

# House Design at Shimtani

## Living In a Small Space

One of the biggest problems with modern homes is that they are so big. Since the 1950's house sizes have doubled while the population in each house has halved. Even if they designed to be energy efficient houses still constitute a large area to be heated, cooled, lit cleaned, painted etc. And of course there is not the embodied energy in the construction of a large house. One brick, for example produces one kilogram of carbon dioxide.

Another issue with big houses is their geographic footprint. Large single residences lead to sprawling suburbs requiring more roads and infrastructure, a greater distance between home and work, and a greater distance to transport food, power, water and waste. This also leads to the destruction of natural environments and a gradual loss of market gardens and farmland that once provided food for the people living in the new subdivisions that displaced them.



The kitchen and living area here at Ecoburbia is about 35 m<sup>2</sup>, and the smaller room which functions as art studio for Tim, office for Shani and storage space is about 25 m<sup>2</sup>. Our "sleep and escape room" out the back is about 25m<sup>2</sup>. Tim's shed is in a cupboard out the back!

All in all we have managed to fit a house, office, art studio, workshop, chickens, rabbits, goats, salad garden and nearly 20,000 water storage all on a 213 m<sup>2</sup> block. (OK so the goats are next door!)

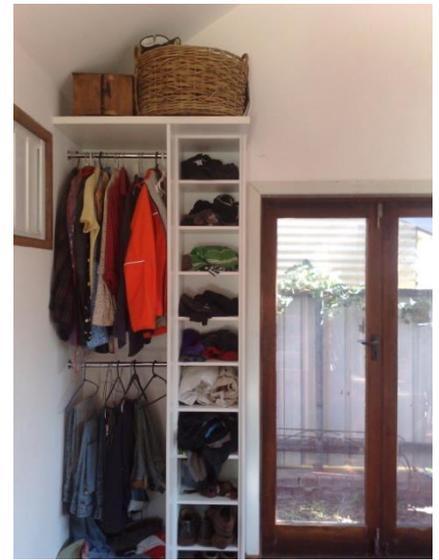
## Our "Sleep and Escape" Room

We find with such an open house it is nice to have a space to escape to if you need it occasionally, so we converted a shed out the back into a bedroom

We really missed showering outside when we moved down here from The Painted Fish, so we have reconnected the old heritage listed outdoor dunny and added an alfresco shower to make our own outdoor ensuite. Tim recently added an outdoor stone bath - luxury after a busy day!



The bedroom is a classic passive solar design, about twice as long as it is wide, with good thermal mass, north facing windows with pelmets and curtains, small ventilated louvers to the south, plenty of insulation, overhanging eaves, a grape arbour to the north etc



You will notice there is a difference in the size of Tim and Shani's wardrobes. Stefan from

Handwerk made up our clothes storage to our own design. The rule is, if it doesn't fit in you can't have it!

You will notice all our animals are right next door - we love waking up to the sound of the chooks and the goats, although we are grateful that the neighbourhood roster is a few houses away!

## The Record Books

Shani really admires people like her friend Adam and Amy who keep amazing records relating to their sustainable journey. Keeping these records is a great way to keep track of what is going on and really motivates you to make sustainable changes. Shani wishes she had data on all sorts of things - house temperature before and after renovation, water and power use before and after Living Smart etc .

Adam recently presented Shani with her very own record book, and offered to make pretty graphs of all the data she collects at the end of one year.

We collect data weekly on our:

- electricity usage
- electricity creation
- gas usage
- water usage from mains
- water usage from the tanks

Daily data on:

- Milk produced by Spice
- Number of eggs



And occasionally rabbit breeding, honey harvests and what has been planted in the garden beds. So get a little book and start recording at your place!

## Photovoltaics

At our home we originally organised Solar Shop to instal a 1.4 kilowatt hybrid photovoltaic system. A hybrid system is a mixture of monocrstaline and thin film panels . We chose hybrid panels as we have a relatively small north facing roof and they have a high output per m2. They also have a relatively low energy payback period.

In anticipation of converting our ute to an electric vehicle, we added a 3 kW system to the west facing rear of the house. This system was installed by a local company called Engin.

Luckily these two systems were installed at a time when you got a guaranteed 10 year 47 cent feed in tarrif. Since we



only use 3-4 units a day we are producing far more than we use and we estimate we should get \$2,600 back each year. We love getting cheques from Synergy!

Over half the houses in Hulbert Street now have photovoltaic panels, and another five homes were told it was not worth while installing them due to shade, roof angles or asbestos.

How is your street going?

## Roof Colour

We were really happy with the effect of spraying the roof at The Painted Fish with a special reflective white paint.



Tim did read a few articles however that suggested any white acrylic paint would have the same effect so when we replaced the roof at Shimtani we used a white colour bond. While it is better than a black roof, it seems to have much less of a cooling effect than the reflective paint.

Mind you, it is much better than the day we removed the old roofing (leaving only the internal ceilings intact) It was that Boxing Day a few years ago when it was 43 degrees - well it was

over 50 degrees inside!

Now with white tin, air cell and batts it is pretty comfortable on all but the hottest days and even then cools down almost instantly when the south westerly hits!

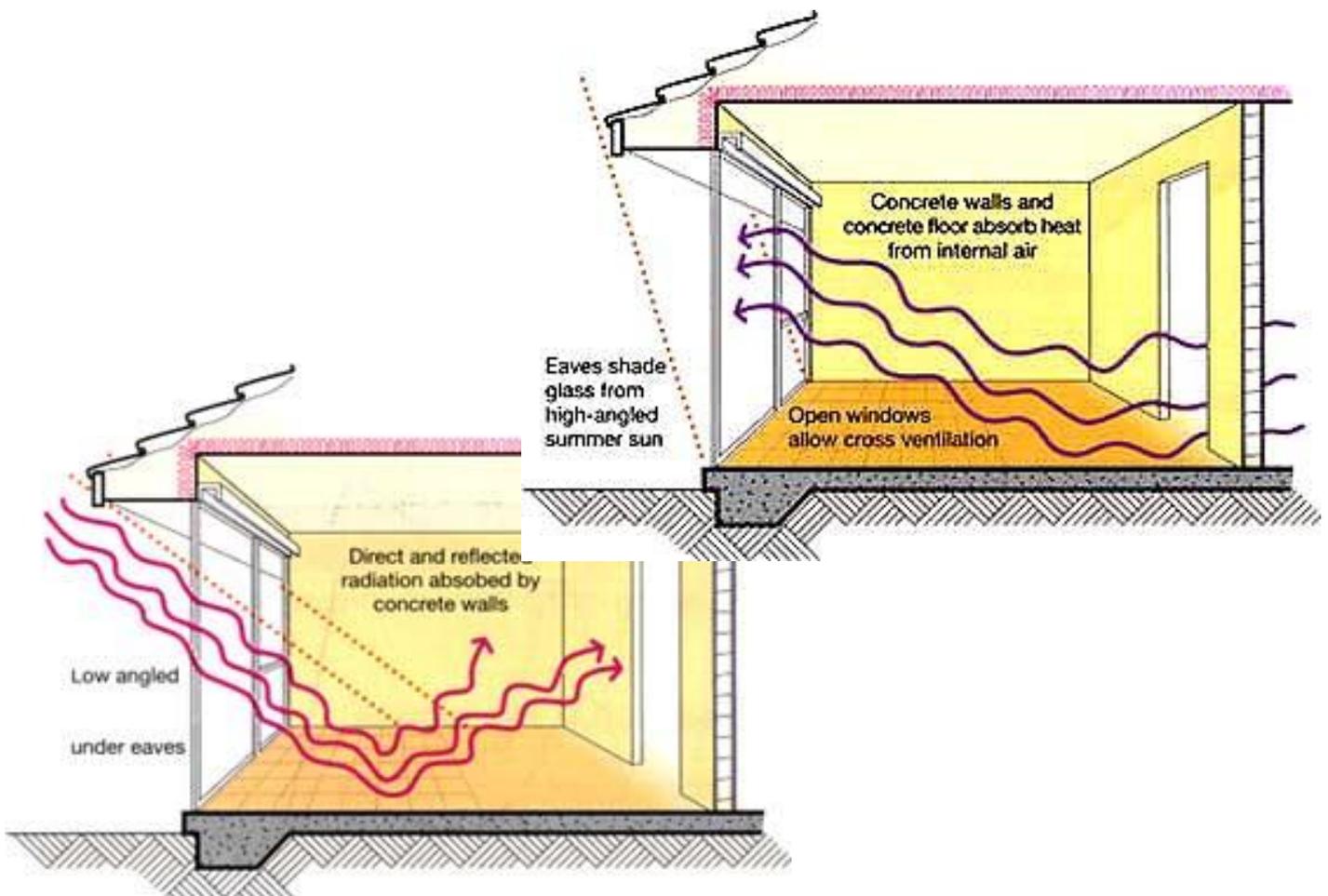
If you are thinking about the colour of the roof on your house, have a feel of the four different colours on the bike shed roof, or use the attached laser thermometer to see for yourself (don't point it at anyone's eyes!) You can decide for yourself which one would be best!

## Thermal Mass

The bedroom and work room at Shimtani have good thermal mass in the slab concrete floor. This, coupled with reasonable solar exposure on the north, works to keep it warmer in winter. In summer the thermal mass of the slab helps to absorb excess heat during the day and then dissipate it at night.

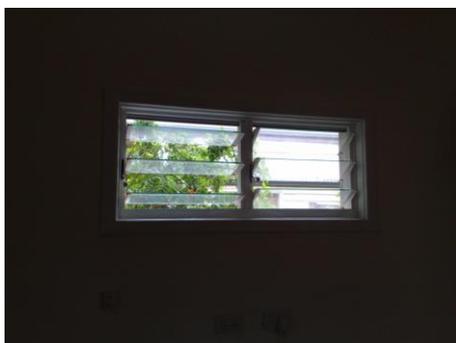
Ideally, as well as the slab floors in the bedroom and office we could have used bricks for the interior walls. However, as brick has a high embodied energy and a high carbon cost, we decided to use gyprock instead.

And does it work? Well, we didn't use a heater this winter, and Shani loves an afternoon nap on the workroom floor on a hot summer's day.



## Windows For Ventilation

To get light and heat into the house in winter we have installed long large north facing windows. As is often the case in suburban settings the proximity of trees, fences and neighbouring buildings limits the availability of winter sun, but most of the time these windows work well - we never need lighting indoors during the day.



These windows are designed with some opaque glass for privacy. They allow the option of lowering just the top half to assist with ventilation in summer.

Together with smaller louvered or side hung windows on the south of the house, these provide great summer ventilation. Because the southern windows are smaller and lower than the windows on the north, they work together to encourage the cooling south west air into the house and the warmer air up and out to the north.

We have also installed two sets of vents directly behind the fridge. We open these in summer to vent the heat from the fridge outside and close them in winter to keep this heat inside.



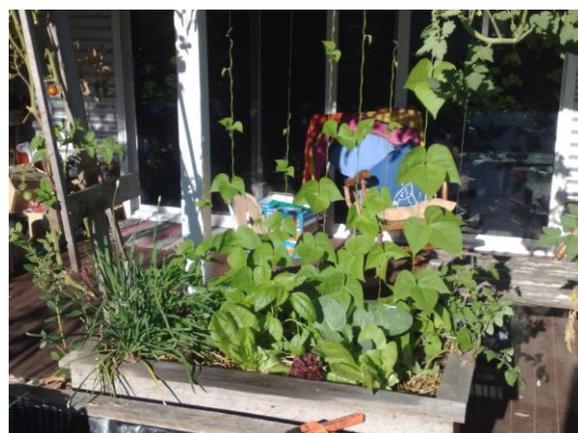
## Windows Treatments

Windows are tricky really - you need them for light and heat in winter and ventilation and cooling in summer . . . . but as far as insulation goes they are like having a big hole in your wall.

### Eastern sliding glass doors

The big area of glass we have facing east is not really ideal but in this case we installed them as a way of opening the house out onto the verandah, out onto the garden and then out into the street - expanding our living space, welcoming community and increasing air flow on summer evenings.

The verandah gives good shade most of the day in summer. Over the really hot months we plant climbing beans and run them up fishing wire to the top of the verandah. This creates a cooling green layer of vertical shade that protects us from the early morning sun, and beans to eat!



We also used a "low e" glass in this eastern section. It retains more heat in winter and allows less to enter in summer. While this does make a difference it is still not adequate and so we have added curtains with pelmets. We cannot recommend good quality curtains with pelmets enough - after installing them we gave away our heater and have now gone through two winters without needing to heat our home.

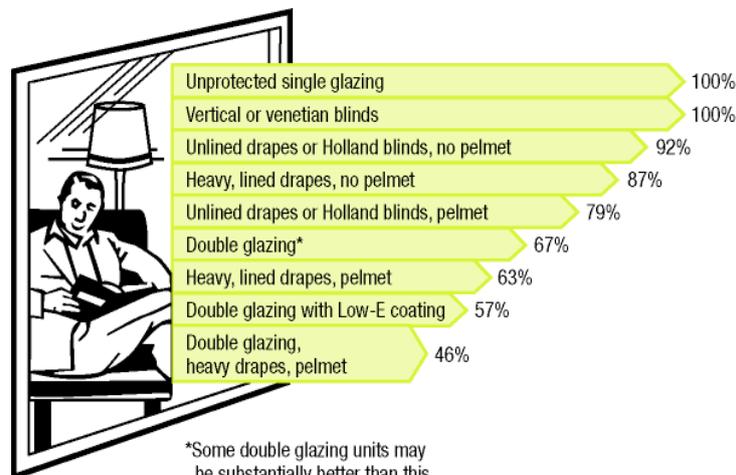
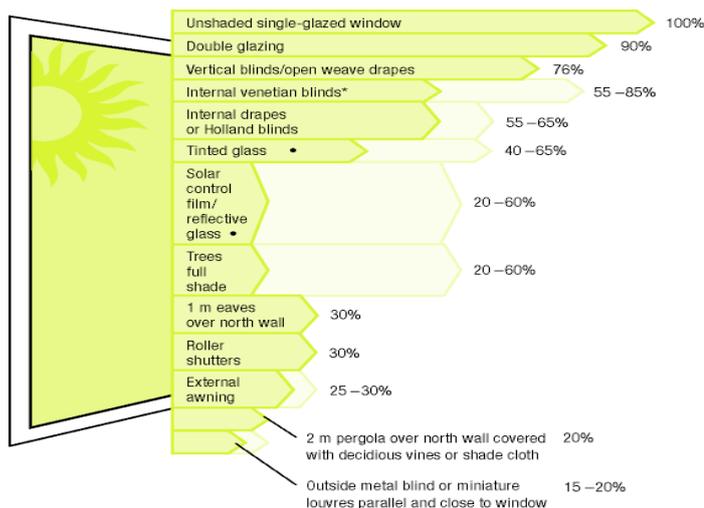
### Southern louver and side hung sash windows

For controlling heat in these smaller windows we found it easiest, cheapest and very effective to cut out sections of air cell and press them in to the window frames on the odd occasion when it is too hot.

**North facing windows** We spent a great deal of time thinking about what to do with these windows. Although they are not really beautiful, roller shutters are a really good way to insulate your windows, especially where you don't have wall space outside for shutters or inside for curtains. Tim describes Perth as having about an 8/4 month split (8 months hot and 4 months cool) so for most of the year are wanting to keep hot air out of your house. For this reason insulation on the outside is highly effective as it stops the sun before it gets to the glass.



We have also planted some deciduous vines (Virginia creepers) along the north side of the house and these will eventually form an "organic solar pergola". We even have dreams of a solarium to capture more winter sun for heating, growing seedlings and drying clothes.



\* Effectiveness is reduced as the colour darkens  
 • Solar film, tinted glass and reflective glass of varying effectiveness is available. They significantly reduce light levels all year round.

\*Some double glazing units may be substantially better than this

The above graphs shows the efficiency of various window treatments in summer and winter.

## Insulation

Shimtani is pretty well insulated!

The roof of the back section of the house is made from econodeck -a sandwich of 200mm polystyrene which has an R value of 5.2.

The roofs of the bedroom and front of the house have aircell and batts with an R value of about R4 in the bedroom and R3-4 in the front of the house.



The external walls in the rear section start with custom orb on the outside (which reflects some heat and cools down quickly in summer). Under this is a 25mm baton which creates the air gap required for the next layer (aircell) to work at its best. Under the aircell is timber framing fitted with R2 batts and then the internal gyrock lining. Tim thinks the whole thing would be rated at about R4.

The bedroom has similar insulation, but the living room is a bit lighter as there are no batts in the walls.

The roller shutters on our northern windows have about 8mm of insulation and the curtains and pelmets on the east create a still air gap which acts an insulator.

The more Tim builds the more insulation he uses!

## Energy Efficient Appliances

When we first moved into this house our daily energy use was about 2kw hours a day (we only had a small fridge!) but we moved Shani's "energy efficient" but large fridge in our daily power rose to 4 kilowatt hours - doubling our daily usage.

After a bit of research we sold the large fridge and bought one that uses about 330 w daily and a chest freezer that uses about 700 w daily. This fridge is larger than we really need but we wanted the chest freezer - we are working on offsetting the energy use by preserving excess garden produce that cannot easily be sun dried! These appliances are made by Vest Frost and we bought them from WA Solar Supplies.

The lights at Shimtani are all compact flouros or LEDs so our lighting use is small. We don't own a TV - plasma or otherwise!





You will notice all the power points here are half way up the wall (like they used to be in the old days!) We did this so it is easier to turn off appliances that are not being used and it works really well.

We recommend using a "power mate" like the one here to investigate all your household appliances - most local libraries have one you can borrow.