

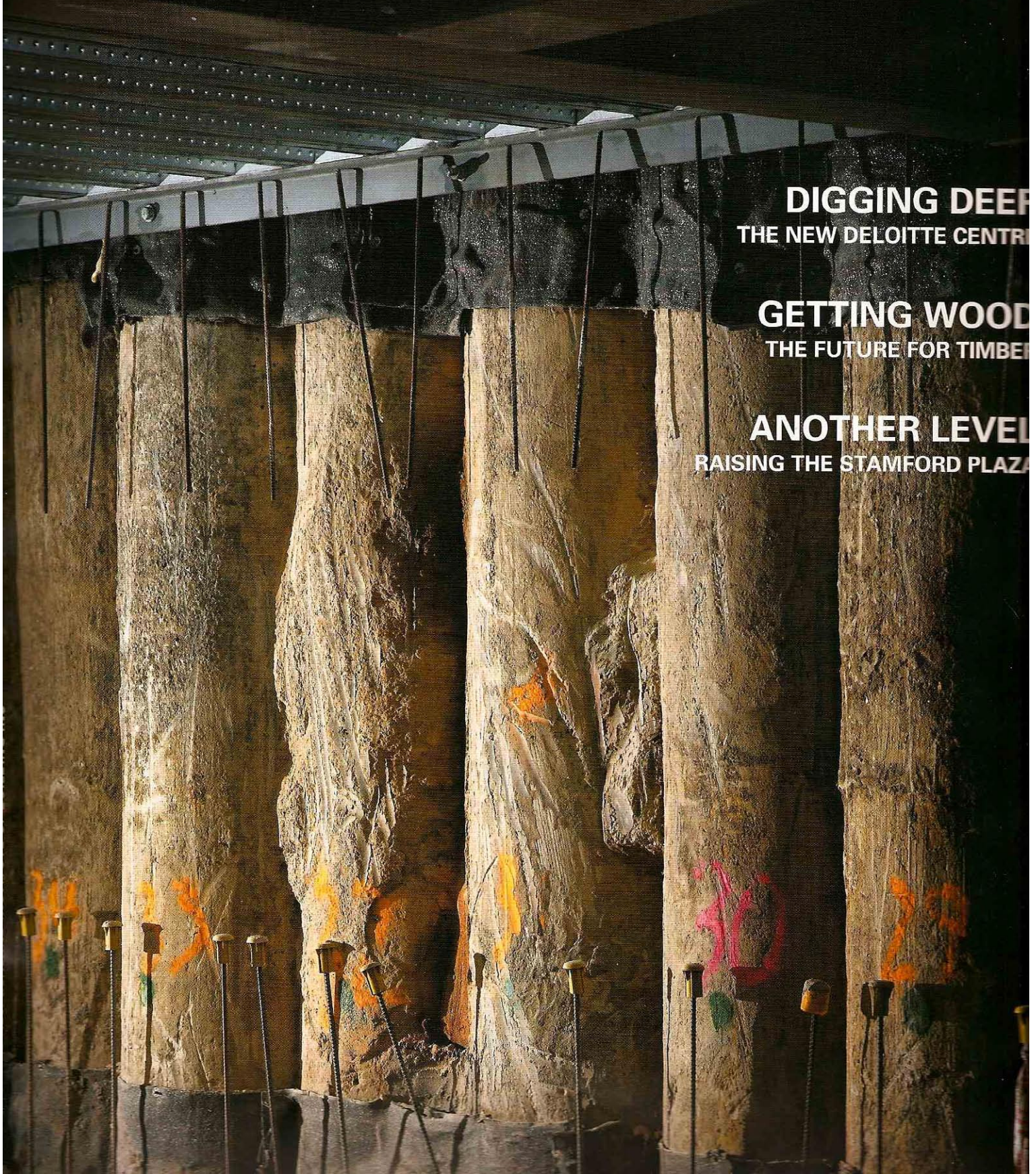
# BUILDING

PROGRESSIVE

**DIGGING DEEP**  
THE NEW DELOITTE CENTRE

**GETTING WOOD**  
THE FUTURE FOR TIMBER

**ANOTHER LEVEL**  
RAISING THE STAMFORD PLAZA





# BRING ME SUNSHINE

If there is one thing New Zealand gets it's a good share of sunshine, so it makes sense to incorporate this free source of energy when you design a house. That is exactly what Powered Living has done, building sustainable houses that are both affordable and stylish.

TEXT MARK LONGLEY



**In the course** of this interview Helen Richards, a Nelson based architect, casually mentioned that Invercargill, one of the least sunny spots in New Zealand gets the same amount of sunshine as Kent, one of the sunniest spots in England. This intrigued me and after 10 minutes spent on Google it was confirmed that this was very nearly true. Kent, along with much of the south of England, averages 1750 hours of sunshine a year. Invercargill averages 1600 hours. That means that the brightest parts of England get about six days more sunshine than the dullest part of New Zealand. The average here is 2000 hours and the hot spots, such

as Blenheim and Nelson, get a balmy 2400 hours of sunshine. (You have to feel for the poor folk who live in the dark parts of England, they only average 1000 hours – no wonder so many emigrate here!)

Further research revealed that the amount of energy received from the sun in New Zealand is the same as in Australia and significantly higher than Europe. In fact your average Kiwi home gets around 30 times more energy from the sun than it uses in electricity and gas. Surely it makes sense to harness this renewable source of energy? That is exactly what Richards has done.

Richards owns and runs Powered Living,

a company that designs houses around a passive solar heating design that are functional and look good. The company has an association with Wellington based architect Roger Walker Architects.

In 2004 Richards completed work on her first Powered Living house, which she built in Nelson. She now lives and operates out of this house and it also acts as a show home. The house uses a thermal mass to collect, store and release the sun's energy and is cost effective to both run and build. The house used traditional building materials and techniques so as not to alienate both clients and builders, and it works. Using solar passive



heating and ventilation Richards is able to maintain a temperature of between 16 and 24 degrees without any back-up heating.

In 2005 two Auckland based architecture graduates, Milti Stefadouros and Duncan Firth, were keen to develop their ideas about sustainable design. They had heard about Richards so flew to Nelson to meet her. Stefadouros says, "We just turned up on her doorstep and she was blown away by that. We got on well and she liked our enthusiasm. She was very open to the idea that we take Powered Living up to Auckland to try and service the North Island." The two took a stand at the 2005 Home Show and found their first clients, a couple who wanted a house built in the Waikato region. The house has now been completed and the clients have moved in.

The northern block is essentially a double-glazed glass block that traps and stores heat in its thermal mass concrete floor. When the temperature drops in the house the heat is transferred to the southern block by a natural process of thermal heat transfer through materials.

Richards is originally from England and studied architecture at the London School of Architecture. She developed an interest in sustainable design at university and over 15 years of practising has developed this into Powered Living, which she set up soon after settling in Nelson in 2000. Put simply her methods use the natural environment, including the sun, to heat the house. "It is to do with the close relationship between the house and the sun," she says. "Not just the sun but the climate. We take into account frost levels, the wind, everything to do with the climate. We then design the house around that."

Stefadouros adds. "There is a concept behind the house and we design to those principles. The homes have similar characteristics, there is thermal mass in the northern part of the building to attract heat. There is a lot of glazing. There is also a lot of good insulation. There are three key points: the environmental agenda, looking at the environment the house is going to sit in and what can we use from those environs. Then there is the sustainability agenda, where do

we source the materials from, what is there embodied energy? Then there is also the toxicity of those materials during the life span of the building."

The houses aim to maintain a steady temperature throughout the year of between 16 and 24 degrees without any, or little, back-up heating. The houses are designed to maximise heat transfer from the northern public block of the house to the southern private block. The northern block is essentially a double glazed glass block that traps and stores heat in its thermal mass concrete floor. When the temperature drops in the house the heat is transferred to the southern block by a natural process of thermal heat transfer through materials. Houses are angled due north to maximise solar gain and take advantage of the low-angled winter sun that passively heats the exposed concrete floor slab and masonry block walls in the colder periods of the year. During the initial design process of the Waikato house Stefadouros created a template on his computer. He says. "We did shadow casting analysis. I built a model of the house on the computer and mapped the sun as it progressed through the day in summer and winter. I could create a snapshot to see how far the sun would penetrate through the window at any time of the day. Simply by adjusting the eaves overhang I could manipulate how far the sun comes in. We needed to make sure that the overhang of the roof was going to provide sufficient shade in the summer because we didn't want the house to overheat. In the winter though you want enough sun to come through to heat it." The house used passive ventilation systems that can be adjusted to allow more or less heat to escape. It has a central clerestory that is used to passively cool the building via a stack effect and cross ventilation during the summer. During the winter southwesterly winds create a negative air pressure that assists the passive trickle air-ventilation of the sleeping areas and moves air gently throughout the house.

In her own house in Nelson Richards uses data loggers that take temperature and other readings and record the data. The temperature has not dropped below 16 degrees nor risen above 24. She says that they have a couple of radiators as back up heating but have never turned them on. Even in areas with less sunshine the houses are expected to cut energy consumption for heating by up to 70 percent. Richards is currently working on the design for a house in Sheffield, midway down the coast of the South Island. There she will use a long, north-facing conservatory to trap the heat.

"For most of the year," she says. "The conservatory is part of the house but when it is cold they can shut it off."

The designs also include solar heating for hot water and Stefadouros says. "We try to encourage passive heating techniques. At Waikato we used a hybrid system to heat the hot water. Solar panels on the roof heated the water, which then passed to a hot water cylinder. On the way out of the cylinder the water temperature is checked and if it isn't hot enough it is boosted by a gas heater. It's very efficient and only boosts when needed."

There is a financial outlay when building these houses, they are double-glazed, well insulated and often with solar panels. However one will significantly reduce the environmental footprint of the house and save power. Richards has focused, in her design, on using conventional building materials in order to both keep the cost down and not to scare off potential clients and builders by making the process as simple as possible. She adds. "Our aim is that these houses look good, are affordable and make sense. It is hard sometimes to make them affordable and it often depends on the client and what they can afford. We do get clients who are happy to spend more money on the insulation and less on something like the kitchen work surface. Those clients are really inspirational to work with." It does make sense to make savings elsewhere to get a house that will cost less to run over its lifetime. Richards is also pragmatic over the materials used. It often comes down to choices. She prefers to use timber where possible but if you are installing large, bi-fold glass doors then you will have to have an aluminium frame, which is not as environmentally friendly. It is about making the most of what is available.

Both Richards and Stefadouros have noticed a change in attitudes since they started out on their sustainable paths. Materials are easier to come by and more clients are showing an interest. Many houses in New Zealand have been built with poor insulation and it is a little amusing that this is now still viewed as an extra cost and not a necessity. Perhaps a big change in attitude is that this type of design is not being viewed so much as a green option, but an economic one. Money talks and there are significant savings to be made. This is not a new concept, passive heating, ventilation and shading through eaves have been used for centuries. Richards sums them up well when she says, "These houses feel good, they are warm and healthy. You get up in the morning even in the winter and feel warm." **PB**