

Facing

Newsletter of Beacon Pathway March 2012



In this issue

Message from the CEO	Page 2
Christchurch	
▪ Build Back Smarter	Page 3
▪ Participation in Canterbury Sustainable Homes Working Party	Page 4
Smarter Homes review	Page 4
Affordability and low energy: the HomeSmart Home	Page 5
SB11 World Sustainable Building, Helsinki: a report from Lois Easton	Page 7

Welcome to *Facing*, the newsletter of Beacon Pathway Incorporated. Through it, we hope to keep you up to date with our activities and research.

Prefab Housing Exhibition, China 2012

Verney Ryan has just returned from attending a Prefab Housing exhibition in China. He reports that although the exhibition showcased a variety of containerised housing solutions, these were mainly innovative for emergency housing and many would struggle to reach standards required for day-to-day living. Overall, the general level of detail and finishing was not up to New Zealand standards, and some of the cladding and roofing systems were quite crudely thought through and unlikely to deliver an acceptable solution for New Zealand.

Verney noted that there appeared to be more evidence of copying than innovation: often showcased solutions appeared to be direct copies of overseas products, including some from New Zealand. However, often products were missing the crucial aspects that made them successful such as the use of high quality componentry.

Prefabrication was generally interpreted as the ability to develop housing more quickly and cheaply in a factory employing inexpensive low skilled labour. New Zealand has the opportunity to differentiate on the basis of factory controlled production quality, economies of scale and delivery, time and cost savings, and higher performance.



Guangzhou was a city with very modern impressive development on a grand scale



Message from the CEO

Welcome to 2012! We've hit the ground running this year with several projects on the go.

Christchurch continues to be an area of concern for us, as repairs are delayed and delayed. It seems unbelievable that Christchurch residents will have to go through a second winter with earthquake damage making their homes colder and unhealthier.

It is with this in mind, that we've been following the issue of retrofitting wall insulation into Christchurch homes when wall cladding or lining needs repair. This is a golden opportunity to add wall insulation which otherwise is a relatively expensive exercise.

The Department of Building and Housing issued guidance on wall insulation in existing homes, and the Christchurch City Council has waived building consents for wall insulation with approved products.

Since then, several major insurers (IAG and AMI) have decided to provide wall insulation in houses where walls were being repaired. They based their decision on a Christchurch City Council document (*Information for Homeowners and Building Practitioners: Building Work that does not require a building consent*) which states:

"All building work (whether subject to a consent or not) is required to comply with the Building Act, Building Code and all other laws...."

The DBH guidance document, *Guidance on Building Code compliance for retrofitting insulation in external walls*, states:

"When buildings, or parts of buildings, are constructed or altered they must meet the Building Code performance criteria"

Additionally, the insurers refer to their policies. AMI's policy states:

"We will use building materials and construction methods in common use at the time of repair or rebuilding."

However, in October 2011, EQC / EQR advised their contractors that they "are not to carry out or supervise the retrofitting of external wall insulation in un-insulated dwellings during the earthquake repair process."

The reasons given were that it would cause time delays (building consents and coordination with homeowners), health and safety concerns, and issues with older electrical wiring. EQC sees wall insulation as giving marginal benefits at best to homeowners and occupiers, and as introducing significant risks to the process.

This decision is very disappointing. The value of fully insulating a home has been well proven, and is reflected in Building Code requirements. Christchurch has an opportunity to substantially upgrade its older uninsulated housing stock, and to improve the health, comfort and resource use of its residents. Canterbury District Health Board is concerned that the EQC / EQR decision perpetuates their ongoing problems with winter spikes in hospital admissions due to cold damp houses.

Additionally, the decision creates an inequitable situation. Homeowners over the \$100,000 cap are being given the choice to have a sub-contractor install at their own expense. However, homeowners under the \$100,000 cap, whose repairs are through EQC / EQR, do not have this option.

The CERA Sustainable Homes Working Party is looking at how this issue can be resolved. We too are keen to see a solution that meets EQC's concerns and enables Christchurch residents to make the most of the opportunity to insulate.

Nick Collins

Christchurch: Build Back Smarter

Delays continue to the repair and re-build of Christchurch.

The larger insurers are still to start significant house repair programmes in the Christchurch urban area. Concern that future aftershocks could cause further damage seems to be the main barrier to activity. The insurers want to minimise the risk of having to do the same types of repair work a second time.

Green Zone categories are influencing repair programme phasing

The further splitting of the Residential Green Zone into three Technical Categories related to likely future land damage is determining the timing for the start of the major earthquake repair work.

See [Press, 30/1/12, 'Low risk homes to get repair first'](#)

TC1 (Green-Grey) is land unlikely to incur damage from liquefaction in a significant future earthquake. Insurance companies are intending to start repair programmes in these areas in early February, provided there are no further significant aftershocks.

TC2 (Green-Yellow) is land that may incur some damage from liquefaction in a significant earthquake and where foundation repair is involved insurers are awaiting further clarification from EQC and/or DBH on land remediation intentions and foundation design.

TC3 (Green-Blue) is land that may suffer moderate to significant damage in a future significant earthquake. Insurers are awaiting land remediation intentions from EQC and additional foundation design guidance from DBH. Technically these are the highest risk repairs and most likely will be the last to be carried out.

23 December aftershocks

The 6 and 5.85 magnitude aftershocks on 23 December will require the PMOs to re-inspect previously assessed properties where new damage has been reported. Properties that were borderline 'repairs', rather than 're-builds' will most likely be re-inspected regardless of additional damage being reported. Further significant liquefaction in some eastern suburbs has increased insurer caution in starting any repairs in the eastern suburbs.

Progress with our Build Back Smarter partners

AMI / Arrow have identified a suitable house for inclusion in the project and the homeowner has expressed interest in being involved. Work is underway to assess the house and develop a retrofit plan that works with the insurer's scope of works and Warm Up New Zealand funding..

IAG / Hawkins were poised to start their major repair programme in February but this has been delayed.

Christchurch City Council and **Housing New Zealand Corporation** have, between them, over 700 damaged and untenanted homes. Both are still involved in resolving issues with their insurers and there is no indication when repair work, or re-building, will begin.

Participation in Canterbury Sustainable Homes Working Party

At a more strategic level of Christchurch's rebuild, Beacon has been proactively advocating and supporting CERA in the establishment of a sustainable homes steering group. This steering group is seeking to "establish long term collaborative working between organisations involved in promotion, delivery or funding of sustainable, healthy and smart homes".

Beacon was invited to participate in this group, which is mapping out current activities, sharing information and collaborating on future projects.

The Working Party has formed four programmes of work.

1. Identifying regulatory opportunities for CERA to mandate higher performing new build, repairs and sub divisions.
2. Communicating what is possible.
3. Working to influence insurance companies and PMOs and educate consumers.
4. Funding options for homeowners.

Lois Easton is leading the first initiative. In Beacon's *Resource Manual for Local Government*, produced in 2009, we catalogued what has been successful across local authorities and it is our intention to provide an update and list of recommendations to CERA.

Other participants in the regulatory programme are Environment Canterbury, Selwyn District Council, Ngai Tahu, Christchurch City Council and Lifetime Design.

Bill King, Beacon's project manager for the Build Back Smarter retrofits in Christchurch, has joined a sub-group looking at the issue of the inclusion of wall insulation in earthquake repairs.

Smarter Homes review

Beacon has recently reviewed and updated the Smarter Homes website (www.smarterhomes.org.nz) for the Department of Building and Housing.

The website was originally developed for the Ministry for the Environment by Beacon and Consumer NZ. The idea was provide homeowners with reliable, independent information about how to design, build and renovate homes that are warmer, drier, healthier, more affordable and kinder for the environment.

However, in the five years since it was launched in 2007, research and knowledge of home performance has moved on. In particular, our understanding of the whole of house approach to high performing homes has sharpened considerably. In response to this, regulations have also changed.

Last year, the Department of Building and Housing pulled the website down as it was out-of-date. However, Beacon, the Eco-Design Advisors and others lobbied the Department to reinstate the website as it still provides a good basic overview for homeowners.

Beacon was contracted to update the site over the last few months. Changes have been submitted to the Department and hopefully, the site will be renewed shortly.



Affordability and low energy

The New Zealand Housing Foundation's HomeSmart Home

There's a growing debate in New Zealand about the affordability of our housing. The Productivity Commission has reported on the issue in recognition of the impact housing affordability has on ordinary New Zealanders, the wider economy, and the size and health of our housing industry.

We believe that affordability is about more than the upfront cost of buying a home, it's also about your home's performance: how much it costs you to run your home, and the indirect health, social and employment costs of cold, damp, unhealthy homes.

The New Zealand Housing Foundation's HomeSmart Home is a great example of affordability over time. The Housing Foundation is a not-for-profit, charitable trust set up to provide affordable housing for low income households.

Built in 2009, the HomeSmart Home amended a standard Housing Foundation design using Beacon's HomeSmart Home guidelines. These guidelines have been developed out of our experience in building and monitoring the performance of two new homes, and they aim to ensure a home meets our performance benchmarks, the HSS High Standard of Sustainability®.

The HomeSmart Home's energy and water efficiency, indoor temperatures and humidity were monitored for a year with a family of 2 adults, a baby and 3 teenagers living there.



Features of the HomeSmart Home

- Glen Eden, Waitakere, Auckland
- 160m² including double garage
- 4 bedrooms, 1 bathroom, 2 toilets
- PV solar power system
- Heat pump hot water system
- Greywater system
- Rainwater tank
- uPVC-framed double glazing
- Low energy lighting
- HERS (Home Energy Rating System) thermal rating of 8.0 stars

The result: a low energy home

The results were exciting. Simple but effective were improvements to the home's passive solar design and thermal envelope. The house was oriented to the north with the garage on the south side and the majority of windows along the northern face. An overhang shaded living area windows with eaves over the upper storey windows. High levels of insulation (R4.6 ceiling insulation and R2.6 external wall insulation) were combined with uPVC framed double glazing.

The family found the house to be very warm in winter and only used the heater when they first moved in with a new-born baby. Warm winter temperatures in living and bedrooms improved the family's health. The family reported that no-one had been sick since arriving in the house and they had not needed asthma inhalers.

Energy use in the HomeSmart Home was startlingly low coming in at 3980 kWh per year. Compare this to a recently monitored group builder house in Christchurch where year-round heat pump use resulted in 14,400 kWh per year energy use and you can see what a saving this is.

In part, the great performance was due to the photovoltaic panels which generated a third of electricity used, but even without this, the home's design and features made it a very efficient electricity user – after all, not many affordable homes would invest in this level of kit. A combination of energy efficient appliances, lighting and hot water combined with good passive heating and thermal design significantly reduced the family's power bills.

The family praised their efficient heat pump hot water system for its contribution to their lower power bills and the warmer home meant minimal heating costs. The house also included a Centameter which enabled the family to keep an eye on their energy use. Other studies have indicated that energy monitors can reduce energy use by about 10%.



Water-wise, the HomeSmart Home also performed well. Water is metered and paid for separately in Auckland, so using less water had a direct financial benefit for the family. Water efficient appliances and fittings, a rainwater tank for the garden, and a greywater system, which reused 30% of waste water from bath, shower and laundry, reduced the family's water use to 117 litres per person per day. This is considerably less than the average in the Waitakere area of 165 litres per person per day. Given the low cost for water efficient fittings and the ease of incorporating them into homes, they should be a top priority for affordability.

Performance against Beacon's HSS High Standard of Sustainability®

Criteria	Benchmark	NZHF HomeSmart Home
Energy Use	5800 kWh/year	3890 kWh/year
Water Use	125 litres/person/day	117 litres/person/day
Living Room Mean Temperature – 5-11pm in winter*	>18°C	19.0°C
Bedroom Mean Temperature – 11pm-7am in winter*	>16°C	18.0°C
Living Room Mean Relative Humidity – 5-11pm in winter*	40-70%	62%
Bedroom Mean Relative Humidity – 11pm-7am in winter*	40-70%	62%

* Winter = May to September

Future improvements

Of course, nothing's perfect and even the HomeSmart Home could be improved. The upstairs rooms tended to overheat in summer - deeper eaves on both upstairs and downstairs windows, and high windows which can be left wide open for natural ventilation would address this.

While the greywater system was a good performer, a larger rainwater tank plumbed to outside, toilet and laundry would use Auckland's excess rainfall more efficiently. And while it's true the upfront cost of a photovoltaic system may not yet justify its use in affordable homes, this may change as the price of power goes up, and the cost of photovoltaic panels comes down.



SB11 Helsinki

Lois Easton reports on the World Sustainable Building Conference

Around 1000 people attended the conference, which was run in parallel with the Nordic Passive House conference. There were a wide range of attendees from a range of countries.

Keynote speakers

The tone of the conference was set by some of the keynote speakers on the first morning – Richard Lorch (editor Building Research and Information), Ray Cole (University of British Columbia) and Bill Bordass (Usable Buildings Trust). We were reminded that buildings and cities represent some of the most durable things in human material culture and that successful and resilient cities have long lives.

The speakers suggested that, looking forward, we need to focus beyond individual building performance to the neighbourhood and community scale.

On Day 2, Michael Gratzel (EPFL) presented on the development of mesoscopic solar cells for integrated building photovoltaics. This was a fascinating presentation and it is clear that this technology is moving forward quickly.

On Day 3, keynote speakers focused on the housing needs of the growing urbanising global community. Of particular interest was the presentation from Cameron Sinclair from Architecture for Humanity. Among the many projects they are involved in, one is a new build earthquake programme in Christchurch with a local Christchurch school.

Beacon research

Earlier Beacon research was presented at SB11. Maggie Lawton presented on energy use in reticulated water systems, and I presented on HomeSmart Renovations. Both presentations were well attended, reflecting the strong interest across the conference in market transformation initiatives.

Key research themes

Housing retrofits

Housing retrofit was much more prominent at SB11. The research focused on retrofits of social housing projects in a wide range of countries. Generally these were apartment style developments, although some were detached and semi-detached. The overwhelming focus was on thermal envelope improvements, heating and ventilation system improvements, hot water system improvements and the installation of micro-generation.

Typical interventions included:

- Tightening of the building to meet passive house infiltration standards
- Installation of heat recovery ventilation systems
- Upgrading of heating systems – to air source heat pumps (UK) and ground source heat pumps (northern Europe)
- Installation of ceiling cavity (loft) insulation, and wall insulation (using external insulation products over-clad)
- Upgrading of windows to low E double glazing in uPVC frames (UK) or to triple glazing in uPVC frames (northern Europe)
- Installation of photovoltaic panels
- Installation of solar hot water systems (although basic improvements to insulation of pipework and hot water cylinder wraps were also common in UK retrofits)

Retrofit studies shared some common themes:

- Human behaviour was reducing the effectiveness of the retrofits from the expected/modelled performance.
- Some people were finding the airtightness increases made the homes feel stuffy, leading to increased opening of windows and heat loss (UK, France research)
- Some people were heating too much – setting thermostats on high temperatures (e.g. 25°C) reducing energy efficiency gains (UK, France research)
- Other energy inefficient behaviours (e.g. appliance use) were offsetting energy saved from thermal and heating upgrades

Very high cost retrofit features (e.g. photovoltaics, triple glazing) were not seen as delivering a good “bang for buck” and would be unlikely to be used in larger scale retrofit roll out programmes (UK research).

Concern was starting to be expressed by some researchers that retrofits needed to both mitigate the effects of climate change, as well as enabling adaption to the changing climate. While some measures were good from a mitigation perspective, they were going to create problems with coping with the future climate – particularly extreme heat events which are predicted to become a lot more common in the future. This really links to the expected life of the building stock – it is clear that in Europe, an expected life of 100+ years is assumed – makes our 50 year Building Code requirements (and 15 years for cladding) look pretty laughable really.

Ventilation and overheating issues

Research findings from a number of authors (e.g. Wago – Norway; Koch – Austria; Neilsen – Denmark and Finland) were showing that the approach taken to reduce heating demand in winter (tight houses, heavy insulation, large south facing windows) was creating overheating problems in summer. The example was given in Neilsen’s paper of low energy developments in Denmark and Finland where overheating was occurring in summer 30% of the time. (Overheating was defined as temperatures above 26°C, which to Nordic people would indeed be hot). Neilsen was advocating that active cooling systems needed to be designed into these homes as the modelling showed that window opening would not be sufficient to cool the houses.

Ventilation and the potential for overheating problems were also raised in relation to retrofit of houses to Passive House standards. Again, some people in retrofitted houses were opening windows more as they didn’t feel the ventilation systems used provided enough fresh air. Additionally there were a number of researchers starting to look into issues of poor indoor environment quality in very tight, actively ventilated houses. Conclusions were few on the ground, but concerns were expressed that the “build ‘em tight, ventilate right” approach wasn’t getting the ventilation right.

Materials in retrofit

A number of papers were presented on the benefits of using wood as a sustainable construction material, including in retrofit situations, with a focus on the sequestration benefits of timber framing. Interestingly, in apartment retrofits, adding additional floors of apartments framed in wood, was seen as a key funding mechanism for retrofits by some authors. The lightness of the wood framing meant additional floors could be added, and the sales of the new apartments could be used to fund the retrofits of the older parts of the building.

One UK author, however, was deeply concerned that a move to light timber framed structures would lead to inability to cope with the substantial summer temperature increases predicted.

Market transformation mechanisms

Almost all projects presented on retrofit housing focussed on social housing. Because all the EU countries have extensive energy and greenhouse gas emission reduction targets, they have identified housing (particularly heating) as being key to this but have started with their own housing stock. Government incentives and support programmes were seen as vital to achieve substantial market transformation. The most notable programme in this area has been the UK Green Deal.

Papers available

I have papers from the conference available if you are interested.

Contact me at: loise@beaconpathway.co.nz

Lois Easton



Some of the NZ contingent at SB11: (from left) George and Alice Baird, Maggie Lawton, Lois Easton, Lisa Burrough