External Research Report

ER51 [2020]

Exceeding the Minimum for Volume Home Builders and their clients

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About This Report

Title

Exceeding the Minimum for Volume Home Builders and their Clients

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Abstract

This report aimed to develop, and market test, specific targeted advice aimed at the interaction point between volume home builders and home buyers with the intention to highlight higher performance options for typical volume home builders' dwelling specifications. Although the project failed to engage a volume home builder, the framework generated a series of information materials than can be adapted to different needs and in different ways. These were adapted for use when the project pivoted to open conversations with community housing providers about exceeding the minimum and to supporting the standards being set by KiwiBuild.

Reference

Ryan, V. & Blackmore, A. 2020. Exceeding the Minimum for Volume Home Builders and their Clients. Report ETM/1 by Beacon Pathway.

Disclaimer

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1 Executive summary

This project addressed the question: "*What could be done to more effectively show consumers and the construction industry that the New Zealand Building Code and standards represent a legally defined minimum, not a target?"*

The original aim of the project was to develop, and market test, specific targeted advice aimed at the interaction point between volume home builders and home buyers with the intention to highlight higher performance options for typical volume home builders' dwelling specifications. Research outputs were to be:

- A framework of features to exceed the minimum and their benefits
- Written and visual communications material outlining 'code-better-best' options for typical volume home builders' dwelling specifications.

The project developed a framework of higher performing features to help volume home builders and their clients better understand and communicate the importance of exceeding the minimum. A methodology to engage volume home builders and an approach to test the framework in the interaction between the volume home builder and the end consumer was developed. However, the research team were unable to recruit a suitable volume home builder who was prepared to be involved in the research.

If the proposed intervention had proved successful, the research team had expected to see improving specifications beyond the minimum building code being taken up more widely by the volume home builders who utilise the intervention materials/tool(s). It was thought that this may also lead to a wider acceptance and understanding for consumers that going beyond the minimum is worthwhile for a variety of reasons. Unfortunately, as little interest in utilising the approaches was forthcoming from the volume home building sector over the period of time that the research was undertaken, it has been impossible to test some of these hypotheses.

Based on the framework, a variety of tailored materials (in prototype) were developed that could be further developed and commercialised to guide discussions with the wider body of home builders (and other suitable organisations) throughout New Zealand. To a large extent, that aim was realised. The opportunity was taken to open conversations with community housing providers about the benefits of exceeding the minimum in their housing standards in terms of both meeting their mission and of their role as landlord. Further, a revised mid-project scope pivoted the effort to the delivery of modular information that supported increased standards and exceeded minimums for KiwiBuild.

The materials originally developed for volume home builders were repurposed to meet the community housing provider and KiwiBuild needs, showing the flexibility of this approach. They are appended as a set of simple 'plain-cover' information resources that can be adapted and used by a range of audiences including: Eco Design Advisors (EDAs), volume home builders, community housing providers, Kāinga Ora and social housing providers, and, potentially, consumers.

2 Introduction

This report provides a summary of work undertaken for project LR0537 Exceeding the Minimum for Volume Home Builders and their Clients, funded by the BRANZ Building Levy.
The research has focussed on how the building industry, and specifically volume home builders, can exceed minimum code levels in appropriate areas.

The key research question addressed by this project is: "*What could be done to more effectively show consumers and the construction industry that the New Zealand Building Code and standards represent a legally defined minimum, not a target?"*

The aim of the project was to develop, and market test, specific targeted advice aimed at the interaction point between volume home builders and home buyers with the intention to highlight higher performance options for typical volume home builders' dwelling specifications. These include items such as insulation, glazing, lighting, home heating, hot water, extract ventilation, water efficiency, and other aspects such as the durability of materials etc.

The following report summarises the lessons learned and provides an overview of the valuable information developed as part of the journey. Key appendices at the end of the report provide raw collated information that can be used in consumer- and industry-facing communications as part of a forward-facing communications plan.

The original programme of work was set up to test whether providing targeted advice on the benefits of specifying above building code features in the home would result in changes in what is included in final home specifications. The project aimed to develop a shared framework of features and benefits that will help the volume home builders and their clients better understand and communicate the importance of exceeding the minimum.

As part of this approach, written and visual communications material was to be developed outlining 'code-better-best' options for typical volume home builders' dwelling specifications. The intervention was aimed at the interaction point between volume home builders and the consumers who come to them to specify and purchase dwellings.

The research also aimed to help determine the optimal method and approach in the interaction between the volume home builder and the end consumer. This required working with a volume home builder.

3 Method

The original project methodology is outlined in the following section. This provides background to the intent of the work and is followed by a section outlining the changes that occurred to this original methodological approach, as well as a synopsis of why these changes were made.

3.1 Original project methodology – what we set out to do

The following section outlines how the project was originally set up and describes the seven key phases. An overview of the different stages of the project is provided with an indication of state of completion and outputs/deliverables achieved within each.

- **Phase One: Foundations** - understand existing New Zealand work undertaken to avoid replication and build off existing knowledge. Information to be reviewed included:
  - BRANZ research - 'Exceeding the Minimum' programme; 'Up-Spec' project and the Homes Benchmarking Project.
  - Beacon's NOW Home protocols
  - Industry views - Hastings District Council's 'Best Homes Scheme' and the SuperHome Movement.
  - Investigate successful international examples e.g. Home Quality Mark, Canada's Buyer's Guide to a Greener Home.

  Outputs: Collated key material
  Status as at March 2020: Completed

- **Phase Two: Outreach** - approach suitable volume home builders /industry experts to better understand:
  - The volume home builders' sales models, processes and customer journey.
  - Each company's standard construction specifications (and willingness to improve)
  - Where participating companies might be currently exceeding the minimum and where they could focus more effort to best effect
  - What would work best for the volume home builder for the proposed intervention.

  Outputs: Volume Home Builders engaged and signed up to project; Stop/Go or Pivot point reached
  Status as at March 2020: Completed (but without a successful volume home builder sign up)

- **Phase Three: Code-Better-Best Framework**- develop framework indicating which areas a 'code-better-best' approach would be most relevant for volume home builders including:
  - distinct code-related features (such as levels of insulation, window efficiencies, ventilation, lighting, home heating, water efficiency, and other aspects such as the durability of materials etc. Interventions were informed by BRANZ papers ER-0894 and ER-0893

- key areas outside of the current regulatory construct such as universal design features or those that focus on improved quality, low maintenance or durability.

Outputs: Framework highlighting key areas for volume home builders to 'exceed the minimum' and outlining a list of features and benefits (financial payback, comfort, health, resale value etc.)
Status as at March 2020: Completed

- **Phase Four: Intervention Invention** – Design key intervention tool(s) according to the specific requirements of the volume home builder and the customer/client.
  Outputs: Prototype intervention tool(s)
  Status as at March 2020: Partially completed – lacking full input from volume home builder and no input/feedback from customer/client. Interventions transformed to deliver information to community housing sector and government housing initiatives (KiwiBuild/Kāinga Ora)

- **Phase Five: Closed Market Test** - test and fine-tune the intervention (and underlying framework) with volume home builders (potentially the sales team or more general management team). This allows a degree of targeting for personalised use by each participating volume home builder.
  Outputs: Closed Market Test findings and finalised intervention tool(s)
  Status as at March 2020: Not completed (see below)

- **Phase Six: Intervention Market Test** - test the intervention with the volume home builders and their clients as part of the sales/specification process. A debriefing questions session to ascertain the impact of the prototype intervention on the decisions made by the client in relation to exceeding the minimum (e.g. did the information lead them to improve specifications of the dwelling in terms of features? And if so, in which areas for what reasons?). The intention was to provide an understanding of the level of desire for various improved features alongside an appreciation of motivation provided by different benefits.
  Outputs: Market Test findings summary report/presentation
  Status as at March 2020: Not completed (see below)

- **Phase Seven: Reporting Results (and Knowledge Transfer):** Results from the previous phases and the project as a whole will be written up in a project summary report. This will include recommendations for next steps and, providing they have proved successful, ideas for further use of the developed interventions material.
  Outputs: Project Summary Report and recommendations. Knowledge Transfer Plan.
  Status as at March 2020: Completed (this report including recommendations for a simple knowledge transfer plan)

3.2 Methodology to engage and recruit volume home builders

The methodology described above assisted the team in formulating the base information required for the project and helped to develop the Framework for exceeding the minimum features (see 4.1 Framework of higher performing features) for volume home builders. Also fully developed was the following methodology to engage and recruit volume home builders.

The selection of volume home builder companies involved:

- Identification of potential companies within Beacon's networks and following discussion with representatives from the Property Council NZ (based on criteria such as size, likelihood of collaborating, willingness to engage etc.).
- Setting meetings with the company and relevant staff to discuss the project
- Provision of written supporting information relating to the project (see 7.1 Final Project Information Sheet for Participants)
- A consent form for agreeing to be involved in the project (see 7.3 Consent Form for Exceeding the Minimum)
- A discussion about their business and building code minimums based around a structured set of interview questions (see 7.2 Interview Guide for Group Home Builders)

From this information and background research on the VHB companies, a simple case frame was developed to understand the types of businesses involved in the research and how reflective these are of the general market. The volume home builder was encouraged to sign-up to taking part in the research, either at the initial meeting or subsequently (once they had cleared approval with head office if necessary).

The processes around each company, their salespeople and their customers, varied following engagement; however, involvement in the project (at volume home builder, salesperson, customer and any other level) included:

- Provision of written and verbal information about the project
- An opportunity to ask questions about the project and to seek any clarity necessary
- Signed consent form which clearly identified:
  - A summary of the project details
  - What the participant was consenting to e.g. interview, notes, recorded conversation etc.
  - How they would withdraw from the research and what would happen to their information if they withdrew
  - Confidentiality of information
  - Details of any incentives provided as part of the research

It was anticipated that the volume home builder and Beacon would jointly brief any salespeople directly involved with the project. In addition, salespeople were to be given written and verbal information on the project and time to consider their involvement, prior to signing the consent form.

A copy of a draft information sheet and consent form for customers are attached in the appendices. The intention was for these to be further refined with the volume home builder so that it could be tailored to work with their unique sales process.

3.3 Changing scope and methodology

Beacon utilised its existing relationships with a number of volume home builders who have been open in the past to working together (e.g. the Beacon NOW Home and the Beacon New Category of Home projects both involved partnerships with large volume home builders). In addition, Beacon also discussed the situation with other key stakeholders such as representatives from the Property Council for guidance on recruiting volume home builders to the project. Section 4.4 Challenges of VHB recruitment talks about these challenges in more detail.

However, after several months spent trying unsuccessfully to interest several volume home builders in the project, a decision was made to abandon the market testing aspects of the proposed work and pivot the work toward the more ready audiences of the community housing sector and government housing agencies (see sections 4.5 Social and community housing provider approach and 4.6 Government approach (KiwiBuild & Kāinga Ora) below). Community housing providers currently build to code minimum standards; however, their mission and structure means that reduced operational costs, lifetime and durability improvements from exceeding minimum standards is certainly an advantage. In addition to opening those conversations, a revised mid-project scope pivoted the effort away from the delivery of consumer facing information to volume home builder clients, to the delivery of modular information that supported increased standards and exceeded minimums for KiwiBuild.

3.4 Key stakeholders

A register of key stakeholders was maintained as part of the project and a number of them assisted with the original scoping of the project.

Stakeholder	Role
Volume Home Build Companies	■ Project guidance ■ Testing 'exceeding the minimum' recommendations and targeted interventions with customers ■ Use of findings in future build and sales programme
The Property Council	■ Assistance /encouragement in signing up volume home builder participants to the project.
BRANZ	■ Provide insight from the current 'Exceeding the Minimum' programme; ■ Close collaboration as the project progresses ■ Regular bi- monthly meetings to inform and share insights where practical
MBIE	■ Insight to current pertinent code requirements and any 'code, better, best' policy settings as well as outlining any proposed revisions to

	specific code requirements. Linkage into the Smarter Homes website for key information and consistency.
EECA	■ Guidance on specific home energy advice e.g. 'code, better, best' insulation level recommendations, preferred heating sources etc.
Homestar and Lifemark	■ Guidance on consistency with residential rating tool and specific advice for universal design requirements
Consumers	■ Testing of resources and structured conversation to assist consumers to understand the 'code, better, best' approach ■ Future interaction with information as volume home builder customers
Other industry - involved in housing value chain e.g. other developers, home builders, home advice centres, real estate agents, valuers, landlords, banks and mortgage lenders	■ Use of material for education, market transformation, knowledge transfer

4 Results/Outputs

Although the research was not successful in achieving a set of results from market testing of the materials, the main output from the research has been the delivery of a useful set of materials that can continue to be used with volume home builders, community and social housing providers, government agencies and wider industry. There is scope in the material for it to be tailored for specific audiences as well as to provide more generic guidance for consumers and would be homeowners.

The bulk of this guidance and information is included in the Appendices to this report – and has been made available to BRANZ for use in wider publication and ongoing knowledge transfer.

4.1 Framework of higher performing features

One of the key outputs from the research has been the development of a simple 'exceeding the minimum framework'. This is a list of key features, informed by previous BRANZ and Beacon research[1]. A range of features were explored which sought to deliver higher performing homes in New Zealand. Each high performance feature suggested in Table 1 (below) was based on the **following key criteria**:

- Proven to achieve outcomes in the areas of energy and comfort, health, safety or ongoing operational cost savings (energy, water, low maintenance and durability).
- Cost effective for the customer/homeowner (in relation to both direct monetary savings as well as features which could add to the value of the home)
- Buildable using current, proven and readily available construction techniques
- Easily communicated to the customer/homeowner

■

[1] ***Notably Beacon's NOW100 and HomeSmart Home programmes of work and BRANZ's Upspec work and Benchmarking reports***

- Of value and attractive to both the builder *and* the customer/homeowner

The idea of the framework was that, as part of the collaborative approach of this project, Beacon would explore the criteria above with participating volume home builders who were involved with the project. This would enable them to develop their own targeted shortlist of higher performance features drawn from Table 1 below. The refined list of interventions would then form the basis of the **'intervention information'** provided to customers.

Table 1: Framework of Higher Performance Features

Higher Performance Features Framework	
1)	Good passive solar design maximising use of winter sun and cooling summer breezes as well as the use of thermal mass for year round low energy use (ideally achieving living areas to the north and no requirement for mechanical cooling in summer).
2)	High performance insulation to 'better' or 'best' standards: a) Ceiling – R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3) b) Walls – R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3) (all possible within 90mm framing) c) Floor – R1.9 (zone 1, 2 and 3), under-slab and/or perimeter insulation (dependent on perimeter/slab ratio)
3)	Higher performance double glazing / joinery a) Low e / argon filled b) Upgrade glazing to thermally broken suite (or combination of both a+b)
4)	More powerful extractor fans in bathrooms / wet areas (e.g. 40 litres/s min but modelled to suit) using motion sensors with a delay timer and ensuring that the duct diameter and extract fan is 150mm. Must be well installed and ducted to the outside of the dwelling. Ideally with low decibel rating to encourage use.
5)	LED lighting throughout – including any downlights being well fitted and meeting IC-4 (2018 NZS) which negate airflow into ceilings/roof cavity and do not compromise thermal envelope. All outdoor lighting fitted with integrated daylight and motion sensing controls (where practicable).
6)	Water efficiency bundle: Showers (WELS 3 star), toilets (WELS 4 star), taps (WELS 5 star), dishwashers and washing machine (if supplied) (WELS 4 star)
7)	Rainwater harvesting system with a minimum tank size of 2,000 litres, connected to as much of the roof as possible and plumbed for use in the home to at least 1 toilet or laundry. Otherwise, install plumbing to take future rainwater harvesting system through separate pipework to toilet or laundry with isolation valve in place for future connection.
8)	Lifetime/Universal Design[2]: Doors with minimum clear opening of 810 mm with lever handles, a bedroom and a bathroom/toilet located on the entry level of the house and paths from the car parking

[2] ***BRANZ research has shown that it is considerably cheaper and less disruptive to build universal design features into an individual new home than retrofit the same house later. As an example, the average extra cost of equipping a new house with UD features is $1,720, while retrofitting these new houses at a later date would cost an extra $16,990 on average (using 2011 figures)(pers.comm. R. Jaques 2018).***

	space to the dwelling are slip resistant, gently sloping and at least 1200 mm wide. Allow for 1500mm turning circle in kitchen and ground floor bathroom. Power points at least 500mm from floor and 500mm from corners. Door handles aligned with light switches at a consistent height between 900mm – 1200mm above the finished floor level.
9)	Efficient Space Heating: Use passive solar approach to reduce requirement for heating and then if heating required use efficient approved wood burner, wood pellet burner, or min 5 star rated heat pump.
10)	Solar hot water or heat pump hot water heating (may depend on supplier)
11)	Materials choices – use Environmental Choice certified materials including plasterboard, paints, insulation, carpets and floor coverings (equivalent international certification schemes may be used).
12)	Future technology: Consider electric car charging point in garage and/or UPVC conduit for easy future install of solar photovoltaic system on roof

4.2 Volume home builder approach

Another key output from the research was the methodology developed to work with volume home builders (VHB) to utilise the advice and information with their clients. Although the research team were unable to sign up an enthusiastic partner for this work, the model is still considered a robust approach that could be tailored to any keen volume home builder in the future. This was partially tested with two large volume home build organisations and had resonance with their processes.

Following any initial meetings required to set up the partnership with the volume home builder and their respective head office (if required), the researchers tailored a process that best met the needs and requirements of the particular organisations involved. The research team was open to suggestions of how best to supply information and advice to consumers with, for instance, one company suggesting provision of education and information at early stages of their customer journey, even prior to the customer signing up to a volume home build package. The researchers also suggested ways of working with the VHB company to develop material suitable for their website, blogs, magazine and social media – specifically, information that related to the specific higher performance features that the VHB company wanted to offer. Examples of these approaches are supplied in the appendices.

An overview of the approach to volume home builder organisations is mapped out below in section 4.2.1. This is indicative only and obviously would need to fit within with each individual company process to ensure a seamless customer experience. The researchers agreed to work with the VHB to ensure that this flexible approach met their needs and, importantly, enhanced their customer experience. The research team also suggested that, once agreed, the defined and targeted process was piloted with one of the more enthusiastic VHB franchises. This would provide the opportunity to further refine various aspects for consideration of a nationwide roll out (for larger organisations working across multiple localities). The intention was that any developed collateral could be used nationally, regardless of where the roll out of the intervention

information was originally used or where the specifications/sales process was occurring. The following approach was mapped out and presented to the volume home builders:

4.2.1 Overview of the process (as presented to VHBs)

1) Information Phase

⇒ We work with you to understand your current standards/specifications and willingness and/or desire to exceed these

⇒ You help us to understand what will work best for you in relation to your processes

⇒ We work with you to develop high level educational collateral relating to your chosen higher performance features (based on Table 1 above)

⇒ The tailored collateral (on websites or in your in-house magazine etc.) helps to inform and educate potential customers of your company when they first engage – it also provides content for you linked to robust independent endorsement of the chosen features

2) Intervention Development

⇒ With input from your company and key staff, we design the best customer intervention information for use at the specification stages of your current customer journey (and that work with your current sales model)

⇒ We work with you to optimise the process of delivering the information for customers to assist them in choosing higher performance specifications/features

3) Customer Interaction

⇒ We work with you to implement the chosen intervention during the customer interview (e.g. provision of a simple higher performance features brochure)

⇒ Some brief explanatory background information is provided to the customer to explain this research project and to confirm their willingness to take part

⇒ The customer completes the specification/sales meeting as per your usual sales process but with the addition of introducing the intervention material

⇒ Following the conclusion of the sales meeting we follow up with the customer via a short post-meeting phone call to find out whether the intervention material influenced them in upgrading to the chosen performance features *(During the trial research phase only)*

⇒ We provide the customer with an incentive for taking part in the research *(During the trial research phase only)*

⇒ We follow up with your sales team to discuss any insights into the success or improvement required to the intervention information *(During the trial research phase only)*

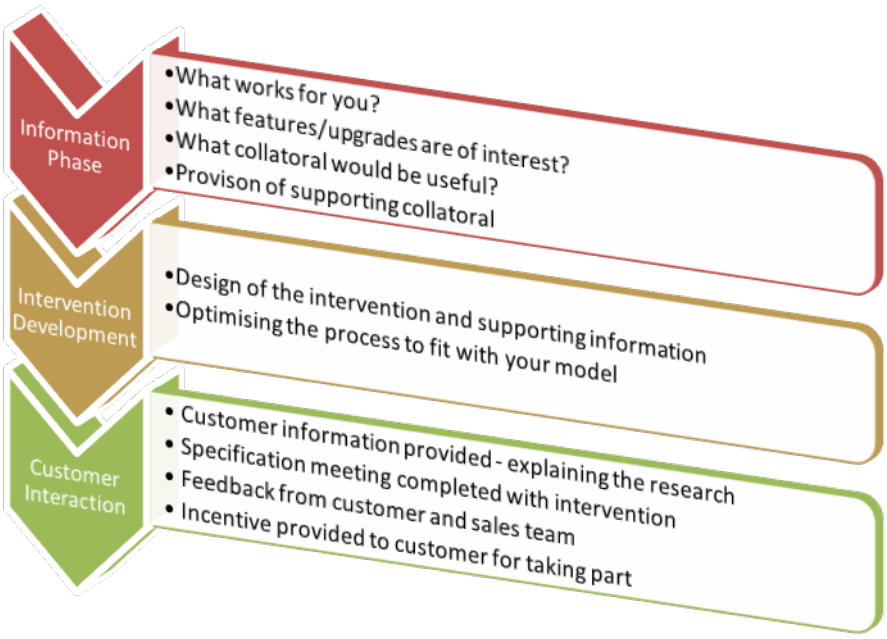

Figure 1: Mapped phases of VHB interaction

4.3 Benefits

In order to help sell the idea of taking part in the project to VHB organisations, the research team developed a list of benefits for partnering in the research. This was utilised in discussions with the VHB as part of the introductory phase of sign up.

4.3.1 Benefits to the Volume Home Builder (as presented to the VHBs)

- The research and the developed materials will help provide the means to discuss the benefits of exceeding minimum code standards to your client base in a way that aligns you with trusted independent sources of information – positioning VHBX as an innovator in this space.
- The research provides access to robust information on options to exceed the minimum and benefits to the house buyer, heightening the trusted relationship that you build with your customer.
- The materials developed will provide a structured facilitated conversation to take place which will add value to the interaction between VHBX and your customers - it should help you make the case for higher levels of investment in key areas such as insulation, heating, better glazing etc.
- Information provided to drive consumer demand through early engagement will provide content for websites magazines etc.
- Trialling this approach enables VHBX to test and understand whether customers are open to higher performance standards – whilst simultaneously providing supportive materials and professional development of sales staff (research suggests that understanding the benefits of upgrading to higher performance is increasingly of importance to customers – especially in relation to health and comfort and ongoing cost savings).

4.3.2 Benefits to customers (as presented to the VHBs)

- A direct incentive for taking part in the research (to be agreed but $50 - $100 voucher per participant provided by the project)
- The developed materials will assist consumers to understand higher performance in more detail and to make an informed decision regarding the specification for their VHBX home.
- The potential to have an upgraded VHBX home that is warmer, more comfortable, healthier as well as being just as affordable to buy and costing less to run
- An upgraded VHBX home that uses less electricity, gas and water, will last well into the future, and may be flexible for changing household needs
- A dwelling that is likely to have greater resale value as buyers realise the benefits of more sustainable homes.

4.4 Challenges of VHB recruitment

As the project progressed, the research team struggled to gain full participation from a suitable Volume Home Builder (VHB) partner. Several companies (who cannot be named due to the level of confidentiality specified in project ethics documents) appeared interested in the potential for the work, but only one progressed to the level required to take the work to a pilot stage.

Interest in partnering from this one company was driven largely by an enthusiastic staff member from one of the VHB company's franchisees. Discussions progressed well with this member of staff and the franchise owner, to the point that they were keen to progress with the project and further, promote it at the head office level and potentially look to incorporate it nationally.

However, the decision to raise this at head office level complicated the process. The researchers met several times with representatives from sales, marketing and the construction/project management team and followed up with regular written and phone correspondence. After months of effort to get an official sign up from the company in question, no such agreement could be reached. The business, like most house building companies at the time, was considered to be 'extremely busy' and reasons for a lack of participation mainly came down to a lack of available time to properly assess the project, including project risks.

Informal discussions with relevant personnel from the company as well as insights gained during evolution of the relationship led the research team to conclude the following:

- The construction sector is busy delivering 'business as usual' which is also very profitable for most firms. There is little incentive to promote higher standards for most companies as the minimum required building code specifications currently sell well.
- The build companies approached did not see a clear marketing advantage in the current market for 'green features' with a perception that consumers were still not focussed on higher performance features.
- There was some reticence about complicating the customer journey with promotional material that might lead to questions about specifications and potentially causing customer confusion – e.g. if extra specifications for insulation are so worthwhile, why doesn't the company already provide this as standard?

- Some aspects of the promoted higher performing features such as perimeter insulation around concrete slabs and under-slab insulation were new to the VHB companies. These were perceived as having the potential to cause supply chain issues and also considered an added complication and risk (financial and long term durability risks of an unknown and un-tested system).
- There were some concerns about being involved in a research project from the point of view of explaining this to the customer mid-way through the sales process. Companies wanted to avoid any customer confusion during the crucial sales timing and also had some concerns over a lack of control of the customer contact and the resulting data.
- Some of the high performance features would require investment from the VHB in building new relationships across the sector at a busy time (e.g. rainwater harvesting suppliers would need to be contacted and a negotiated supply organised if the customer wanted to incorporate this feature).
- Interruption of the customer journey was perceived as risky for little perceived benefit – the customer was already spending 'x' and considering attractive 'upgrades' (such as granite benchtops, improved appliance ranges); why complicate the process with other costly add-ons that mightn't add as directly to the VHB margins?
- Ultimately the VHB company was somewhat resistant to new processes that might interrupt and/or introduce risk to the efficient flow of successful current housing delivery.

As a result of the reasons stated above, the research team had to accept that, disappointingly, it was simply easier and less risky for VHBs to say 'no' than to take on additional work at a very busy time for the sector. This may, in part, be resolved should consumer demand for higher performing housing that exceed minimum standards in New Zealand strengthen. The reality is that a coordinated and multi-pronged approach is required to shift industry.

As stated in a recent BRANZ report ER 27 'Doing Better in Residential Dwellings: Going Beyond the Code in Energy and Accessibility Performance'…

> *"New Zealand and international research into take-up of building performance enhancing solutions consistently shows that a concerted and multi-pronged approach is required. That approach requires a robust investment pathway into relevant research and combining regulatory, industry incentives, consumer education and accreditation as well as industry development."*[3]

[3] ***Bev James, Nina Saville-Smith, Kay Saville-Smith and Nigel Isaacs, (2018) Doing Better in Residential Dwellings: Going Beyond the Code in Energy and Accessibility Performance***

4.5 Social and community housing provider approach

Midway through the research, the Beacon team entered discussions with Community Housing providers as well as representatives from Community Housing Aotearoa (the lead organisation for community and social housing providers). This was the result of some related, but independent, project work that was undertaken at the time with a community housing provider who required assistance from Beacon to review and improve their base housing specifications.

The ongoing challenges in securing the participation of a suitable volume home builder provided an opportunity for the team to pivot the work to a sector which was interested in exceeding the minimum – and also interested in the information and cost/benefit work underpinning it. In most cases, community housing sector organisations are producing housing to be as affordable as possible for their clientele. In many instances, stock is constructed and either rented, or rented with a range of financing arrangements in place, to move tenants into position of home ownership. As such, the typical community housing provider has a waiting list of potential customers, so the requirement to 'sell' higher performing features to the future owner is almost non-existent. The research team worked with representatives from the community housing sector to explore key messaging to encourage this sector in the market to exceed minimum standards. The sector should not be underestimated in terms of size – organisations making up the lead umbrella organisation, Community Housing Aotearoa, have a goal to deliver 15,000 new social and 85,000 new affordable homes by 2030. However, they currently have no specific requirements relating to an increase in minimum standards beyond code. The reduced operational costs for tenants, lifetime and durability aspects apparent in a higher performing home that is built to exceed minimum standards is certainly an advantage for most community housing providers. With these opportunities in mind, the research team widened the conversation about how to utilise the framework materials under development to provide information to this important sector.

Work continues on the approach with the community housing sector and the research was utilised in an informative article aimed at those building social housing in New Zealand (full text available in 7.11 Article in Journal of Australasian Housing Institute)


MAKING COMMUNITY HOUSING MORE SUSTAINABLE

Figure 2: Magazine article in the Journal of the Australasian Housing Institute

4.6 Government approach (KiwiBuild & Kāinga Ora)

The ongoing lack of interest from suitable volume home builder companies in conjunction with a significant opportunity to leverage KiwiBuild activity was also an area explored by the research team as a *pivot* to the original proposed research.

A revised mid-project scope pivoted the effort away from the delivery of consumer facing information to volume home builder clients, to the delivery of modular information that supported increased standards and exceeded minimums for KiwiBuild. At the time of the research, KiwiBuild was working on a detailed specification and scope for the standards and features that proposed new KiwiBuild dwellings would provide. The research team were able to assist by providing input to the developing standards, utilising information that closely followed the framework developed to exceed minimums for volume home builders. The expectation was that the base information could be re-purposed to be utilised by KiwiBuild in addition to any engaged volume home builders and the work underway with the community housing sector. As per the information provided for VHB and community housing providers, aspects of the modules were designed to link to technical information and content that was also being produced by BRANZ for KiwiBuild at that point in time.

An ongoing dialogue was set up between KiwiBuild, Beacon and BRANZ to facilitate the provision of key supporting technical and consumer facing information into the KiwiBuild process. The researchers developed good relationships with the team at KiwiBuild who expressed a desire for the input that was being provided.

The extent of uptake and buy in from KiwiBuild will be driven by the level of higher standards that are politically acceptable when adopted. However, the supporting information that was developed is designed to be independent and suit multi-purpose applications. The benefit of this is that further discussions with both volume home builders and the community housing sector can continue to be progressed in parallel.

The aim is to support increased standards proposed by community and social housing providers (including Kāinga Ora) and to communicate the benefits to consumers of exceeding the minimum in key areas of new build. The opportunity is for Kāinga Ora to help drive the rest of the market toward better housing outcomes (e.g. volume home builders and others in the housing delivery chain) through adoption of adopted ‘up-spec’ standards. The modular information produced (alongside consumer facing messaging highlighting key benefits) will assist in increasing knowledge and desire to achieve higher standards.

4.6.1 The importance of post-construction checks for KiwiBuild

Recent Beacon research[4] has indicated that a number of new dwellings constructed fail to meet expectations as set out in specifications documents. Therefore, the advice to KiwiBuild differed slightly to that offered to volume home builders and included a section covering post-construction and/or post-occupancy audits of specified products and levels. Key areas to examine were as follows:

- The installation of insulation (correct R levels to specification as well as being laid appropriately with appropriate documentation in place)
- Use of thermal imaging to assess wall insulation levels and effects of thermal bridging
- The correct specification for lighting, especially where downlights or 'eco-bulbs' are specified (ensuring that these are effective and low wattage LED)
- Features implemented to achieve Lifetime Design principles are constructed as specified (especially that level entrance specifications had been installed as required)
- Correct products were being used (especially where environmental choice and low VOC has been specified). Be vigilant about product substitutions
- Appropriate commissioning such as temperature set points on hot water cylinders and delivery to taps are safe and in line with appropriate standards
- Correct specification and installation of ventilation to bathrooms and kitchens (ensuring that all are vented to the outside of the dwelling, ductwork is correctly installed, and the correct controls such as time delay switches are in place and set up properly)
- Shower and tap flow rates are as specified and neither have not had flow restrictors removed
- Pipework around hot water cylinders is fully insulated
- Designs are not causing overheating problems and tenants are provided with appropriate advice on building use (ventilation, moisture removal, use of daylighting etc.) through a bespoke Home User Guide
- Correct commissioning of space heating devices including availability of simple instructions for use and understanding by tenants of operation.

4.7 Project wrap up

Toward the end of 2019, an ongoing dialogue was progressing between KiwiBuild, Beacon and BRANZ to facilitate the provision of key supporting technical and consumer facing information into the KiwiBuild process. However, continual restructuring (and the eventual demise) of KiwiBuild and the integration into Kāinga Ora has led to further delays in development and adoption of their core house building standards. Additional meetings with KiwiBuild/Kāinga Ora staff at the end of 2019 indicated protracted timelines for delivery of the core standards that had been progressed to date – with no certainty that they would be adopted. Therefore, at the end of 2019 the decision was made to finalise the core information developed over the course of the project and provide this to Channel Delivery at BRANZ for use by the sector.

[4] *This was broadly informed by recent case study work on new dwellings undertaken as part of the Thermal Bridging in Walls Project but also experience from Beacon's demonstration home projects and work with the community housing sector comparing specifications against what was delivered*

The scope of the project has varied from the delivery of consumer facing information to volume home builder clients to the delivery of a set of simple 'plain-cover' resources that can be adapted and used by a range of audiences including: Eco Design Advisors (EDAs), volume home builders, community housing providers, Kāinga Ora and social housing providers, and, potentially, consumers. The information follows the framework developed to exceed minimums for volume home builders and will support increased standards and exceeded minimums for the actors in the housing delivery chain outlined above.

5 Conclusion

This report provides a summary of Project LR0537 Exceeding the Minimum for Volume Home Builders and their clients. The main challenge of the research was recruitment of a suitable volume home builder to partner with in order to market test the materials produced. Despite the lack of success in this endeavour, the project successfully produced a range of materials which are now available for BRANZ and wider industry to utilise in the pursuit of encouraging industry to exceed minimums when designing, specifying and constructing new dwellings in New Zealand.

The set of simple 'plain-cover' information resources is to be delivered to BRANZ Channel Delivery by 31 March 2020 via this report and associated appendices. This signals the conclusion of the Levy funded aspects of the project; However, the supporting information is designed to be independent and suit multi-purpose applications. The benefit of this is that further discussions with both volume home builders and the community housing sector can continue to be progressed following the completion of the project. The materials produced will have an ongoing route to uptake and use in the sector. Beacon will continue to promote the material as part of its day to day advocacy in the sector, and via associated activity such as the Home Performance Advisor training programme.

5.1.1 Recommendations

1. Utilise the information to drive consumer demand
    a. Evolve framework base material and present graphically
    b. Consider work with Consumer NZ and Smarter Homes to produce guidance for new home builders and customers of volume home companies
    c. Provide top-tips for new home builders and purchasers – what to look for when specifying your home
    d. Consider utilising the material to produce a simple 'Buyers guide to a greener home'.
    e. Promote the benefits of exceeding the minimum to the consumer 'demand' audience
2. Continue to pursue the community housing sector
    a. Provide sector wide guidance in a variety of media (conferences, journal articles, simple specifications documents)

   b. Highlight features in regular newsletter editions in conjunction with Community Housing Aotearoa with links to simple website for improving community housing specifications
   c. Showcase ongoing affordability benefits and life cycle cost analysis (especially for those organisations who retain ownership of the stock)
3. Continue to offer services, information and advice to volume home builders
   a. Allow users to develop bespoke modular information working with their branding
   b. Offer brochure and website collateral that fits with their specific VHB approach
   c. Continue to seek appropriate partnership with a volume home builder who develops an interest in going beyond the minimum to utilise the material
4. Continue to help advocate with government agencies, social housing providers and Kāinga Ora
   a. Provide material to support ongoing conversations about developing their evolving standards
   b. Seek ways to promote material through local authorities (following example from Christchurch Build Back Smarter – see appendix for example)
   c. Consider the opportunities to drive consumer demand through expectations of government social housing being constructed to higher standards than basic built to code minimum volume home dwellings

The opportunity is there for housing providers to utilise the materials to help drive the rest of the market toward better housing outcomes (e.g. volume home builders and others in the housing delivery chain) through adoption of robust 'up-spec' standards.

The modular information produced (alongside consumer-facing messaging highlighting key benefits) will assist in increasing knowledge and desire to achieve higher standards. The expectation of the researchers is that this will deliver similar intended benefits to New Zealand as those set out in the original scope of this research. Availability of the modular approach to the community housing sector and engaged volume home builders through knowledge dissemination will provide ongoing and additional benefits to the New Zealand residential sector.

6 References

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7 Appendices

The following resources are available in the appendices:

1. Final Project Information Sheet for Participants
2. Interview Guide for Group Home Builders
3. Consent Form for Exceeding the Minimum
4. Proposal for Volume Home Builders
5. Top recommendations for VHB clients to exceed Code minimums
6. Information sheet for VHB customers
7. Recommendations for high performance homes – modular information
8. Different ways of communicating the recommendations
9. Sample VHB flyer
10. Sample presentation approach for customers (the wheel)
11. Final project list of interventions – final for Kiwibuild

7.1 Final Project Information Sheet for Participants

Information sheet - Customer

Exceeding the Building Code Minimum in New Homes

The New Zealand Building Code sets out a number of minimum standards for new home building which have to be met for all newly constructed dwellings. However, in a number of areas (such as insulation or glazing etc.) there are benefits of exceding this 'minimum standard' in terms of comfort, energy and cost saving as well as improved health and environmental benefits.

This research aims to test whether providing advice to customers on the benefits of including above the minimum building code features in a home will result in changes in what they decide to specify in the design and constuction of their dwelling. The research is funded by BRANZ (Building Research Association of NZ) from the Building Research Levy.

Beacon Pathway is working with a couple of home building companies to test the type of advice provided on above code specification, and how and when to provide this to achieve the best outcomes. [Name Builders] have agreed to be part of this research. We are approaching you to ask if you would be willing to also be involved in the research. If you agree, we would require you to sign a consent form and the salesperson will provide advice on a number of additional features which are above the minimum building code which you could consider including in your home. The components of the research will be clearly identified by the salesperson [These aspects will be coordinated in more detail with the volume home builder company]. Following your session with the salesperson we would like to ask you a few questions about your reactions to the additional information you received. This helps us to see how effective the materials are in communicating. In exchange for taking part in this research you will receive [incentive – exact incentive TBC following discussion with volume home builder].

The information we gather from you as part of the research will be anonymised for any reporting and at no time will you be identified. The results from the research will be reported to BRANZ following the completion of the research in late 2018. If you would like to be emailed a copy of the research, please indicate this on your consent form.

If you would like more information or have any concerns or comments about the project, please contact: Verney Ryan

Phone: 021 837 639

Email: verneyr@beaconpathway.co.nz

BRANZ Funded from the Building Research Levy

Creating homes and neighbourhoods that work well into the future and don't cost the Earth

7.2 Interview Guide for Group Home Builders

Exceeding the Minimum for Volume Home Builders – Recruitment Interview guide

Introduction: Thank you for meeting with me. The purpose of meeting is to:

- discuss some research that Beacon Pathway is doing about what would encourage customers of volume home builders to include above building code features in their homes
- ascertain whether your Company/organisation is interested in being involved, and if so, agreeing a process to formalise this
- for Beacon to develop a better understanding of the Volume Home Builder industry.

First of all I need to make sure you understand what the research is about [Give info sheet and talk through].

Do you have any questions about any of this? [Answer questions]

If that is all ok I need your signature on this consent form and we can get started [Sign consent form]. Thanks!

- **To begin, can you tell me about your Company?**
  - *Approximately how many houses do you build and sell each year?*
  - *What sectors of the market do you cater for?*
  - *Are dwellings individually designed or part of a 'range' or package?*
  - *Who usually does the design, building and consent work?*
  - *Do you follow standard processes for building or are you involved in new aspects? e.g. any prefab components etc.*

- **How does your sales / specification process work?** *Explore customer journey and ascertain if independent company or most specification undertaken by their employees*
  - *Do sales / specification staff work on any commission or salary?*
  - *How much can customers (and/or) staff amend as part of the specification process?*
  - *What aspects of the design and/or construction are most usually altered in terms of specifications?*
  - *Are there any specifications or specific areas of the design/construction where customers currently choose to go above building code? If there are – what do you think might be driving them to make those decisions? Explore cost savings, health benefits, environmental savings.*
- **What trade-offs are customers most willing to make?** *Explore size vs features*
- **What areas are 'out of bounds' as far as upgrading specifications beyond the building code minimums** *(e.g. triple glazing)*

Thank you. We've really appreciated talking to you and learning from your experience. Do you have any further comments? Thank you

7.3 Consent Form for Exceeding the Minimum

Consent form - Customer

Research Project - Exceeding the Building Code Minimum in New Homes

Thank you for considering being a part of this research project. You have been invited to participate because you have approached [Building Company] who we are working with to assess whether providing advice on the benefits of exceeding Building Code minimum requirements influences the decisions made by new home purchasers.

The information and insights you provide will become part of the overall research in a summarised format but you will not be identified personally. Any data or quotes used in the final report and any public documents will be anonymised to reduce the likelihood of anyone identifying you.

You may withdraw from the research at any time by emailing or phoning Verney Ryan, 021837639 or verneyr@beaconpathway.co.nz. Every effort will be made to withdraw or amend any information you have contributed.

Please indicate your willingness to contribute to the research by checking the relevant boxes below:

- ☐ I have read and understood the Information Sheet and have had an opportunity to have my questions answered.
- ☐ I understand that the information I contribute will become part of the overall research and any direct quotes from me will be anonymous.
- ☐ I understand that I may withdraw from this research at any time and every effort will be made to withdraw or amend information I have provided to that date.
- ☐ I give permission for my XX Builder to disclose information to the researcher on the decisions I make in relation to the interventions being testing in this research
- ☐ I agree to photographs taken of me as part of this research being used in related publications
- ☐ I am happy to participate in this interview, and have my information recorded via observation and written/typed notes, photographs, transcripts and audio recording (for the purposes of accurate transcribing)

My name _____

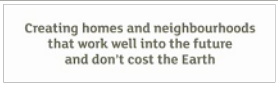
My phone number _____

My email address _____

My signature

_____Date_____

Researcher name _____



7.4 Proposal for Volume Home Builders

Proposal for Volume Home Builder 'X' (VHBX) Driving Customer Demand for Higher Performance

Background

The New Zealand Building Code sets out a number of minimum standards for new home building which have to be met for all newly constructed dwellings. However, in a number of areas (such as insulation or glazing etc.) there are benefits of exceeding this 'minimum standard' in terms of comfort, energy and cost saving as well as improved health and environmental benefits.

Not so long ago, the prime driver of home design in New Zealand was aesthetics. But the focus is steadily shifting to improved sustainable design as more and more New Zealand homeowners come to realise the benefits of warm, dry, resource efficient homes.

This research aims to test whether providing advice to customers on the benefits of including above the minimum building code features in a home will result in changes in what they decide to specify in the design and construction of their dwelling. The research is funded by BRANZ (Building Research Association of NZ) from the Building Research Levy.

Beacon is seeking to work with progressive home building companies to develop and test advice that can be provided on 'above code specification', and how and when to provide this to achieve the best outcomes for the customer. Our research indicates that the most successful approach would be tailored to a specific customer journey and should fit in with the approach delivered by the home builder sales team. Therefore, the specifics of the advice are still under development and will be tailored to your needs, but it might be a simple brochure, or a series of 30 second videos that form part of the discussion between customer and salesperson when specifying particular aspects of the house that they are commissioning.

Potential Higher Performing Features

A range of features are being explored which seek to deliver higher performing homes in New Zealand. Each 'high performance feature' suggested in Table 1 on the next page is based on the following key criteria:

- Proven to achieve outcomes in the areas of energy and comfort, health, safety or ongoing operational cost savings (energy, water, low maintenance and durability).
- Cost effective for the customer (in relation to both direct monetary savings as well as features which could add to the value of the home)
- Buildable using current, proven and readily available construction techniques
- Easily communicated to the customer
- Of value and attractive to both the builder *and* the homeowner

As part of the collaborative approach of this project, Beacon will explore the criteria above with VHBX, in order to develop a short list of higher performance features drawn from Table 1 below. These would then form the basis of the ***'intervention information'*** provided to customers.

Table 2: Key Higher Performance Features

Key Higher Performance Features
1) Good passive solar design maximising use of winter sun and cooling summer breezes as well as the use of thermal mass for year round low energy use (ideally achieving living areas to the north and no requirement for mechanical cooling in summer).
2) High performance insulation to 'better' or 'best' standards: a) Ceiling – R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3) b) Walls – R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3) (all possible within 90mm framing) c) Floor – R1.9 (zone 1, 2 and 3), under-slab and/or perimeter insulation (dependent on perimeter/slab ratio)
3) Higher performance double glazing / joinery a) Low e / argon filled b) Upgrade glazing to thermally broken suite (or combination of both a+b)
4) More powerful extractor fans in bathrooms / wet areas (e.g. 40 litres/s but modelled to suit) using motion sensors with a delay timer and ensuring that the duct diameter and extract fan is 150mm. Must be well installed and ducted to the outside of the dwelling. Ideally with low decibel rating to encourage use.
5) LED lighting throughout – including any downlights being well fitted and meeting IC-4 (2018 NZS) which negate airflow into ceilings/roof cavity and do not compromise thermal envelope. All outdoor lighting fitted with integrated daylight and motion sensing controls (where practicable).
6) Water efficiency bundle: Showers (WELS 3 star), toilets (WELS 4 star), taps (WELS 5 star), dishwashers and washing machine (if supplied) (WELS 4 star)
7) Rainwater harvesting system with a minimum tank size of 2,000 litres, connected to as much of the roof as possible and plumbed for use in the home to at least 1 toilet or laundry. Otherwise, install plumbing to take future rainwater harvesting system through separate pipework to toilet or laundry with isolation valve in place for future connection.
8) Lifetime/Universal Design[5]: Doors with minimum clear opening of 810 mm with lever handles, a bedroom and a bathroom/toilet located on the entry level of the house and paths from the car parking space to the dwelling are slip resistant, gently sloping and at least 1200 mm wide. Allow for 1500mm turning circle in kitchen and ground floor bathroom. Power points at least 500mm from floor and 500mm from corners. Door handles aligned with light switches at a consistent height between 900mm – 1200mm above the finished floor level.

[5] *BRANZ research has shown that it is considerably cheaper and less disruptive to build universal design features into an individual new home than retrofit the same house later. As an example, the average extra cost of equipping a new house with UD features is $1,720, while retrofitting these new houses at a later date would cost an extra $16,990 on average (using 2011 figures)(pers.comm. R. Jaques 2018).*

9)	Efficient Space Heating: Use passive solar approach to reduce requirement for heating and then if heating required use efficient approved wood burner, wood pellet burner, or min 5 star rated heat pump.
10)	Solar hot water or heat pump hot water heating (may depend on supplier)
11)	Materials choices – use Environmental Choice certified materials including plasterboard, paints, insulation, carpets and floor coverings (equivalent international certification schemes may be used).
12)	Future technology: Consider electric car charging point in garage and/or UPVC conduit for easy future install of solar photovoltaic system on roof

The Process – Tailored for VHBX

Following our initial meeting with VHBX and your Head Office we suggest that we tailor a process that best meets your needs and requirements. We have taken on board your suggestions to provide education and information at early stages of your customer journey and we think it would be of value to work with you to develop material suitable for your website, blogs, magazine and social media that relate to specific higher performance features.

An overview of the process for the research is mapped out below. This is indicative only and obviously would need to fit in with your process to ensure a seamless customer experience. We would work with you to ensure that this flexible approach met your needs and enhances your customer experience. Our suggestion is, that once agreed, this process is piloted with one of your franchises and this could then be further refined for consideration of a nationwide roll out. Any developed collateral could be used nationally, regardless of where the roll out of the intervention information was originally used or where the specifications/sales process was occurring.

Overview of the process

1) **Information Phase**
   - ⇒ We work with you to understand your current standards/specifications and willingness and/or desire to exceed these
   - ⇒ You help us to understand what will work best for you in relation to your processes
   - ⇒ We work with you to develop high level educational collateral relating to your chosen higher performance features (from table 1 above)
   - ⇒ The tailored collateral (on websites or in your in-house magazine etc.) helps to inform and educate potential customers of VHBX when they first engage – it also provides content for you linked to robust independent endorsement of the chosen features
2) **Intervention Development**
   - ⇒ With input from VHBX, we design the best customer intervention information for use at the specification stages of your current customer journey (and that work with your current sales model)
   - ⇒ We work with you to optimise the process of delivering the information for customers to assist them in choosing higher performance specifications/features

3) Customer Interaction

⇒ We work with you to implement the chosen intervention during the customer interview (e.g. provision of a simple higher performance features brochure)

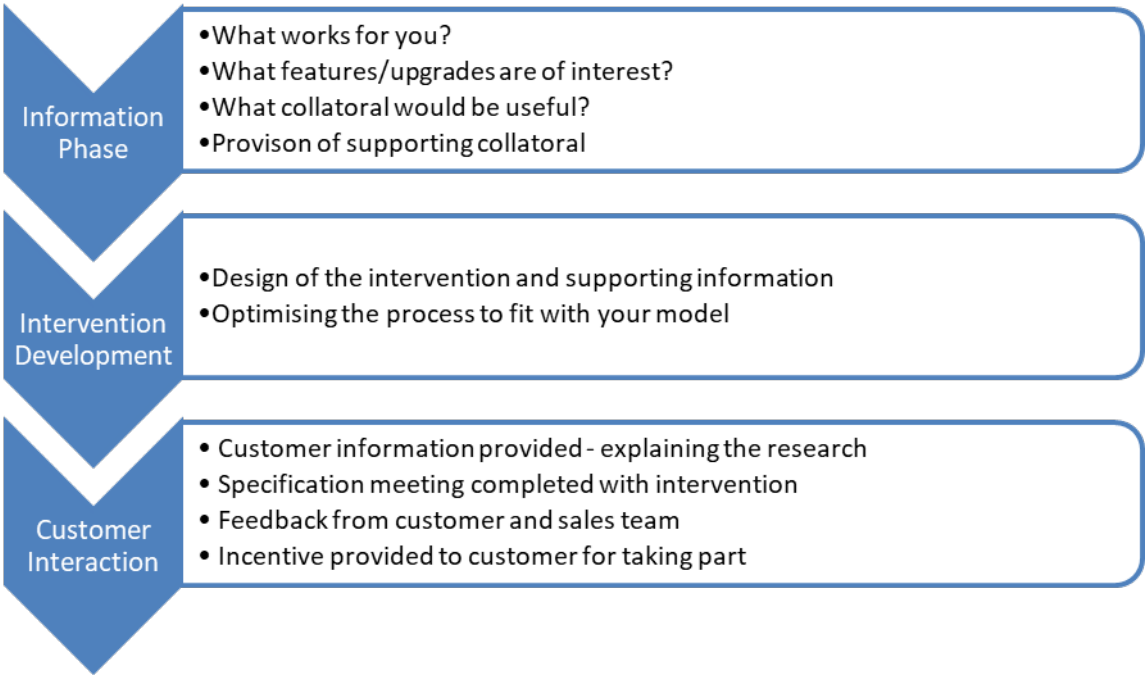
⇒ Some brief explanatory background information is provided to the customer to explain this research project and to confirm their willingness to take part

⇒ The customer completes the specification/sales meeting as per your usual sales process but with the addition of introducing the intervention material

⇒ Following the conclusion of the sales meeting we follow up with the customer via a short post-meeting phone call to find out whether the intervention material influenced them in upgrading to the chosen performance features

⇒ We provide the customer with an incentive for taking part in the research

⇒ We follow up with your sales team to discuss any insights into the success or improvement required to the intervention information.



Benefits and costs

Beacon is committed to maximising the benefits of the work outlined in this proposal whilst keeping any additional VHBX time-cost to a minimum. This project is all about working collaboratively to achieve good outcomes for VHBX, as well as your clients.

There are no direct contributions required from VHBX (or your customers) to support the project. Our only requirement is to develop a partnership where we can work collaboratively to deliver the interventions to the customers that will help to educate them in making better decisions about increasing the performance of their home. We will undertake the bulk of the work in the design of the intervention and accompanying information – but check in with you at regularly agreed intervals to ensure that the material and approach is suitable. Some agreed personnel time from VHBX would be required to facilitate that process, but it would be kept to a minimum and in most instances would involve short meetings, phone calls and email correspondence.

We believe that the project has the potential to deliver the following benefits:

Benefits for VHBX:

- The research and the developed materials will help provide the means to discuss the benefits of exceeding minimum code standards to your client base in a way that aligns you with trusted independent sources of information – positioning VHBX as an innovator in this space.

- The research provides access to robust information on options to exceed the minimum and benefits to the house buyer, heightening the trusted relationship that you build with your customer.

- The materials developed will provide a structured facilitated conversation to take place which will add value to the interaction between VHBX and your customers - it should help you make the case for higher levels of investment in key areas such as insulation, heating, better glazing etc.

- Information provided to drive consumer demand through early engagement will provide content for websites magazines etc.

- Trialling this approach enables VHBX to test and understand whether customers are open to higher performance standards – whilst simultaneously providing supportive materials and professional development of sales staff (research suggests that understanding the benefits of upgrading to higher performance is increasingly of importance to customers – especially in relation to health and comfort and on-going cost savings).

Benefits for Customers of VHBX:

- A direct incentive for taking part in the research (to be agreed but $50 - $100 voucher per participant provided by the project)
- The developed materials will assist consumers to understand higher performance in more detail and to make an informed decision regarding the specification for their VHBX Home.
- The potential to have an upgraded VHBX Home that is warmer, more comfortable, healthier as well as being just as affordable to buy and costing less to run;
- An upgraded VHBX Home that uses less electricity, gas and water, will last well into the future and may be flexible for changing household needs
- A dwelling that is likely to have greater resale value as buyers realise the benefits of more sustainable homes.

Next Steps

We are keen to embark on the work with VHBX as soon as possible and are happy to work with your Head Office in respect to coordination and with the appropriate franchise in relation to a pilot roll out.
The most pragmatic next step would be for us to discuss and/or agree the following:

1) VHBX agreeing to take part in the research
2) For us at Beacon to develop a better understanding of your current standards and specifications in relation to building code minimums
3) Agree the key higher performance features that are of interest to VHBX (drawn from Table 1 above as a starting point – and noting that you may already be implementing some of these features)
4) Develop an understanding of what sort of information and intervention would fit best with your current customer journey (e.g. brochure, information sheets etc.)
5) Define a more detailed scope for us to deliver appropriate collateral with your marketing staff (that fits with your in-house style and VHBX 'voice')
6) Agree an indicative timetable for undertaking the pilot with the appropriate franchise and/or nationwide roll out

Should you wish to proceed, a further meeting to address the items above may be useful, although we are also happy to liaise via email/phone etc. If you would like more information about the research project, please contact:

Verney Ryan
Phone: 021 837 639
Email: verneyr@beaconpathway.co.nz

7.5 Top recommendations for VHB clients to exceed Code minimums

	Choice	Specification	Benefits for client	Where to find more information
1	Orientation and design of house for solar gain	Orient living areas to the north to maximise winter sun for heating Design for cross breezes and opening windows so no requirement for mechanical cooling in summer. Shading from high summer sun to north and west (eaves, shutters, blinds, curtains)	Winter sun warms house, less need for heating. Breezes and shading stop house getting so hot, less need for air conditioning in summer. Both mean that year round clients have lower energy requirements, reduced power bills. Upspec says save between $50/year in Auckland to $200/year in Invercargill, minimal investment.	www.level.org.nz/passive-design Upspec website https://www.branz.co.nz/cms_display.php?st=1&sn=257 https://www.smarterhomes.org.nz/smart-guides/siting-and-location/house-orientation/
2	High performance insulation to 'better' or 'best' standards	a) Ceiling – R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3) b) Walls – R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3) (all within 90mm framing) c) Floor – R1.9 (zone 1, 2 and 3)	Insulation stops your warm air escaping from your house (heat loss). So you won't need to heat as much to stay a comfortable and healthy temperature. Lower power costs or energy (eg gas or firewood) costs. Warmer indoor temperatures are healthier for the family. Easier to add insulation in ceiling and under suspended floors but need to do walls while you have opportunity. Zones relate to where you live in NZ – zone 3 is the coldest. Upspec says depending on how much you upgrade and where you live, could save up to $170/year for upgraded ceiling insulation.	http://www.level.org.nz/passive-design/insulation/ https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/insulating-your-home/
3	Insulated concrete slab floors	Insulate under the slab and around the perimeter. Underfloor insulation must be continuous to minimise thermal weak points. The pod-style flooring systems have a base of non-continuous segments of polystyrene.	Most flooring warmth leaks out around the perimeter of a slab. It will cost more to heat a room with an uninsulated slab. Cost savings $210-440/year. It will be easier to heat these rooms too so they will stay comfortable and healthy for longer. Upspec says thermal benefit of insulated slab is very good (Auckland) to excellent (Invercargill). High cost to do it (adds between $2800 and $4600)	Upspec https://www.branz.co.nz/cms_display.php?st=1&sn=258 http://www.level.org.nz/passive-design/insulation/options-for-floor-insulation/

		Adding correct and well insulated thermal mass provides heating and comfort benefits.		https://www.smarterhomes.org.nz/smart-guides/design/thermal-mass-for-heating-and-cooling/
5	Higher performance double glazing / joinery	a) Low e glass (lets light and heat in, but helps prevent heat from escaping) b) Argon filled (better insulator), 12mm gap for optimal performance c) Thermally broken aluminium window frames (these have a very strong spacer which doesn't conduct heat between the inner and outer parts of the aluminium frame. d) Combination of the above	Windows are the weakest point in the barrier that keeps your heat inside – most heat escapes from these. While you are building is best / easiest / cheapest time to invest in double glazing. Substantial investment but worth getting it right. Will also help keep heat out in summer. BRANZ research has shown that if thermally-broken frames and glazing with a low-e coating are specified instead of the typical low-quality double glazing, the benefits are substantial. The insulation value is increased by 65% and heating energy costs in the house are typically reduced by between 20-24%.	http://www.level.org.nz/passive-design/glazing-and-glazing-units/ https://www.smarterhomes.org.nz/smart-guides/construction-and-materials/glazing/
6	More powerful extractor fans in bathrooms / wet areas	40 litres/s) using a delay timer / humidistat if needed (as noted in Level: NZS 4303:1990 Ventilation for acceptable indoor air quality, Table 2 sets out the mechanical extract air flow rate requirements. In houses, the minimum extract air flow rate is: for kitchens – 50 litres per second (l/s) intermittent, 12 l/s continuous for bathrooms and toilets – 25 l/s intermittent, 10 l/s continuous.) Typical air flow rates for domestic air extraction systems range from about 30 l/s to about 150 l/s.	Opening windows is not enough. Damp air from showers, baths, washing machines, cooking goes through house. Damp air is harder to heat – you have to heat more to get the same warmth so your heating will cost more. Condensates on cold surfaces which is perfect conditions for mould which is unhealthy. Can also damage your interior materials e.g. bulging MDF, rot Use timer or sensor to ensure you don't use more energy than needed.	http://www.level.org.nz/energy/active-ventilation/air-extraction-systems/ https://www.smarterhomes.org.nz/smart-guides/air-quality-moisture-and-ventilation/active-ventilation/

		Extract to outside – not into ceiling space		
7	Energy efficient lighting	LED lighting throughout – including any downlights meeting IC-4 (2018 NZS) which negate airflow, as a minimum. All outdoor lighting fitted with integrated daylight and motion sensing controls. Insulation Contact (IC) and Insulation Contact – Fire Resistant rated (IC-F) ones can have insulation installed up to and over them, provided the insulation can cope with temperatures up to 90°C.	Lighting = 8% of household energy use in the average New Zealand home. LEDs cost more to buy but will save money in long run – last a long time and use very little power. lowest lifetime cost of all lights If you are using downlights choose IC-4 rated so that there are no gaps in your ceiling insulation – important for keeping warm and not spending $ on heating that escapes into your ceiling space. Save power by having sensors on outdoor lights so they are only on when needed	https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/smart-lighting-choices/ https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/downlights-recessed-lights/ http://www.level.org.nz/energy/lighting-design/
8	Water efficiency bundle	• Showers (WELS 3 or 4 star) • toilets (WELS 4 star) • taps (WELS 5 star), • dishwashers and washing machine (if supplied) (WELS 4 star)	If you live where water is charged separately you will instantly save on your water bills. Even if you are not charged for water, you will save on your power bills because you will end up using less hot water and heating less water. WELS is a system that tells you how much water your appliance or fitting is using – the more stars the more efficient they are. Modern fittings use much less water without sacrificing doing a good job	http://www.level.org.nz/water/water-supply/appliances-and-fixtures/ https://www.smarterhomes.org.nz/smart-guides/water-and-waste/efficient-use-of-water/
9	Rainwater harvesting	Rainwater harvesting system with a minimum tank size of 2,000 litres and connected to as much of the roof as possible and plumbed for use in the home to at least 1 toilet or laundry	If you live where water is charged separately you will instantly save on your water bills. Provides resilience in face of water shortages/drought. About 11% of water use in homes is for the outside, changing with season Up Spec says in Akld with water charges benefit is outstanding, saving 93000-120000l/yr	https://www.smarterhomes.org.nz/smart-guides/water-and-waste/collecting-and-using-rainwater/ http://www.level.org.nz/water/water-supply/mains-or-rainwater/

10	Lifetime Design	• Doors have minimum clear opening of 810 mm with lever handles • A bedroom and a bathroom/toilet is located on the entry level of the house • paths from the car parking space to the dwelling are slip resistant, gently sloping and at least 1200 mm wide. • allow for 1500mm turning circle in kitchen and ground floor bathroom • electrical sockets located 500mm above finished floor and 500mm away from corners	Plan ahead for the future – invest now so that your home is flexible enough to live in as you age, or if you get elderly relatives living with you, Saves more expensive retrofitting or moving to a better suited property. Easy simple choices to make while the home is being built	https://www.smarterhomes.org.nz/smart-guides/design/designing-an-adaptable-home/
11	Efficient heating	Use efficient MfE approved wood burner or wood pellet burner, or energy star rated heat pump. Do this in combination with #1 'orientation for passive solar heating'	Getting the right heater for your space means that you will heat efficiently – using the least electricity or fuel necessary to heat your space. Important because you need to keep your rooms to healthy temperatures and you don't want to be tempted not to heat. Don't forget bedrooms – they need to be 18°C and over during the night to be healthy to sleep in. Consider whether to have heating that heats the whole house e.g. ducted heat pump, central heating. Central heat source with heat transfer system. Or heat source for main rooms with spot heating for bedrooms and other rooms. Check the energy rating on appliances and get the best rating you can afford. If using wood or pellet burner, also check it is a low emission version – high	https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/heating-your-home/ http://www.level.org.nz/energy/space-heating/

			emissions pollute the air and can cause respiratory problems.	
12	Efficient water heating	Solar hot water or heat pump hot water heating	Hot water typically about one third of household energy use so potential for energy savings – save on your power bill	http://www.level.org.nz/energy/water-heating/ http://www.level.org.nz/energy/water-heating/heat-pump-water-heating/ http://www.level.org.nz/energy/water-heating/solar-water-heating/
13	Choose healthy materials	• Choose Environmental Choice certified plasterboard, paints, insulation, carpets and floor coverings • Choose low-VOC (volatile organic compound) paints, vinyl, adhesives, wallpaper, carpet, timber products such as MDF/plywood	Environmental Choice has done the hard work of figuring which choices will be best for the planet. If you're interested in environmental health, look for the Environmental Choice tick. Always choose low VOC options – VOCs are chemicals that become airborne and therefore breathable at room temperature. VOCs can have a range of effects on health, including irritated eyes and airways, headaches, nausea and rashes. Some VOCs are more hazardous than others – some have no known health effects, while others are highly toxic and have been linked to serious health effects like organ damage or cancer.	https://www.smarterhomes.org.nz/smart-guides/construction-and-materials/materials-inside-your-home/ https://environmentalchoice.org.nz/
14	Future technology	• Electric charging point in garage • UPVC conduit for easy future install of solar photovoltaic system on roof • Solar Photovoltaic for electricity generation (PV)	Like any electrical wiring, it's much easier to have this installed during construction, than to retrofit it and potentially have to make good damage. Electric cars are becoming much more popular with government incentives and rising petrol costs. Similarly solar PV costs are reducing as power costs rise, and improvements in technology mean that battery storage becoming more of an option – won't be long before the benefits outweigh the cost	https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/generating-your-own-electricity/ https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/generating-your-own-electricity/

7.6 Information sheet for VHB customers

Exceeding the Building Code Minimum in New Homes

The New Zealand Building Code sets out a number of minimum standards for new home building which have to be met for all newly constructed dwellings. However, in a number of areas (such as insulation or glazing etc.) there are benefits of exceding this 'minimum standard' in terms of comfort, energy and cost saving as well as improved health and environmental benefits.

This research aims to test whether providing advice to customers on the benefits of including above the minimum building code features in a home will result in changes in what they decide to specify in the design and constuction of their dwelling. The research is funded by BRANZ (Building Research Association of NZ) from the Building Research Levy.

Beacon Pathway is working with a couple of home building companies to test the type of advice provided on above code specification, and how and when to provide this to achieve the best outcomes. [Name Builders] have agreed to be part of this research. We are approaching you to ask if you would be willing to also be involved in the research. If you agree, we would require you to sign a consent form and the salesperson will provide advice on a number of additional features which are above the minimum building code which you could consider including in your home. The components of the research will be clearly identified by the salesperson [These aspects will be coordinated in more detail with the volume home builder company]. Following your session with the salesperson we would like to ask you a few questions about your reactions to the additional information you received. This helps us to see how effective the materials are in communicating. In exchange for taking part in this research you will receive [incentive – exact incentive TBC following discussion with volume home builder].

The information we gather from you as part of the research will be anonymised for any reporting and at no time will you be identified. The results from the research will be reported to BRANZ following the completion of the research in late 2018. If you would like to be emailed a copy of the research, please indicate this on your consent form.

If you would like more information or have any concerns or comments about the project, please contact: Verney Ryan

Phone: 021 837 639

Email: verneyr@beaconpathway.co.nz

7.7 Recommendations for high performance homes – modular information

Modules explaining each recommendation for a high performance house

1 Good passive solar design

Recommendation: Design to make the most of winter sun and summer shade, and breezes for cooling

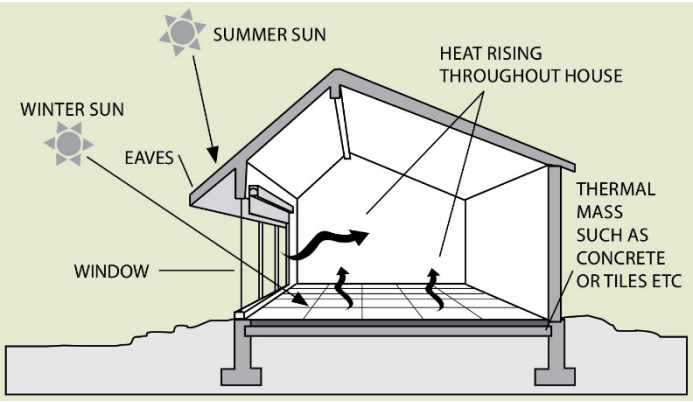
- Orient the living areas toward the north to maximise use of winter sun for heating
- Appropriately size and locate windows and doors (most on the northern side and least on the southern sides of your home)
- Use shading (eaves, trees or external shades) to reduce overheating in summer especially on the north and western side of your home
- Design windows on opposite sides of the house which can be opened to provide free cooling through breezes in summer.
- Use dense materials such as concrete, tiles or brick beneath north-facing windows to absorb the heat from the sun and release it at night. This is known as thermal mass

Here's why

Designing your house to take advantage of the sun will keep it warmer in winter – for free! Getting this right early on will make a big difference to how comfortable you are and to how much heating or cooling you need to do of your home.

Making the most of the sun in winter needs to be balanced with not overheating in summer. This is a balance of which way your home faces, the layout of your rooms, how many windows you have and which way they face, and shading.

Dense materials (known as thermal mass), such as concrete, tiles or brick, absorb and store the heat from direct sunlight and heated indoor air. Then at night when the air temperature drops, the heat radiates from the warmer thermal mass to the cooler air in the room. In summer, the floor or wall draws the warmth from the surrounding air, cooling the room. This keeps comfortable even temperatures inside a home year round.



You can include thermal mass as a floor or wall. An insulated solid concrete slab on the ground is the most commonly found example of a thermal mass floor, although you can also use concrete blocks, bricks, rammed earth or stone. If you don't want the entire floor exposed, a strip of insulated thermal mass material along the sunny side of a room – for example, a metre

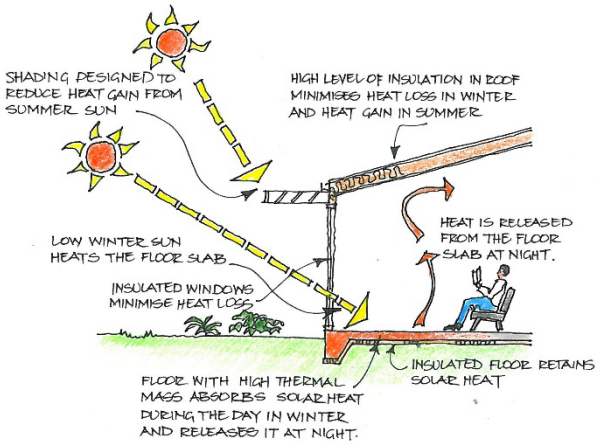
or so wide - can also work well. Other options are walls exposed to the sun, using thermal mass in the floor of a north-facing conservatory, or in the wall separating the conservatory from the main part of the home, a trombe wall or a gabion basket.

Things to know

Position the home as far as possible from neighbouring buildings, terrain or vegetation that might block north sun - in winter, objects cast shadows two or three times their height. Design your home's layout with the sun in mind:

- Main living areas facing north – anywhere between 20°W – 30°E of true north. They will be warmed by the sun most of the time throughout the year, but will need shading to prevent summer overheating.
- East-facing rooms get early morning sun and will be cooler in the late afternoon – these are ideal for kitchens, breakfast areas and bedrooms (fewer hot nights!).
- West-facing rooms get low-angle, late afternoon sun which means they can easily overheat in summer. However, they do provide good winter heating so they can be suitable for living areas (but not kitchens where evening cooking creates heat) provided shading is used during summer.
- South-facing rooms get little or no sun. Use these for utility areas such as the garage, laundry, bathroom, toilet, storage rooms and stairs, where people spend little time.

The majority of glazing in the house, such as windows, skylights and glass doors, should be on the northern and eastern faces to let in the sun. There should be less glazing facing west because heat from the late afternoon sun can cause glare and overheating. South-facing windows receive daylight but minimal sun – keep them to a minimum and as small as possible to reduce heat loss.



Plan for shading to make sure the home will not get too much sun in summer, taking into account that the sun travels higher in the sky in summer, so shading should be designed to:

- shade high-angle summer sun over north-facing doors and windows
- shade low-angle summer sun over east- and west-facing doors and windows
- let low-angle winter sun into your home from all directions.

Options for shading are: eaves, louvres, shutters, sliding screens, awnings, removable sail shades, and deciduous trees.

Thermal mass can be quite technical – watch out for these dos and don'ts:

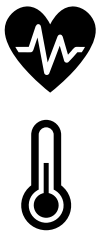
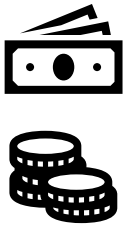
- DO insulate the thermal mass to stop heat loss into the outside air and ground.
- DO ensure your thermal mass floor or wall will be exposed to direct sunlight in winter. Alternatively, you can use thermal mass near a wood burner, heater or other source of radiant heat.

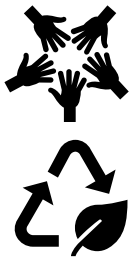
- DON'T use thermal mass in cold unheated areas, south-facing rooms, or away from the winter sun.
- DO calculate the correct thickness - concrete slab floors should be 100-200mm thick for the best performance, while thermal mass walls should be 100–150mm thick.
- DON'T cover thermal mass floors as carpet, rugs, lino, cork or timber coverings will not let the heat through. However, you can cover areas of the floor which do not receive direct sunlight.
- DO remember that concrete will not perform at its best until it has dried out. Drying time will vary depending on humidity and thickness. A 100mm thick slab can take four months to dry out (longer in winter), and thicker slabs will take longer.

Upfront costs

There is no additional cost to designing your home to make the most of the sun. If you would like to include thermal mass, Up-Spec suggests the additional cost of an insulated concrete slab floor exposed in the living areas is up to $4,600.

How you will benefit

	**Health and comfort** Letting in the sun to warm your house will help achieve a comfortable and healthy temperature in winter. Warmer indoor temperatures (over 18°C for living areas and 20°C if you have young, old or sick family members) are healthier for the family. Having the sun warm you home over the day will keep it comfortable even when you're not home to heat it.
	**Saving money** One of the easiest – and cheapest – ways to heat a home is to make the most of the sun's warmth. The more the sun heats your home, the less you'll need to use heaters, and the lower your energy bills. Up-Spec suggests that an insulated concrete slab floor exposed to the sun in living areas will save between $200 and $440 each year, depending where in the country you live.
	**Good for the planet** If you don't need to heat as much, you'll use less reticulated gas and electricity, or pellets / firewood. Lower use helps to conserve resources and leave energy available for all who need it.



Other benefits

You have the opportunity now to make the right decisions on your home's layout, orientation, windows and shading right at the beginning. Some of these would be very difficult – or impossible – to change in the future. And thermal mass floors or walls are a one-time opportunity! Do it now and do it right at relatively little cost.

Find out more

Read more about passive solar design (also called passive heating and passive cooling):

https://www.smarterhomes.org.nz/smart-guides/design/passive-heating/

https://www.smarterhomes.org.nz/smart-guides/design/thermal-mass-for-heating-and-cooling/

https://www.smarterhomes.org.nz/smart-guides/design/passive-cooling/

Extra for experts

Find out how to achieve effective thermal mass, and link to relevant standards and BRANZ advice: www.level.org.nz/passive-design/thermal-mass/

Find the evidence for the pay-off for insulated and exposed concrete slab floors: https://www.branz.co.nz/up-spec

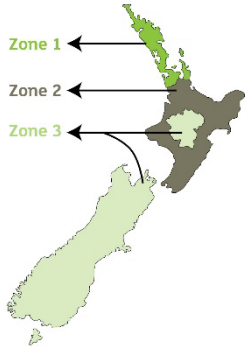
Find sun path diagrams for New Zealand produced by the Victoria University of Wellington, Centre for Building Performance: www.victoria.ac.nz/cbpr/resources/nz-sun-chart.aspx

2 Insulate to the max

Recommendation:

Insulate beyond Building Code minimums to better or best standards

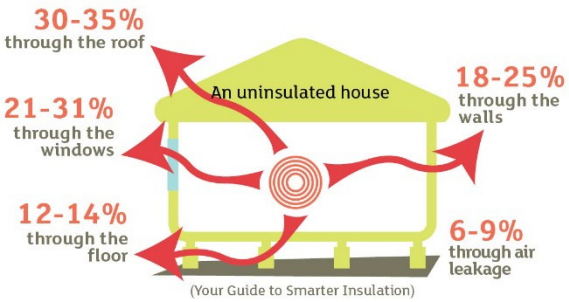
- Ceiling – R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3)
- Walls – R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3); all possible within 90mm framing)
- Suspended floor – R1.9, based on R2.0 bulk insulation, 90mm joists at 400crs, closed perimeter
- Concrete slab floor – R1.9, based on 100mm under-slab and slab-edge EPS insulation, area/perimeter ratio over 2.5



New Zealand climate zones as defined in the Building Code

Here's why

Insulating your house is like putting on some warm socks – the wool keeps the cold air away from your feet and stops you losing your body's warmth through your feet. A house can lose heat through its roof/ceiling, floor, walls and windows – these structures together are called the thermal envelope. This diagram shows where most of the heat escapes in an uninsulated house.



To insulate a house (or put its warm socks on), you need to insulate each of the parts of the thermal envelope. That's why insulation is recommended for floors, ceilings and walls.

All new homes have to be built to the energy efficiency requirements of the Building Code – that's standard. But the levels of insulation required by the Building Code are the minimum only for a basic level of warmth. You can't put in less insulation than those levels – but you can put in more!

The more insulation, the less heat you lose from your house through your walls, ceiling or floors. This means you won't need to heat as much to stay a comfortable temperature. we always recommend that you exceed the Building Code minimums. Zone 3 includes the coldest parts of New Zealand – if you live here, you need more insulation again.

Things to know

Insulation only works well when it is well-installed (no gaps, folds or bunching). It is quite an investment, so ensure your insulation is working for you by using installers who have passed training by the Insulation Association of NZ (IAONZ).

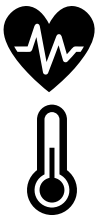
If you are building a house with a concrete slab floor, don't forget that this will need insulating too. Insulate under the slab and around the edges - most warmth leaks out around the perimeter of a slab and insulating these edges is particularly important in Zone 3. Very importantly, under-slab insulation must be continuous, otherwise there are gaps for the heat to escape through - pod-style flooring systems have a base of non-continuous segments of polystyrene.

If you are specifying downlights in your ceilings, make sure these the relatively new IC4 rated standard - so that the insulation can go over top of them and they don't let heated air leak through into your ceiling space (remember, you don't want any gaps in your insulation).

Upfront costs

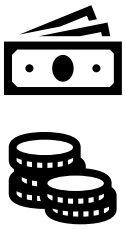
According to Up-Spec (from BRANZ), upgrading the R-value of the ceiling insulation you specify will cost you an extra $200 (in the north) up to $1,600 (in the south). The additional cost of insulating a concrete slab is between $2,500 (insulating under the slab) and $3,900 (insulating under and around the slab). This is money well spent to keep everyone cosy for the lifetime of the house.

How you will benefit



Health and comfort

Insulation stops your warm air escaping from your house so you won't need to heat as much to stay a comfortable and healthy temperature. Warmer indoor temperatures (over 18°C for living areas and 20°C if you have young, old or sick family members) are healthier for the family. There is now plenty of research to show that cold homes (below 16°C) lead to health problems such as cardiovascular and respiratory disease amongst the elderly, increased respiratory problems in children, increased illnesses such as colds and flu, mental health problems and the exacerbation of conditions such as arthritis.

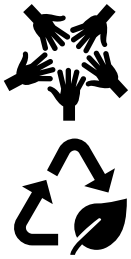


Saving money

Because your home loses less heat, you won't have to heat as much to stay healthy and comfortable. You'll have lower heating costs either in your power bills or energy (e.g. gas or firewood) bills. Up-spec says simply upgrading your ceiling insulation can save up to $170 on your heating costs.

Good for the planet

If you don't need to heat as much, you'll use less reticulated gas and electricity, or pellets / firewood. Lower resource use helps to conserve resources and leave energy available for all who need it.



Other benefits

If you are building a new home, you have the opportunity now to get it right. Some areas are very difficult and expensive to add insulation to in the future. Ceilings under flat or low roofs with limited ceiling space are difficult to access, and adding insulation to walls generally requires recladding or relining rooms. And concrete slabs are a one-time opportunity! Do it now and do it right at relatively little cost.

Once fully insulated, always fully insulated – your home will retain its value into the future, either for you enjoying comfortable living, or when you sell it. And there is growing evidence that buyers are increasingly valuing insulated homes.

Find out more

Read more about insulating your home:

https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/insulating-your-home/

https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/types-of-insulation/

https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/insulation-materials/

Find an installer in your area: https://www.energywise.govt.nz/at-home/insulation/insulation-installers/

Check if insulation subsidies apply to you: https://www.energywise.govt.nz/funding-and-support/funding-for-insulation/

Extra for experts

Find the evidence for why you should specify xxx, and link to relevant standards and BRANZ advice: http://www.level.org.nz/passive-design/insulation/

Find the evidence for the pay-off for higher specification insulation: https://www.branz.co.nz/up-spec

Find IAONZ qualified installers: https://www.iaonz.co.nz/

3 Up-spec your windows

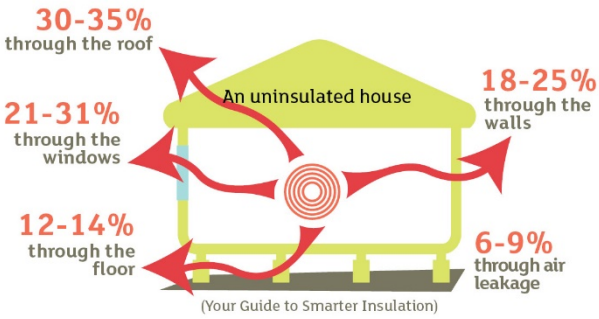
Recommendation: Upgrade to higher performance double glazing / joinery

- Low E glass
- Argon filled double glazing
- Thermally broken framing
- Or a combination of all three

Here's why

Windows are the biggest culprit for letting your warm indoor air escape. A third of your heating disappears out windows, even though they are less than 10% of your home's construction.

This is because the materials that windows are made of – glass, wood, aluminium, PVC – all conduct heat. Some conduct heat more than others, so making good choices of materials for your glass and frames can make a big difference to how much heat you lose from your home.



Things to know

There are two parts to a double glazed window: the glass; and the frame.

A double-glazed window uses two panes of glass, separated by a gap – in technical speak, an 'IGU' (insulated glazing unit). The gap is often filled with air; however, you can specify an IGU filled with argon gas. Argon gas is a better insulator than air, although slightly more expensive.

You can also choose from a variety of glass panes to improve the insulating quality of your windows. Low emissivity glass panes (known as 'low E') reflect heat back into the room, reducing heat loss through windows.

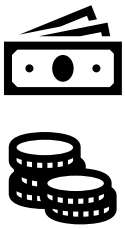
The frames for a double glazed window are perhaps the least considered part. They certainly form the smallest part of a window. The hidden surprise is that in an insulated home with double glazing and standard aluminium frames, 15% of your heating will escape through the frame. That's because aluminium is a great conductor of heat.

There is a way to stop this heat loss – specifying thermally broken aluminium frames. These frames have a barrier in the middle of the frame which prevents the heat from escaping.

Upfront costs

According to Up-Spec (from BRANZ), upgrading to thermally broken, aluminium-framed, double glazing with low-E coating will add an extra $4,100.

How you will benefit

	**Health and comfort** Taken altogether, low-E glass, argon filled double glazing, and thermally broken frames will be nearly twice as effective as standard double glazing in keeping your house warm. A warmer house is a more comfortable and healthier home for your family.
	**Saving money** You will not need to heat as much because you won't be leaking heat out your windows – enjoy the lower power bills or energy costs! Up-Spec calculates that upgrading your windows will save you up to $580 every year depending where you live (you'll save more if you're in Invercargill, than if you lived further north!)
	**Good for the planet** If you don't need to heat as much, you'll use less reticulated gas and electricity, or pellets / firewood. Lower use helps to conserve resources and leave energy available for all who need it.
	**Other benefits** High performance double glazing will cost you more at the outset. But it is a one-off cost that will pay off over all the years you live in your home. And it is far cheaper to install it while your home is being built, than to change your windows in the future. Double glazing and well insulating frames can also keep unwanted noise out, making your home quieter.

Find out more

Read more about choosing windows and frames:

https://www.smarterhomes.org.nz/smart-guides/construction-and-materials/glazing/

https://www.smarterhomes.org.nz/smart-guides/construction-and-materials/window-frames/

Extra for experts

Find the evidence for why you should specify higher performing double glazing, and link to relevant standards and BRANZ advice: http://www.level.org.nz/passive-design/glazing-and-glazing-units/

Find the evidence for the pay-off for higher specification windows: https://www.branz.co.nz/up-spec

Find out about the Window Energy Efficiency Rating System (WEERS): https://www.wganz.nz/guides/energy-efficiency/

4 Choose powerful extraction fans

Recommendation: Ensure extraction fans are effective at getting rid of damp area

- Choose more powerful extractor fans for all bathrooms / wet areas. Look for fans with:
  - an air flow rate of at least 40 litres/second
  - motion sensors and a delay timer
  - a duct diameter of 150mm.
- Choose a rangehood for the kitchen with a powerful fan above 50 litres/second
- Fans and rangehoods should be well installed and ducted to the outside of the house.
- Ideally, look for a fan with a low decibel rating.

Here's why

Normal household activities, such as cooking and washing, release moisture into the air in your home. A shower, for example, can produce 1.5 litres each time it is used. This moisture evaporates into the air – you can't see it unless it turns up as condensation on colder surfaces.

Activity	Litres
Cooking	3.0 per day
Showers and baths	1.5 per day (per person)
Clothes drying (unvented)	5.0 per load

Damp houses, particularly when they are also cold, are the perfect conditions for mould which thrives in humidity greater than 70%. Mould, with its tiny spores, is at the root of many respiratory illnesses and asthma as well as some forms of gastroenteritis. Dust mites also thrive in humid environments, exacerbating asthma and allergies.

Opening windows is not enough – you need to get rid of this moisture right where it's generated - with rangehoods or extraction fans.

Things to know

Power is important: you need an air flow rate of at least 40 litres/second to effectively get rid of the moisture that is generated – more for a larger bathroom.

Location is important: locate extraction fans close to or above the shower/bath or clothes dryer. Kitchen rangehoods should be close enough to the hob to be effective. Make sure the outlets are not right by a window where the damp air can be blown back inside.

Size is also important for rangehoods – they should cover the whole hob.

Because the air extracted by rangehoods and bathroom fans is moisture laden, it should not vent into the roof space but be ducted to outside the house. Damp air in your roof space will

damage your insulation and make it less effective. Pay attention to the ducting – straight ducting is much more effective than ducting which has kinks or goes around too many corners.

Choose models with automatic controls, such as a motion sensor or a humidistat, and a timer which runs for ten minutes after it is turned off. This means your extraction fan will work even if you forget to turn it on! And it won't keep running if you forget to turn it off!

Upfront costs

According to EECA, extractor fans typically cost less than 1 cent per hour to run. If you have two extractor fans in your home and run each of them for 90 minutes per day, they will add less than $1 to your monthly power bill.

How you will benefit

Health and comfort

Getting the moisture from kitchens, bathrooms and laundries out of the house means that you'll be less likely to have mould. Damp air settles as condensation on cold surfaces and provides just the conditions that mould likes to grow in. The World Health Organisations says there is no safe level of mould – it has been linked to asthma and respiratory illnesses. A drier home is not only better for everyone's health, the drier air is easier to heat – it will be easier to warm your home and keep it healthy and comfortable.

Saving money

Damp air takes more heating to reach comfortable temperatures. By getting rid of the moisture that cooking, laundry, baths and showers generate, you'll use less energy heating your home, and save on your energy bills. And in the long term, the materials your home is made of – plasterboard, wood, MDF – will last longer too. Too much damp can lead to rot or swelling in some materials. Keep it dry and you won't need to do expensive replacements.

Good for the planet

With dry air and surfaces your house will be easier to heat meaning that you'll use less reticulated gas and electricity, or pellets / firewood. Lower resource use helps to conserve resources and leave energy available for all who need it.

Other benefits

A dry home with less moisture in it means less mould and mildew. This can save you time and energy cleaning mould from surfaces, and will help your home to last longer.

Find out more

Read more about controlling moisture in your home, extraction fans and rangehoods:

https://www.smarterhomes.org.nz/smart-guides/air-quality-moisture-and-ventilation/controlling-moisture-and-damp/

https://www.smarterhomes.org.nz/smart-guides/air-quality-moisture-and-ventilation/active-ventilation/

https://www.energywise.govt.nz/at-home/dampness/

Extra for experts

Find out best practice for extraction systems, and link to relevant standards and BRANZ advice: http://www.level.org.nz/energy/active-ventilation/air-extraction-systems/

5 Efficient home heating

Recommendation: Make the most of the sun coming into your home and then choose energy efficient heating models

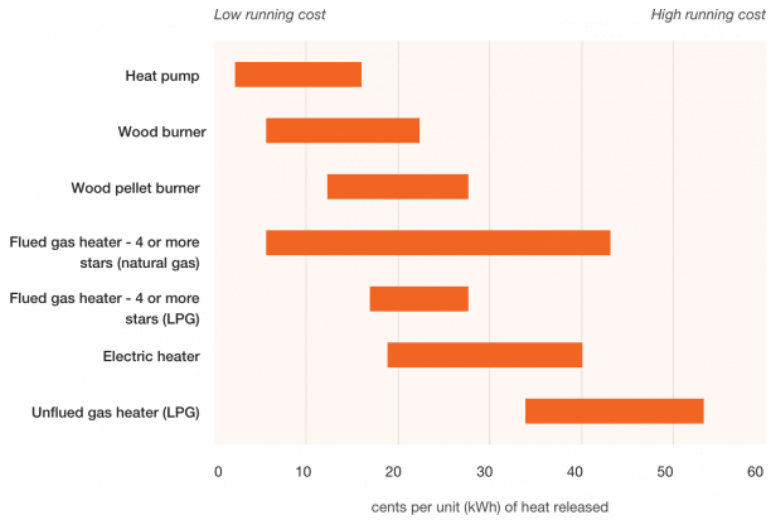
- Use passive solar design to reduce the need for heating
- Choose an efficient Ministry for the Environment-approved wood burner or wood pellet burner, or minimum 5 star rated heat pump.

Here's why

You need more than insulation alone to keep warm – you also need to heat your home to a comfortable and healthy temperature. That's hard to do if you're worried that your energy bills will be too expensive.

The World Health Organisation recommends minimum indoor temperatures for good health of 18°C, and higher (20°C) if you have young, old or sick family members in the home.

Using the sun to warm your home is free, so start with good design that lets the sun in. If that's not enough in winter (and it won't be in New Zealand's colder areas), then choose heating options that are efficient. Getting the right heater for your home means that you will use the least electricity or fuel necessary to heat your space. This graph from Energywise shows the running costs of a range of heater types.



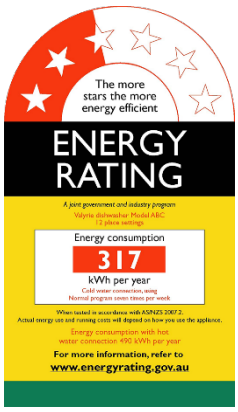
Things to know

See Module One: Good passive solar design for more information on designing to make the most of the sun.

Consider how to heat the whole house. Don't forget bedrooms – unheated, bedrooms can get very cold (well below a healthy temperature) during the night. Options for heating the whole house are:

- A ducted heat pump

- Central heating.
- A central heat source such as a wood burner with a heat transfer system.
- A heat source for the living areas with spot heating (e.g. electric fan heater or panel heaters) for bedrooms and other rooms.



Check the energy rating on heat pumps and choose a 5 star model. The label will tell you how much energy (in kilowatt hours) you will use in a year – that will help you choose the most efficient model.

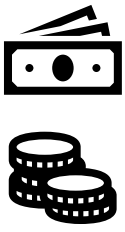
If using wood or pellet burner, also check it is a low emission version – high emissions pollute the air and can cause respiratory problems.

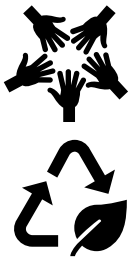
Also choose the right heater to heat your space – larger rooms will need a more powerful heater to be both efficient and effective. The correct heat pump sizing will also mean quieter running and lower lifetime maintenance.

Upfront costs

Choosing an efficient model of heater should not cost you any more upfront. Check the energy rating label for savings on running costs going forward.

How you will benefit

	**Health and comfort** Warmer indoor temperatures (over 18°C for living areas and 20°C if you have young, old or sick family members) are healthier for the family. You'll be more likely to heat to comfortable and healthy temperatures if you are not worried about your energy bills.
	**Saving money** According to Up-Spec, a correctly sized heat pump could save you up to $290 every year. The more efficient the model (more energy rating stars), the more you will save!
	**Good for the planet** The more effective and efficient the heater, the less reticulated gas/electricity or pellets / firewood you will use. Lower heating use helps to conserve resources and leave energy available so that everyone can get their houses to healthy temperatures.



Other benefits

Choosing the right heater can add value to your home, making it warm, healthy and comfortable

Find out more

Read more about heating your home: https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/heating-your-home/

For an overview of the pros and cons of different heating systems: https://www.energywise.govt.nz/at-home/heating-and-cooling/types-of-heater/

See the list of MfE approved wood burners: https://www.mfe.govt.nz/woodburners

Extra for experts

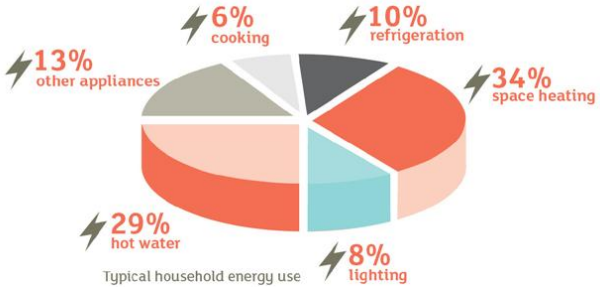
Find out best practice for space heating, and link to relevant standards and BRANZ advice: http://www.level.org.nz/energy/space-heating/

6 Efficient lighting

Recommendation: Select efficient light fittings and bulbs:

- Choose LED lighting both inside and out
- Make sure any downlights are well fitted and meet IC-4 (2018 NZS) standards – these can have ceiling insulation on top of them and stop heated air from your living space leaking into your ceiling.
- All outdoor lighting fitted with integrated daylight and motion sensing controls (where practicable).

Here's why



Choosing energy efficient lighting is a simple and easy way to use less energy in your home. Lighting alone uses 8% of a typical home's energy use.

LED lighting is the most efficient available, using up to 85% less electricity than incandescent bulbs. It has a very long life (approximately 50,000 hours) so you should be able to fit-and-forget them.

Downlights have long been a hole in the ceiling letting warm air out because the heat they generated meant it was too much of a fire risk to lay insulation near them. However, the relatively new IC-4 rated downlights allow insulation to be laid over the top of them. Choose these models and you can enjoy the downlight look without letting your warmth escape into your roof space.

Things to know

There is a lot to consider in choosing lights:

- Light colour - Choose a warm white LED for a more comfortable light in your home. Cool white LEDs are good for task lighting where contrast is important e.g. workshops, garages and offices.
- Beam angle - The beam angle measures how the light spreads out from the bulb. For general floodlighting, choose a downlight with a larger beam angle – about 90 degrees or higher. Use narrow angle downlights – about 30 degrees or less – for spotlighting, such as for highlighting pieces of art.
- Brightness - Lumens measure light output - the higher the lumens, the brighter the light. As beam angle increases, you need more lumens to maintain the light's intensity.

Dimmable? If you want to be able to dim your lights, check the packaging to make sure you choose a model that is dimmable.

If you're upgrading your ceiling insulation, that's a great time to also replace downlights. Most importantly, after retrofitting the IC-4 rated downlights, cover them with ceiling insulation. Check for a statement on the box and a label on the actual downlight to make sure they can have insulation covering them. If you're replacing existing downlights, measure the diameter of the existing holes in the ceiling so you can choose a replacement that fits best.

Upfront costs

LED light fittings and bulbs vary in quality and price. According to BRANZ website Up-spec, choosing LED lighting will cost you an extra $150 over the whole house. The bulbs may be more expensive to buy; however, each LED bulb you buy instead of an incandescent light bulb can save you between $100 and $300 over its life

How you will benefit

Health and comfort

Energy efficient lights will not impact your comfort - they will do the job just as well as less efficient models. The newer IC-4 downlights will mean you don't have gaps in your ceiling insulation so your rooms will stay warmer and healthier.

Saving money

BRANZ researchers upgraded a house to a mix of compact fluorescent lamps and LED lights. They found this reduced energy use by 51% and saved 50% in lighting costs. Up-Spec calculates yearly savings of $150.

Good for the planet

More efficient lighting reduces the electricity you use, helping to conserve resources. LED lighting usually lasts for many years – reducing the need for replacement and also eliminating the small amount of mercury used in compact fluorescent bulbs.

Other benefits

If you're renovating or building new, you have the perfect opportunity to select energy efficient options that will save you money now and into the future. The right lighting can also add value to your home and save you time in replacing bulbs and fittings.

Find out more

Read more about efficient lighting choices and selecting downlights:

> https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/smart-lighting-choices/
>
> https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/downlights-recessed-lights/

Read more about how to choose the right light and a tool to calculate how much you'll save by switching to energy efficient bulbs: https://www.energywise.govt.nz/at-home/lighting/

Extra for experts

Find information on lighting design, including lamp selection, lighting levels, and design features, and link to relevant standards and BRANZ advice: http://www.level.org.nz/energy/lighting-design/

Find the evidence for the pay-off for LED lighting: https://www.branz.co.nz/up-spec

7 Water efficient tapware and appliances

Recommendation: Select tapware and appliances at least as efficient as (or better than) the following:

- Showers - WELS 3 or 4 star
- Toilets - WELS 4 star
- Taps - WELS 5 star
- Dishwashers and washing machines - WELS 4 star

Here's why

Choosing water efficient taps, toilets, showerheads and appliances can make all the difference to the amount of water you use, and still do a good job.

Savings from such a simple switch can add up to be substantial.

- For an 8kg washing machine, switching from a 3 star machine to a 4.5 star machine could save around 49 litres per wash. That means if you do 5 loads per week you could save around 14,000 litres per year.
- Switching from a 3 star to a 4 star shower head could save up to 4.5 litres per minute. If you have an eight minute shower every day, that's a saving of more than 13,000 litres per person over a year.

Things to know

WELS is a water efficiency labelling scheme – the more stars the more water efficient.

The water consumption figure tells you exactly how much water the product uses. For showers and taps, this is in litres per minute. For appliances, this is in litres per load. And for toilets, this is in litres per flush. The label also tells you if the product is best in mains pressure or in low pressure systems.

Upfront costs

There is little cost difference in selecting taps, showerheads, toilets or appliances with more WELS stars, according to BRANZ website Up-spec. Making this simple choice will bring you benefits at little to no cost to yourself.

How you will benefit

Health and comfort

Your comfort will not be affected by selecting water efficient taps, shower heads, toilets and appliances. They will do the job just as well as less efficient models.

Saving money

If you live where water is metered and charged separately, you will instantly save on your water bills. If you use tank water or bore water, taking steps to use less water in your house will reduce the draw on your tank or bore, and save you from expensive top-ups.

Even if you are not charged for water, you will still save money. A water efficient tap, shower head or appliance which uses hot water will reduce your power bills because you will end up using less hot water and therefore heating less water.

Indirectly, you benefit from a city or region-wide reduction in water usage. This means the cost to the local council for building new dams, water treatment stations and other infrastructure, or for water treatment and reticulation, is also reduced. Ultimately, it will mean less pressure for rates rises.

Good for the planet

Water is a resource that is becoming increasingly scarce. Our water sources are under increasing pressure from growing cities and populations, industries, and agriculture. At the same time, climate change is leading to more and worse droughts, while extreme storms can also impact supply. Reducing demand for reticulated water will mean communities are more resilient and will cope better for longer in the face of droughts and other climate events. Non-renewable water sources, for example, groundwater, will not be exhausted.

Other benefits

If you're renovating or building new, you have the perfect opportunity to select options that will save you money now and into the future. Don't pay for a plumber to come and retrofit your tapware and toilets – make the decision to do it now!

Find out more

Read more about saving water by reducing flow rates in your taps, showers and appliances: https://www.smarterhomes.org.nz/smart-guides/water-and-waste/efficient-use-of-water/

Read more about the WELS Water Efficiency Labelling Scheme: http://www.mfe.govt.nz/fresh-water/we-all-have-role-play/choosing-water-efficient-products

Calculate how much your shower will cost you with the Upper Hutt City Council's calculator: https://upperhuttcity.com/water-drainage/water-conservation/how-much-is-your-shower-costing-you/

Extra for experts

Find the evidence for why you should specify toilets, showers, appliances and taps, and link to relevant standards and BRANZ advice: http://www.level.org.nz/water/water-supply/appliances-and-fixtures/

Find the evidence for the pay-off for higher specification fixtures and appliances: https://www.branz.co.nz/up-spec

8 Rainwater harvesting

Recommendation: Collect and use rainwater:

- Install a rainwater harvesting system
  - minimum tank size of 2,000 litres
  - connected to as much of the roof as possible
  - plumbed for use in the home to at least 1 toilet or laundry.
- Alternatively, install plumbing to take future rainwater harvesting system through separate pipework to toilet or laundry with isolation valve in place for future connection.

Here's why

Water is a resource that is becoming increasingly scarce. Our water sources are under increasing pressure from growing cities and populations, industries, and agriculture. At the same time, climate change is leading to more and worse droughts, while extreme storms can also impact supply.

This is leading to pressure on councils' water supply and infrastructure. Costs of providing these services are rising. One response is to meter water – some councils, including Auckland, already do this, and more will follow. Using free rainwater instead of expensive reticulated water will definitely buffer you against rising water bills in the future.

An added bonus is that it will reduce the stormwater running over your property by catching the water off your roof.

Things to know

Check what your local council requires:

- Some councils will only let you use rainwater for 'potable' purposes (e.g. drinking and bathing) if it has been treated
- If you're connecting a rainwater system to the plumbing of a house that also has a mains supply, you will need a building consent.
- You are also required by law to ensure that the mains water is isolated from the rainwater system. This is achieved by using a backflow prevention device. A qualified plumber must install this and you may be required to have annual checks on this device.

Most councils will require you to connect to the mains water if there is a connection available, even if you will only use it as a backup.

You will need the right sized tank for what you intend to use the water for. As a guide and depending on whether you live in a dry or wet climate, Up-Spec says:

- A 1,000 litre tank provides 63,000 - 93,000 litres for garden-only purposes.
- A 5,000 litre tank provides 76,000 - 120,000 litres for laundry and toilet-only purposes.
- A 23,000 litre tank provides 83,000 - 134,000 litres for laundry and toilet-only purposes.

Upfront costs

According to BRANZ website Up-spec, a rainwater tank will cost you $2,400 for a 1,000 litre tank plumbed to the garden, $4,700 for a 5,000 litre tank plumbed to laundry and toilet, and $7,400 for a 25,000 litre tank plumbed to the whole house.

How you will benefit

Health and comfort

Most rainwater tanks can switch over to mains water if they run dry so your comfort will not be affected. For people on tank water only, you will need to conserve water in dry periods, and this may affect your comfort.

If you want to use tank water for potable purposes (drinking and bathing), you may be required to treat your water to ensure it does not affect your health. However, you can save a considerable amount of water by simply using tank water for non-potable purposes such as laundry, toilets and garden.

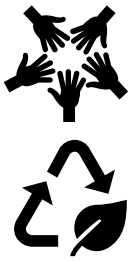
Saving money

If you live where water is metered and charged separately you will instantly save on your water bills. In Auckland, Up-Spec calculates a 25,000 litre tank will save 138,000 litres every year – that will make a big difference to your water bill

Indirectly, you benefit from a city or region-wide reduction in water usage. This means the cost to the local council for building new dams, water treatment stations and other infrastructure, or for water treatment and reticulation, is also reduced. Ultimately, it will mean less pressure for rates rises.

Good for the planet

Reducing demand for reticulated water will mean communities are more resilient and will cope better for longer in the face of droughts and other climate events. Non-renewable water sources, for example, groundwater, will not be exhausted.



Other benefits

A rainwater tank will make your family more resilient during disasters or other events which interrupt mains water services. You will have your own water source to draw on during these times.

Find out more

Read more about saving water by reducing flow rates in your taps, showers and appliances: https://www.smarterhomes.org.nz/smart-guides/water-and-waste/collecting-and-using-rainwater/

Extra for experts

Find out more about best practice rainwater harvesting, and link to relevant standards and BRANZ advice: http://www.level.org.nz/water/water-supply/mains-or-rainwater/

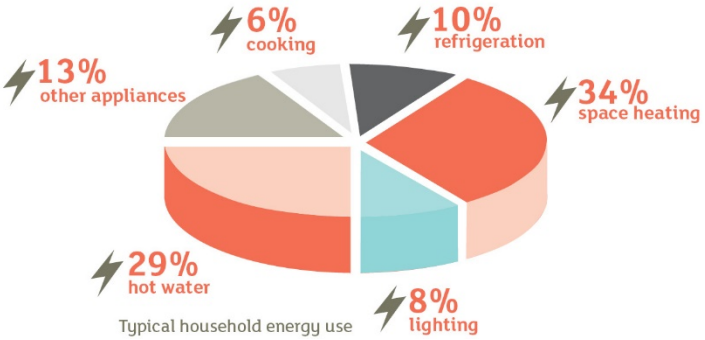
Find the evidence for the pay-off for higher specification fixtures and appliances: https://www.branz.co.nz/up-spec

9 Efficient water heating

Recommendation: Install either a solar hot water system or a heat pump hot water system.

Here's why

A third of your household's energy use goes to heating your water. It makes sense to choose an energy efficient system, or even to choose a solar system that uses free heat from the sun. It especially makes sense if you have a large household with higher hot water use.



Heat pumps use electricity far more efficiently than ordinary electric water heaters. A well-installed solar system should be able to deliver up to 75% of your hot water needs over the year, in most parts of New Zealand.

Things to know

Both solar and heat pump hot water systems need to be the right size and installed well to ensure they work efficiently and effectively. Both systems can be either all-in-one (where the panels/heat pump and cylinder are integrated) or split (where the cylinder is inside and the panels/heat pump are outside). Both systems will benefit from also wrapping the hot water cylinder and lagging the first metre of pipes leading out of the cylinder – this stops heat loss from your water while it is 'standing' waiting to be used.

Solar systems:

- Usually have backup (or booster) heating for days when there is not enough sun – this could be electric, gas or wetback. Use timers and controller to ensure the system doesn't use boost energy when you don't need the water
- Size of panels - typically, you should have 1m^2 of solar panel collectors for every person in the house.
- Location and orientation of panes – these should not be shaded, should ideally face between north-east and north-west, and should be tilted towards the sun (the optimum angle is equivalent to your latitude)

Size of cylinder - The Solar Association recommends that the cylinder size is approximately 75 litres volume of hot water for every 1m² of collector area.

Heat pump water heaters:

- Work most efficiently at warmer outside temperatures (above 6-7°C) so are less efficient in winter. Ask suppliers for the heat output figures at an external air temperature of 2°C – the higher the figure the better.
- Some models clearly outperform others, especially at lower temperatures - check Consumer NZ reports to find the better models.
- They can be a little noisy so install the external unit away from bedrooms

Upfront costs

Solar systems have a high upfront cost ($5000-$9000) compared with other water-heating options and will need annual maintenance. On the plus side, you will not pay at all for the hot water they generate. Heat pump hot water systems are more expensive to purchase than a standard electric hot water cylinder ($4000-$8000); however, their efficient operating costs mean that they are a good, long-term investment.

How you will benefit

	**Health and comfort** You will not miss out on hot showers even if you have a solar hot water system – these use booster heating to heat water when the sun isn't out.
 	**Saving money** Consumer NZ research shows that a well specified and installed heat-pump water heater would reduce your hot water bill by two-thirds over standard electric water heating. Beacon research found that when installed at the latitude angle, with well-sized collectors, and connected to well-insulated cylinders, the solar hot water systems saved 70-75%.
 	**Good for the planet** Solar energy is renewable which is always good for the planet. Heat pump systems use electricity which is largely generated from renewable hydroelectricity.
 	**Other benefits** Some solar systems operate without pumps – meaning that you can still have hot water when the power has been cut off and making your house more resilient

Find out more

Read more about water heating options:

https://www.smarterhomes.org.nz/smart-guides/water-and-waste/hot-water-options/

https://www.smarterhomes.org.nz/smart-guides/water-and-waste/solar-water-heating/

https://www.energywise.govt.nz/at-home/water/

Find a tool to help you assess the best water heating system for you:
https://www.energywise.govt.nz/tools/water-heating/

Extra for experts

Find out more about water heating, and specifically heat pump and solar systems, and link to relevant standards and BRANZ advice:

http://www.level.org.nz/energy/water-heating/

http://www.level.org.nz/energy/water-heating/heat-pump-water-heating/

http://www.level.org.nz/energy/water-heating/solar-water-heating/

10 Universal Design features

Recommendation: Design for future changes in your age, health and lifestyle:

- Doors with minimum clear opening of 810 mm with lever handles
- A bedroom and a bathroom/toilet located on the entry level of the house
- Paths from the car parking space to the dwelling are slip resistant, gently sloping and at least 1200 mm wide.
- Allow for 1500mm turning circle in kitchen and ground floor bathroom.
- Power points at least 500mm from floor and 500mm from corners.
- Door handles aligned with light switches at a consistent height between 900mm – 1200mm above the finished floor level.

Here's why

Universal design is about creating homes that are safe, convenient and accessible regardless of physical ability or life stage. Homes are designed in such a way that they are accessible to everyone – from young children to older adults.

By building these features into your new home, you can stay in your home through all stages of your life. Your home will work for you, with no expensive modifications needed.

Things to know

New Zealand has its own universal design certification: Lifemark®. It is based on five principles:

- The home is usable. It has thoughtful design features that meet the needs of people of different ages and abilities over time, including reachable power points and easy to use taps, window latches and light switches.
- The home is adaptable. It allows easy and safe access for all, regardless of age or ability. This is achieved using level entry access, wider doorways and corridors and rooms designed to ease everyday living.
- The home is accessible. It has easy adaptable design features to suit changing needs as we progress through life.
- The home is safe. It makes home life safe for people of different ages and abilities over time.
- The home has lifetime value. It is a simple and low cost option for designers, builders and homeowners.

The Lifemark website has design standards and tips, and can put you in contact with accredited partners to help design for the future.

Upfront costs

BRANZ research has shown that the average extra cost of including Universal Design features in a new house is $1,720.

How you will benefit

	**Health and comfort** Universal design is about making your house work for you over your lifetime, no matter what physical disabilities or lifestyle changes you may encounter.
 	**Saving money** It is considerably cheaper and less disruptive to build universal design features into a new home than add them to the same house later. Retrofitting a house with universal design features would cost an extra $16,990 on average, compared to only $1720 if included while it was being built.
 	**Good for the planet** Building these features in from the start can help save time, effort and resources adapting the house later on when it is needed.
 	**Other benefits** If added into the design when being built, Universal Design features will provide value for the lifetime of the house. It will be adaptable to all stages of life, and appealing to a wide range of future buyers.

Find out more

Read more about designing an adaptable home: https://www.smarterhomes.org.nz/smart-guides/design/designing-an-adaptable-home/

Read more about Lifemark®: https://www.lifemark.co.nz/

Extra for experts

Get an overview about universal design, and try a Universal Design costing estimator:

https://www.branz.co.nz/universal_design

https://www.branz.co.nz/cms_display.php?sn=215&st=1&pg=19558

Find out more about Lifemark® and its design standards, or become a Lifemark® Accredited Partner:

https://www.lifemark.co.nz/

11 Choose healthy and environmentally friendly materials

Recommendation: Use Environmental Choice certified materials including plasterboard, paints, insulation, carpets and floor coverings. The equivalent international certification schemes may be used.

Here's why

Environmental labels are designed to identify products that are less harmful to the environment. To achieve a label, they have to meet standards around materials sourcing and manufacturing as well as installation and disposal.

Looking for an environmentally certified produce saves you the effort and time to research its environmentally sustainability yourself – the label tells the story.

Typically, an environmental label looks for materials which:

- promote healthy indoor air quality
- have minimal health risks during construction or retrofitting
- are durable and have low maintenance requirements
- incorporate recycled content or can readily be recycled
- reuse existing or demolished building materials or can readily be reused
- are made from renewable or sustainably managed resources
- have low embodied energy including minimal impacts due to transport
- have low impact on landfill or are biodegradable
- minimal impact on the environment (air, water, land, habitats and wildlife)

Cert.TM

Things to know

This is the Environmental Choice tick - watch out for it on:

- Concrete and cement
- Steel
- Insulation
- Paint
- Furniture and fittings
- Flooring and carpets

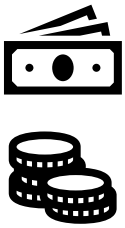
Environmental Choice specifications are concerned not only for the environment, but also for human health. If you buy certified paint, for example, you can be sure it does not contain any

VOCs (Volatile Organic Compounds - chemicals that become airborne and breathable at room temperature some of which have been linked to serious health effects like organ damage or cancer), formaldehyde, or carcinogenic, mutagenic or toxic substances.

Upfront costs

Generally, selecting Environmental Choice products will not add anything to your upfront costs.

How you will benefit

	**Health and comfort** Because human health is one of the criteria to be a certified Environmental Choice product, you can rest assured that choosing these products will be good for your health
	**Saving money** Many Environmental Choice approved products are of a similar price to those without such good environmental credentials
	**Good for the planet** You can buy an Environmental Choice product knowing it is the best choice you can make for the environment.
	**Other benefits** Through buying Environmental Choice labelled products, you are helping to support the New Zealand Government, businesses and consumers to transition to a sustainable and low-emissions economy by recognising sustainably preferable products and services.

Find out more

Find Environmental Choice certified products: https://environmentalchoice.org.nz/

For more information on choosing materials for your home: https://www.smarterhomes.org.nz/smart-guides/construction-and-materials/materials-inside-your-home/

Extra for experts

For information on the environmental impacts of different materials, try BRANZ Level fact sheets

http://www.level.org.nz/material-use/

Find out more about Lifemark® and its design standards, or become a Lifemark® Accredited Partner:

https://www.lifemark.co.nz/

12 Future proof your home

Recommendation: Install an electric car charging point in garage and/or UPVC conduit for easy future install of solar photovoltaic system on roof

Here's why

Both electric cars and solar photovoltaic power are technologies that are developing and coming of age rapidly. While they may seem too expensive at the moment, prices are dropping as more people take up the opportunity to travel in an environmentally friendly way or to generate their own renewable energy.

Plan for the future by installing these two easy features in your new home, and when in the future you want to adopt these technologies, you'll be well set to go ahead.

Things to know

By considering future needs and new technologies as you design and build your house you can ensure that adoption of these technologies, at a time that suits you and your budget, can easily be achieved

Upfront costs

Thinking through options for where an electric car charging point or solar panels might be places, has low upfront costs.

How you will benefit

	**Health and comfort** Installation of these features will not improve health and comfort – but it might give you peace of mind that you are prepared for the future when these technologies are more accessible
 	**Saving money** Investing a small amount of money now in planning for these technologies you will save money in the long run when these technologies become more common place and installation can go ahead. An electric car combined with solar electricity production to power it, can be a much cheaper transport alternative to fossil fuels.

Good for the planet

Solar generated electricity is a great local source of renewable energy which is always good for the planet. Electric car charging uses electricity which, in New Zealand, is largely generated from renewable hydroelectricity. It also offsets the use of petrol and diesel for transport – both environmentally damaging fossil fuels.

Other benefits

The addition of locally generated solar electricity and a car charging point may add value to your home for potential future buyers.

Find out more

Find out more about electric vehicle charging:

https://www.energywise.govt.nz/on-the-road/electric-vehicles/ev-charging/

https://worksafe.govt.nz/managing-health-and-safety/consumers/safe-living-with-electricity/safely-charging-your-electric-vehicle-at-home/

For an overview of generating your own electricity: https://www.smarterhomes.org.nz/smart-guides/power-lighting-and-energy-saving/generating-your-own-electricity/

For more information on whether solar photovoltaics is right for you (bear in mind that prices will change and you may need to seek more up-to-date information closer to making the decision to install solar PV): https://www.consumer.org.nz/articles/grid-tied-pv-systems

For a calculator on how much solar energy is available to you: https://solarview.niwa.co.nz/

Extra for experts

For information on photovoltaic systems, with relevant legislation and standards:

http://www.level.org.nz/energy/renewable-electricity-generation/photovoltaic-pv-systems/

http://www.level.org.nz/energy/renewable-electricity-generation/additional-components/

To calculate the average yearly energy generation capability of a PV system:
https://www.branz.co.nz/cms_display.php?friendly_url=Pvcalculator

7.8 Different ways of communicating the recommendations

Shorter information pieces for BBS-style one pager

Invest now for a warmer, healthier future

1. Face the sun
   Orient your house to the north so that the winter sun warms your north-facing living areas. Use eaves and shading, and limit windows to the west, to stop your home overheating in summer.

2. Go beyond the basics with your insulation
   Specify higher insulation than Code minimums. We recommend:
   - Ceiling: R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3)
   - Walls: R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3)
   - Suspended Floors: R1.9 (all zones) – insulate under and around concrete slabs(see below)

   Insulation stops your warm air escaping from your house so you won't need to heat as much to stay a comfortable temperature. Enjoy lower power or energy costs and stay healthier.

3. Insulate under and around concrete slab floors
   Your warm indoor heat can leak out through uninsulated slab floors. Ask for the slab to be insulated underneath and around the perimeter. Your home will be cheaper to heat and stay toasty for longer.

4. Up-spec your windows
   Windows are a weak link in the barrier keeping your heat inside your home. Now's the easiest and cheapest time to invest in double glazing – we recommend using low emissivity glass, argon gas between the panes, and frames which are thermally broken (they use a spacer that doesn't conduct heat). You'll need less energy to heat your home, it will stay warmer for longer, and you can enjoy the lower bills and better health that comes with a warm home.

5. Choose powerful extraction fans
   Getting the moisture from bathrooms and laundries out of the house means that you'll be less likely to have mould (better for everyone's health) and the drier air is easier to heat (cheaper and healthier). We recommend choosing an extraction fan with an airflow rate of at least 40 litres per second. Make sure all that damp air is being pumped outside – you don't want it making your ceiling insulation damp!

6. Lighting that doesn't cost the earth
   When you're considering lighting, don't just focus on the cost of buying lights. The ongoing costs can be significant, as much as 8% of your household's power bill. Choose LED lighting – they may cost slightly more to buy, but they last a long time and cost very little to run. If you like downlights, specify IC-4 (NZS:2018) standard so that your ceiling insulation can go over top of the light with no gaps and no warmed indoor air leaks out into your ceiling space.

7. Be water wise
   Some simple choices in your taps, toilets, showerheads and appliances can make all the difference to the amount of water you use. In metered areas, you'll see the difference in your water bill, but everyone will benefit from the lower water heating costs. WELS is a water efficiency rating system – the more stars the better. We recommend looking for:
   - WELS 3 or 4 star showerheads
   - WELS 4 star toilets
   - WELS 5 star taps
   - WELS 4 star dishwashers and washing machines

8. Heat your home the best way possible
   Choosing the right heater(s) for your home means you will be able to keep your rooms at healthy temperatures without blowing the power bill. Check the energy rating label on heaters – the more stars the better. We recommend heat pumps or Ministry for the Environment-authorised low emission wood burners. And don't forget your bedrooms – if you can't afford a ducted heat pump or central heating system, use a heat transfer system or use standalone heaters in those rooms.

9. Spend less to heat your water
   A third of your power bill goes to heat your water so it's worth choosing the most energy efficient system you can – or thinking about solar water heating. Solar or heat pump hot water heaters can save as much as 75% of water heating bills compared to conventional systems.

10. Wire up for the future
    You may not be ready yet to invest in an electric car or a photovoltaic energy system, but now's the time to put the wiring in place. Include an electric car charging point in the garage and UPVC conduit for easy future install of a solar photovoltaic system on your roof.

11. Plan ahead for life's changes
    Simple easy choices now can make all the difference to your ability to stay in your home as you age. You can choose to have your home Lifemark rated – that's the ultimate – or make simple changes, such as wider doors, higher electrical sockets, nonslip surfaces, yourself.

12. Make healthy choices in your furnishings and décor

    Specify Environmental Choice certified plasterboard, paints, insulation, carpets and floor coverings – they have done the hard work of figuring which choices will be best for the planet. Always choose low VOC options for paints, vinyl, adhesives, wallpaper, carpet, timber products such as MDF/plywood – VOCs are chemicals that can have a range of effects on health, including irritated eyes and airways, headaches, nausea and rashes.

Blog or overall web page

Invest now in a healthier future

Here's the top twelve choices you can make for a warmer, more efficient home

There are a lot of decisions to make when you're designing your new home – from your new home's layout, to floor coverings, to which benchtop to choose.

This is also the golden time to make choices which could make your home warmer, healthier and cheaper to run in the future.

Why? Because it is easier – and cheaper – to include these choices while your home is being built than it is to add them later. And because you'll reap the benefits of having a home that is warm and easy to heat, doesn't cost as much to run, and is healthy for you and your family to live in.

So what choices can you make now to bring you these benefits in the future?

We recommend:

1. Make sure your house plan orients your living areas to the north to make the most of the winter sun's warmth.
2. Specify higher insulation than the Building Code minimums:
    - Ceiling: R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3)
    - Walls: R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3)
    - Suspended Floors: R1.9 (all zones)
3. Insulate under and around the perimeter of concrete slab floors to stop heat leaking out through uninsulated slab floors.
4. Invest in double glazing with low emissivity glass, argon gas between the panes, and frames which are thermally broken (they use a spacer that doesn't conduct heat).
5. Choose the right heater(s) for your home - check the energy rating label on heaters – the more stars the better. We recommend heat pumps or Ministry for the Environment-authorised low emission wood burners. And don't forget your bedrooms – if you can't afford a ducted heat pump or central heating system, use a heat transfer system or use standalone heaters in those rooms.
6. Install powerful extraction fans with an airflow rate of at least 40 litres per second. Make sure all that damp air is being pumped outside – you don't want it making your ceiling insulation damp!
7. Choose LED lighting – they may cost more to buy, but they last a long time and cost very little to run. If you like downlights, specify IC or IC-F rated ones so that your ceiling insulation can go over top of the light cans with no gaps.
8. Save water – and water heating costs – by selecting
    - WELS 3 or 4 star showerheads
    - WELS 4 star toilets
    - WELS 5 star taps
    - WELS 4 star dishwashers and washing machines

9. Find the most energy efficient system you can. Check the energy rating labels for the system with the most stars you can afford. We recommend choosing a heat pump water heater.
10. Make healthy choices in your furnishings and décor - specify Environmental Choice certified plasterboard, paints, insulation, carpets and floor coverings, and always choose low VOC options for paints, vinyl, adhesives, wallpaper, carpet, timber products such as MDF/plywood.
11. Wire up for the future - include an electric car charging point in the garage and UPVC conduit for easy future install of a solar photovoltaic system on your roof.
12. Plan ahead for life's changes - have your home Lifemark rated – or make simple changes, such as wider doors, higher electrical sockets, nonslip surfaces, yourself.

More information:

www.smarterhomes.org.nz

Blog – double glazing

Choosing windows for views, light, sun AND warmth

Windows – they are a major feature of your new home. When selecting your house plan, you will have considered some key factors:

- Whether the windows are placed to make the most of views?
- Does each room have enough light?
- Do your windows let in winter sun while minimising late afternoon summer sun?

There is one more consideration and now's the time to think about it. Selecting windows that will keep your home warmer.

The fact is that windows are the biggest culprit for letting your warm indoor heat escape. 30 - 40% of your heating disappears out windows (even with double glazing), even though typically they are less than 10% of your home's construction.

We know your new VHBX home will be well insulated in walls and ceilings and double glazing is standard. Did you know you can also specify higher performance double glazing to better 'insulate' your windows too?

There are two parts to a double glazed window: the glass; and the frame.

A double-glazed window uses two panes of glass, separated by a gap – in technical speak, an 'IGU' (insulated glazing unit). The gap is often filled with air; however, you can specify an IGU filled with argon gas. Argon gas is a better insulator than air, though slightly more expensive.

You can also choose from a variety of glass panes to improve the insulating quality of your windows. Low emissivity glass panes (known as 'low E') reflect heat back into the room, reducing heat loss through windows. They can also reduce the amount of UV light coming in through the windows. This has the benefit of reducing fading of your furnishings.

The frames for a double glazed window are perhaps the least considered part. They certainly form the smallest part of a window. The hidden surprise is that in an insulated home with double glazing and standard aluminium frames, 15% of your heating will escape through the frame. That's because aluminium is a great conductor of heat.

There is a way to stop this heat loss – specifying thermally broken aluminium frames. These frames have a barrier in the middle of the frame which prevents the heat from escaping.

Taken altogether, low e glass, argon filled double glazing, and thermally broken frames will be nearly twice as effective as standard glazing in keeping your house warm. A warmer house is a healthier home for your family. And you will not need to heat as much because you won't be leaking heat out your windows – enjoy the lower power bills or energy costs!

High performance double glazing will cost you more at the outset. But it is a one-off cost that will pay off over all the years you live in your VHBX Home. And it is far cheaper to install it now while your home is being built, than to change your windows in the future.

Two more notes on windows:

1. If your home will be in a particularly noisy or cold environment, consider triple glazing. Triple glazing consists of three panes of glass separated by air gaps to provide comparatively high levels of heat retention and noise reduction.
2. Curtains are another important barrier to stop heat escaping through your windows. Choose floor length, lined curtains (a double lining is more effective than thermal backing on a fabric).

More information:

https://www.smarterhomes.org.nz/smart-guides/construction-and-materials/glazing/

http://www.level.org.nz/passive-design/glazing-and-glazing-units/

Blog – powerful extraction in wet areas

Getting wet air out of your bathrooms and laundries

Bathroom and laundry extraction fans may seem like a small detail in your new home planning, but it's worth paying attention to getting it right.

Why is it so important? Bathrooms and laundries generate a lot of wet air. Every shower or bath puts 1.5 litres of water into the air inside your home. And every load dried in a clothes dryer generates 5 litres of water. This is a problem because wet air can:

- encourage mould, fungi, dust mites and mildew, which can be harmful to your family's health
- make your home harder to heat, and make your power bills higher
- damage your paintwork, wallpaper, wall linings and curtains
- cause rot and deterioration to timber structures.

Getting the moisture from bathrooms and laundries out of the house means that you'll be less likely to have mould (better for everyone's health) and the drier air and surfaces make the home easier to heat (cheaper and healthier).

Extraction fans are a must. We recommend choosing an extraction fan with an airflow rate of at least 40 litres per second. This means it will be powerful enough to effectively get rid of that wet air.

Choose one with a delay timer or a humidistat for better control of when and how long the fan works.

A delay timer will continue to run the extraction fan after you have left the room and switched off the lights. Some timers will base how long they run for on how long you have been in the room – if you've had a long shower, there will be more steam and the timer will keep the fan on for longer.

A humidistat is a sensor that detects the level of humidity (how much moisture there is in the air, and then switches the fan on or off – this can help dealing directly with the problem by ventilating exactly when it is needed.

The final detail to get right is to make sure all that damp air is being pumped outside and not into the ceiling – you don't want it making your ceiling insulation damp!

More information:

https://www.smarterhomes.org.nz/smart-guides/air-quality-moisture-and-ventilation/active-ventilation/

http://www.level.org.nz/energy/active-ventilation/air-extraction-systems/

Blog – higher spec insulation

Insulation – more is better!

We Kiwis are starting to get the message about insulation. It's the important layer that stops your warm inside air escaping. And there is never a better opportunity to insulate – and insulate well – than when a new home is being built.

All new homes have to be built to the energy efficiency requirements of the Building Code – that's standard. But what many people don't realise, is that the levels of insulation required by Building Code are the bare minimum and only provide a basic level of warmth. You can't put in less insulation than those levels – but you can put in more!

The more insulation, the less heat you lose from your house through your walls, ceiling or floors. This means you won't need to heat as much to stay a comfortable temperature. And we know that warmer indoor temperatures are healthier for the family (they should be over 18°C as a recommended minimum and over 20°C if you have young, old or sick family members in the home).

You'll also enjoy lower power or energy (e.g. gas or firewood) costs. The Upspec website (www.branz.co.nz/up-spec) says you could save up to $170/year for upgraded ceiling insulation alone.

We recommend specifying higher insulation levels than Code minimums. How much will depend on which zone you live in <zone graphic> – zone 3 is the coldest.

We recommend:

- Ceiling: R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3)
- Walls: R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3)
- Suspended wooden floors: R1.9 (all zones) – and insulate under and around concrete slabs

This will cost you extra now but will pay off in lower bills in the future and more comfortable healthier living. Bear in mind, that some areas are very difficult and expensive to add insulation to in the future. Ceilings under flat or low roofs with limited ceiling space are difficult to access, and adding insulation to walls generally requires recladding or relining rooms. And concrete slabs are a one-time opportunity!

So grab your chance now and make a choice to enjoy warmer living in the future.

More information:

https://www.smarterhomes.org.nz/smart-guides/heating-cooling-and-insulation/insulating-your-home/

http://www.level.org.nz/passive-design/insulation/

7.9 Sample VHB flyer

Invest in your future

Spend a little more now, pay lower running costs, and enjoy a healthier home in the future

VHB logo here

Use powerful extraction fans

We recommend choosing an extraction fan with an airflow rate of at least 40 litres per second. Make sure all that damp air is being pumped outside – you don't want it making your ceiling insulation damp!

Why? Getting the moisture from bathrooms and laundries out of the house means that you'll be less likely to have mould (better for everyone's health) and the drier air is easier to heat (cheaper and healthier).

Up-spec your windows

Windows are a weak link in the barrier keeping your heat inside your home. Now's the easiest and cheapest time to invest in double glazing – we recommend using low emissivity glass, argon gas between the panes, and frames which are thermally broken (they use a spacer that doesn't conduct heat).

Why? You'll need less energy to heat your home, it will stay warmer for longer, and you can enjoy the lower bills and better health that comes with a warm home.

Lighting that doesn't cost the earth

When you're considering lighting, don't just focus on the cost of buying lights. Choose LED lighting – they may cost more to buy, but they last a long time and cost very little to run. If you like downlights, specify IC or IC-F rated ones so that your ceiling insulation can go over top of the light cans with no gaps.

Why? Save on your power bills, and choosing IC rated downlights will keep the warmth inside.

Wire up for the future

Include an electric car charging point in the garage and UPVC conduit for easy future install of a solar photovoltaic system on your roof.

Why? You may not be ready yet to invest in an electric car or a photovoltaic energy system, but now's the time to put the wiring in place.

Spend less to heat your water

Check the energy rating labels for the system with the most stars you can afford. We recommend choosing a heat pump water heater.

Why? A third of your power bill goes to heat your water so it's worth choosing the most energy efficient system you can.

Plan ahead for life's changes

Simple easy choices now can make all the difference to your ability to stay in your home as you age. You can choose to have your home Lifemark rated – that's the ultimate – or make simple changes, such as wider doors, higher electrical sockets, nonslip surfaces, yourself.

Why? It's cheaper to do it now, than retrofit later

Face the sun

Orient your house to get the most winter sun in your north-facing living areas. Use eaves or shading, and limit the number of west-facing windows to stop overheating in summer.

Why? Heat from the sun will keep your home warmer and healthier, and you'll need to heat less so your power bills will be lower.

Insulate under and around concrete slab floors

Your warm indoor air can leak out through uninsulated slab floors. Ask for the slab to be insulated underneath and around the perimeter.

Why? Your home will be cheaper to heat and stay toasty for longer.

Go beyond the basics with your insulation

Specify higher insulation than Code minimums. We recommend:

- Ceiling: R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3)
- Walls: R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3)
- Suspended floors: R1.9 (all zones)

Why? Insulation stops your warm air escaping from your house so you won't need to heat as much to stay a comfortable temperature. Enjoy lower power or energy costs and stay healthier.

Heat your home the best way possible

Check the energy rating label on heaters – the more stars the better. We recommend heat pumps or Ministry for the Environment-authorised low emission wood burners. And don't forget your bedrooms – if you can't afford a ducted heat pump or central heating system, use a heat transfer system or use standalone heaters in those rooms.

Why? Choosing the right heater(s) for your home means you will be able to keep your rooms at healthy temperatures without blowing the power bill.

Make healthy choices in your furnishings and decor

Specify Environmental Choice certified plasterboard, paints, insulation, carpets and floor coverings – they have done the hard work of figuring which choices will be best for the planet. Always choose low VOC options for paints, vinyl, adhesives, wallpaper, carpet, timber products such as MDF/plywood – VOCs are chemicals that can have a range of effects on health, including irritated eyes and airways, headaches, nausea and rashes.

Why? Better health for you and your family

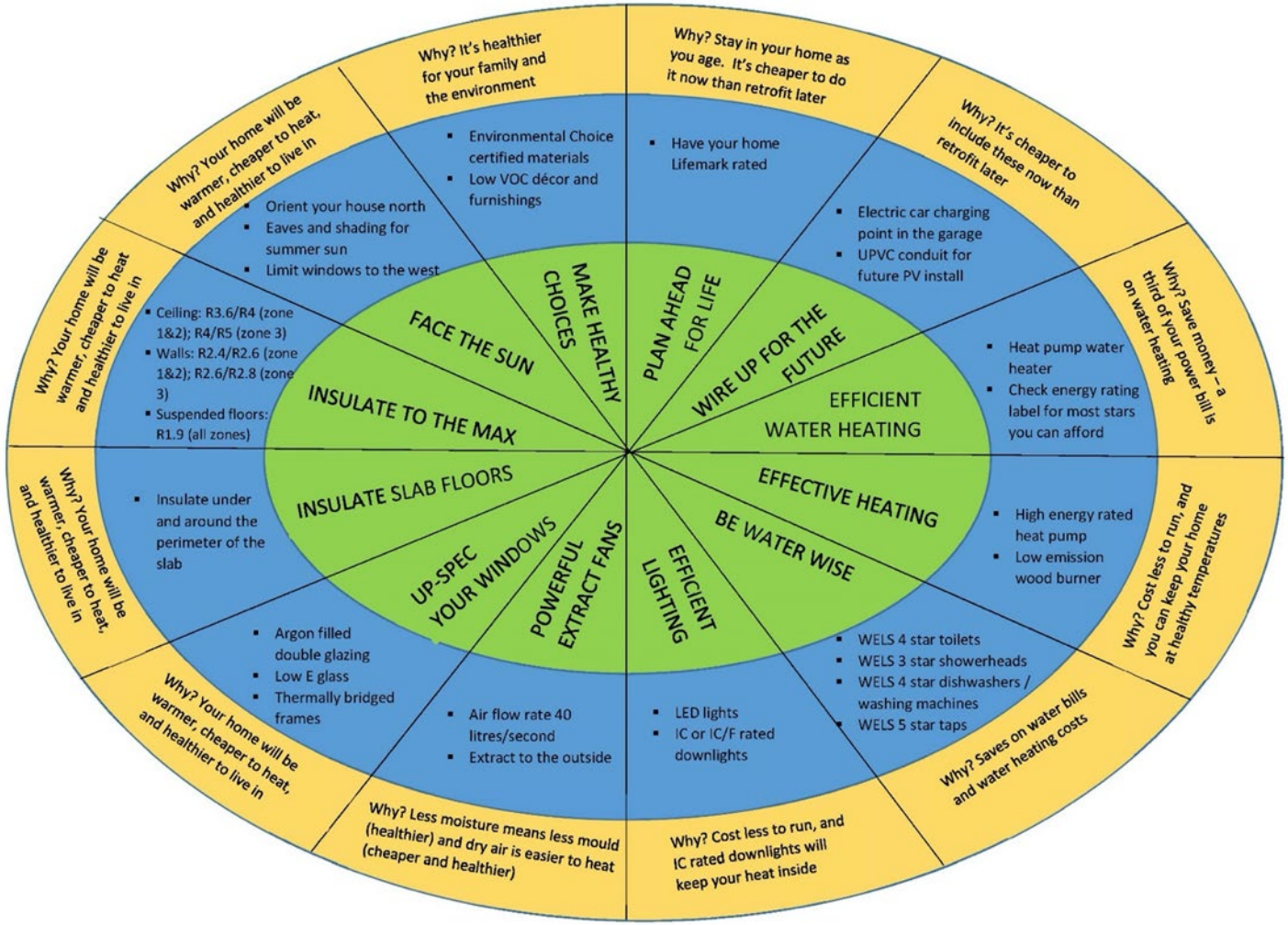
Be water wise

WELS is a water rating system – the more stars the better. We recommend looking for:

- WELS 3 star showerheads
- WELS 4 star toilets
- WELS 5 star taps
- WELS 4 star dishwashers and washing machines

Why? Some simple choices in your taps, toilets, showerheads and appliances can make all the difference to the amount of water you use. In metered areas, you'll see the difference in your water bill, and everyone will benefit from the lower water heating costs.

7.10 Sample presentation approach for customers (the wheel)



7.11 Article in Journal of Australasian Housing Institute

The Journal of the Australasian Housing Institute, Volume 16 • Number 2 • June/July 2019

MAKING COMMUNITY HOUSING MORE SUSTAINABLE

> Verney Ryan from Beacon Pathway illustrates why the community housing industry should be leading the way when it comes to healthy, sustainable living standards.

New Zealand is faced with an inter-generational problem of inadequate housing, with community housing providers at the fore of ensuring all New Zealanders are well housed.

Community housing providers share common objectives that are unique in the housing sector. One is that achieving a positive outcome for the family living in the home is central – providing warm, dry, safe homes where the residents know that providers care about them. Another is that the homes are a long-term asset to the developer.

> Homes are a long-term asset to the developer

Both of these objectives mean sustainability (at the home and development level) should be at the heart of community housing.

HOUSE LEVEL SUSTAINABILITY

The general principles of sustainable homes are that houses need to be warm and dry for the residents' health, and also use energy and water efficiently, reducing operational costs for residents as well as environmental impact.

There are obvious benefits for residents but also payoffs for developers. The following are Beacon Pathway's recommendations for sustainable homes:

WARMER HOMES

Good passive solar design – orient living areas to the north to maximise winter sun for heating; design for cross breezes and opening windows; shading from high summer sun to north and west (eaves, shutters, blinds, curtains).

High performance insulation to 'better' or 'best' standards:

(a) Ceiling – R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3)
(b) Walls – R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3)
(c) Floor – R1.9 (zone 1, 2 and 3), under-slab and/or perimeter insulation

High performance low-e and argon-filled double glazing, and thermally broken frames.

The benefits of these features are passed onto residents. Homes are easier and cheaper to heat because there is less heat loss. This means these types of homes are warmer and healthier for clients.

> Every dollar spent on insulation brings $6 of benefits

The payoff for residents is in savings on power bills and medical costs. New Zealand research organisation Motu calculates every dollar spent on insulation brings $6 of benefits – ceiling and floor insulation could save a household $3,110 in energy costs, hospital admissions and days off school/work.

BRANZ's Up-Spec website calculates passive solar design could save between $50 per year in Auckland to $200 per year in Invercargill for very little investment. While double glazing is a high-cost feature (between $2,800 and $4,600 per average house-lot of windows), it can reduce heating energy bills by between 20 and 24 percent.

The additional cost of insulating a concrete slab is between $2,500 (insulating under the slab) and $3,900 (insulating under and around the slab). However, industry is starting to offer properly insulated modern systems for little more than a normal raft slab. Upgrading insulation R value can add between $200 (in the north) to $1,600 (in the south).

Passive design approaches, using the sun's energy, are best considered during the early stages of design and add little to construction cost.

> Passive design approaches, using the sun's energy, are best considered during the early stages of design and add little to construction cost

DRIER HOMES

More powerful extractor fans in bathrooms/wet areas with motion sensors/delay timer and duct diameter of 150mm.

Must be ducted to the outside of the dwelling, ideally with low decibel rating to encourage use.

This Housing Foundation home includes a 4,000 litre rainwater tank, collecting all the roof water, and providing water for garden and outdoor uses

Recent research for New Zealand's Building Research Levy[2] defined the core outcomes that New Zealand would want to see in its future medium-density developments (see below). Two tools – a site review/developer survey and a resident survey – were created to assess how well individual developments provided these outcomes, as a way to guide good practice.

These outcomes are a great guide for community housing development too:

1. Character, context and identity – developing a site and buildings that integrate with, or relate to, existing building form and style in the surrounding neighbourhood.

   This includes integrating with the local physical environment (e.g. slope and geographic features), reflecting local history and culture, using design to give a sense of identity, and being welcoming and accessible for residents and visitors.

2. Choice – the development provides for, and enables, occupancy for a diverse range of residents that can benefit from, and support, a thriving local economy.

   This includes being close to important destinations and amenities, providing diverse typologies to attract diverse residents, offering affordability through dwelling options and financial instruments, and ensuring there is the infrastructure to support the population density.

3. Connectivity – connecting infrastructure enables safe, universal access via active mobility, and shared and private modes of transport within and through the site to identified key destinations.

   This includes providing a range of active transport choices for residents, safety from vehicles on-site, accessibility for services, good signage for wayfinding, and appropriate parking provision and management.

4. Liveability – providing quality facilities and aiding positive interactions between residents and the wider community.

   This includes having the flexibility to adapt units, providing storage, designing for integration of future technologies, designing for reduced noise and increased privacy, the inclusion of communal spaces where people can interact, offering security features such as lighting and active/passive surveillance, and the encouragement of resident interaction.

5. Sustainability – efficient and cost-effective resource use through design, behaviour and technological advancement.

   This includes designing for a changing climate (sea-level rises, increasing temperatures, storms, etc.), the sustainability of individual homes/units (as previously outlined), providing recycling and composting options, and offering outdoor spaces for gardening and food production

SUSTAINABILITY IS THE OPPORTUNITY TO DO THINGS BETTER

Community housing providers have the opportunity to do things better than normal. Paying attention to the sustainability of houses will bring the benefits of warm, dry, healthy homes – that cost less to run – to their residents. They will also be houses that need less maintenance because they have been built to last, without the risk of potential damage by the cold and damp.

Paying attention to the sustainability of the whole development will mean less damage to the environment, the opportunity for residents to use public transport or walk to their destinations, and stronger communities that are stable and satisfied. This will reduce both direct costs and indirect costs over time, and play a part in the global fight against climate change.

Community housing providers can lead the way in making housing more sustainable.

Verney Ryan is a co-leader and lead researcher for Beacon Pathway. He has a broad background in urban planning, sustainable development, energy-efficiency, renewable energy and environmental resource management. He leads a range of applied research and demonstration projects for Beacon.

Verney has also worked extensively on projects to identify good practice in medium-density developments and sustainable housing, both new-build and retrofit, and is currently is advising on the sustainability and resilience of *marae* (Māori meeting grounds).

2 See Beacon Pathway http://www.beaconpathway.co.nz/new-homes/article/medium_density

7.12 Final project list of interventions – final for Kiwibuild

Features for Higher Performance

Verney Ryan, Beacon Pathway

Background

The New Zealand Building Code sets out a number of minimum standards for new home building which have to be met for all newly constructed dwellings. However, in a number of areas (such as insulation or glazing etc.) there are benefits of exceeding this 'minimum standard' in terms of comfort, energy and cost saving as well as improved health and environmental benefits.

The following list of features has been developed as part of a research project which aims to test whether providing advice to customers on the benefits of including above the minimum building code features in a home will result in changes in what they decide to specify in the design and construction of their dwelling. The research is funded by BRANZ (Building Research Association of NZ) from the Building Research Levy.

Beacon has been attempting to work with progressive home building companies to develop and test advice that can be provided on 'above code specification', and how and when to provide this to achieve the best outcomes for the customer. Gaining traction with volume home builders under current market conditions has been challenging. However, there may be a significant opportunity to utilise the developed 'higher performance checklist' to discuss and agree a consistent approach that could be offered as part of work being undertaken for national house building programmes including KiwiBuild, Housing New Zealand Corporation and the Community Housing Sector.

Potential Higher Performing Features

A range of features are being explored which seek to deliver higher performing homes in New Zealand. Each 'high performance feature' suggested in Table 1 below is based on the following key criteria:

- Proven to achieve outcomes in the areas of energy and comfort, health, safety or ongoing operational cost savings (energy, water, low maintenance and durability).
- Cost effective for the customer (in relation to both direct monetary savings as well as features which could add to the value of the home)
- Buildable using current, proven and readily available construction techniques
- Easily communicated to the customer
- Of value and attractive to both the builder *and* the homeowner

The list in Table 1 on the next page has primarily been informed by the BRANZ Up-Spec Programme and Beacon's Now Home Protocols.

Key Higher Performance Features
1) Good passive solar design maximising use of winter sun and cooling summer breezes as well as the use of thermal mass for year round low energy use (ideally achieving living areas to the north and no requirement for mechanical cooling in summer).
2) High performance insulation to 'better' or 'best' standards: a) Ceiling – R3.6 or R4 (zone 1 and 2); R4 or R5 (zone 3) b) Walls – R2.4 or R2.6 (zone 1 and 2); R2.6 or R2.8 (zone 3) (all possible within 90mm framing) c) Floor – R1.9 (zone 1, 2 and 3), under-slab and/or perimeter insulation (dependent on perimeter/slab ratio)
3) Higher performance double glazing / joinery a) Low e / argon filled b) Upgrade glazing to thermally broken suite (or combination of both a+b)
4) More powerful extractor fans in bathrooms / wet areas (e.g. 40 litres/s but modelled to suit) using motion sensors with a delay timer and ensuring that the duct diameter and extract fan is 150mm. Must be well installed and ducted to the outside of the dwelling. Ideally with low decibel rating to encourage use.
5) LED lighting throughout – including any downlights being well fitted and meeting IC-4 (2018 NZS) which negate airflow into ceilings/roof cavity and do not compromise thermal envelope. All outdoor lighting fitted with integrated daylight and motion sensing controls (where practicable).
6) Water efficiency bundle: Showers (WELS 3 star), toilets (WELS 4 star), taps (WELS 5 star), dishwashers and washing machine (if supplied) (WELS 4 star)
7) Rainwater harvesting system with a minimum tank size of 2,000 litres, connected to as much of the roof as possible and plumbed for use in the home to at least 1 toilet or laundry. Otherwise, install plumbing to take future rainwater harvesting system through separate pipework to toilet or laundry with isolation valve in place for future connection.
8) Lifetime/Universal Design[6]: Doors with minimum clear opening of 810 mm with lever handles, a bedroom and a bathroom/toilet located on the entry level of the house and paths from the car parking space to the dwelling are slip resistant, gently sloping and at least 1200 mm wide. Allow for 1500mm turning circle in kitchen and ground floor bathroom. Power points at least 500mm from floor and 500mm from corners. Door handles aligned with light switches at a consistent height between 900mm – 1200mm above the finished floor level.
9) Efficient Space Heating: Use passive solar approach to reduce requirement for heating and then if heating required use efficient approved wood burner, wood pellet burner, or min 5 star rated heat pump.
10) Solar hot water or heat pump hot water heating (may depend on supplier)
11) Materials choices – use Environmental Choice certified materials including plasterboard, paints, insulation, carpets and floor coverings (equivalent international certification schemes may be used).
12) Future technology: Consider electric car charging point in garage and/or UPVC conduit for easy future install of solar photovoltaic system on roof

[6] *BRANZ research has shown that it is considerably cheaper and less disruptive to build universal design features into an individual new home than retrofit the same house later. As an example, the average extra cost of equipping a new house with UD features is $1,720, while retrofitting these new houses at a later date would cost an extra $16,990 on average (using 2011 figures)(pers.comm. R. Jaques 2018).*

The importance of post-construction checks

Recent Beacon research has indicated that a number of new dwellings constructed fail to meet expectations as set out in specifications documents. Therefore, we recommend a post-construction and/or post-occupancy audit of specified products and levels. Key areas to examine are:

- The installation of insulation (correct R levels to specification as well as being laid appropriately with appropriate documentation in place)
- Use of thermal imaging to assess wall insulation levels and effects of thermal bridging
- The correct specification for lighting, especially where downlights or 'eco-bulbs' are specified (ensuring that these are effective and low wattage CFL or LED)
- Features implemented to achieve Lifetime Design principles are constructed as specified (especially level entrances)
- Correct products being used (especially where environmental choice and low VOC has been specified) – watch for product substitutions
- Appropriate commissioning such as temperature set points on hot water cylinders and delivery to taps are safe
- Correct specification and installation of ventilation to bathrooms and kitchens (ensuring that all are vented to the outside of the dwelling and the correct controls such as time delay switches are in place and set up properly)
- Shower and tap flow rates are as specified and have not had flow restrictors removed
- Pipework around hot water cylinders is fully insulated
- Designs are not causing overheating problems and tenants are provided with appropriate advice on building use (ventilation, moisture removal, use of daylighting etc.)
- Correct commissioning of space heating devices including availability of simple instructions for use and understanding by tenants of operation.

If you would like more information about the project, please contact:

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