

## **Ruatuna: The showhome with a difference**

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“I’d like a house built of straw, on a hill overlooking the ocean.” This bizarre building request 12 years ago from an eccentric 75 year old American client was to change the way Evan Crawford built houses forever.

Evan, director of Straw Built Homes Ltd and sister company Sustainable Structures Ltd, is based in the Eastern Bay of Plenty on New Zealand’s North Island and has worked in the building industry for over 20 years. “I’ve used many different building materials over the years and built some amazing houses, but I would always end up a little disappointed with some aspect of their design: they were either too hot, too cold or some other problem,” he explained. “Straight away on the straw project, we saw vast improvements in thermal insulation and acoustics and the more we looked at it, the more viable straw became.” Evan had found his perfect building partner.

Evan’s passion for building with straw has led to some ambitious projects, from New Zealand’s first straw bale school classroom to three storey mansions, but with less than 350 straw bale houses in New Zealand, straw is still seen as a strange building material. He often comes up against “little piggy syndrome”, and people have a hard time believing that a house built from straw could survive the big bad huff, puff and blow of the famous sou’wester, not to mention the torrential rain, ice, snow and earthquakes that rattle the country. “We needed to change people’s perceptions,” Evan explained. “We needed to show that it’s not that weird after all to live in a house made of straw.”

Historically, houses in New Zealand have not been built to suit the climate. Often built from brick and tile, or timber and corrugated iron, with little consideration towards the sun, many houses remain poorly insulated with no double glazing. This makes them difficult not to mention expensive, to heat. A 2006 study by the New Zealand Commissioner for the Environment reported that over a quarter of homes were cold and damp and linked this to increased health risks and an “excess winter mortality” rate.

With a vision to bring affordable, low maintenance, energy-efficient design to a wider public, Evan has certainly got his work cut out, but he believes the phenomenal

insulation, significantly reduced energy consumption and environmental benefits of straw speak for themselves. So he built a flagship straw bale house to prove it.

Ruatuna, a fully functional and stylish three bedroom house, is a “showhome with a difference”, and showcases cutting-edge sustainable design using a technique called ‘try-vertising’. In other words, Evan offers people the opportunity to spend the night there and test-sleep in straw. “Usually people visiting showhomes have no idea what the lighting is like in the morning or whether it’s cold at night,” Evan said, “but with Ruatuna, they can.”

As a realist who doesn’t believe 100% sustainability is possible in our current climate, Evan believes Ruatuna is about as good as it gets. Sustainable design features include:

**Straw bale construction:** “The benefits of using straw are numerous but the most obvious environmental advantage can be found in terms of its low ‘embodied energy,’” Evan explained. “This means the actual cost on our planet, in non financial terms, to use straw.” As a waste product from the agricultural industry, straw has minimal embodied energy; all it needs is dry storage, packaging and transportation, and, as an added bonus, it’s available on a yearly cycle, compared to the decades it takes to grow trees.

**An insulation envelope of R9:** Another crucial environmental, cost effective and atmospheric benefit is the thermal resistance, or insulation, of straw. Within the 500mm thick walls, air is captured in the hollow cellulose straw tubes and retained five times longer than conventional housing. “In other words your house acts just like a thermos flask, reducing energy use by 40%,” Evan said. “The house remains cold in summer and hot in winter. This will become more and more valuable as the cost of energy keeps ramping up.”

**Double glazing:** “We don’t have many strict rules but the use of double glazing in our buildings is non-negotiable,” Evan said. “We always use it”. In Ruatuna, the aluminium double glazing might appear contradictory, due to its high embodied energy, but Evan sees it as an affordable alternative to the higher priced, lower embodied energy alternatives currently available in New Zealand. This compromise is not ideal, but is still

part of Evan's vision to bring affordable energy-efficient design to a wider range of people.

**Active and passive solar design with a hydronic under-floor heating:** Technology advances have had huge repercussions for sustainable design, and the latest computer modeling was used to achieve maximum passive solar benefits at Ruatuna. "Computers can work everything out prior to construction so we can see all the benefits and concerns before building," Evan explained. "Apart from solar heated water for everyday use, Ruatuna also has a hydronic under-floor heating system but, so far, it hasn't been necessary to turn it on as the house is warm enough without."

**Black and grey water Vermi-compost effluent system:** Ruatuna is plumbed and reticulated so grey and black water are separated to go to individual treatment systems. Cleaned water comes out of both and is fed into the (non vege) garden.

**Convection cooling:** Fan lights above the doors in Ruatuna enable ventilation without having the door open and also allow for a more even spread of light. A duct into the pantry sucks cold air in from the outside to help keep the veggies cool, while a high window naturally vents the warm air out of the pantry and into the house.

Other benefits include:

- **A 2500 gallon rainwater collection system**
- **Excellent thermal mass** – making for great acoustics and a very quiet house
- **Compressive and ductile structural strength** – when compressed, straw is as strong as wood
- **Fire resistance** – straw bales are packed so tightly, they are up to three times more fire-retardant than other types of construction
- **A healthy living atmosphere** – less chemicals are used in construction and straw provides for a consistent comfortable temperature and walls that breathe
- **Excellent seismic properties of straw** – especially in a country as earthquake prone as New Zealand
- **Flexibility** – straw bale construction can be used anywhere and in any climate, as long as it is used correctly

- **Less waste** – the average, three bedroom house built in New Zealand produces six tones of rubbish to go to landfill. Building Ruatuna only filled eight 44 gallon drums and four of those went to recycling
- **Easy plastering** – a truck mounted plaster pump can deliver 32 litres/minute and undertook a full outer coat of Ruatuna in one day, significantly reducing time and labour costs;
- **Straw stuffing parties** – straw projects can encourage whole community involvement, such as building the straw bale classroom in local Waiotahi Enviroschool. Volunteers, including school kids, saved \$15,000 in labour costs and received a first-hand lesson in sustainability.

A more aesthetic advantage to straw bale, and an area that particularly interests Evan, are the endless design opportunities. “New technology has completely changed the way we build and paved the way for us to design and build hugely creative houses,” Evan said. “I won’t say it’s always easy, because original houses create original problems, but we have found we can overcome most issues, and the amazing thing about straw bale,” he continued, “is the flexibility in the building process. If you want a door you attack the bales with a chainsaw, if you want a nook, you just carve one out. There is usually not a straight wall in the house, which gives a cosy organic feel, and people just love the quirky shapes and neat designs we can do.”

I visited Ruatuna in the depths of a kiwi winter, keen to experience a night in straw bale for myself. I had been wedded to my hot water bottle at night for weeks, but, if this is any indication, I didn’t even think to get it out of my bag during my stay. The curved walls were really cosy and it seemed to be a cross between a hobbit home and the swankiest joint in Better Homes and Gardens. Browsing through the selection of incredible buildings from past projects and happy visitor comments in the house was eye-opening and by the end, straw bale had won me over. Evan was right: the house is pure common sense.

Did you know?

- Ruatuna is available to hire for NZ\$200 night and sleeps up to four. This fee is waived if guest go on to commission a house.

- Straw bale construction is available in 50 countries, including Australia, but it remains far from mainstream building material and there is a huge surplus of straw available.
- The US burns enough straw every year to build a million houses.
- In Arizona, where it is super hot in summer and freezing cold in winter, straw bale houses have a 30% higher resale value.