BBS/12

Mt Pleasant 1: Build Back Smarter Case Study

A report prepared by Beacon Pathway Incorporated
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About This Report

Title

Mt Pleasant 1: Build Back Smarter Case Study

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Abstract

The Build Back Smarter Project aims to develop evidence that residential performance upgrades at the point of earthquake repair is able and worthwhile to be implemented as part of the Canterbury earthquakes recovery process. Using the case studies of ten homes, the project is exploring and demonstrating what is possible as part of the repairs. This report documents the third completed case study – the upgrade of a house known in the project as Mt Pleasant 1.

Reference

Easton, L. (February 2014). Mt Pleasant 1: Build Back Smarter Case Study. Report BBS/12 for Beacon Pathway Incorporated.

Contents

Figures

1 Introduction

Over the past 2 ½ years Beacon Pathway Inc has been undertaking research into how energy and water efficiency and indoor environment quality improvements can be incorporated into earthquake repairs from the 2010 and 2011 Canterbury earthquakes. The research has involved the use of case studies to explore and demonstrate what is possible as part of the repairs. This report documents the fifth completed case study – a house known in the project as "Mt Pleasant 1".

2 Mt Pleasant 1

Figure 1: Mt Pleasant 1

Mt Pleasant 1 is a 1918 weatherboard bungalow with a large extension built in 2002. The house consists of four bedrooms, an open plan living room, dining room and kitchen, a laundry and two bathrooms, with a separate garage. Because of the extension and some wider modernisation undertaken in the house, it has downlights installed in the both the older and modern parts of the home. The house is served by a small 1996 electric hot water cylinder serving the ensuite and laundry and an instant gas hot water system for the main bathroom and kitchen.

The exterior cladding of the house is timber weatherboard and it has a suspended timber floor for the older part of the home, and an uninsulated concrete slab for the more modern part of the home. The orginal part of the house had lath and plaster wall and ceiling linings, with plasterboard linings in the extension. The total dwelling area is 174m^2. The roof was clad with chip coated steel tiles (replaced with long run prepainted steel as part of repair). Heating in the home was with a large heat pump and a flued gas heater. The heat pump was installed post earthquake as the electric night store heater previously used had been damaged. The house has a heat transfer system linking the living room with the entrance hall, and has a DVS forced air ventilation system. The house has large areas of glazing towards the northern views across the estuary, Christchurch city and along the coast.

The house is owned by a couple who have lived there for the last 3.5 years, moving in not long before the earthquakes.

2.1 Earthquake damage

The house suffered from significant damage to foundations from the earthquakes, made more complex by the two different foundation types. Ground movement caused uneven settlement of ring foundation and piles of the older part of the home, and voids formed beneath the 32m^2 concrete slab to part of the extension. Damage also included damage to the roof cladding, window joinery, exterior paintwork, entry floor tiles, tongue and groove flooring finish, retaining walls, fencing and driveway. Most interior lath and plaster ceiling and wall linings were badly cracked.

Figure 2: Ceiling damage to Mt Pleasant 1

The house was insured by IAG and the Project Management Office (PMO) was Hawkins.

In terms of the scope of the earthquake repairs:

- Repair of the foundations by packing and replacing floor piles, grout pumping into the voids beneath the concrete slab, epoxy injections into the cracks in the ring foundation.
- Replacement of the roof
- the driveway, fencing and retaining walls
- Most lath and plaster ceiling linings were replaced throughout
- Most lath and plaster wall linings replaced throughout
- Internal doors were eased and adjusted throughout
- Full interior and exterior redecoration.

The owners also took a cash settlement for the retaining wall, fencing and driveway repairs and will be arranging this work themselves.

The total value of earthquake repairs is estimated at $260,000 excl. GST. The repairs were undertaken over a period from May 2013 to December 2014. Because the foundations were not replaced, a building consent was not required.

2.2 House performance assessment and retrofit

The house was assessed using Beacon's Home Assessment and Prioritised Plan tool. The pre-retrofit condition and performance interventions undertaken are outlined in Table 1 below.

Table 1: Pre-retrofit condition and interventions

Mt Pleasant 1	Pre-retrofit condition	Interventions	Cost (excl GST)
Thermal	Thin macerated ceiling insulation less than 70mm in older part of house (70%) and thin fibreglass batts in more modern extension including a sloping skillion ceiling was located along one outside wall edge of the lounge and three bedrooms.	R3.2 ceiling insulation installed over existing insulation. R1.8 ceiling insulation installed in skillion sloping ceiling	$3283.37
	No wall insulation or building wrap in older part of the house	R 2.8 Wall insulation installed in older part of house with building wrap segments inserted between the frames	$1487.94

Mt Pleasant 1	Pre-retrofit condition	Interventions	Cost (excl GST)
	No underfloor insulation or vapour barrier under low suspended floor in older part of house.	R1.6 underfloor insulation installed under part of suspended floor where access available. No vapour barrier able to be installed as insufficient access	$1335.66
	Draughty external doors	Replacement at homeowner's cost of external doors with double glazed u-PVC doors.	
	Very large area of western facing glass- draughty windows, and single glazing, insufficient curtains	New double glazed uPVC windows installed at homeowner's cost	$27,000 incl. GST (homeowner cost)
Hot water	180L 1996 electric hot water cylinder servicing ensuite and laundry – insufficient space for a hot water cylinder wrap or pipe lagging. Instant gas hot water system for kitchen and main bathroom – pipe lagging required	NA	
Heating	Living flame gas effect heater in living room – not used due to high running cost. 10kW heat pump in living room – installed post earthquake to replace broken night store heater. Portable electric heaters used in bedrooms.	Gas heater removed. Freestanding 15.7 kW woodburner installed at homeowner's cost. Heat transfer system installed to take heat from living room to two bedrooms.	$3000 incl. GST (homeowner cost) $1018.08

Mt Pleasant 1	Pre-retrofit condition	Interventions	Cost (excl GST)
	Heat transfer from living room to south facing entrance hall.		
Lighting	33 downlights – a mix of halogen and incandescent bulbs throughout. Ceiling insulation covering the downlights (macerated paper and fibreglass)	Replacement with LED/ IC rated downlights.	$1,188
Ventilation	Ineffective bathroom extract fan in main bathroom – ducted to ceiling. Externally ducted bathroom extract in ensuite. No kitchen rangehood, stove located under a window.	New bathroom extract installed – was specified to be ducted externally but builder didn't do so. Under dispute. Bench level extractor fan repaired by homeowner.	$172.44
Water	Two high flow showerheads. High flow kitchen and bathroom taps. Two dual flush toilets. Good opportunity for rainwater tank installation.	New lowflow tapware installed by homeowner. Low flow showerheads installed. 1000 litre rainwater tank installed.	$1200 (homeowner cost) $308.88 install cost $2582
Other Energy	Two heated towel rails – on all the time	Timers installed on heated towel rails	$336.56
Total BBS Retrofit Cost before EECA subsidy			**$11,713**

Figure 3: A gas effect fire (left) replaced by woodburner (right)

The gas effect fire was originally installed in the living room for heating, but because it was so costly to run a 10kW heat pump was installed post earthquakes and gas effect fire was not used. During repairs, the homeowners paid to replace this with a woodburner.

Figure 4: Extensive north-facing glazing to take advantage of the views has led to overheating – some awnings already installed

Figure 5: Downlights were widespread in the house with halogen and incandescent bulbs.

2.2.1 Homestar™ assessment

Prior to the repair and retrofit, the house was assessed by a Homestar™ Homecoach using the simplified online tool. The house was assessed as being 2 star. Following the retrofit and repair, a reassessment indicated the house now meets a 5 star on the online tool. A Certified Homestar™ assessment has not been undertaken. The Homestar™ Homecoach reports are attached in Appendix One and Appendix Two.

3 Findings – Repair Process

3.1.1 Inclusion of Build Back Smarter upgrades

As for previous case studies, the inclusion of the Build Back Smarter upgrades caused no issues with the repair process. Again, however, the installation of the bathroom extract fan was inadequate with the builder ducting the fan into the ceiling, rather than externally as specified. This seems to be a standard problem in Christchurch – every Build Back Smarter case study house has had inadequate extract ventilation system installation.

The builder used a method for replacing lath and plaster ceiling and wall linings whereby not all the lining was removed. This meant that, in places, only partial insulation of insulation was possible.

Figure 6: Lath and plaster ceiling and wall linings were not completely removed so insulation had to be fitted where possible.

3.1.2 Costs of upgrade features

Again, the value of the Build Back Smarter upgrades were minor in the midst of the substantial $260,000 repair undertaken by the insurer. In addition to this, the homeowner undertook substantial additional work at the time of repair at a total cost of $35,000. Most significant was the replacement of all windows with double glazed uPVC windows at the cost of $27,000, replacement of the inefficient gas fire with a $3000 woodburner, replacement of the plumbing fittings at $1,200 and installation of new vanity units in the bathroom and a ceramic bench top in the kitchen for $3000.

Figure 7: Windows were replaced with double glazed uPVC windows at the homeowner's cost.

3.1.3 Homeowner feedback

Having been back in the house for three months of summer, the owners are impressed with how much warmer the house is on the few colder days and evenings over that period, even without any heating turned on. The wood burner has been tested and the heat transfer kit found to be very effective at taking the chill off the two bedrooms that have outlets. The ducting length is reasonably short and the woodburner does have a high output which together with the new insulation is resulting in a significant comfort and energy use improvement. The homeowners are now planning to install an additional duct to the third bedroom as they feel there is sufficient excess heat to transfer. The double glazed PVC-u windows and doors seal very well and this will also be contributing to the performance improvement. The owners believe that the BBS upgrade features did not cause any delay in the completion of the earthquake repairs.

The owners still have some unresolved earthquake repairs they are continuing to negotiate with the builder, the PMO and the insurer.

4 Discussion

As a result of being involved in the project, and based on recommendations from the Upgrade Plan, the homeowner undertook substantial performance improvements at their cost as part of the project. This is the first instance that the homeowners have prioritised performance improvements over the cosmetic – although this may be largely due to the fact that the house had been substantially renovated prior to the earthquakes.

The poor installation of the bathroom extract fan (again) highlights what may be a systemic issue in the industry.

5 References

Easton, L. (2013a) Build Back Smarter Huntsbury 2 Case Study. Report BBS/6 for Beacon Pathway Incorporated

Easton, L. (2013b) Build Back Smarter Halswell 1 Case Study. Report BBS/9 for Beacon Pathway Incorporated

Easton, L (2013d) Build Back Smarter Spreydon 1 Case Study. Report BBS/10 for Beacon Pathway Incorporated.

Easton, L (2013c) Build Back Smarter Somerfield 1 Case Study. Report BBS/11 for Beacon Pathway Incorporated.

Appendix One: Homestar™ Homecoach pre-upgrade report

Homestar™ report

Homecoach assessed

Your Homestar rating

2

Analysis

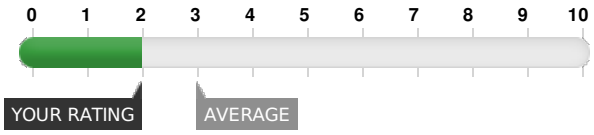
Congratulations, on completing the Homestar™ rating.

This house has achieved a rating of 2 stars under the Homestar Residential Rating Scheme.

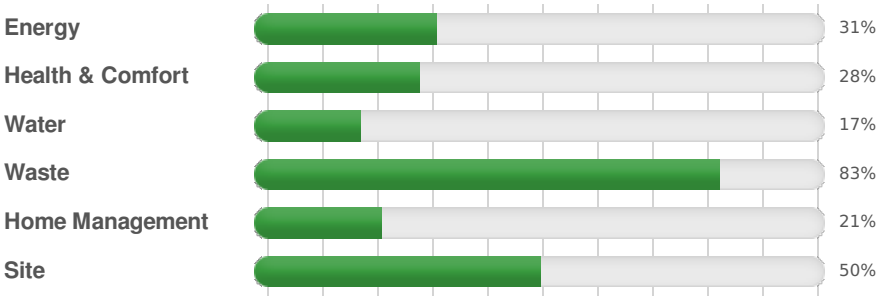
It is possible for this home to achieve a higher star rating, except that it is currently being held back by a mandatory minimum performance level in the core issue of overall warmth and comfort (specifically the ability for the house to achieve healthy winter-time temperatures without using excessive energy). To gain a higher star rating address this core issue first, and then reassess the house once the changes have been made.

A small part of the rating tool rewards non-permanent fixtures of the home such as fridges, freezers, dishwashers, compost facilities etc. If these are removed (for instance when the house changes occupancy) this could affect the star rating of the house.

Compare your rating
The average score for your type of house (California Bungalow (1920–1940)) is 3



Your house has been identified as a type of bungalow. These are relatively easy to retrofit and should perform well once they have been upgraded. Extra insulation can be put into the ceiling and under the floor easily in most cases, and bungalows are suitable for a wide range of heating types. Issues with heritage restrictions in certain neighbourhoods may make interventions such as fitting double glazing or providing solar hot water panels slightly more complicated. However, overall, providing the 'bones' of your house are sound, a range of retrofit interventions will work well.



Recommendation information

Use the recommendations in this report to prepare a plan for your whole house. This will guide you through the process of making your home cosy, warm, healthy, cheaper to run and with a higher rating. Some recommendations involve simple actions you can take at little or no cost. Others involve investments that will pay for themselves through lower running costs or other benefits like making your home more comfortable.

The recommendations are provided in order of priority for improving your overall health and comfort in the home, but you can re-prioritise based on the potential to improve your star rating, the operational cost savings, or whether the recommendation will be kinder on the environment – simply click on the headings to change the order.

Costs and improvement potential

Appendix Two: Homestar™ Homecoach post-upgrade report

Mt Pleasant 1

1. Homestar™ Report: Self Assessed

Your Homestar Rating

5

Analysis

Congratulations Adam, on completing the Homestar™ rating.

This house has achieved a rating of 5 stars out of 10 under the Homestar™ Residential Rating Scheme. Most New Zealand houses currently score between 2 and 4 stars.

The Homestar™ rating system rates houses on a variety of categories which look at health, comfort, resource use and environmental effects of residential dwellings. Individual Category scores are provided below.

More information

Home Performance Categories:

Compare your rating: