NEW ZEALAND PASSIVE HOUSE DIARY

INSTALMENT #3

By Jon Iliffe

In the last instalment we discussed walls and windows and the importance to the overall design. In this entry we will explore shading, orientation and air tightness.

In high density areas often a house does not have the option to be built orientated to the sun. Unlike the passive solar design a Passive House (PH) design is not so reliant on the sun for heating.

One of the challenges in many new homes is the opposite problem of too much solar gain which can see temperatures in the house reach 30°C plus for much of the summer. A PH will operate between 20-25°C with almost no need for active cooling or heating. This is achieved by taking into account the local climate data along with all the details of the build. Position, size of windows and external shading are a significant part of this equation to prevent overheating.

Drawing of blinds or curtains that are inside the building reduces solar gain but not sufficiently to be effective. If you have travelled to Europe you will have seen the use of external shutters or louvres on many of the buildings. These are very effective as they prevent the sunlight from entering and heating up the building. The high levels of insulation also work to keep the heat out in summer just like a chilly bin does for your picnic but also keep the heat in when you need it in winter. For many designs, particularly those with a lot of glass, window shading can be used to help control the temperature within a house regardless of the weather conditions.

The next topic to look at which goes hand in hand with windows is air tightness. This is one of the main "turn offs" for Kiwis on the first hearing, but when the concept is understood, how and why it works, it can be really attractive.

Why is air tightness important for energy efficiency and comfort?

An older villa leaks air at a rate of 20-25 air changes an hour when tested at a pressure of 50 pascals (N50). A new standard home will leak between 5-10. When you heat a house that leaks even if you have good insulation the warm air will escape. This is why, especially in older homes, people would try and heat one or two rooms because the cost of heating the whole house would be very high. Even in a newer home the uncontrolled movement of air means the rooms in the house will vary in temperature and will be expensive to heat evenly.

Most European buildings now include air tightness as a part of their building codes requirement. By law they are required to have new homes tested for air tightness as it has been recognised that it has such an impact on the efficiency and comfort of a home.

The PH Standard has a requirement for a home to leak no more than 0.6 air changes N50 which is up to 15 times more air tight than a typical new home.

As you read this you may be thinking, "Does this mean you can't open windows and doors in a PH"? The answer is NO. Many areas of New Zealand have a beautiful climate for much of the year and the indoor outdoor flow is a great feature of many homes. So when the weather is favourable you can definitely open up the windows and doors. But when the bugs come out, the temperature drops or you want to shut out the road noise and close the windows and doors you will enjoy a continuous flow of fresh air, even temperatures and a relative humidity that is just right for healthy living.

Air tightness does not happen by accident, the building design must show how the airtightness is achieved and the joinery must be airtight. For this construction, INTELLO, a humidity-variable moisture control and airtightness membrane has been used internally between the insulation and the plasterboard (see Figure 1). This is manufactured by Pro Clima, a German company that produces intelligent membranes specifically for the construction industry worldwide.

The windows have a double seal arrangement and every electrical cable or pipe will be sealed as it enters or leaves the building. The house will then be tested with a Minneapolis blower door which pressurises and de-pressurises the building whilst calculating the leak rate.

As you can see from Figure 2, the windows are now being fitted and once completed the house will be ready for a preliminary test to check for air tightness. This is done prior to the finishing work so any possible leaks can be identified and fixed whilst still accessible.

Once this building has passed the blower door test the application for Passive House Certification can be placed with the Passive House Institute as all the other design criteria have already been met.

Fig. 1: Intello used between insulation and plasterboard.

Fig.3: Minneapolis blower door test

Fig.2: Eco windows being fitted

Criteria to be a Passive Building

In order for a house to be certified it must meet three minimum standards.

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)

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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**)