

Saving Energy in the House at The Painted Fish

Photovoltaics



Our photovoltaic array is a 1.12 kilowatt system and was installed in late 2006

This system produces 6-7 kilowatt hours on a sunny summer day, and this is enough to cover about half to two thirds of the electricity needs at The Painted Fish. In winter our system produces 5 kilowatt hours on a sunny day (less if it is cloudy). Our first power bill after installation went from \$150 to \$15. The

excess produced by our 4.5 kilowatt system at our house means we are net producers over all. We recently received a cheque from Synergy - for \$1,400!

The system has three main elements:

1. The **panels** which collect the sunlight and convert it into 12 volt AC electricity. We used poly crystalline rather than thin film panels as we had a restricted area of roof facing north.
2. The **inverter** which change the 12 volt power into 240 volt AC.
3. The **power meter** measures how much power is being sent into or drawn off the grid. Extra power is bought by Synergy We now have a bidirectional digital meter but we loved the old dial one we originally had—you could watch the dial move backwards during the day!!



Installing a system also makes you extremely aware of the electricity requirements of various household appliances - ask Shani about what happens when she plugs in her hair dryer!



Why is the roof white?

Because white surfaces reflect heat while dark surfaces absorb it, the roofs at The Painted Fish and some of the cottage walls have been painted with a special white reflective paint called Insultec.

This stops the heat penetrating in summer and keeps the inside of the buildings cooler.

Check out the three bits of tin we have left here in the sun – one tin, one black and one white. Have a feel and see for yourself.

And people still built houses with black roofs!

Eco Vents

At the high point on the ceiling of each building at The Painted Fish is an "Ecovent". These vents contain a diaphragm disk full of liquid with a low melting temperature.

When the temperature increases, the liquid turns to gas and the diaphragm expands. Levers use this movement to open



a butterfly valve venting the hot air

outside, helping to cool the buildings. When it is cold, the vents close automatically keeping any warm air inside.



At 18 degrees Celsius the vents are fully closed and at 30 degrees Celsius they are fully open. We recommend testing the vents with a hair dryer before you put them in—it's great fun to watch them open and close!

MBR Sheetmetals used to import ecovents but apparently not any more – if anyone knows where you can get them from please let us know.

The "Solarium" Heating System

The solarium was created by adjusting the cottage verandah, since it was the only north facing aspect available. Tim had the steel beams made up, roofed the verandah in second hand 10 mm laminated glass, added clear café blinds (\$1,300), and modified some window louvers (purchased from Neil Bennett and Company).

The louvers can be adjusted depending on the time of the year, opening to 35 degrees in the middle of winter to let in the maximum sun and shutting completely in summer, creating a shady verandah.



You know how your car gets hot if you leave it in the sun, even on a cold winter's day? The solarium works just like that - as sunlight enters through the glass it changes from short wave to long wave radiation and the heat is trapped. We find it gets quite warm even on a cloudy day. By opening the upper and lower louver windows into the house a circular air flow is created, with hot air rising into the house and cool air sinking and being forced into the solarium. By shutting the louvers up as the sun goes down the heat is trapped in the insulated house.



And the results?— we don't have before and after data but most guests find they do not really have to turn on the gas heater.

The "Waterfall" Cooling System

Trust a stonemason to think of this!

On hot days, the water from the small southern boundary courtyard pond is pumped over the limestone wall.

Being extremely porous, the limestone soaks up the water and any south west breezes are picked up through the many holes, evaporating the water and blowing the cool air through the house via the louver windows.

Basically this works like an old style Coolgardie safe.



The holes in the stone were created by using plumbing pipe as the stone was laid and then removing it once the mortar was dry. Ideally the pipes should have been set at 45 degrees on a south west angle.

The stone work was completed by Tim and Nick Beach, and the copper water feature was created by Tim. Sadly this feature was stolen in July 2011 and Tim has not had the time or heart to replace it.

Window Treatments in the Cottage



Over summer we find that on really hot days, even when the eastern windows don't get hit by direct sunlight because of the grape vine, the ambient heat still affects the cottage.

As an experiment we cut out some pieces of air cell and just press fitted them into the windows.

We found it make quite big

difference so - as often happens with temporary measures - we are still using them.

The grape vine outside the front of the cottage also provides amazing shade for the summer months. Shani uses the grapes to make grape jelly, which lasts all winter.



Window Treatments In The Studio



You will notice the studio has louvered windows on the southern side of the building. These can be opened to 45 degrees to funnel cooling south westerly breezes through the studio in summer, and closed up tight in winter.

The west top windows in the studio bedroom have been tinted. The big old Japanese Pepper stops most of the afternoon sun but late in the day some sun

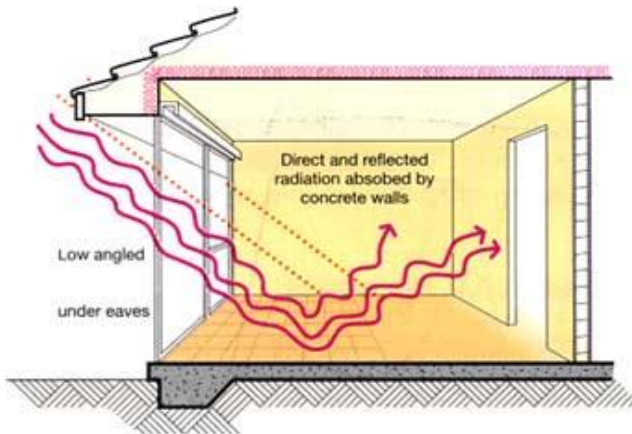
hits the western windows and the tinting reduces this impact.

We are aware that to improve the heating in the studio we should really put pelmets and curtains on the big expanse of northern glass, but most of the year it works pretty well.



The coolest place in the studio on a hot still night is the balcony above the bath house. It is the perfect place to roll out a swag.

Good Solar Design - Includes Shade!

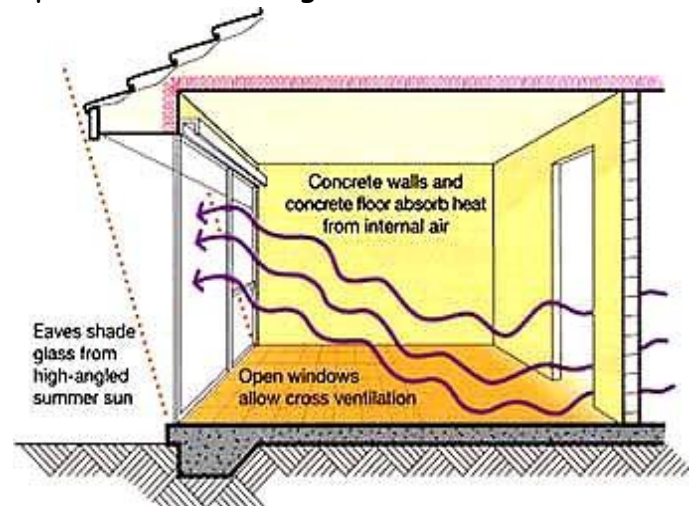


The north facing wall of the studio is all glass.

During **winter** when the sun angle is low (35 degrees at the winter solstice) the light and heat pass through the solar pergolas heating up the slab and internal masonry walls. The ponds reflect more light and heat up into the studio. At night the heat stored in the slab and walls seeps out into the studio and helps keep it warm. We are also contemplating installing full curtains to help keep the heat in at night.

During **summer** when the sun angle is high (82 degrees at the summer solstice) the solar pergola stops direct light from hitting the slab, which helps the studio stay cooler. The ponds act to moderate temperature and the evaporation helps cool the area.

The solar pergolas have relatively low thermal mass and good airflow to ensure that they cool down easily.



Our solar pergolas cost about \$900 to get made up by Needhams (MBR Sheetmetal will also make them) and Tim installed them.

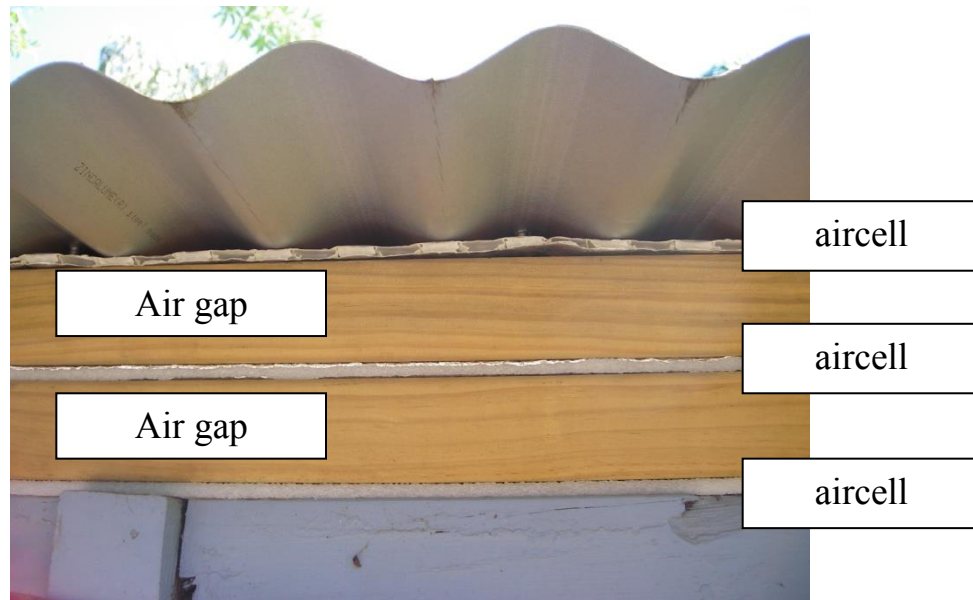
As well as solar pergolas we have used grape vines for shade. Any plants are great for shade as their transpiration gives an additional cooling effect.



Our main shade tree, the Japanese Pepper, is unfortunately not deciduous but it does give great cooling shade in summer and some protection from winter storms.

We use light coloured Coolaroo shade cloth outside the carriage, studio and cottage in summer and it is much more effective than regular shade cloth.

Insulation



Someone recently asked Shani and Tim what was the one thing they should do at a newly purchased property to make it more energy efficient. As Shani started muttering about putting in north facing windows, moving the living areas, adding verandahs Tim quietly said "insulate".

All the roofs at the Painted Fish are triple insulated, using a variety of different materials. All the walls except for the carriage are insulated with air cell - which operates in three ways:

- 1) Radiation—the double silver sides reflect back heat reducing radiation.
- 2) Conduction—the closed air pockets reduce conduction.
- 3) Convection—the aircell and framing create closed air spaces which reduce convection currents.

One summer an English couple stayed with us all through January. They commented when they left that they could comfortably work inside all day even on the hottest days. But sometimes you just need to head to the beach!