Martins Farmhouse

Overview

UN SDG	Aligned to NZIA Sustainable Outcomes
6 CLEAN WATER AND SANITATION	**Sustainable Water Cycle** Design Principle: Restore natural water cycles, reduce demand
7 AFFORDABLE AND CLEAN ENERGY	**Net Zero Operational Carbon** Design Principle: Reduce demand first, then supply clean energy
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	**Net Zero Embodied Carbon** Design Principle: Build less, build light, build for longevity
15 LIFE ON LAND 14 LIFE BELOW WATER	**Protection of Papatūānuku and Ecological Systems** Design Principle: Leave every site ecologically better

Martins Farmhouse is a certified Passive House built almost entirely from natural, locally grown materials (strawbale, timber and clay) on a regenerative rural property in the Whanganui hinterland. For architect Guy Shaw of Energy Architecture, it proved a long-held conviction: that the world's most rigorous building-performance standard, which specifies outcomes rather than materials, is fully compatible with traditional, low-impact construction.

Clients came already convinced. They had written about Passive House for years and, as a sawmiller, brought a wide range of locally grown timbers. They asked for a modest, highly functional home to shelter generations and minimise environmental harm.

The result is a three-bedroom, all-electric home whose non-load-bearing strawbale walls, clay plasters and milled-timber interiors were raised largely by the owners' own hands, needing only the slightest heating and no cooling. Consented through the Alternative Solutions pathway, it sits within a 27.4-hectare property the owners are regenerating through forestry, nursery, gardens and a wetland.

Typology	Housing
Architect	Energy Architecture and Black Pine Architects
Certification target	Passivhaus Classic

Key Sustainability Features

At a Glance

Architect
Energy Architecture

Project architect
Black Pine Architects

Main contractor
David Brown Building

Specialist trade
Pat Mawson (strawbale construction and natural plasters)

Joinery
Rob O'Keefe Joinery

Engineer
eZED

Passive House certifier
Sustainable Engineering Ltd

Photographer
Andy Spain

Location
Whanganui hinterland

Climate Zone
2

Gross floor area
127 m^2

Completion
2025

Waste

Construction waste was minimised most effectively where organic waste was processed on site. The owners also sorted waste into streams and pushed reuse and recycling strategies as far as possible, so offcuts were reused in the project itself.

- Timber: All untreated timber offcuts were used in the build, retained for future projects, distributed locally for small joinery or passed on as firewood.
- Reuse into fixtures: Elm flooring offcuts were crafted into cupboard and drawer handles; dining-room bench seats were padded with wool insulation offcuts.
- Substitution: A late design change specified Saveboard in place of small amounts of plywood wallboard.
- Site facilities: A client-built composting toilet replaced a chemical portaloo, composting on site safely and cleanly.

Embodied Carbon and Materials

The materials strategy is the heart of the project. Strawbale walls turn an agricultural waste product into a carbon store for the life of the building; light-earth internal walls displace glass batts; timber window frames displace aluminium; and durable timber floors avoid the short replacement cycles of carpet. Transport emissions were cut by sourcing locally: barley straw grown around Bulls, clay from Marton and a good deal of the timber milled locally by the client.

- Structure: Non-load-bearing strawbale walls (Lawson cypress buck-and-beam framing with barley-straw infill), timber-truss roof, concrete slab
- Envelope: Clay plaster to strawbale walls with a lime topcoat externally; western red cedar cladding to the weather-prone western façade; light-coloured profiled steel roofing for solar reflectivity.
- Interior: Insulated English elm floating floor over the slab; light-earth internal walls finished in clay plaster and a translucent casein wash; low-VOC, MDF-free plywood kitchen; Mexican cypress joinery, decking and soffits.
- Insulation: Ceiling R14.8 (4 layers Terra Lana wool); conventional wall sections R4.8 (2 layers); Goldfoam XPS R2.9 between slab and flooring

Water

The home is self-sufficient for all three waters. Rainwater is harvested from the large roofs of both the house and the adjacent farm shed, then pumped uphill to two 30,000-litre tanks and gravity-fed back to house and garden – a low-energy loop that needs no mains connection.

Total rainwater storage 90,000 litres (2 × 30,000 L uphill tanks, plus collection tanks)

- Quality: Downpipe filters, inlet filter, calming inlets, floating outlets and screened vents/outlets safeguard water quality throughout.
- Wastewater: Grey and black water are separated and processed through a two-chamber, gravity-fed NaturalFlow vermiculture system to an onsite dispersal field.
- Demand: Selected low-flow fittings reduce demand.
- Potable water use: All potable water sourced from rainwater collection.

Energy

A fully electric Passive House engineered for near-passive comfort: stable temperatures throughout, using little heating energy and no active cooling. Triple-glazed timber-framed windows, Passive House-certified skylights, a highly insulated and airtight envelope and mechanical ventilation with heat recovery (MVHR) do the work a conventional home would ask of a heat pump.

Predicted space heating demand	15 kWh/m²/yr
Predicted space cooling demand	0 kWh/m²/yr (no active cooling)
Total predicted energy use	50 kWh/m²/yr
Actual energy use	53 kWh/m²/yr — includes EV charging that was not in the original model
Electrification	100% electric

Comfort & health:

Indoor air quality monitoring confirms improved air quality.

Resilience:

Water and power provisioned for future works.

Cultural and Design Context

The house sits on a steep, windswept 27.4-hectare property that the clients are actively regenerating: sustainable forestry, a native plant nursery, organic food gardens and orchards, and an ongoing wetland restoration. The brief was for a home that is welcoming, comfortable and expresses a Kiwi building vernacular, while being compact, wheelchair accessible, resilient to climate shocks, nestled into the landscape and designed to last generations.

Certifications and Targets

Passivhaus Classic certified. Designed and verified to the Passive House standard for airtightness, energy efficiency, humidity control and effective ventilation. Consented through the Building Code Alternative Solutions pathway. Target building design life: 90+ years. The project pursued no formal embodied-carbon or ecological certification; its environmental case rests on a natural, local material palette and measured operational performance.

2030 Kaitiakitanga Building Performance Targets for Residential Builds

Metric	2030 Target	This project
Operational energy	<60 kWh/m²/yr	50 kWh/m²/yr
Embodied carbon	<156 $kgCO_2e/m^2$	Not yet measured
Potable water	<132 L/person/day	Rainwater and drinking water self-sufficient.
Overheating	≤5% of year >25°C	Not yet measured
100% Electric - No fossil fuels	100% Electric - No fossil fuels	Yes

Social and Cultural Outcomes

This project's social value is best read through accessibility, community wellbeing and craft. Universal access was designed from the start rather than retrofitted: an entry ramp, level thresholds, wider doorways, grab rails and a compact, fully accessible bathroom with a roll-in shower.

- Community and craft: The traditional bale-raising day drew friends from near and far; the owners learned the light-earth method from natural builder Pat Mawson and built almost all the interior walls themselves, with local makers crafting joinery and fixtures.
- Health and wellbeing: Humidity-regulating natural materials, abundant natural light, user control and 'amazing' acoustic calm make for a demonstrably healthy interior.

Ecological and Biophilic

The home is one element of a property-wide process of regeneration, where rewilding and wetland restoration sit alongside productive growing spaces that fold food production into the site's ecology.

- Biophilic design: Biophilic principles informed the home's orientation, natural materials, daylighting and connection to the surrounding landscape.
- Habitat: The scheme creates, restores and protects habitat and enhances biodiversity; no trees were removed for the build.

Conclusion

Martins Farmhouse shows that the highest building performance standards and the oldest natural materials can be aligned. Passive House-certified yet built from straw, clay and timber grown and milled within a few kilometres of the site, it stores carbon, shelters generations and asks almost nothing of the grid. Raised largely by the owners' own hands on land they are returning to health, it is proof of Guy Shaw's conviction that the most demanding standard can be met by the most natural means.

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