BBS/6

Huntsbury 2: Build Back Smarter case study

Final

A report prepared for Beacon Pathway Incorporated
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About This Report

Title
Huntsbury 2: 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 first completed case study – the upgrade of a house known in the project as Huntsbury 2.

Reference
Easton, L. (January 2013). Huntsbury 2: Build Back Smarter case study. Report BBS/6 for Beacon Pathway Incorporated.

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1 Introduction

The Build Back Smarter Project aims to develop evidence that residential performance upgrades at the point of earthquake repair are both worthwhile and able to be implemented as part of the Canterbury earthquakes recovery process. The research involves the case studies of ten homes to explore and demonstrate what is possible as part of the repairs. This report documents the first completed case study – a house known in the project as "Huntsbury 2".

2 Huntsbury 2

Figure 1: View of Huntsbury 2

Huntsbury 2 is a large 1960s brick and stucco house with a first floor extension built in the 1970s and a basement garage. The house downstairs area consists of two bedrooms, a living room, dining room, kitchen, laundry and bathroom, with the basement garage below the dining room. The first floor extension has two bedrooms and is accessed from downstairs through a large foyer. The exterior cladding of the house was originally stucco over block, with sheet cladding material upstairs. The total dwelling areas is 119m^2 with 63m^2 upstairs. Both the lower and upper floors have suspended timber floors. The roof is clad with clay tiles. Heating in the home was with an inset woodburner, and hot water is supplied by a 1950s electric hot water cylinder.

The house is owned by a retired couple who have lived there for the last 20 years, and brought up their family in the house.

2.1 Earthquake damage

The house suffered no damage in the September 2010 earthquake, but was substantially affected by the February 2011 earthquake, with damage to exterior stucco block cladding (see Figure 2 below), cracked ceiling and wall linings as well as a range of minor damage to tiles, and some other fixtures.

Figure 2:Earthquake damage to Huntsbury 2 exterior cladding

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

In terms of the scope of the earthquake repairs:

- Most of the block-work and stucco veneer cladding on the ground floor was replaced and building wrap installed.
- Ceiling linings were replaced in the living room, hall and all four bedrooms.
- Wall linings were replaced in the dining room, living room, hall, and a bedroom due to cracking and damage.
- Wall linings in the kitchen, stairwell and the other 3 bedrooms were also replaced because it was more cost effective for the builder than removing the wall paper and replastering.
- The non-compliant (emissions) woodburner was replaced.
- Once wall linings in the dining room were removed, extensive earthquake damage to the inset woodburner flue and chimney were discovered, the steel flue was replaced and some repairs done to the open fireplace chimney were made.

The total value of earthquake repairs is estimated at $150,000. The repairs were undertaken over a period from July 2012 to October 2012.

Because of the nature of the repairs, a Building Consent was only required for the woodburner replacement.

2.2 House performance assessment and retrofit

The house was assessed using Beacon's HomeSmart Renovations assessment tool. The pre-retrofit condition and performance interventions undertaken are outlined in Table 1 below.

Pre-retrofit condition	Interventions	Cost (ex GST)
Thermal		
Ceiling insulation less than 70mm in original ceiling. No access to 1980s addition ceiling.	■ Top-up of ceiling insulation with R4 batts and cutting an additional access hatch. ■ Access hatch cut to 1980s ceiling. Ceiling insulation top-up with R4 batts.	$2600
No wall insulation downstairs. Upstairs double sided foil in walls.	■ R2.8 wall insulation installed in living, dining, kitchen, hall and downstairs bedroom with building wrap inserts in south wall where veneer was not removed. ■ Foil replaced with R 2.8 wall insulation with building wrap inserts in upstairs bedrooms.	$3310
No underfloor insulation Damp underfloor no vapour barrier.	■ R 1.6 underfloor installation installed. ■ Polythene vapour barrier installed.	$3160
Large south facing windows in	■ Low emissivity double glazed panes	$3880

Pre-retrofit condition	Interventions	Cost (ex GST)
upstairs bedrooms. Timber framed single framed draughty windows – one large double glazed picture window in living room.	installed into existing timber frames in south facing windows of master bedroom**.**	
Two draughty external doors.	■ Draught excluders installed on one door as second door installation not practical.	$27
Hot water		
Uninsulated D grade 1955 hot water cylinder. Unlagged hot water pipes. Old (disconnected) solar hot water system on roof.	■ Pipe lagging installed on hot water pipes	$18
Heating		
Older (non compliant for emissions) inset woodburner in dining room. No upstairs heating.	■ Thermostat controlled heat transfer system to master bedroom.	$600
Other Energy		
Curtains throughout house – but not well fitted. Incandescent bulbs in a number of fittings.		
Ventilation		
No kitchen rangehood, stove located on internal wall with difficult ventilation options. Bathroom extract fan vented to outside. Dryer with no external vent.	■ Rangehood installed with externally vented ducting taken through laundry and boxed in.	$930
Water		
Efficient showerhead. High flow kitchen and bathroom taps. 3/6 litre dual flush toilet		
Total Cost		**$14,524**

Table 1: Huntsbury 2 pre-retrofit condition and interventions undertaken

Figure 3: Uninsulated suspended timber floor in Huntsbury 2

2.2.2 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: Homestar™ pre-retrofit Homecoach report.

3 Findings – Repair Process

Figure 4: Huntsbury 2 mid repair – Exterior cladding being replaced

3.1 Inclusion of Build Back Smarter upgrades

In this case study, inclusion of Build Back Smarter upgrades appears to have had no impact on the pace or difficulty of the repair process for the case study household or insurer. The key reasons for this ease of inclusion were:

- The liaison was primarily with the builder as main contractor, rather than the PMO or insurer, and the builder was quite happy to add additional (paid) work into his scope.
- The homeowner also requested additional work of builders on top of the scope of work from the PMO for earthquake repairs (as discussed further below).
- The existence of a person facilitating communications between the homeowner, the builder and the PMO, ensuring that matters are dealt with promptly, before any issues arise. In this case, Bill King (Beacon's Build Back Smarter Project Manager) played this role for the project. However, our evaluation has identified that this facilitating/co-ordinating role is fundamental and would be an essential element to any rolling out of upgrade at time of repair – i.e. building back smarter.
- The timeframe allowed for the work (when the homeowners were being accommodated elsewhere) involved sufficient down-time and delays awaiting attendance of some sub-trades for the builder to be able to accommodate the additional scope of works without disrupting his schedule.

Figure 5: Uninsulated wall with cladding removed – a classic Build Back Smarter opportunity

Figure 6: Old insulation in the living room walls

(this wasn't expected but was replaced as part of the Build Back Smarter work)

Figure 7: Wall insulation being installed prior to relining

Figure 8: Ceiling insulation topped up with heat transfer system also installed

3.2 Additional Build Back Smarter opportunities arising during repairs

In addition to the work identified by the Build Back Smarter assessment and planned as part of the upgrade, additional wall insulation opportunities arose during the construction period. Because the damage to the upstairs wall linings was not severe, the insurance scope identified that these should have the wallpaper removed, the joints raked and be replastered. However, the fiddliness and time consuming nature of this job meant the builder preferred to replace the wall linings. When these were removed, it was discovered that foil sheet had been fixed to the framing before the plasterboard was fixed. As a result there was no insulation in the cavities but, with the wall lining removal creating the opportunity, Community Energy Action was able to install wall insulation in the upstairs rooms as well.

Because the cladding was not removed, no exterior-applied building wrap was installed. This meant that the insulation installers had to use the method outlined in NZS 4246: 2006, which involves installing inserts of building wrap into the cavities – a time consuming (and therefore more costly) installation method, but still deemed to be very worthwhile.

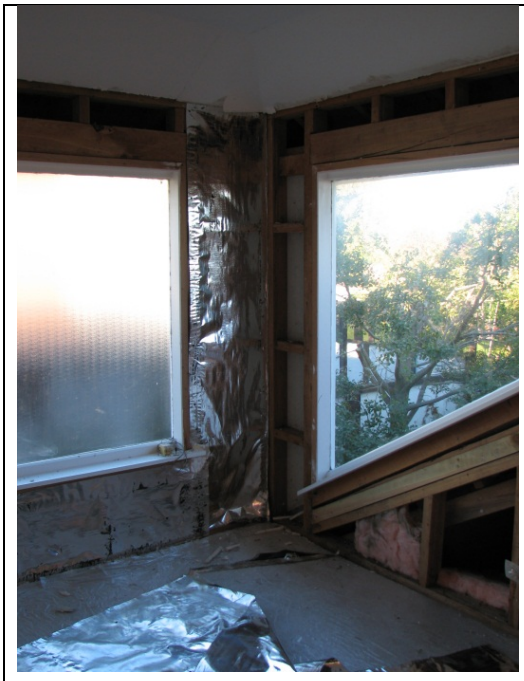


Figure 9: Foil sheet behind plasterboard was found in the upper storey when the linings were removed.

Figure 10: Inserts of building paper were stapled into the cavities prior to insulation installation where wall linings, but not cladding, were replaced

3.3 Homeowner initiated scope changes

A number of homeowner-initiated scope changes occurred during the upgrade and repair process. These arose for two reasons:

- The homeowner decided they want some additional work done as a consequence of the earthquake repair scope
- As the earthquake repairs were undertaken, they uncovered additional work which should be ideally done at the time of repair, but were not covered by the insurance scope:
  - Fibreglass reinforcing of the stucco veneer (suggested by the builder as an "earthquake proofing measure" but something that would not be covered by insurance);
  - Shoring up and replacement of sagging lintel over the French doors which supported the upper storey of the house which had slumped following previous renovations, and
  - Replacement of some of the more dangerous pieces of TRS wiring uncovered during the repair process (note the homeowners had the option of completely rewiring their home, but due to affordability considerations only had the "dodgy bits" replaced).

Figure 11: Completed stucco block veneer replacement – additional fibreglass reinforcing was included at the homeowner's cost

The effect of unplanned scope changes is something that Beacon plans to look into in more detail as part of the other Build Back Smarter case studies, but it does seem that the extent of scope changes initiated by the homeowner/builder (and of things which are likely to reduce the likelihood of future insurance claims) in the Huntsbury 2 case study were actually far more extensive than any of the Build Back Smarter measures, and these were also able to be accommodated within the planned construction timeline. Affordability will, however, be an issue for some homeowners.

4 PMO experience of the upgrade process

The Hawkins' project manager was interviewed following the completion of the repair process using a structured interview technique. While Hawkins and IAG 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 project manager has put forward 3 houses to the Build Back Smarter project, and was convinced that it was a sensible approach to undertake during the repairs.

The approach taken, in this instance, 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 very small, and the Beacon project manager was able to deal directly with the builder which saved time for him but put more responsibility for QA of the Build Back Smarter work onto the Beacon project manager. This also meant there was no fee or margin payable to the PMO.

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. The house was empty so there was no disturbance to the occupants, and the implementation was done by CEA as installers in a timely manner.

Generally the project manager felt that the Build Back Smarter project added significantly to the quality of the repair job undertaken. The PMO project manager relied on the Beacon project manager and the homeowner with regard to quality checks on the Build Back Smarter upgrade work however. This raises issues for the wider scale roll-out of the approach. While CEA are acknowledged to be a very good provider of insulation installation services, Beacon undertook thorough quality checks of the installation. A homeowner, on their own, is not likely to be able to adequately judge the quality of installation.

In terms of upscaling the Build Back Smarter approach, the project manager felt that this would be a fairly doable prospect, provided the liaison/project management role undertaken by Beacon was provided for. The independent assessment and advice on what upgrades should be undertaken as part of the repair process was also seen as an important part of the equation as it gave people good information on the priorities.

As was evidenced in this case, some homeowners are able to fund additional work as part of the upgrade process, particularly those who are able to add costs onto existing mortgages. The project manager felt that older households were those most likely to struggle with additional costs.

5 Homeowner experience and willingness to pay

The owners of Huntsbury 2 were interviewed 5weeks after their house was completed. The main expectations they had around the project related to improved warmth and the value of insulation. In this respect, despite the short post-repair timeframe, they felt that the upgrade had delivered a substantial improvement. Prior to the earthquakes, the house had been noted for its cold, with the dining room heated by an inset woodburner providing a "warm room" in an otherwise cold house. The bedrooms in particular were felt to have been very cold, although no supplementary heating was normally used to heat them.

The most notable change for the homeowners post-repair and upgrade was the ease of heating their home and the impact that had had on their lifestyle. The upgraded woodburner and extensive insulation meant that the homeowners were now able to heat their whole house – and enjoy "warm even temperatures, and no longer have to put on a down jacket to go into the living room" On some recent high temperature days, they have also noticed that the house has been pleasantly cooler than they previously recalled.

5.1 Experience of the Repair Process

The delays experienced leading up to the repair process (which commenced 1 ½ years following the earthquake damage occurring) were seen as a significant stress to the household. The initial experience with EQC was also regarded as being a largely negative process. A loose/dangerous chimney flue was initially identified as an emergency repair, but this was never undertaken. Prior to the claim being referred to the insurance company, the EQC assessment identified there was no problem with the flue; however, once repairs started, the extent of damage was revealed with the initial post-earthquake assessment proving correct.

Once the insurance process with IAG was underway, this was generally felt to be quite good, although again rife with delays and much slower than expected. The case manager approach was seen as a good thing, with the homeowners establishing a positive relationship with their case manager. Similarly the PMO Project Manager was seen as helpful and competent and a good communicator which made the pre-repair process easier to deal with.

In terms of the repairs themselves, the homeowners had a positive experience with the builder and subtrades – a good professional job, done in a timely manner. The Build Back Smarter upgrades were able to fit seamlessly into the work programme, with the ebb and flow of work being such that the insulation and ventilation improvements were easily accommodated.

The homeowners also took the opportunity to make improvements of their own at the same time. Old TRS wiring was uncovered early on, and the builder organised for an electrician to upgrade the unsafe portions. A beam supporting the upper storey extension was sagging and the homeowners had the builder replace this. They also took the opportunity to install fibreglass reinforcing in the stucco, ensuring a greater degree of resilience to any future land movement.

All this additional work was able to be accommodated within the scheduled programme of repair.

5.2 Build Back Smarter approach

The homeowners saw significant value in the Build Back Smarter approach, particularly the independent assessment and advice on priorities for upgrades. They felt without this they wouldn't have known where to start, although they acknowledged they were keen on the idea of more insulation from the very start.

The homeowners found the written report useful – only Helen was at home during the time of the assessment, and the report enabled her to talk through the findings with David when he was home. The inclusion of clear priorities and rationale was also helpful, although once the decision on work which was to be done was made, the report hasn't been further referred to.

5.3 Cost and willingness to pay

The homeowners spent approximately $10,000 on additional work during the repair process, and indicated that knowing what they know now, they would not hesitate to get insulation installed at the time of repair. This is consistent with the findings from the HomeSmart Renovations[1] and Papakowhai Renovation[2] research projects – once people have experienced full insulation compared to their old cold house, they regard it as an essential item. The couple also found considerable value in the heat transfer system – which is operated by a thermostat and takes warm air directly upstairs to the bedroom. The presence of the thermostat, and improvements in warmth of the house had led the couple to purchase an indoor temperature station – and generally had increased their awareness of the temperatures within the home.

Figure 12: An access hatch to install ceiling insulation, and heat transfer kit to the master bedroom were installed as part of the upgrade.

[1] ***Saville Smith et al, 2010***

[2] ***Easton, 2009***

As a retired couple, David and Helen were very aware about how much they could spend on additional work on their home, and carefully weigh the costs and benefits. They considered that they might not have undertaken the rangehood/external ventilation if they had had to pay for those things themselves. They also indicated an unwillingness to pay for the external venting of the dryer – which, though infrequently used, vents moist air inside the house. Again this is consistent with the findings from the HomeSmart Renovations project[3] – despite the fact that extract ventilation has considerable health, dampness and ease of heating benefits, householders in that research project were significantly less likely to take up extract ventilation recommendations than insulation recommendations.

With regard to the double glazing, the homeowners hadn't yet made a firm decision about whether that was something they would have been happy to fund or not. One large window in the living room had already been double glazed – but until the full insulation was installed, the room was still very cold. The Build Back Smarter double glazing installation was to south facing windows in the upstairs bedrooms, which were also fully insulated at the same time. It's difficult therefore to separate double glazing and insulation benefits. Interestingly the initial response from households receiving double glazing in the Papakowhai project was that this was of limited value; however, over time – and particularly after experiencing a full winter – the households valuing of the double glazing increased substantially[4].

In terms of actions which were recommended but not taken, the homeowners indicated they would be unlikely to replace the 1950s hot water cylinder as "it's still going fine after 50 years". This was initially planned for replacement as part of the Build Back Smarter upgrade but, for budgetary reasons, was not progressed. The cylinder was unable to be wrapped with a hot water cylinder wrap due to tight space constraints in the hot water cupboard. A retired couple could be expected to be relatively low hot water users and the standing losses from a 1950s D grade cylinder could be expected to be significant. Again this reinforces findings from other research; people tend to replace their hot water cylinder when it breaks down, and not before, regardless of performance.

[3] ***Saville-Smith, et al, 2010***

[4] ***Easton, 2009***

6 Discussion

6.1 Wall insulation and repair – Issues raised by EQC

While the Build Back Smarter case studies are focussed on houses subject to repairs being undertaken under the home insurance process, many more homes (including some with very substantial damage) are being repaired through the EQC/EQR process. In October 2011 EQC issued a directive to EQR and its contractors that wall insulation was not to be installed as part of EQC repairs – even if the homeowner was prepared to fund its installation. The reasons given by EQC are as follows:

1) "Time delays caused by some Councils requiring a Building Consent as it is a requirement of the Building Act 2004
2) Time delays in arranging for Homeowners or Homeowners' Contractors to fit insulation under EQR and Contractor supervision and the associated inter-contractual and liability issues.
3) Issues on older houses with suspect or degradation issues of insulation to electrical wiring.
4) The release of the Department of Building and Housing Guidance Note relating to insulation.
5) H&S concerns."

The Huntsbury 2 case study provides some opportunity to look at the issues raised by EQC in a practical example.

6.1.1 Issue One: Building consent requirements

The first of these relate to issues of Building Consent. The Christchurch City Council has advised that provided guidance as a BCA on when a Building Consent is not required when installing wall insulation into existing external walls[5]. In the Huntsbury 2 case study, two methods were used to install wall insulation, both of which complied with this guidance, therefore no Building Consent was required. The two methods were:

- Installing segment wall insulation where building wrap was put in place as part of the recladding work undertaken
- Stapling building wrap into the wall cavities (as outlined in NZS 4240:2006) and installing segment insulation where the internal linings only were being replaced.

Both of these wall insulation methods could be regarded as standard industry practice (although stapling building wrap into the cavities is a time consuming and expensive process), and were easily accommodated into the build schedule. Since the Huntsbury 2 repair was completed the Ministry of Business and Innovation and the Energy Efficiency and Conservation Authority have issued further guidance on retrofitting wall insulation as part of earthquake repairs. This identifies how and when wall insulation is able to be installed without the requirement for building wrap inserts to be stapled into the cavities. In light of this, it appears that no barrier in

[5] ***Christchurch City Council Form B-390, updated 20 July 2011***

the form of Building Consent compliance/time delay exists. This guidance also addresses the issue raised by EQC of "the Department of Building and Housing Guidance Note relating to insulation".

6.1.2 Issue Two: Time delays and inter-contractual/liability issues

The second issue raised by the EQC directive is time delays and associated inter-contractual and liability issues.

With regard to time delays, the experience of the Huntsbury 2 case study was that there was sufficient down-time within the contractor's normal schedule that the wall insulation installation was easily accommodated. However, it should be noted that a prompt response from the insulation installation company was required, and this was a change from their business model and approach of booking well ahead for ceiling and underfloor installations.

With regard to intercontractual and liability issues, these were dealt with relatively simply – the insulation installer was subcontracted to the builder as head contractor who charged a margin on top of the fee from the insulation installer. No issues arose in terms of payments or quality of installation; however, an EECA accredited insulation installer was specified as part of the project requirements.

6.1.3 Issue Three: Degraded wiring

The third issue raised by the EQC directive was around suspect or degraded wiring and the potential impact of wall insulation. Again this was tested in the Huntsbury 2 case study. When the repair work commenced, the builder identified that there was degraded wiring in the house, and sought the advice of an electrician. He recommended to the homeowners the replacement of some of the wiring, to make the house safe (irrespective of the wall insulation issue) and the homeowners spent $1000 getting this work done. This is an example of good practice – undoubtedly the builder would have been uncomfortable with completing the job (regardless of the wall insulation) where he knowingly left unsafe wiring in place. It is not known to what extent this is industry standard practice, but the replacement of the unsafe wiring meant that the wall insulation was able to be installed without risk.

Registered electricians are well aware of the potential issues with TRS wiring and as the volume of insurance repair work increases, builders will become more aware of these issues also. PMOs have provided specific training for their staff on recognising and assessing potential risk with TRS wiring. Most over-cap insurance repairs have the power supply to the house disconnected at the start of the repair and that this stage the electrician involved would usually assess the condition of the electrical supply by inspecting the distribution board. This would identify the presence of TRS wiring. Of course TRS wiring is only found in a proportion of older houses, and it will be unsafe in only a proportion of circumstances, but this is a useful case study of how the issue can be dealt with.

6.1.4 Issue Five: Health and safety concerns

The final issue raised by EQC was "health and safety concerns". Insurance repair of damaged housing is within the definition of 'Construction Work' under the Health and Safety in Employment Act. All requirements for managing safety on a construction site apply to the insurance repair sites. PMOs are particularly vigilant in ensuring all health and safety requirements are met. Sites are also subject to random inspection from the regulatory authority officers. In the case of the Huntsbury 2 case study, this standard practice was applied and no issues arose.

7 Conclusions

A number of conclusions can be drawn from the Huntsbury 2 Build Back Smarter case study:

- Inclusion of Build Back Smarter upgrades seems to be easily incorporated into the repair process – without impacting on the timeframe
- The independent assessment and recommendations, including a written report, are important for the homeowner
- Insulation upgrades – and in particular wall insulation, combined with better heating/heat transfer deliver immediate and valued results for homeowners (this supports findings from previous Beacon research)
- The concerns raised by EQC around wall insulation retrofit at the same time as insurance repairs don't appear to be borne out in practical application
- Opportunities for wall insulation retrofit can be greater than initially scoped as the builder is likely to employ the quickest and most practical methods – which often will involve relining rather than repairing plasterboard
- Homeowners need to be adequately informed of the opportunities to improve the performance of their homes so that they can make informed decisions on additional work that could be completed in conjunction with their insurance repairs
- Extending the Build Back Smarter concept beyond the pilot project will require consideration of how lower income homeowners will be able to fund improvement works.

8 References

Easton, L. (Ed) (2009) Papakowhai Renovations. Project Summary and Case Studies. Report TE106/18 for Beacon Pathway Limited.

Saville-Smith, K., Fraser, R., Buckett, N. and Camilleri, M. (2010) HomeSmart Renovations: Householder Actions and Responses to Dwelling Performance. Report HR2420/13 for Beacon Pathway Limited.

9 Appendix One: Homestar™ pre-retrofit Homecoach report

Homestar™ report

Homecoach assessed

Your Homestar rating

2

Analysis

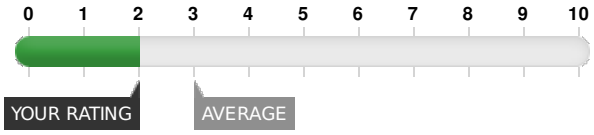
Congratulations, on completing the Homestar™ rating.

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

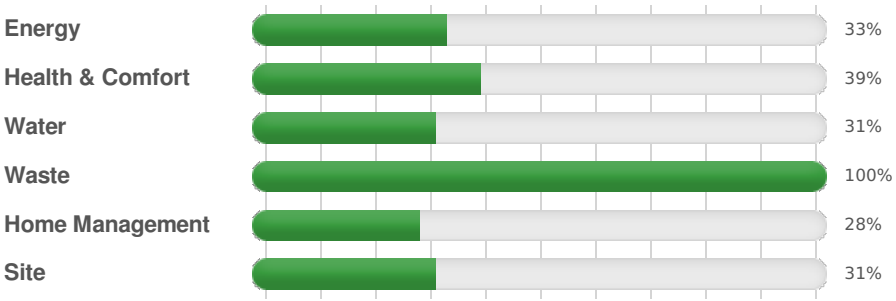
It is possible for this home to achieve a higher star rating, except that it is currently being held back by a mandatory minimum performance level in the core issue of overall warmth and comfort (specifically the ability for the house to achieve healthy winter-time temperatures without using excessive 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 (Detached State house/mass housing 1950–1960) is 3



Your house has been identified as a type of state or mass housing built in the 1950's. Typically, houses from this era have 'good bones', good orientation and good levels of access to renovation areas which means you have a high chance of success in renovating these houses to perform well. Cavities both in the ceiling and under the floor give relatively easy access to add better insulation and resolve dampness issues. In some cases, the small room sizes of this housing type mean that you may need to choose your heating options quite carefully. Often the pitch of the roof in this type of house makes it easier to install solar hot water systems, and the main living areas are well-orientated to the sun, providing good opportunity to maximise the amount of warmth coming in from the sun.



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

The costs are just a guide – they will vary by location, complexity of your house and individual situation. The house icons indicate how much the recommendation contributes to the priority selected – the more the better (for instance 5 house icons for environment means that the recommendation will be very beneficial to the environment).

Recommendations

Recommendation	Material Costs Unsorted	Installation Costs Unsorted	Points Potential Unsorted	Health & Comfort Unsorted	Cost Savings Unsorted	Environment Unsorted
Install double or secondary glazing to your main windows. HEALTH & COMFORT » WINDOWS Double glazing or secondary glazing helps to prevent heat loss from the house. If you are installing new windows, choose window frames that are good insulators (wood, PVC or thermally broken aluminium). Low-emissivity (low-E) glass also helps to reduce heat loss through windows.	$$$$$	$$$$	▲▲▲▲	▲▲▲▲	▲▲▲▲	▲▲▲▲
Install more ceiling insulation. HEALTH & COMFORT » CEILING Ceiling insulation should be the number one priority in any household. Ideally, you should have at least 150 mm to 200 mm thick, continuous insulation in the ceiling or roofspace.	$$$$	$$$	▲▲▲▲	▲▲▲▲▲	▲▲▲▲▲	▲▲▲▲
Fix problems in existing ceiling insulation. HEALTH & COMFORT » CEILING You've identified one or more problems with your existing ceiling insulation that makes it less effective. Address the cause of the problem (where appropriate) and get the affected areas repaired or replaced.	No cost	No cost				
Consider insulating your walls. HEALTH & COMFORT » WALLS If you have insulated the ceiling and under the floor, your house will be warmer but the largest proportion of heat will now be lost through the uninsulated walls. It's difficult to insulate walls in existing houses without taking the lining or cladding off. Take the opportunity to insulate when you renovate and have either the lining on the inside or the outside cladding of external walls removed.	$$$$$	$$$$$	▲▲▲▲	▲▲▲▲	▲▲▲▲	▲▲▲▲
Draught-proof the house. HEALTH & COMFORT » WALLS Draughty doors, windows and floors are a significant source of heat loss and may be making you and others in the house uncomfortable. Install some basic draught stopping on all outside doors and windows, and seal up any major gaps in floorboards.	$	$	▲▲	▲▲▲▲	▲▲▲▲	▲▲▲▲
Install underfloor insulation HEALTH & COMFORT » FLOORS If your underfloor is accessible (i.e. it's more than half a metre off the ground), get a minimum of R1.4 bulk insulation installed between the floorboards, flush against the underside of the	$$$$	$$$	▲▲▲	▲▲▲▲	▲▲▲▲	▲▲▲▲

flooring.						
Install a vapour barrier. HEALTH & COMFORT » DAMPNESS Fix any drainage or plumbing issues, make sure your underfloor area is properly ventilated, and look at installing a polythene ground cover under the house to stop rising damp.	$$	$$$				
Provide a covered outdoor washing line. HEALTH & COMFORT » DAMPNESS Drying clothes outside instead of a clothes dryer is an effective and cheap way to save energy. Drying clothes inside adds unwanted moisture to the home which can lead to damp and mouldy conditions. If the washing line is undercover or in a ventilated space away from the house, like a garage, then you can dry clothes even when it's raining.	$	$				
Install a kitchen rangehood vented to the outside. HEALTH & COMFORT » DAMPNESS It is important to have and use a rangehood in your kitchen. This will remove the moisture and cooking fumes generated while cooking. Kitchen ventilation systems must be vented to the outside of the house to be effective. Systems which go into the roofspace may create moisture problems.	$$	$$				
Replace older fridges/freezers with modern energy star rated appliances. ENERGY The energy efficiency of fridges and freezers has improved by about 50% in the last 10 years. Consider upgrading to an energy star rated fridge and/or freezer if yours is more than 15 years old.	$$$	No cost				
Consider solar or heat pump water heating. ENERGY Solar and heat pump water heaters are very efficient and can make considerable savings on power bills. Both systems have lower environmental impacts than traditional ways of heating water.	$$$$$	$$$$				
Insulate your hot water pipes. ENERGY Insulating your hot water pipes reduces heat loss and therefore energy wastage. Insulate as much hot water piping as you can, using foam pipe insulation available from hardware stores.	$	No cost				
Install a hot water cylinder wrap. ENERGY Wrapping your cylinder with insulation reduces the heat lost through the walls of your cylinder. You will need less energy for heating water and save money on your power bill.	$	$				
Upgrade to a more efficient hot water system. ENERGY If the hot water cylinder is more than 10 years old, you should consider replacing it with a solar hot water system, heat pump hot water system or a more efficient cylinder with a wetback.	$$$$$	$$$$				
Install a rainwater tank with a capacity of at least 4,000 litres. WATER Capturing rainwater off the	$$$$	$$$				

roof provides an alternative supply to the house and garden and reduces your overall stormwater runoff.						
Install an approved greywater system. WATER If permitted in your council area, install a greywater system. These systems re-use waste water for underground irrigation of the garden or toilet flushing.	$$$$	$$$				
Vent clothes dryer to the outside of the house. HOME MANAGEMENT Unvented clothes dryers create moisture problems in a home.	$	$				
Prepare a home maintenance and operation manual. HOME MANAGEMENT A home operation and maintenance manual stores all of the useful information about your home in one place. Guidelines and a template are provided here	No cost	No cost				
Plant more native plants on your section SITE	$$	$				

10 Appendix Two: Homestar™ post-retrofit Homecoach report

Homestar™ report

Homecoach assessed

Your Homestar rating

5

Analysis

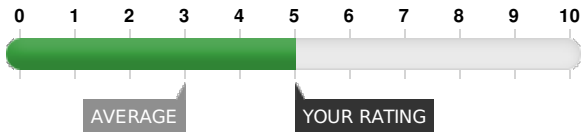
Congratulations, on completing the Homestar™ rating.

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.

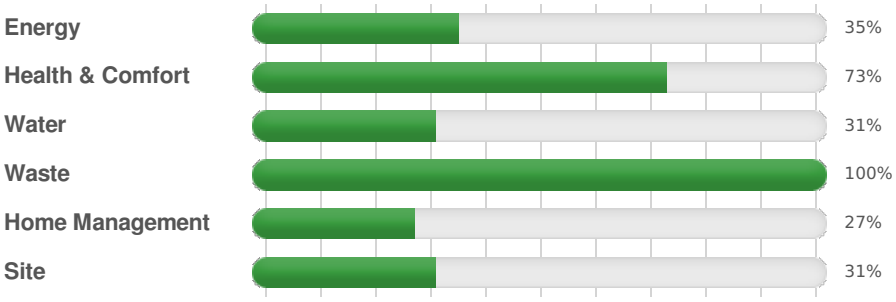
The Homestar™ rating system rates houses on a variety of categories which look at health, comfort, resource use and environmental effects of residential dwellings. Individual Category scores are provided below.

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 (Detached State house/mass housing 1950–1960) is 3



Your house has been identified as a type of state or mass housing built in the 1950's. Typically, houses from this era have 'good bones', good orientation and good levels of access to renovation areas which means you have a high chance of success in renovating these houses to perform well. Cavities both in the ceiling and under the floor give relatively easy access to add better insulation and resolve dampness issues. In some cases, the small room sizes of this housing type mean that you may need to choose your heating options quite carefully. Often the pitch of the roof in this type of house makes it easier to install solar hot water systems, and the main living areas are well-orientated to the sun, providing good opportunity to maximise the amount of warmth coming in from the sun.



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

The costs are just a guide – they will vary by location, complexity of your house and individual situation. The house icons indicate how much the recommendation contributes to the priority selected – the more the better (for instance 5 house icons for environment means that the recommendation will be very beneficial to the environment).

Recommendations

Recommendation	Material Costs Unsorted	Installation Costs Unsorted	Points Potential Unsorted	Health & Comfort Unsorted	Cost Savings Unsorted	Environment Unsorted
Install double or secondary glazing to your main windows. HEALTH & COMFORT » WINDOWS Double glazing or secondary glazing helps to prevent heat loss from the house. If you are installing new windows, choose window frames that are good insulators (wood, PVC or thermally broken aluminium). Low-emissivity (low-E) glass also helps to reduce heat loss through windows.	$$$$$	$$$$	⌂⌂⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂
Draught-proof the house. HEALTH & COMFORT » WALLS Draughty doors, windows and floors are a significant source of heat loss and may be making you and others in the house uncomfortable. Install some basic draught stopping on all outside doors and windows, and seal up any major gaps in floorboards.	$	$	⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂
Consider insulating your other walls. HEALTH & COMFORT » WALLS If you have insulated the ceiling and under the floor, your house will be warmer but the largest proportion of heat will now be lost through the uninsulated walls. It's difficult to insulate walls in existing houses without taking the lining or cladding off. Take the opportunity to insulate when you renovate and have either the lining on the inside or the outside cladding of external walls removed.	$$$$$	$$$$$	⌂⌂⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂
Provide a covered outdoor washing line. HEALTH & COMFORT » DAMPNESS Drying clothes outside instead of a clothes dryer is an effective and cheap way to save energy. Drying clothes inside adds unwanted moisture to the home which can lead to damp and mouldy conditions. If the washing line is undercover or in a ventilated space away from the house, like a garage, then you can dry clothes even when it's raining.	$	$	⌂⌂	⌂⌂⌂	⌂⌂⌂⌂	⌂⌂⌂⌂
Replace older fridges/freezers with modern energy star rated appliances. ENERGY The energy efficiency of fridges and freezers has improved by about 50% in the last 10 years. Consider upgrading to an energy star rated fridge and/or freezer if yours is more than 15 years old.	$$$	No cost	⌂⌂⌂		⌂⌂⌂⌂	⌂⌂⌂⌂
Consider solar or heat pump water heating. ENERGY Solar and heat pump water	$$$$$	$$$$	⌂⌂⌂		⌂⌂⌂⌂	⌂⌂⌂⌂⌂

heaters are very efficient and can make considerable savings on power bills. Both systems have lower environmental impacts than traditional ways of heating water.						
Insulate your hot water pipes. ENERGY Insulating your hot water pipes reduces heat loss and therefore energy wastage. Insulate as much hot water piping as you can, using foam pipe insulation available from hardware stores.	$	No cost				
Install a hot water cylinder wrap. ENERGY Wrapping your cylinder with insulation reduces the heat lost through the walls of your cylinder. You will need less energy for heating water and save money on your power bill.	$	$				
Upgrade to a more efficient hot water system. ENERGY If the hot water cylinder is more than 10 years old, you should consider replacing it with a solar hot water system, heat pump hot water system or a more efficient cylinder with a wetback.	$$$$$	$$$$				
Install a rainwater tank with a capacity of at least 4,000 litres. WATER Capturing rainwater off the roof provides an alternative supply to the house and garden and reduces your overall stormwater runoff.	$$$$	$$$				
Install an approved greywater system. WATER If permitted in your council area, install a greywater system. These systems re-use waste water for underground irrigation of the garden or toilet flushing.	$$$$	$$$				
Vent clothes dryer to the outside of the house. HOME MANAGEMENT Unvented clothes dryers create moisture problems in a home.	$	$				
Prepare a home maintenance and operation manual. HOME MANAGEMENT A home operation and maintenance manual stores all of the useful information about your home in one place. Guidelines and a template are provided here	No cost	No cost				
Plant more native plants on your section SITE	$$	$				