NEW ZEALAND PASSIVE HOUSE DIARY

INSTALMENT #1 By Jon Iliffe

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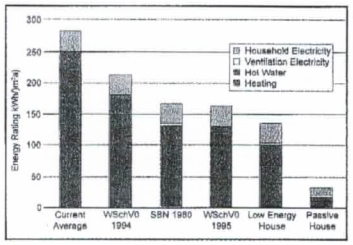
Carters is working together with Auckland University, Jessop Architects, Proclima and EcoBuild Developments in conjunction with a team of suppliers such as Tasman Insulation, and supported by Auckland City Council to build the very first Passive House in New Zealand.

WHAT IS A 'PASSIVE HOUSE'?

The term 'Passive House', or PassivHaus in Germany, is an ultra efficient voluntary building standard developed in Germany in the 1980s that saves up to 90% on space heating and cooling energy. The focus is on minimising the building's energy loss whilst ensuring a healthy living environment for the occupants.

The graph shows various energy standards in Germany and how they compare to the Passive House option.



Research was initially carried out in colder countries like Sweden, Canada, and America on how to keep a house warm with minimum energy use. The first Passive House was built in 1991 by Dr Wolfgang Feist in Darmstadt Germany. After his experimental build Feist was able to develop a tool that would predict energy use for any type of construction. The Passive House Planning Package (PHPP) software can determine the performance of a building based on the local climate data before any construction is started. It predicts the heating and cooling loads, heat loss and primary energy usage for a structure, showing how each of the building parameters will perform. This enables an accurate evaluation of the structure ensuring the design will be energy efficient without over specifying for little or no gain.

To date the Passive House concept has been applied to 30,000 + structures worldwide, ranging from residential detached, terraced and high rise flats, office blocks, schools, public swimming pools and even a supermarket.

In order for a house to be certified it must meet three minimum standards. We will look at each in detail in future instalments of New Zealand's first Passive House Diary.

1	Space heating and cooling demand no more than or the maximum heating load	15kWh/(m²yr) 10W/m²
2	Airtightness test result (n50)	≤ 0.6 air changes/h
3	Total specific primary energy demand	≤ 120kWh/(m²yr)

- The space heating and cooling demand is the total amount of energy used each year to maintain a healthy and comfortable living environment.
- Heating load is the maximum amount of heat energy that can be used at any one time in the building.
- The building air tightness must be verified with a pressure test using a blower door.
- The primary energy demand for the total amount of domestic hot water, heating, cooling, auxiliary and household electricity must not exceed this amount.

Why should New Zealand consider 'Passive House'?

Regardless of the climate, if built to the Passive House standard, the home will provide the best living environment. Temperatures are between 20°C to 25°C in every room, all year round with constant fresh air which comes recommended by the World Health Organisation. This is achieved with virtually no active heating or cooling requirement hence passive, saving costs for the home owner and radically reducing energy consumption for years to come.

Over the coming months we are going to follow the build of New Zealand's first Passive House and explore in more detail the differences when comparing this build to standard houses.

We will look at:

- **Foundation and wall construction**
- **Window placement, frames and glazing**
- **Shading and orientation**
- **Air tightness**
- **Ventilation**
- **Health**
- **Energy Efficiency**
- **Passive House Certification**

The house is under construction in Glendowie and will be home to the Ivanier family. When Philip Ivanier was asked why he decided to build a Passive House he said "I was inspired to start the project when I struggled to find a well insulated energy efficient home for my young family."

The beginning – Design

Jessop Architects has created a contemporary split level family home that fits beautifully on the sloping section. Once the details of the design were established they were loaded into the Passive House Planning Package* to understand exactly how it will perform all year round. Some adjustments were then made to ensure that it meets both the performance and comfort standard that is a trademark of all Passive House Buildings around the world.

**Passive House Planning Package – see side bar for more details.*

Foundations

When designing a Passive House, one of the critical elements is the foundation and floor details.

The influence on the thermal performance of a house from the foundation and slab is significant; for example if you want a home to be at a temperature of 22°C and the ground temperature is 15°C, without insulation you are effectively trying to heat up the ground as well as heating up the home and that can be very expensive.

A standard build will sometimes have some insulation under the floor slab but with nothing under the footing and around the edges the heat energy is able to leak out.

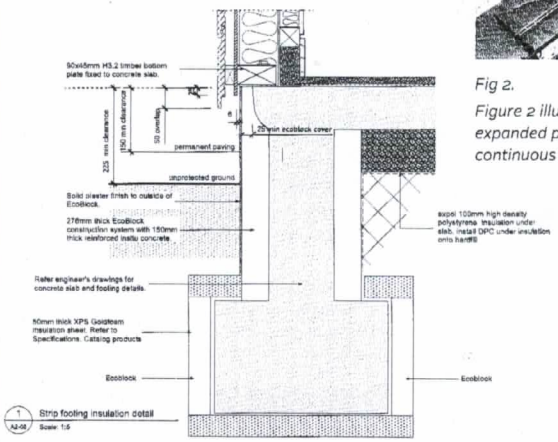


Fig 1.

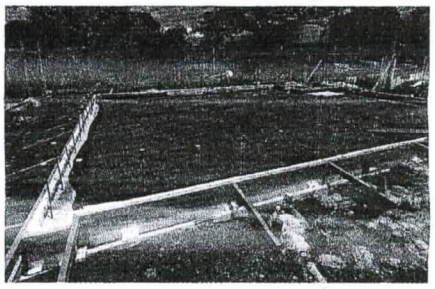
Demonstration of continuous layer of insulation for the foundation.

This build uses concrete for both the foundations and floor which is like a standard build. What sets it apart is the foundation and slab is isolated from the ground by a continuous layer of insulation (see Fig 1). This design will eliminate the need for underfloor heating by ensuring an even floor temperature all year round. The concrete slab can be covered with carpet, tiles, wooden strip flooring or simply left as polished concrete which will not significantly affect the overall performance or temperature of the house.

One of the positive features of a Passive House is there are no restrictions in the design of the structure just as long as the build and products selected give you the required performance for your particular climate to meet the criteria to be classified as a Passive House. This gives great freedom to design but ensures the outcome will provide the healthy environment and energy savings that Passive House is known for.

Follow the progress of the build in the next entry into the New Zealand Passive House Diary where we look at the wall construction.

To follow the blog with up to date progress see http://passivehouse1nz.blogspot.com/



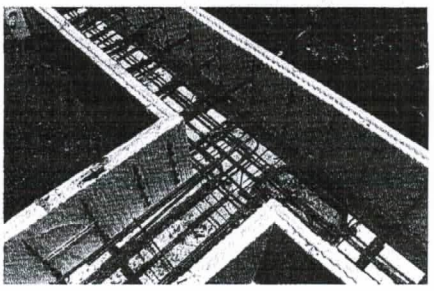


Fig 2.

Figure 2 illustrates the use of a high grade expanded polystyrene (EPS) from Expol to form the continuous insulation layer.

Jon Iliffe is a director of Ecobuild Developments (www.ehaus.co.nz) a company that specialises in Passive House design and building. He is a qualified engineer and a Certified Passive House consultant. He is also a board member of Passive House Institute New Zealand (PHINZ phinz.org.nz) which is a not for profit organisation which promotes education and transfer of knowledge linking in with the International Passive House Association (IPHA www.passivehouse-international.org)