

Passive Solar Design

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Essential Elements of a good energy efficient house on the South Coast of WA

1. **Orientation** – orient the long axis of the house east-west within 15°
2. **Floor** - Concrete slab on ground – Excavate, cut and fill, retaining walls, anything to keep the house firmly in contact with the ground, avoid stumped floors.
3. **Exterior walls** – Low maintenance insulated exterior masonry walls-double brick, reverse brick veneer, stone faced brick over polystyrene
4. **Interior walls** - masonry interior walls-brick, mud brick, rammed earth, stone any material that is heavy and will therefore store heat and cool.
5. **Windows** – maximize on the north, around 15% of floor area in north facing windows.
 - a. Minimize on the east and west to reduce summer gain
 - b. Use timber or PVC windows if possible to reduce heat loss through high conductivity of metal windows.
6. **Ceilings** – make ceiling space as big as possible to make insulating and re-insulating easy.
 - a. For a raked ceiling provide at least 100mm space for the insulation to bulk out.
 - b. Include some high north facing clerestory windows if possible.
 - c. For good natural light make sure no part of the interior is more than 4m away from a window.
7. **Verandahs** – none on the north side and keep them to a minimum elsewhere to maximize natural light to the interior.
8. **Laserlite and other clear sheeting** – should **never** be used over the north windows because excessive reflection and refraction will stop most of the winter sun from entering the house.
9. **Roof** – include some north facing roof to take solar hot water service and future photovoltaic solar cells.
10. **If you have to have 2 storeys** –
 - a. Make the upper floor a suspended concrete slab for thermal mass
 - b. Have masonry walls upstairs, consider making the house smaller to pay the extra cost!
 - c. Separate the upper and lower floor with a door to the stairs.
11. **Avoid mezzanine floors** overlooking lower floors they are heat gobblers.
12. **Ceiling heights** – keep to a minimum. If raked, the ceiling height should be about 4.2m max.
13. **Clerestories** – Include north facing clerestories. Windows viewing the sky will give 3 times more natural light than windows looking onto terrestrial objects.

PTO



Larger trees to the south as wind break and summer shade

NOTE - Resist the temptation to add shelter to the front of the solarium or north windows with glass, 'Laser Light' or other sheeting as this will greatly reduce the amount of heat gained by the sun in mid winter due to reflection caused by inevitable dust buildup and the low angle of the winter suns rays.



Orient the house with the long access running east to west in order to provide large north windows.

Insulate exterior brick cavity walls with Aircell. Avoid solid exterior walls due to their low insulation value.

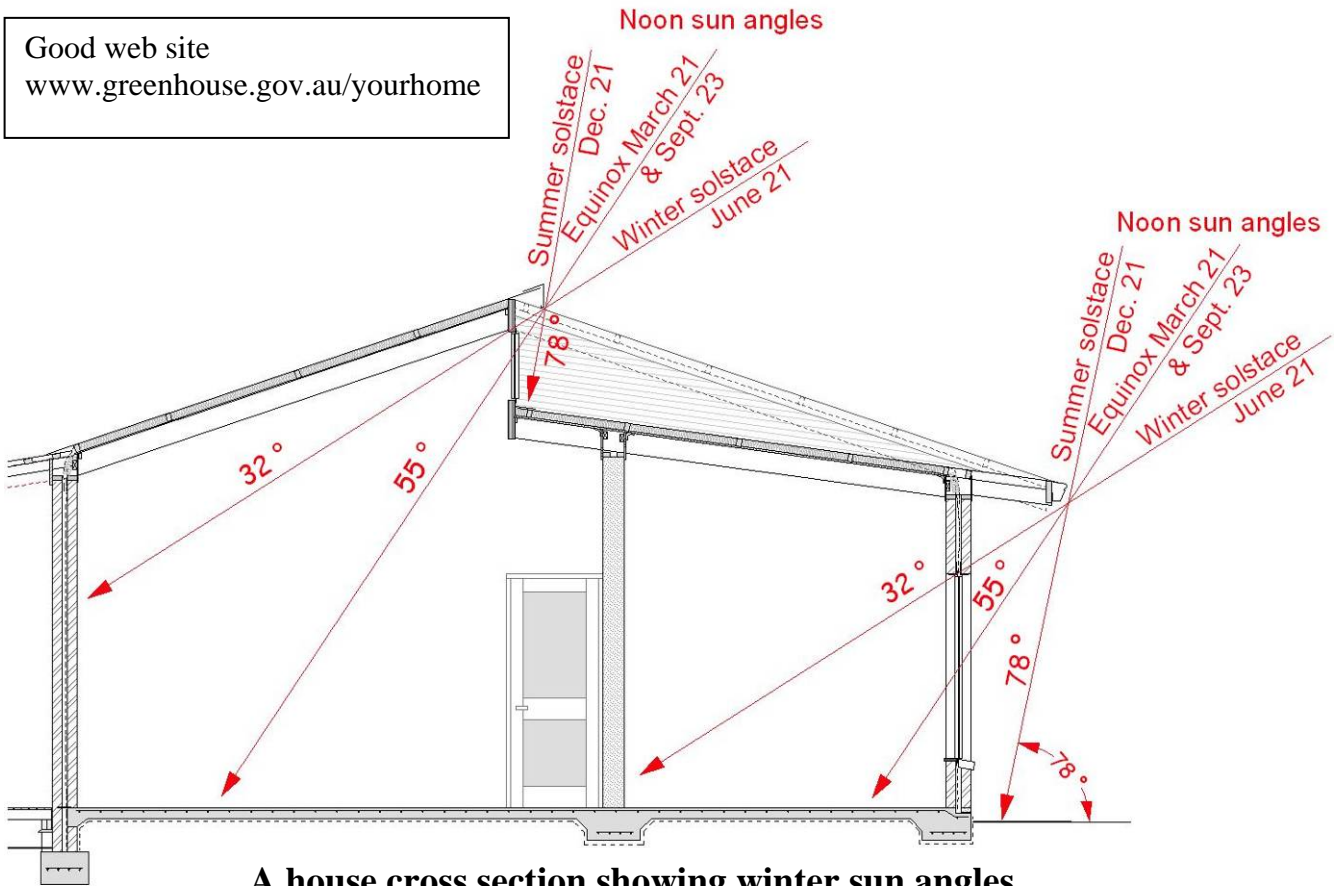
NORTH WINDOWS - The area of north facing windows should be up to 17% of the total floor area of the house assuming the house has high thermal mass.

THERMAL MASS - The more mass in the building the better. eg brick internal walls, concrete floor, internal fish ponds, stone fire place etc. Effective thermal mass must be insulated from the exterior avoid solid rammed earth, mud brick or stone external walls.

Passive Solar Basics

Shadows shown are for sun at noon winter solstice

Good web site
www.greenhouse.gov.au/yourhome



A house cross section showing winter sun angles