

David and Val Baker's Bohemian House, South Australia 2025

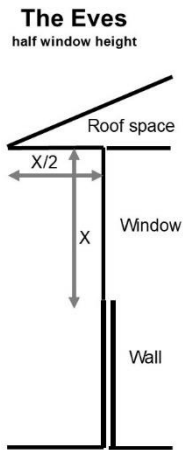
But at last, we were in - We started looking at houses in 1973 at a time when the banks required an amount in your account for 6 months that was then equal to half the cost of building a house (at that time) before they would consider a loan. 1974 was a very wet winter and our house was built between March and October. In that time the cost of the build rose by 50%. We moved in along brick pallets over wet, red clay with borrowed old furniture. But at last, we were in.

There were compromises, we still love our (50-year-old) John S Chappel designed, Turner Wood, Raked ceilings with exposed beams (nice) but it meant no roof insulation (bad) as the roof space was tile-batt depth (about 5cm). I asked for white concrete roof tiles to reflect summer sun (nice). The house has big windows to the north meant winter sun (nice) but a large eucalypt 30 metres away meant 4 hours of winter shade in the middle of the day (bad). Larger windows to the south (nice) meant heat leakage in winter on the south side (bad). Although the house had 0 stars (bad), we loved it, it felt good to live in.

The 2005 revolution was the start of practical and financial action (after 30 years we eventually had some money to invest in making the house more sustainable). Now my heating and cooling energy per square meter, indicates 7 stars performance. Below are some things I have learned and put into practice at our house which was in SHD 2013 & 16.



Windows – thermal-backed curtains floor-to-closed-pelmets to reduce heat loss and gain through the windows was done in 1990. The pelmets prevent heat from rising and falling behind the curtains - the “still” air improves the heat transfer performance of the window. **Honey-comb blinds** with a closed top, were fitted to the bedroom windows. **Double glazing** with an e-glass layer for every window. (I eventually found out that there is double glazing and double glazing. I suggest you spend the extra money and go for Argon gas.) Recently I’ve added “**Air Cell**” type sheets inside and outside the windows we don’t use. For northern main-room windows, the foil-and-cell insulation is put there, behind the curtains, on hot days and cold (possibly 130) winter nights. The large windows to the south are 50% shut-down – curtains always closed. **Roller shutters** deserve a special mention. They are fantastic (especially if white) for direct sunlight off windows. But, as the shutters are open at the top where the roller cavity is, the air temperature is the same on both sides of the shutter. Roller shutters win if you want “security” (nothing is truly secure) and ventilation. As we have hopper windows, I arranged for the installer to mount the roller shutters on a frame away from the window so the hopper can open 10cm. We have no east or west windows (part of the reason for choosing this house design). Regarding the size of eaves – equinox sun angle is 55 degrees elevation – it is recommended that the width of the eaves is 50% of the window height measured ceiling.



Roof insulation – non at the start. A contractor added blow-in paper insulation- but it was hydroscopic, and when it rained, it rained inside. I replaced it with 30mm fibreglass insulation in plastic bags (R2.5) and a ribbon of “Air Cell” (R0.2) between the tile bats. In 2010 we had Kingspan Kooltherm K17 (R1.4) under the Gyproc ceiling, between the beams. Total roof R value is now R4. PS Insulation does not stop heat transfer, it just slows it down.

External Walls – The house has double-brick walls (R value = 1). I had hydrophobic insulation pumped into the external wall cavities to help thermally isolate the outer and inner bricks.

Solar panels on the north side provide us with day-time power and we export to the grid. (The house panels also shade half the roof tiles from summer sun).

Hot water – In 2005 I exchanged the large gas fired hot water tank for instantaneous gas and solar hot-water panels (good saving). Three years ago, I replaced the solar-panels with evacuated tubes which provide free hot water for 8 months (if it wasn’t for the gum tree in the yard we would have all-year free hot water).



Sun angles.

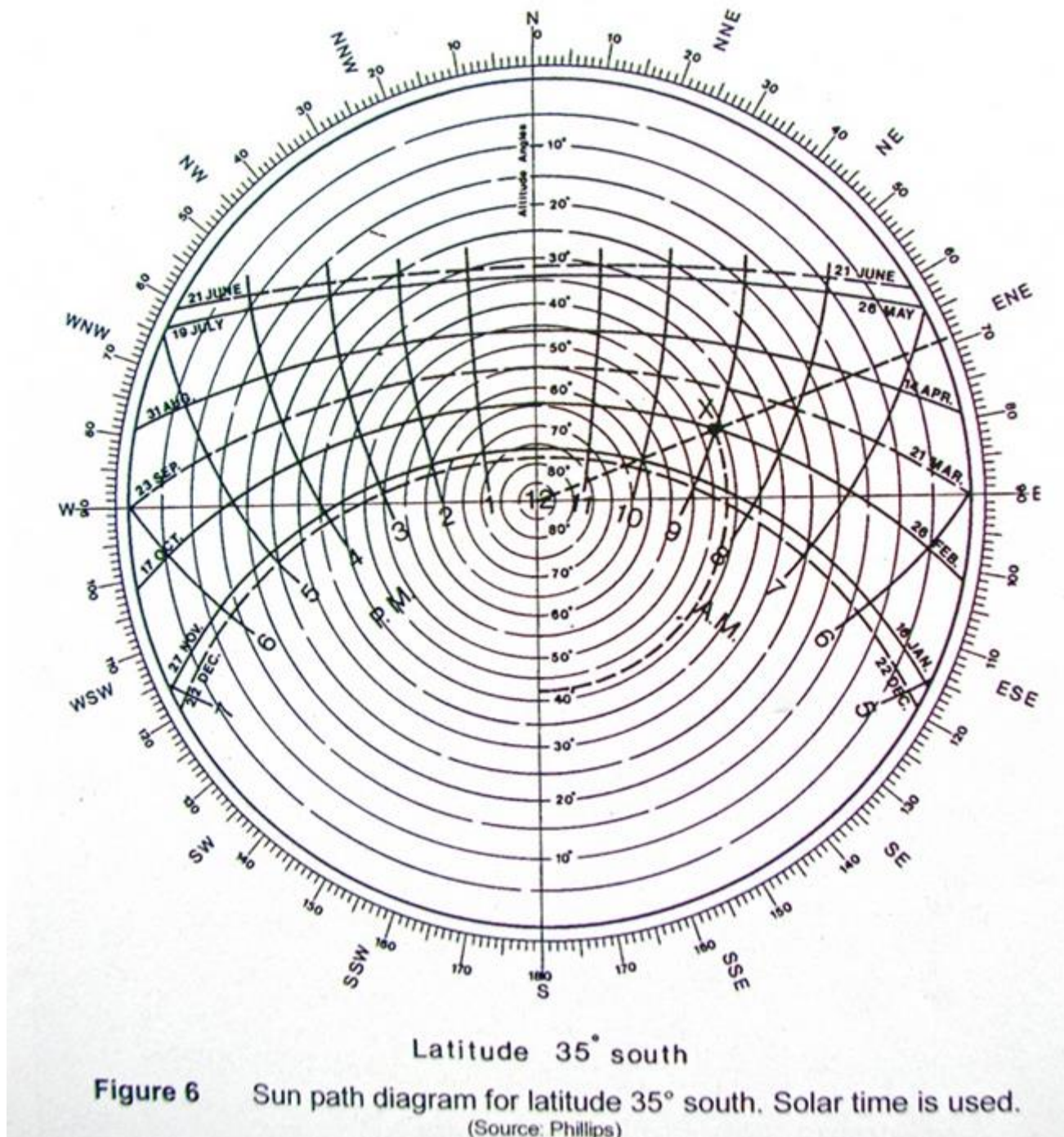
At the **equinox** (March, September around 20th or 21st) the sun rises in the east and sets in the west.

From March to September (**winter**), the sun rises/sets **north of east/west** and the sun is lower in the sky (solstice peak height is 32 degrees in Adelaide, rising and setting 28 degrees north of east/west).

From September to March (**summer**), the sun rises/sets south of east/west this means the south wall of the house gets low-angle direct sunlight in the morning and evening. The sun is higher in the sky from 9am to 6pm than in winter. Peak height is 78 degrees elevation, rising and setting 30 degrees south of east/west).

Some comments - for **south side** shade - I have put a wide shade cloth to the east and west and in the southwest, a large dense grapefruit tree provides great shade across the south of the house late in the afternoon.

Much is said about deciduous trees to let in winter sun and block summer sun but in winter the branches block sunlight and getting leaves and dropping leaves takes a long time. I think it is much better to have adaptive shade.



Summer – simply – insulate, close air gaps, double glazing and heavy drapes with pelmets and **SHADING**

- **Shading**

- I'm writing this mid-March 2025 after 2 heat waves, and as we are close to the equinox, the sun angle is low - 50 degrees elevation, which means walls and floors that do not normally see hot sunlight are being heated. Additional shading is required to combat this.



- It is important to shade outside walls and paving during the day. Shading can be slid back (**shade cloth, butterfly clips, stainless wire**) or in place for summer. **Shade should not be fixed** on sides and bottom; but it should be allowed to move in the breeze to allow cooling.

- Shade across from the house to a supported bar works well as there is a breezeway, the hot shade is away from walls and people and the free movement allows the breeze to cool the walls.
- Additional shade using a reflective bubble-wrap product like Air Cell. Slinging it under a pergola polycarbonate roof will drop floor temperature by 2 degrees.
- East and west shading is important, and Air Cell can be hung vertically and secured with small metal clamps available from hardware store. The clamps make for easy removal on cooler/darker days.
- East/west roller shutters (white is best for direct sun) are brilliant on east and west windows to keep the sun off the glass. If you don't like the look of shutters, put them up after the sun is down.
- Roller shutters in the shade, will be the same temperature on both sides as there is a large hole inside the box that takes the shutter. Although they are advertised as having insulation inside the strips. They are not closed to outside air.
- Shading north walls in summer requires the eaves to be 50% of the wall height.

Below – shade photo – across the south (front) of the house to the carport and under a pergola. Butterfly clips on shade cloth run on stainless steel wire. Wire hooks onto stainless hooks. Shade can be pushed back to let more light into the house on cloudy days and for winter.



Above – shade from the house to the carport is suspended using butterfly clips and stainless steel wire.



Above - Shade along pergola sides, similar mounting to above. Note boxes for PVC clear roller blinds.



Above - on north side shade breeze-way outside bedroom 1 with white roller shutter and double-glazed hopper window. Note the upside-down steel guttering to form a rail – shade and guttering is taken down over cooler months. Note you can see the corner of a wicking bed for herbs and raspberries canes down the side of the house.

The shades have been used for over 20 years. The horizontal centre rail is an upside-down steel gutter. All shade around the house and this gutter is completely removed from April to November.



Above - East side breeze-way with simple supports.

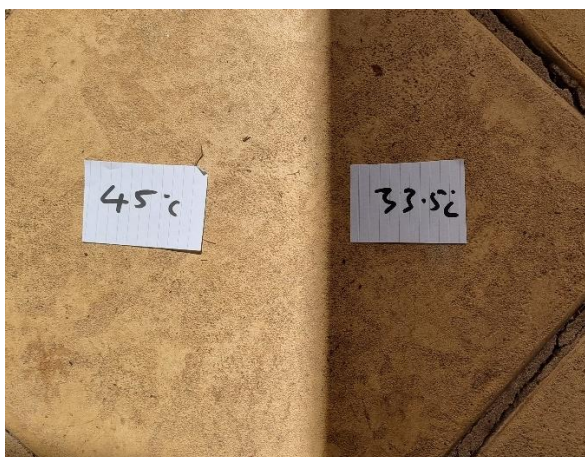
More Summer -

- Roof colour. !! A white roof will reflect sun heat, and the roof and attic will be cooler in summer. A black roof will cause the attic to be 10 to 15 degrees hotter on a hot day. Black roofs will add insignificant warmth to the attic in winter as winter sunlight is lower angle, less hours and weaker than summer sun. As the roof has air movement, any gained warmth will not reach the ceiling. Solar panels will put the roof in shade.
- Regardless of roof colour, if I had a flat ceiling, I would have 2 times the recommended roof insulation, it WILL keep the house warmer and cooler. And an “air cell” layer under the roof will help stabilise the attic temperature.
- Set air-conditioner to 23 degrees C or above, not 22 degrees or below. (Even 23 degree feels cool.)
- We cook outside on hot days to save heating the house (even a kettle for a cup of tea).
- We have reduced our gas use for cooking by putting an induction plate (needed 15-amp circuit) and air-frier above the gas burners (which have not been used for 18 months).

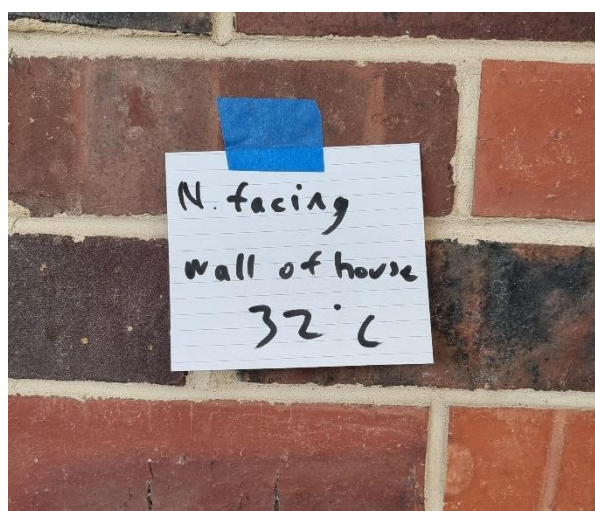
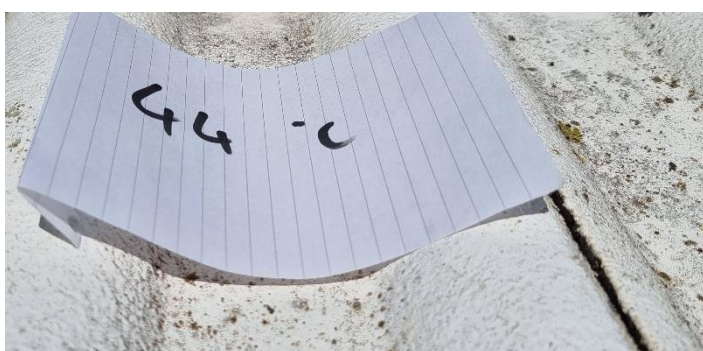


- We have an induction plate, microwave and oven (for bread) outside to reduce heating the house in summer.
- Regarding induction plates – You can buy 10-amp versions (for camping) but for serious cooking you need a 15 amp, larger diameter heater and test different cooking pots. (We use cast iron pans and SolidTeknics Noni stainless steel). (Electric oven and induction plates might require 3 phase wiring.)

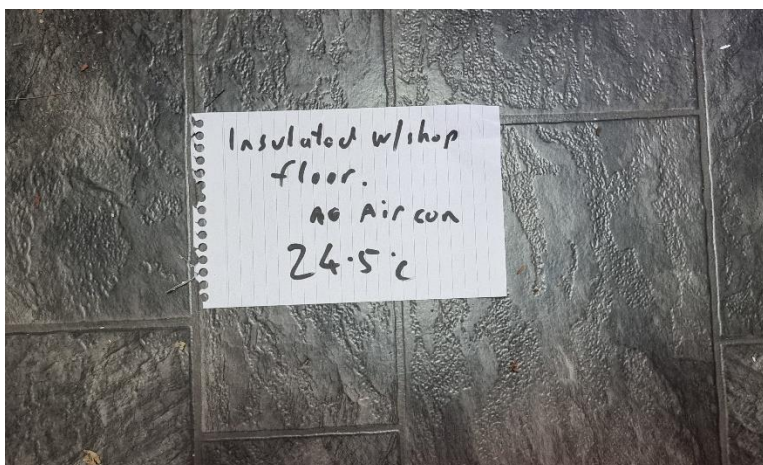
White vs dark materials and shade – Wed 12th March 1pm BOM temperature = 32.5C. Some comparisons below:



Above- Black and white ceramic tiles in the sun for 1 hour. Sunlight coming across paving (shading is important).



White roof tiles 44C (had sun for 5 hours). North-facing (dark) brick wall of house is under shade from eaves 32C.



Workshop floor temperature 24.5 degrees. Workshop has a white Colourbond roof with roof and wall insulation.

From the above, shade and material colours are important considerations. E.g. a black roof requires an additional R1 roof insulation over a white roof for the same indoor summer comfort.

Winter – simply insulate, close air gaps, double glazing and heavy to-the-floor drapes with pelmets.

- Store shade systems away, winter is when we have low angle sun in the north and no SE or SW sunlight. Trees and buildings might impact sunlight on your house but try to get maximum sun into the north windows then at night, shut the window down with heavy inside drapes and pelmets (as single glass windows with no coverings are basically transparent to heat transfer.). Pelmets (with a horizontal shelf above the curtains and cell blinds) stops heat rising behind the curtains. This still air provides insulation and stops heat loss against the cold glass.
- Good quality Argon-filled double-glazing works well. An additional e-glass layer on one internal surface adds more R value to the window.
- Set air-conditioner to 18 - 20 degrees C. An air-conditioner blowing air will feel cool on the skin, so direct the A/C cool air to the ceiling or put a jumper on, don't wind the A/C up.
- We had a column gas heater put inside an outside wall in the early years. But I later discovered that it leaked lots of heat to the outside wall. So, I had an internal gas heater installed. That went during Covid and now it's a log fire or reverse cycle air-conditioning.
- Our pergolas have polycarbonate roofs with adjustable shade (for summer) and clear plastic blinds (for winter) making the outside areas pleasant for most of the year.

If you have solar panels and are on a low export tariff, use your appliances during the day – dishwasher, slow-cooker, washing machine. This will use **your** electricity instead of power from the grid at night. Use low-level air-conditioning during the day even if you are not home, and you may not need air-conditioning at night (in summer use a small fan).

Try to have internal thermal mass like tiled or terrazzo floors (removing carpets and rugs helps improve the thermal mass as carpet is an insulator) or internal brick walls. We have double brick so thermal mass in the walls (but it is only R1 and leaks heat and cold), but the floor is wood, so no thermal mass there.

Replace all incandescent and CF lighting with **LEDs**. Down lights only light the floor and therefore more lights are needed to light a room. A 4Mx4M room would need 4 down lights (50w halogen (200 watts of heating in summer) or 10w LED) but the room could be adequately lit with a centre (not so sexy) room light (LED 15W). And, don't forget to turn off the lights and other not needed electrics when you leave the room. Remote control anything (from a phone for example) uses more power as the remote receiver is always on, waiting for a command.

Water – We have 76,000L of rainwater tanks, wicking beds for vegetables and herbs (at the east side of the house) and we compost all kitchen waste.



Small house 131sq M, but, the small passage-way helps for bigger rooms. This passage feeds two bedrooms, laundry, toilet, bathroom and 4 full-height cupboards. There is even under-floor staoage.



One last idea for washing-up by hand – instead of using a petroleum-based liquid (which takes a heaps of water to disperse), use Velvet laundry soap. Wet the plate/dish/cutlery put some soap on your fingers and wipe over the article to be washed. Then rinse. – Less water, no plastics and no oil-slick. It's also good for your hands.

Well done if you got this far. I hope there was something useful.

Useful web links

- <https://www.yourhome.gov.au/>
- <https://yess.net.au/>
- <https://www.sa.gov.au/topics/energy-and-environment/using-saving-energy>

