Project Pātūtū: pre-fabricated timber and straw panels

A research project led by Min Hall
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Unitec Institute of Technology – Aotearoa New Zealand

Unitec Research Symposium 9th October 2020
“Pātūtū draws on the idea of shelter, of walls, the process of creating a screen (against the elements) and the process of stacking some thing on top of the other. Pātūtū speaks to the unique process used to erect this type of structure and its finished form as a haven of comfort, safety and durability.”

Kimoro and Veraneeca Taiepa
“How can home-grown materials be used to produce a sustainable prefabricated wall panel system for house building in Aotearoa New Zealand?”

“Can prefabricated home-grown building components be utilised for papakāinga and other group housing projects?”
What’s the difference between Hay and Straw?

- **HAY** is dried grasses including the seed head which is harvested for its nutrient value for stock food
- **STRAW** is the remaining stalk left over after the seed heads of various grains – wheat, rye, barley, rice – are harvested for food production
International Stationary Baler 1941
Simonton House
Purdum, Nebraska, 1908

Greyhound Wolverine Hay Press

Four Sizes:
14 x 18
16 x 18
17 x 22
18 x 22

Strongest Steel Frame
Baler on the market.
Biggest Tonnage. Low
Lift. Keep Cool.
Steel Aids without extra cost

Steel Wheel
and 6, 5 and 4
and five with
out extra cost.

Requires Less Power. Futs more
weight in bales. Extension Frame
and Engine/Mounted.

A Press that will last for years
Get a Press Now and Keep Your Engine Going
CATALOG FREE

The Bunting Manufacturing Co., 116½ Superior St., Toledo, Ohio

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100 year old bale pulled from house in Nebraska

The Holy Bale
House of Straw

During the Marlborough valley among the rolling hills, New Zealand's first straw bale house is taking shape.

B at this is not the Shamrock! Dwelling of the southwest coast Little Limpo, he has the first straw house has a distinct and unique design, which has been recognized in the United States, where the straw bale is gaining interest.

Owen, designer and builder Peter Kundycki came to see the house a weekend and fell in love from the moment he visited. Since then, he has been working on the project.

The inspiration to pioneer the house of New Zealand came about years ago when I was staying with an artist friend in New Zealand. She had recently completed her straw house in the American south-west, where the house was turned over in suburban manors, and any experience ideal for regional construction with materials and methods that are better for housing.

For 17 centuries, French Straw Bales were made, with 90 square metre house built in this valley.

The house strengthens the landscape.

New Zealand’s first straw bale building 1993-5
New Zealand House and Garden - May 1995

Kundycki House
Marlborough 2012
Straw Bale Sleepout Motueka – 2000
Architect: Min Hall
Straw Bale House  Masterton - 2006  Architects: Melling Morse
Photographer: Paul McCredie
## WHY USE STRAW AND WHAT ARE THE ISSUES?

### ATTRIBUTES OF STRAW BALE

- It’s a system, not just a material
- High Thermal Resistance – R5 (R9)
- Thermal Mass
- Low embodied energy
- Low embodied carbon
- Renewable
- Buildability
- Availability
- Low toxicity

### THINGS TO CONSIDER

- Moisture
- Integrity of plaster systems
- Fire
- Vermin
- Drainage Cavities
- Services
- Building Consent
Kuske House 2010
Richard Sellars Architect, Nelson

Harley-Joblin House 2009
Richard Wilden Designer, Banks Peninsula, Canterbury

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Mechanical resistance & stability

Structural performance of prefabricated straw bale panels

Safety in case of fire

Hygiene, health and environment

Hygiene, health and environment
ECOCOCON PANELS
BUILDINGS IN ALL POSSIBLE STYLES
Resource Matters Elective 2019

Student Eseta Uili working with a mini bale
Crimm's Fairy Tales
Illustrated by Arthur Rackham

Rumpelstiltskin – Straw into Gold

Resource Matters Elective Course 2019
‘C’ frame

‘IC’ frame

Drawings by Alex Anderson
Do we have enough straw to make a difference?

Table 1. Straw production in Aotearoa New Zealand for the year ended June 2012

<table>
<thead>
<tr>
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<th>Area grown (Ha)</th>
<th>Quantity straw (tonnes)</th>
<th>Straw/Ha (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>54,900</td>
<td>362,500</td>
<td>6.6</td>
</tr>
<tr>
<td>Barley</td>
<td>66,300</td>
<td>563,500</td>
<td>8.5</td>
</tr>
<tr>
<td>Total</td>
<td>121,200</td>
<td>926,000</td>
<td>7.6</td>
</tr>
</tbody>
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2017/18 – 97,000Ha grown – 737,200 tonnes of straw

635,000 bales

From “Counting straw: the capacity of New Zealand’s grain growing sector to supply straw for construction” – Min Hall, ASA 2019, Roorkee, India.
MGH Rangiora House

MGH Rangiora House using C Frame panel

276 bales
Do we have enough straw to make a difference?

Counting Straw

- 21,000 consents for stand-alone dwellings in 2017
- Enough straw for 2,200 of these out of straw and timber

YES! Enough for 10% annually
Straw burn-off  South Canterbury
Photograph: John Bisset, Timaru Herald, 9 March 2012
"How can home-grown materials be used to produce a sustainable prefabricated wall panel system for house building in Aotearoa New Zealand?" 

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