Jack's House

Overview

UN SDG	Aligned to NZIA Sustainable Outcomes
	**Good Health and Wellbeing** Design Principle: Healthy, comfortable spaces connected to nature
	**Net Zero Operational Carbon** Design Principle: Reduce demand first, then supply clean energy
	**Net Zero Embodied Carbon** Design Principle: Build less, build light, build for longevity
	**Protection of Papatūānuku and Ecological Systems** Design Principle: Leave every site ecologically better

'CEDE' is a universal kitset building system, to help with our climate and housing crisis. Jack's House is the first 'CEDE' home to be built. It is a free-standing three-bedroom home with two toilets, one bathroom, laundry, kitchen, dining and living areas, providing 79m² over two levels on a compact 6.5m x 6.5m building footprint. The design was developed to fit within many existing front and back yards, a seed 'sown' throughout the country.

Designed by W3, Jack's House focuses on quality, sustainability and efficiency. It is almost completely made from sustainably grown, renewable New Zealand-grown pine, including all piles, framing, cladding, linings, window frames, decking and balustrades. Material waste and labour were reduced by working to standard material sizes.

This, combined with a digital fabrication model labelled with a clear, step-by-step assembly guide, significantly reduced the time and cost of construction. Jack's House was completed in 25 weeks on site for $400,000 + GST (2025 pricing) – a measured low-carbon result with an attainable price, rather than treating sustainability as a premium. Jack's House is an example that a well-designed compact home can be low-carbon, cost-effective and also very comfortable to live in.

Typology	Housing
Architect	W3 and building system by CEDE
Certification target	None pursued; full life-cycle assessment undertaken (NZGBC ECCHO)

Key Sustainability Features

At a Glance

Client
Jack Turner

Architect
W3, Sammy Ho

Structural engineer
Constructure

Main contractor
BBM Construction

Planning & civil
Tektus Consultants

Building system
CEDE

Photographer
Hamish Melville

Location
Titirangi, Auckland, Aotearoa New Zealand

Climate Zone
1

Gross floor area
85 m²

Completion
2025

Water

Water demand is kept low through simple, robust measures rather than complex systems.

- Fixtures: Low-flow, water-efficient fixtures and fittings throughout.
- Distribution: Hot-water pipe runs were minimised to cut the water wasted waiting for heat.

Embodied Carbon and Materials

Wherever possible the house is built from renewable, low-carbon New Zealand-grown pine: the entire structure, floor, stairs, rigid air barrier, cavity battens, cladding, linings, thermally treated windows and doors, kitchen, cabinetry, decking and balustrades. Roofing is corrugated iron; benchtops and hardware are stainless steel; wet-area floors are Marmoleum. The compact 79 m² plan, stacked over two levels on an efficient footprint, keeps the raw quantity of material – and its embodied carbon – low, and standard material units, precise BIM modelling and the kitset process trim it further. At 79 m2, the home is 44% smaller than the average 140 m2 Aotearoa New Zealand home (Stats NZ) at 180kgCO2/m2, the total upfront carbon emission is significantly reduced by 16.60 tonnes, a 65.9% reduction.

Estimated embodied carbon	109.46 $kgCO_2e/m^2$ (A1–A5 upfront)
vs NZ benchmark	~39% below the ~180 $kgCO_2e/m^2$ benchmark
Whole-building saving	~66% reduction in embodied carbon compared with the 140 m² home
Building design life	90 years
Assessment	Full LCA (A1–D), NZGBC ECCHO tool, BIM-based volumes

- Structure: Timber piles on concrete footings; lightweight timber-framed construction throughout; prefabricated framing and trusses.
- Envelope: New Zealand-grown pine rigid air barrier, cavity battens and weatherboards; thermally treated timber tilt-and-turn windows with low-E double glazing; corrugated-iron roof.
- Interior: New Zealand-grown pine linings, stairs and cabinetry; New Zealand-grown pine and Marmoleum flooring; stainless-steel benchtops and hardware.
- Note: the largest embodied-carbon elements by mass are the concrete pile footings and the recycled-polyester insulation.

Waste

Working to standard material sizes with a digital fabrication model and a step-by-step assembly guide, CEDE schedules materials far more accurately than manual take-offs, reducing both offcuts and labour. Prefabricated framing and trusses further reduced site waste.

- Design for disassembly: Built for simple manual assembly and disassembly; deconstruction contractors estimate it could be taken apart in about two weeks, with over 95% of materials upcycled or recycled.
- Dry construction: No plasterboard was used anywhere, removing wet plastering trades and their waste and easing future deconstruction; Marmoleum in place of PVC vinyl avoided the waterproofing and tiling of wet areas.
- Reuse: Offcut plywood linings were reused as shelving within the home.

Energy

An all-electric home engineered around an efficient thermal envelope. The simple square form gives an optimal wall-to-floor ratio; a complete plywood rigid air barrier, well-sealed timber tilt-and-turn windows and low-E double glazing minimise heat loss and gain while maximising daylight. A ducted heat pump and balanced ventilation system carry comfort and indoor air quality and modular window layouts drive passive cross-ventilation and stack ventilation through the stairwell. The north-facing roof is optimised for future solar panels.

Predicted space heating demand	23 kWh/m²/yr
Predicted space cooling demand	7.5 kWh/m²/yr
Total predicted energy use	57.7 kWh/m²/yr
Actual energy use	N/A — not yet a full year in operation
Electrification	100% electric

Comfort and health:

Ducted heat pump and balanced ventilation, with tilt-and-turn windows sealing against full-perimeter compression gaskets, make for a warmer, quieter, less draughty home.

Solar-ready:

The north-facing roof is sized and oriented for a future PV array.

Cultural and Design Context

The house sits on a steep, vegetated site in Titirangi, subdivided from a larger section. Rather than dominating the land, the design is a small square form placed on the site and clad in familiar suburban weatherboard to fit with its context. The wider ambition is about housing procurement: CEDE treats the individual home as a repeatable system for attainable, low-impact housing, and Jack's House is its proof of concept. Hand-crafted by local builders, it celebrates the traditional timber-framed construction long embedded in Aotearoa's building culture as a high-quality, practical method for the future.

Certifications and Targets

Jack's House pursues no formal building-rating certification. Its environmental case is quantified through a full life-cycle assessment carried out with the NZGBC ECCHO tool under the NZGBC Embodied Carbon Methodology 2024, drawing on a BIM model in which every material component is measured for exact volume. All life-cycle stages (A1–D) were assessed against a 90-year design life.

2030 Kaitiakitanga Building Performance Targets for Residential Builds

Metric	2030 Target	This project
Operational energy	<60 kWh/m²/yr	57 kWh/m²/yr
Embodied carbon	<156 $kgCO_2e/m^2$	109.5 $kgCO_2e/m^2$
Potable water	<132 L/person/day	Not yet measured
Overheating	≤5% of year >25°C	≤6.2% of year >25°C
100% Electric - No fossil fuels	100% Electric - No fossil fuels	Yes - PV-ready

Ecological and Biophilic

The house takes up as little of the site as possible. Building coverage is just 57 m², including two canopies, representing a 14% impervious footprint – 46% below the 60% permitted under the district plan. The driveway and paths are formed from permeable limestone chip and the storage-container shed has a food-garden green roof.

- Biophilic design: Natural timber linings throughout and three intimate courtyards immerse the interior in greenery; portrait windows act as living paintings, framing vegetation and the wider landscape.
- Habitat: Strong relationships are drawn to the existing mānuka tree to the north, the Waitākere Ranges and the Waitemātā Harbour; no trees were removed, supporting birdlife and habitat connectivity.

Social and Cultural Outcomes

This project's social value lies in access and craft. By loyally sourcing from Aotearoa New Zealand manufacturers and building suppliers, it keeps value in our communities and supports domestic forestry and manufacturing resilience. More fundamentally, it links environmental and social sustainability: by delivering high-quality architecture at a reasonable price and in a short timeframe, it puts a well-made, low-carbon home within reach of far more of society.

Conclusion

Jack's House shows that lower carbon, lower cost and higher quality can coexist. Built almost entirely from renewable New Zealand-grown pine, it has an embodied carbon footprint 39% below the Aotearoa benchmark of 180 kgCO2/m2 (NZGBC), is all-electric and solar-ready and is designed to come apart as cleanly as it went together. Jack's House provides a solution to the climate and housing crises. This prototype is a worked model for homes that can be repeated across the country – a genuinely low-impact housing prototype, backed by a full life-cycle assessment.

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