

A High Standard of Sustainability for New Zealand Homes

Authors: Lois Easton and Dr. Megan Howell, Beacon Pathway
 For further information, please contact Lois Easton (loise@beaconpathway.co.nz)
 Website : www.beaconpathway.co.nz

SUMMARY

New Zealand faces a challenge to retrofit its 1.6 million existing, mostly cold and damp, homes to be more sustainable. Homeowners are increasingly interested in making changes, and need practical advice and achievable targets to help them begin; solutions are needed to suit the mass market.

The HSS High Standard of Sustainability™ (HSS™) provides a set of benchmarks to measure improvements. It takes a whole-of-house approach, covering water, energy, indoor environment quality, materials and waste, and helps homeowners to understand the performance of their homes and gain insight into the effect of their behavioural choices.

THE NEED FOR THE HSS™

As sustainability becomes a more common claim in the marketing of home building products, there is the potential for a great deal of confusion – just what makes for a sustainable home? How can homeowners make the best choices for their specific needs?

All of these factors point to a need for New Zealanders to be able to define what achieving a high standard of sustainability in a home means – how the home should perform, and what features are necessary to deliver that level of performance.



THE HSS™: IMPROVING UNDERSTANDING

The HSS High Standard of Sustainability™ (HSS™) identifies benchmarks in five key performance areas (see figure 1).¹ The benchmarks are underpinned by issues of affordability and future flexibility. In combination, they are a tool by which homeowners can:

- understand the performance of their homes; and
- gain insight into the effect of their behavioural choices (that is, the gap between the home's design potential and its actual performance).

Beacon's focus is on the homes of ordinary New Zealanders rather than any particular income or demographic group. For this reason, the HSS™ is defined within the confines of what is reasonably achievable for the mass market today.

Initial benchmarks have been established as a "first cut" starting point, based on the best available national information. This included the Household Energy Enduse Project and the ALF3 model for setting energy benchmarks,² and work commissioned to assess national levels of domestic water consumption (on a per capita basis) for the water benchmark.³ It is expected that the benchmarks will be revised over time as data sets improve, and to require higher levels of performance over time. Work is already underway in this regard.

energy

- New homes: 7,600kWh/yr (climate zone 1), 8,500 kWh/yr (climate zone 2), 9,800 kWh/yr (climate zone 3)
- Existing homes: 9,050 kWh/yr (climate zone 1), 11,000 kWh/yr (climate zone 2), 12,000 kWh/yr (climate zone 3)

water

- 180L/person/day

indoor environment quality

- Temperature: mean minimum 18°C living room; 16°C bedroom
- Ventilation: 0.4-0.6 (new), 0.5-0.7 (existing) air changes/hour
- Mean relative humidity: 20-70% in bedrooms and living space
- Checklist of features for pollutants

waste

- Provision for kitchen waste composting or storage space for kitchen waste collection
- Space for recyclables storage
- No in-sink waste disposal unit
- New building construction or renovation in accordance with REBRI construction guidelines

materials

- New homes checklist: materials which promote good 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 choices; construction (waste) guidelines; have low impact on landfill or are biodegradable; have third-party certification (e.g. NZ Environmental Choice; Forest Stewardship Council)
- Existing homes checklist: applies principles from new homes checklist to retrofit or renovation, where appropriate

Fig 1. Benchmarks of the HSS™

A WHOLE-OF-HOUSE APPROACH



Fig. 2. Interdependencies between key performance areas

The sustainability of a home is an interdependent web of features/performance areas (see figure 2). It is not possible to address only one resource stream and call the house sustainable because this can lead to compromises and under-performance in other aspects of the home. For example, energy efficiency can be achieved through under-heating the home, but this compromises indoor environment quality. High water use has energy implications - approximately 30% of typical New Zealand household energy consumption is spent heating water.

A MEASURABLE APPROACH

By specifying measurable benchmarks, the HSS™ identifies the design potential of a home and establishes a simple feedback loop between occupant behaviour and home performance. Occupants can regularly measure their performance against the benchmarks, and better understand where they can make improvements. Some measures can be easily obtained (e.g. from power and water bills). A simple monitoring tool is in development to measure indoor environment quality. In some instances, the HSS™ has had to rely on checklists - due to the nature of the performance being measured and the lack of available data to set measurable benchmarks. As research progresses, it may be possible to specify measurable benchmarks for these areas.



The Waitakere NOW Home: Beacon's live research project

APPLICATION

The Waitakere NOW Home® (completed in 2005) demonstrates that it is possible to meet the HSS™ benchmarks within the constraints of average budgets and "ordinary" New Zealand home design. Including passive solar design, resource efficiency, water harvesting and other simple design features, the home:

- produced less than 2.5 tonnes of construction waste (compared to 6 tonnes in 'conventional' 3-bedroom homes)⁴
- used 7,400kWh/year and required supplementary space heating for only two days in the first year of occupation, with some comfort creep up to 8,500kWh/year in year two.⁵
- used 100L reticulated water/person/day in year one, dropping to 85L/person/day in year two.

CHALLENGES AND FURTHER RESEARCH

The HSS™ has a number of ongoing challenges to respond to, including:

- ensuring benchmarks strike a balance between 'stretch' and achievability for the mass market.
- developing fine-grained measures to reflect different housing designs and regional climate variations.
- further developing the knowledge base and tools to support achievement of the HSS™ (e.g. life cycle analysis on systems and packages of features.)
- potentially expanding to include other performance areas, e.g. storm water, wastewater, ecology and social sustainability dimensions.

1 Easton, L. (2006). Defining the Benchmarks for Beacon's High Standard of Sustainability: Interim Report to Board, November 2006. Report PR109. Auckland: Beacon Pathway Limited.
 2 BRANZ. (2006). Defining the Benchmarks for Assessing Beacon's High Standard of Sustainability – Energy and Indoor Environment Quality (Report prepared for Beacon Pathway). Judgeford, Wellington: BRANZ Ltd.
 3 Lamborn, R. (2006). Defining the Benchmarks for Beacon's High Standard of Sustainability: Water (Report prepared for Beacon Pathway). Auckland: Synergine Group.
 4 Kazor, M. and Koppel J. (2007) Scoping Waste in the Residential Built Environment. Report TE 230 for Beacon Pathway Limited.
 5 French, L., Heinrich, M., Jaques, R., Kane, C., and Pollard, A. (2007) Waitakere NOW Home®: First Year of Performance Monitoring, Report NO102 for Beacon Pathway Limited. and Pollard, A., French, L., Heinrich, M., Jaques, R., Zhao, J. (2008). Waitakere NOW Home®: Second Year of Performance Monitoring. Report for Beacon Pathway Limited, Auckland.