BBS/11

Somerfield 1: Build Back Smarter Case Study

A report prepared by Beacon Pathway Incorporated
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About This Report

Title

Somerfield 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 fourth completed case study – the upgrade of a house known in the project as Somerfield 1.

Reference

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

Disclaimer

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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 fourth completed case study – a house known in the project as Somerfield 1.

2 Somerfield 1

Figure 1: Somerfield 1

Somerfield 1 is a modest, 1935 weatherboard bungalow. The house consists of two bedrooms, a living room, dining room, kitchen, laundry and bathroom, with a separate garage. The exterior cladding of the house is timber weatherboard and it has a suspended timber floor, although the floor clearance was too low for underfloor insulation or a vapour barrier to be installed. The internal wall linings were lath and plaster. The total dwelling area is 110m². The roof is clad with corrugated iron. Heating in the home was with an older inset woodburner combined with portable electric heaters and hot water was supplied by a 135 litre 1960s electric hot water cylinder. Because of problems with dampness in the house prior to the earthquakes, the household had installed a positive pressure ventilation system, although dampness still remained a problem. Liquefaction from the earthquakes may have further exacerbated the dampness problem.

The house is owned by a couple with two children under 16. The family have lived there for the last 15 years.

2.1 Earthquake damage

The house suffered from significant damage to foundations from the earthquakes. Ground movement caused uneven settlement of ring foundation and piles, damage to sewer and stormwater drains, the concrete terrace, external paths and the driveway. All interior lath and plaster ceiling and wall linings were badly cracked. Because of the foundation failure, repair also required the removal of the internal brick chimney.

Figure 2: Earthquake damage to Somerfield 1 ring foundation

The house was insured by AMI (Southern Response) and the Project Management Office (PMO) was Arrow.

In terms of the scope of the earthquake repairs:

- The house was jacked up and the concrete ring foundation replaced with timber piles and baseboards
- Lath and plaster ceiling linings were replaced throughout
- Lath and plaster wall linings replaced throughout
- Doors and windows were eased and adjusted throughout
- The concrete deck was replaced with a wooden deck
- Driveway, paths and patio paving were replaced
- Sewer and stormwater drainage was checked and minor repairs were made
- The house was re-wired at the insurer's cost.

The total value of earthquake repairs is estimated at $150,000 excl. GST. The repairs were undertaken over a period from May 2013 to September 2013. Because the foundations were replaced, a building consent was required from Christchurch City Council.

2.2 House performance assessment and retrofit

The house was assessed using Beacon's House 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

Halswell 1	Pre-retrofit condition	Interventions	Cost (excl GST)
Thermal	Thin (<70mm) fibreglass ceiling insulation	R 3.2 blanket overlaid on top of existing insulation.	$2162
	No wall insulation or building wrap	R 2.8 Wall insulation installed in whole house with building wrap segments inserted between the frames	$1981
	No underfloor insulation or vapour barrier Damp under floor	R1.6 underfloor insulation installed Polythene vapour barrier installed	$2590 $926
	Draughty external doors	Draught excluders installed on 1 door	$27.62
	Draughty wooden frames single glazed. Draughty louvre window in sunporch.	Louvre window replacement & double glazing for childrens' bedroom proposed but declined	

Halswell 1	Pre-retrofit condition	Interventions	Cost (excl GST)
	Very large south windows in both bedrooms & lounge. Substantial condensation on all windows.	by homeowner.	
Hot water	Old (1960s) hot water cylinder with wrap and lagged pipes	New hot water cylinder installed by homeowner in ceiling as part of kitchen upgrade.	Paid by homeowner
Heating	Old inset woodburner in lounge. Internal double chimney. Electric heaters used in bedrooms.	New low emission woodburner installed and chimney removed as part of earthquake repairs. Heat transfer system installed taking heat from lounge to bedrooms.	Chimney removed as part of earthquake repairs. Homeowner funded new free standing wood burner. $1521.45
Ventilation	Old ineffective extract vent in kitchen window. Ineffective bathroom extract vent – combined vent/light unit with long duct and bad location.	New rangehood externally vented installed as part of kitchen upgrade by homeowner. New bathroom extract ventilation was supposed to be installed in better location. Builder didn't replace unit because contractor felt it was adequate.	
Water	Efficient showerhead. High flow kitchen and bathroom taps. Dual flush toilet	Tap aerators specified as part of work but not installed by builder. Rainwater tank still to be installed	$3000 provisional sum
Total BBS Retrofit Cost			**$13,113**

Figure 3: The house was lifted up for foundation repair – enabling access to install underfloor insulation and a ground vapour barrier in Somerfield 1

Figure 4: Louvre window in sun porch. This was causing significant draughts but the homeowner didn't want it replaced.

Figure 5: A positive pressure ventilation system had been installed by the homeowners to try and reduce the dampness in the house; however, mould and condensation were still prevalant

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 Two.

3 Findings – Repair Process

Figure 6: Lath and plaster linings were replaced with plasterboard as part of the repair, enabling wall and ceiling insulation installation

3.1.1 Inclusion of Build Back Smarter upgrades

As with the previous Huntsbury 2 and Halswell 1 case studies, inclusion of Build Back Smarter upgrades in the Somerfield 1 repairs appears to have had no impact on the pace or difficulty of the repair process for the case study household, PMO or the insurer. The PMO in this case was Arrow, rather than Hawkins, but as for the previous case studies, the liaison was primarily with the builder as main contractor, rather than the PMO or insurer.

In this case study, however, there were significant problems with the quality of the installation of the Build Back Smarter upgrade features by the appointed builder and his subcontractors. Specific problems included:

- Damage to ceiling and underfloor insulation by electricians and plumbers after installation, requiring both to be relayed at extra cost to the project. The ceiling insulation had to be installed prior to the Council building inspection (pre-line) but then was substantially disrupted during the rewire of the house.
- Problems with installation of the heat transfer system – the inlets and outlets and thermostat were installed in the wrong locations and had to be remedied.

- Problems with the replacement of the bathroom extract. Very poor communication on site – the foreman thought a new extract fan had been installed on the existing inefficient ducting. The quantity surveyor advised, however, that the builder thought the one that was installed there already was working ok so it wasn't replaced.

The costs of these poor installations were relatively high. As with other case studies, the upgrades went through the appointed builder, who charged 5% P&G and 15% builder's margin on top of the cost of the work quoted (including that undertaken by CEA). To pay costs to refit part of the underfloor insulation is disappointing. This reflects the low degree of oversight and quality assurance provided by the builder and PMO in relation to non-insurance works. The building firm was a large reputable building company which has substantial repair work contracts for Arrow/Southern Response. However, in a situation where all trades are stretched, the actual level of competence of the installers of the ventilation unit and heat transfer system was low. Anecdotally, problems with installation of heat transfer systems are common, as many electricians and builders have little experience with this. The house also had a complex ducting situation in the roof space, with the positive pressure ventilation system already installed. However this should not be a problem to a competent installer.

The experience of this upgrade highlights that, with the value of most insurance repairs being well in excess of $100,000, the upgrades to improve house performance are small value and very minor in the mind of the appointed builder and will, in all likelihood, receive a relatively minor consideration when undertaken.

As in the previous case studies, the homeowner also sought additional work to be undertaken at the time of repair: an upgrade to the kitchen and associated appliances; upgrades to the washhouse and toilet; and a new woodburner and hot water cylinder were also installed. This work was undertaken by the appointed builder at the same time as the repair work and came to approximately $45,000 incl. GST. No problems were identified by the homeowner in relation to this work.

3.1.2 TRS wiring and borer-damaged floor joist replacement

As part of the assessment process, both Beacon and the PMO Arrow had identified the house had TRS wiring, and that this may have been an issue, particularly with wall insulation replacement. Once the initial lath and plaster removal had been undertaken, the PMO identified that the wiring was a significant health and safety issue and needed to be replaced. A 6 week delay resulted while the PMO and insurer debated whether this was a cost which should be funded by the homeowner or the insurer. In the end it was decided that because the wiring problem was discovered during the repair process, this was a cost which fell with the insurer. Similarly, when the house was first lifted, some borer-damaged floor joists were identified. These were replaced by the insurer as part of the foundation repair.

4 Builder experience of the upgrade process

The site foreman for Somerfield 1 was interviewed about the builder’s experience with the project and Build Back Smarter interventions. His role was to oversee construction, co-ordinate all subtrades on site, and liaise with the homeowner through the repair process.

Generally the experience of the process was also a good one with the most measures installed with little problem or impact on the overall project. The builder’s supervisor identified that a bit more detail on the work to be done (e.g. a plan showing the location where heat transfer system and bathroom extract should go) would have been useful. A physical drawing (even just a sketch) for work to be undertaken by subtrades such as electricians and plumbers would assist in the ease of implementation of the upgrades. He identified that this was one of five major repairs he was running at the same time – so actual time spent at each job was limited.

Coordination was required with Community Energy Action over the installation of the wall insulation when the linings were off and the underfloor insulation and vapour barrier while the house was lifted prior to foundation replacement. This went smoothly from the builder’s perspective.

Key recommendations arising from the interview with the building company site foreman are:

- Investigate whether builders would be willing to allow access to the house sites for other subtrades at the time of repair, rather than doing all work through the appointed builder.
- Ensure a drawing is provided where electrical or plumbing work specific to the upgrade is required –this suggests the need for architectural draughting expertise, or greater on-site overview by BBS case management.

5 PMO experience of the upgrade process

The Arrow project manager was interviewed following the completion of the repair process. While Arrow and Southern Response management had signed up to the Build Back Smarter project, it has been up to individual project managers to work with Beacon to identify potential case study houses. This house had been put forward by a previous project manager and the household signed up before the new project manager got involved.

The project manager hadn’t heard about the Build Back Smarter project prior to taking over the project but was supportive of the approach of allowing people to improve their houses at the time of repair. As with the Hawkins project-managed houses, the approach taken was for the project manager to push down most of the liaison and working through of the interventions to the builder/head contractor on the job. This meant that the impact of the Build Back Smarter process on the PMO was small, and the Beacon project manager was able to deal directly with the builder.

In terms of the upgrade process, the project manager felt that the installation of wall insulation when the cladding and/or linings were being removed was easily incorporated into the repair process.

In this house the Build Back Smarter upgrade originally included hot water cylinder replacement and installation of a wetback. When the prices came back from the builder, this was deleted due to the excessive cost. However, unknown to Beacon at the time, the homeowners decided to replace the hot water cylinder and install a new one in the roof as part of the kitchen upgrade they funded, so this work was undertaken. This caused a delay as a structural engineer's certificate was required by the Council in order to sign off the Building Code compliance. Because it was in the original specification, the project manager had attributed this cost – and delay – to the Build Back Smarter project. Although it wasn't in fact a Build Back Smarter upgrade, it was originally intended to install the new cylinder in the roof (albeit the lounge rather than the kitchen) so the engineering issues are important to note.

In terms of upscaling the Build Back Smarter approach, the project manager felt that installing insulation is easily accommodated, but that other work would need to depend on the willingness of the builder to fit it into his programme. The project manager also noted that Arrow is currently tightening up on the inclusion of non-repair work being completed at the same time as repair work – insulation being the exception to this.

The project manager agreed that the time pricing and invoicing the Build Back Smarter work, at its small scale relative to repairs, was more of an unwanted distraction for the builder – and that the proposal to take the Build Back Smarter work off the builder and instead be implemented by accredited Build Back Smarter contractor sounded like an easy solution to this – provided all contractors were aware of and complied with Health and Safety requirements in full.

6 Homeowner experience and willingness to pay

The owner of Somerfield 1 was interviewed one week after her house was completed.

The main expectations she had around the project were that the house would become warm and dry. In this respect, despite the short post repair timeframe, she felt that the upgrade had delivered a substantial improvement. Previously the house had been noted for its dampness, even after the installation of the postive pressure ventilation system.

Prior to the earthquakes, the homeowners had taken what they thought were the best steps to reduce the dampness of the house and installed the positive pressure ventilation system, even though there was only a low level of insulation in their ceiling. The homeowner reported this had a slight improvement on the overall level of dampness in the house but that there was still mould growing in some rooms.

The most notable change for the homeowner post repair and upgrade was the reduction in moisture in the home, a notable improvement in warmth, and the absence of condensation on the windows. In particular, the lack of draughts and improvement in temperature of the floor was noticed. The house was also noticeably easier to heat with the heat transfer system giving good results.

"The house was so damp that if I brought papers home from work, they would absorb so much moisture they wouldn't go through the fax machine any more".

"It's great no longer needing to wear socks to bed – or having to put slippers on to get up in the morning."

6.1 Experience of the repair and upgrade process

The delays experienced leading up to the repair process (which commenced 2 years following the earthquake damage occurring), and then in the timeframe for repairs – the repairs took 21 weeks instead of the 14 expected – were seen as a significant stress to the household. The household lived in 2 rental units, and then for the last week in a caravan on site during the repair process, all of which was disruptive to both work and the children's schooling.

6.2 Build Back Smarter approach

The homeowner saw significant value in the Build Back Smarter approach, but would have liked to have had more interaction with the Beacon Project Manager. She found the house assessment useful, and wished that she had had this done prior to getting the positive pressure ventilation system installed.

6.3 Cost and willingness to pay

The homeowners spent approximately $45,000 incl. GST on the upgrade of the kitchen, laundry, hot water system and wood burner during the repair process, the maximum amount that they could afford to add to their existing mortgage. As a relatively low income household, their capacity to fund improvements at the time of repair was very limited.

If they had to have paid themselves, the insulation measures included in the house as part of the Build Back Smarter process were things the homeowner would have liked to have seen included in her upgrade – and they indicated that, knowing what they know now, they would have reduced the scope of their kitchen upgrade to pay for the insulation.

In terms of actions which weren't taken but were recommended, the homeowner indicated that they would have liked to get the bathroom extract vent ducted so that it went directly out the wall, rather than the current inefficient arrangement.

7 Discussion

7.1 Level of skill in trades

The volume of work now underway in earthquake repairs has resulted in a high demand for most of the construction sub-trades, as well as the main contractor's own staff resources. Many contractors are relying on specialisation to stretch their resources, or employing less skilled labour. This has resulted in less experienced staff sometimes being assigned to carry out a narrow range of tasks that they often have had little training or experience with.

This is particularly noticeable in the electrical and plumbing sub trades. In an effort to cope with the volume of work, new staff are often given just enough training to carry out one aspect of that trade and move from job to job doing just one part of that trade's usual range of work. Responsibility for the final outcome then gets spread across a range of different participants. While the main contractor's site foreman has final responsibility for the quality and co-ordinating of the sub trades on the site, this person will often be working beyond their competency or experience level and may be responsible for up to five different sites (as in this case) all at different stages of repair.

The main contractor in this case is one of a group of 17 builders selected by Southern Response in June 2013 to complete the larger house repair projects. They have been guaranteed 50 repair projects at an average cost of $250,000 over 12 months. The contractor is aiming to grow their workforce from 65 employees to between 100 and 150 over the next 24 months and more than 200 in five years' time.

7.2 Builders' margins for work undertaken by contractors

This case study, and other Build Back Smarter houses currently under repair, has large builders' margins – both P&G and contractors' margins for work being undertaken by third party subcontractors. This has had the effect of substantially increasing (by 20% in this case) the cost of the interventions. This, combined with the need to use the electricians and plumbers already contracted by the building repairer, has resulted in some interventions (e.g. the installation of a wetback in this case study) were priced at a prohibitively high level for the work which was proposed.

This confirms the findings in the Halswell 1 case study that the model adopted by Build Back Smarter for the pilot, of going through the PMO and subcontracting through the appointed builder, is not the best for a wider roll out. The original intention of the BBS approach was to work in with the insurer and their PMO; however, it has become clear through the case studies, that the PMO is actually taking little or no role in relation to the BBS repairs, and that homeowners are often getting quotes and negotiating with contractors to undertake additional work at the time of repairs.

This house was the first Arrow/Southern Response house to be completed in the Build Back Smarter Pilot. It is noted that EECA have recently completed negotiations with Arrow around how they will allow wall insulation installation to be included at the time of repair. Unfortunately, this explicitly directs that such work will be done by the appointed builder in the project. This contrasts with the EQC approach, whereby the builder is required to allow EQC-accredited wall insulation installers access to install the insulation, but no extra builders' margin is provided for. The homeowner directly liaises with the wall insulation installer, and pays them directly.

Based on the findings of the case studies to date, it is clear that the EQC approach is preferable to that negotiated between EECA and Arrow, and that in progressing with the development of a Build Back Smarter Service, efforts should be made with the PMOs to allow BBS Service accredited contractors access to the site to do upgrades at the tie of repair.

Some of these types of interventions may be able to be deferred to the end of insurance repairs when the appointed builder has largely finished with the site as, in practice, sub-trades were often not taking advantage of the ceiling or wall linings being removed and were not fitting many items until linings are replaced.

8 Conclusions

The conclusions of the previous case studies[1] are supported by the Somerfield 1 case study. A number of additional conclusions can also be drawn:

- The independent assessment and prioritised recommendations are important for the homeowner.
- The case manager role will be key to helping homeowners in any upscaling of the Build Back Smarter approach.
- Where electrical or plumbing work is required as part of the upgrade, a drawing is needed to assist with the installation process. If this work is done by the appointed builder's subcontractors, no assumption of experience or competence around ventilation and heat transfer improvements should be made.
- Extending the Build Back Smarter concept into a Service will require consideration of how to enable upgrades to be done by accredited installers, rather than just those appointed by the PMO to undertake repairs.
- Builders' margins also have a significant impact on the cost of the work, and the implementation model for the scale up should follow the EQC approach of the homeowner contracting the work separately.

[1] ***Easton (2013a) and Easton (2013b)***

9 References

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

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

Appendix One: Homestar™ Homecoach pre-retrofit report

Homestar™ report

Homecoach assessed

Your Homestar rating

2

Analysis

Congratulations, on completing the Homestar™ rating.

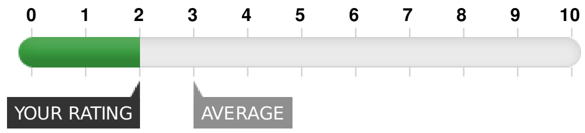
This house has achieved a rating of 2 stars under the Homestar Residential Rating Scheme.

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.

Energy	33%
Health & Comfort	34%
Water	27%
Waste	83%
Home Management	32%
Site	31%

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-retrofit report

1. Homestar™ Report: Self Assessed

Your Homestar Rating

5

Analysis

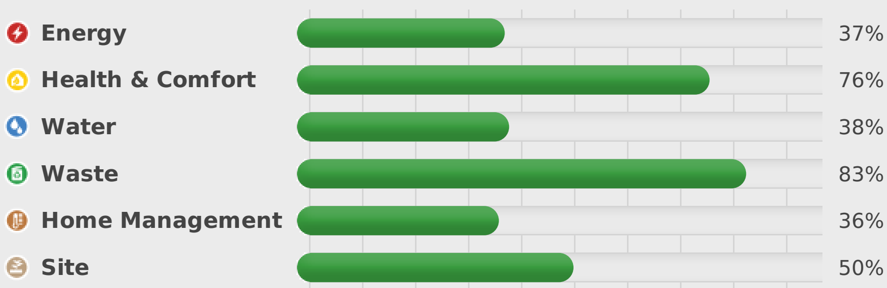
Congratulations Adam, on completing the Homestar™ rating.

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.

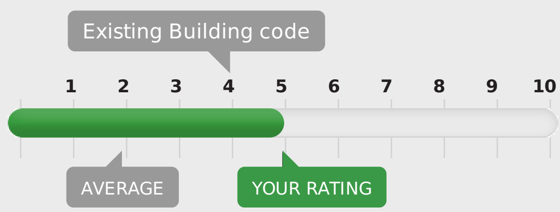
The Homestar™ rating system rates houses on a variety of categories which look at health, comfort, resource use and environmental effects of residential dwellings. Individual Category scores are provided below.

More information (/report-more-info)

Home Performance Categories:



Compare your rating:



Recommendations: Follow us, we've got a plan

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