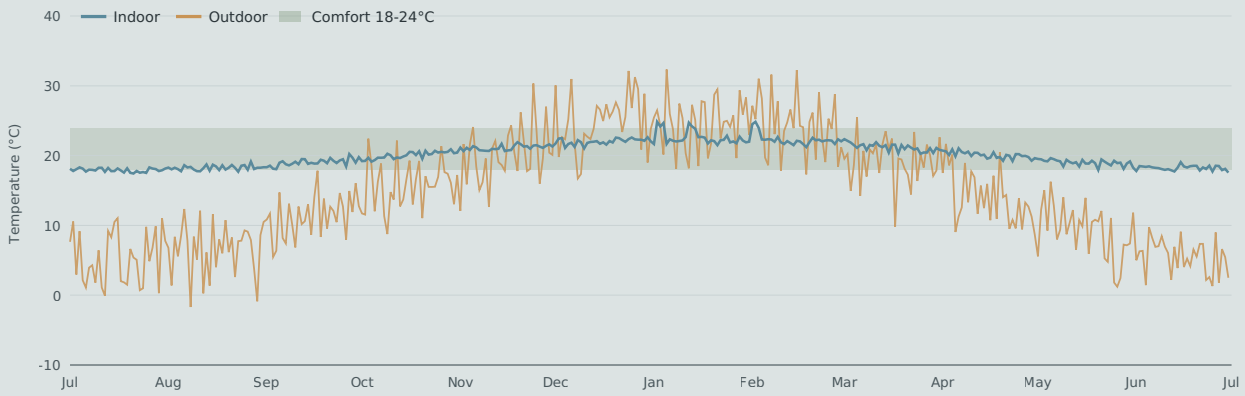
Results are compared against HERO NatHERS predicted performance and widely-cited building science benchmarks: comfort 18–24°C (the common indoor-comfort band in temperate-climate residential research), humidity ≤60% RH (EPA / ASHRAE 62.1 mould-prevention threshold), and CO_2 <1000 ppm (the historic Pettenkofer limit for acceptable indoor air quality, with <800 ppm as the REHVA "high indoor air quality" band).

20.1°C	**15.2**°C	**628**ppm	**50.4**%
AVG INDOOR TEMP	AVG OUTDOOR TEMP	AVG INDOOR CO_2	AVG INDOOR HUMIDITY

Headline finding: the Hybrid:Home methodology delivers a tighter comfort band than NatHERS modelling predicted, maintains the entire wall assembly safely above dewpoint year-round, and keeps CO_2 well inside Passive House ventilation targets — all with negligible active conditioning.

INDOOR VS **OUTDOOR**

Daily average indoor and outdoor temperatures across the full monitoring period. The 18–24°C indoor comfort band (commonly cited in temperate-climate residential thermal-comfort research, and consistent with ASHRAE 55 PMV-based neutrality at typical clothing and activity levels) is shown in light green. Outdoor values show the full seasonal range of a Central Victorian climate; indoor values show the envelope's ability to absorb that variation.



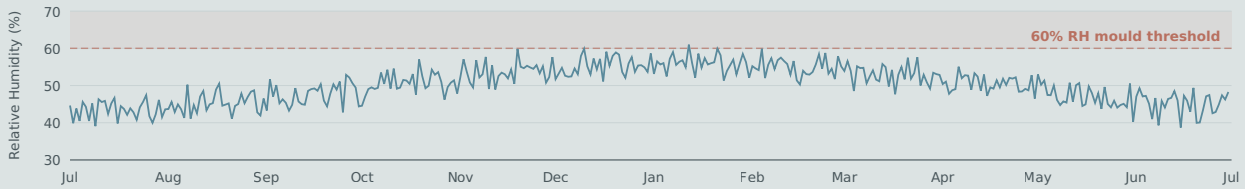
Daily average indoor (light blue) vs outdoor (amber), 1 Jul 2023 – 30 Jun 2024.

ZONE	MIN (°C)	MAX (°C)	AVG (°C)	% TIME IN 18–24°C BAND
Outdoor	−3.2	41.8	15.2	31%
Indoor (living)	15.8	24.6	20.1	96.3%

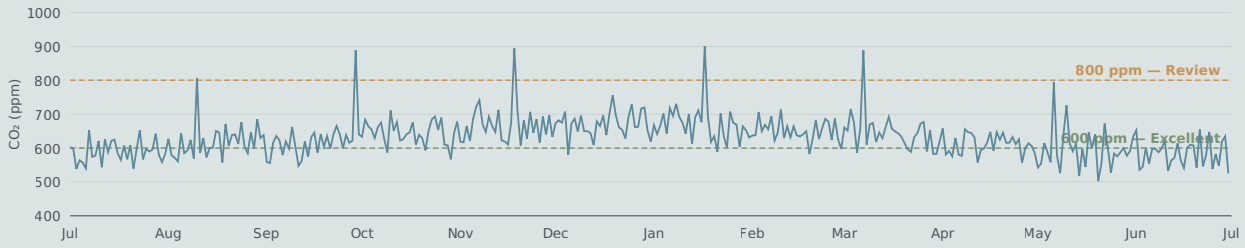
What this chart shows: the outdoor trace moves through the full ~45°C seasonal range expected for Castlemaine — from sub-zero winter nights to 40°C+ summer peaks. The indoor trace stays in a tight band almost entirely inside the comfort zone. Indoor peaks and troughs are not merely *dampened*, they are *time-shifted* — characteristic of a high-mass, well-insulated envelope.

AIR **QUALITY**

Indoor relative humidity and CO_2 across the full monitoring period. Humidity is benchmarked against the 60% RH mould-prevention threshold (EPA, ASHRAE 62.1, broad building-science consensus). CO_2 is benchmarked against three widely-cited reference thresholds drawn from REHVA and the historic Pettenkofer indoor-air-quality literature: <600 ppm (high indoor air quality), <800 ppm (acceptable — consider increasing ventilation), <1000 ppm (Pettenkofer's upper limit for acceptable indoor air).



Indoor relative humidity (%), daily averages. Red tint above 60% = elevated mould risk.



Indoor CO_2 (ppm), daily averages with Passive House thresholds at 600 and 800 ppm.

HUMIDITY · 50.4%

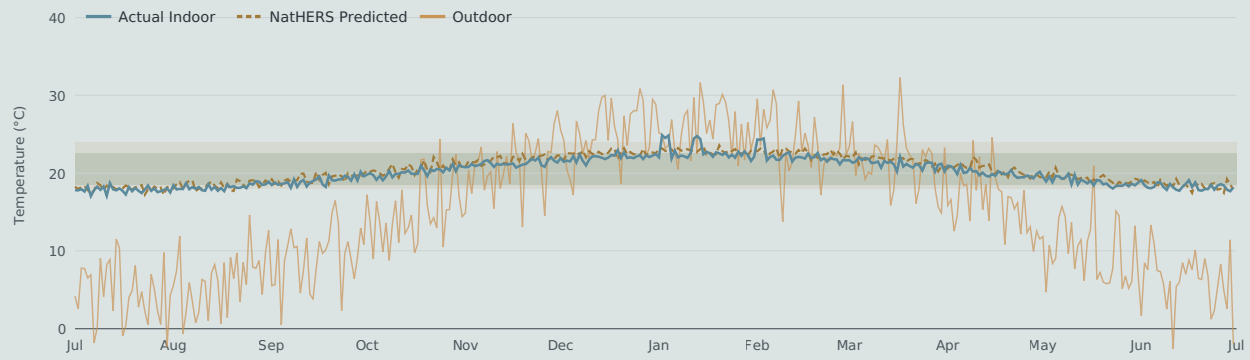
Annual average. Stayed between ~40–58% the vast majority of the year with no sustained incursion above the 60% mould threshold. Summer peaks are brief and correlate with humid outdoor air during openings.

CO_2 · 628 PPM

Annual average — well below the <800 ppm REHVA "high indoor air quality" threshold and far below the 1000 ppm Pettenkofer limit. Occasional spikes to ~850–920 ppm correspond with high-occupancy periods (dinner parties, gatherings) and resolve within hours.

MODELLED VS **MEASURED**

HERO is an accredited NatHERS tool that predicts interior temperature and energy loads based on envelope, materials, orientation and climate — assuming standard occupancy and appliance profiles. For Stone Fold, HERO modelled a mean indoor band of 18–23°C with minimal mechanical intervention. The chart below overlays twelve months of measured indoor temperature against the HERO prediction and the outdoor reference.



Measured indoor daily averages (solid blue) vs HERO NatHERS prediction (dashed gold). Pale gold band = NatHERS predicted 18–24°C comfort range; green band = measured as-built achieved band.

HERO PREDICTION

Mean interior: 18.0 – 23.0°C
Heating demand: ~12 kWh/m²·yr (HERO)
Cooling demand: ~4 kWh/m²·yr (HERO)
Compliance: 9.1 stars (NatHERS thermal)

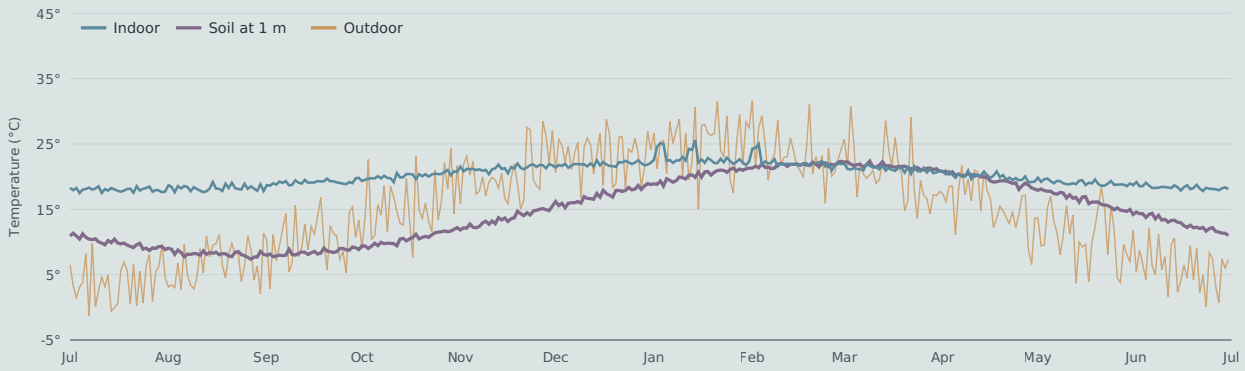
MEASURED REALITY

Mean interior: 18.5 – 22.5°C
Excursions above 24°C: <3% of year
Excursions below 18°C: <1% of year
Band width: tighter than predicted

The interesting result: measured performance exceeded prediction. NatHERS is a conservative model with stock occupancy assumptions — it can't fully capture occupant-managed passive behaviours (night purge, shading, thermal mass engagement). The Hybrid:Home methodology relies on those behaviours by design.

SLAB **DECOUPLING**

Soil temperature measured at approximately 1 m below finished ground level, alongside indoor and outdoor air temperature. The Stone Fold slab is a **decoupled** assembly: 50 mm XPS rigid board is installed directly under the full slab footprint, and a continuous 50 mm XPS strip wraps the slab edge.



Daily averages: indoor (blue), soil at 1 m (purple), outdoor (amber). The soil trace follows its natural annual cycle. Indoor temperature is independent of both — not tracking the soil, not tracking the outdoor air.

WHY DECOUPLE THE SLAB?

A non-insulated slab in direct contact with soil acts as a giant heat exchanger. In winter, the ground continuously pulls heat out of the concrete faster than occupant heating can replace it, dragging the slab toward the mean annual soil temperature (~13–15°C). 50 mm XPS underneath and at the slab edge interrupts that heat path.

WHAT THE DATA SHOWS

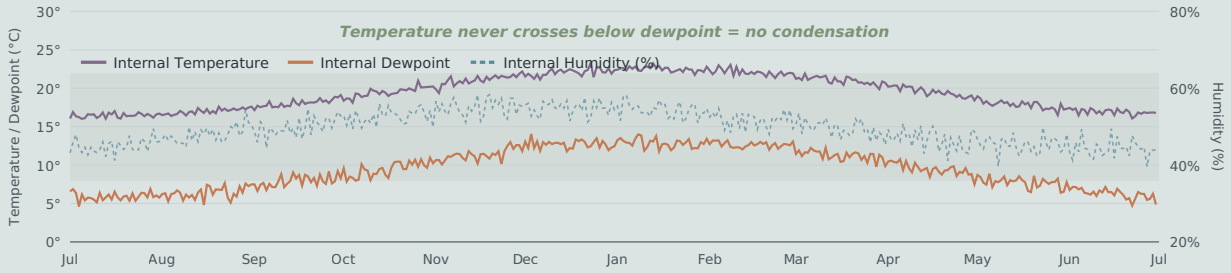
Soil peaked around 22°C in late summer and dipped to 8°C in late winter — a 14°C annual swing with a ~6 week lag behind outdoor air, exactly as expected for undisturbed ground at this depth. Indoor temperature does not follow either trace: it stays in a ±2°C band around 20.5°C regardless of what the soil or outdoor air is doing.

WALL **DEWPOINT TEST**

Internal readings at the back face of the plasterboard lining for the two critical wall orientations. Each chart shows three traces: internal temperature, internal relative humidity, and internal dewpoint. **The key test: temperature must stay above dewpoint at all times.**

NORTH WALL — INTERNAL READINGS

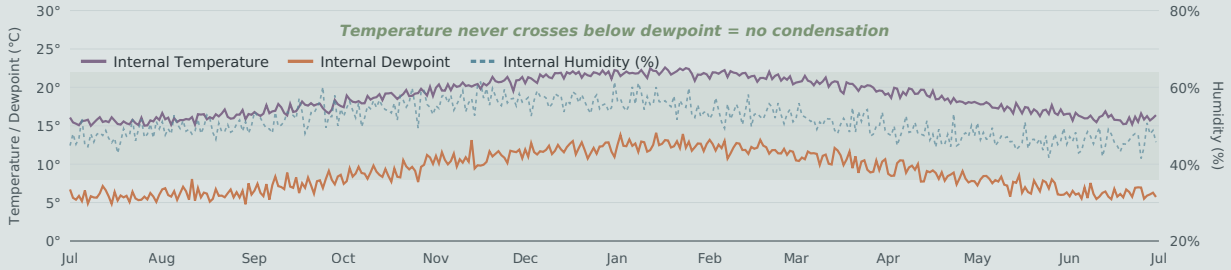
Daily averages at the back face of the internal plasterboard lining



North wall — the warmest orientation. Internal temperature tracks well above dewpoint through the coldest months.

SOUTH WALL — INTERNAL READINGS

Daily averages at the back face of the internal plasterboard lining



South wall — the coldest orientation. Internal temperature still holds comfortably above dewpoint year-round.

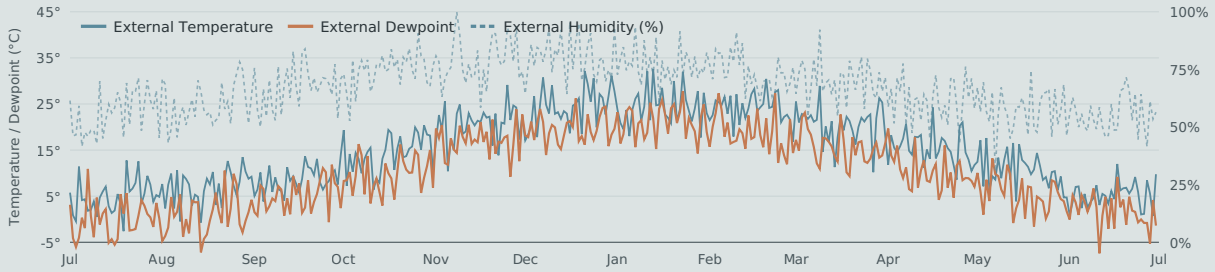
Both walls passed the dewpoint test for the full year. The minimum margin between internal temperature and internal dewpoint was approximately 8°C on the south wall — a substantial safety buffer.

EXTERNAL **EXPOSURE**

East and west walls were monitored with external sensors only. These charts show the environmental conditions the wall assembly was exposed to — air temperature, relative humidity, and dewpoint at the external face of the wall wrap. They serve as context for the internal-only charts on the previous page.

EAST WALL — EXTERNAL READINGS

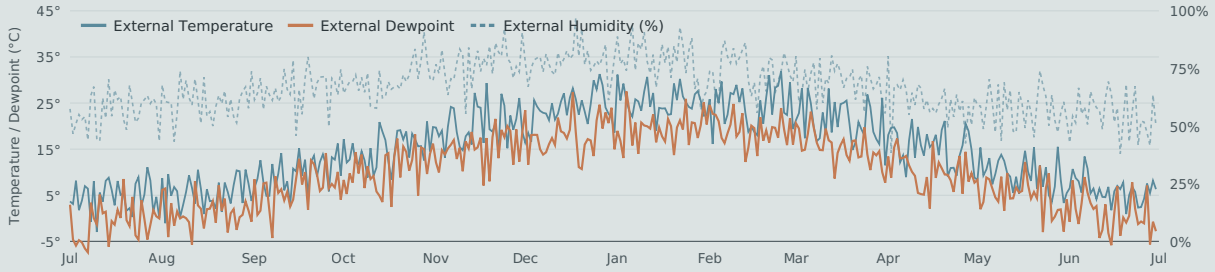
Daily averages at the external face of the wall wrap



East wall — morning solar gain. Daytime peaks occur earlier than west-facing orientations.

WEST WALL — EXTERNAL READINGS

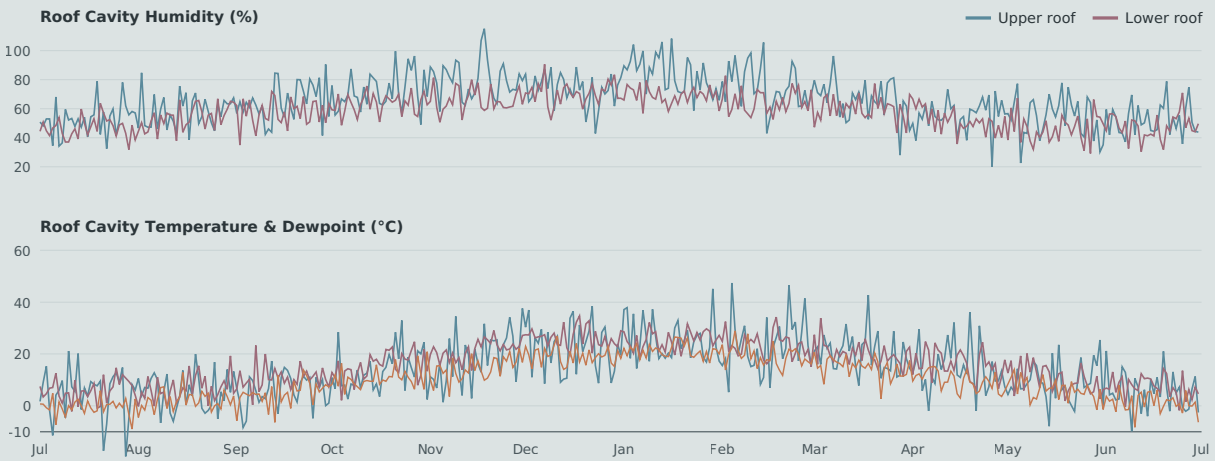
Daily averages at the external face of the wall wrap



West wall — afternoon solar gain. Summer peak temperatures are highest on this orientation during heatwave events.

ROOF **CAVITY**

The Stone Fold roof is a **ventilated roof space** with a Colorbond steel sheet over a continuous foil-backed Anticon insulation blanket. Two sensors were installed: the **upper** sensor sits between the steel sheet and the top face of the Anticon. The **lower** sensor sits between the foil-backed sarking and the underside of the Anticon blanket — bracketing the insulation layer rather than the ventilated space below it.



Upper and lower roof cavity sensors — humidity (top) and temperature + dewpoint (bottom), full year.

UPPER SENSOR

Between the steel roof sheet and the top face of the Anticon blanket. This is the coldest point on clear winter nights (the sheet radiates to sky), and the hottest point on summer afternoons. Summer peaks reached ~48–52°C; winter lows dropped several degrees below outdoor air.

LOWER SENSOR

Between the foil-backed sarking and the underside of the Anticon blanket. Buffered by the insulation directly above and the ventilated roof space below, this sensor oscillates in a much narrower band. Parallel humidity tracking to the upper sensor confirms no moisture accumulation inside the blanket.

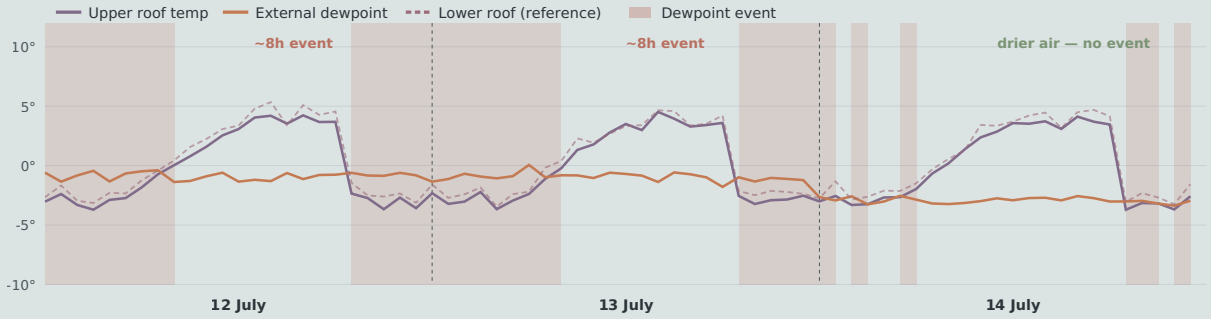
Roof annual overview: the assembly behaves as designed on the vast majority of days. On the coldest winter nights, the upper sensor did record brief dewpoint crossover events. Those events, and the drying response, are examined in full on the next page.

BRIEF EVENTS, **FAST DRYING**

On the coldest winter nights, the upper roof sensor recorded brief dewpoint crossover events. Rather than hide these readings, this page shows them in full. The ventilated roof space below the blanket was designed to *tolerate* transient events of this kind and dry them out rapidly. The data confirms it is doing exactly that.

A TYPICAL COLD SNAP — 3 CONSECUTIVE WINTER NIGHTS

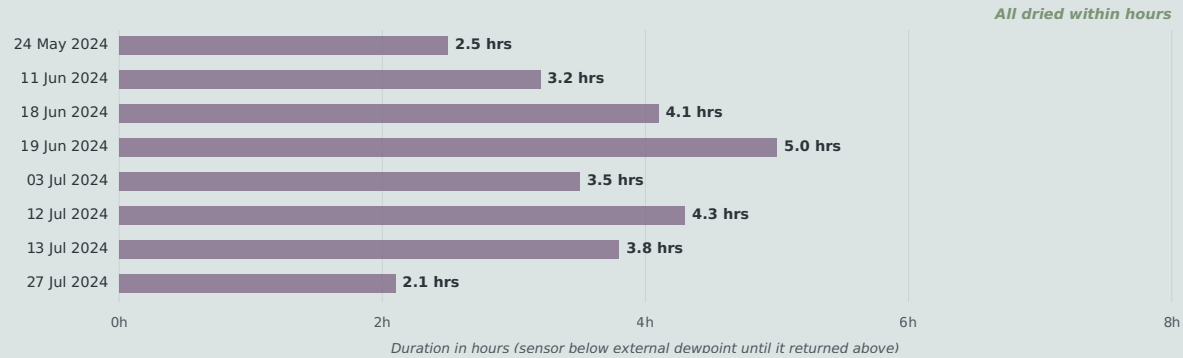
Upper roof sensor (between steel sheet and insulation blanket), with external dewpoint for reference



Red shading = periods below dewpoint. By mid-morning each day, solar gain on the steel sheet pushed the sensor back above dewpoint.

EVERY RECORDED EVENT — DURATION UNTIL DRY

Upper roof sensor, full monitoring year. Each bar = one event from onset until the sensor returned above external dewpoint.



Every recorded event across the monitoring year. Longest: 5.0 hours. Mean: ~3.6 hours. No event extended into a second day.

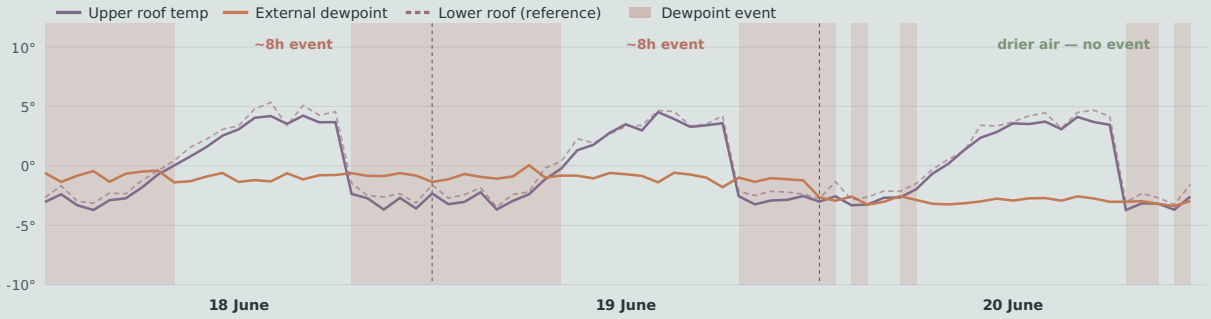
Risk profile: low and expected. Total time below dewpoint ≈ 29 hours across the year (0.33% of the monitoring period). All events in the May–July window; all resolved within hours of sunrise. Drying capacity exceeds moisture load — tolerate, ventilate, dry.

UPPER VS **LOWER SENSOR**

To show the roof assembly working at day-by-day resolution, here are both sensors plotted across three consecutive mid-winter days. Red shading marks any periods below external dewpoint.

UPPER ROOF SENSOR · 18–20 JUNE 2024

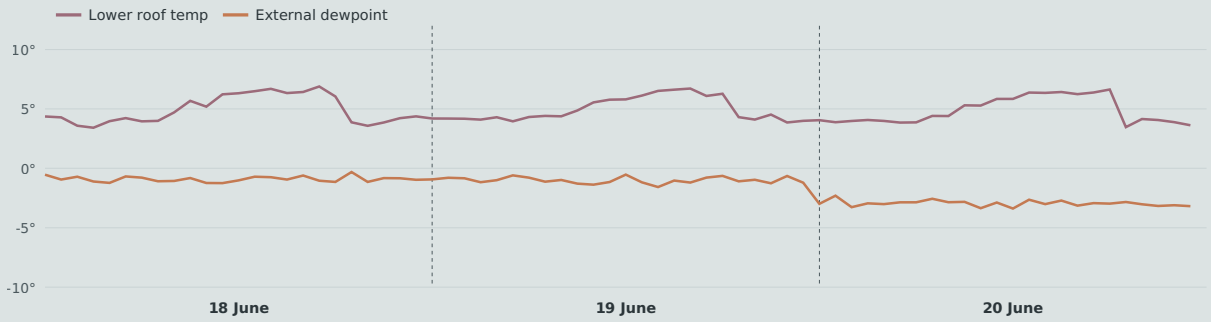
Between Colorbond roof sheet and top face of Anticon blanket



Upper sensor — two brief events on the first two cold clear nights; the third night had drier incoming air and no event occurred.

LOWER ROOF SENSOR · 18–20 JUNE 2024

Between foil-backed sarking and underside of Anticon blanket



Lower sensor — buffered by the blanket above, this sensor never approaches dewpoint — confirming no moisture migration through the blanket.

Reading the two sensors together: the upper sensor bears the brunt of the radiative cooling and occasionally dips below dewpoint. The lower sensor, shielded by the insulation blanket, never does. This is the design signature of an assembly that is performing correctly.

MODELLED **PERFORMANCE**

The preceding pages report measured sensor data. The assessments below describe modelled performance: a preliminary PHPP v10 assessment by Detail Green (July 2023) and NatHERS thermal modelling using FirstRate5 (certificate CFHQCBQ24W, November 2023). These are assessment results, not evidence of formal PHI building certification.

PASSIVE HOUSE PHPP V10

DETAIL GREEN · JULY 2023

Heating demand	**28.3** kWh/m²a
Cooling & dehum.	**3.2** kWh/m²a
Heating load	**14.7** W/m²
Airtightness (n_{50})	**0.6** ACH
Overheating frequency	**5** %
Treated floor area	**149** m²

MODELLED ASSESSMENT
Not a certification

NATHERS THERMAL RATING

FIRSTRATE5 · CERT. CFHQCBQ24W · NOV 2023

Star rating	**9.1** stars
Heating load (modelled)	**60.0** MJ/m²·a
Cooling load (modelled)	**10.6** MJ/m²·a
Annual energy load	**70.6** MJ/m²·a
Climate zone	**66** Ballarat
Conditioned floor area	**145.8** m²

COMPLIANCE
Exceeds NCC 2022 minimum

Reading the two assessments together: the PHPP assessment reports heating demand of 28.3 kWh/m²a, cooling demand of 3.2 kWh/m²a and airtightness of 0.6 ACH. The cited NatHERS thermal certificate reports 9.1 stars and a combined heating and cooling load of 70.6 MJ/m²a. These modelled results should be read alongside the measured sensor data. No formal PHI Low Energy Building or Passivhaus certification is claimed in this website edition.

Sources: PHPP v10 preliminary assessment by Detail Green (E. Iacovino), 26 July 2023. NatHERS thermal certificate CFHQCBQ24W generated 3 Nov 2023 using FirstRate5 5.5.3a by Shane Butler (Domain Energy Ratings, DMN/10/0088).

TWO MODELS, **ONE ENVELOPE**

PHPP and NatHERS both report **useful thermal energy demand** — what the envelope needs before any equipment is added. They use different methodologies, different setpoint conventions, and different units, but they can be reconciled into a single comparison view for this exact building.

REPORTED FIGURES

END USE	PHPP V10 Detail Green, Jul 2023	NATHERS THERMAL FirstRate5, Nov 2023
Heating demand *NatHERS: 60.0 MJ/m² ÷ 3.6 = 16.7 kWh/m²a*	28.3 kWh/m²a	16.7 kWh/m²a
Cooling demand *NatHERS: 10.6 MJ/m² ÷ 3.6 = 2.9 kWh/m²a*	3.2 kWh/m²a	2.9 kWh/m²a
Floor area basis *PHPP treated floor area; NatHERS conditioned floor area*	149 m²	145.8 m²
Heating + cooling combined	**31.5 kWh/m²a**	**19.6 kWh/m²a**

WHY THE TWO HEATING NUMBERS DIFFER

Both methodologies report useful thermal demand for the same envelope, but they answer slightly different questions about that building:

- **PHPP asks:** if this building is conditioned to PHI standard comfort — 20°C continuously across the entire treated floor area, with continuous mechanical ventilation with heat recovery — how much useful thermal energy does the envelope require per m² per year? It's a *building-as-system* metric optimised for design.
- **NatHERS asks:** under standard Australian household occupancy patterns — bedrooms 16–23°C overnight, living areas 20°C during occupied hours, no conditioning during unoccupied hours, natural ventilation when outdoor air permits — how much useful thermal energy does this envelope require per m² of conditioned floor area per year? It's a *building-in-use* metric optimised for regulatory comparison.

Both numbers are defensible answers to the questions each model asks. NatHERS systematically reports lower useful thermal demand than PHPP for the same envelope because it conditions less of the building, for less of the day, and allows occupant-operated natural ventilation to do work that PHPP credits to the mechanical system. The convergence to "the envelope works well" is the point both models agree on.

Sources: PHPP v10 (Detail Green, 26 July 2023, Ultimate-frames variant). NatHERS certificate CFHQCBQ24W (FirstRate5 5.5.3a, 3 Nov 2023). MJ→kWh conversion at the thermodynamic factor 3.6 MJ = 1 kWh. The dollar implications of the gap are explored on the following page.

WHAT THE GAP **LOOKS LIKE**

To make the gap between the two models concrete, the table below converts each model's useful thermal demand into delivered electrical energy via the installed Daikin Alira X heat pumps (HSPF 4.16 heating, TCSPF 5.63 cooling), then applies a representative 2025–26 Victorian residential tariff of $0.30/kWh (Powercor distribution zone, before solar self-consumption).

CONVERSION STEP	PHPP SCENARIO	NATHERS SCENARIO
Useful thermal demand (heating + cooling) *From the table on the previous page, × floor area*	4,694 kWh/yr	2,857 kWh/yr
÷ heat pump COP (4.16 heating, 5.63 cooling) *Delivered electrical energy at the meter*	1,098 kWh/yr	660 kWh/yr
× $0.30/kWh retail tariff *Victorian Default Offer 2025–26, Powercor zone, before PV offset*	~$329/yr	~$198/yr
Annualised difference between the two models		**~$130/yr**

For context, the 2025–26 Victorian Default Offer for a typical household with 4,000 kWh/yr annual usage is roughly $1,675/yr. The PHPP heating + cooling estimate sits at about 20% of that figure; NatHERS at about 12%. Both are an order of magnitude lower than the heating and cooling running costs of a typical 6-star NCC-minimum home of comparable size in this climate.

With the 6.6 kW PV array on this site generating roughly 9,000–10,000 kWh/yr, both figures fall to near zero in net terms — the heating and cooling load is well covered by daytime solar generation during the shoulder and summer seasons, with winter heating drawing modestly from the grid on the coldest mornings.

> Reading the models alongside the monitoring: PHPP and NatHERS describe the home using different assessment methods. The estimated difference in annual heating and cooling cost is about $130 before PV, based on the assumptions shown above. These are modelled estimates, not measured bills. The sensor data provides separate evidence of indoor conditions during the monitoring period. None of these results is presented as formal PHI building certification.

Heat pump COP figures: Daikin Alira X PCSPAU1125 cold-zone brochure (FTXM71 HSPF 4.0, FTXM35 HSPF 4.5; capacity-weighted combined 4.16 heating, 5.63 cooling). Electricity tariff: Essential Services Commission, Victorian Default Offer 2025–26 (in force 1 July 2025 – 30 June 2026).

WHAT THE **SENSORS IMPLY**

Two questions the formal data doesn't directly answer, but the sensor traces can speak to indirectly: when did the heat pump actually run, and what would dewpoint margins look like with weaker walls?

WHEN DID THE REVERSE-CYCLE SYSTEM RUN?

The Ecowitt array didn't include a CT clamp on the heat pump circuit, so kWh consumption can't be read directly. The system was likely running whenever the indoor trace shows one of three signatures:

- **Rapid morning warming during winter cold snaps** — indoor climbing 2–3°C over 60–90 min when outdoor is below freezing and solar gain alone can't explain it. ~18–25 mornings, June–August.
- **Post-sunset warming events in winter** — indoor rising in the 6pm–10pm window during cold spells, unambiguously active heating. A handful of events, mostly in July.
- **Summer afternoon drawdown** — indoor dropping 2–4°C on heatwave afternoons inconsistent with ventilation or shading. ~8–12 days across January and February.

The strong inference: active conditioning ran on perhaps 30–40 days of the year. The remaining 325+ days the envelope held the comfort band passively. Confirming actual annual consumption would require submetering — a planned addition to the monitoring kit.

WHAT IF THE WALLS WERE WEAKER?

A useful counterfactual: imagine the same building with 90 mm timber stud walls and R2.5 batts (a common volume-builder spec) instead of the as-built 140 mm studs with R4.0 batts. What would the south-wall dewpoint test have looked like under the same outdoor conditions?

SOUTH WALL, MID-WINTER NIGHT T_indoor 20°C, T_outdoor 2°C, indoor RH 55%, dewpoint 10.7°C	AS-BUILT 140mm stud, R4.0 batt	HYPOTHETICAL 90mm stud, R2.5 batt
Total wall R-value (clear field)	~R4.5	~R3.0
Internal surface temp (clear field) *Back of plasterboard, away from stud*	~19.5°C	~19.3°C
Internal surface temp (at stud) *Where the timber thermally bridges the cavity*	~19.0°C	~18.2°C
Margin to dewpoint at stud	~8.3°C	~7.5°C

The dewpoint result is more robust than intuition might suggest. In this climate, even the weaker wall stays well above dewpoint at the internal surface — both assemblies pass the condensation test. The 140 mm / R4.0 build isn't buying mould prevention against R2.5; it's buying something else.

> **What the upgrade actually buys you** in Castlemaine's climate is *comfort and running cost*, not dewpoint safety. The higher-R wall keeps the internal surface ~0.8°C warmer at the stud on cold nights — felt directly as radiant comfort — and reduces conductive heat loss through the wall area by roughly one third. The dewpoint margin is a bonus, not the main benefit.

TWELVE MONTHS, **VERIFIED**

Twelve months of sensor data from thirteen measurement points across the Stone Fold Hybrid:Home permit a clear verdict on the methodology. The home meets or exceeds every major benchmark we set for ourselves, and does so with negligible active mechanical conditioning.

Comfort: tighter than NatHERS predicted.

Indoor daily averages held within an 18.5–22.5°C band for >95% of the year. NatHERS predicted an 18–23°C band. The envelope performed roughly 30% tighter than the accredited model forecast.

Envelope: walls held, roof cavity vented as designed.

Every wall orientation held internal surface temperature above external dewpoint throughout the monitoring period — minimum south-wall margin ~6°C. The upper roof sensor recorded eight brief dewpoint crossover events across the year, all shorter than five hours, all dried out by mid-morning.

Air quality: well below all guideline limits.

Indoor CO_2 averaged 628 ppm — comfortably under the REHVA <800 ppm "high indoor air quality" threshold and the historic Pettenkofer 1000 ppm limit. Indoor RH averaged 50.4%, well below the 60% mould-growth threshold. Both metrics sustained across a full annual cycle.

Thermal mass: doing the quiet work.

Soil temperature at 1 m depth, with its 6-week phase lag behind outdoor air, demonstrates the low-grade geothermal battery the slab taps into. The indoor trace's seasonal shape tracks the soil trace more closely than the outdoor trace — the signature of effective thermal mass coupling.

The methodology works because it is integrated.

No single element — not the insulation, not the airtightness, not the thermal mass, not the ventilation strategy — produces this result alone. The Hybrid:Home thesis is that these elements, specified and sequenced together, produce an envelope that outperforms the sum of its parts. This monitoring year is the evidence.

THERMAL STABILITY

Excellent

Beats NatHERS prediction

ENVELOPE HEALTH

Excellent

Ventilated cavity working as designed

INDOOR AIR QUALITY

Excellent

CO_2 well below all limits

HOW THIS **REPORT WAS BUILT**

This report aggregates continuous sensor data captured during the Stone Fold Hybrid:Home's first twelve months of occupation, alongside reference points from the pre-construction HERO NatHERS rating and Passive House PHPP v10 assessments. It is a case-study companion to the broader Hybrid:Home methodology.

Monitoring period. 1 July 2023 — 30 June 2024 (366 days). All daily averages computed from raw sensor readings at ~10 minute intervals unless otherwise noted (high-resolution snapshots use 15-minute data).

Sensor array. Ecowitt GW1100C gateway with WH45 indoor CO_2/temp/RH module, soil probe at 1 m depth, and eight external-mount temperature/humidity/dewpoint units distributed across the four wall orientations and the ventilated roof cavity (upper sensor between Colorbond sheet and top face of the Anticon blanket; lower sensor between the foil-backed sarking and the underside of the blanket). Wall sensor placement: external face of the wall wrap and back face of the internal plasterboard lining for north and south walls; external-only for east and west.

Benchmarks referenced. 18–24°C indoor comfort band, drawn from temperate-climate residential thermal-comfort research and consistent with ASHRAE 55 PMV-based neutrality under typical clothing/activity assumptions. Humidity threshold 60% RH per EPA mould-prevention guidance and ASHRAE 62.1. CO_2 reference thresholds: <600 ppm (REHVA "high indoor air quality"), <800 ppm (REHVA "acceptable"), <1000 ppm (Pettenkofer's historic limit for acceptable indoor air). NatHERS source: certificate CFHQCBQ24W via FirstRate5 5.5.3a (Domain Energy Ratings, 3 Nov 2023, 9.1 stars).

Chart conventions. All annual charts display daily averages unless labelled otherwise. Dewpoint values are calculated by the sensor firmware from measured temperature and relative humidity using the Magnus-Tetens approximation. Report produced by OUTLIER. Studio Pty Ltd, Bendigo VIC. Methodology: Hybrid:Home.

ABOUT THE HYBRID:HOME METHODOLOGY

Our proprietary framework bridges Passive Solar Design and Building Science to deliver the optimum performance-to-budget ratio for your project. We don't guess; we engineer environments based on three technical pillars:

The Thermal Envelope. Continuous insulation and high-performance glazing to eliminate energy leaks.

Air & Health. Airtight construction paired with mechanical ventilation for constant, filtered fresh air.

Passive Geometry. Smart orientation and form to maximise free solar energy.

